Statutory Report on Wildlife

to the

Nunavut Legislative Assembly

Section 176 of the Wildlife Act

August, 2013

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Statutory Report on Wildlife to the Nunavut Legislative Assembly

A. Introduction

The Government of Nunavut (GN), through the Nunavut Land Claims Agreement (NLCA) and the *Wildlife Act*, has legal responsibility for managing wildlife and wildlife habitat in Nunavut through research and monitoring, harvest management, habitat management, land use planning and environmental impact assessment. The GN's Department of Environment (DOE) Wildlife Division carries out these activities.

In Nunavut these projects and programs are handled in a collaboration rather than top-down programming. The NLCA decision process specifies how wildlife management decisions are made. Co-management partners work together and apply the best available Inuit Qaujimajatuqangit (IQ) and scientific knowledge. These two different sources of information complement each other and offer information at different scales and from different perspectives that contribute to a full understanding of Nunavut's land and wildlife.

The responsibility for stewardship of the land is shared by many organizations and individuals in Nunavut. This includes Inuit organizations, land and resource boards, wildlife co-management organizations such as the regional wildlife organizations (RWOs) and hunter and trapper organizations (HTOs) and several levels of government. This "co-management" system makes Nunavut a world leader in dealing with the complex relationships among traditional lifestyles, modern conservation practices, and industrial development.

Effective co-management of Nunavut's wildlife is particularly important during Nunavut's rapid growth in population and the resulting changes to the landscape. Nunavut's abundant wildlife resources have sustained Inuit for generations. However, the impact of increased human numbers and development must be managed if traditional harvest practices are to persist for future generations. All co-management partners play a role in ensuring the long-term sustainability of Nunavut's diverse wildlife populations. Nunavummiut depend on wildlife for the health and well-being of their families and for their unique way of life.

Conservation governance occurs at local, territorial, national, and international levels. At each of these levels a different set of competing interests and values (e.g., political, economic and

social factors) come to play. Reconciling these many perspectives requires sound and reliable information as well as a responsive and functional governance system. Nunavut's co-management system facilitates sound use of wildlife resources and good land-use planning practices which reduces conflict between Nunavut's traditional users and the mainly southern and mainly urban national and international conservation community. Our co-management system encourages a balance between environmental protection, sustainable harvesting and industrial development.

To meet this goal, the DOE Wildlife Division gathers the necessary scientific information and associated Inuit Qaujimajatuqangit (IQ) to support the planning and management of Nunavut's wildlife and habitats. We consult with our partners in wildlife management that include Elders, local users and people holding IQ, the Nunavut Wildlife Management Board (NWMB), Hunters and Trappers Organizations (HTOs), Regional Wildlife Organizations (RWOs) and other Inuit organizations, to make joint decisions that support the sustainable management of our wildlife. Some species move across borders into other territories, provinces, or countries. In such situations DOE works with neighboring jurisdictions (e.g., Greenland, Quebec, Ontario, Saskatchewan, Newfoundland, Manitoba and the Northwest Territories) to ensure that appropriate wildlife management decisions and environmentally sound projects move forward.

This report is an update of activities in DOE's Wildlife Division that have taken place since the previous report. It outlines progress in the leadership role Nunavut has created for itself with its collaborative processes and makes recommendations for future activities.

B. Executive Summary

Statutory Report on Wildlife to the Nunavut Legislative Assembly
Section 176 of the Wildlife Act April, 2013

This report on Wildlife to the Nunavut Legislative Assembly from the Department of the Environment (DOE) Wildlife Division includes reviews of the co-management system, its successes and challenges, trends and forecasts for wildlife resources. Descriptions of research projects carried out in the three regions and with particular species are included. These contain a description of methods for gathering information about wildlife to help make co-management plans and decisions.

Co-management

In the past few years, there have been many successful co-management initiatives. They have included information and support from GN scientists, Inuit Qaujimajatuqangit (IQ) holders, Elders, Hunter and Trapper Organizations (HTOs) and Regional Wildlife Organizations (RWOs), other governments and Nunavut Tunngavik Incorporated (NTI), all of whom are essential components of a unique system to conserve wildlife in Nunavut for the benefit of Nunavummiut. Information gathering and decision-making are improving to better support the needs and priorities of Nunavummiut. These improvements include assisting with the development of industry (particularly exploration and resource extraction) for the economic benefit of Inuit in ways that reduce or prevent negative impacts from this type of land use.

Research and management planning for caribou and muskoxen

Research includes monitoring, estimating population numbers, and analyzing all available information to best support good decision-making. DOE has carried out population surveys for a range of species using a wide range of methods. The size of the Territory, combined with its general lack of transportation infrastructure, creates many challenges when assessing all populations. Inuit hunters help by providing information they gather when harvesting, assisting in the surveys, and sharing their knowledge of the land and its wildlife.

Where there are indications of population declines (e.g., decline of caribou on Southampton Island), best management practices requires detailed, up-to-date information. In 2012, caribou harvest levels on Southampton Island were deemed to be unsustainable due in part to caribou

being harvested and sold over the internet using subsidized country food shipping programs, and to the prevalence of brucellosis, a disease that affects reproductive success. Other caribou herds that require increased monitoring and management are the Dolphin and Union caribou, classified as Special Concern under the federal *Species at Risk Act* (SARA), Baffin Island caribou, and the Peary caribou, which were designated as Endangered under SARA in 2011. Diseases such as brucellosis and foot rot are infecting some caribou herds. These require more monitoring and testing. Additionally, work is required on predator/prey interactions, specifically how wolves and grizzly bears use caribou calving grounds and how this impacts caribou populations. While Inuit are an integral part of the arctic ecosystem, the population of Inuit is increasing disproportionately to the production limits of wildlife for basic country foods needs. As communities continue to grow, those needs will exceed the sustainable limits of wildlife such as caribou – such as currently may be the case for Baffin Island caribou based on 2012 South Baffin survey results.

Many muskox populations are increasing. There are some communities where caribou numbers are very low, where HTOs are encouraging more harvest of muskox to reduce the pressure on caribou populations and allow the caribou numbers to increase again. More co-management planning is required to understand and mitigate impacts from proposed resource exploration/extraction on this species and their current and historical habitat.

Polar bears, grizzly bears and wolverines

Nunavut manages or shares management of 12 of the world's 19 polar bear subpopulations using a sustainable harvest system. Total Allowable Harvest (TAH) levels are set for each subpopulation and closely monitored and managed. If the number of polar bears that are harvested exceeds the TAH in a given year, the TAH the following year is adjusted to compensate.

Barrenland grizzly bears have very large home ranges and exist at low density, which makes them difficult and expensive to study. They are vulnerable to over-hunting because their life history strategy relies on long life for adults. Information is being collected from harvested animals and from genetic hair snagging, and a traditional knowledge study is underway.
The number of grizzly bear and polar bear/human encounters appears to be increasing in some areas. DOE's Wildlife Operations Section is working with communities to develop and implement community bear management plans to help avoid bear encounter issues and

minimize bear mortalities. Two new programs for Wildlife Damage Prevention and Wildlife Damage Compensation were implemented in the fall of 2012.

Wolverine research is carried out on harvested carcasses which are provided to the Research Section by hunters. Numbers to date indicate populations are abundant and productive, and meeting harvest demands. Further research is needed to determine if increasing resource development on the tundra may affect the species survival.

Education and research programs

Conservation officers carry out many educational programs in the communities where they are stationed. They provide school presentations, community workshops, radio announcements and posters. They also answer people's questions about legislation that they enforce and run courses to help harvesters with fur and pelt handling.

Some informal education programs have begun to encourage young people to learn about wildlife and its management by including them in survey work. Aerial surveys have offered opportunities for Inuit hunters to learn about this type of observation and help determine population numbers, range and occupancy of their habitat. In other studies, Nunavummiut provide valuable support to ground-based research projects on raptors and ungulates. To learn about Nunavummiut priorities with respect to wildlife, DOE has carried out three public opinion polls over the past several years. They were planned to determine people's preferences and priorities for polar bears and caribou. As well, public perception of DOE was sought and obtained with the responses indicating more work is required to improve awareness of and trust in DOE's work.

The size of the territory, remote nature of the work, complicated logistics, and limited field seasons make research and monitoring more difficult and expensive in Nunavut than in other jurisdictions. As both development pressure and the demand for healthy, reliable country food continue to increase, so also does national and international oversight of our conservation programs. Although Nunavut makes a strong financial commitment to its wildlife research and management programs, over half of the resources required to sustain existing program is raised through grants and partnership funding with other agencies, universities, environmental non-governmental organizations (ENGOs), and private industry.

There is a need for increased species and ecosystem monitoring and to enhance co-management activities for terrestrial wildlife in Nunavut. Notwithstanding these challenges, the Wildlife Division will continue and redouble its efforts to provide reliable and timely information to guide sound conservation practices and establish effective environmental protection measures.

1. Wildlife Division Roles and Responsibilities

The Government of Nunavut has a legal mandate for the management of terrestrial wildlife species in Nunavut. DOE's Wildlife Division fulfills GN obligations within Nunavut's *Wildlife Act*. It also fulfills GN responsibilities under a wide range of federal legislation and both national and international agreements and conventions, including on-going responsibility for the co-management of Nunavut wildlife as obligated under the NLCA.

One of the primary goals of the Division is to achieve a balanced approach to wildlife management that meets legislative requirements, uses both Inuit Qaujimajatuqangit (IQ) and science, reflects the values and needs of Nunavummiut, and contributes to the continued persistence of wildlife in Nunavut.

The Division's objectives are to provide current and reliable information from various sources (including Inuit Qaujimajatuqangit and in-house scientific research) and make management recommendations to co-management partners in order to make effective but not overly restrictive wildlife management and land use decisions. Other objectives are to develop wildlife management plans with co-management partners in order to protect wildlife populations, meet national and international obligations, provide support and resources to co-management partners and harvesters, and ensure legislative and regulatory compliance through education and enforcement.

Partners in this unique system of wildlife management include the Nunavut Wildlife Management Board (NWMB), Hunters and Trappers Organizations (HTOs) and Regional Wildlife Organizations (RWOs) and Nunavut Tunngavik Incorporated (NTI). Although co-management partners have their own processes and projects, we all work cooperatively towards developing policy and influencing decisions on wildlife and habitat protection, food security, economic potential, and the continued use of wildlife in traditional lifestyles and economies.

2. Wildlife Division Organization

Research Section

The Wildlife Research Section is decentralized and regionalized. The Research Section is based in Igloolik with regional offices in Kugluktuk, Arviat, and Pond Inlet. Nine full-time biologists and a social scientist report to the Manager of Wildlife Research, with seven full-time technical staff supporting regional and species-specific projects, policy and legislative issues, collection and incorporation of IQ, and public opinion research. Additional personnel are hired seasonally to support field and laboratory work. Contractors are also used when specialist expertise and laboratory analysis are not available in Nunavut.

Operations Section

The Wildlife Operations Section is similarly decentralized with four regional wildlife managers reporting to the Senior Manager Wildlife Operations who in turn reports to the Director of Wildlife Management. Under these managers for South Baffin, North Baffin, Kivalliq and Kitikmeot, there are nine Level 3 Conservation Officers (CO3s), 21 Level 2 COs, one Manager Trainee, one CO Trainee and three Wildlife Clerks. The Coordinator Regulations and Operations reports to the Senior Manager, as does the Wildlife Deterrent Specialist.

3. *Wildlife Act* and Regulations

The Nunavut *Wildlife Act* [S.Nu. 2003, c.26] came into force in 2005. The Department of Environment is responsible for fulfilling GN responsibilities under the Act. According to the Act its purpose is "to establish a comprehensive regime for the management of wildlife and habitat in Nunavut, including the conservation, protection and recovery of species at risk, in a manner that implements provisions of the Nunavut Land Claims Agreement (NLCA) respecting wildlife, habitat and the rights of Inuit in relation to wildlife and habitat. [Section 1 (1)]"

Extensive work on the part of all co-management partners has gone into the development of the comprehensive regulations package required to fully implement the new Act. However, regulations required to fully implement the new *Wildlife Act* have not yet been enacted.

4. Update on Nunavut's Wildlife Co-Management System

4.1 Nunavut's Wildlife Co-Management System: An Overview

Pursuant to the NLCA the responsibility for managing wildlife and its habitat is shared by many organizations and individuals. This includes Inuit organizations, land and resource boards established under the NLCA, wildlife co-management organizations such as the RWOs and HTOs, as well as several levels of government. Within Nunavut there is a commitment to working closely and collaboratively to ensure effective co-management through land-use planning, environmental impact assessment and wildlife management at the territorial, regional and community levels.

4.2 Progress Report: Wildlife Co-Management

The overall goals of the co-management system are to be governed by and implement the principles of conservation, fully acknowledge and reflect the primary role of Inuit in wildlife harvesting, and to serve and promote the long-term economic, social and cultural interests of Inuit harvesters. Additional goals include integrating the management of all species of wildlife as far as practical and inviting public participation while promoting public confidence, particularly among Inuit.

Two public opinion polls conducted in most Kivalliq communities provide some of the best available information on public perceptions of the wildlife management system. These polls showed a wide range of opinions held by the public with elders and conservation officers held in highest regard and trust. At the same time, the public feel that bureaucrats' and legislators' performances can improve.

4.3 Wildlife Co-Management: Successes and Challenges

Successful co-management can be defined as multiple stakeholders with common interests working together toward the same goals and objectives. There is shared power and shared decision-making resulting in long-term sustainability of Nunavut's wildlife resources, using best available knowledge for wildlife decision-making. Success is measured not only by the outcome of specific projects, but also by reduced conflict between wildlife co-managers due to shared

understanding of roles, approaches, and interests that complement each other to achieve common goals. Ultimately, success occurs in achieving long-term sustainability of wildlife through communication, consensus and informed decision-making.

Achievements

2009 Wildlife Symposium: In 2008-2009, a Nunavut-wide Wildlife Symposium was organized by representatives from NTI, NWMB, the Nunavut Inuit Wildlife Secretariat (NIWS) and DOE. Its purpose was to bring territory-wide representatives from all co-management organizations together, to develop constructive communication about the most important issues related to Nunavut's wildlife.

Every aspect was jointly planned. Elders, HTO representatives, RWO representatives, NWMB representatives, government officials, biologists, and NTI officials met both formally and informally to review and discuss presentations on a wide variety of topics. A number of recommendations were presented. There were four main themes recurring throughout the meeting. Everyone recognized that each partner plays an important role in achieving these shared objectives:

1. It is important to have Inuit doing research and being directly involved in research projects to ensure true collaboration.
2. Finding alternatives to handling wildlife in research using innovative, non-invasive ways to conduct research must be a focus.
3. Research and monitoring are crucial aspects of Nunavut's wildlife management system and require as much knowledge/information as possible to make wise co-management decisions for harvest and land-use.
4. Communication and coordination needs to improve between all wildlife co-management stakeholders. Working together is a major priority.

Communications and Outreach Programs: In 2008,an Environmental Education Specialist position was created within DOE's Policy Division, to generate effective and engaging public communication, education and outreach, including a variety of educational materials and programs to raise awareness.

Elders Advisory Committee: In 2009, an Elders Advisory Committee was established with nine Qaujimanilik - three elders from each region appointed for their wisdom and expertise in the

area of wildlife and environment. This committee meets at least twice a year to advise the Minister about IQ related to wildlife, harvesting and management.

Participation in Workshops, Meetings and Research: Since the Wildlife Symposium, the Division has worked to improve communication and participation with all partners. There have been many collaborative meetings and workshops to develop community-based species-specific management plans (for example, the Kivalliq region muskox management plan and the draft Peary caribou management plan). Advice from NTI, HTOs, RWOs, and the Elders Advisory Committee is continually being sought to incorporate IQ and Inuit information into prioritizing, planning, and carrying out research and monitoring initiatives.

Inter-Jurisdictional Agreements and Partnerships: Nunavut shares the management of many populations of wildlife with neighboring jurisdictions. A number of Agreements and Memoranda of Understanding (MOUs) have been developed or initiated with the appropriate governments or management organizations. These include the MOU that created the Canada-Greenland Joint Commission on Polar Bears, as well as inter-jurisdictional agreements between Nunavut and NWT for caribou and polar bear management, and between the Territory and the Beverley and Qamanirjuaq Caribou Management Board.

Nunavut Caribou Strategy: Every community in Nunavut was asked to participate in developing the Caribou Strategy. Wildlife co-management partners at the community, regional and territorial levels had direct input, as did other stakeholders, including industry. The Strategy is based on an IQ framework using a variety of activities that stakeholders believe are priorities for ensuring the future of caribou.

Social Science Research: In 2007, a new position for Social Science Research was created to improve the Research Section's ability to focus on human activity in all aspects of wildlife management. This researcher- a beneficiary of the Nunavut Land Claims Agreement - is conducting research to gauge public interests, participation and confidence in Nunavut's wildlife management system and also studying Inuit and hunter knowledge. Three separate projects have provided information for management of the Davis Strait polar bear population, the western Hudson Bay polar bear population and the Southampton Island caribou population.

Challenges

All partners in any co-management system face some difficulties in fulfilling their mandate. This is true as well in Nunavut where many partners continue efforts towards consensus and working collaboratively to conserve wildlife. A rapidly changing environment demands more research and monitoring with limited funding and personnel. Despite the challenges, through collaboration, partners continue to find ways to advance important issues.

Co-management partners have indicated a need for more financial and human resources for all organizations in wildlife co-management, including HTOs, RWOs, NWMB, NTI and DOE, to meet the demands of large monitoring and research projects and to prepare for and participate in the meetings and workshops which inform decision-making.

Overcoming the misunderstanding that IQ and science are incompatible or that scientific studies attempt to replace or supplant IQ are important goals. As well, understanding and overcoming any apparent or real differences between national/international obligations and local interests might speed decision-making and acceptance of these decisions outside of Nunavut. Efforts to improve consultation and collaboration between industry and wildlife co-managers are also needed to further advance Territorial goals.

5. Trends and Forecasts for Use of Wildlife Resources

Nunavut's human population is increasing by a growth rate that is much higher than the national average. GN strategies, and working groups such as collaborative Nunavut Roundtable for Poverty Reduction are looking at ways to deal with widespread poverty and food insecurity throughout the Territory. They promote harvesting and the use and distribution of country foods. While food security and the preservation of Inuit cultural harvesting traditions is of key importance, it is important that wildlife co-managers and other agencies work together to come up with innovative solutions to challenges related to the use of wildlife. The collaborative processes already established, both legally and socially are integral to addressing these challenges.

Nunavummiut highly value country food and the demand for harvest activities that contribute to this traditional way of life are expected to remain constant or increase. The NWMB's 2004 Harvest Study was originally intended to help the NWMB establish Inuit basic needs levels for wildlife, assist with TAH allocations and contribute to "s*ound management and rational use of*

wildlife resources." It was the most comprehensive estimate of actual harvest levels in the territory, but is no longer current.

Table 1 provides an estimate of average annual harvest levels for Nunavut wildlife. GN harvest information is incomplete, with comprehensive harvest records for only grizzly bears, polar bears and muskoxen. Reliable estimates of the current (2013) demand for most wildlife are not available. Recommendations have been made for mandatory harvest reporting for species with harvest controls. As well, reporting selected species that are important ecologically, culturally and/or economically would assist with more accurate estimates for harvest forecasts.

Table 1: Estimated average annual harvest levels for key wildlife in Nunavut

Values for caribou and muskoxen were taken from the NWMB Harvest Study and show only subsistence harvesting. Commercial and sport hunt levels are small in comparison. Values for wolverine, grizzly and polar bears were taken from the most recent harvest records (averaged between 2007/2008 – 2011/2012 for polar bears and the 2011/2012 harvest season for wolverine and grizzly bears). The "harvest" values include all anthropogenic removals including harvest, accidental, illegal, and defense kills.

Wildlife Population	Qikiqtaaluk	Kivalliq	Kitikmeot	Total
Barrenground caribou Mainland	2534	17489	3773	21515
Barrenground caribou Baffin Island	7825	0	160	8008
Peary caribou	54	0	1	55
Dolphin-Union caribou	--	0	2150	2150
Reindeer	23	0	0	23
Mainland Muskoxen	1	114	80	195
Victoria Island Muskoxen	-	0	50	50
Arctic Island Muskoxen	41	0	25	66
Polar Bears[1]	311	54	51	447
Grizzly Bears[1]	0	21	9	30
Wolverine[2]	3	42	60	105
Fox[3]	308	2754	617	3679
Wolves[3]	6	298	127	431
Raptors	0	0	0	0
Arctic Hare	653	43	75	771
Arctic Ground Squirrel	3	4	557	564
Ptarmigan	10111	1882	393	12386
Snowy Owl	1	1	0	2

[1]Based on reported harvest, average from July 2007 to June 2013.

[2]Data obtained through the carcass collection program are based on voluntary reporting, so harvest numbers should be considered as the minimum harvest. Based on carcass collection program, average from July 2007 to June 2013.

[3]Fur sales, April 2010 to March 2011.

5.1 Trends in Polar Bear Harvest

There are 12 subpopulations of polar bears, either shared or entirely in Nunavut, which are harvested by all 25 communities. All human-caused mortalities (for example, regular, sport, defense, accidental and illegal kills) are recorded for each subpopulation. The total number removed is regulated by a sex-selective quota system that allows maximum sustainable harvest rates and accommodates any over-hunting with a resulting harvest reduction the following year.

The average annual removal of polar bears in Nunavut from all subpopulations over the past six years was 447. The level of harvesting is estimated to be sustainable in all Nunavut subpopulations, with the exception of Baffin Bay and Kane Basin (jointly harvested with Greenland) where sustainability is uncertain, and Southern Hudson where the combined removals by all jurisdictions that share the harvest from these populations may be unsustainable. Both Nunavut and Greenland significantly reduced Total Allowable Harvest rates for Baffin Bay and Kane Basin over the last several years to address the concern of possible overharvesting. As noted elsewhere in this paper, a three year study of the Baffin Bay and Kane Basin subpopulations is in its final year and an updated assessment of sustainability should be available in 2014. Preliminary results of a population study conducted in 2012 on the Southern Hudson subpopulation indicate that population estimate has not changed since the last study in 2006. Accordingly, in 2013 the Polar Bear Technical Committee has assessed this population as stable. Discussions between all jurisdictions harvesting from Southern Hudson is ongoing to ensure a joint sustainable harvest is established and maintained..

Polar bear harvesting is an important part of Inuit culture, as well as a potential source of income. Demand for polar bears includes the subsistence use of meat and other parts by Inuit communities, the sale of hides both in Canada and internationally, and sport hunts - a significant source of income in some communities.

The TAH for each of Nunavut's 12 polar bear subpopulations is set at a level that ensures the long-term conservation of polar bears. This will result in a sustainable harvest of the subpopulations for present and future generations of Nunavummiut. Since detailed harvest recording began for polar bears in Nunavut several decades ago communities' harvest levels have been very close to set TAH limits (See Figure 1).

International pressure to change the listing of polar bears from Appendix II to Appendix I (no international trade) of the Convention on International Trade in Endangered Species (CITES) would remove polar bears from the international market but could contribute to illegal hunting. In 2013, Nunavut and Inuit were successful for the second time in demonstrating the sustainability of Canada's polar bear harvest against a proposal by the United States to up-list polar bears under CITES. Informed sources advise that the US will again attempt to up-list polar bears again in 2016. A CITES up-listing would reduce economic benefits from polar bear harvesting and polar bear sport hunts. However, polar bear harvesting would certainly continue as the local human population grows and because polar bear hunting remains an important part of Inuit culture and traditional economy. DOE and our co-management partners across Canada will continue to work to educate world, including animal rights groups and environmental activists, to show that polar bears are managed sustainably and remain abundant and productive.

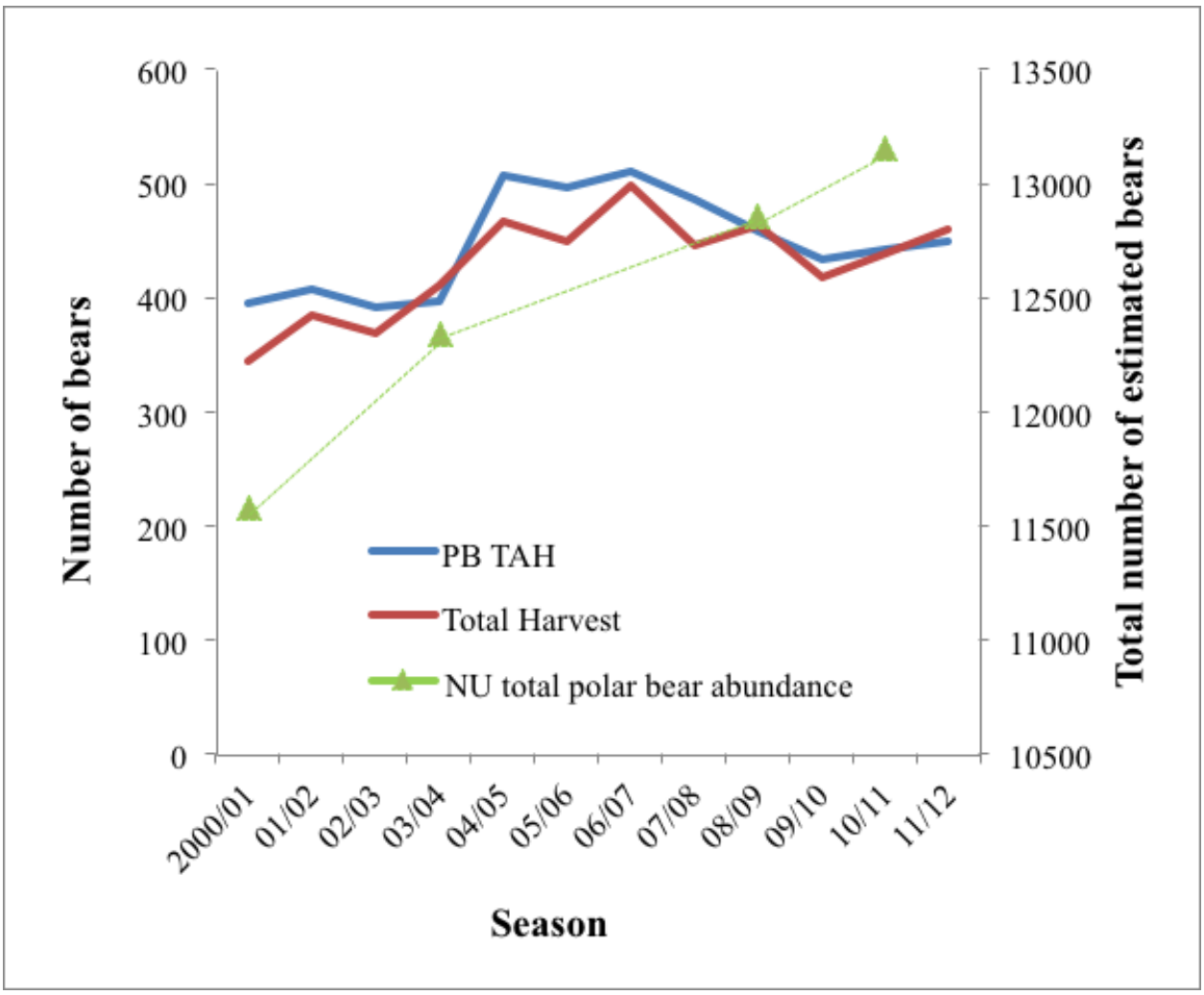

Figure 1. Overview of Nunavut's TAH, the total harvest (left axis), and the estimated total polar bear population abundance within Nunavut between 2000 and 2012.

5.2 Trends in Grizzly Bear Harvest

Grizzly bears occur in the Kivalliq and Kitikmeot regions. Currently there is no TAH on the subsistence harvest of grizzly bears in the Territory. However, pre-Nunavut (NWT) quotas for sport hunting and commercial use of grizzly bear parts were set in 1987 based on past harvest rates. These quotas, and associated non-quota limitations such as prohibitions on the harvesting of cubs and females with cubs, remain in place. The harvest of grizzly bear remained low until very recently. However, a significant and possibly unsustainable increase has been observed in the Kivalliq grizzly bear harvest in the last four years (2008-2012). In 2011, DOE started consulting with the RWOs and HTOs to develop a consensus-based co-management plan for grizzly bears. The HTOs and the RWO support this initiative and have identified local hunting rules to ensure the harvest remains sustainable.

To reduce the number of grizzly bears killed in protecting life and property DOE is implementing community bear management plans and increasing bear safety public awareness. The new (2012) GN Wildlife Damage Prevention and Compensation Programs will help deal with public safety.

6. Capability of Nunavut Wildlife Resources to Meet Anticipated Demands

Nunavut has identified 23 subpopulations of caribou, 12 subpopulations of polar bears and 12 subpopulations of muskoxen. Many of these subpopulations are shared with other adjacent jurisdictions.

Systematic (scheduled intervals) monitoring of the main herds of caribou and muskoxen that provide most of the terrestrial country food to Nunavummiut is limited. Given the recent evidence of declines in several caribou subpopulations consideration needs to be given to increasing the frequency of population assessments, disease monitoring and predator impacts. There is a general GN commitment to a 15-year inventory cycle for polar bears contained in the memoranda of understanding for harvest for each polar bear subpopulation. In Tables 2 and 3, DOE provides estimates of the current ability of some Nunavut wildlife populations to meet estimated needs.

Table 2: Estimated annual demand for the next five years for Nunavut terrestrial species excluding caribou and muskoxen, by region.

*Notes for the three following table**s**:* Species likely to produce more than the demand from communities in their range are designated (+). Adequate, but no surplus is designated as (0). Insufficient to meet the demand is designated (-). UK means unknown and that there is currently no GN research taking place. There are low harvest levels to date but there is also no knowledge of what levels of harvest can be sustained by these species, although there are no indications of shortages.

Wildlife Species	**QIKIQTAALUK**		
	Demand	**Capacity**	**Sufficiency**
Polar Bear	600	304[1]	-
Grizzly Bear[2]			
Wolverine[3]	3	5	+
Fox	UK	UK	UK
Raptors	UK	UK	UK
Arctic Hare	700	UK	UK
Arctic Ground Squirrel	100	UK	UK
Polar Bear	600	304[1]	-

Wildlife Species	**KIVALLIQ**		
	Demand	**Capacity**	**Sufficiency**
Polar Bear	120	54[1]	-
Grizzly Bear[2]	19	10	-
Wolverine[3]	50	50-60	+
Fox	2,754	UK	UK
Raptors	UK	UK	UK
Arctic Hare	200	UK	UK
Arctic Ground Squirrel	100	UK	UK
Ptarmigan	3,000	UK	UK
Wildlife Species	**KITIKMEOT**		
	Demand	**Capacity**	**Sufficiency**
Polar Bear	120	51[1]	-
Grizzly Bear[2]	9	14-16	+
Wolverine[3]	50	160	0

Fox	617	UK	UK
Raptors	UK	UK	UK
Arctic Hare	300	UK	UK
Arctic Ground Squirrel	1100	UK	UK
Ptarmigan	2000	UK	UK

The numbers presented above are based on IQ, expert opinion of professional biologists, published information and interim research results. Note that many of the species populations indicated may also move into other jurisdictions. Harvest requirements from those jurisdictions are not included in these tables.

Footnotes to above Tables:

[1] Numbers are averaged from 2007/2008 – 2012/2013 harvest seasons for polar bears in Nunavut. The estimate for polar bear total capacity to Nunavummiut considered population productivity and the distribution of sustainable harvest between regions and other jurisdictions that share polar bear subpopulations.

[2]Grizzly bears are susceptible to over-harvest due to their slow reproductive rate and negative interactions with people. Increased resource development is considered to be the most serious threat because it will increase mortality due to human/bear conflict. As well, the Kivalliq region has increased its grizzly bear harvest substantially. Under the NLCA Inuit can sell any wildlife harvested legally including grizzly bears.

[3]Wolverine harvest monitoring data shows that the populations are healthy and meeting the minimum demands. Further research is needed to determine whether increasing resource development on the tundra may affect this species' persistence across its range.

Table 3. Forecast annual demand and removal capacity for the next five years for Nunavut caribou herds

Sub-species	Region		Herd	Demand	Capacity	Sufficiency
Barrenground Caribou[1]	**Qikiqtaaluk**		North Baffin[2]	3081	~5000	-
			North East Baffin	1276		
			South Baffin	12833		
			Melville Peninsula	1213	UK	UK
	Kivalliq		Qamanirjuaq Herd[3]	22627	20859	-
			Lorillard Herd	1365	1216	0
			Southampton Island Herd	5674	500-600	-
			Coats Island Herd	200	155	-
		Kitikmeot	Beverly Herd	6457[4]	3720-6200	-
			Wager Herd	5079[5]	2813	-
			Bluenose East Herd	642	5000	0
			Bathurst Herd	214	UK	0
Dolphin and Union Caribou	**Kitikmeot**			2000-3000[6]	2000-3000	-
Island Caribou				223	UK	UK
Peary Caribou	**Qikiqtaaluk**		Northern Ellesmere Island	0	UK[7]	UK[7]
			Southern Ellesmere Island	20		
			Axel Heiberg Island	0		
			Devon Island	8		
			Bathurst Island Group	15		
			Prince of Wales Island	0		
			Somerset Island	0		
Reindeer				40	UK[8]	UK[8]

[1] The demand is based on the NWHS 5-year mean (1996-2001, which is widely believed to have under-estimated the true harvest) plus 7% as an estimate of community growth. Reporting caribou harvest is not mandatory, so this is the only source of information available.

[2] Except for caribou harvested on the mainland by Igloolik and Hall Beach residents, all barrenground caribou harvested in the Qikiqtaaluk region are found on Baffin Island. Decline in caribou numbers has been reported by HTOs but no population surveys have been completed in north Baffin. Survey data for southern Baffin Island obtained in 2012 indicates that caribou are greatly reduced in numbers there.

[3] This estimate includes an estimate of 3,500 combined harvest demand from the neighboring jurisdictions of Saskatchewan and Manitoba, plus an estimate of 6,000 caribou sold to Baffin Island in recent years through the internet.

[4] This estimate is broken down as follows: 1488 from the Kivalliq region, 1647 from the Kitikmeot region, 2877 from Saskatchewan, and 445 from NWT.

[5] This estimate represents 2573 for Kivalliq and 2056 for Kitikmeot.

[6] This is a minimum demand for the current number of caribou harvested, because requests to increase commercial and sport-hunting tags are denied due to possible over-harvest of this herd.

[7] There has been no number set for sustainable harvest of Peary caribou. This will not be set until the co-management plan has been completed. Some subpopulations may be too small to support harvesting. There is uncertainty about the actual numbers of caribou harvested.

[8] Some residents of Sanikiluaq have raised concerns about the management of reindeer harvesting in the Belcher Islands. A ground survey was conducted in winter 2012 to update the status of this population.

Table 4. Forecast average annual demand and removal capacity for the next five years for muskox subpopulations across Nunavut

Region	Subpopulation	Demand	Capacity	Sufficiency
Qikiqtaaluk	Northern Ellesmere Island[1]	0	199[2]	+
	Southern Ellesmere Island	17	6[2]	-
	Axel Heiberg Island[1]	0	101[2]	+
	Devon Island	4	9[2]	+
	Bathurst Island Group	3	1[2,3]	-
	Prince of Wales Island	6	6-21[4]	+
	Somerset Island		29[2]	+
Kivalliq	Central Kivalliq	93[5]	182	+
	Northern Kivalliq	21	90	+
Kitikmeot	Victoria Island	Subsistence: 100-175 Commercial: 350-400[6]	1500	+
	Arctic Islands	22	24	0
	Mainland - Western Kitikmeot	60-80	80-95	+
	Mainland - Central Kitikmeot	25-35	150	+
	Mainland - Eastern Kitikmeot	40	151	+

[1] This remote area is not currently harvested by any residents of Nunavut.

[2]Muskoxen in the high Arctic are susceptible to abrupt changes in population size resulting from die-offs and loss of additions due to unpredictable severe weather events. A co-management plan that includes a monitoring program of population status and harvest levels is under development.

[3]The Bathurst Island Group includes Cornwallis Island, but the capacity estimate only applies to Bathurst Island as the last estimate (done in 2002) of muskox numbers on Cornwallis Island was 12.

[4]The first number implies that the population of Prince of Wales would have kept declining at a 60 percent rate since the 2004 survey, and the second implies that this population has remained stable since 2004.

[5]An exemption permit was issued in 2011 to increase the TAH of this population to 182 muskoxen for the 2011-2012 season. Information about the proportion of the TAH that will be harvested is not yet available.

7. Research and Management Initiatives by Region and Species

The Research Section of DOE gathers scientific information about wildlife resources as part of the collaborative management planning that must take place for wildlife sustainability. The traditional pursuits of hunting, trapping, and fishing continue to contribute to the land-based economy of Nunavut. Country food is highly valued by most Nunavummiut and harvesting activities are an important cultural, social and economic activity of Inuit life.

The non-consumptive value of wildlife is also apparent from the growing tourism industry, which includes wildlife viewing as a large component. Territorial, national and international wildlife values are evidenced by the efforts to protect northern ecosystems through the proposed establishment of new protected areas (e.g., proposed Bathurst Island National Park, Lancaster Sound National Marine Conservation Area and Napurtulik/Axel Heiberg Island Territorial Park). Competing interests include the exploration and development of mineral and petroleum resources and the establishment of shipping routes (e.g. North West Passage). The influences of climate change include the reduction and thinning of summer arctic sea ice, which has increased interest in the establishment of both land and sea transportation routes to facilitate extraction of mineral and energy resources. The ultimate impacts of proposed land-use activities could reduce the productivity and increase the harvest pressure on Nunavut's terrestrial wildlife species. Due primarily to remoteness, challenging weather conditions, and associated high research costs a number of wildlife information gaps exist all across Nunavut. Wildlife research and management priorities depend on the GN (DOE) responsibilities identified by the NLCA, local concerns, and emerging issues such as proposed large-scale developments. Wildlife research priorities are re-considered annually as part of the budget planning cycle.

7.1. Qikiqtaaluk Region Research and Management Initiatives

The Qikiqtaaluk Region is the largest region in Nunavut (1,040,418 km^2) and spans from the islands in James Bay to the south to the northern reaches of Ellesmere Island. With the exception of the Melville Peninsula, the entire region consists of islands within the Arctic Archipelago. The Arctic Archipelago supports a variety of fauna. Caribou (*Rangifer*) are an iconic, keystone terrestrial species of nutritional and cultural significance to Inuit. Across the Arctic Archipelago two subspecies are present Peary caribou (listed as Endangered under the *Species at Risk Act*, Feb 2011), and Barrenground caribou (unclassified). The High Arctic

Islands are also inhabited by Muskoxen. More than half of Nunavut's total population lives in the Qikiqtaaluk Region (16,939 of 31, 906; 2011 Nunavut Bureau of Statistics), with 8 of 13 communities on Baffin Island. Baffin Island, over 500,000 km^2, represents about half of the region's terrestrial land mass.

Peary Caribou and Muskoxen

Abundance, Composition and Distribution Studies: The focus of these projects was combined aerial and ground surveys of species abundance, composition, and distribution following concerns of another population crash after severe icing in 1997. Existing survey data for Peary caribou and muskoxen demonstrated significant declines on some arctic islands, primarily due to severe weather events. For other populations, periods of decline and recovery were evident but the magnitude and frequency varied among islands. Historical information on the distribution and abundance of many Peary caribou and muskoxen populations is infrequent, partial or absent.

Our research methods consisted of 1) Ground surveys conducted by local hunters on snowmobiles (from 2001-2006) to delineate specific areas occupied and unoccupied by caribou and muskoxen based on observations of recent tracks, foraging sites and animals; and 2) aerial surveys (2001-2008) using a systematic line- transect design and standard distance sampling techniques to estimate densities and abundance of Peary caribou and muskoxen for each island group.

All of the island groups were surveyed between 2001 and 2008 and the updated results for each survey and both species were presented to local communities for their input and interpretation. Peary caribou densities varied between island groups and range from 0.0083 – 0.2626 per km^2 with an across-island total abundance of about 4000 (aged 10 months or older). Muskoxen densities varied between 0.0129 – 0.1372 per km^2 (by island group) with a total muskox abundance estimated at 17,500 (aged one year or older). Previous information for some of these areas was almost 50 years old. In May 2013 the Bathurst Island Complex was re-surveyed for Peary caribou and muskox. Bathurst caribou had tripled (from 187 in 2001 to 559 in 2013), and 770 muskoxen were seen (Bathurst muskox population estimate in progress).

Movement and Space Use of Peary Caribou: DOE initiated a satellite collaring program in 2003 to investigate movement patterns and space use of Peary caribou. Location data was collected

on a small sample of animals over a three year period. These data contributed to a better understanding of Peary caribou movements and habitat use, but the sample was too small for definitive population delineation and habitat selection analyses. Non-invasive genetic work currently underway will provide additional insight into inter-island movements, relatedness among populations, sex-biased dispersal, movement based on habitat quality, movement corridors, and how populations recover from die-offs. These studies can be conducted without capture and collaring, which is opposed by most communities, and provide insight over a longer period of time, although they are not able to inform seasonal or fine-scale habitat selection. Currently, population boundaries are inferred based on previous studies of movements, IQ, survey results, and apparent geographic barriers. The landscape genetic work may refine these boundaries or suggest that Peary caribou are best regarded as a single metapopulation. The genetic work will also clarify hybridization dynamics where barren-ground and Peary caribou overlap across their range and the origins of Peary caribou. Samples are currently being sought from biologists in Greenland to address questions of dispersal and relatedness among Greenland and Ellesmere caribou. Harvest management is most concerned with demographic units, while retention of biodiversity is most concerned with retention of genetic diversity. The information set for these two management perspectives is complimentary, but also different.

IQ on population changes and ecology of Peary caribou and muskox has been collected for the high arctic islands of Nunavut. This work documents observed changes in the distribution and abundance of Peary caribou and muskox over approximately 50 years and provides background and local information for interpretation of scientific data. Environmental niche modeling and a population viability analysis are currently being completed by Environment Canada and the University of Toronto as part of the scientific assessment for the Peary Caribou Recovery Plan required under SARA. Unfortunately only a small number of Peary caribou observations were available for the study area, limiting the analysis of resource selection and any subsequent conclusions regarding the relationship between Peary caribou and snow cover. Finally, research on inter-specific relations including the impact of wolf populations is necessary to ascertain whether predation might exacerbate a decline or dampen the recovery of small Peary caribou populations.

Space Use and Movement of Arctic Island Muskoxen: In order to describe spatial patterns and identify populations, a satellite telemetry program was conducted from 2003-2006. These data contributed to a better understanding of movement patterns and space use, subpopulation

delineation, habitat selection, and intra/inter specific relationships. However, current Arctic Island muskox population boundaries are inferred based on a qualitative consideration of previous studies of movements, IQ, survey results, the movement of radio-collared animals, and known geographic barriers. IQ on population changes and ecology of Peary caribou and muskox has been collected for the high arctic islands of Nunavut. This work documents observed changes in the distribution and abundance of muskox over approximately 50 years and provides background and local information for interpretation of scientific data. The relationship between muskox and Peary caribou is not well understood and future research initiatives could include concurrent long-term telemetry studies, resource selection, stable isotope analysis, simulation modeling, and the investigation of inter-specific interactions, including wolf predation.

Arctic Ungulate and Environmental Community Based Monitoring Program: Local harvesters have on-going contact with caribou and muskoxen and a profound relationship with the environment. This unique knowledge is captured by training Inuit hunters and youth to collect both samples and data from harvested animals and their habitat. The goal of this program is to establish baseline values for basic ecological and health-related parameters, with a focus on long-term monitoring for the detection of change. By developing a community based monitoring program we hope to address some of the unique challenges of conducting northern research while engaging community members, wildlife managers and scientists in a collaborative effort that combines resources and knowledge. Collection of fecal pellets while hunters are on the land to supplement samples collected during surveys has also been suggested by the communities and is aimed for implementation in spring 2014.

Population structure of Muskoxen in the Canadian Arctic Archipelago: Extensive survey work (ground and aerial) and a collaring program have contributed samples for the genetic evaluation of muskoxen diversity and subpopulation structure across the Qikiqtaaluk Region. Work is on-going and a regional analysis is underway. Additional samples are necessary for some portions of their range and the monitoring, surveying, and harvest sampling outlined in the High Arctic Muskox Management Plan will be an important way to address sample and information requirements (see above) while gaining unique local and Inuit knowledge.

Harvest Monitoring of Muskoxen and Peary Caribou: The collection of harvest data for muskoxen is on-going. Community participation and GN staffing in remote communities is

essential to program success which depends on the completion of harvest data records for each kill. Harvest reporting is outlined in the draft High Arctic Muskox Management Plan. Community engagement is particularly important for Peary caribou, as harvest reporting is currently voluntary.

Peary Caribou Management Planning

The information described above contributes to the development management and monitoring plans (e.g., SARA: Peary Caribou Management Plan). DOE , working with the communities of Resolute Bay, Arctic Bay, and Grise Fiord, produced a draft management plan for Peary caribou based on IQ and scientific data (most recently a series of surveys covering the entire High Arctic from 2001-2008, and now with population estimates being updated, starting with the Bathurst Island Complex in spring 2013). The draft plan was also presented to Kugaaruk, Taloyoak, Gjoa Haven, and Cambridge Bay to include the knowledge and concerns of Kitikmeot communities. It will be revised based on feedback obtained, with the aim of submitting it to the Nunavut Wildlife Management Board for its approval by the end of 2013. Co-management partners will share information and responsibilities for implementing the plan, and meet annually to discuss the latest information and potential management actions.

Muskox Management Planning

The proposed Draft Management Plan for High Arctic Muskoxen of the Qikiqtaaluk Region was developed in conjunction with the communities of Arctic Bay, Resolute Bay, and Grise Fiord, as well as NTI. Workshops were held in the fall of 2010 in Grise Fiord and Resolute to share the results of the 2001-2008 survey and discuss implications for management. Using the existing management plan for the Kivalliq as a template, DOE developed a draft plan for the muskoxen of the High Arctic Islands of the Qikiqtaaluk region, shared this draft with the co-management partners, and consulted with relevant communities in March 2012. Revisions to the current draft have been made according to input received to date, and the plan was submitted for NWMB decision in March, 2013. Overall, the three communities have expressed support for the Management Plan and its recommendations, in particular because of the ongoing collaborative process it outlines for the management of muskoxen in the region.

Through community-based ground surveys that are conducted annually, but on a spatially cyclic basis, changes in local herd numbers can be monitored. An annual meeting to discuss results and potential management recommendations will be used to target future survey efforts and in

the event of observed declines or concerns of herd status, trigger further action which may include increased ground survey frequency or aerial surveys. Recommendations that would change harvest rates or Non-Quota Limitations such as harvest seasons would be sent the NWMB for decision.

Barrenground Caribou

Caribou Health Monitoring - Caribou Sampling for Disease Monitoring and Genetic Analysis: The purpose of the Caribou Health Monitoring (CHM) program is to establish and evaluate a hunter-based program of information and sample collection for health monitoring and genetic analysis of Barrenground caribou in the Qikiqtaaluk Region. This research addresses key wildlife concerns of local HTOs and wildlife managers while providing an opportunity for hunters and scientists to combine their knowledge and resources for the benefit of caribou.

Local harvesters have on-going contact with caribou and can provide important information on this species. The CHM program makes use of this opportunity by training Inuit hunters to collect both samples and data from animals that they already harvest. The goals of this program include the establishment of baseline values for health parameters and genetic diversity, with the potential for long-term monitoring to detect future change. Increasing capacity in communities and engaging youth in research and wildlife management issues is a priority. This project contributes to research on genetic diversity, disease, morphology, body condition, distribution and diet and, traditional ecological knowledge (TEK) on caribou.

Distribution and Abundance of Barrenground Caribou on Baffin Island, Nunavut: The Government of Nunavut currently recognizes 3 populations of Barrenground caribou on Baffin Island. The status of these populations is largely unknown. No reliable current or historic estimates of population size exist for these caribou. A 1985 estimate for the size of the Baffin Island caribou population was > 100,000 caribou. The status was updated in 1991 when it was suggested that populations were stable with 60,000 -180,000 in South Baffin, >10,000 in Northeast Baffin, and between 50,000-150,000 in North Baffin. Since the mid-1990s, Baffin communities and hunters have reported low caribou numbers all across Baffin Island.

To address fundamental gaps in information regarding Baffin caribou abundance and distribution, an aerial survey was undertaken across the range of South Baffin caribou in (March- May 2012). Transects were positioned 10 km apart, ran east-west across the study

area, and were stratified by ecoregion. The results indicate critically low numbers of caribou and support information from community experts. Data and opportunistic samples are also being analyzed regarding population structure/diversity, winter diet, and habitat selection.

Space Use and Movement on North Baffin Caribou: As part of a multi-year caribou collaring program to evaluate the distribution, movement, and space use of Barrenground caribou (*Rangifer tarandus groenlandicus*) on northern Baffin Island, GPS collars were deployed on a total of 32 adult female caribou in April 2008 (n= 4) and April 2009 (n=28). Collars collected 2 locations per day for a period of up to 27-28 months when the collars were automatically released from the animals. From 2010 -2011, monitoring efforts included the investigation and collection of inactive GPS collars, mortalities, assessment of summer condition and calf production, and the recovery of released collars. There is limited knowledge regarding North Baffin caribou and their distribution, movement and use of space. The number of caribou was estimated at greater than 30,000 in 1985 and at 50,000-150,000 in 1991, but there is general consensus that these numbers have greatly diminished.

Recent exploration efforts in North Baffin, particularly the Mary River area, have heightened concerns and raised questions about the potential impact of development on caribou fitness and survival, and the long-term integrity of caribou habitat. Data on mortality and calf production, and the preliminary analysis of movement, home range and space use was provided to support the GN environmental impact assessment of Mary River Iron Ore Mining Project. A final multi-scale analysis is on-going and includes habitat selection and diet.

Subpopulation structure of Barrenground and Peary caribou across the Arctic Archipelago: Extensive survey work, collaring programs and the caribou health monitoring program have contributed samples for the genetic evaluation of caribou diversity and population structure across Baffin Region. Work is on-going and a regional analysis is underway. Existing data and samples have already contributed to several reports and publications which provide both a local and global dimension to our understanding of caribou genetics.

Space use and movement of South Baffin Caribou:. A multi-year caribou collaring program (1987-1994) provided caribou location data that is currently being evaluated to understand the distribution, movement, and space use of Barrenground caribou (*Rangifer tarandus*

groenlandicus) on south Baffin Island, at a time when abundance was high. The number of caribou was estimated at 60,000-180,000 in 1991.

Local communities and hunters have reported a decline in caribou since the mid-1990s and recent survey efforts confirm a low abundance of caribou. Recent exploration efforts across the Hall Peninsula, Cumberland Peninsula, and in the South Baffin Calving grounds, has heightened concerns and raised questions about the potential impact of development on caribou fitness and survival, and the long-term integrity of caribou habitat. A preliminary analysis of movement, home range and space use provided the GN with valuable information to infer population boundaries for survey design. A final multi-scale analysis is on-going and will include development of a habitat selection model.

Baffin Island Caribou Management Plan: From 1987 to1995, a number of aerial surveys, radio-collaring, body condition, foraging, and Inuit knowledge studies were conducted on South Baffin caribou. The central result from these studies was identification of an approximately 60 year natural cycle of over-grazing, population decline, habitat recovery, and subsequent population increases. When caribou numbers cycle down, caribou abundance is insufficient for resident hunters. Additionally, when local forage conditions decline, South Baffin caribou shift their range as they attempt to find suitable habitat. These movements cause a local shortage of caribou. In contemporary times, declines in caribou numbers are accentuated by increased human population numbers and modern harvesting equipment, especially in the Iqaluit area.

Since 2007, research proposals and efforts have targeted fundamental information gaps on population abundance, distribution and composition to support management planning initiatives. In 2012, the GN undertook an aerial survey across south Baffin Island which corroborated growing concerns about the critically low numbers of caribou. In July 2013, the GN organized a co-management workshop to discuss conservation measures and management actions for Baffin Island caribou. Participants included co-management partner representatives from 10 HTOs that harvest caribou on Baffin Island, the NWMB, NTI, and QWB. During the workshop, a number of recommendations and ideas were presented that will form the basis of a Baffin Island caribou management plan. Community consultations to further develop and finalize the management plan for Baffin Island caribou will continue in the autumn of 2013.

7.2 Kitikmeot Region Research and Management Initiatives

The Kitikmeot region is the least populated region of Nunavut. More than half the people rely heavily on hunting wildlife for food and other sources of income such as the sale of meat, fish, furs and guiding for sport hunting.

The primary industries in the Kitikmeot are mineral exploration and mining activities which provide employment and economic benefits. Sound land use, wildlife planning and co-management are important for the region to protect some critical areas including migratory corridors that extend onto the sea-ice.

All research initiatives and their results have been shared through newsletters to co-management partners and through regular meetings with affected HTOs and RWOs. The Kitikmeot research program contributed to a federal assessment of the status of Canadian ecosystems.

Wolverine and Grizzly Bear *(see also Carnivore Programs Section 7.4)*
Monitoring programs for grizzly bear and wolverine to determine their status and harvest levels employ hair-snag methods for sampling individual DNA. From 2004-2006, a pilot study using this technique was initiated by the Kugluktuk HTO in collaboration with DOE. A larger scale grizzly bear population study using hair snags was also conducted in the Western Kitikmeot.

Although a wolverine population assessment was not possible, the work did provide an estimate of female wolverine home range in that area and some information on local abundance and harvest rates.

A grizzly bear population assessment is being prepared with results to date and local observations. Additional information is being analyzed regarding grizzly bear behavior, movement, population demographics, Arctic carnivores' diet, mammals' hormone levels and an assessment of stress in grizzly bears. This project has also provided recommendations for hair snagging methods for grizzly bear and wolverine monitoring in the Arctic.

Other Carnivore Programs *(see also Carnivore Programs Section 7.4)*

Continuing wolverine carcass collection and grizzly bear harvest monitoring programs provide information on harvest impacts and baseline data that may be useful in evaluating environmental impacts. Other carnivore species were sampled and that information contributed to research on wolf and Arctic fox population structures and carnivore parasites. Traditional knowledge of carnivore species was collected in the West Kitikmeot under the Naonayaotit Traditional Knowledge Project. DOE contributed to that study and awaits release of the report from the Kitikmeot Inuit Association.

Dolphin and Union Caribou

The Dolphin and Union (DU) Caribou Herd (locally called Island Caribou) were reduced to a very small number between 1920 and 1970 when they began to recover. An aerial survey in 1997 estimated the number of caribou had increased (~28,000) within the study area on the south coast of Victoria Island. A 2007 survey (including telemetry on movements) indicated that the abundance of DU caribou population was unchanged from the 1997 estimate. Other non-DOE research initiatives focusing on female DU caribou have suggested some changes in space use; a possible decline in birth rates and body condition, and the presence of parasites. A 2006 assessment of the herd for contaminants, showed low levels overall.

The history of the herd, environmental factors and human activity that could affect it, resulted in the listing of this herd under Schedule 1, Part 4 (Special Concern) under the federal *Species at Risk Act.* The DU herd crosses the sea ice between the mainland and Victoria Island at Dolphin and Union Strait as part of its normal migration route. Climate warming reductions to sea ice or increased maritime traffic during the migration crossing could interfere with the annual DU migration timing and result in demographic impacts. Departmental research data and subsequent analyses and publications have been made available to impact review boards, conservation organizations and other scientists, for baseline studies and environmental impact assessments. Traditional knowledge on the DU Caribou herd was collected but has yet to be published.

Dolphin and Union Caribou Management

Concerns from the Kitikmeot Hunters and Trappers Association (KHTA), available IQ and knowledge of the DU caribou herd led to a workshop in 1998, involving co-management partners to develop the foundations of a herd management plan. While there were minutes from the workshop no other management action was conducted at that time. The status and

possible future of the herd due to natural factors and human activity have triggered renewed support for management planning.

The Kitikmeot organizations stopped their community hunts for the DU herd in 2007 to reduce harvest impacts. In spring 2012, the Cambridge Bay groups called for a workshop to discuss the status and co-management of this herd. The workshop has yet to occur.

Kitikmeot Mainland Caribou

Assessments of Kitikmeot mainland caribou herds (shared with the NWT) have been led by the Government of the Northwest Territories (GNWT), with DOE biologists and Nunavut hunters supporting and participating. Mainland caribou herds in the western and central arctic have generally been declining over the past decade, but a recent (2010) survey of the Bluenose East Caribou herd suggested some recovery had occurred there. Unfortunately weather and caribou movements compromised a 2012 Bluenose East Caribou survey so the 2010 recovery remains unconfirmed. Some human activities (including harvest) can accelerate the natural decline/recovery cycle in caribou numbers and delay recovery.

Kitikmeot Mainland Caribou Management

The decline of the three Bluenose caribou herds identified in 2005-2006 prompted the establishment of the Bluenose Caribou Advisory Committee. NTI and DOE agreed that a working group should draft a management plan for the Bluenose herds. In 2007, a workshop in Kugluktuk was organized by DOE to discuss the available information with the Kugluktuk HTO, local hunters and Elders and possible actions for the Bluenose East herd. The Kugluktuk HTO followed up with education programs and community hunts targeting muskoxen as an alternative species to caribou.

The Bluenose Caribou Management Plan Working Group was created in 2008-2009 and consultation began with communities within the range and who were harvesting from these herds. Draft versions of a management plan were presented to co-management organizations between 2010 and 2011.

Bathurst and Beverly Caribou

The Bathurst caribou herd has been monitored annually by GNWT with support and participation of hunters and biologists from the Kitikmeot. In 2011, DOE partnered with GNWT to

conduct a large-scale calving-ground aerial survey of the Beverly and Ahiak herds. The 2011 survey found that the herd size was about half of the June 1994 population estimate. The survey also determined that the Beverly herd has shifted its calving grounds about 200 to 300 km north. Continued monitoring is required in order for co-management partners to effectively manage these herds as they become vulnerable to harvest activities and shift calving areas from year to year.

Caribou harvest monitoring in this area has been started by DOE with voluntary reporting from hunters. While numbers are incomplete at present, genetic and movement-based population descriptions have been recorded. As well, traditional knowledge of mainland caribou was collected in the West Kitikmeot under the Naonayaotit Traditional Knowledge Project.

Bathurst Caribou Management

The Bathurst Caribou herd is a shared resource between communities in the NWT, Nunavut and Saskatchewan. In the Tlicho Agreement (NWT) one objective is to develop management planning for the Bathurst caribou in partnership with responsible jurisdictions and any Aboriginal group who traditionally harvests from the herd.

GNWT, the Tlicho Government, and the Wekeezhii Renewable Resources board met in June, 2012 to discuss short and long-term management planning for the herd. It recommended a user group workshop to lay the groundwork for a detailed herd management plan. In January 2013, a three day Bathurst Caribou Harvesters' Gathering was held to facilitate communication and identify consensus management goals between researchers, co-managers, and resource users.

Boothia Caribou

In 2006, during a muskox aerial survey, DOE also looked at the area to delineate the primary caribou calving areas and estimate the number of caribou using them during calving season. Analyses of the data were not completed, but available information was provided to mineral exploration companies about known or potentially sensitive areas.

Mainland and Boothia Peninsula Muskox

One of the NWMB's 2001 research priorities was to update the status of muskox on the mainland and Boothia Peninsula. Between 2001 and 2010, most of the muskox populations were surveyed except for the Queen Maud Gulf, east of Bathurst Inlet and the head of the Back

River areas. Muskoxen were estimated from observations during a 2011 caribou calving-ground survey.

A general review of muskoxen status in the Kitikmeot was presented to the NWMB. Some of its information was presented at the Arctic Ungulate Conference in 2011. Traditional knowledge of muskoxen was collected in West Kitikmeot through the Naonayaotit Traditional Knowledge Project.

In 2007-2008, a demographic and ecological study in western Kitikmeot was begun but not completed. The Cambridge Bay muskox commercial harvest relies on abundant and healthy populations and a small die-off had been reported. In 2007, a muskoxen monitoring program was initiated to investigate potential disease on Victoria Island. The muskoxen disease monitoring program will be expanded to other Kitikmeot communities in 2013.

Harvest monitoring is improving. Coupled with data from surveys, it provides relevant information to other departments that can help address hunger and poverty.

Muskoxen Status and Management Review

This review is to be finalized. DOE developed a set of management actions for muskoxen, which were discussed with Kitikmeot communities and other stakeholders between 2009 and 2012. The NWMB approved the recommendations and DOE has been implementing them through a series of exemption permits until such time as the new wildlife regulations are in place.

Grizzly Bear Management

See Carnivore Program section 7.4.

Wolf Management

Kugluktuk HTO asked that the seasonal restriction on wolf harvest meant to foster caribou population recovery, be removed temporarily to increase young hunter educational opportunities. In September 2011, the NWMB approved this exemption for one year. No additional wolf harvest was reported during summer 2012 indicating that this exemption had no effect.

7.3 Kivalliq Region Research and Management Initiatives

Kivalliq Caribou

Caribou are critically important to people in the Kivalliq region. Monitoring caribou and all the factors affecting them and developing management and action plans for the herds, are needed to help ensure an adequate supply of healthy caribou.

Understanding the effects of human activities on caribou herds is difficult because they migrate and are also affected by seasonal and geographic changes. The effects of change accumulate over time, so that site-specific monitoring of herds is not enough to detect or monitor more than behavioral changes or animal death. As well, caribou abundance varies over time based on a number of factors, but most often by stress caused by changes to their habitat (natural and human-caused).

A broad-scale analysis of information collected over several years from caribou collars was recently completed. This projected was initiated to confirm information from different sources about caribou herd size, health and distribution. The study supported local knowledge and helped to explain changes in herd distribution noted but not well understood by biologists. The results were adopted by GN and regional co-management organizations as the accepted distribution of barrenground caribou herds on the Nunavut mainland (Figure 2). As well, agreement was reached on the locations and boundaries of concentrated yearly calving areas. This information can be used for environmental impact assessments, to help coordinate survey efforts and protect critical caribou habitat (Figure 3).

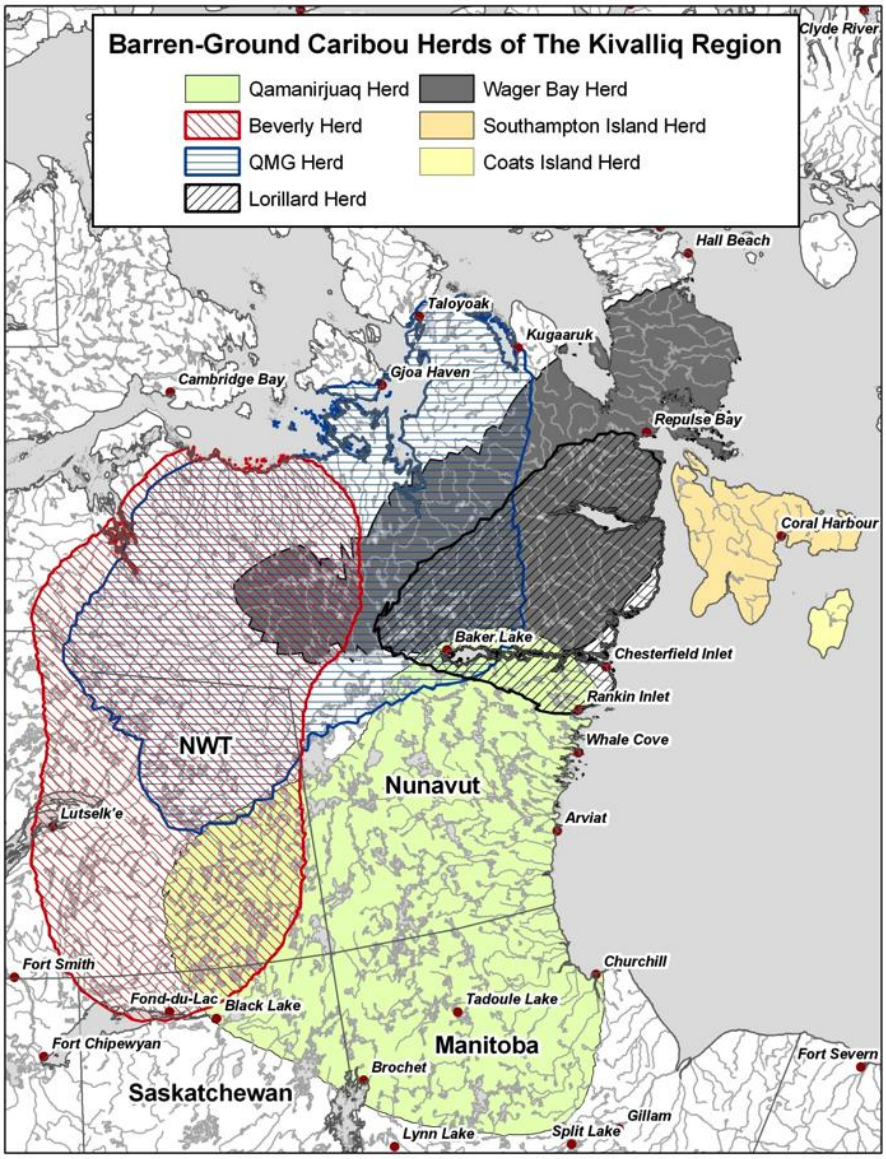

Figure 2. Barrenground caribou populations in the Kivalliq region of Nunavut. Please note that the QMG (Queen Maud Gulf) herd was recently renamed the "**Ahiak"** herd.

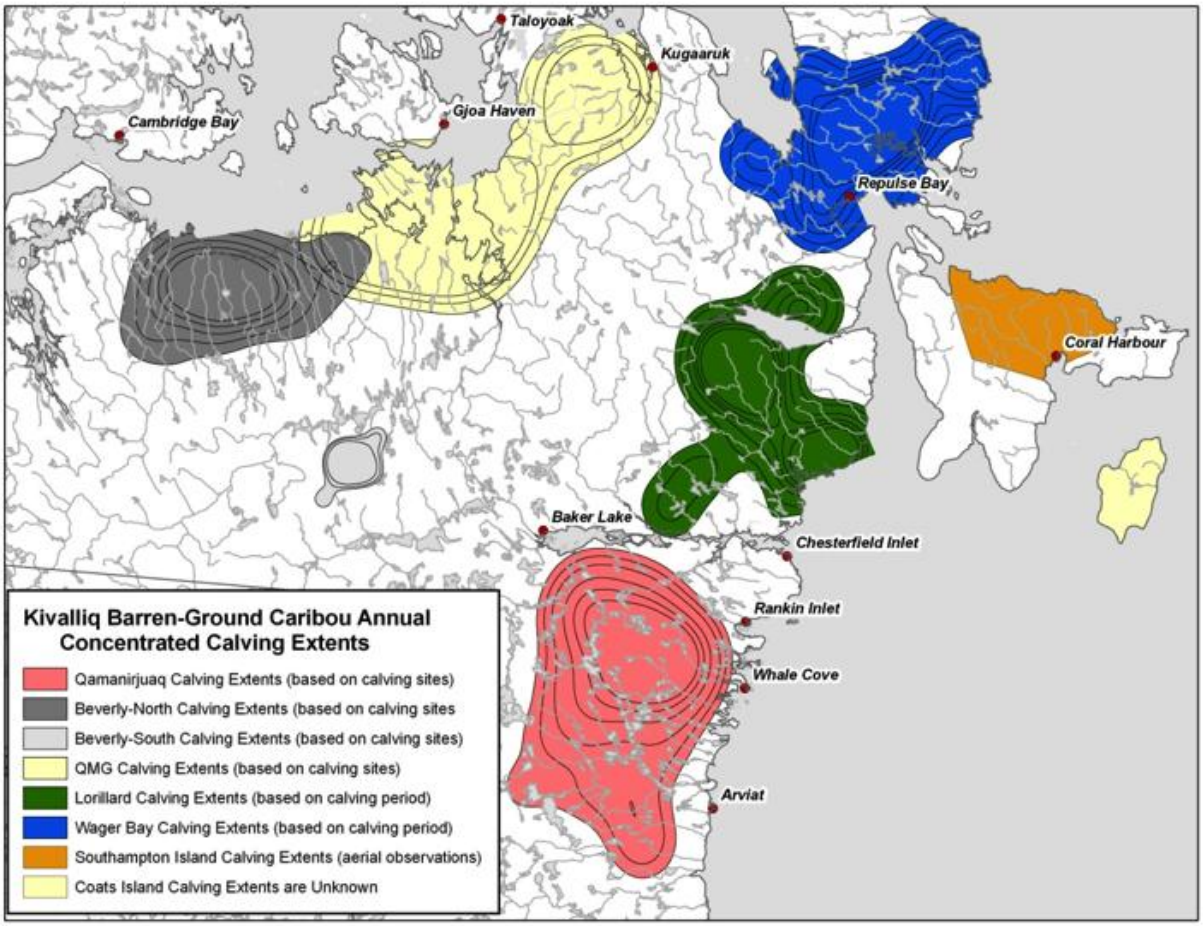

Figure 3. Annual concentrated calving ranges of Kivalliq barrenground caribou populations. Please note that the QMG (Queen Maud Gulf) herd was recently renamed the "**Ahiak"** herd.

Qamanirjuaq Caribou

The Qamanirjuaq Caribou Monitoring Program includes spring classification and satellite telemetry studies, abundance surveys, condition and disease monitoring. These investigations were undertaken with input and support from many partners in Nunavut and the Northwest Territories.

Telemetry Program: Knowing where caribou are located is key to developing effective research programs and making effective management decisions for caribou. The objectives of this project are to monitor distribution and seasonal range use and establish an important habitats data-base for the Qamanirjuaq caribou which includes location and activity, vegetation, hydrology and topography. As well, telemetry can provide resource users, RWOs, territorial and inter-jurisdictional management boards, information for management decisions related to appropriate land-use activities. A third objective is to locate concentrations of caribou, including

calves during the spring to determine herd composition. This helps to estimate whether the herd is growing or declining and to monitor the health of the population since a recent decline in abundance has been detected.

Spring Classification Program: Studies for trends in composition between 1994 and 2011 looked at the number of calves of the Qamanirjuaq herd which survived the winter. These studies indicated fluctuations – declines, then mild recovery. Some recovery could be from a heavy harvest of wolves and grizzly bears in 2010, but this has not been confirmed.

Aerial Survey Program: The Qamanirjuaq monitoring program includes calving-ground reconnaissance surveys every 24 months to determine trends in abundance. Intensive estimates take place when a survey indicates a significant decline in calf numbers. Surveys are proposed to continue every two years until trends indicate sustained growth.

The most recent estimate of the Qamanirjuaq caribou herd was made in June 2008. Breeding females were directly estimated and this was used in combination with fall composition results to determine total herd size. Initial information collected following the 2008 estimate suggests the Qamanirjuaq caribou population is currently in decline.

Disease and Condition Monitoring Program: Part of the Qamanirjuaq caribou monitoring program investigates disease and condition. It takes place annually, with local harvesters collecting blood and tissue for analysis. All blood samples are screened for reproductive status as well as diseases including Brucellosis (a reproductive disease). Teeth, muscle tissue, and a rumen sample are collected for analysis. Brucellosis is not currently present within the Qamanirjuaq caribou population.

Multiple cases of hoof rot began appearing in spring and fall 2011. These were confirmed by Canadian Cooperative Wildlife Health Center (CCWHC). Early studies suggest this disease infected thousands of caribou just prior to fall migration. The area with the most sightings and confirmed cases included a corridor from Rankin Inlet west to Peter Lake and south to Whale Cove. Evidence of limping caribou dropped sharply south of Whale Cove near Sandy Point north of Arviat on Hudson Bay's west coast. Conservation officer occurrence reports and hunter observations have been recorded and laboratory analyses of diseased tissue are ongoing. Increased monitoring for this disease is proposed.

Qamanirjuaq Caribou Management

A management plan has been developed by the Beverly and Qamanirjuaq Caribou Management Board with involvement from the governments of Saskatchewan, Manitoba, the NWT and Nunavut. The board includes two voting members chosen by the Kivalliq Wildlife Board as well as one GN member.

The present plan uses the results of the Qamanirjuaq Caribou Monitoring Program to make recommendations to all jurisdictions included in this population's range. Study results have been used to review harvest rates, coordinate exploratory aerial and ground operations, enforce Kivalliq Inuit Association (KIA) and AANDC caribou protection measures and for environmental impact assessments.

Beverly and Ahiak Caribou

The Beverly and Ahiak Caribou Monitoring Program responsibilities are shared with the GNWT which maintains the telemetry program, spring composition studies and disease and condition monitoring for the Beverly population of mainland migratory barrenground caribou. DOE manages the telemetry program for the herd of tundra-wintering barrenground caribou, June reconnaissance surveys and June abundance surveys for both the Beverly and Ahiak Herds. These research initiatives have been carried out in partnership with local HTOs and other provincial and territorial governments.

Telemetry and Aerial Survey Programs: The Nunavut components of the Beverly and Ahiak monitoring program are the same as those for the Qamanirjuaq monitoring program and include the same research activities. Intensive surveys are undertaken until signs of decline have reversed.

In 2011, DOE also completed an examination of the entire calving area known to be occupied by both the Beverly and Ahiak caribou populations. Its purpose was to obtain current numbers of breeding females in the Beverly herd of boreal forest-wintering caribou and the Ahiak herd of tundra-wintering caribou. Initial findings confirm the Beverly herd breeding females are in significant decline though the decline is not as great as expected. It appears there are fewer than half the 1994 estimate of breeding females. Total herd estimates for both the Beverly and Ahiak herds are still under discussion.

Ahiak Management Activities

As with the Qamanirjuaq herd, a management plan was developed by the BQCMB. The results of the Beverly Caribou Monitoring Program are used to make management recommendations to all jurisdictions whose political boundaries include Beverly caribou range. Results also have been used to review harvest rates, coordinate exploratory aerial and ground operations, enforce Nunavut Impact Review Board (NIRB), KIA and INAC caribou protection measures and for environmental impact assessments.

The plan analyzes the sustainability of the present harvest and makes management recommendations to all jurisdictions harvesting from the Beverly herd. The BQCMB co-ordinates the management of the herd, acts as the single forum for management decisions and is authorized to pursue partnerships for the herd's conservation. Information on herd size is an integral part of the BQCMB management plan to use "enhanced management actions" when the herd is declining. Further management actions are required if herd size cannot meet subsistence needs levels.

A management plan for the Ahiak caribou population has not been developed to date. Confusion about herd status and distribution has complicated and delayed the process, though new information about distribution and abundance was received in 2011. An Ahiak management plan may result following complete analysis of the Beverly and Ahiak population study expected in late 2013.

Northeast Mainland Caribou

A study of Lorillard and Wager populations of barrenground caribou on the Northeastern mainland of Nunavut took place with territorial HTOs in 2006. Since then there has been no long term monitoring program of these caribou populations. There is limited ongoing research including an exploratory survey of the western ranges of the Wager Bay subpopulation in 2009 and an abundance and reconnaissance survey of that population in 2011 as part of the Beverly and Ahiak abundance surveys.

Interestingly, some collars placed on female caribou in 2011 ended up moving to the Lorillard calving range, likely due to Lorillard caribou moving beyond their usual boundaries that winter and being confused with the Ahiak herds being surveyed.

Telemetry Program: Though this mixing was uncommon, these collared Lorillard caribou are being monitored. The knowledge gathered from them will be used to establish a habitats information base for the Lorillard subpopulation and to provide all interested parties information for making management decisions particularly for land use activities. When possible, telemetry will locate caribou concentrations during spring to determine herd composition and the number of spring calves, confirm numbers and check the health of the population.

Aerial Survey Program: From 2007 to present, three surveys have been flown within the northwestern regions of the Wager Bay subpopulation. Survey results are being interpreted in conjunction with the Beverly and Ahiak subpopulation abundance estimates. The Ahiak subpopulation and Wager Bay subpopulation appear to be mixing, though the Ahiak herd clearly dominates this extensive calving area. Low densities of caribou were found within the eastern boundaries of the survey area where Wager Bay caribou were expected. Preliminary results suggest that the caribou occupying this area, are not sexually segregated, a marked difference from the Beverly caribou population.

Southampton Island Caribou

The Southampton Island Caribou Monitoring program is operated in partnership with the Coral Harbor HTO, the Kivalliq wildlife Management Board (KWB), DOE and Agriculture Canada. The study objectives were designed to manage the herd for both commercial and subsistence harvesting. They included determining the status and trends of the Southampton Island caribou population which has been affected by a high incidence of Brucellosis and years of commercial and subsistence harvesting. As well, the study examined the herds' condition to see if/how changes relate to range condition, availability and/or area.

Another objective was to review the sex and age of the harvest to determine potential modifications in age/sex structure by harvesting fewer animals than allotted using non-quota limitations (NQL) to help increase recovery.

Aerial Survey Program: Since 2003 the Southampton Island caribou population has been surveyed every two years to estimate numbers. In 2012 and 2013 extra surveys were conducted to confirm a severe decline below sustainable harvesting levels. Aerial surveys have tracked abundance to update an established management plan. Currently survey results

indicate a declining population that could be extirpated if not effectively monitored and managed.

Declines are believed to have resulted from reduced pregnancy rates due to Brucellosis, continuing subsistence and hunter-based commercial harvest as well as recent export of caribou off the island. An estimated 1,200 caribou were harvested exclusively for export during the 2011/2012 harvesting season.

A Total Allowable Harvest of 1000 caribou was put into place for the Southampton Island herd in 2012 and extended in 2013.

Disease and Condition Monitoring Program: Disease and condition studies have been conducted annually from 2007 to 2011. In a meeting with the Coral Harbor HTO in 2011 it was decided that continued harvesting to check the condition of the herd may contribute to the decline in the herd and the harvest of 100 caribou for study was stopped until there is evidence of recovery.

In its place a harvester condition/sampling program was developed and initiated in 2012 to track disease levels, general condition and pregnancy rates. Information collected will be used for the existing management plan to recommend adjustments to harvesting levels and NQLs.
From 2007 through 2009, caribou condition remained fair to good though pregnancy rates remained low and Brucellosis presence had declined. However the disease increased sharply by March 2011. The reasons for the increase and implications for the future of this population are currently being studied.

Southampton Island Caribou Public Opinion Study: Through the NLCA, wildlife management and conservation are related to each other, but are not the same. Conservation is part of wildlife management, but wildlife management includes considering human-created impacts.

Public opinion polls are commonly used to gauge the public perspective on many different issues. Such a poll was conducted with 58 residents of Coral Harbor, the main community that harvests from the Southampton Island caribou population, to determine their priorities.

Participants were asked about their priorities for the Government of Nunavut, Department of Environment, and wildlife managers, and on their concerns about caribou status.

The majority of respondents felt that the Department of Environment and wildlife managers should focus on caribou as a priority, and that caribou abundance levels are below their preference. Most respondents were concerned about the future of the Southampton Island caribou population.

Regarding wildlife management, most respondents indicated the following.

- The performance of elders, conservation officers, and the Nunavut Wildlife Management Board received the highest ratings.
- The performance of legislators, the Government of Nunavut and scientists received the lowest ratings.
- Elders, conservation officers and hunters and trappers organizations were the most trusted wildlife management groups.
- Legislators, bureaucrats, and scientists were the least trusted wildlife management groups.
- The Department of Environment was rated most highly for 'courteous treatment,' 'providing understandable information,' and 'explanation of decisions.'
- The Department of Environment was rated most poorly for 'use of input,' 'providing information,' and 'response to concerns.'

Southampton Island Caribou Management

Barrenground caribou were reintroduced to Southampton Island from Coats Island in 1968 following herd extirpation from Southampton Island in the early 1950s. Since its introduction the herd grew from the 48 animals to its peak by 1997. It has been harvested extensively both commercially and domestically since 1968. In 2003 the herd began to decline to, or slightly above, subsistence harvesting levels by 2011. Commercial harvesting for the sale of meat was ended by 2009.

Due to the "founder effect" of the low number of individuals (48) that were the progenitors of the current caribou herd, Southampton Island caribou have relatively low genetic diversity. Low genetic diversity can increase susceptibility to disease and parasites which may have contributed to the wide spread infection with Brucellosis first detected in the Southampton herd

in 2000. The incidence of Brucellosis rose to 58.8 percent in 2011 and is partly (perhaps mostly) responsible for the drop in pregnancy rates since 2000. Most of the herd decline has occurred in the last five years.

By 2011 recommendations to close all commercial harvesting were made by the Coral Harbor HTO. Despite the continued decline and recommendations from the Coral Harbor HTO and DOE to reduce the harvest to subsistence only, the sale of Southampton Island caribou meat to Baffin Island communities started using the internet and subsidized country food shipping programs. This export increased the overall harvest by an estimated 30 percent. Significantly lower herd numbers indicate that this additional harvest will push herd numbers well below the level required to sustain the domestic subsistence harvest. Coral Harbor HTO recently asked for intervention from the Minister of Environment to prevent local extirpation. Currently, herd size has dropped below the rate of subsistence harvesting and an interim Total Allowable Harvest (TAH) of 1,000 caribou was assigned through a Ministerial Management Initiative effective July 1st, 2012.

The Coral Harbor HTO and DOE developed and agreed to a management plan for the Southampton Island barrenground caribou population in January 2012. In this plan, management actions rely on meaningful consultation, IQ and timely results of scientific research. The plan has been ratified by the Coral Harbor HTO, KWB and DOE. It was submitted to the NWMB as required for establishing a TAH to help the herd's recovery.

Coats Island Caribou

There is no monitoring program planned for this caribou population, given the extreme cyclical nature of its abundance and the relatively low harvest rates. Little research has been conducted on the Island since the 1990s, because the radical unpredictable declines cause survey estimates to be poor predictors of future abundance or sustainable harvest levels. Since 2007, only baseline research has taken place as a single opportunistic aerial abundance survey and harvest-based disease, condition and genetic sampling.

Aerial Survey Program: Despite being unable to determine abundance, a visual survey took place in 2010 during a Polar Bear visual survey. This provided evidence of a dramatic die-off during winter 2010, which was confirmed in 2011 when hunters reported seeing dead caribou in

small groups where high densities were expected. However hunters observed some healthy caribou that summer.

In 2012 there were reports indicating harvesting rates were up on Coats Island. This may have been caused by the severe declines on Southampton Island, so that hunters moved to Coats Island

Disease and Condition Monitoring Program: Disease and condition studies were started on Coats Island with mixed success. Blood serum screening shows no sign of Brucellosis. Tissues are being submitted for genetic analysis. HTOs can assist with collecting this information. There have been requests from the Coral Harbor HTO to start a management program for Coats Island caribou due to the pressure from increased harvesting, transferred from the Southampton Island herd which is also in decline.

Kivalliq Muskox

The Kivalliq muskox population was hunted to near extinction in the early 1900s. Protection was put in place in 1917 but there were few sightings until the late 1970s and 1980s. In the early 1980s, management began of a few established groups in Central Kivalliq to extend their range back into its historic boundaries - the entire Kivalliq mainland.

The goal continues to be access to healthy, established muskox populations for all Kivalliq communities without lengthy travel. This has received considerable support in theory. However a shorter growing season and thicker snow cover in the eastern arctic could make muskoxen's expansion challenging if harvest levels are high.

Since the 1996 harvest, Kivalliq hunters have noticed muskox closer to their communities and beyond existing management boundaries. Continuing reports of their expansion has prompted frequent surveys to adjust management regulations and reflect increasing numbers and range. More information is needed since there now appears to be two populations of muskox but co-managers have yet to determine the potential long-term effects of new management zones and quotas on these populations.

Central and Northern Kivalliq Muskox

Central and northern Kivalliq muskox populations are managed by KWB, NTI, DOE and Kivalliq HTOs in partnership. They are an important part of the Kivalliq muskox management plan (2009) designed to maintain healthy, accessible muskox populations. The collection and incorporation of IQ and scientific knowledge is also important to keep the management plan current.

Most of the monitoring is done using aerial surveys and IQ to determine the trends and abundance of muskox and distribution changes. Also included in the survey are the relative numbers of predators, calf abundance and general health and range condition. These studies were designed to complement proposed muskox surveys in the Kitikmeot Region and the Thelon Game Sanctuary. Results of these IQ and scientific studies continue to be used to set sustainable harvest quotas, range, Non-Quota Limitations (NQLs) and re-establish muskox in its historic range. To date this has been a successful partnership.

Aerial Survey Program: Since 2007, re-assessments through aerial surveys of both the Central and Northern muskox have used IQ and local knowledge from HTO members to develop survey areas and general trends. As well, these surveys provide training for new observers. The investigations indicate a significant increase in muskox abundance since 1999 and a dramatic expansion in muskox range in the central Kivalliq mostly east but also south. This expansion is thought to have facilitated a concurrent range expansion of barrenground grizzly bears, though this has not yet been proven. The 2012 survey to estimate numbers is being analyzed with results expected in late 2013.

Kivalliq Muskox Management

The Kivalliq Muskox population management plan is designed to assist the co-management partners - the Kivalliq Wildlife Board (KWB), DOE and NTI. Members of Arviat, Whale Cove, Rankin Inlet, Chesterfield Inlet, Baker Lake, Repulse Bay and Coral Harbor communities harvest muskox from the two populations and are represented on the KWB by their respective HTO chairs. IQ and community consultations have been used throughout the development of this management plan to help define the direction of muskox harvesting in the region. The goals of the management plan are to protect, conserve and manage the herd sustainably. The plan's priorities are to seek permanent changes to the Wildlife Act Regulations reflecting boundary alterations, to eliminate "seasons," to set TAH and adjustment of NQLs when and where appropriate and agreed to by all parties.

An action plan was developed to identify the immediate needs of the KWB. However the board intends to revisit the plan annually or as necessary if/when new information becomes available. There will be on-going consultation between the KWB and its partners regarding the Kivalliq muskox population which is neither a species at risk nor a conservation concern.

Kivalliq Ecological Land Classification/Vegetation

This program studies the vegetation found in the Kivalliq Region and is conducted in partnership with the KWB, the NWMB, Parks Canada, the BQCMB, Cumberland Resources Inc., local HTOs as well as NWT, Saskatchewan and Manitoba. The Kivalliq Habitat Mapping project began as a pilot study in 2000 and later expanded to cover the entire Kivalliq Region. Several areas were selected and reviewed to ensure the information is correct as to number of plant species and their distribution/coverage, to complete a digital "vegetation map" of the area.

The database and map is continually being used in association with Geographical Information System (GIS) software to determine wildlife habitat quality, quantity and availability which affect the distribution and abundance of many wildlife species. Migratory caribou, as well as muskox populations, are affected by the abundance or lack of high quality forage on their ranges. High quality forage, its location and amount, is one tool used to assess and predict significant areas for wildlife survival.

Exploration and mining, water development projects, urban expansion, pipelines, road construction, chemical contamination and noise pollution are increasing across the region. Identifying and mapping this vegetation can help wildlife managers and environmental assessment programs determine any potential effects of land use on wildlife. The potential effects of climate warming on northern ungulates are a concern. Mapping plant communities with analyses and photographs allows the comparison of sites between years and the assessments of potential impacts on the reproduction of wildlife populations. This information is used to assess important habitat requirements for caribou and muskox and to determine their amounts in any given range.

7.4 Carnivore Research Initiatives and Management Activities

Nunavut's carnivore research program currently focuses on grizzly bear, wolverine, wolf and Arctic fox.

Carnivore/Predators' Effect on Caribou

Recent surveys of barrenground caribou herds across Nunavut have indicated populations are declining and have relatively low birth rates. Concurrently, hunter observations in many Nunavut communities indicate that grizzly bear and wolf populations are increasing. There is concern that predators may be contributing to the decline in caribou numbers. Calf losses are an acute management concern when barrenground caribou are declining.

A four-year study of predator-prey activity on the Beverly calving grounds began in 2010. Its objectives are to investigate the extent and causes of newborn mortality among caribou calves, determine the locations and numbers of wolf and grizzly bear and their dens on calving grounds and examine the feeding habits of wolves and grizzly bears using stomach content and other analyses. Wolf and grizzly bear sightings in core calving area suggest that predation is active in the Beverly Caribou herd calving ground, and that wolf predation is the main cause of calf mortality during early calving.

Wolverine Carcass Collection

Wolverine is listed as species of Special Concern under the COSEWIC, and is a candidate to be listed as a "species at risk" under the federal *Species at Risk Act*. In Nunavut, wolverine is listed both as a furbearer (Schedule 5.2) and a big game (Schedule 5.1) under NLCA and is an important cultural and economic resource. The structure of the harvested population and its variations are crucial to implement a meaningful and rational management system for a species potentially sensitive to over harvest and habitat loss due to industrial resource extraction.

A harvest monitoring and carcass collection program was initiated in the western Kitikmeot in the 1980s and expanded to other regions in 2009, to characterize the geographic distribution, age and sex structure of the harvest as well as to study feeding habits. Harvest data obtained through the carcass collection program are based on voluntary reporting. Skinned wolverine carcasses were obtained from hunters with the support of HTOs and Conservation Officers. To encourage the return of samples, a $50 subsidy was provided to hunters for each carcass brought back to their wildlife office.

Initial findings suggest that high harvest happening near communities, apparently, due to higher hunter effort, and remote areas, with little or no harvest, produce animals that disperse to areas with higher hunting activity. The high harvest of young animals and the low proportion of adult females in the reported harvest, indicate that the population is healthy and likely not overharvested.

Wolverine Hair Snagging

Baseline wolverine population is needed to make decisions about TAH, study impacts of development and monitor trends in numbers. To establish baseline information ("natural" wolverine density in the areas with limited or no harvest pressure), a two year study is started northwest of Baker Lake in April 2013. 209 hair snag stations were set up in a series of 4x4 km grids covering about 3,300 km^2 study area. A total of 846 hair samples were collected over three sampling sessions (10 days each) between March 27 and May 07, and submitted for DNA analysis. Local hunters were involved in the collection of snagged hair samples to identify individual wolverine using DNA.

Grizzly Bear Harvest Study

The grizzly bear is listed as species of special concern by the COSEWIC and is a candidate to be listed under the federal *Species at Risk Act*. The monitoring of the harvest is an important part of the information necessary to monitor such a species. Grizzly bear harvest data have been collected since the early 1980s. Samples from harvested bears have been obtained from defense kills, sport hunts, and on a voluntary basis from bears harvested for subsistence. The Kitikmeot annual harvest has remained constant at about 10 per year since the inception of a quota system in 1984. The sustainability of the Kitikmeot harvest can be inferred from the local observations that grizzly bears remain at approximately historical densities throughout the region and that the neither the sex ratio nor the mean age of the harvest indicates any demographic change. However, grizzly bear harvest in Kivalliq has increased substantially from a yearly average harvest of six animals between 2000 and 2007 to nineteen between 2008 and 2013. Grizzly bears do not occur on Baffin Island.

Grizzly Bear Hair Snagging

Currently, there is little quantitative information about grizzly bear densities or population dynamics in Nunavut. This information is difficult, expensive and labor-intensive to obtain,

because the bears are relatively few in number, wide-ranging and are dispersed rather than concentrated in all seasons. Collecting hair samples by using hair-snagging posts is a relatively low cost way to obtain genetic information over an extended period that can be used to estimate population numbers.

DOE recently participated in a DNA hair snag study to assess distribution and abundance in west Kitikmeot. This study was initiated by the Kugluktuk HTO and co-funded by DOE and NWMB. About 400 grizzly bear hair snagging posts were deployed over 40,000 km^2 study area. A total of 179 individual grizzly bears were detected in the study area over the two years (2008-09).

DOE plans a 2 year hair snagging study in the Kivalliq region starting from 2014 to estimate grizzly bear density and abundance in the Kivalliq region within a large area southwest of Baker Lake. Community members will be hired to help obtain the baseline information which will be used to establish a TAH.

Inuit Knowledge Carnivore Study

A traditional knowledge study about grizzly bear, wolverine and wolves was initiated by Université du Québec à Rimouski in Baker Lake in March 2012 in collaboration with DOE. Its objective is to collect IQ about wolverine, wolf and grizzly bear distribution, abundance changes and food, reproduction, behavior and how they each adapt to environmental change. Interviews were conducted with Elders and hunters. The recorded information will be placed in archives according to community members' recommendations and permission using CD-ROM, the Inuit Tapiriit Kanatami's (ITK) knowledge center, the Isuma network, and the Polar Data Catalog to make sure it is available to everyone who is interested.

Wolf and Arctic Fox Population Description and Movement

Arctic fox and wolf are two important furbearers in Nunavut's culture and economy. The level of harvest is fluctuating annually depending on prey abundance, accessibility and pelt price. DOE used a number of ways to monitor the size of the wolf harvest (including records of sales from fur auction houses, export permits and carcass collection program). Initial findings of harvest monitoring suggest healthy wolf and fox populations in Nunavut. Further, they are more readily adaptable to human developments than the other furbearers, and so there is no pressing need for quantitative studies.

A wolf carcass collection program is underway in Kivalliq and Kitikmeot Regions to look at their diet. Wolf stomach content, as well as muscle, liver and hair samples were collected from local hunters in exchange for a $75 subsidy and submitted for study to the Université du Québec à Rimouski. With the university's help the importance of caribou to wolves' diets as well as any differences in their consumption by wolves over time can be examined.

Another study of wolves has confirmed there are differences between wolves of the Nunavut western mainland and the High Arctic, wolves from the Eastern Mainland and wolves from Baffin Island. It also found that there is some interaction between these groups, though not as much with wolves of the High Arctic.

Arctic fox is valued for its fur but foxes are also a common carrier of the rabies virus. A study did not show any genetic differences between groups across the Arctic fox North American range, suggesting that individuals move over long distances. This behavior and lack of a complete description of the species (numbers, location, and health) in Nunavut make it difficult to predict an outbreak of rabies or its spread across the territory. A joint study by all Canadian provinces and territories was initiated in 2012 to follow the movement of rabies virus in northern Canada, through the genetic analysis of rabies virus and fox samples.

Grizzly Bear Management

DOE and its co-management partners are developing a grizzly bear management plan. The plan will review existing knowledge of grizzly bear ecology and identify research needs to fill knowledge gaps, examine known and potential effects of development, report past and present harvesting practices, public safety concerns and defense kills. It will provide guidelines for management into the future.

Consultations first took place in 2003 in the Kitikmeot and the Kivalliq regions, with further consultation over the last number of years in the Kivalliq region towards management plan development and implementations of a community based management system.

Nunavut adopted the NWT management system for grizzly bears at division. This system is still used in the Kitikmeot region (10 grizzly bear tags are issued to the region per year). In the Kivalliq region, local HTOs have reported increased problem bear concerns for the past number

of years. Consultations were conducted in 2008 with the Kivalliq RWO and HTOs about grizzly bear harvest levels and agreement about joint management decisions. The Kivalliq grizzly bear harvest is now regulated through local hunting rules established by the HTOs in consultation with DOE. The HTOs and the RWO support the creation of a grizzly bear co-management plan for the Kivalliq Region to ensure the harvest remains sustainable.

7.5 Polar Bear Program (PBP) Research Initiatives and Management Activities

About 50-60 percent of the world's polar bears occur in Nunavut. Approximately 80 percent of the world's total harvest of polar bears takes place in Canada, mainly undertaken by the local Inuit but also by sport hunters. Of the 13 polar bear subpopulations in Canada (Figure 4), all but one is within or shared with Nunavut. These 12 subpopulations account for approximately 13,000 - 14,000 bears. Nunavut is therefore responsible for the majority of polar bear conservation, research and management in the world.

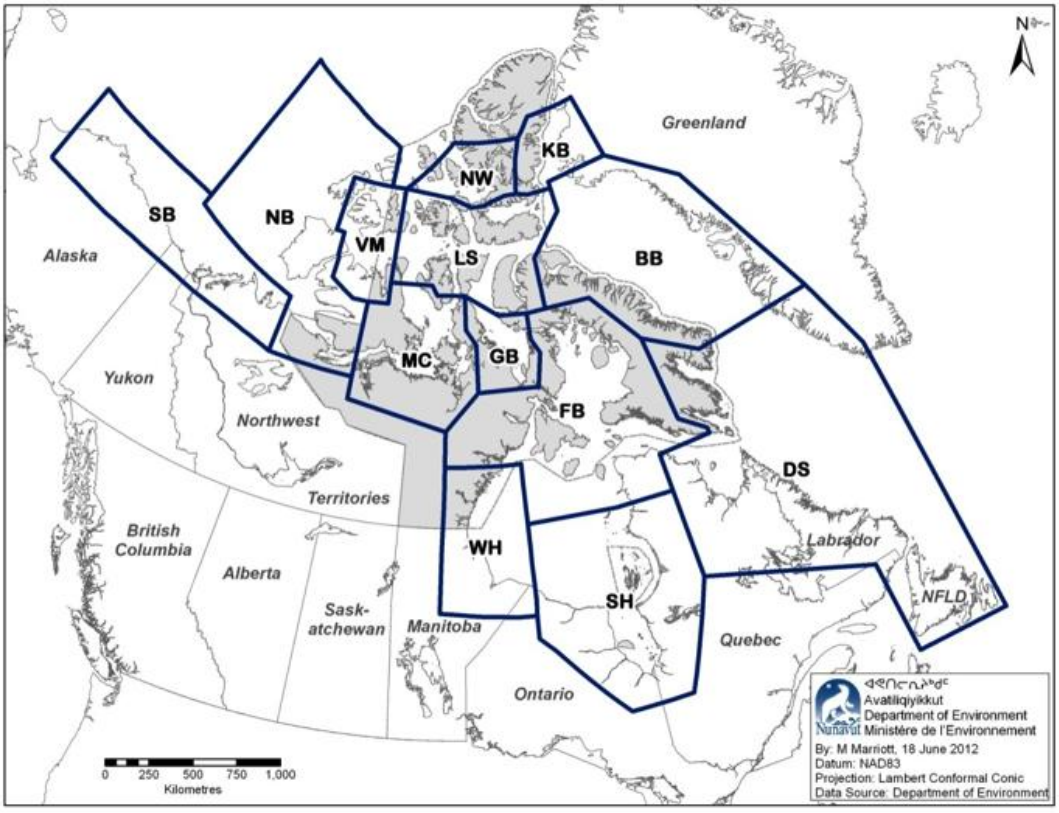

Figure 4. Canada's and Nunavut's (shaded area) polar bear subpopulations. BB: Baffin Bay, DS: Davis Strait, SH: Southern Hudson Bay, WH: Western Hudson Bay, FB: Foxe Basin, GB: Gulf of Boothia, MC: M'Clintock Channel, LS: Lancaster Sound, KB: Kane Basin, NW: Norwegian Bay, VM: Viscount Melville, NB: Northern Beaufort, SB: Southern Beaufort.

The Polar Bear Program (PBP) focuses its research on applied population demography (specifically TAH decisions). This work requires population modeling - (the study of groups of animals living in the same area and how they interact) and genetics. It also includes foraging and habitat ecology, contaminant monitoring, harvest monitoring/reporting and behavioral ecology of Nunavut's polar bear populations.

Human dimensions research relevant to harvesting polar bears has been carried out for the Davis Strait and Western Hudson Bay polar bear subpopulations. This work has facilitated collaboration with Nunavut's various co-management organizations and neighboring jurisdictions to meet the many research and monitoring requirements demands for polar bear conservation.

Alternative techniques to traditional capture-mark-recapture (CMR)

Since 2007, to reflect Inuit societal beliefs and values, the PBP has developed less invasive alternatives to the traditional capture-mark-recapture (CMR) studies in order to estimate population abundance. One method - DNA biopsy sampling - uses a small dart to remove a small skin sample without affecting the bear, but providing identification of individual bears (Figure 5). This is now being applied on a larger scale for the population re-assessments in Baffin Bay and Kane Basin.

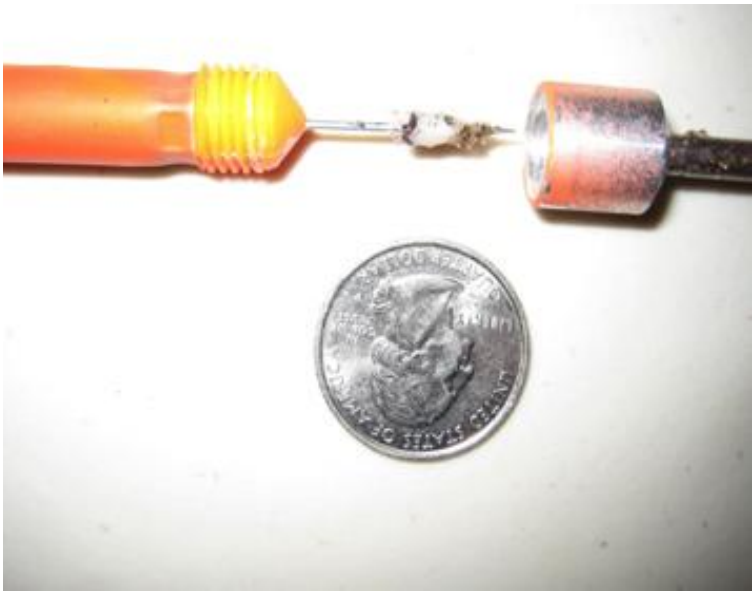

Figure 5. Example of a disassembled biopsy dart tip showing the extracted skin sample during the sampling process.

Another non-invasive approach has been the use of aerial surveys. Through a collaborative effort with the University of Minnesota, DOE has applied this technique to estimate the population abundance for Foxe Basin. The results show that aerial surveys can be used to determine polar bear numbers in specific regions (e.g., seasonally ice-free regions). While aerial surveys only provides a snapshot at a given time and place, repeated surveys can establish trends in population abundance and help measure the success of the prescribed management program.

Davis Strait Population Inventory

This population was studied in the late 1990s using satellite radio telemetry and again in the mid-2000s with CMR to estimate abundance. The purpose of the study was to estimate population numbers, survival rates, and recruitment rates in order to identify the maximum TAH for this subpopulation. The conclusion was that polar bears had increased in numbers from the 1970s to about 2160 in 2005 (probably because of increased harp seals and lower harvesting); and was continuing to increase slowly under current harvest levels. However, recruitment rates for this subpopulation were relatively low compared to other subpopulations; and Davis Strait sea ice has been declining since the mid-1990s. The Davis Strait subpopulation is best regarded as approximately stable (constant) at current harvest levels, but vulnerable to continued sea ice decline. DOE recommends that the current (historical) MOU target goal for this population of 1650 bears be re-evaluated in order to define management and conservation goals.

Davis Strait Polar Bear Public Opinion Study

A poll was conducted to learn what the Nunavut public in Iqaluit, Kimmirut and Pangnirtung think about polar bears, climate change, IQ, and natural resource management.

Most respondents indicated the following.

- They think polar bears are dangerous.
- There are currently 'many' polar bears; they prefer that there are 'some' polar bears.
- There are too many polar bears, but they can tolerate the number of polar bears.

Regarding natural resource management, most respondents indicated that they are 'somewhat dissatisfied' with the degree of influence they have over wildlife management.

Davis Strait Polar Bear Elder/Hunter Knowledge Studies

In addition to public opinion polls one-on-one interviews with Elders and hunters were conducted in Iqaluit, Kimmirut and Pangnirtung to get their opinions on polar bears, climate change and *Inuit Qaujimajatuqangit.*

These interviews indicated that people believe the following.

- Polar bears are becoming more abundant and there are problem polar bears.
- People have seen a variety of changes in the climate, and sea ice does not form as well as it used to
- Some informants suggested that the decrease in ice has likely led to an increase in polar bears, though others said polar bears do not live exclusively on ice.
- Inuit-government relations and the effectiveness of Inuit participation are not seen as very good, with language being a barrier.

Foxe Basin (FB) Population Inventory/Aerial Survey

Because of Inuit concerns about CMR studies in this area, other methods of finding out numbers and condition of bears have been employed. They include aerial surveys and a collaborative project of radio collaring to establish population boundaries, assess habitat and sea-ice use as well as possible effects of human activities. The new population estimate of 2580 bears from 2010 suggests a slow increase from estimates made during the 1990s, which was the management goal. This result is evidence that past management of the FB population has been effective and the population is stable.

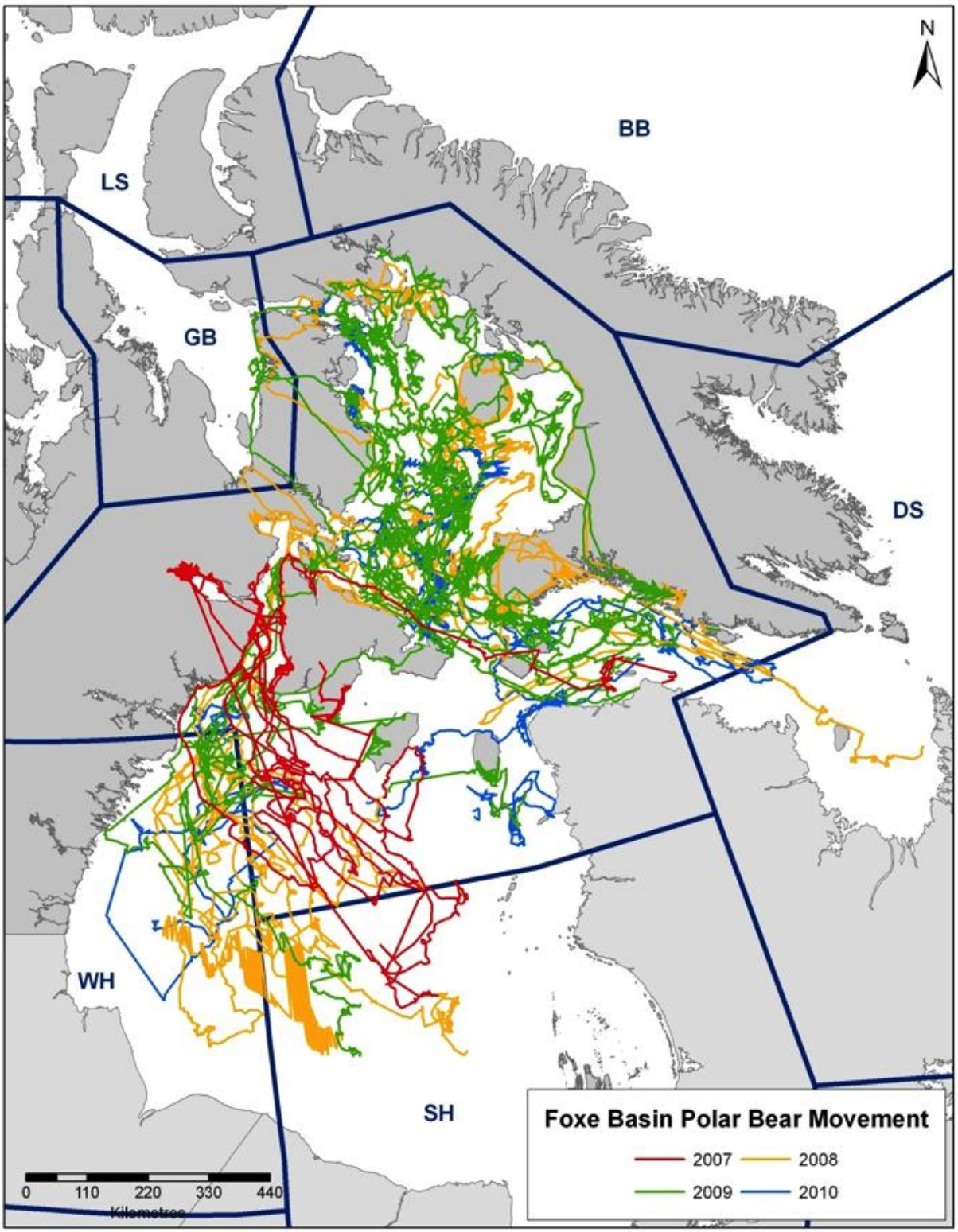

Figure 6. Polar bear movements in Foxe Basin from 2007-2010. (Data from GN and V. Sahanatian).

Western Hudson Bay (WH) Population Inventory/Aerial Survey

The Canadian Wildlife Service (CWS), in collaboration with the Manitoba government, regularly inventories part of the polar bear population in WH. Different types of surveys since 1999 indicated that this subpopulation was in decline because of lowered survival rates, reproduction, and body condition, which are all attributed to earlier sea ice break-up from climate change. This prompted the GN to undertake an aerial survey in 2011 which found that the numbers and condition of bears were better than expected, but births were low, indicating that continued monitoring of this subpopulation is necessary. It also appears that a shift in distribution occurred which could have led to previous abundance estimates that were lower. Based on this new information a TAH recommendation was made and accepted by the NWMB.

Western Hudson Bay Polar Bear Public Opinion Study

A public opinion poll was conducted with residents of Arviat, Baker Lake, Chesterfield Inlet, Rankin Inlet and Whale Cove that harvest from the western Hudson Bay polar bear population to find out their priorities. Questions were asked about the government, DOE, wildlife managers, polar bears and their population levels, wildlife managers performance and trust in them, as well as how people felt about participation with the DOE.

Respondents indicated that wildlife managers should focus on polar bears and caribou. About polar bears, people indicated the following:

- There are currently 'the most' polar bears; they prefer that there are 'some' polar bears
- Respondents were not concerned about the future of this group of polar bears

Elders, conservation officers and HTOs rated highest and were the most trusted, while bureaucrats, legislators and the GN were rated lowest and trusted least. DOE was rated most highly for ‘courteous treatment,’ ‘providing understandable and accurate information’ but was rated most poorly for ‘use of input’, response to concerns’ and having a ‘fair decision making process.’

Kane Basin (KB) and Baffin Bay (BB) population reassessment

Stakeholders have expressed concerns about the status of the Kane Basin (KB) and Baffin Bay (BB) polar bear subpopulations in the past. Therefore the Canada-Greenland Joint Commission on Polar Bear (CGJC) made it a priority that estimates of subpopulation numbers be updated.

The last demographic study estimated KB to have 164 bears but this subpopulation is thought to be declining due to unsustainable harvest levels. As well, sea-ice conditions raise questions about the current KB population boundaries. Recent (1997) estimate of the BB subpopulation estimated that there are 2,074 bears, with latest projections indicating a decline to fewer than 1,600 bears. Changes in sea-ice conditions coupled with high harvest rates in Greenland have raised concern about this group's status.

A research plan was proposed to the CGJC to re-estimate abundance and composition. Included in the proposal was a review of vital rates of the KB and BB subpopulations and a re-evaluation of their boundaries as well as locations with respect to ice conditions, food availability and distribution. A collaborative research project between Nunavut and Greenland began in 2011 with some satellite collars, ear tags, and lip tattoos being placed on animals from both subpopulations to obtain information on movements. As well, DNA samples have been collected through biopsy sampling. The study will continue throughout 2013 with new abundance estimates available prior to the 2014 harvest season.

Polar Bear Harvest Program (PBHP)

The polar bear harvest program is an important and integral part of the overall PB program. Through it, harvest data from every human-killed polar bear within Nunavut is collected along with about 2,000 research samples each year. Payment to harvesters is made through the PBHP. The PBHP sets the annual quota for each of the communities using harvest data. It is a flexible quota which allows for maximum harvest, by requiring a selective harvest biased towards males.

Every year a harvest report is produced and annual quota recommendations are presented to the NWMB and the national Polar Bear Technical Committee (PBTC). The harvest program is also responsible for handling, archiving and distributing collected samples. This has become a large research data base requiring continual maintenance and entry of new information to be useful for any present and future polar bear research.

Other Research/Collaborations

The department collaborates with other government organizations, university departments and environmental interest groups such as the World Wildlife Fund. The government organizations may be foreign (e.g., Greenland), federal (e.g., Environment Canada) or provincial/territorial

(e.g., Quebec, Manitoba, Northwest Territories). In some cases the department is the lead for a research project; in others we play a supporting role.

Population Inventory Cycle

The primary mandate of the PBP is to determine sustainable harvest levels within Nunavut and to set a TAH for each subpopulation within Nunavut. The TAH is developed from population inventories, birth/death rates and traditional knowledge of population trends and animal health. HTOs and RWOs are consulted and recommendations are made to the Nunavut Wildlife Management Board. When agreement is reached, the TAH for each subpopulation is divided among the communities that traditionally harvest from them. The local HTOs and RWOs administer the harvest within their region and communities.

The PBP conducts inventories of each of the 12 polar bear populations that are shared or within Nunavut on a rotating schedule (Table 4). A population inventory includes geographic delineation, age, sex and populations size and occurs on average every 15 years.

Some inventories need to be completed more frequently so changes in abundance can be detected and any required management practices can be applied. Inventories of populations that are shared with other jurisdictions are often conducted in collaboration with the DOE.

Before research begins, local HTOs are consulted in order to obtain and incorporate the latest local traditional knowledge into the survey. During the study, HTO and community members are involved during field operations. Once the study is completed, the PBP consults with the HTOs and RWOs to report back on the results and determine appropriate TAH levels and management practices.

Table 5. Schedule of polar bear inventories in Nunavut.

Population	**Last inventory completed**	**Next inventory scheduled to begin[3]**
Davis Strait	2007[1]	2017
Baffin Bay	underway	2020
Kane Basin	underway	2020
Norwegian Bay	1998[1]	2016

Lancaster Sound	1998[1]	2016
Foxe Basin	2011[2]	2017
Southern Hudson Bay	2012	2016
Western Hudson Bay	2011[2]	2018
Gulf of Boothia	2000[1]	2015
M'Clintock Channel	2000[1]	2014
Viscount Melville	underway	2020
Northern Beaufort Sea	underway	2019

[1] Based on capture-mark-recapture studies

[2] Based on aerial survey

[3] This inventory schedule is tentative and depends on methods of previous inventory, traditional observations about population abundance and other environmental concerns that might indicate that monitoring should occur more frequently.

Polar Bear Management

In Nunavut, polar bears have been managed under Memoranda of Understanding between the GN and each HTO for each subpopulation. When polar bears were designated a Species of Special Concern under *SARA* in 2011, it triggered the requirement for a national management plan within three years. DOE has organized a focus group comprised of representatives from RWOs, NTI and NWMB to guide the development and implementation of a management plan for Nunavut. Several meetings have been held. Once a draft plan has been prepared, consultation will be held with communities to incorporate their feedback into a final plan, which is expected to be finalized in 2014.

7.6 Ungulate Genetic Studies (see also Research by region sections 7.1, 7.2 and 7.3)

A Nunavut-wide genetic assessment of caribou and muskox populations was made in partnership with the NWMB and Nunavut HTOs with assistance from the Manitoba Department of Natural Resources (which collected genetic material from its northern caribou populations).

The management of Nunavut caribou and muskox populations as distinct units with harvesting recommendations for each, requires research methods that can identify each herds' individual boundaries. While studies of caribou and muskox movement, population trends and seasonal

range continue to be used for these studies, a genetic approach is cost effective in defining the characteristics of groups within various caribou and muskox populations.

Caribou and muskox are valuable economic and cultural game species in Nunavut. However, through traditional knowledge and scientific studies it is clear that these species are not always a dependable resource because of unpredictable range shifts, population declines and forage availability. The changing environment coupled with human activity within caribou and muskox ranges - which may cause animal stress – could potentially affect genetic diversity and possibly create inbreeding and the inability to adapt to change.

7.7 Other Species - Programs and Activities

Other species for which the GN is responsible include all raptors, arctic hare, arctic ground squirrel, voles and lemmings, as well as resident birds such as ptarmigan and ravens. There is currently no direct DOE research into these species except for raptors. There are low harvest levels for most of these species.

Since 2011, information about abundance and the collection of tissues and feces from small herbivores in particular, has been used to place these species (which are at a lower priority for management) into an ecosystem model. This method will provide needed information for management decisions, since complex relationships exist among several species within the Arctic terrestrial ecosystem. An example of a complex relationship in an ecosystem is the recent decline of ptarmigan and lemmings in the Eurasian Arctic. This created a major impact on arctic predators such as wolves. Independent studies on these species are conducted by industry, universities and the federal government.

In 2008, the NWMB asked that the DOE begin basic research to fill data gaps for raptor species in Nunavut. Although there is a raptor nest database of known breeding locations the information is not complete. A new, comprehensive update is required as peregrine falcons and gyrfalcons will be considered by the NWMB for possible harvest within Nunavut.

In addition to the database of raptor nests DOE has supported a long-term study of peregrine falcons that breed near Rankin Inlet. Studies involving this population have provided information on the ecology of and detection of poisons in these birds. This project is among the longest

studies of Arctic breeding raptors anywhere in the world. Occupancy, reproductive performance and pesticide amounts in breeding-aged peregrines have been studied. The proportion of occupied sites remained stable between 1980 and 2010, and though the number of eggs laid varies each year, egg production levels remain unchanged. However, the number of chicks that hatch and the number of chicks surviving to banding age have both declined. Climate factors such as increased precipitation are considered possible causes.

Since 2009, Igloolik and Steensby Inlet have been sites for similar research giving a broader perspective of breeding success and raptor sensitivity to stress. The expanded research project, has three major areas of study. They are assessing raptor species with potential economic benefit to Nunavut, supporting significant community involvement in raptor research through hiring and training local community members and filling knowledge gaps regarding the status of Arctic raptors. All of these goals would contribute to the development of policy for a raptor TAH in Nunavut.

8. The State of Biodiversity in Nunavut

Factors that could reduce biodiversity in Nunavut include a human population growth of 1.7 percent (higher than most of the rest of Canada), a consequent need for enhanced economic growth in the Territory (largely resource development but also tourism), and climate warming. To help with stewardship, and to fulfill its responsibilities DOE conducts general status assessments of all Nunavut wildlife such as animals, plants, fish, and insects. General status assessment is a continuous process and DOE has prepared national reports every five years beginning with Nunavut Wild Species 2000. In the two subsequent reports, which updated all previously assessed species, the number of species assessed was expanded.

The assessment now includes the general status ranks of all of Nunavut's vascular plants, four invertebrate groups (freshwater mussels, dragonflies and damselflies and tiger beetles), terrestrial vertebrate species (amphibians, reptiles, birds and mammals) and macro-lichens, mosses, black flies and mosquitoes.

Plants and animals known to or suspected to exist in Nunavut

- *Vascular plants* - 626 species known in Nunavut of the 5111 known in Canada
- *Freshwater mussels* – two species known in Nunavut of the 54 known in Canada

- *New groups of insects*, odonates (dragon and damsel flies), predaceous diving beetles, ground beetles (including tiger beetles), lady beetles, bumblebees, black flies, horse flies, and mosquitoes now known in Nunavut
- *Butterflies* – 47 species known in Nunavut of the 302 resident species in Canada
- *Amphibians* include frogs, toads, newts and salamanders, eight species known in Nunavut of the 47 species found in Canada
- *Reptiles* - only the Common Garter snake is known or suspected in Nunavut of the 48 species found in Canada
- *Terrestrial Mammals* – 38 species known in Nunavut of the 169 terrestrial mammals in Canada.
- *Birds* — 256 species in known in Nunavut of the 664 bird species in Canada, 41 percent is considered "Accidental" because breeding has not been confirmed. There are four living species assessed as "At Risk" in Nunavut: the Eskimo Curlew (COSEWIC Endangered), the Ross's Gull (COSEWIC Threatened), the Ivory Gull (COSEWIC Endangered), and the Red Knot (COSEWIC Endangered).
- *Mosses* – 290 species are found in Nunavut of the 1006 mosses found in Canada. "At Risk:" Porsild's Bryum (COSEWIC Endangered)
- *Macro-Lichens* – 272 species are found of the 862 species known in Canada.

To date only a fraction of Nunavut's plant and animal species have been included in these assessments. For groups not represented in this report a full text of the assessments can be found online at http://www.wildspecies.ca

Species at Risk and COSEWIC

In 2003, the federal *Species at Risk Act* (SARA) was proclaimed to protect wildlife species at risk in Canada. Within the Act, the Committee On the Status of Endangered Wildlife In Canada (COSEWIC) was established as an independent body of experts responsible for identifying and assessing wildlife species considered to be at risk.

Table 6. Species at Risk that fall under GN mandate - current legal (SARA) status

COSEWIC Designation	**DOE Management Responsibility**	**SARA Status**
Endangered	Peary Caribou	Schedule 1. **Species on Legal List**

		The national recovery strategy was initiated in 2012. Populations of the High-Arctic and Banks considered "endangered." Population of the low Arctic is considered "threatened."
Threatened	Porsild's Bryum (a moss)	Recovery strategy in place. Schedule 1, threatened. **Species on Legal List**
Special Concern	Polar Bear	Schedule 1, Special concern. **Species on Legal List**
	Grizzly Bear, northwestern population Reassessment done in 2012	Species not added to Legal List pending further consultation
	Barrenground Caribou, Dolphin and Union Herd	
	Wolverine	
	Peregrine Falcon	*Special concern, Schedule 1.* **Species on Legal List**
	Short-eared Owl	*Special concern, Schedule 1.* **Species on Legal List**
	Felt-leaf Willow	Special concern, Schedule 1. **Species on Legal List**

In Nunavut, the *Wildlife Act* has provisions for listing species, community consultations and protection of listed species, the Nunavut Species at Risk Committee (to make assessments) and recovery processes. Although passed into law this has currently not been implemented since the required Wildlife Regulations have yet to complete the decision-making process identified in Article 5 of the NLCA.

Recovery of Species at Risk

SARA sets very explicit timelines for recovery and management planning for Listed Species. Nunavut participates in the recovery planning process for species that occur within the Territory.

9. Operations Section Management and Enforcement

9.1. Overview

The Operations Section works with co-management partners to ensure conservation of Nunavut wildlife species. Operations participates in the development of co-management wildlife management plans (e.g., Polar Bear MOUs, Community Bear Management Plans, and Peary Caribou Management Plan). Operations provides support and resources to co-management partners and harvesters in the Wildlife Damage Prevention Program (new in 2012), Wildlife Damage Compensation Program Fall (new in 2012), Disaster Compensation Program and the Fur Program. Wildlife officers provide community liaison and participate in wildlife research activities in their area; and support search and rescue activities as required. Additional duties include issuing licenses and permits such as export permits and marine mammal transport licenses, ensuring legislative and regulatory compliance, and conducting investigations into alleged violations of acts or regulations.

The Operations Section fulfills GN responsibilities under a wide range of territorial legislation which include the *Wildlife Act, Environmental Protection Act*, *Territorial Parks Act, Forest Management Act, Forest Protection Act* and *Herd and Fencing Act*. Operations is also responsible for enforcement of some federal conservation legislation through memoranda of understanding with GN. This legislation includes the *Migratory Birds Convention Act*, the *Fisheries Act* and the *Wild Animal and Plant Protection and Regulation of International and Inter-provincial Trade Act* (WAPPRIITA)

9.2 Compliance and Enforcement

One of Operation Section's main roles is to ensure people comply with legislation and regulations. This activity has three components: education, prevention and enforcement.

Nunavut conservation officers' (COs) promote conservation education by providing school presentations, community workshops, radio announcements and posters to the communities where they serve. They also answer people's questions about legislation that they enforce.

Prevention is carried out by COs patrolling – that is being “out on the land,” talking with people and being seen by resource users. An officer’s presence often acts as a deterrent to illegal activity.

Enforcement is required when education and prevention have failed. There are numerous enforcement options available to COs in Nunavut. These include: verbal warnings; written warnings; HTO discipline of a member; summary offence (misdemeanor) ticket information (SOTIs); long form information (court) and alternatives.

Summary of enforcement statistics (2007-2013)

Investigation description	**Number of investigations**
Wastage	16
Hunt without License	9
Export without a permit	8
Harvesting out of season	5
Harvest family group	14
Illegal possession	13
Defense of life/property	97
Harassing wildlife	1
Harvesting out of area	1
Environmental protection	4
Fisheries	13

Enforcement action used:	Number of times used:
Unresolved	16
No offence committed	83
Verbal warning	8
Written warning	19
HTO resolved	3
SOTI	1
Long-form information	3
Alternative measures	0
Active investigations	19

Future Plans for Wildlife Operations

An enforcement database is being developed, which would enhance COs' ability to check an individual's background in other communities, which would assist in decision-making for investigations. It could also track Territory-wide enforcement activities statistics. Similarly, an on-line licensing system is being developed (based on the LISIN program from NWT) and will streamline the Department's licensing processes as required by Nunavut's wildlife legislation.

Community Relations

Nunavut Conservation Officers maintain positive working relationships between hunters, co-management partners and DOE. Some COs have assisted with HTO projects such as the Rankin Bowhead Hunt 2009 (providing polar bear deterrence for a hunt crew), assisting with community hunts for caribou, beluga and also with organizing exploratory fisheries. Joint patrols have been operated in some communities with other agencies (DFO, Parks Canada, and RCMP). As well, some communities have successfully hired bear monitor personnel to assist COs with deterring polar bears in Arviat, Clyde River, Qikiqtarjuaq and other areas.

Many fur handling courses have been held over the past few years in larger centres and communities with high fur harvest. These courses have increased fur handling knowledge and greatly increased the return harvesters receive at fur auctions. A new fur tracking system is being started in communities which will allow "real time" notification of shipment arrivals, sales and other activities to the Wildlife Offices so that harvesters can keep track of the furs they ship to auction.

Some COs are involved with after school programs and in-school programs in their communities including outdoor school trips, archery programs and GPS use. COs have assisted people in setting up their GPS units, SPOT units and similar technology to enhance safety when traveling on the land.

COs have been involved in wildlife research projects, including logistics, arranging local participation with the HTO, and direct participation in the field work. A debit machine placed in the Iqaluit Wildlife office makes it possible for people outside the Territory to buy fishing/hunting licenses more easily. Search and rescue statistics were not available for all communities. However, in the last 7 years, the Iqaluit Wildlife Office assisted on 45 searches for overdue community members.

10. Wildlife Conservation in Nunavut

Through this report, the DOE Wildlife Division has offered both a contemporary "snapshot" and the historical development of wildlife co-management and stewardship in Nunavut. The environment is not constant and many wildlife populations fluctuate due to natural events that cannot be controlled by humans. Thus wildlife management is never a goal that can be achieved. Rather it is a dynamic activity that continues in perpetuity to ensure that future generations retain wildlife resources to the same or to a greater extent as people today.

Growing communities and more efficient hunting techniques combined with converging environmental pressures such as environmental contamination, climate change, exotic species invasion and development can potentially diminish the productivity of Nunavut wildlife over time. These impacts must be managed and hopefully mitigated to ensure that basic needs levels for wildlife can be met in the short and the long term. The Department of Environment is committed to working in partnership with all Nunavummiut to ensure the retention of wildlife resources in the Territory for their food, and health benefits, and also to support Inuit cultural identity and the economy.

Polar bear harvests

The increasing interest in polar bears world-wide puts pressure on Nunavut which is home to most of the polar bears in the world. A critical factor in building on the past success in sustainable polar bear management will be the collaborative development of a polar bear

management plan that relies on Inuit and scientific knowledge to secure the future of this important species in a rapidly changing environment.

Grizzly bear harvests

Among the challenges facing co-managers, will be determining how grizzly bear harvest and defense activities are managed. Defense of life and property (human safety) is always the primary concern, but grizzly bear populations are vulnerable to over-hunting as witnessed by their extirpation over most of their former range. Consultation and collaboration will continue to help prevent and/or deter human/grizzly bear encounters and conflicts, and to identify an agreed management goal that ensures their long-term persistence.

Monitoring caribou and muskox populations for best conservation practices

Caribou populations require regular monitoring and a better understanding of how herd fidelity, migration patterns, health, and predation changes at various stages of their demographic cycles. Of particular interest is the importance of specific calving grounds to herd persistence. Continuing study of the abundance, genetics, and movements of caribou and muskox are needed to ensure that harvests are managed sustainably because decisions that affect one herd may have an effect on others, and harvest practices must be adjusted as herd abundance fluctuates. These species appear to be vulnerable to Brucellosis and in some regions to over-harvesting when they are at low numbers. Co-managers will be carefully establishing, monitoring and adjusting harvest levels as appropriate to ensure that populations remain healthy and reproductive. This is important for all in Nunavut who depend on country food and on subsistence harvesting.

Muskox in the High Arctic are susceptible to abrupt changes in population size resulting from die-offs and sometimes reduced productivity due to unpredictable severe weather events. We must establish and maintain community-based and scientific monitoring programs to determine population trends and adjust management actions accordingly, These will be integral components of the muskox management plan that is under development.

Industrial development, land-use planning and DOE research

As industrial exploration and development activities increase, and municipal infrastructure expands to meet the demands of growing communities, land-use planning must be informed by conservation information provided by DOE research. Monitoring of wildlife populations,

vegetation mapping, and identification of critical habitats assist wildlife managers and environmental assessment programs trying to determine any potential effects of land use activities on wildlife. Industry representatives, economic development agencies, and wildlife co-management partners must work closely to ensure that research is addressing knowledge gaps in our understanding of the impacts of development on wildlife and habitat.

Climate warming dynamics

Climate warming in Nunavut can lead to permafrost thawing, increased wetland drainage, and soil and surficial sediment loss. It can also lead to longer growing seasons, increased biological productivity and the introduction of species that migrate from the south. Climate change may result in the degradation of sea ice habitat, affecting polar bears and other animals that cross the ice in seasonal migrations or for local foraging.

Public Opinion Polls

Recent public opinion polls have indicated that working relationships between DOE (GN) wildlife staff and Nunavummiut can be improved. There is an apparent gap in trust, information sharing and collaboration. Co-management is only successful when there is good faith between all parties. Improving relationships with the public and all co-management partners is a high priority goal for the DOE.

Public opinion polls can assist the GN to determine the people's priorities regarding stewardship of wildlife in the Territory and help co-management partners ensure its sustainability well into the future. Such polls can help develop the leadership role that Nunavut and the Nunavummiut are taking in collaboration to build the Territory and set an example for others to follow in sustainable wildlife management.

Future of Nunavut Wildlife Co-management

Enhanced traditional and scientific knowledge of wildlife and their habitats in Nunavut, together with stewardship and management actions, contributes to a future where wildlife populations are abundant, productive and secure. The Department will continue to play a key role, together with its co-management partners, in managing the delicate balance between environmental protection, wildlife conservation and economic growth.

Acronyms Used in Report

BQCMB	Beverly and Qamanirjuaq Caribou Management Board
CCWHC	Canadian Cooperative Wildlife Health Centre
CHM	Caribou Health Monitoring
CGJC	Canada-Greenland Joint Commission on Polar Bear
CITES	Convention on International Trade in Endangered Species
CMR	Capture-Mark-Recapture
CO	Conservation Officer
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWS	Canadian Wildlife Service
DFO	Department of Fisheries and Oceans Canada
DOE	Department of Environment
DU	Dolphin and Union Caribou Herd
GN	Government of Nunavut
GNWT	Government of the Northwest Territories
HTO	Hunters and Trappers Organization
AANDC	Aboriginal Affairs and Northern Development Canada
IQ	Inuit Qaujimajatuqangit
ITK	Inuit Tapiriit Kanatami
KHTA	Kitikmeot Hunters and Trappers Association
KIA	Kitikmeot Inuit Association
KWB	Kivalliq Wildlife Board
MOU	Memoranda of Understanding
NIRB	Nunavut Impact Review Board
NLCA	Nunavut Land Claims Agreement
NQL	Non-Quota Limitation
NTI	Nunavut Tunngavik Incorporated
NWMB	Nunavut Wildlife Management Board
PBP	Polar Bear Program
PBHP	Polar Bear Harvest Program
PBTC	Polar Bear Technical Committee
RWO	Regional Wildlife Organizations
SARA	*Species at Risk Act* (federal)
SOTI	Summary Offence Ticket Information
TAH	Total Allowable Harvest
TEK	Traditional Ecological Knowledge
WAPPRIITA	*Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act* (federal)

Note: Please see page XX for polar bear subpopulation acronyms and accompanying map.