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

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May, 2007

1.0 Review of Wildlife and Habitat Management Programs for Terrestrial Species in Nunavut

Under the Nunavut Land Claim Agreement (NLCA), the responsibility for conservation of terrestrial species is divided between the Government of Nunavut (Department of Environment), the Nunavut Wildlife Management Board (NWMB), Hunters and Trappers' Organizations (HTOs) and Regional Wildlife Organizations (RWOs). These organizations work collectively and independently as their respective priorities dictate. The scope of our report will extend to research and management initiatives that the Minister of Environment is responsible for or partnering with other organizations.

Most of the responsibility for wildlife research and management initiatives falls to the Wildlife Research Section (WRS) in the Wildlife Division of the Department of Environment (DoE). The Environmental Protection Division responds for our Department where divisional input is required for land use and impact assessment processes. Additionally the Policy and Legislation Division has responsibility for the *Wildlife Act* and the Wildlife Regulations that are required to implement the *Wildlife Act*. The Wildlife Research Section is regionalized and decentralized. The Section is structured into Regional, Species, and Management program areas. These include: Qikiqtaaluk, Kivalliq, and Kitikmeot Regional Biologists; Polar Bear Biologist; Carnivore Biologist; Ecosystems Biologist; Legislation and Management Biologist; and a recently proposed Inuit Knowledge Biologist. There is necessary overlap in some areas. Regional Biologists currently assume responsibilities for most of the ungulate research and management in Nunavut, as well as environmental impact assessment for wildlife and habitat. The Polar Bear Biologist is responsible for polar bear-related management and research. The Carnivore Biologist is responsible for terrestrial furbearer research and management initiatives. The Ecosystems Biologist is responsible for coordinating environmental impact assessment for the division, in addition to research initiatives at the landscape level and management of the division's Geographic Information System (GIS).

The Legislation and Management Biologist is responsible for the division's involvement in various Acts and Regulations including the federal *Species at Risk Act* (SARA) and associated wildlife recovery planning. Our summary of wildlife and habitat management programs is presented in a format consistent with the organizational structure of the DoE.

1.1 Wildlife Act and Wildlife Regulations: The Wildlife Act was developed from 2001-2003, and was passed by the Nunavut legislative Assembly in December 2003. It was the intent of the department to complete all of the regulations and orders under the Act and bring them all into force at the same time as the Act – replacing the previous act and regulations. However, drafting of the regulations through the working group process proved to take more time than expected. The Wildlife Act, being modern and land claim compliant, brought with it many benefits and much clarity. On analysis, it was determined that we could bring the Act into force using the old regulations, thereby bringing the benefits of the new Act to wildlife management. The Act was brought into force on July 9, 2005, and to date operates using the old regulations. This system, while functional, has necessarily delayed implementation of some parts of the Act, as some of the newer parts require supporting regulations. For example, there is trust fund that requires a new regulatory regime to operate.

Pursuant to the NLCA, much of the material contained within the draft regulations and orders falls under the jurisdiction of the NWMB. The drafts were submitted to the NWMB for their review in 2006. The NWMB decided to adopt a public hearing process to review the drafts, and conducted the hearings in three parts, in September 2006, October 2006, and May 2007. These hearings have now been concluded, and the NWMB has advised that it will be making its decisions in June 2007, and forwarding them to the Minister likely in July. Pursuant to the decision making process defined by the NLCA, the Minister will then either accept or reject the boards decisions, which will ultimately result in final decisions for implementation. Until the NWMB provided its decisions we will not know how much work remains to be done to finalize the drafts. However, providing the NWMB does not reject large amount of the recommendations, we anticipate being able to have final drafts in the fall of 2007.

As the regulations will contain some substantive changes from the previous system, it will be necessary for the department to ensure that Inuit harvesters, researchers, and other affected stakeholders are informed of the new regulations and any new obligations they may have. The department will therefore undertake a communications effort to allow smoother implementation.

1.2 Qikiqtaaluk Region:

1.2.1 Qikiqtaaluk Research Initiatives:

Peary caribou: The Peary caribou research project has been partnered with the Resolute and Grise Fiord HTOs, Queen's University, and Parks Canada. The focus of the project has been combined aerial and ground surveys of species abundance, composition, and distribution following concerns of another population crash caused by severe icing in 1997. Interim survey results (in progress) suggest Peary caribou currently exist at low densities and in small numbers across much of their high arctic range. The final year of the survey will be spring 2007 with a final report anticipated by January 2008. The survey will provide estimates of population numbers which will be used to develop sound management initiatives. The population structure of Peary caribou is being investigated using genetic techniques; however these methods alone may not be sufficient to identify demographic units that should be managed independently. The Department of Environment initiated a satellite collaring program in 2003 to investigate movement patterns and space use of Peary caribou. Location data has been collected on a small sample of animals over a 3 year period. The data will be analyzed to develop an understanding of movement patterns and space use which can assist in the delineation of populations. Population delineation is essential to rational management so additional telemetry studies may be required. Currently population boundaries are inferred based on previous studies of movements, Inuit Qaujimajatuqangit (IQ), survey results, the movement of radio-collared animals, and known geographic barriers (DoE 2005). IQ on population changes and ecology of Peary caribou and muskox has been collected for the high arctic islands of Nunavut (Taylor 2005). 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. Future research initiatives on Peary caribou could include long-term telemetry studies, habitat investigation, resource selection, and simulation modeling to consider impacts from harvest, climate change, and periodic icing events. Initial investigations of snow cover and its relationship to the distribution of Peary caribou have been completed (Maher 2005) in partnership with Queen's University. 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 recovery of small Peary caribou populations.

High Arctic muskox: Research on high Arctic muskox has been partnered with the Resolute and Grise Fiord HTOs, Queen's University, and Parks Canada and has occurred as a multi-year program in conjunction with research on Peary caribou. In general, the Government of Nunavut has undertaken a long-term research project to survey and estimate muskox across their range. Since 2001 the Department of Environment (DoE) and HTO's from Resolute Bay and Grise Fiord have completed joint ground/aerial surveys on the Bathurst Island Group, Cornwallis Island, western Devon, Prince of Wales, Somerset, and in 2005-06 the entire non-glaciated area of Ellesmere and Graham Islands. Parks Canada has partnered to survey National Parks within the study area. In 2007, aerial survey techniques will be used to record wildlife numbers and their locations on Axel Heiberg Island, the Ringnes islands and their smaller satellite islands: these islands have not been surveyed since 1961.

In order to describe spatial patterns and identify populations, a satellite telemetry program was also initiated in 2003, collecting location data from a small number of animals over a 3 year period. This data will be analyzed to identify movement patterns and space use and can assist in the delineation of populations, evaluation of habitat selection, and potentially assist in the understanding of intra and inter specific relationships. Currently population boundaries are inferred based on previous studies of

movements, Inuit Qaujimajatuqangit (IQ), survey results, the movement of radio-collared animals, and known geographic barriers (DoE 2005; Gunn and Jenkins 2006). IQ on population changes and ecology of Peary caribou and muskox has been collected for the high arctic islands of Nunavut (Taylor 2005). 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, habitat investigation, resource selection, stable isotope analysis and simulation modeling.

North Baffin caribou: Subject to funding, research on the North Baffin caribou will begin in 2007. Barren-ground caribou are an important game species of Inuit hunters and 6 communities harvest caribou on North Baffin Island. There is little information on the population(s) and caribou are known to occur in subunits or herds that have spatially and temporally variable levels of mixing. It appears that scientific research has been proposed for north Baffin Island on a few occasions; however, the reallocation of funding and limited resources have left the area devoid of basic wildlife information. No population surveys have ever been conducted in north Baffin and only one preliminary nonsystematic calf survey was completed in 1997. The survey, although limited, provides evidence of calving in the central lakes area of north Baffin which is currently being investigated for mining interests. Work is required to define the herd or herds, the annual and seasonal ranges of animals, and to assess fidelity to calving areas and important post calving areas (particularly with respect to potential industrial development).

There is considerable potential for mining activities in North Baffin, and IQ and a preliminary calving survey in 1997 have identified the area as significant to caribou. It is very important to collect long-term information on the movement and distribution of caribou as patterns can vary with changes in spatial and temporal dimensions. A satellite based collaring program is well suited for tracking wildlife movements and can provide a cost-effective means of remotely monitoring activity. Because north Baffin caribou may

be wide ranging and mix with other herds, satellite collars are necessary to delineate herds, identify their locations, and inform the spatial dimensions for further research (i.e. population surveys). This research program may be partnered with BaffinLand Iron Ore Mining and the University of Victoria, and includes the collection of local knowledge and full community consultation. In 2007, community consultation will commence and background information compiled. As well, satellite collars will be purchased for deployment in the fall of 2007 or spring 2008. This multi-year project will inform future research including population surveys, genetic analysis and simulation modeling.

1.2.2 Qikiqtaaluk Management Initiatives:

Peary Caribou Management Plan: In collaboration with Grise Fiord and Resolute Bay HTOs, a Peary caribou management plan was developed and submitted to the NWMB in May 2005. We received comments from the NWMB biologist in September 2006. The delay appears to be related to capacity issues because of the demands from the Wildlife Regulations process, but may also be due to resistance from Nunavut Tungavik Incorporated (NTI) and the affected HTOs to move to a regulated harvest. Peary caribou have been identified as an endangered species by COSEWIC, and can now be legally taken in any number throughout their range in Nunavut. The regulatory components of the draft Peary caribou management plans are also part of the proposed Wildlife Regulations. Under the *Wildlife Act*, Total Allowable Harvest Limits (TAHs) have been recommended for all six Peary caribou populations in the Baffin Region. The regulations are currently before the NWMB for decision.

High Arctic Muskox: For the 19 populations that are recognized in Nunavut, TAH's and Non-Quota Limits (NQLs) have been recommended for 18 populations. Recommendations have been applied to all muskox populations in the Baffin Region and are detailed in a Wildlife Management document for muskox (Gunn and Jenkins 2006). In November, recommendations were formalized under the *Wildlife Act*, in the proposed muskox Total Allowable Harvest Order. The regulation is currently before the NWMB for decision.

South Baffin 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 a 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 en masse as they attempt to find suitable habitat. These movements can also result in a local shortage of caribou. Declines in caribou numbers are accentuated by an increase in human population and associated hunting pressures, especially in the Iqaluit area.

This research was intended to culminate in a 10-20 year caribou management plan. There was extensive consultation with both the public and co-management partners. A draft management plan was developed and presented at the 4th South Baffin Caribou Management Plan workshop in March 2005. At that time, it was also proposed that the draft be presented to the HTO's, QWB, NWMB, and NTI for written comment. However, in 2005, staff turnover forced a delay in this initiative. The new Baffin Regional Biologist is on staff and will be completing this initiative.

1.3 Kitikmeot Region:

The Kitikmeot region is currently the least populated region of Nunavut. Subsistence activities are still omnipresent and most people rely heavily (>50%) on wildlife harvesting for food and some source of income (sale of meat and fish, sale of furs, sport hunts guiding). Non-lethal use of wildlife is still limited in the economy (e.g. ecotourism guides) but could become more important as costs of travel to Nunavut decrease and services improve. The main non-governmental economy in the Kitikmeot is probably linked to the mining activities. The mining industry provides some incomes in the region but also potentially affects, mainly through cumulative effects on the environment,

wildlife populations and the level of harvest that is sustainable. Land use planning and the protection of some critical areas is a major conservation issue in the Kitikmeot. In the western Kitikmeot, recent surveys indicate that many caribou populations have declined.

1.3.1 Kitikmeot Research Initiatives:

Wolverine and Grizzly bear Hair Snagging: This project aims at developing a method to monitor wolverine and Grizzly bear population status and harvest levels in a way that acceptable by the communities (hair snagging technique does not involve the capture or chase of the animal) and that provide results with acceptable confidence intervals (For details see Dumond 2006a). The pilot study is leaded by Kugluktuk HTO in collaboration with DoE for technical advice, scientific coordination and funding, NWMB for funding, and Hornby Bay Mining for in-kind funding. The final report on the pilot study should be available by fall 2007. This report will present the technique and its applications and will present an analysis of the data collected during the 2 years of field work, including the minimum number of bears and wolverine identified through the technique, an estimate of the wolverine and bear local abundance, and an estimate of harvest rates for these two species by Kugluktuk hunters. The project also allows the archiving of DNA material that can be used later on for population delineation or other purpose. The hair collected through the hair snagging technique and harvested Grizzly bears have been used in a peer reviewed paper on Grizzly bear diet across North America (Mowat & Heard 2006). This preliminary work has been promising and a project at a larger scale is being proposed by DoE to assess wolverine and Grizzly bear populations' status in the Western Kitikmeot (Dumond 2007a).

Mainland Caribou Projects: Mainland caribou herds in the western and central arctic have been declining over the past decade and concerns have been raised regarding the potential impact of some human activities (including harvest) on the temporal aspect of the caribou herds fluctuations (human activities may accelerate declines and delay recovery).A tremendous amount of work to assess caribou herds has been led by the GNWT on the

western caribou herds (Cape Bathurst, Bluenose West, Bluenose East, Bathurst and Ahiak caribou herds). Populations estimates for all the herds but the Ahiak herd (The size of the Ahiak caribou herd was not estimated) are showing a decline of these herds. GNWT and GN-DoE conducted an aerial distributional survey of the Bluenose East Caribou herd in spring 2004 (Dumond 2004). During the summers 2005 and 2006, GN-DoE assisted GNWT to conduct a photo-census of the Bluenose East Caribou Herd and provided some in kind assistance to the calving ground survey of the Bathurst Caribou Herd. Among the declining western mainland caribou herds, the Bluenose East herd is the most important for subsistence harvesting by Nunavummiut. GN-DoE is proposing, in collaboration with other organizations, a research program on the Bluenose East Caribou Herd in order to assess the status of the herd and potential factors responsible for its decline (Dumond 2007b; Kutz 2005; Veitch 2007). Traditional knowledge on Caribou was collected in the West Kitikmeot under the Naonayaotit Traditional Knowledge Project (Banci & Hanks 2005). The Department contributed to that study and is waiting for the Kitikmeot Inuit Association to officially release the reports.

Boothia Caribou Project: Mining exploration is looking at areas on and around the Boothia Peninsula. During June 2006, we surveyed the area for caribou in order to delineate the main calving areas and obtain an estimate of the number of caribou using the area during the calving season (Dumond 2006b). This will allow providing recommendations to limit disturbances in calving areas during the calving.
A research proposal has been submitted to complement this survey. The proposed project will aim at determining the proportion of various types of caribou (Mainland, Island, and Peary) and their condition and the recruitment in the caribou population wintering on Boothia Peninsula (Dumond 2007c**)**.

Dolphin and Union Caribou Project: The Dolphin and Union Caribou Herd (locally called Island Caribou) was once reduced to a very small number and only started recovering some 30 years ago. The latest survey of the herd was in 1997 indicating and increase of the herd with an estimated 28,000 animals (Nishi & Gunn 2004). The history of the herd, and environmental and anthropogenic factors that could potentially affect

negatively this herd, justified the listing of this herd as "Special Concerns" under the COSEWIC (COSEWIC 2004).

An aerial survey was planned in October 2006 to assess the status of the herd and estimate some of the causes of mortality. Unfortunately, poor weather conditions and late freeze up did not allow conducting the survey that has been postponed to Fall 2007 (Dumond & Torretti 2007). Between 1998 and 2004, the movements, productivity, body condition and parasites in females Dolphin and Union Caribou were studied, as well as the quality of the herd summer habitat and the prevalence of certain parasites. Reports, thesis and peer reviewed papers are being written by collaborators and should become available in fall 2007 – winter 2008.

Mainland and Boothia Peninsula Muskox: In the Kitikmeot, one of the research priorities established by the Nunavut Wildlife Management Board (2003) was to update the status of muskox on the Kitikmeot mainland and Boothia Peninsula. In spring 2004, Kugaaruk HTO conducted a muskox ground survey with some technical support from GN-DoE. GN-DoE is waiting for the final data from this survey to help the HTO with the analysis and report. In August 2005, GN-DoE conducted an aerial survey of the area between Bathurst Inlet and the Coppermine River. Preliminary results were presented to the impacted communities and were distributed through the Kitikmeot Wildlife Newsletter (Dumond 2006c). The final report is in preparation and should be available by early summer 2007 (Dumond in prep. a). In June 2006, we conducted an aerial survey of the Boothia Peninsula and the area south of it (Dumond 2006b). The final report is planned for the fall 2007 (Dumond in prep. b). This coming year, we are planning an aerial survey of the muskox population west of the Coppermine River as well as an assessment of the health and recruitment of the muskox population in this area (Dumond 2007b). Traditional knowledge on muskox was collected in the West Kitikmeot under the Naonayaotit Traditional Knowledge Project (Banci & Hanks 2005). The Department contributed to that study and is waiting for the Kitikmeot Inuit Association to officially release the reports.

Harvest and Ecological Research Operational System (HEROS): This research proposal aims at recording wildlife observations and wildlife harvest through a friendly computer interface allowing wildlife professionals, co-management partners but also hunters and land users to enter and view (with some restriction for general public) the data (Dumond 2007d). Due to the vast surface of the Territory and the limited resources to collect information, this system will allow to gather some basic information through the participation of local hunters and land users. These data will be useful for research planning, management initiatives, and land use permit application reviews.

Vegetation Mapping: Vegetation or habitat mapping has been conducted in various areas of the Kitikmeot region, including the Slave Geological Province (Matthews et al. 2001), the Queen Maud Gulf (REF), the Boothia Peninsula (Laidler 2002), and the south of Victoria Island (Patterson unpublished data). A proposal has been submitted to map the vegetation of the western Kitikmeot mainland in order to analyze habitat and landscape use of wildlife in these areas and provide baseline data for land use planning and impact assessment (Dumond 2007e).

1.3.2 Kitikmeot Management Initiatives

Grizzly Bear Management: In 2002, the Department initiated a Grizzly bear management plan project. In the fall 2003, Kitikmeot and Kivalliq RWOs and HTOs were consulted through a working document and questionnaire. Only two communities have provided the department with written feedback. A draft management plan is being prepared (Dumond & Campbell in prep. a) for review by the HTOs, ROs, and the NWMB

Bluenose East Management Plan: An advanced draft management plan for the Cape Bathurst, Bluenose West and Bluenose East Caribou herds was prepared by GNWT-RWED (Nagy et al 1998) but this document has remained as a draft, and was not discussed with co-management boards, therefore no finalized management plan was implemented.

Dolphin and Union Caribou Management Plan: Concerns from the Kitikmeot Hunters and Trappers Association and the available scientific and traditional knowledge of that herd triggered a workshop involving co-management partners with the purpose to develop the foundations of a Dolphin and Union Caribou Herd Management Plan. Minutes from the workshop were taken but no other management action was conducted due to other priorities.

Muskox Status and Management Review in the Kitikmeot: A review on the status of muskox and their management in the Kitikmeot is close to be finalized (Dumond 2006d). The GN-DoE developed a set of management actions for muskox. These recommendations were discussed with Kitikmeot communities. The muskoxen management recommendations were forwarded to NWMB, who are expected to make a decision in mid 2007.

1.4 Kivalliq Region:

1.4.1 Kivalliq Research Initiatives:

Qamanirjuaq Caribou Monitoring Program, Qamanirjuaq Caribou Classification Studies, and Qamanirjuaq Condition and Disease Monitoring: Kivalliq Qamanirjuaq Caribou Population (Figure 1) research initiatives have been partnered with the Kivalliq Wildlife Board (KWB), the Nunavut Wildlife Management Board (NWMB), the Beverly and Qamanirjuaq Caribou Management Board (BQCMB), the Local HTO's (Hunter and Trapper Organizations) of Arviat, Whale Cove, Rankin Inlet and Baker Lake, and the Jurisdictions of the North West Territories (NWT) and Manitoba (Campbell 2006a interim report) (Interim and final reports on these studies are listed in Appendix 1).

The Qamanirjuaq Caribou Herd is the largest herd in Nunavut occupying (300,000km^2) of poorly understood range. Kivalliq Inuit utilize an estimated 15,000 Qamanirjuaq caribou per year worth an estimated 12 million dollars ($800/caribou). The logistics involved in determining how these caribou use their range are for the most part labor

intensive and cost restrictive. An ongoing satellite telemetry program launched in 1993 has provided the information to build a comprehensive location and activity database. This database has provided biologists, HTOs, the KWB Kivalliq Wildlife Board), and inter-jurisdictional and jurisdictional management boards with the only source of information connecting the Qamanirjuaq caribou to their seasonal range. This kind of information is essential to the development of management plans and the steering of land use activities in an informed, conservation minded direction. As land use activities heighten to meet the needs of a rapidly growing natural resource based economy, the maintenance of viable wildlife populations with high sustainable yields will require an escalation in our attempts to quantify wildlife habitat (Donihee & Grey 1983; Scotter 1980; Thompson et al 1980). Knowing where the caribou are is the key to avoiding conflicts between natural resource industries and caribou (Tennenhouse 1986). Understanding population trends is essential for herd management.

The objectives of the project are to maintain 20 GPS/satellite collars on Qamanirjuaq caribou cows to: 1) establish an important habitats information base for the Qamanirjuaq caribou herd by integrating the location and activity database, using spatial analysis software, with vegetation, hydrological, topographical, exploration and land use databases, 2) provide resource users, regional Wildlife Organizations, Jurisdictional and inter-jurisdictional management boards access to an information base with which to make management decisions and steer land use activities, in an informed and conservation minded direction, 3) locate caribou concentrations during spring to determine herd composition as well as determine spring recruitment values for the purposes of estimating herd trend, and monitor the health of the population in light of a recently detected decline in spring recruitment values.

Presently a management plan has been developed by the Beverly and Qamanirjuaq Caribou Management Board with involvement from the Jurisdictions of Saskatchewan, Manitoba the NWT and Nunavut. The present plan utilizes the results of the Qamanirjuaq Caribou Monitoring Program to make management recommendations to all jurisdictions occupied by Qamanirjuaq caribou range. Results of these studies have been

used to review harvest rates, coordinate exploration aerial and ground operations, enforce KIA (Kivalliq Inuit Association) and INAC caribou protection measures, and for environmental Impact assessments.

Beverly Caribou Population Monitoring Studies: The Beverly Caribou Population Monitoring Study is being partnered with the KWB, NWMB, the BQCMB, and the Baker Lake HTO. Other jurisdictions including the North West Territories (NWT), Saskatchewan the federal Government are also partnering in this project. (Interim and final reports on these studies are listed in Appendix 1).

The intent of the study is to obtain a current estimate of the number of breeding females in the Beverly herd of barren ground caribou (Figure 1). The last survey of the Beverly herd was conducted in 1994. Recent surveys of the Bathurst, Bluenose East and West and Cape Bathurst barren ground caribou herds show significant declines in all these herds and provide strong evidence to support a similar decline for the Beverly herd. The survey method consists of a 1) systematic reconnaissance survey that outlines the distribution of calving caribou and patterns of caribou numbers, 2) photographic survey that uses a specialized plane to photograph caribou on the annual calving area and 3) classification survey that determines the number of breeding and non-breeding females on the annual calving ground.

At present little is known of the status, health and seasonal range use of Beverly caribou. Information collected during the above studies on population status will be used to assess the sustainable harvest of the Beverly herd and determine whether enhanced management activities are required. Current information on the location of the annual Beverly calving ground will help reduce the effects of industrial and commercial activities.

Current information on the annual calving ground of the Beverly herd is required for the management of land use activities to reduce possible effects of human activities. Caribou Protection Measures were implemented by DIAND to protect breeding cows during the calving and post-calving periods, but there has been no funding for the caribou

monitoring component of the measures since 1991, and Caribou Protection Areas (CPAs) are based on past calving and post-calving information. Since the CPAs were established, Beverly caribou have regularly calved outside of the CPAs including at least 4 years in which less than 5% of calving occurred within the CPA (Gunn & Sutherland 1997). Data from satellite-radio collared cows from the Qamanirjuaq herd have also demonstrated that cows have regularly calved outside of the CPAs.

Presently a management plan has been developed by the BQCMB with involvement from the Jurisdictions of Saskatchewan, Manitoba the NWT and Nunavut. The present plan will utilize the information from this population estimate (Scheduled for June 2007) to analyze the sustainability of the present harvest and make management recommendations to all jurisdictions occupied by Qamanirjuaq caribou range. The BQCMB co-ordinates and provides a single forum for the management of the Beverly herd and is mandated to pursue partnerships for the herd's management. Information on herd size is an integral part of their 2005-2012 management plan as "enhanced management actions" when the herd is determined to be declining. Further management actions is also required if herd size is not able to meet subsistence needs levels.

Northeast Mainland Caribou Collaring and Delineation Studies: The study of Lorillard and Wager Populations of barren-ground caribou occupying the Northeastern mainland of Nunavut is being partnered with the KWB, the NWMB, and the Repulse Bay and Chesterfield Inlet HTOs (Campbell 2006 Final report). Interim and final reports on these studies are listed in Appendix 1).

Repulse Bay, Baker Lake, Chesterfield Inlet, Pelly Bay and Igloolik have reported general declines in Northeastern mainland caribou health and numbers. With little information available on the number and size of caribou populations within the Northeastern mainland region, their range requirements and seasonal range use, managers had been unable to address community concerns. Surveys flown between 1976 and 1987 found three distinct densities and associated calving grounds occupying the Northeast mainland of the Kivalliq Region in June; the Melville, Lorillard and Wager Herds (Figure 1) (Calef & Helmer 1976; Calef & Heard, 1981; Heard et al. 1981; Heard et al. 1986; Donaldson, 1981). A VHF collaring program deployed within the Wager and Lorillard ranges during the 1980's found the presence of at least three additional aggregations of caribou in the area displaying calving ground fidelity (Heard et al. 1986). Further research to confirm these aggregations in 1999 to 2005 suggest that these aggregations are no longer apparent.

The objectives of the project were to: 1) utilize satellite telemetry and calving ground delineation's to determine the range and number of distinct populations occupying the Northeast mainland. Collars were systematically deployed over the study area during early spring, a time of year, other then calving, when the expression of herd fidelity is at its strongest. 2) Utilize satellite telemetry to address the land use management issue of important winter, spring, and summer and fall range. This base-line information is essential for determining where, when, and how natural resource industries can become established without jeopardizing the conservation of northeastern mainland caribou or their range.

The study of the Lorillard and Wager herds of barren-ground caribou concluded during the 2006/07 fiscal year. Much of the data has been analyzed and a report produced. Following the completion of the analysis talks towards the development of a management plan for the herds with the communities of Repulse Bay (Wager Herd) and Chesterfield Inlet (Lorillard Herd) can begin. Estimated completion of the final analysis is February/March 2008. Results from this research have and continue to be used to make management recommendations to communities and resource users on the ranges of both herds, review harvest rates, coordinate exploration aerial and ground operations, enforce KIA as well as for environmental Impact assessments.

Southampton Island Caribou Condition Studies, Southampton Island Population Monitoring Studies: The above programs studying the Southampton Island Caribou Population (Figure 1) have been partnered with the KWB, the NWMB, the Coral Harbour HTO, and Agriculture Canada (Campbell 2006b - interim report). Interim and final reports on these studies are listed in Appendix 1).

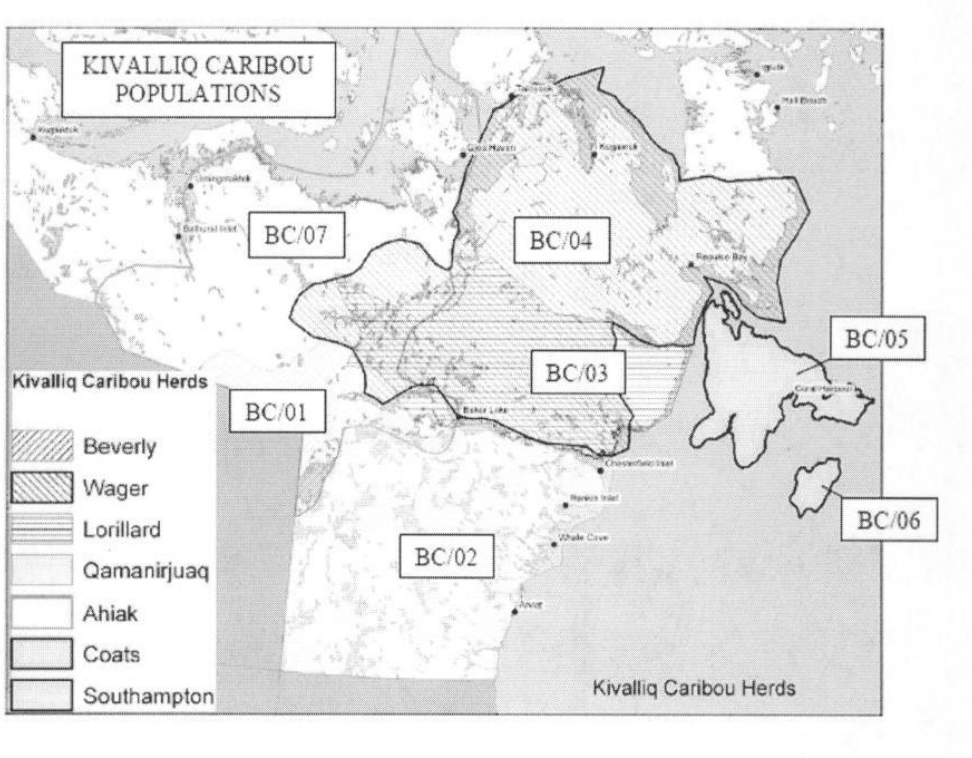

Figure 1. Barren-ground caribou populations in the Kivalliq region of Nunavut

Wolves (*Canis lupus*) and barren-ground caribou (*Rangifer tarandus groenlandicus*) were a common component of Southampton Island ecology until the early 1900's. The decline of these animals became obvious by 1935 and was followed by the local extinction of wolves by 1937 (Parker 1975). The extirpation of caribou from Southampton was complete by 1952, a result in part of over hunting. The absence of this resource was keenly felt by residents of Coral Harbor prompting both the local HTO and government to initiate the re-introduction of caribou onto the Island. In 1967, 14 years following their extirpation, 48 caribou from Coats Island were introduced onto Southampton Island. Caribou numbers have since increased rapidly which is in part due to exceptional range conditions resulting from the 14-year absence of caribou from the Island. The Southampton Island Caribou Herd is extensively utilized both commercially and domestically. Commercial harvests have seen a general increase from 564 in 1992, to 759 in 1993, 1,554 in 1994, 2,356 in 1995, 1,839 animals in 1996, 3,365 in 1997, 2,956 in 1998, 1,094 in 1999, 2,166 in 2000, 3,696 in 2001, 3,834 in 2002 to 5005 animals in 2003. In 2005, 4,000 animals were harvested at a sixty percent male ratio.

The Department of Environment (DoE) over this same period recommended a harvest of 3,500 animals at a minimum 80 percent females with no mature females. The latest survey results suggest that the population is stable though a high incidence of *Brucella suis* is causing concern for both community members and biologists. Close monitoring of herd trend and health is strongly recommended to detect and possibly mitigate any demographic impacts.

The objectives of these research studies were to provide basic information on the Southampton Island Caribou Herd to manage the population for both a commercial harvest as well as subsistence harvest. The objectives include: 1) The determination of Southampton Island caribou population trend as increasing, stable or decreasing in light of a high incidence of the disease *Brucella suis* as well as years of commercial and subsistence harvesting. 2) The monitoring of the condition of Southampton caribou and how any change in condition relates to range condition, availability and/or extent. 3) Monitoring the sex and age structure of the harvest to determine potential modifications in age/sex structure resulting from the commercial harvest is also required to predict short term trends. 4) Finally the study of feeding habits using rumen and stable Isotope analysis to determine range condition, quality and dietary shifts that may relate to changes in caribou health as observed during the condition analysis and again provide short term predictive power to the management of this herd.

These programs have been providing the Coral Harbour HTO with the information required to manage there caribou population for both commercial and subsistence utilization on a two year cycle. Without these programs the herd could be harvested to a point where the subsistence harvest is affected.

Nunavut Wide Ungulate Genetic Studies: The Nunavut wide genetic assessment of caribou and muskox populations is being partnered with the NWMB, and Nunavut HTO's. In addition Manitoba is providing assistance in the collection of genetic material from its northern caribou populations (Campbell 2006c – interim report). Interim and final reports on these studies are listed in Appendix 1).

The management of Nunavut caribou and muskox populations as distinct demographic units with associated harvesting recommendations requires research methodologies capable of delimiting these populations. Studies of caribou and muskox movement, population trends, and seasonal range will be used to direct the proposed study as well as compliment its results. Many methods have the potential of meeting these research goals however a genetic approach is proposed as a cost effective general first step towards defining demographic units to caribou and muskox populations across Nunavut.

Caribou (*Rangifer tarandus*) and muskox (*Ovibos moschatus*) are valuable economic and cultural game species in Nunavut. Through traditional knowledge and scientific studies we know that these species, especially caribou, are not always a dependable resource due to the unpredictable nature of range shifts, population declines and resource availability. In the case of Peary caribou a changing environment has led to declines in many populations leading to their addition to the COSEWIC endangered species list. In addition to natural events many caribou and muskox populations have and will experience various levels of stress due to human impacts on their ranges. As caribou and muskox range conditions change with increased land use, the maintenance of existing genetic diversity could become more difficult (Zittlau 2004). Genetic diversity is considered a necessity if a population is to avoid the risk of inbreeding effects and adapt to changing environmental conditions (Zittlau 2004; Proctor 2003; Proctor & Paetkau 2004).

The objectives of these studies are to study the genetic relatedness of Nunavut caribou and muskox populations. Much debate has surfaced over the years concerning the relatedness of caribou populations and muskox distributions across northern North America. Specific to this report is the need to delimit these populations and or groupings for many reasons. The project is in the data collection phase until spring 2007. February 2008 should see the completion of the analysis and the associated report.

It is important to understand the genetic structure of caribou populations and to determine the current levels of diversity within these populations (Zittlau 2004; Proctor 2003; Proctor & Paetkau 2004). The importance of this kind of study reaches into the very management regime and decision-making process where management decisions effecting one herd can have profound effects on related herds (Zittlau 2004).

Central Kivalliq and Northeast Kitikmeot Muskox Studies: The Kivalliq and Northeast Mainland muskox population study was partnered with the KWB, the NWMB, and all Kivalliq HTO's. The studies were completed in 2001 (Campbell & Setterington 2001). Interim and final reports on these studies are listed in Appendix 1).

The distribution and abundance of muskox in the Central Kivalliq region of Nunavut (Figure 2), which includes muskox management zones MX/20 and MX/21 were estimated using fixed-width line transect surveys in July of 1999. The number and distribution of muskox in the northern Kivalliq and northeast Kitikmeot region, which includes MX/17 and MX/18, were estimated using fixed-width line transect surveys in July 2000 (Figure 2). Requests for this study came from all Kivalliq HTO's as well as the Kugaaruk, Taloyoak and Gjoa Haven HTO's. All groups reported seeing muskox expanding both their range and their number. Information provided by the Arviat, Whale Cove, Rankin Inlet and Baker Lake HTOs provided evidence of this range expansion within the central Kivalliq, while observations from the Northeast Kitikmeot were inconclusive. The population study was initiated in 1999 following through in 2000 in response to requests from Kivalliq and Northeast Kitikmeot hunters for increased quotas and closer harvesting opportunities. Both of these requests were granted in the Central and North central Kivalliq. In the northeast Kitikmeot a quota reduction was recommended due to the extremely low densities observed.

The objectives of the project were to utilize stratified random transect aerial surveys to determine the population status of Kivalliq and northeast Kitikmeot muskox populations. The study was also designed to complement proposed muskox surveys in the Kitikmeot Region and Thelon Game Sanctuary.

Results of this study have and continue to be used to set sustainable harvest quotas and foster the establishment of muskox into historic range. The success of this harvest management program is a direct result of the information collected during these studies and its continued success will rely of similar studies in the future.

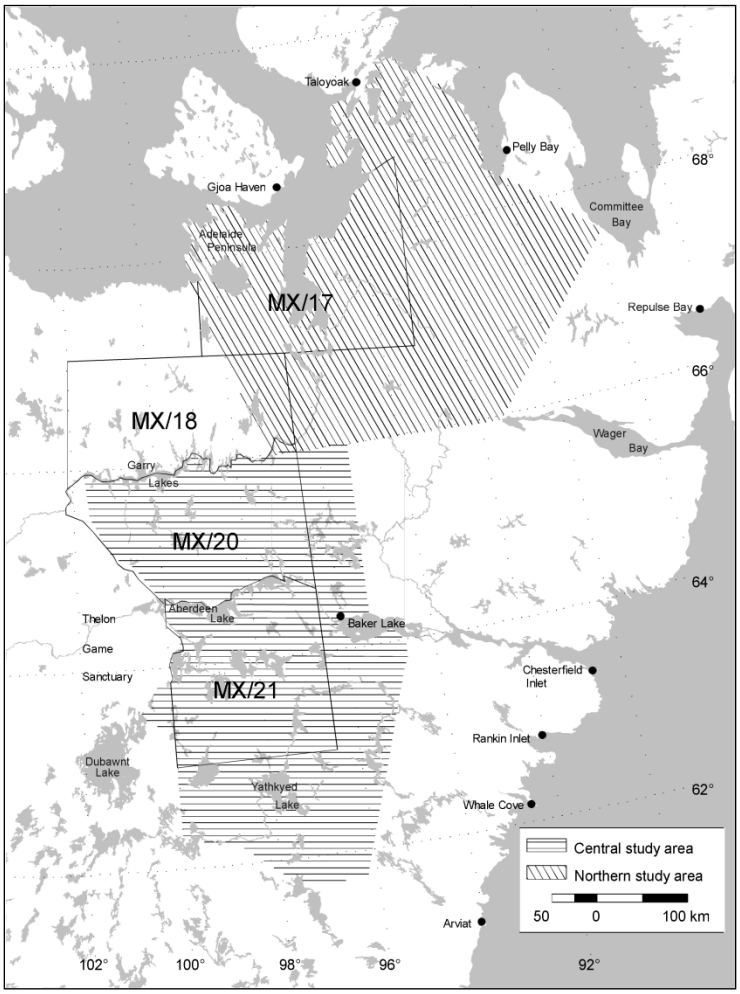

Figure 2. The northern and central Kivalliq muskox survey study areas and muskox management units are presented.

Kivalliq Wide Ecological Land Classification Studies: This program studies the vegetative communities of the Kivalliq Region and has been/is partnered with the KWB, the NWMB, Parks Canada, the BQCMB, Cumberland Resources Inc., the Local HTOs of

Arviat, Whale Cove, Rankin Inlet, Baker Lake, Chesterfield Inlet, Coral Harbour and Repulse Bay, and the Jurisdictions of the North West Territories, Saskatchewan, and Manitoba (Campbell, 2006d – Interim Report). (Interim and final reports on these studies are listed in Appendix 1).

The Kivalliq Habitat Mapping project began as a pilot study in July/August 2000. The pilot study was successful initiating the projects expansion to cover the entire Kivalliq Region (Campbell 2006d Interim Report). From August 8-14th 2000, approximately 200 plant communities in the Banks Lake study area were visited and plant type and percent cover recorded. During August 2001 160 sites were visited and plants and their percent cover values recorded in the Tehak Lake area. During August 2002 240 plant communities were examined in the Beverly lake area and 65 sites in the Lyon Inlet area, again in August 2003 240 sites in the Lyon Inlet area were sampled, in 2004 600 sites were sampled in the Baker Lake, Rankin Inlet and Snowbank River areas, while in 2005 450 plant communities were sampled in the Princess Mary Lake and Brown Lake areas. In August 2006 550 sites were sampled in the Henik, Edehon, Nulitin, Maguse and Hicks Lake areas south to the Manitoba border (Figure 3).

The objectives of the project are to use digital Landsat 5 and Landsat 7 imagery to stratify (map) terrestrial habitats of the Kivalliq Region into15-20 vegetation classes and 5-10 abiotic or non-living classes (e.g., boulder fields, water, etc.). The digital database (vegetation map) resulting from the proposed analysis will be used in association with GIS (Geographical Information System) software to determine wildlife habitat quality, quantity and availability, factors which largely govern the distribution and abundance of many ecologically and economically important species of wildlife. It is increasingly clear that migratory caribou populations as well as muskox populations are regulated by the abundance of high quality forage on their range. An understanding of the locations and size of distinct vegetation classes containing high quality forage and how these classes relate to wildlife will be critical to a manager's assessment and prediction of a population's status.

Additionally the identification of vegetation classes important to wildlife coupled with a map displaying the size and location of these vegetation classes will assist wildlife managers in their assessment of the potential impacts of land use on wildlife through the modification of their habitat. Strip mines, water development projects, urban expansion, pipelines, road constriction, chemical contamination, noise pollution etc. are on the increase across Nunavut a trend that will only intensify with time. This project will provide managers with more sophisticated ecological tools to deal with the increased pressures placed on wildlife habitat if wildlife and their habitats are to be conserved for future generations to enjoy. Finally, concern regarding climate change and its potential effects on northern ungulates including caribou and muskox, is increasing. The mapping of plant communities with associated cover values and photographs will allow managers to assess future change through a comparison of sites between years. This index of change will allow managers to asses the potential impacts of the observed change to the productivity of wildlife populations.

Presently we have used this information to assess important habitat requirements to caribou and muskox as well as to determine the amount of these important habitats within any given range. The data from these studies has already been used as a resource selection function for proposed mine sites within the Kivalliq to acknowledge and therefore reduce the mines impacts on wildlife.

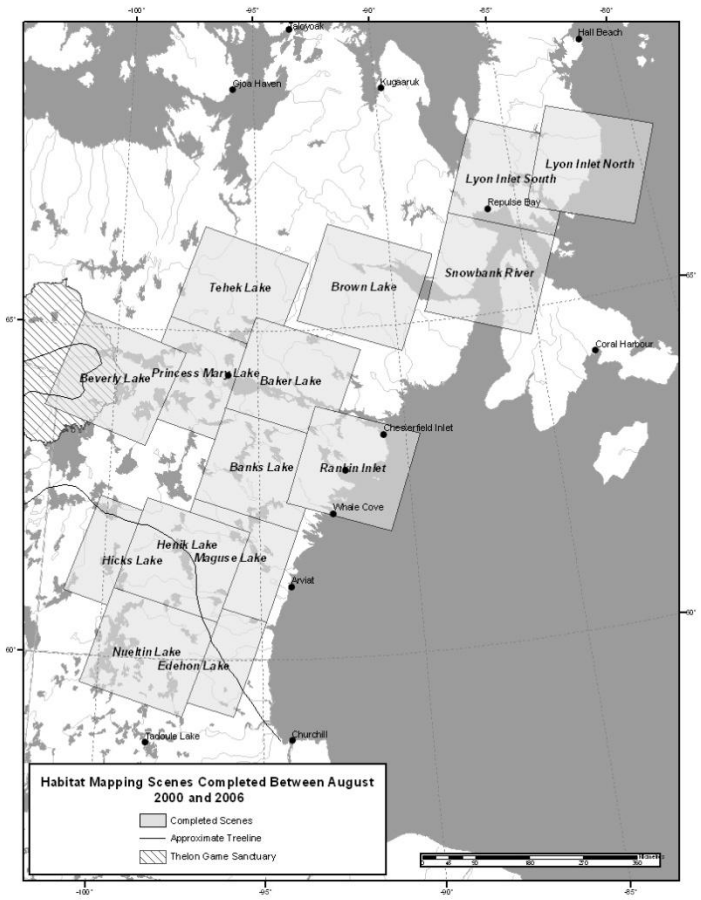

Figure 3. Landsat 7 and Landsat TM scenes sampled as of August 2006.

The "Journey of the Caribou" CD: This CD represents a review of the Kivalliq Caribou Monitoring program initiated in 1993 and ongoing (Figure 4+5). The data generated over the monitoring programs history is still in the analysis phase and expected to reveal a new understanding of caribou distribution and movements for the herds occupying the Kivalliq Region of Nunavut. This first edition CD was specifically designed to bring the information in a visual format to Nunavummiut at the community level as well as provide an impact assessment tool that pulls together our best knowledge of caribou distributions and movements in the Kivalliq Region. The CD has been distributed to all Kivalliq HTOs and Wildlife officers, all Nunavut Wildlife Biologists and Managers, the KWB, the NWMB, Nunavut Arctic Collage, NTI, KIA and Many Kivalliq Schools. The CD is also available for general distribution.

This CD represents the beginning of an on-going process whose main goals are founded in conservation education. Each year the CD will be updated and new information added including ecological land classification data and any other research data pertinent to caribou and muskox. We also hope in the coming years to expand this CD Nunavut wide and develop a companion text for meeting and classroom use.

1.5 Carnivores

1.5.1 Nunavut Carnivore Research Program: Wolverine, Grizzly Bear, Arctic Fox and Wolf

Inuit Knowledge: Traditional ecological knowledge on Grizzly bear, wolverine, wolf and foxes was collected in the West Kitikmeot under the Naonayaotit Traditional Knowledge Project (Banci & Hanks. 2005). The Department contributed to that study and is waiting for the Kitikmeot Inuit Association to officially release the reports.

Wolverine Carcass Collection: Wolverine is listed as species of special concern under the COSEWIC, and is candidate to be listed under the federal *Species at Risk Act*. 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. Since 1985, in the West Kitikmeot region, wolverine carcasses were collected from hunters and trappers for $25 each carcass. The program is on a volunteer basis but we estimate that we obtain 80 to 90% of the wolverine carcasses harvested by Kugluktuk hunters. The carcasses are necropsied and data on morphology, body condition, age, sex, reproductive status, and stomach contents have been collected. These data are being analyzed and several reports and peer reviewed papers are in progress (Dyck in prep.; Dyck & Dumond in prep; Appendix II).

Grizzly bear Harvest Study: Grizzly bear is listed as species of special concern by the COSEWIC and is 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. These data are being analyzed and a reports and a reviewed paper will be produced (Dumond & Campbell in prep b; Appendix II).

Kivalliq Grizzly Bear TK: An Inuit knowledge study of barren ground Grizzly bears was initiated in partnership with the Baker Lake HTO. The study had stalled because of contractual difficulties in completing the translations of the interviews. This project has been re-initiated.

Wolf and Arctic Fox Population Delineation and Movements: Arctic fox and wolf are two important furbearers in Nunavut's culture and economy. Some concerns regarding the status of the arctic wolf were also raised. Also, Wolf is listed under the CITES which requires an evaluation of the sustainability of the harvest and trade of this species. Population delineation is often necessary to establish the status of a species and its potential to sustain a certain level of harvest. A study of wolf skull morphology suggests a difference between wolves of the Nunavut western mainland and the High Arctic, wolves from the Eastern Mainland, and wolves from Baffin Island. The skulls of the wolves from south Baffin were the smallest of all the areas compared (Krizan 2005). The wolf genetic study confirmed a differentiation of the Arctic Island wolves but also identified corridors of gene flow between lower Arctic Island and western mainland and between Baffin Island and the eastern mainland (Carmichael et al. Submitted). Low genetic diversity of some Arctic Island wolves indicates past or present isolation and low abundance. Arctic fox is valued for its fur but is also a common carrier of the rabies virus, a potential fatal virus for any warm blooded animal including human. A genetic study did not show any genetic differentiation across the Arctic fox North American range, suggesting very long movements of individuals during dispersal or in the search of food (Carmichael et al Submitted; Carmichael 2006). This behavior and the lack of population delineation in Arctic foxes make difficult the prediction of rabies epizootics and the patterns of propagation across the territory.

1.6 Polar Bears (*Ursus maritimus*):

Over 50% of the world's total polar bears occur in Nunavut. Approximately 80% of the world's total kill of polar bears occur in Canada, mainly by the local Inuit, but also by sport hunters. Of the 13 polar bear populations in Canada, all but one is within or shared with Nunavut. These 12 populations comprise of approximately 14,000 bears. Therefore, much of the responsibility for conservation, research and management of polar bears falls to Nunavut.

1.6.1 Polar Bear Research Initiatives

The polar bear program produces peer-reviewed scientific studies independently and also initiates and collaborates with other scientists on polar bear research (Appendix I, II). Much of this research is conducted with information gathered during the polar bear population inventories and with data from the harvest program. The main areas of research are: population delineation, TAH determination, population modeling; genetics; foraging ecology and climate change; contaminants; harvest reporting; and behavioral ecology.

Davis Strait Population Inventory: The Davis Strait population was geographically delineated in 1997 - 1999, using satellite radio telemetry (Taylor et al. 2001). For the estimation of abundance and demographic rates, the mark-recapture study began in 2005 and will continue through 2007. 623 polar bears were caught in 2005, 841 bears were caught and released in the Davis Strait population in 2006. From these initial data, our current preliminary estimate of polar bears in Davis Strait is approximately 2300 polar bears. Population estimates will change with data collected in 2007. The population's status will be reassessed early in 2008.

Foxe Basin Population Inventory: The current population size in Foxe Basin is thought to be 2,300 bears, based on Inuit Knowledge. The last population estimate, referenced to 1994, was based on tetracycline marking was 2197 bears. A population inventory will

commence in 2007. Delineation of the Foxe Basin population will begin in 2007 and continue through 2009; we will be collaborating with the University of Alberta to collar approximately 30 polar bears, and use satellite telemetry of location data to delineate the Foxe Basin polar bear population. A mark-recapture population inventory of Foxe Basin will occur between 2009 and 2011.

Western Hudson Bay Population Reconnaissance: The Canadian Wildlife Service in collaboration with Manitoba regularly inventories the polar bear population in Western Hudson Bay. The current population estimate (2004) based on mark-recapture is 935 bears. It has been suggested by local knowledge of Hunters in Nunavut, that there are polar bears during the open water season as far north as the Chesterfield Inlet in Nunavut. They suggest that these bears have been missed by the CWS surveys. In 2008, the GN will conduct a survey extension project, to approximate the number of bears that may have been missed by this survey. If this is found to be the case, a change in summer distribution of bears may have occurred.

Polar Bear Harvest Program: The polar bear harvest program collects harvest data and specimens from every polar bear harvested within Nunavut. The program uses the harvest data to determine the annual quota for each of the communities. This quota is based on the flexible quota system, which uses the annual base allocation (TAH) from each community, and adjusts the next year's quotas based on cumulative sex-specific harvest data. Communities can accumulate sex-specific credits, if they under harvest. The flexible quota system is used to allow 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 PBTC. The harvest program also collects data for research on body size, and collects samples, such as tissue and fat samples to be used for future research. The harvest program also collects a pre-molar tooth for aging. However, currently the Polar Bear harvest program lacks the personnel capacity to age polar bear teeth. Age data should be used to determine the age-distribution of the harvest sample.

1.6.2 Polar Bear Management Initiatives:

15-year Polar Bear Population Inventory Cycle: Much of the GN's management initiative for polar bears is the determination of the sustainable harvest within Nunavut, *i.e.* total allowable harvest (TAH) for each population within our jurisdiction. TAH is developed from population inventories, which estimate population abundance, demographic parameters (birth and death rates) and status (growth or decline). The GN recommends a TAH to the NWMB, in consultation with HTO's and RWO's. Upon agreement, the TAH for each population is divided among the communities that traditionally harvest from these populations. The local HTO's and RWO's administer the harvest within the communities.

The Polar Bear Project conducts the population inventories for the 12 populations within our jurisdiction on a rotational basis; then consults with the relevant HTOs and RWOs to identify appropriate TAH levels and management practices. A population inventory includes both geographic delineation of the population and the estimation of demographic rates and population size.

Table 1 is the approximate 15-year cycle for population inventories. The 15 year interval was identified because there will still be about 10% of the previously marked individuals in the population. Recaptures of these older individuals are essential for accurate estimates of adult survival rates. In addition, inventories of populations which are shared with other jurisdictions are often conducted in collaboration with the GN, but not necessarily according to the schedule.

Table 1. Schedule and status of polar bear inventories in Nunavut.

Population	Last inventory completed	Next inventory scheduled to begin
Davis Strait	Ongoing	2022
Baffin Bay	1998	2013
Kane Basin	1998	2013
Norwegian Bay	1998	2013

Lancaster Sound	1998	2013
Foxe Basin	1993	2008
Southern Hudson Bay	2003, analysis on-going	2018‡
Western Hudson Bay	2004	2019*
Gulf of Boothia	2000	2015
M'Clintock Channel	2000	2015
Viscount Melville	1991	2006 †
Northern Beaufort Sea	1986	Current inventory, analysis on-going

‡ This population may be inventoried earlier, depending on Ontario, which is the jurisdiction with the majority of the bears in this population.

* This population likely will be inventoried earlier, because of on-going CWS activities

† This population is out of sync, as Foxe Basin is a larger population with many communities, and therefore was identified as a priority. In addition, the Inuvialuit in Northwest Territories usually inventory this population.

Wildlife Regulations: Currently, the GN has offered a range of management options to be considered by the NWMB, the Kivalliq Wildlife Board and local HTO's in the Kivalliq, which harvest from Western Hudson Bay polar bear population. Management options are being suggested as there is a published decline of the Western Hudson Bay population to 935 bears. The MOU for this population signed by all management partners, identifies a hunting moratorium to be imposed on this population, as the estimate is <950 polar bears. The range of management options recommended by the GN range from a moratorium of harvest to that of a reduction to a TAH of 47, which is the historical TAH for this population (before the TAH was increased to its current level at 56). Manitoba's only removals from this population are problem bears. These recommendations will be discussed at a community meeting in Arviat in April, 2007. The GN has also asked the NWMB for a decision on the TAH for Baffin Bay polar bear populations. This population is considered to be in decline due to historical and current over harvest.

1.7 Other Terrestrial Species

Other species within the GN mandate include arctic hare, arctic ground squirrel, voles and lemmings, and resident birds such as ptarmigan and ravens. There is currently no GN research directed towards these species due to lack of capacity in the Wildlife Research Section and low harvest levels (low priority) for most of the species. However, there are independent studies on these species that are conducted by industry, Universities, and the federal government. There are still capacity issues within the Wildlife Research Section that will prevent resources being directed towards these species unless specific concerns arise with a species or specific population.

1.8. Interim and Final Reports, Recent Publications, and Research Initiatives:

Appendix I lists the current status and citation for interim and final reports, and journal peer-reviewed publications. These are available from our Departmental library cmallory@gov.nu.ca, or from the authors, or from the general library.

Appendix II on lists ongoing research initiatives, indicates when they will be completed, and identifies any interim of final reports that are available.

2.0 Effectiveness of the relationships among the various persons and organizations managing wildlife and wildlife habitat.

2.1 Nunavut's Wildlife and Habitat Co-management System

The wildlife co-management system described in Article 5 of the NLCA is one the best systems ever devised. It ensures good conservation practices, and appropriate consultation with co-management partners and especially NLCA beneficiaries. The intention of this system is that conservation measures are developed and implemented with the support of the users.

The implementation, however, of the wildlife co-management system has not been smooth, and remains in need of clarification and streamlining. For example, the NWMB decision making process for the approval of initiatives such as management plans is very process oriented, and takes enormous amounts of staff and financial resources to support. The time frame for decisions has become elongated, and many subject matters becomes stale whole going through the process. In general, wildlife management decision making should be responsive to changing needs, and be able to adapt itself quickly as circumstances require. Instead, In Nunavut initiatives are taking a year or more to find their way through the process, while the circumstances behind the initiatives are urgent, and/or changing.

An additional concern related to the important matter of consultations, and what level of consultation is necessary for a given issue. In recent years, the expectations and for consultations have been growing, to the point where the department is now expending more resources in consultation and discussion than on implementing wildlife and habitat research and management programs. This diversion of so much of Nunavut's limited financial and human resources into the co-management process means that fewer monitoring, research, and conservation programs can be implemented, and we have less information available to feed the decision making process.

There are dangers inherent in making decisions too slowly, and with insufficient qualify information. The potential hardships that can be brought upon harvesters from bad decision making can be seen by examining the conservation failures in Greenland and Quebec. In addition to the impacts on harvesters of reduced wildlife populations, there remains a danger that, pursuant to the federal *Species at Risk Act* (SARA), the Canadian Government can step in and undertake conservation measures should they determine that Nunavut is doing an insufficient job. Therefore ineffective management poses a threat not only to our wildlife populations, but also to our mandate to manage them. It is noteworthy that in the reasoning behind the proposed listing of polar bears under the United States Endangered Species Act, they specifically raised concerns about the integrity of Nunavut's wildlife management regime.

A further complicating factor in the decision making process is the role of Nunavut Tunngavik Incorporated (NTI)and their often adversarial approach to discussions that is often very obvious. Article 5 of the Nunavut Land Claims Agreement is clearly intended to be read as a whole, with the provisions respecting Inuit rights being read along side those respecting wildlife management and conservation. NTI, however, has stated its position that it is to opposed any government restrictions on harvesting by beneficiaries. In bringing this position into the decision making process, NTI selectively supports articles within the NCLA concerning Inuit rights to harvest, while ignoring articles which point to the need to sustain *a long-term renewable resource* in light of a *steadily increasing* Inuit population according to the *principles of conservation*. This approach by NTI is a new one, and contrasts with their participation in preparing the draft Wildlife Act, a project in which thye participated with a goal of developing a modern, effective management system.

In the interests of ensuring that Inuit harvesting rights are interfered with to the minimum amount, NTI has very effectively impressed on the NWMB a standard of decision making that is very difficult to meet. The standard, in short, is that any initiative must be accompanied by complete, perfect and mutually agreed information, along with consensus from affected parties and interests. The reality is that the department, with

very few exceptions, is unable to meet this standard, and out of practical necessity must approach the NWMB with best available information that is not complete or perfect. More importantly, it is an unachievable goal that there will always be consensus or support for management initiatives, for the simple reason that these initiatives almost always entail restrictions, which NTI will not support, and which communities do not like. This situation means that even smaller, relatively simple initiatives draw up many more resources, and take more time, than is necessary or practical. The department has raised this concern to both NTI and the NWMB, and will continue to seek their agreement on the need to simplify and streamline the process.

3.0 Trends and Forecast of Use of Wildlife Resources in Nunavut

Nunavut's human population is currently increasing by about 2.54 percent per year (5-year average from Statistics Canada Web Site). The Nunavut Labor Force Survey suggests that there could be a decrease in the proportion of Nunavummiut that pursue traditional activities like hunting. However, Nunavummiut highly value country food and the demand for harvest activities that contribute to traditional economy such as fur harvesting, inter-settlement trade, or commercial harvesting will remain constant or increase. The NWMB's Harvest Study (Priest & Usher 2004) was intended to help the NWMB establish levels of total allowable harvest and to contribute to "s*ound management and rational use of wildlife resources*" (NLCA 5.4, 1993) in Nunavut. To that end, the most comprehensive estimates of harvest levels come from the NWMB Harvest Study. However, these data are not a true indication of the demand for wildlife resources in Nunavut because all of the known biases operate to under-estimate the true harvest (Priest & Usher 2004).

One of the most important biases in the NWMB Harvest Study was that the record included only what was actually harvested, not how many would have been harvested if the communities full needs had been met. Similarly, our own (GN) harvest data consists of partial wolverine harvest data collection (mainly in the Kitikmeot). We (GN) have comprehensive harvest records for Grizzly bears and polar bears only. Except for Grizzly bears and polar bears, we are thus not able to quantify harvested numbers by species or population, let alone project the current estimated demand for most terrestrial populations in Nunavut. At current staffing and financial resource levels we do not have the capacity to collect better information, although we are recommending (Wildlife Regulations) that harvest reporting be mandatory for species with harvest controls (statutory TAH). Table 1 lists all 25 Nunavut communities with respect to sufficiency for some of the most important (most harvested) terrestrial species. Arctic hare, ptarmigan and arctic ground squirrel are terrestrial species that are typically harvested in Nunavut. There are no harvest restrictions on these species and populations appear to be able to sustain current harvest levels. Voles and lemmings currently have no significant human removals.

Ravens have been protected in the past, and are vulnerable to human-caused mortality because they are long lived and have few young. Current land developments in Nunavut may create some localized negative effects on wildlife resources. Cumulative effects of exploration and development activities in Nunavut on Nunavut wildlife populations are unquantified.

Table 2. Many Nunavut communities do not currently have sufficient terrestrial wildlife resources to meet their needs. The following table identifies sufficiency (*) or insufficiency (-) for the most commonly harvested species. NA denotes the lack of the species in the community hunting area.

Community	Inuktitut Name	Mainland Caribou	Island Caribou	Peary Caribou	Musk ox	Polar Bear	Grizzly Bear	Wolverine
Qikiqtaaluk								
Iqaluit	Iqaluit	NA	-	NA	NA	-	NA	NA
Kimmirut	Kimmirut	NA	-	NA	NA	-	NA	NA
Cape Dorset	Kingnait	NA	-	NA	NA	-	NA	NA
Hall Beach	Sanirajak	NA	-	NA	-	-	NA	-
Igloolik	Iglulik	NA	-	NA	-	-	NA	-
Arctic Bay	Ikpiarjuk	NA	-	NA	-	-	NA	NA
Resolute Bay	Qausuittuq	NA	-	-	*	-	NA	NA
Grise Fiord	Ausuittuq	NA	-	-	*	-	NA	NA
Pond Inlet	Mittimatalik	NA	-	NA	-	-	NA	NA
Clyde River	Kangiqtugaapik	NA	-	NA	NA	-	NA	NA
Qikiqtarjuaq	Qikiqtarjuaq	NA	-	NA	NA	-	NA	NA
Pangnirtung	Pannirtuq	NA	-	NA	NA	-	NA	NA
Sanikiluaq	Sanikiluaq	NA	-	NA	NA	-	NA	NA
Kivalliq								
Rankin Inlet	Kangiqliniq	*	NA	NA	-	-	*	-
Arviat	Arviat	*	NA	NA	NA	-	*	-
Whale Cove	Tikirarjuaq	*	NA	NA	NA	-	*	-
Chesterfield Inlet	Igluligaardjuq	*	NA	NA	-	-	*	-
Baker Lake	Qamanittuaq	*	NA	NA	-	-	*	-
Coral Harbour	Sallit	*	*	NA	NA	-	NA	-
Repulse Bay	Naujaat	*	*	NA	-	-	*	-
Kitikmeot								
Cambridge Bay	Ikaluktutiak	*	-	NA	*	-	*	-
Gjoa Haven	Uqsuqtuq	*	NA	NA	-	-	NA	-
Taloyoak	Talurjuaq	*	NA	-	-	-	NA	-
Kugaaruk	Arviligjuaq	*	NA	NA	*	-	NA	-
Kugluktuk	Qurluqtuq	*	NA	NA	*	-	*	-

4.0 Capability of Nunavut Wildlife Resources to Meet Anticipated Demands

Nunavut currently recognizes 23 independent populations of caribou, 12 populations of polar bears, and 12 populations of muskox. In total, Nunavut recognizes a total of 92 demographic units for all terrestrial species in our Territory. Many of these populations are shared by other adjacent jurisdictions. Currently Nunavut does not have the capacity for systematic monitoring of even the main herds of caribou and muskox that provide most of the non-marine country food to Nunavumiut. The DoE has committed to a 15 year inventory cycle for polar bears (Polar Bear MOUs); however the GN has fallen behind that schedule. Each year many priorities for terrestrial wildlife in Nunavut identified by HTOs and the NWMB cannot be addressed due to capacity limitations in the Wildlife Research Group. These deficiencies reduce our ability to forecast the ability of Nunavut wildlife populations to meet anticipated needs. The following forecasts (Tables 2, 3, and 4) are for a five year period, with comments on the long-term prognosis. These evaluations are necessarily a combination of calculations and professional opinion based on published reports and harvest statistics, interim research results, and both written and oral Inuit knowledge.

Table 3. Current average removal rates as number of individuals per year for some of the main wildlife categories in Nunavut. Values were taken from the NWMB Harvest Study and the most recent information from GN harvest records for wolverine, Grizzly bears and polar bears.

Wildlife Population	**Qikiqtaaluk**	**Kivalliq**	**Kitikmeot**	**Total**
Barren-ground caribou Mainland	2534[1]	17489	3773	21515
Barren-ground caribou Baffin Island	7825[2]	0	160	8008
Peary caribou	54[3]	0	1	55
Dolphin Union caribou	--	0	2150	2150
Reindeer	23	0	0	23
Mainland Muskoxen	1[4]	0	80	81
Victoria Island Muskoxen	-	0	50	50
Arctic Island Muskoxen	41[3]	0	25	66
Polar Bears	297	90	62	451
Grizzly Bears	0	6	15	21
Wolverine	1	22	150	173
Fox	308	2754	617	3679
Wolves	6	298	127	431
Raptors	0	0	0	0
Arctic Hare [5]	653	43	75	771
Arctic Ground Squirrel [5]	3	4	557	564
Ptarmigan [5]	10111	1882	393	12386
Snowy Owl [5]	1	1	0	2

1- Hall Beach & Igloolik, may also include caribou Baffin Island
2- All communities excluding Grise Fiord, Resolute Bay, Igloolik, Hall Beach & Sanikiluaq.
3- Figures for Resolute Bay & Grise Fiord, and based on numbers (10yr mean, 1997-2006) supplied by the community HTOs, the NWMB's NWHS & DoE.
4- Kitikmeot Region muskox taken by Hall Beach resident.
5- Based on NWHS 5year mean (1996–2001)

Table 4. The projected (estimated) average annual demand and sustainable removal capacity for the next 5 years for Nunavut terrestrial wildlife populations are listed. Strictly quantitative methods for projecting demand and capacity are not available for some populations. The values presented represent expert opinion of professional biologists, and consider published information, interim research results, and Inuit knowledge (both written and oral). Also note that many of the populations indicated are inter-jurisdictional. Harvest requirements from other jurisdictions are not included in this table.

Wildlife Population	**Qikiqtaaluk**		**Kivalliq**		**Kitikmeot**		**Total**	
	demand	capacity	demand	capacity	demand	capacity	demand	capacity
Ahiak Herd	NA	NA	408	UK	800	16000	1208	16000
Qamanirjuaq Herd	NA	NA	12275	31200	NA	NA	12275	31200
Beverly Herd	NA	NA	816	9962	NA	NA	816	9962
Lorillard Herd	NA	NA	1243	845 – 1585	NA	NA	1243	845 – 1585
Wager Herd	NA	NA	1637	2216 – 3409	1500	2216-3409	3137	2216 – 3409
Coats Island Herd	NA	NA	UK	UK	NA	NA	UK	UK
Southampton Herd	NA	NA	5303	3503 - 4729	NA	NA	5303	3503 - 4729
Bathurst Herd	NA	NA	NA	NA	200	10250	200	10250
Bluenose East Herd	NA	NA	NA	NA	1500	5300	1500	5300
Barren ground Caribou Baffin Island	15705	UK[1]	NA	NA	NA	NA	NA	NA
Barren ground Caribou Melville Pen.	1678	UK	NA	NA	NA	NA	NA	NA
Barren ground caribou total	17383	UK	24866*	UK	4000	UK	30544	UK
Peary caribou	66	UK[2]	NA	NA	NA	NA	66	UK
Reindeer	40	UK[3]	NA	NA	NA	NA	NA	NA
D-U caribou	NA	NA	NA	NA	2500	2250	2500	2250
Island caribou	NA	NA	NA	NA	200	UK	200	UK
Mainland Musk Ox	NA	NA	25	104	100	350	125	454
Victoria Isle Muskox	NA	NA	N/A	N/A	70	1500	70	1500
Arctic Isle Musk Ox	51	UK[4]	N/A	N/A	UK	200	51	200
Polar Bears	600	286	120	84	120	67	840	437

Grizzly Bears	NA	NA	NA	NA	3	14-16	3	14-16
Wolverine	NA	NA	NA	NA	150	150	150	150
Fox	UK	UK	UK	UK	UK	UK	UK	UK
Other Carnivores	UK	UK	UK	UK	UK	UK	UK	UK
Raptors	0	0	0	0	0	0	0	0
Arctic Hare	700	700	200	200	300	300	1200	1200
Arctic Ground Squirrel	100	100	100	100	1100	1100	1300	1300
Ptarmigan	15000	15000	3000	3000	2000	2000	20000	20000
Snowy Owl [1]	1	5	1	5	1	5	3	15

[1]The status of barren-ground caribou on Baffin Island is largely unknown. No population surveys have ever been completed in north Baffin and survey in southern portions are dated. Nonetheless, a decline in caribou numbers has been reported by the HTO's.

[2] The status of Peary caribou is currently being assessed and we know that some populations are too diminished to support harvesting. As well, there is uncertainty regarding the actual numbers of caribou harvested. Recommendations for mandatory reporting and TAHs are currently under view by the NWMB.

[3]A decline in the Belcher Island Reindeer herd has been reported by the Conservation Officer. An aerial survey is being proposed for 2008.

[4] The status of Arctic Island Muskox in the Baffin Region is currently being assessed and we know that some populations are too diminished to support harvesting. Other populations are large enough to meet the demand of both Grise Fiord and Resolute Bay and the redistribution of harvesting pressures to these populations has been recommended

Table 5. The projected capacity of Nunavut terrestrial wildlife to meet user group demands over the next 5 years is summarized. Animals that are 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 (-). If the range of the animals does not extend to the Region identified, the designation is (NA).

Wildlife Population	**Qikiqtaaluk**	**Kivalliq**	**Kitikmeot**	**Nunavut**
Qamanirjuaq Herd	NA	+[1]	NA	+
Beverly Herd	NA	0[1]	NA	0
Lorillard Herd	NA	0[1]	NA	0
Wager Herd	NA	+[1]	0	+/0
Coats Island Herd	NA	0	NA	0
Southampton Herd	NA	+[1]	NA	+
Ahiak Herd	NA	+[1]	+	+
Bathurst Herd	NA	NA	+	+
Bluenose East Herd	NA	NA	0	0
Barren ground caribou Mainland	-	+	+	+[1]
Barren-ground caribou Baffin Island	-	NA	NA	-[2]
Peary caribou	-	NA	-	-
Dolphin Union caribou	NA	NA	-	-
Island caribou	NA	-	NA	-
Reindeer	-	NA	NA	-
Mainland Muskoxen	NA	+	+	+
Victoria Island Muskoxen	NA	NA	+	+
Arctic Island Muskoxen	-/+[3]	NA	+	+
Moose	NA	+	+	+
Polar Bears	-	-	-	-[4]
Grizzly Bears	NA	+	0	+
Wolverine	NA	0	0	0
Wolves	+	+	+	+
Fox	+	+	+	+
Other Carnivores	+	+	+	+
Raptors	+	+	+	+
Arctic Hare	+	+	+	+
Arctic ground Squirrel	+	+	+	+
Ptarmigan	+	+	+	+
Snowy Owl	0	0	0	0

[1] Mainland caribou herds are forecast to decline as part of their natural cycle. Currently herd levels are large enough that they are forecast to provide sufficient animals to meet the demand over the next 5 years,

but the trend will be downward and Barren-ground caribou may not be present in sufficient numbers to meet projected needs in the next 5 years.

[2] Baffin Island caribou herds are believed to decline as part of their natural cycle. Current herd levels are largely unknown but in some areas (i.e. north Baffin) hunters are reporting insufficient animals to meet their demand.

[3] In the Baffin Region 9 populations of Arctic Island Muskox occur. Although some have sufficient capacity to support hunting, other populations are to low, and harvesting restrictions are necessary to ensure their recovery. The redistribution of hunting pressure is necessary for conservation.

[4] Some polar bear populations have been shown to have experienced reduced productivity due to climate change impacts. Continuing climate change may cause the sustainable removal rates of some or all polar bear populations to decline.

4.1 Barren-ground caribou:

There are 6 main populations (herds) of barren-ground caribou in Nunavut (Qamanirjuaq, Beverly, Ahiak, Bathurst, Bluenose East, and Dolphin-Union). There are 2 other lesser herds (Lorillard, Wager). These herds have traditionally been regarded as distinct populations but they do not appear to be genetically distinct except for the Dolphin-Union herd. The genetic information and observations of mixing between herds from radio collared animals suggest that barren-ground may exist as a meta-population approach, and that herd membership and fidelity to calving grounds may be more ephemeral than previously believed. In any event, the most recent information on trends in barren-ground caribou populations is that they are believed to be cycling down. The decline is not due to climate change, development, harvest, or any anthropogenic factor; although all of these can influence the rate of decline. The primary factor causing the decline appears to be over-grazing by the caribou themselves. The decline is thus a natural cycle and cannot be controlled or reversed by management action, although careful management will be required to retain the remaining individuals and protect refuge habitats when the population is at low levels. This understanding of caribou population dynamics is consistent with Inuit knowledge. The decline of barren-ground caribou is not a management failure, but rather a natural phenomenon that must be accommodated with flexible management practices.

As the decline progresses, caribou numbers will become insufficient to meet community demands. This will cause hardship among people who have become used to the abundant caribou resources we have enjoyed over the past 20 years. The shortage of caribou will probably become the primary management issue for the coming decades. Our capacity to address this impending crisis is minimal. We do not have the resources to monitor effectively and currently do not the Departmental capacity for conservation education. Without effective communication with Nunavut harvesters, Nunavut co-management partners, and the national and international conservation community; any response to the impending decline will be political and controversial. SARA status designations do not

anticipate species with cyclic population dynamics. Barren-ground caribou may well be declared a SARA "species at risk" and fall under federal jurisdiction.

The current abundance of barren-ground caribou is expected to sustain the projected needs of Nunavut harvesters over the next 5 years even as the various herds decline. Dramatic declines in numbers due to weather events are possible, and are more likely now that in the past due to climate change impacts. Our projection of a comfortable surplus of barren-ground caribou for the next 5 years is uncertain. Our indication that there will likely be a shortfall of harvestable barren-ground caribou in Nunavut for the second 5 year interval is more reliable.

Bluenose East Caribou Herd: The Bluenose Caribou Herd has declined by 36% over the past 6 years from an estimate of 104,000 caribou in 2000 to an estimate of 66,186 caribou in 2006. Recruitment will assessed this coming spring and fall (Veitch 2007). Considering the significant decline of the BNE caribou herd in a short period of time and the similar trend observed in neighboring herds, we forecast that the herd will either reach stability or continue to decline. Management actions in order to preserve the caribou range, reduce wastage, change some hunting practices will be required to favor the herd recovery. Harvest limitations are already implemented by the NWT who is sharing this herd with Nunavut. The current annual harvest on the Bluenose East caribou herd is estimated to be in the order of 4000 – 5000 animals, mainly harvested for subsistence by NWT and Nunavut communities. In Nunavut, the harvested is estimated to be in the order of 1500 animals from this herd. This harvest level will likely be too high if the herd continues to decline. With an estimated 9% growth for Kugluktuk community, a proportional increase in the harvest would result in a harvest of 135 more animals. If the overall harvest increase is 9%, the kill will be around 4500 – 5500 animals per year, representing a harvest rate of 8% if the herd remain stable around 66000 animals. A further decline of the herd or a higher increase in the harvest over the next 5 years would like not be sustainable. The Kitikmeot community harvesting from this herd in Nunavut is Kugluktuk.

Bathurst Caribou Herd: Few animals from the Bathurst caribou herd are harvested in Nunavut. Harvest in Nunavut take mainly place in the Contowoyto Lake and Pellate Lake area (outpost camps and sport hunts), and for subsistence by people in Bathurst Inlet. The herd has been declining for several years and was estimated in 2006 to 128,000 animals. The subsistence harvest on this herd in Nunavut is not a concern for the coming 5 years. The Kitikmeot communities harvesting from this herd in Nunavut are Kugluktuk, and Bathurst Inlet.

Ahiak Caribou Herd: The only estimate available for the Ahiak caribou herd was deducted from a calving ground survey in 1996. The herd was then estimated to be in the order of 200,000 animals. Considering that this herd is shared with other jurisdictions and that no other data are currently available, it is not possible to determine the current and forecasted status of this herd. The Kitikmeot communities harvesting from this herd in Nunavut are Cambridge Bay, Umingmaktok, and Gjoa Haven.

Dolphin and Union Caribou Herd: The Dolphin and Union Caribou herd was at very low densities during the mid-20th century. They have started to recover and as per the last survey on the herd in 1997, the herd was increasing and estimated to 28,000 animals. Since the 1980s, the herd resumed its migration to winter on the mainland and calf and breed on Victoria Island. Within the last ten years, various factors can have affected the herd and its current trend is unknown. Local knowledge indicates a deterioration of the health in the herd and an increase of predators on the herd's summer range. An unknown number of caribou die every fall breaking through the ice when trying to cross to the mainland.

This herd is shared with NWT where it is mainly harvest by Uluartuq. In Nunavut the subsistence harvest on this herd is currently estimated to be in the order of 2000 to 3000 animals. This represents a level of harvest between 7 and 11% of the 1997 herd estimate. A survey is plan for October 2007 to assess the current trend of the herd (Dumond & Torretti 2007). Until then, it is not possible to provide a forecast of the capacity of the herd to sustain the needs of the communities. The Kitikmeot communities harvesting

from this herd in Nunavut are Kugluktuk, Cambridge Bay, Bathurst Inlet, and Umingmaktok.

Arctic Island Caribou: The status of resident caribou on King William and Boothia Peninsula is unknown. A proposal has been submitted to determine the status of non-migratory caribou on the Boothia Peninsula (Dumond 2007c). The Kitikmeot communities harvesting from this herd in Nunavut are Gjoa Haven, and Taloyoak.

Qamanirjuaq Caribou Herd: Within the Kivalliq Region Qamanirjuaq caribou are utilized primarily for subsistence but also for clothing, sport hunting and commercial meat sales. Qamanirjuaq caribou are harvested by the communities of Arviat, Rankin Inlet, Baker Lake, Whale Cove and Chesterfield Inlet. The future demand on Qamanirjuaq caribou (Table 3) is listed alongside estimates of the resources capacity to fill that demand (Table 4). All values are examined using estimates of current use as well as five year projections based on the 2001 community population figures and growth rates adjusted for 2006 and projected to 2011.

The dramatic decline in Qamanirjuaq numbers, identified in the early 1950's, sparked a flood of scientific studies all attempting to understand the underlying mechanisms responsible for the decline (Heard & Calef 1986; Parker 1972). Research efforts were at their peak between the late 1970's and early 1980's. A population survey in 1982 showed that the trend was dramatically, and despite research efforts, mysteriously, reversed (Gates 1983). This mysterious increase was not surprising to local hunters as the local knowledge of the time disagreed strongly with scientific findings.

Population surveys conducted on the Qamanirjuaq population of barren-ground caribou have shown an increase from 44,000 animals in 1977 to 260,000 +/- 60,000 animals in 1987 to 496,000 +/- 105,400 animals in 1994 (Heard et al 1981; Gates 1983; Russell 1990). Cow/calf ratios have shown a decline from 48:100 in 1994 to 47:100 in 1995 to 42:100 in 1996, to 30:100 in 1999 to 26:100 in 2003 and most recently to 16:100 in 2006 (Figure 6). This downward trend is worrisome and must be validated annually to track the trend. Spring composition values as low as 16:100 or lower, when compared to the current declines being observed in western herds, suggests that the Qamanirjuaq Caribou Herd could be at the beginning of a decline (Campbell, 2006a (interim report)). If this decline follows those of the western populations this could mean that within the next five years the demand (when factoring in other Jurisdictional harvesting) will likely exceed capacity and management action to control harvesting will have to be taken.

Given an estimated sustainable harvest of 10% for a stable population and 8% for a declining population, a projected capacity can be calculated based on the 1994 survey estimates though managers must be cautioned not to use these estimates to set future harvest quotas without first verifying herd status. As early information indicates a declining trend in productivity a sustainable estimate using 8% of the lower confidence levels is used (390,600) projecting an estimated sustainable harvest of 31,200 animals by 210,000 given that the population has remained stable since 1994 and given that productivity does not decline further. Again a population estimate must be considered a necessary first step prior to setting future quotas.

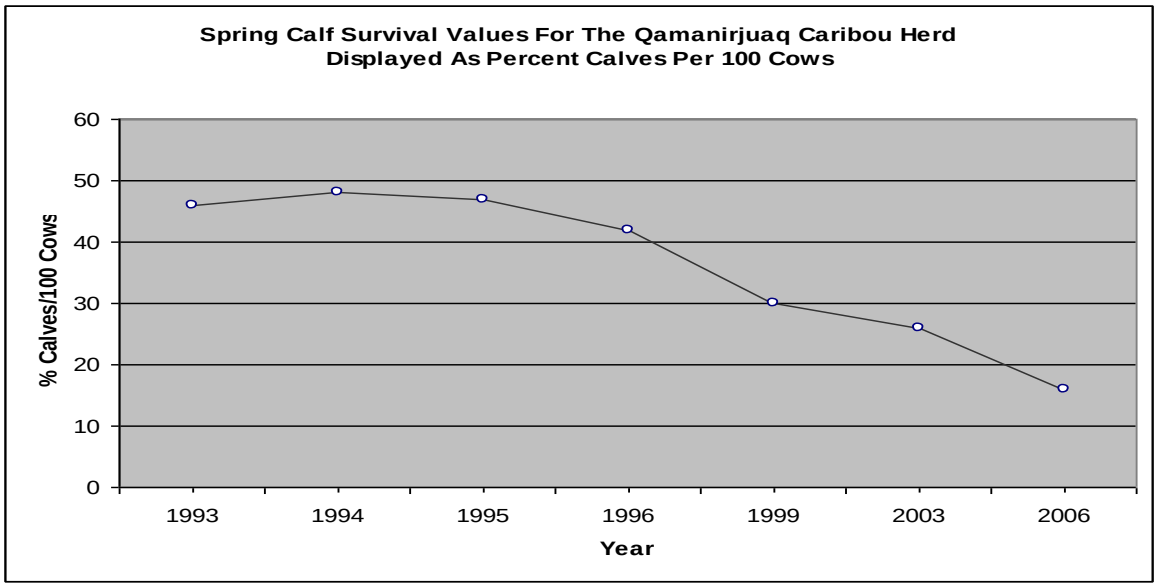

Figure 6. Spring recruitment measured as calves per 100 cows. Information based on periodic spring classification between 1993 and 2006.

Beverly Caribou Herd: Within the Kivalliq Region Beverly caribou are utilized primarily for subsistence but also for clothing, sport hunting and commercial meat sales. Beverly caribou are harvested by the community Baker Lake and on occasion Arviat. The future demand on Beverly caribou (Table 3) is listed alongside estimates of the resources capacity to fill that demand (Table 4). All values are examined using estimates

of current use as well as five year projections based on the 2001 community population figures and growth rates adjusted for 2006 and projected to 2011.

The Beverly herd was last surveyed in 1994 when herd size was estimated at 276,000 ± 106,600 (SE) (Williams 1995). Estimates of herd size are based on aerial photography of the calving ground where the numbers of breeding cows are counted. The herd was likely stable between 1984 and 1994; however, recent observation and studies suggest that the herd may have declined. Since the fall of 2001, hunters from northern Saskatchewan have expressed concern about reduced numbers of Beverly caribou. A reconnaissance survey of the Beverly calving ground in 2002 found that the size of the calving ground was reduced and had a lower density of animals relative to past surveys (Johnson and Mulders, in prep). Results from a photographic calving ground survey of the Bathurst herd in 2003 and 2006 (Gunn et al 2006) indicated that the Bathurst herd has been declining at about 5% a year for the past decade. Post-calving photographic surveys of the Cape Bathurst and Bluenose East and West herds in July 2005 and 2006 (Nagy & Johnson 2006a, 2006b) showed significant and continued declines in these three herds from 2000. There appears to be synchronicity between the barren ground herds in response to large-scale weather patterns, and therefore, a decline in these NWT barren ground herds provides strong evidence to support a similar decline for the Beverly herd.

Given an estimated sustainable harvest of 10% for a stable population and 8% for a declining population, a projected capacity can be calculated based on the 1994 survey estimates though managers must be cautioned not to use these estimates to set future harvest quotas without first verifying herd status. It appears clear from the available evidence that the Beverly herd, either through emigration to the Ahiak Herd, or through a sustained reduction in productivity, has suffered the same pattern of decline as that observed for the western herds. A calculated annual rate of decline of 5% has been applied to the western herds and there for will also be applied to their neighboring Beverly population. The first evidence of a decline (or range shift) was discovered during a Beverly Range reconnaissance survey flown in 2004. By 2010 (using the lower confidence limit of the 1994 population estimate) the herd could have declined to

124,524 animals. Taking 8% of this figure would then project an estimated sustainable harvest of 9,962 animals per year.

Lorillard and Wager Caribou Herds (Northeast Mainland): Within the Kivalliq Region the Lorillard and Wager populations of caribou are utilized primarily for subsistence but also for clothing, sport hunting and commercial meat sales. Wager and Lorillard caribou are harvested primarily by the Kivalliq communities of Repulse Bay and Chesterfield Inlet, but the Wager Caribou herd is also shared with the Kivalliq communities of Gjoa Haven, Taloyoak, and Kugaaruk. Wager and Lorillard caribou demand (Table 3) and the resources capacity to meet that demand is listed in Table 4. All values are examined using estimates of current use as well as five year projections based on 2001 community population figures and growth rates adjusted for 2006 and 2011.

A June survey estimate of the Lorillard herd of caribou using the June 1999 reconnaissance survey data found 13,918 +/- 5,377 adult caribou (95% confidence limits) (Figure 7). Identical surveys (using the same transects flown in 1999) flown in June 2001 and 2003 found 34,520 +/- 17,977 (95% confidence limits) and 12,156 +/- 3,697 (95% confidence limits) adult caribou respectively. Though the coefficient of variations for the 1999 and 2001 surveys were very high (1999 = .39, 2001 = .52) the data was tested to determine the significance of the change using equation 5.3 of Thompson et al. (1998). There was a significant increase in the number of adult Lorillard caribou on the calving grounds between June 1999 (Y = 13918) and June 2001 (Y = 34520) (z = 2.34, P = 0.02).

A population estimate of the Wager Herd using the June 2000 reconnaissance survey data found 13,095 +/- 3,532 adult caribou (95% confidence limits) on the calving ground (Figure 7). An identical survey (using the same transects flown in 2000) flown in June 2002 found 20931 +/- 5296 adult caribou within the same study area. Though the coefficient of variation for both surveys was high (2000 = .27, 2002 = .25) the data was tested to determine the significance of the change using equation 5.3 of Thompson et al. (1998). There was a significant (z = 2.62, P = 0.01) increase in the number of adult caribou on the calving grounds between June 2000 (Y = 13095) and June 2002 (Y =

20931) and no significant difference detected between the 2002 and 2004 estimates. There was a significant ($z = 2.34$, $P = 0.02$) increase in the number of adult caribou on the Lorillard calving grounds between June 1999 ($Y = 13918$) and June 2001 ($Y = 34520$).

The underlying reasons for this increase over such a short period of time may be related, in part, to the movement of Lorillard animals out of the June 1999 calving ground survey area prior to the survey and/or the movement of Wager caribou south of Wager Bay and into the Lorillard River area in 2000. This movement was documented using the location data of ST-14 satellite collars, which indicated seven of the ten satellite collared Wager cows made this journey of which only 6 retuned north of Wager Bay by June 2001. There was no significant difference between the 1999 and 2003 results and a significant difference between the 2001 and 2003 results. These findings are consistent with the initial hypothesis that Wager animals moved into the Lorillard study area over the 2001 survey period and moved back to the Wager study area prior to the 2003 survey. Following the 2001 survey Wager collars once again moved out of the Lorillard study area and the correlated drop in caribou numbers seemed to be the result.

An aerial estimate of Northeast Mainland caribou flown in 1983 found 119,800 +/- 13,900 caribou (Heard et al 1986). A population estimate of Northeastern mainland caribou was made in May 1995. The survey results suggested that caribou numbers had dropped significantly from 119,800 +/- 13,900 animals in 1983 to 73,994 +/- 11,670 caribou in 1995. In view of the most recent findings when compared to the 1995 observed declines it appears that the Northeast mainland caribou numbers have changed little or decreased from the 1995 estimates suggesting a stable or slightly decreasing trend. A population estimate of both the Wager and Lorillard populations of Northeast mainland caribou is required to verify these hypothesized trends.

Using reconnaissance based data as an index only to caribou numbers on both the Wager and Lorillard ranges, and given an estimated sustainable harvest of 10% of a stable population and 8% for a declining population, a projected capacity can be calculated though managers must be cautioned not to use these estimates to set future harvest quotas

without first verifying herd status. As both the Wager and Lorillard populations appear to be stable with no present indication of decline for the near future, 10% of the total population is used to determine the sustainable harvest. Therefore the estimated sustainable harvest of the Lorillard population would be approximately 845-1585 animals/year while the wager population could sustain a harvest of between 2,216 and 3,409 animals/year.

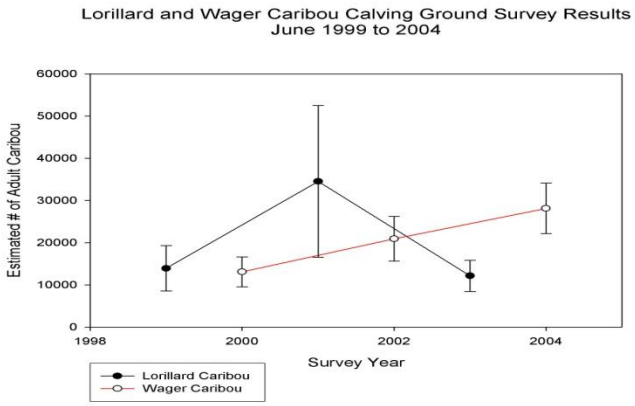

Figure 7. Population estimates based on calving ground delineation flights in June 1999, 2000, 2001, 2002, 2003 and 2004 over both the Lorillard and Wager spring range.

Southampton Island Caribou Herd: Within the Kivalliq Region Southampton Island caribou are utilized primarily for subsistence but also for clothing, sport hunting and commercial meat sales. The commercial harvest of caribou on Southampton Island is the largest in the territory and has been in operation since 1996 harvesting as many as 5000 in one season. Southampton Island caribou are harvested primarily by the community of Coral Harbour. The demand on Southampton Island caribou (Table 3) and the resources capacity to meet that demand (Table 4) are listed. All values are examined using estimates of current use as well as five year projections based on 2001 community population figures and growth rates adjusted for 2006 and 2011.

Wolves (*Canis lupus*) and barren-ground caribou (*Rangifer tarandus groenlandicus*) were a common component of Southampton Island ecology until the early 1900's. The decline of these animals became obvious by 1935 and was followed by the local extinction of wolves by 1937 (Parker 1975). The extirpation of caribou from Southampton was complete by 1952, a result in part of over hunting. The absence of this resource was keenly felt by residents of Coral Harbor prompting both the local HTO and government to initiate the re-introduction of caribou onto the Island. In 1967, 14 years following their extirpation, 48 caribou from Coats Island were introduced onto Southampton Island. Caribou numbers have since increased rapidly which is in part due to exceptional range conditions resulting from the 14-year absence of caribou from the Island. The lack of predation and low initial harvest rates also played a role in the overwhelming success of the introduction which was first realized following a population survey in 1978, estimating 1,200 +/- 340 caribou (Heard & Ouellet 1994). Since the 1978 survey the Southampton caribou population continued to grow rapidly to 5,400 +/- 1,130 in 1987, 9,000 +/- 3,200 in 1990, 13,700 +/- 1,600 in 1991, 18,275 +/- 1,390 in 1995 (Heard and Ouellet, 1994), 30,381 +/- 3,982 in 1997, 17,981 +/- 2,127 in June 2003 (Campbell 2006 (draft report)) and finally 20,582 +/- 3,065 in June 2005 (Campbell 2006 (draft report)) (Figure 8).

The survey results suggest a population growth rate of approximately 27 %/year up until 1997 followed by a 40% decline between June 1997 and June 2003 and an increase of 9% between 2003 and 2005. Commercial harvests have seen a general increase from 564 in 1992, to 759 in 1993, 1,554 in 1994, 2,356 in 1995, 1,839 animals in 1996, 3,365 in 1997, 2,956 in 1998, 1,094 in 1999, 2,166 in 2000, 3,696 in 2001, 3,834 in 2002 to 5005 animals in 2003, 3,200 animals in 2004, 4,038 in 2005 and 3803 in 2006.

Between 2003 and 2005 the population showed no significant change though the estimate was 9% higher then the 2003 estimate. This suggests that the harvest over the two year period was at or slightly below the maximum sustained yield of the population. The number of animals harvested over that period was 8,000 commercially and an estimated 3,000 for subsistence, suggesting that an annual harvest of 5,500 animals will likely cause

the population to stabilize or slightly increase between 2005 and 2007 given that mortality rates remain the same and that the harvest, over all is not sexually skewed.

Caribou condition between 2004 and 2005 declined while over the same period caribou diets shifted from primarily graminoides and lichens to mosses. In addition the disease *Brucella suis* was reaching unprecedented serum prevalence levels (50% from a random sample of 400 animals). Plans to study these aspects of herd health have been made for the February 2007 harvest. Following this work the data will be analyzed to see if this trend continues.

With few predators and adequate range conditions the Southampton Island caribou population has been growing at an unprecedented rate. Recently however disease and declining range conditions have retarded productivity as low as 50% in 2005. Though the 2006 productivity figures suggest a rebound we should approach the estimation of the sustainable capacity of this population with caution. Unique to Southampton Island is the near absence of wolves lowering mortality rates both on adults and calves. These circumstances do not occur on the mainland and for these reasons that harvest rates in excess of 20% have been sustainable. The Southampton Island population of caribou is still considered a growing population so projecting estimates of sustained yield in the absence of population data would be dangerous. Using the 2003 and 2004 survey estimates combined with estimates of use a harvest of between 3,503 and 4,729 animals should be sustainable over the short term. Periodic surveys must be continued to insure the sustainability of this figure.

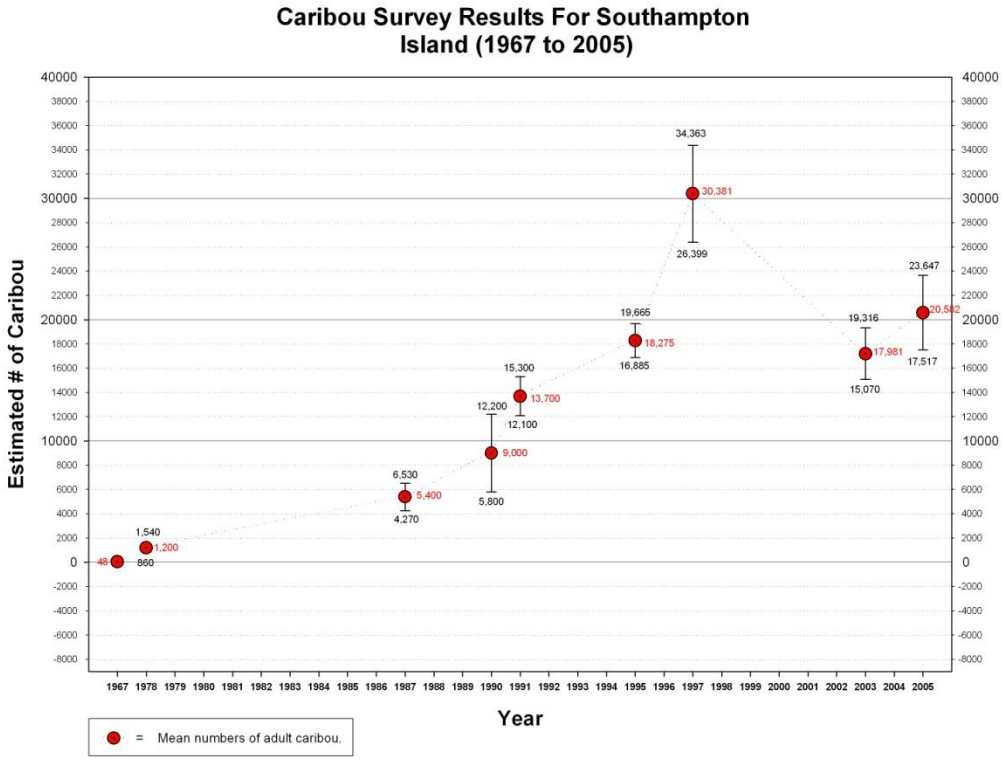

Figure 8. A history of survey results of the Southampton Island caribou population. The first value has been arbitrarily set at zero.

Coats Island Caribou Herd: The origin of this herd is not know but evidence suggests that the herd has been established on the Island since the early part of the century (Ouellet et al 1996). Over a period spanning 3 decades the demographics of this population is best characterized by rapid population increases followed by occasional substantial winter die-offs. These die-offs were occurred at least twice between 1961 and 1991 (Ouellet et al 1996). Survey results such as those flown in 1978 estimating 4,200 animals and that of 1980 estimating 1,700 animals show how quickly adverse weather can decimate these small Island populations. Additional surveys flown since the 1980 survey estimated. The 1980 survey result is the only accessible published figure on the status of the Coats Island Population. No capacity estimates can be made at this time for this population due to the populations known and often severe fluctuations as well as the lack of recent survey information.

Baffin Island Caribou Populations: Baffin Island, the largest island in Canada (~ 507,451 km2), forms the eastern margin of the Canadian Arctic Archipelago. Barren-ground caribou inhabit the island and are recognized as 3 populations; South Baffin, Northeast Baffin and North Baffin. Most research has been directed at the South Baffin population, apparently due to hunting pressures (Ferguson and Maltin 2001). The South Baffin caribou herd occupies approximately half the island, and a population estimate of >60,000 was estimated based on surveys in 1984 (William and Heard, 1986). Ferguson and Gauthier (1991) suggested that population size likely ranged from 60,000 to 180,000. However, no population surveys have been completed on South Baffin caribou since the 1980's. The current status of the population is largely unknown.

Research on Northeast Baffin caribou and North Baffin caribou has been extremely limited. To my knowledge no surveys of these populations have ever been completed. Ferguson and Gauthier (1991) report >10,000 caribou in Northeast Baffin, and between 50,000 and 150,000 caribou on North Baffin based on 'best guess'. The status of these populations is unknown.

Eight communities harvest almost exclusively from Baffin Island; Pond Inlet, Arctic Bay, Clyde River, Qikiqtarjuaq, Pangnirtung, Kimmirut, Iqaluit, and Cape Dorset. Hunters from Igloolik and Hall Beach utilize both mainland and Baffin Island caribou. In general, hunters report low caribou numbers in North and Northeast Baffin.

A long-term research program on North Baffin caribou has been proposed (Jenkins 2006). There is little information on the population and caribou are known to occur in subunits or herds that have spatially and temporally variable levels of mixing. Work is required to define the herd or herds, the annual and seasonal ranges of animals, and to assess fidelity to calving areas and important post calving areas (particularly with respect to potential industrial development). There is considerable potential for mining activities in North Baffin, and IQ and a preliminary calving survey in 1997 have identified the area as significant to caribou. A satellite based collaring program is proposed, providing

movement and space use data that will permit the design and implementation of a meaningful population survey.

Because information is lacking on all Baffin Island populations, there is uncertainty regarding the sustainability of current harvesting levels. The region requires a more realistic budget to meet the mandate of the Wildlife Division, and to undertake timely research that will inform management decisions. As well, mandatory reporting of harvesting is necessary to fully consider this impact. Until population surveys are completed and harvesting demands are fully known, it is not possible to provide a forecast of the capacity of these populations to sustain the needs of the communities.

4.2 Peary caribou:

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in their Assessment Summary of May 2004, classified the entire pearyi subspecies of caribou, as Endangered, that is, it is facing imminent extinction. This caribou is a Canadian endemic subspecies and numbers have declined by about 72% over the last three generations, mostly because of catastrophic die-off likely related to severe icing episodes. Voluntary restrictions on hunting by local people have occurred and efforts to conserve Peary caribou by local HTO's are well documented. Nonetheless, the overall decline of Peary caribou across its entire range is profound and further management and conservation efforts are necessary to ensure the recovery of Peary caribou and the re-establishment of populations capable of sustaining the harvesting needs of the local people. Thus the establishment of a TAH for Peary Caribou Populations is in keeping with Section 5.3.3, a) of the Nunavut Land Claim Agreement that identifies 'conservation purposes' as criteria for limiting Inuit harvest.

TAHs for Peary caribou populations in the Baffin Region have been recommended (DoE 2005) and are currently under review by the NWMB. Theoretically the proposed level of harvest (66 caribou) meets user demand, however, caribou is a preferred food for residence of Grise Fiord and Resolute Bay, and there is considerable resistance to

limiting harvest. As well, the distribution of harvest is important and Peary populations in the vicinity of Grise Fiord and Resolute Bay are extremely depleted and can not support harvest demands.

Six populations of Peary caribou have been delineated for the purpose of managing harvest; they were identified as PC01 through PC06. The geographic boundaries of the PC population had been previously evaluated from assessment of IQ, survey results, movements of radio-collared animals, and known geographic barriers to caribou movements (DoE 2005, Ferguson unpublished data).

PC/01 - refers to the Bathurst Island Population and geographically includes Bathurst Island, Cameron, Ile Vanier, Massey Island, Alexander, Little Cornwallis and Cornwallis Islands and other minor islands.

This population has undergone significant declines since it was initially surveyed in 1961 (Tener), almost 98% loss based on survey results of 1961 and 1997 (from 3608- to 78 individuals). This total loss is the result of two major declines; the most recent occurring in the mid 90's when several severe winters lead to a significant die-off of both caribou and muskox, reducing Peary caribou to and estimated 78 individuals. The latest aerial survey results, collected in 2001 suggest that the Bathurst Peary caribou population is just starting to recover and population estimates are still low (less than 200 individuals). Ground surveys by HTO and IQ collected in Resolute and Grise Fiord supports these results. Traditionally, the Bathurst Island Complex is the hunting area of the Resolute Bay HTO. Recent population surveys clearly indicate that the population in not sufficient in size to sustain the needs of the communities.

PC/02- refers to the Somerset/Prince of Wales Population and geographically includes Somerset and Prince of Wales Islands, Russell, Prescott, Pandora, and other small peripheral islands.

Numerous authors have documented large scale movement between winter range on Somerset Island and calving area on Prince of Wales Island and their satellite islands Indeed, Peary Caribou on Prince of Wales and Somerset Island have been identified as a genetically distinct population (COSEWIC 2004, in DOE 2005). Since 1974 there has been a steady decline in population, from close to 6000 in 1974 to an estimated 60 in 1995 (DoE 2005). In the latest aerial survey in 2004, no caribou were observed on any of the islands after flying 6392 km. These islands can be difficult to assess but elders indicate that they were an important hunting area. The population is now at extremely low densities, and can not support any hunting.

PC/03 and PC/04 are situated on Devon Island. We know little about the historical average abundance of Peary caribou populations on Devon Island however, similar to Bathurst Island and other arctic islands it is likely that the population is at lower density today than in the past.

PC/03 refers to the West Devon Population and geographically includes the western portion of Devon Island, including Grinnell Peninsula. During an aerial survey in May 2002-2003, only 14 clusters of caribou were observed for a total of 35 caribou. Because only 2 of these clusters were observed while flying transects, density calculations were not possible. However we can conclude that the density of Peary caribou on Devon was extremely low and will support only limited hunting pressure.

PC/04 – refers to North Devon Population. As previously mentioned there have been few surveys of Peary Caribou on Devon Island, however, recent surveys indicate caribou at low densities. In fact, IQ indicates few caribou in North Devon (Taylor 2005). The majority of caribou observations were reported for West Devon including Grinnell peninsula.

PC/05 - refers to the Ellesmere/Axel Heiberg Population and geographically includes all of Ellesmere Island as well as Axel Heiberg Island to the west. *A harvest of less than 5 male recommended by Case and Ellesworth (1989) when only 89 (37-141, 90%CI)*

caribou estimated in Southern Ellesmere, including Bjorne Peninsula, and Svendson Peninsula. In 2005, a TAH of 50 was recommended based on 5% of the most recent population estimate (1000) for Eastern Queen Elizabeth Islands (COSEWIC 2004). This recommendation will be evaluated when surveys of Ellesmere (2005/06) and Axel Heiberg Island (2007) are complete. Notably, only portions of the population have been surveyed in the past and it is difficult to evaluate whether harvesting demands for the next five years can be sustainable.

PC/06 – refers to other Queen Elizabeth Islands. This area represents other Islands within the Baffin Region that are known to have low densities of PC. Indeed PC/06 encompasses the remaining Peary Caribou range in Baffin Region. For conservation purposes it is important that these areas be recognized in our management program. Indeed, these islands may act as refuge during bad environmental conditions. That is, there is some evidence to suggest that caribou have traveled to these outer islands during severe winters when forage is difficult to obtain. Individuals that survive may act to re-populate areas when then return to their traditional range. No harvesting in these peripheral areas is currently recommended.

4.3 Muskox:

Kitikmeot Muskox: Overall, with an estimated total of 50,000 muskox (Dumond 2006d), the muskox populations in the Kitikmeot are sufficient to address the subsistence needs of the communities (Forecasted need for 2010 of 154 muskox, see Table 12b. However, we recognize 8 muskox populations in the Kitikmeot and the local trends or distribution of these muskox populations makes it difficult for some communities to access this resource at a reasonable cost. Also the decline of some caribou herds may lead to an increased demand for muskox meat. Nevertheless, the sustainable harvest level for the Kitikmeot muskox populations is over ten times the projected need for muskox and therefore we believe that the resource can sustain the demand for the next 5 years.

Central Kivalliq and Northeast Kitikmeot Muskox: Within the Kivalliq Region muskox are utilized primarily for subsistence but also as komatik robes and sleeping mats, for

carving (horns) and sport hunting. Muskox are harvested primarily by the communities of Baker Lake, Arviat, Rankin Inlet and Whale Cove. Muskox demand and the resources capacity to meet that demand are listed in Tables 1+2. All values are examined using estimates of current use as well as five year projections based on 2001 community population figures and growth rates adjusted for 2006 and 2011.

The distribution and abundance of muskox in the Central Kivalliq region of Nunavut, which includes muskox management zones MX/20 and MX/21 were estimated using fixed-width line transect surveys in July of 1999 (Figure 6). There were 4022-5854 adults in the entire central Kivalliq study area. In MX/20 there were between 843 and 2201 muskox scattered sparsely throughout the management zone. In MX/21 there were between 1747 and 2539 muskox. In the area south of MX/21 there were between 257 (minimum count) and 1266 adults (upper 95% confidence limit). The distribution of muskox was sparse throughout the strata. There appears to have been an increase in the number of muskox in MX/21 from 1991 to 1999, but the survey areas were somewhat different in each year, so the comparison is treated with caution (Table 6). Muskox appear to be continuing to colonize areas south of MX/21 (south of Yathkyed Lake). The 1999 estimate suggested that there was an increase of 1325 to 2041 muskox (lower and upper 95% confidence limits) in MX/21 from the number estimated in 1991. As the 1991 survey found muskox in a much smaller area than the 1999 survey, yet at similar densities, these differences could indicate both population and range expansion.

The number and distribution of muskox in the northern Kivalliq and northeast Kitikmeot region, which includes MX/17 and MX/18, was estimated using fixed-width line transecting surveys in July 2000. There were between 1840 and 3402 adult muskox (95% confidence limits) in the northern study area. There were between 595 and 1317 adult muskox in the MX/17 portion of the northern study area. There were very few muskox observations north and east of the MX/17 boundaries.

Distribution of muskox in the northern Kivalliq appear to have changed little from those observed on the Adelaide Peninsula and vicinity in 1992 (Gunn et al. 1996), or from the

northeast mainland caribou survey in 1995 (Buckland et al. 2000) (Campbell in prep). A distributional shift to the east from areas known to be occupied by muskox was not evident. Comparisons between the July 2000 observational data and available local knowledge suggest that animals have abandoned historic range within the northern tip of the survey area between Taloyoak and Kugaaruk. Adult and calf distribution was limited almost entirely to the western portion of the survey area south from the northern coast of the Adelaide Peninsula, as was found in the previous studies noted above.

Calves represented approximately 16.8% of the animals observed during the northern muskox survey. This value was considerably higher then the 6.6% calves observed by Gunn et al. (1996) during a survey of the Adelaide Peninsula in 1992. In 1986 however proportions of calves were similar (17.1%) suggesting variability in the annual productivity of Adelaide Peninsula muskox. The northern muskox survey calf proportions were also consistent to those observed within the central Kivalliq where 16.9% calves were observed on transect suggesting a consistent muskox calf ratio across the central and northern Kivalliq and northeastern Kitikmeot.

Harvest quotas for all management zones are based on 3% of the estimated adult muskox population (lower 95% confidence limit). A quota of 18 is suggested for MX/17, 25 in MX/20, 52 in MX/21, and an additional seven (7) may be harvested from the portion of the population that is now south of the southern boundary of MX/21 south of Yathkyed Lake. Current harvest quotas in MX/17 (55 tags), MX/18 (30 tags), MX/20 (3 tags) and MX/21 (25 tags) are at levels set following the 1991 population survey (Fournier & Gunn 1997).

Table 6. A summary of results of muskox surveys in the central Kivalliq Region of Nunavut (surveys limited to MX/21 and vicinity from 1985-1999).

Year	Total Stratum Area (km^2)	Pop. Est.	SE	CV	Lower 95% CI	Upper 95% CI	% Calves	Authors
1985 (Nov)	19,706	1,262	563	0.45	159	2,365	17.9	Case & Graf (1986)
1986 (July	8,261	838	176	0.21	476	1,200	11.5	Case et al. (1986)
1991 (July)	12,555	1,203	145	0.13	919	1,487	15.9	Mulders & Bradley (1991)
1999 (July)	19,475	2,143	199	0.09	1,747	2,539	15.0	This Study

Arctic Islands Muskox: In Canada, muskox were listed in 1960 as Endangered (Order-in-Council). More recently, COSEWIC has not rated muskox which would indicate no immediate concerns. In the NWT, muskox were listed in 2000 as "Secure". In NWT and NU, the status of muskox on the mainland is still influenced by the massive unregulated commercial exploitation of muskox for their hides in the late 1800s. Indeed, exploitation had reduced muskox to a few isolated areas by the early 1900s. Subsequently, muskox have slowly re-colonized the mainland territories. For the most, muskox on the Arctic Islands were not subject to the commercial exploitation in the late 1800s. However, there is a suggestion that 133 hides were traded at Ellipse Sound in 1916-18 (presumably from Somerset or Devon Island) and that some expeditions locally over-hunted muskox (i.e. northern Ellesmere and Devon). More recently, muskox numbers have significantly declined on some islands, mostly because of catastrophic die-off likely related to severe icing episodes. Within the Baffin Region, muskox occur in 9 populations, identified as MX/01 through MX/09 (Table 7). All of these populations are not recognized in the current quota system, and recommendations to update the units and quotas (TAHs) have been presented to the NWMB (in Nov. 2006). The recommendations are based on joint ground/aerial surveys completed from 2001-2006. Preliminary results indicate that some populations can support the requirements of the local communities, whereas others are small and susceptible to environmental variation. A redistribution of hunting pressure is

necessary to ensure recovery of these populations, and harvesting under the current harvest quotas is not sustainable.

Table 7. TAH recommendations for the Nunavut High Arctic Muskox

Population	TAH	Description
MX/01	3	***Bathurst Island Population.*** TAH based on 3% of the current minimum count (94) determined in 2001. The objective is to encourage population growth until the population is about half the peak sizes (1961, 1994) when the TAH should be re-examined. The population is relatively small and could be vulnerable to environmental variation. The sex and age structure is unknown.
MX/02	0	***Cornwallis Island Population***. The objective is to encourage population growth until the population reaches half the known peak (N=25) when the TAH should be re-examined. The population is extremely small (based on 2002 survey) and could be vulnerable to environmental variation.
MX/03	20	***Central Ellesmere Island Population***. Recent aerial & ground survey of Ellesmere Island found the majority of muskoxen distributed north of designated muskoxen populations (Fosheim Peninsula). The TAH represents 5% of the upper confidence interval of the population estimate.
MX/04	4	***Southern Ellesmere Island Population***. The population is small. Given the poor condition of observed muskoxen in 2005, a harvest of 3% of the mean abundance estimate is recommended until new information on trends/recovery is available.
MX/05	14	***North Devon Island Population***. IQ suggests muskoxen are increasing. Recommendation of a TAH of 14 or 5% of the 1990 estimates.
MX/06	2	***South Devon Island Population***. Objective to maintain the population at a level to meet current Inuit needs. A TAH of 2 which is 3% of 1990 estimate is recommended as the population is small (72, 1990 survey).
MX/07	5	***West Devon Island Population***. The population is small but appears to be increasing. . The objective is to maintain the population. A TAH of 5 or c. 5% of the 2002/03 estimate is recommended
MX/08	117	***Somerset Island Population***. Objective is to encourage sustainable harvesting of muskoxen and foster the recovery of caribou. The average annual rate of increase (6%) is recommended as the TAH.
MX/09	20	***Prince of Whales Island Population***. Since 1995 muskox abundance has declined. The recommended TAH is a balance between allowing muskoxen to decline further (possibly foster caribou recovery) without accelerating the decline to the point of jeopardizing sustainable harvesting.

4.4 Polar Bears:

There are 12 populations of polar bears in Nunavut which are harvested by all 25 communities. All of the accidental, illegal, defense, regular, and sport kills are recorded for all populations. The total anthropogenic mortality is regulated by a quota system that accommodates over-hunting in some years with subsequent harvest reductions in subsequent years. The average annual Nunavut removals for all populations for the past 5, 3, and 1 year are: 422, 450, and 460 respectively. Demand for polar bears includes the meat which is prized in all Nunavut communities, and to support the traditional economy, including the sale as hides and sport hunts. These removals do not represent demand because the demand is greater than the maximum sustainable removal rate for all populations and all communities. In three populations (Western Hudson Bay, Baffin Bay, and Kane Basin) the combined removals by all jurisdictions that share these populations is believe to be excessive. If this over-harvest is continued, these populations will eventually decline to depletion. The projected demand for polar bear harvest opportunities will probably always exceed the capacity of polar bear populations to meet that demand by a wild margin due to increased numbers of hunters and the limited capacity of polar bear populations to sustain additional (or even current) removal rates.

The Total Allowable Harvest (TAH) for each of Nunavut's 12 polar bear populations is adjusted by assessing the risk to polar bear populations by harvest. TAH is set to insure that populations remain stable, by using demographic data collected during the population inventories. In almost every year throughout Nunavut, with few exceptions, communities harvest very close to the limits set by the populations' TAH. We interpret this, in addition to our experience during community consultations, as the lack of capacity of Nunavut's polar bear populations to meet the demand for polar bear harvest. This lack of capacity will likely become more extreme if: 1) more polar bear populations are found to decline due to the effects of climate warming; 2) human-bear interactions increase as polar bears spend more time on land during increased open-water seasons and 3) the demand for polar bear harvest increases with the increasing Inuit population.

Despite these predictions, an assessment of the capacity of Nunavut's polar bear populations to meet anticipated demands requires: 1) sufficient funding and personnel to monitor and inventory the polar bear populations to responsibly recommend TAH; 2) a functional co-management system which allows for the implementation of conservation measures aimed to insure future harvest levels from increasing populations of Inuit and 3) sufficient funding and personnel to insure the development of a polar bear deterrent program. The following provides a brief assessment of the current and projected trends for each of Nunavut's 12 polar bear populations, and the relationship of these trends to demand:

Davis Strait: The current estimate of the Davis Strait population is approximately 2100 bears; this population is currently being inventoried. This population is considered stable, and the TAH (46, Nunavut) is likely conservative. Inter-Jurisdictional (IJ) agreements are currently being negotiated between Canada and Greenland (Denmark), and will be soon negotiated with Quebec and Labrador to better manage the Davis Strait population. These IJ agreements will affect the administering of the TAH for Davis Strait. There is currently no evidence of the effects of climate change on the Davis Strait population. However, remote sensing has demonstrated that ice has declined in Davis Strait due to climate warming. Continued warming could compromise polar bear habitat and a decline in population size may occur in the future. The demand for polar bear harvest in Davis Strait will remain high and likely increase, especially considering the human population increases in Iqaluit. Demand for subsistence use in the Qikiqtaaluk region is higher than the capacity of the populations. In addition, as open water season is increased, there will likely be increases in defense kills, as has been demonstrated over the last several years in communities that harvest from Davis Strait.

Northern Beaufort Sea: The current abundance estimate of the Northern Beaufort Sea population is approximately 1200 bears; this estimate is based on abundance and demographic rates estimated in 1986. This population is currently considered stable. Current analyses are now underway, as a recent population inventory was completed in 2006. This population is managed by the U.S.A. (Alaska), the Northwest Territories and

Nunavut; population inventories are generally initiated by the Northwest Territories and Alaska. The current Nunavut TAH is 6 bears (Kugluktuk). The expanse of the open-water season has been cited as a concern for this population. Hunters in Kugluktuk were given 12 bears as a quota for 2005 – 2006 (through using accumulated credits); however they were only able to harvest 1 bear, because of unsafe ice conditions, due to earlier ice breakup. The community suggests the warming trend in the last 20 years has decreased their ability to harvest polar bears, as polar bears have moved north to better ice conditions. The capacity of the population has been decreased due to habitat change, despite interest in hunting from Nunavummiut.

Norwegian Bay: The current (1998) abundance estimate for Norwegian Bay is 190 polar bears. The density polar bears are low due to thick, multi-year ice and relatively low densities of seals. Projected estimates and risk are based on vital rate estimates determined from pooled data from Lancaster Sound and Norwegian Bay. The Nunavut TAH for Norwegian Bay is 4 bears; technical specialists within the GN will recommend a reduction to 3 bears (the long-term average kill), which would change the risk assessment for this population from decreasing to stable. We have no information regarding the effects of climate change on this population over the next five years. However much of this area is shallow water which is preferred by bearded seals. Thinning ice and more active ice would improve Norwegian Bay sea ice for bearded seals, so it is possible that productivity may increase if climate warming continues.

Viscount Melville Sound: The current abundance estimate for Viscount Melville Sound is 215 polar bears; this projection is based on demographic rates assessed in 1992. This area has low production of seals, and the polar bear density is considered low due to multi-year ice. There was a 5 year hunting moratorium on this population from 1992-1997 to allow it to recover from a seriously depleted state due to legal over-hunting. Currently the base allocation to Cambridge Bay is 3 polar bears. All bears have been taken under the sport harvest, suggesting that this population is too remote to provide practical access for subsistence hunting. The population is currently increasing (recovering) slowly, suggesting that capacity to meet any increase in demand is low.

Lancaster Sound: The current abundance estimate for Lancaster Sound is 2541 polar bears; this estimate is referenced to 1998. The current TAH for the population is 85, divided among three communities: Arctic Bay; Resolute Bay and Grise Fiord. This population is abundant, but has relatively low productivity, in spite of a relatively high density of ringed seals. Projected estimates and risk are based on vital rates pooled from data from Lancaster Sound and Norwegian Bay. The quotas for these communities are large, and usually filled; there is high demand for sport hunts. The demand for bears in this population is higher than the biological capacity of the population. In addition, the Lancaster Sound population is in the area of potential increases in resource exploration and mining, and possible 12-month shipping; these activities will negatively affect polar bear habitat.

M'Clintock Channel: The current abundance estimate is 284 bears, which was estimated from mark-recapture research completed in 2000. The current TAH is 3 bears, which was increased from an interim harvest moratorium (2001-2004), but is substantially less than the historical harvest of 42. This population was depleted by previous legal over hunting. The demand for polar bear harvest is likely higher than the capacity for the population to sustain.

Gulf of Boothia: The current abundance estimate is 1528 bears, following a mark-recapture survey in 2000. It is thought that given the current annual harvest (74), the population may be slightly increasing. There are defense kills in some communities, and harvest for the most part meets the quotas. The demand for polar bear harvest is likely higher than the capacity for the population to sustain.

Foxe Basin: The current abundance estimate is 2,119 bears; this estimate was developed in 1996. Local hunters indicate that numbers have increased since harvest quotas were reduced in 1993, however, climate caused reductions in ice may have reduced habitat quality so the current trend and status is uncertain. It is thought that the population has since increased, and is considered stable. There is high demand for subsistence harvest in

the communities. There are many communities which access the Foxe Basin population, and therefore increasing human population size will increase the demand, perhaps limiting the capacity of the Foxe Basin population to meet the need.

Western Hudson Bay: The current abundance estimate is 935 bears (down from 1200 in 1986); this estimate is based on a 2004 survey. The MOUs signed with Nunavut communities that harvest from this population suggest that a hunting moratorium be enacted. In April 2007, an NWMB community consultation will be held in Arviat to consider management recommendations for the Western Hudson Bay population, which range from a moratorium, to a reduction of the TAH from 56 to 47 bears per annum. Scientific information states that the biological capacity of the population is insufficient to meet the demand of hunters in the Kivalliq. However, some Kivalliq hunters feel the science is flawed and that polar bears have not declined in WH.

Southern Hudson Bay: The current abundance estimate for this population is approximately 1,000 animals. The current harvest is considered sustainable, and Sanikiluaq regularly harvests at the level of the quota. Declines in body condition and reproductive parameters in this population were documented in a recent (2003-2005) study. The Southern Hudson Bay population is adjacent to the Western Hudson Bay population that has shown declines in both population number and body condition. The declines in Hudson Bay are believed to be due to climate warming. If climate continues to warm the biological capacity of the population to meet even a constant demand could fail.

Kane Basin: Nunavut currently harvests few polar bears from the Kane Basin population, which is estimated to comprise of approximately 164 bears. The current Nunavut quota is 5 bears; however 0 bears were harvested in 2005 – 2006. This lack of demand is best interpreted as lack of access, as the bears are far from the settlement of Grise Fiord and traveling conditions are difficult. This population is considered depleted, due to historical and continuing over-harvest by Greenlanders. The current Greenland

and Nunavut combined quota is considered unsustainable. A co-management agreement between Greenland (Denmark) and Canada is currently under discussion.

Baffin Bay: Mark-recapture work between 1993 and 1997 indicated that the population size in Baffin Bay was 2,074 bears. Since this time, incorporating harvest and demographic rates (measured from 1997), the population has been projected to have declined to approximately 1,500 animals. In 2005, the Nunavut quota was increased to 105 bears, which was based on the perception of local Inuit hunters that the population had increased and an under-estimate of the Greenland annual removal from Baffin Bay. The GN has asked the NWMB to review current TAH levels in Baffin Bay because of conservation concerns. There are many defense kills in communities in Baffin Bay, indicating either more bears than the population models suggest, or a change in the open-water season distribution of bears, or a change in bear behavior. Although polar bear meat is prized in the Qikiqtaaluk, the high demand is also reflective of an increase in bear-human interactions. If the population continues to decline from over-hunting or because of climate warming effects on sea ice, the capacity of the population to meet the demand will be progressively eroded.

4.5 Grizzly Bear:

There is limited information on Grizzly bear population status and trends. The most information is from the west Kitikmeot and Slave Geological province where the Grizzly bear population is believed to be stable or slightly increasing (McLoughlin et al. 2003; Dumond & Campbell in prep. b). In the Kitikmeot subsistence harvest is not regulated under a quota but family groups and denning bears are protected. If alone, the subsistence harvest is below the sustainable recommended harvest level in the West-Kitikmeot (recommended maximum harvest of Grizzly bears per year in the West Kitikmeot = 13 to 14, McLoughlin et al. 2003). In average only 3 bears per year are harvested by Inuit in the West Kitikmeot including usually 2 per year harvested for the sale of the hide. Between 1980 and 2004 the annual harvest was fluctuating from year to year but overall the subsistence harvest tended to decrease but sport hunts and kills in defense of life and

property have increased. The total Grizzly bear harvest (Subsistence, Commercial, Sport and Defense kills) in the Kitikmeot region increased between 1980 and 2004 and is now regularly higher than the recommended maximum harvest level. Due to the increase in other types of harvest, subsistence harvest may become compromised. GN-DoE initiatives are trying to reduce Grizzly bear killed in defense of life and property (Community based people – bear conflict management project*)* but resources are limited and the increase in land use (private cabins, mining exploration, tourism and research) increases the number of people-bear conflicts.

The subsistence harvest for Grizzly bears is expected to decline. Currently the Grizzly bear harvest is meeting the demand. However as development progresses with its burden of increased defense kills, and the economic value of Grizzly bear harvesting is better appreciated, the resource is likely to become too limited to accommodate all sources of removals. Conservation measures will have to focus on what can be controlled, which includes subsistence and sports hunting.

Currently all Grizzly bears harvested are come off a quota of 10 for the Kivalliq region. The average harvest is below this quota but it seems that the demand for bears is increasing because the subsistence harvest of bears seems to have slightly increased between 1980 and 2004. The 5-year average of the number of Grizzly bear killed in defense of life and property is relatively stable and low since 1986, remaining below 2 bears per year in average (Dumond & Campbell in prep. b).

4.6 Wolverine:

We do not have a comprehensive quantitative population estimate for wolverine populations in Nunavut, but some work has been initiated to address this deficiency (see Dumond 2006a; Dumond 2007a). However, there is currently no TAH on wolverine, and wolverine pelts are used locally or sold at the fur auction. The fact that pelts are sold to the fur auction in some communities seems to indicate that currently the harvest in these communities is enough to provide furs for subsistence needs with an excess that can be

sold out of the community. However, data collected by the GN-DoE indicates possible effects of the harvest on the wolverine population structure in the West Kitikmeot in years when the harvest is high. In the East Kitikmeot, the harvest of wolverine is limited due to wolverine population low density (Cardinal 2004) and the terrain that often prevent hunters from tracking successfully the animals. Hunters from the East Kitikmeot indicate that wolverine population may be increasing. With the current lack of information on the wolverine populations' densities and trends, it is difficult to predict the adequacy of the resource to meet future communities' needs.

4.7 Wolf:

Although we do not have harvest or population data on wolves in Nunavut, it seems that at this time there is no issue regarding the availability of wolves now and for the next 5 years. However, it is important to note that wolf abundance is eventually linked to their prey abundance. Therefore, a decline in caribou populations could influence the trend in the wolf population. The delineation of wolf populations is a first step in the quantitative assessment of a species.

4.8 Foxes:

Fox populations (Arctic fox and Red fox) are currently sufficient to sustain subsistence needs. There are no concerns regarding the sufficient abundance of foxes to sustain subsistence needs in the Kitikmeot at this time and for the next 5 years. Fox numbers appear to be mainly effected by population cycles of their prey, so there is no reason for setting a TAH for this species.

4.9 Raptors:

Nunavut currently lacks the survey information required to fully delineate independent demographic units (populations) for its raptors. We have no systematic surveys that cover even a small portion (e.g., 5–10%) of the breeding range for any species. To ensure

protection of critical habitat features, we need to have more information on territory use and foraging ecology of the birds to determine the importance of protection of the nest sites and surrounding habitats. The territory (when combined with NWT) conducted extensive occupancy/productivity surveys from the mid-1980s through to the mid 1990s in two areas — Coppermine (Kugluktuk) and Hope Bay. The intent of those surveys was to locate Gyrfalcon and peregrine falcon nests and to develop trends in occupancy and productivity. The surveys were conducted once per year at a time when chicks were hatched but not yet fledged. There is one long-term study of Peregrine Falcon life history in Rankin Inlet Nunavut. This is a well-known and well-published study that has provided a great deal of information on life history characteristics and a long-term data set on occupancy, productivity, migration, and contaminant loading that is not available anywhere else. The information is extremely valuable for building our continued knowledge of Peregrine Falcons in Nunavut, but that study is limited to an extremely small proportion (<<0.1%) of the expected breeding population in Nunavut. The NWT/NU Raptor nest database compiles all the known breeding locations of all diurnal raptors in the NWT/NU. This is a comprehensive database with continual additions with the discovery of new sites. Some sites have been visited and tracked numerous times, but the majorities of sites has been recorded only once and have probably never been investigated since. The database gives us a general idea of distribution of breeding sites through the territory, but is limited by intermittent search effort and voluntary data recording.

We are currently revising our Wildlife Regulations in partnership with the Nunavut Wildlife Management Board and NTI. We are under increasing pressure to provide evidence of conservation need and protection needs if such are suggested. In order to present that evidence, studies to gather the information as mentioned above will be necessary across a broader region of the territory than is currently being collected.

4.10 Other Terrestrial Species:

Arctic Hare, ptarmigan and ground squirrel are regularly harvested by Nunavummiut (Table 2). Voles, lemmings, non-game furbearers and common ravens are not harvested at significant levels. There are no known conservation issues resulting from the expected limited demands for these species. There are no harvest restrictions in place and all species are harvested to the level of need. These species are not a primary food source, such as caribou or seal. Harvesting pressure may increase as Nunavut's human population increases, but we currently have no information on what levels of harvest can be sustained by these species. Arctic hare have cyclic populations with high and low abundance periods. Similarly ptarmigan may have local declines in abundance due to weather events associated with the hatching period and normal population cycles. These are natural occurrences and should not have long term effects on the populations but may create periods when the demand may exceed the capacity in the short term. In Kugluktuk, the demand for moose seems to have increased and particularly when caribou are not easily available (low density or distributed far from the community). However, we only have anecdotal information on this species in Nunavut and it is not possible to provide a forecast. These species are ranked as secure by the National General Status Working Group in Wild Species 2005.

5.0 Assessment of the State of Biodiversity in Nunavut

Canada has assumed a leadership role in international efforts for the conservation of biodiversity (Biodiversity Convention, 1992). Nationally, Nunavut participates in a Federal/Provincial/Territorial Biodiversity Working Group formed to coordinate biodiversity conservation across Canada by the Canadian Wildlife Directors Committee (CWDC). Retention of biodiversity in Nunavut is a management priority, but in the short-term there are few landscape-level threats to Nunavut's biodiversity that necessitate significant management initiatives. Nunavut has naturally low species diversity for resident terrestrial wildlife species. Nunavut was recently glaciated, so there has been

relatively little evolutionary time for speciation to occur. Because Nunavut is northern, it experiences great fluctuations in seasonal temperatures each year. Nunavut terrestrial species must be robust to a wide range of climatic conditions, so the "niche" of Nunavut species tends to be broad rather than specialized and narrow; which also limits the number of species present. Nunavut has experienced almost no habitat degradation or fragmentation from farming, forestry, or other development; especially compared to southern jurisdictions. However, climate warming is predicted to result in sea ice habitat degradation, which would affect polar bears and other terrestrial species that cross the ice in seasonal migrations or local foraging movements. Alternatively climate change could result in invasion of exotic southern species (including pathogens) and increase biodiversity. COSEWIC has identified only one wildlife species in Nunavut as endangered (Peary caribou), and this species is not currently a SARA "species at risk". Species diversity is not a primary management issue for Nunavut.

5.1 United Nations Convention on Biological Diversity

The Biodiversity Convention is about global sustainable development which requires the conservation of biodiversity and the sustainable use of biological resources. It illustrates an understanding of the relationship between human activity and the natural world and the need to sustain living organisms, their genetic diversity and the integrity of ecosystems. Implementation of the Convention requires a co-operative approach to be adopted within and between nations of the world. Canada was the first to sign the United Nations Convention on Biological Diversity on December 4, 1992 with support of Provinces and Territories (not Nunavut).

The objectives of the Convention are:

- the conservation of biodiversity;
- the sustainable use of biological resources; and
- the fair and equitable sharing of benefits arising from the use of genetic resources.

5.2 Canadian Biodiversity Strategy

In 1995 the federal government released the Canadian Biodiversity Strategy. The Canadian Biodiversity Strategy was developed to implement the UN Biodiversity Convention in Canada and to address issues posed by the loss of biodiversity. It recognizes existing constitutional and legislative responsibilities in Canada, while promoting intergovernmental co-operation.

The five goals of the strategy include:

- to conserve biodiversity and use biological resources sustainably;
- to move to an ecological approach to resource management through an improved understanding of how ecosystems function;
- to improve Canadian's understanding of the need to conserve biodiversity;
- to develop incentives and legislation that promote conservation and sustainable use;
- to work with other countries to conserve biodiversity.

The *Biodiversity Outcomes Framework* is a new F/P/T initiative to provide the missing implementation and reporting framework for the *Canadian Biodiversity Strategy.* It proposes to accomplish this by focusing on why, what, and how biodiversity affects us and can it be maintained. The Framework uses an adaptive management approach to maintain goods and services essential to ecological and human wellbeing. It further proposes that the outcomes will lead to partnerships in conservation planning and improved education and involvement for Canadians. This initiative is close to being implemented by the Canadian Council of Ministers of Environment, supported by the Canadian Wildlife Directors Committee (CWDC).

5.3 The Commission for Environmental Cooperation (CEC)

Canada, Mexico, and the United States are linked through economic, social, and cultural exchange and share many ecosystems and migratory species given their geographical location. In recognition of this shared environment, and the consequent shared responsibility, environmental provisions were included in the Northern American Free

Trade Agreement (NAFTA). These provisions in NAFTA were supplemented by a side agreement, the North American Agreement on Environmental Cooperation (NAAEC). The Commission for Environmental Cooperation (CEC) of North America was created by the NAAC to facilitate this cooperation with the goal of conserving, protecting, and enhancing the North American Environment.

In the spring of 2000, a workshop was held with indigenous peoples to seek their guidance on North American priority issues facing marine and terrestrial biodiversity. Additionally, the CEC convened a workshop with ecologists that identified 14 regions of prime importance for focused North American attention, based on biological and ecological continental significance and high levels of threat. Two of those regions deemed as priority for biological conservation include portions of Nunavut (Figure 9).

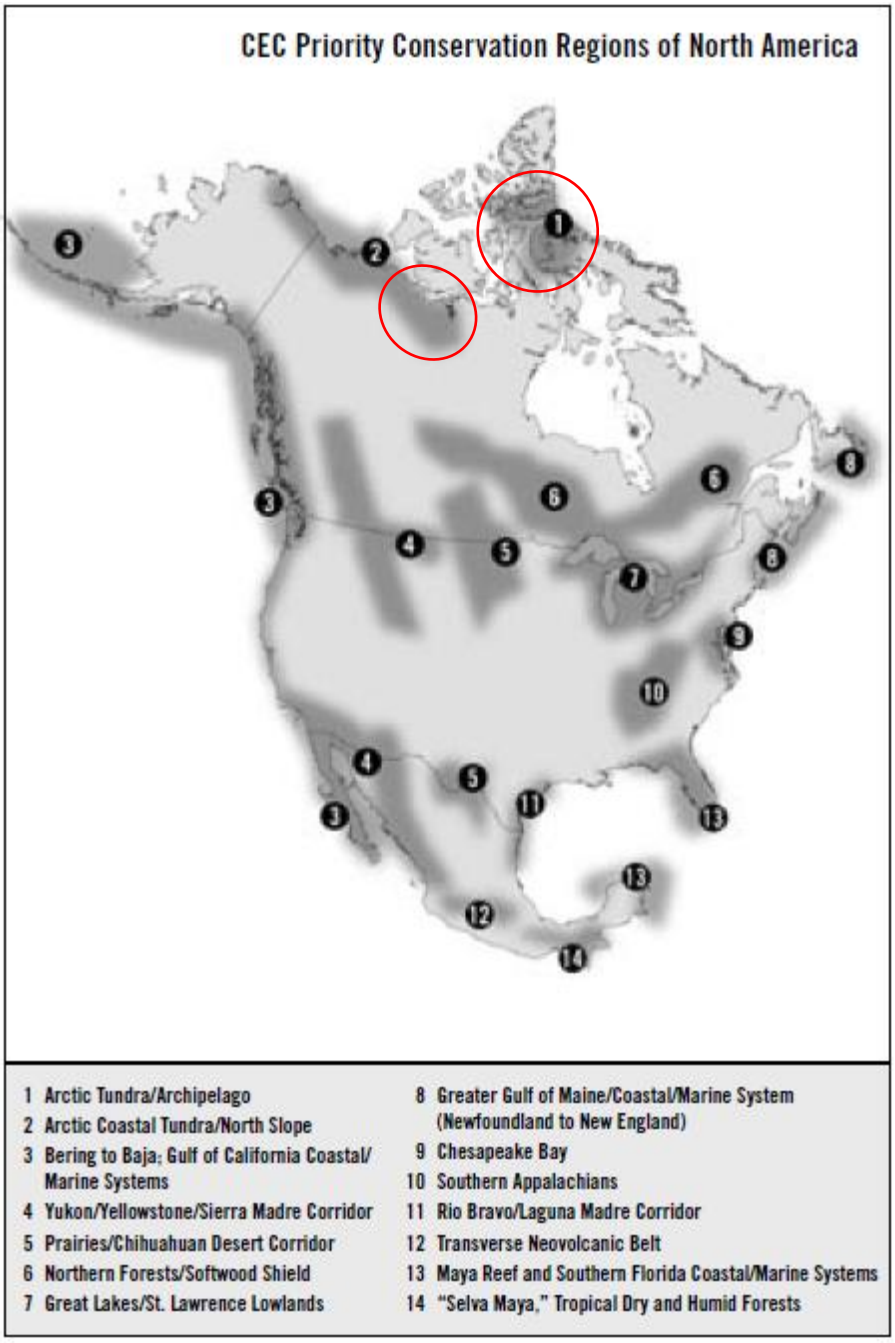

Figure 9. The Commission for Environmental Protection (CEC) Priority Conservation Regions of North America identified two priority areas in Nunavut (CEC 2003).

Commission for Environmental Cooperation. 2003. Strategic Plan for North American Cooperation in the Conservation of Biodiversity. http://www.cec.org. 99 pp.

5.4 National General Status Working Group

The *Canada Accord for the Protection of Species at Risk* (1998) identifies the need for a coordinated effort towards maintaining biodiversity and assessing all wildlife in Canada. The National General Status Working Group (NGSWG) is a federal/provincial/territorial body created to facilitate this goal. This working group is tasked with providing general assessments on all species in Canada, a considerable process that will take several years. The Government of Nunavut, Department of Environment conducts General Status Assessments of all Nunavut wildlife (plants, animals, fish, insects, etc.). Although General Status ranks (Table 8) are not a legal designation, in consideration of the NLCA (5.2.34 (f)), General Status ranks are considered "draft" until review by NWMB. The NWMB has not yet been actively involved in the General Status process.

While General Status Assessment is a continuous process, national reports are prepared every 5 years. The second report, Wild Species 2005, was published in 2005. Included in that report is an assessment of the General Status rankings of all of Nunavut's vascular plants, four invertebrate groups (freshwater mussels, dragonflies and damselflies, and tiger beetles), and terrestrial vertebrate species (amphibians, reptiles, birds and mammals). Nunavut prepared its own General Status Report in 2000 (*Nunavut Wild Species 2000*). While the databases are maintained, the resources are not available to update this report on a 5-year basis to match the federal reporting period.

To date, only a very small proportion of Nunavut's plant and animal species have been included in the General Status Assessment. Overall, it is estimated that there are 70,000 recorded species in Canada, and an additional 68,000 un-described species. The proportion of those species expected to contribute to Nunavut's overall biodiversity is unknown. Overall, the General Status working group assessed only 11% of the known species, or 5% of all expected species. This national proportion probably closely represents the proportion of species assessed in Nunavut. A summary of recent data compilations by species group that have been assessed is provided below.

Table 8. Description of General Status rankings used to assess Nunavut species.

GS Category	Description
Extirpated	Species that are no longer present in a given geographic area, but occur in other areas.
Extinct	Species that are extirpated worldwide (i.e., they no longer exist anywhere).
At Risk	Species for which a formal detailed risk assessment (COSEWIC assessment or territorial equivalent) had been completed and that have been determined to be at risk of extirpation or extinction (i.e., endangered or threatened).
May Be At Risk	Species that may be at risk of extinction or extirpation, and are therefore candidates for detailed risk assessment. These species are ranked with the highest priority for COSEWIC or jurisdictional consideration.
Sensitive	Species which are not at risk of extinction or extirpation but may require special attention or protection to prevent them from becoming at risk. These species are ranked with a medium priority for further consideration.
Secure	Species which are not at risk or sensitive. These species have the lowest priority for further consideration.
Undetermined	Species for which insufficient information, knowledge, or data is available to reliably evaluate their general status.
Not Assessed	Species which are known or believed to be present, but which have not been examined.
Exotic	Species that have been moved beyond their natural range as a result of human activity.
Accidental	Species occurring infrequently and unpredictably, outside their usual range.

The findings of this group are published as the Wild Species 2005 Report

Vascular Plants — Vascular plants are the "higher plants" characterized by the possession of roots, shoots, and leaves. Of the 5074 vascular plant species known to exist in Canada, 665 species are known or suspected to exist in Nunavut. The majority of them (42%) are considered Secure (Figure 10). A significant proportion (23%) were considered "May Be at Risk" because of very limited information, and based on only one or two

known records in small areas of Nunavut with particular ecosystems (e.g., Taiga Shield and Hudson Plains Ecozones) whose availability is limited in the territory. None of the 14 exotic species are considered at this time to be "invasive alien species" and are not at this time considered a threat to Nunavut's naturally occurring biodiversity. The General Status exercise identified a need for broader vegetation inventory work throughout the territory, and the requirement for more specific inventory work within the treed portion of the territory.

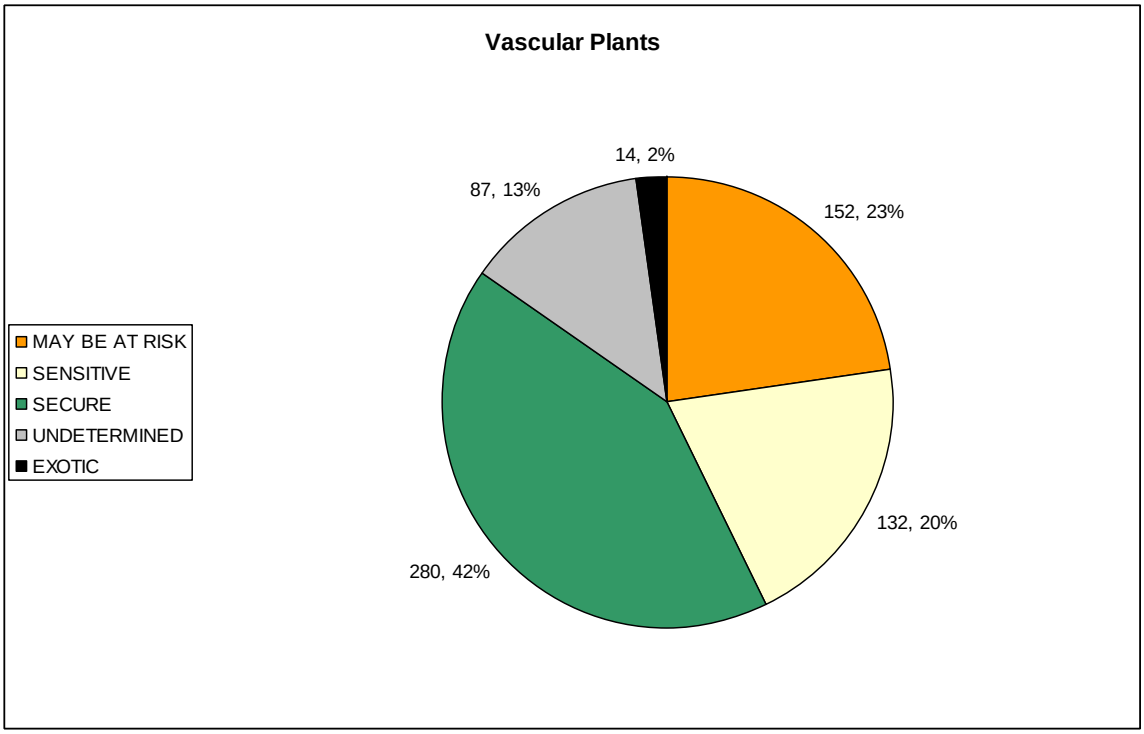

Figure 10. General Status summary of the ranks given to the 665 known vascular plant species in Nunavut.

Freshwater Mussels — Of the 55 species of freshwater mussels found in Canada, two (2) are known/suspected in Nunavut. Due primarily to no or limited information, only the two species were either "Not Assessed" or the status was "Undetermined." These status designations will remain until further inventory/research is conducted.

Odonates — Odonates are the order of insects known as Dragonflies and Damselflies. Of the 209 species found in Canada, 42 are known or suspected in Nunavut. The status of all of them remains "Undetermined" until further inventory/research becomes available.

Butterflies — There are 284 resident species of butterflies in Canada, of which 47 are known to have occurred in Nunavut. The greatest portion of the butterflies (56%, Figure 11) are considered "Secure". However, 26% are considered sensitive due to limited records and limited range occurrence within Nunavut. Only one population is known to exist in Nunavut for the species that was determined to be "May Be at Risk." The "Exotic" species is not considered a threat to Nunavut's naturally occurring biodiversity.

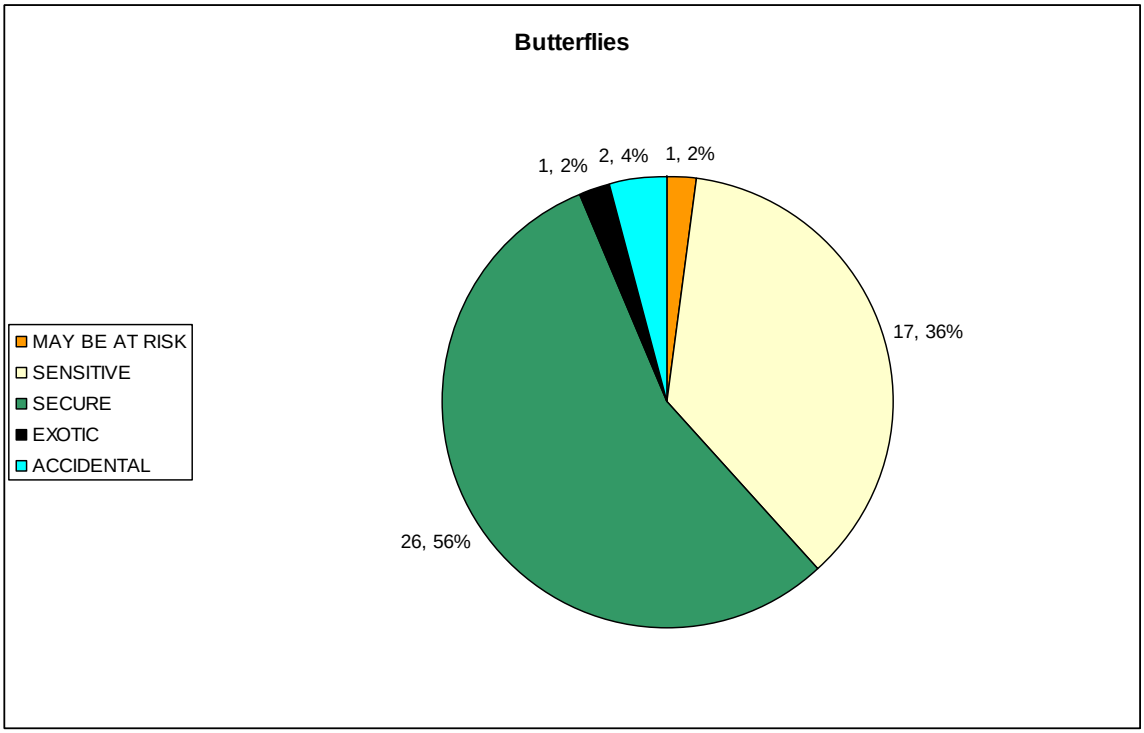

Figure 11. General Status summary of the ranks given to the 47 known butterfly species in Nunavut.

Fishes — Nearly 1400 species of fishes are known in Canadian waters (11% freshwater, 85% marine, and 4% in both freshwater and marine). Twenty-four (24) species of freshwater fish are known or suspected in Nunavut's freshwater habitats. Of those species, four (4) are considered "Sensitive", seven (7) are "Secure" and 13 are

"Undetermined" or "Not Assessed". Arctic Char and three other species were categorized as "Sensitive" because of some local over harvesting, or because of very limited distribution in the territory.

Amphibians — Amphibians include frogs, toads, newts and salamanders. Of the 46 species found in Canada, eight (8) are know/suspected to exist in Nunavut. Due to lack of inventory work, all amphibian species have a General Status rank of "Undetermined" or "Not Assessed" in Nunavut.

Reptiles — Reptiles are cold-blooded scaly animals including snakes, lizards, turtles, and tortoises. Of the 47 species known to exist in Canada, one (Common Garter-snake) is known/suspected in Nunavut. Its General Status rank is "Not Assessed" because no information is available.

Terrestrial Mammals — Of the 169 terrestrial mammals known to occur in Canada, 38 are known to exist in Nunavut (Figure 12). About one-half of the terrestrial mammals are considered "Secure", and close to one-third (mainly small furbearing mammals) remain "Undetermined." Some species whose range is limited in Nunavut are considered "Sensitive", or large predators such as Grizzly bear and polar bear which face a number of potential threats are considered "Sensitive" and require some type of management focus. Peary caribou is the one terrestrial mammal considered "At Risk" in Nunavut (COSEWIC Endangered).

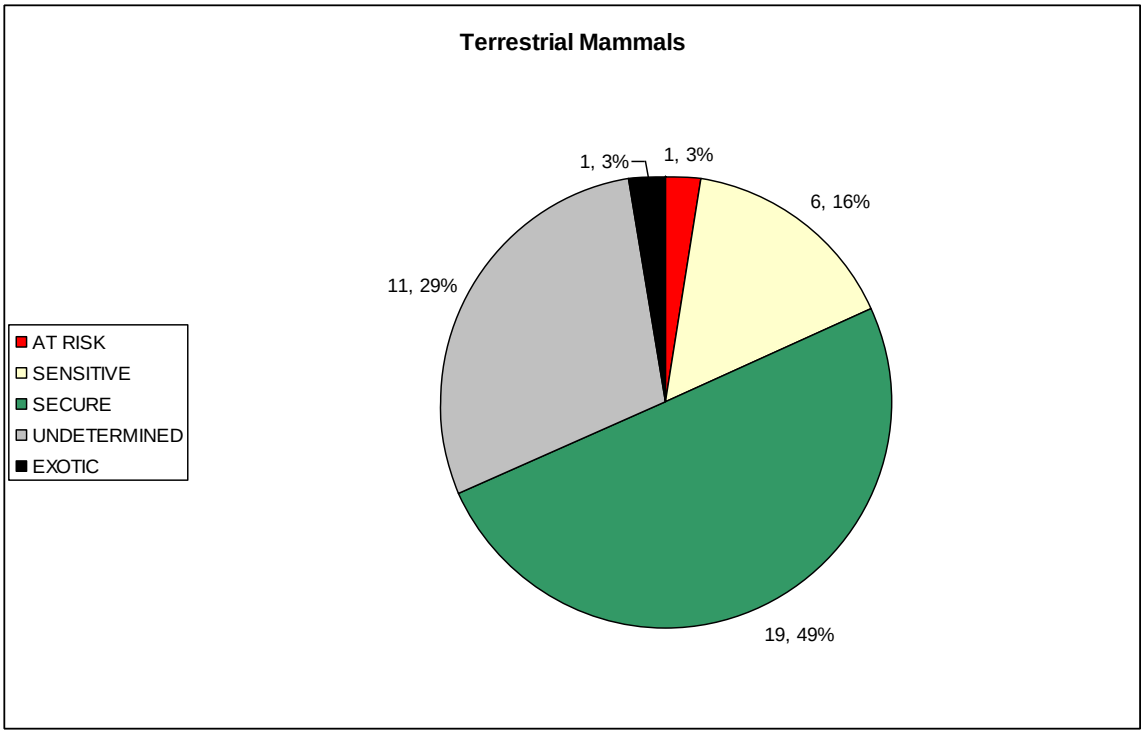

Figure 12. General Status summary of the ranks given to the 38 known terrestrial mammal species in Nunavut

Birds — Of the 653 birds found in Canada, 255 have been found in Nunavut. The largest proportion (42%, Figure 13) is considered "Accidental" because breeding has generally not been confirmed, but they have been documented at least once in Nunavut. The majority of regularly occurring bird species in Nunavut are "Secure", and the status of many (27%) remains "Undetermined." The Whooping Crane is Extirpated from Nunavut (but probably did not regularly occur here), and the Extinct species is the Passenger Pigeon (which was considered an accidental record in the territory at the time of its existence). The two species determined "At Risk" are the Eskimo Curlew (COSEWIC Endangered) and Ross's Gull (COSEWIC Threatened). The two exotic species (European Starling and House Sparrow) are ubiquitous throughout North America, and only the House Sparrow has a small (< 20 birds) established resident population in Arviat. These birds are not considered a threat to Nunavut's naturally occurring biodiversity.

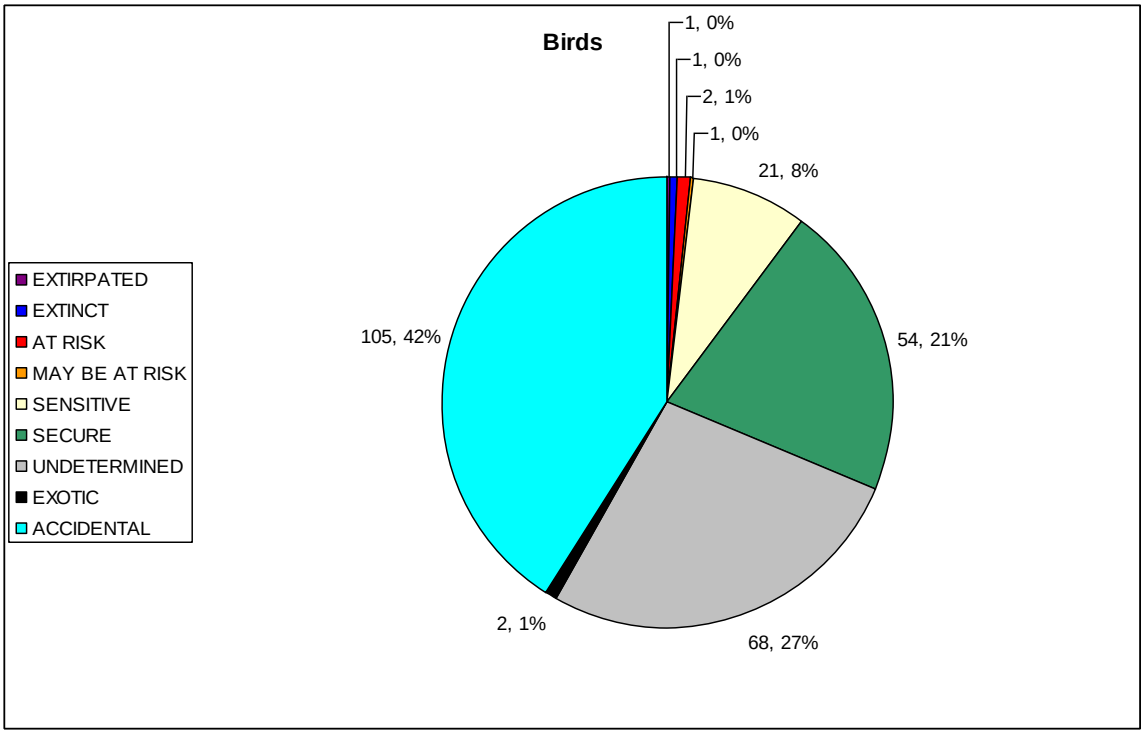

Figure 13. General Status summary of the ranks given to the 255 known birds in Nunavut is listed.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is an independent scientific body identified by the CWDC to make status determinations for species in Canada. COSEWIC is also identified in the federal Species at Risk Act (SARA) as the body that makes recommendations as to SARA status to the responsible federal Minister. SARA describes a process that requires consultation and respects the co-management decision process in the NLCA. Currently several species have been proposed

5.5 Federal Species at Risk Act (SARA)

The precursor to the development of the federal *Species at Risk Act* (SARA) was the *Canada Accord for the Protection of Species at Risk* which was signed by most Provinces, Territories and the government of Canada in 1996. Nunavut is not a signatory to the Accord because Nunavut did not exist in 1996. The Accord recognizes the need for inter-jurisdictional cooperation, independent species assessment, an avenue to legally

protect species listed as at risk, and a need for coordinated recovery of species at risk (SAR). Most of this has been accomplished in the Federal Species at Risk Act (SARA).

SARA came into force in June 2004. The Act gives legal protection to wildlife and their homes once they have been designated as "at risk" by being identified as "special concern", "threatened", or "endangered". Once a Nunavut terrestrial species has been designated as a SARA "species at risk", the responsible Minister ceases being the GN Minister of Environment. For SARA "species at risk" the responsible Minister is the federal Minister of Environment. SARA initiatives are cooperatively directed by the Canadian Endangered Species Coordinating Committee (CESCC) of which the Territorial Minster of Environment is a member.

5.6 Role of COESWIC

The *Species at Risk Act* gave legal standing to a pre-existing body called the Committee on Endangered Species of Wildlife in Canada (COSEWIC), an independent body of scientific and traditional knowledge experts. COSEWIC is responsible for the assessment of species to determine if they are at risk (an independent process from government). A species status assessment by COSEWIC goes to the federal government via a recommendation for listing at a specific status (
Table 9) based on scientific and local and traditional knowledge. SARA is the legislation that actually lists and protects species at risk. Nunavut has a designated voting member on COSEWIC from the Wildlife Research Section.

Table 9. COSEWIC Status designations are listed.

Status	Description
Extinct	Species no longer exists in the wild
Extirpated	Species no longer exists in the wild in Canada but exists elsewhere in the world
Endangered	Species facing imminent extirpation or extinction
Threatened	Species likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction
Special Concern	Species may become threatened or endangered because of a combination of biological characteristics and identified factors
Not at Risk	Species not at risk
Data Deficient	Insufficient information upon which to base a status designation

5.7 Assessment and Listing Process

When a species has been assessed by COSEWIC the responsible Federal Minister places the recommendation on an official registry called the "SARA Registry" for public review and input and, after a prescribed time period, the Federal government must either officially add the species to the "List" or send back the recommendation to COSEWIC for re-assessment, if this process is not completed in the required time it is listed by default.

The "List" is officially called Schedule 1. Schedule 1 contains the names of all of the species that have been assessed by SARA and are listed as extirpated, endangered, threatened, and of special concern. Schedule 2 is a list of the species that have been assessed by COESWIC and are listed as endangered and threatened pre SARA. Schedule 3 contains the names of the species that have been assessed by COESWIC and have been listed as species of special concern pre SARA. Schedule 2 and 3 must be reassessed by COSEWIC before they can be added to Schedule 1 and legally protected under SARA.

In Nunavut, the NWMB plays a role in the assessment of Nunavut species. Under both SARA and territorial legislation the Nunavut Land Claims Agreement (NLCA) specifies in Section 5.2.34 (f) that the Nunavut Wildlife Management Board must "approve designation of rare, threatened, and endangered species".

Table 10. Species at Risk that fall under GN mandate and current legal (SARA) status

COSEWIC Designation	**DoE Management Responsibility**	**SARA Status**
Endangered	Peary Caribou	Species not added to Legal List (pending further consultation by government).
Threatened	**Peregrine Falcon, *anatum* subspecies**	**Species on Legal List.** To be reassessed spring 2007
	Porsild's Bryum (a moss)	Species not added to Legal List (pending further consultation by federal government).
Special Concern	Polar Bear	Referred back to COSEWIC for further information or consideration. Status report in preparation, expected spring 2008
	Grizzly Bear, northwestern population	Species not added to Legal List (pending further consultation by federal government).
	Barren-ground Caribou, Dolphin and Union Herd	
	Wolverine	
	Peregrine Falcon, *tundrius* subspecies	*Special concern, Schedule 3*
	Short-eared Owl	*Special concern, Schedule 3*
	Felt-leaf Willow	**Species on Legal List**

Only two of the species for which DoE is responsible that COSEWIC has assessed as "At Risk" are on Schedule 1 of SARA:

1. Peregrine Falcon anatum subspecies (Threatened); and
2. Felt-leaf Willow (Special Concern).

Polar bear, Grizzly bear, wolverine, Peary Caribou, Dolphin and Union Caribou, and Porsild's Bryum are either assessed or in the process of being assessed by COSEWIC and are likely to be officially listed under SARA in the next 1 to 3 years.

5.8 Recovery of species at risk

When a species is listed under SARA another process begins which is the Recovery process. If listed as "Endangered" or "Threatened" a Recovery Team of professionals is identified and would include territorial personnel, scientific experts, and federal personnel. The Recovery Team is charged with preparing a Recovery Strategy within one year. The Recovery Strategy is a formal document that has a consultation process and must meet SARA criteria. Recovery goals are set to reduce the decline of the species and a target of what is considered sustainable for the future is determined. The Recovery Strategy is succinct in identifying threats and goals and is the first stage of the recovery process.

The Recovery Strategy is implemented by another document called an Action Plan. The Recovery Team, or a subsidiary group, develops one or more Action Plans which are also formal documents. This is a flexible working document that identifies specific methods by which the broad goals are to be achieved.

If a species is listed as "Special Concern" than a Management plan must be developed, within 3 years of listing, again following SARA criteria.

Recovery is directed by the Canadian Wildlife Directors Committee of which our Director of Wildlife is a member. The National Recovery Working Group (NRWG) provides policy direction to the CWDC; the GN also has members on the NRWG from the Wildlife Research Section.

5.9 Bi-Lateral Agreement and SARA

The Federal Government is currently finalizing a Bi-Lateral Agreement with Nunavut (and all other P/T) in regard to Species at Risk and the joint management and recovery of species at Risk in Nunavut. Nunavut is close to agreeing on final word of the bilateral agreement. Once the final wording is agreed upon Nunavut will be in a position to sign the bilateral. Nunavut could consider signing *The Canada Accord for the Protection of Species at Risk* in conjunction with the bilateral agreement.

5.10 Nunavut Species at Risk Legislation and the Nunavut Species at Risk Advisory Committee

In Nunavut the *Wildlife Act* has sections relevant to species at risk which are similar to SARA but less complex. There are provisions for listing species, community consultations, protection of listed species, an assessment committee called the Nunavut Species at Risk Committee, and recovery processes. Although legislated this has currently not been implemented because the Wildlife Regulations required to implement the Wildlife Act have not completed the decision process identified in Article 5 of the NLCA.

5.11 Review of the compliance and enforcement activities under the *Wildlife Act*

Since the coming into force of the Wildlife Act in 2005, there have been very few actual charges laid under the Wildlife Act. The primary reason is that we continue to operate under the old regulations. A secondary reason is that the departments Conservation officer most often work with HTOs to find informal and community based means to resolve compliance issues. By working closely with Hunters and Trappers Organizations in communities we are often able to come to agreement on a non-court approach to violations and encouraging future compliance.

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5.12 Capacity issues in meeting the Government of Nunavut's conservation and public mandate.

As part of the Government of Nunavut the department of Environment is but one department that receives a share of available funding resources. There is not sufficient funding available in the GN or in any one department, to be able to fund all the projects and initiatives that the Nunavut public would like. There are substantial quantities of external funding available, and department staff are very successful in accessing this, but the situation still necessitates the setting of priorities based on conservation needs, community expectations, NWMB interests, and economic factors. Balancing these priorities is often a challenge. For example, polar bear harvesting contributes substantial money directly into the Nunavut economy, and our polar bear research program is heavily scrutinized by non-Nunavut interests. Generally then polar bear research is seen as a priority area. However, caribou are the major harvested species in Nunavut, and caribou meat contributes the equivalent of many millions of dollars to Nunavut communities in food value. At the same time, federal initiatives such as the species at Risk Act place emphasis on species that would not normally be research priorities, such as grizzly bear and wolverine. Lastly, there has been a large increase in mineral exploration and development, and it is necessary to ensure that baseline and monitoring research is conducted to ensure that development can take place in a manner that does not negatively impact wildlife populations.

If all existing resources were available for field work and management then the department would be in a much better position to meet information needs. However, as noted above, the demands for consultations are drawing off more than half of the available resources. For the foreseeable future the department will have to continue to prioritize its research and management efforts based on the competing demands.

Appendix I. Literature cited and the current status and citations for interim and final reports, and journal publications not yet published. Grey literature is available from our Departmental library cmallory@gov.nu.ca, or from the authors, or from the general library.

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Appendix II: Nunavut Wildlife Research Section Research Initiatives and Status

Project Name	DoE Lead	Funding Sources	Start Date	Completion Date	Comments
Qamanirjuaq Caribou Monitoring	M. Campbell	DoE, NWMB	Apr-03	Oct-06	File Report in prep.
NEM Caribou Delimitation	M. Campbell	DoE, NWMB, Parks Canada	Apr-99	Jan-06	File Report in prep.
Vegetation Mapping	M. Campbell	DoE, NWMB, Parks Canada, Cumberland Resources	Jul-00	Oct-09	File Report in prep.
Southampton Island Caribou	M. Campbell	DoE, ED&T, NWMB	Jun-03	Oct-06	Analyses complete/File report in prep.
Caribou and Muskox Genetics as they apply to Demography.	M. Campbell M. Dumond	DoE, NWMB	Oct-05	Oct-06	Sampling and analysis ongoing (Dr. P. McLoughlin, U of S.)
Using Stable Isotope Analysis to determine Barren-Ground Caribou Diet & Distribution.	M. Campbell	Trent University	Feb-06	Feb-06	Draft report in review (Dr. Michael Power, Trent University)
Representing Local Knowledge; Resource Management & Inuit Knowledge of Barren Ground Caribou	M. Campbell	BQCMB, DIAND.	Nov-06	Feb-06	Draft report in review. (Anne Kendrik)

Kivalliq Wildlife Disease Manual.	M. Campbell	CCWHC, Arctic Net	Jan-05	Mar-06	Power point presentation and disease booklet final draft. (Dr. T. Leighton of CCWHC), Dr. G. Balch of Trent University, Dr. G. Campbell of CCWHC)
Status of Kivalliq Muskox Populations.	M. Campbell M. Setterington.	DoE, NWMB	Jul-99	Jul-01	Draft file report complete, final version complete by March 2006.
Estimating Peary Caribou on High Arctic Islands (2001-2007)	D. A. Jenkins	DoE, NWMB, CWS, PCSP	Jul-06	Apr-08	File Report in prep (collaborations with Dr. P. McLoughlin, U of S)
Estimating Muskox on High Arctic Islands (2001-2007)	D. A. Jenkins	DoE, NWMB, CWS, PCSP	Jul-06	Apr-08	File Report in prep (collaborations with Dr. P. McLoughlin, U of S)
Estimating Peary Caribou and Muskox Numbers, Composition, and Distribution on Ellesmere Island	D. A. Jenkins	DoE, NWMB, CWS, PCSP	Nov-06	Jan-07	Interim report complete
Wildlife Management (Muskox) in the	D. A. Jenkins	DoE	Oct-06	Nov-06	Draft file report complete (collaboration with

Baffin and Nunavut Wildlife Act Draft Regulations and Orders					A. Gunn)
Wildlife Management (Peary Caribou) in the Baffin and Nunavut Wildlife Act Draft Regulations and Orders	D. A. Jenkins	DoE	Jan-07	In Prep	Draft file report in prep
Space use and movement patterns of North Baffin Caribou (Rangifer tarandus groenlandicus)	D.A. Jenkins	DoE University of Victoria, Baffinland Iron Ore Mines, NWMB	Mar - 2007	Dec -2012	Collaring funds requested.
Estimating Peary caribou and Muskox numbers, composition and distribution on the high arctic islands of Nunavut	D.A. Jenkins	DoE, PCSP, NWMB	Mar – 2007	May 2007	Funding for survey requested.
Winter Habitat Characterization and Mapping by Remote Sensing and Ground Surveys	M. Ferguson G. Hope	DOE, Queen's University	Apr-03	Dec 2005	Completed 2005 A Maher MSc
IQ about population changes and	M. Ferguson G. Hope	DOE, Queen's University	Apr-03	Dec-05	Completed 2005 A. Taylor, M.A. Thesis

ecology of Peary caribou and muskox on the high arctic islands of Nunavut					
Winter Habitat Characterization and Mapping by Remote Sensing and Ground Surveys	M. Ferguson G. Hope	CCRS, CWS	Apr-03	unknown	Analysis and reports in progress. Data and report promised but not guaranteed. (Paul Budkewitsch)
Peary Caribou Population Modeling	M. Ferguson G. Hope	Unknown	Apr-03	unknown	Provisional collaborative efforts initiated but no guarantee of deliverables (J Tews)
Wolf Morphology Study	M. Dumond	DoE / NWMB	Apr-99	Jun-05	Report contracted to Julia Krizan. Completed in 2005.
Survival and sustainable Harvest of the Dolphin and Union Caribou Herd	M. Dumond	Doe / NWMB	Apr-98	Winter-07	Final report by 2007 (Dr. B. Patterson former Kitikmeot Wildlife Biologist)
The influence of food and parasites on the movements and population dynamics of the Dolphin-Union caribou herd	M. Dumond	University of Aberdeen / DoE	Apr-02	Winter-07	Thesis and publications in progress (J. Hughes, University of Aberdeen, Scotland).
IQ on the Dolphin and Union Caribou	M. Angohiatok M. Dumond	DoE / NWMB	Apr-03	not known	Project on hold – half of the data

herd					collected. Need to be resumed.
Muskox Survey MX19	M. Dumond	DoE / NWMB	Apr-05	Mar-06	Field work and interim report completed, final analysis and report March 2006.
Grizzly Bear Harvest Study	M. Dumond M. Kotierk	DoE	Annual	Annual	Report from 1980 to 2004 to be finalized in 2006, followed by peer reviewed paper.
Nunavut Grizzly Bear Management Plan	M. Dumond	DoE	Apr-03	Winter-07	First draft under review.
Wolverine Carcass Collection	M. Dumond M. Kotierk	DoE	Annual	Annual	Several reports analyzing the data from 1986 to 2004 is in progress and should be finalized in 2006-2007. A peer reviewed paper has been submitted.
Grizzly Bear and Wolverine Hair Snagging	M. Dumond	NWMB, DoE, Kugluktuk HTA	Apr-04	Mar-07	Collaboration between the HTO and DoE
Nunavut Arctic Fox Population Genetic Structure	M. Dumond	University of Alberta, DoE	Apr-01	Fall-06	PhD. Thesis defense in August 2006 (L.Carmichael, U of A)

Bluenose Caribou Herd Status	M. Dumond	GNWT-ENR, DoE, Other NWT	Apr-05	Mar-07	Project leaded by GNWT-ENR.
Dolphin and Union Caribou Herd Survey	M. Dumond	DoE, NWMB	Apr-06	Mar-07	Ongoing
Peary Caribou and Muskox distribution and abundance on Boothia Peninsula	M. Dumond	DoE, NWMB, PCSP	Apr-06	Mar-07	Ongoing
Muskox Distribution and Abundance in the Southeast of Victoria Island	M. Dumond	Cambridge Bay Muskox Working Group, DoE	Mar-07	Spring-07	Survey requested and funded by the muskox working group. DoE will conduct the survey and provide data to the working group.
HEROS project (using hunters' knowledge in wildlife management)	M. Dumond	NWMB, Kugluktuk HTA	Apr-06	annual	Kugluktuk HTA is primary, DoE is in support.
Pan-Arctic Caribou and Moose Contaminant Monitoring Program	M. Campbell	DIAND	Apr-06	annual	DoE will provide samples (M. Gamberg of Gamberg Consulting and J. Michel of DIAND)
Resilience of Caribou and Reindeer populations:	M. Dumond	International Polar Year and others	Apr-06	Jun-08	DoE will provide samples (Dr. S. Kutz of U. of Calgary).

technique development and validation to detect exposure to pathogens					
Resource allocation for nitrogen balance in Rangifer: the body-diet continuum	M. Dumond	International Polar Year and others	Apr-06	Jun-08	DoE will provide samples (Dr. P. Barboza of University of Alaska)
Central Kivalliq Grizzly Bears through Traditional Knowledge	M. Kotierk	DoE, NWMB	Jun-05	Winter-07	Initial interviews completed. Transcription, translation impending.
Rankin Inlet Peregrine Falcon Project	M. Campbell	ArcticNet	Jun-05	annual	Long-term ecological monitoring program
Davis Strait Polar Bear Population Inventory	E. Peacock	DoE, NWMB, PCSP, Labrador	Aug-05	Mar-08	interim report for 2006 completed; manuscript in prep, which includes preliminary population estimates
Nunavut Polar Bear Harvest Program	F. Piugattuk	GN	Ongoing		Long-term ecological monitoring program
Mercury and Selinium Contaminants in Polar Bear Hair	M. Taylor	DoE, Greenland, U of S, Denmark	Jun-05	Aug-05	Analysis and manuscript by Dr. R. Dietz, Natl. Env. Research Institute,

					Denmark)
Circumpolar contaminants in Polar Bear Tissues	M. Taylor	DoE, NWT, U of Alberta, OMNR, Makivik	Jan-05	Nov-08	Nunavut will contribute samples from harvested bears to Dr. R. Letcher, National Wildlife Research Centre
Climate change and the Ecology of Polar bears in Davis Strait	M. Taylor	DoE, CWS, U of Dalhousie	Oct-98	Oct-07	Multi-disciplinary study examining telemetry , nutritional, and physiographic data
Effects of Sex-Selective Harvest on Polar Bear Population Dynamics	M. Taylor	DoE, U. of Saskatchewan	Mar-04	Oct-04	Publication in review.
Overview of the Nunavut Polar Bear Harvest 1990 – 2000	M. Dyck	DoE	Jul-03	On-going	Ongoing until teeth are aged; waiting on the building of personnel capacity in the polar bear lab.
Variation in Polar Bear and seal growth in Lancaster Sound and Western Hudson Bay, in the context of climate warming	M. Dyck	DoE, IPY	Jul-05	On-going	Waiting on funding
Polar Bear genetics	E. Peacock	GN;	Apr-07	Variable	Part of this work

in Davis Strait, Kane Basin and Baffin Bay		NWMB(requested)			may be completed by M.Dyck for dissertation work. Dr. Paul Wilson at Trent University will also collaborate with other aspects
Foraging Ecology of Polar Bears and Climate Change in Davis Strait	E. Peacock	GN; NWMB(requested)	Apr-07	Mar-09	This work will include C, N, and S stable isotopes analyses, and will be done in collaboration with Dr. Keith Hobson and Dr. Ian Stirling.
Population Modeling for Nunavut Polar Bear Populations	E. Peacock	No specific funding	Ongoing		E. Peacock and M. Taylor will build a general mark-recapture model to update Nunavut Polar Bear estimates, yearly, by incorporating annual harvest recoveries
Major Histocompatibility Complex (genetic determinant of immunity variation in Polar Bears)	E. Peacock	National Science Foundation; American Museum of Natural History	Jan-07	Jan-09	This work is in collaboration with Dr. Diana Weber at the American Museum of Natural Hostory. 100 polar

					bear samples from across Nunavut have been sent for analysis.
Foxe Basin Polar Bear Population Inventory	E. Peacock	GN; NWMB(requested)	Mar-07	Mar-11	This current year is for fuel caching.
Foxe Basin Ice Habitat Ecology for Polar Bears	E. Peacock	GN; NWMB(requested)	Mar-07	Mar-10	This work is done in collaboration with Vicki Sahatien and Dr. Andy Derocher at U of A
Western Hudson Bay Survey Extension Project	E. Peacock	GN; NWMB(requested)	Mar-07	Nov-07	This work is to investigate a distributional shift of polar bears in the Western Hudson Bay population
Davis Strait Polar Bear Body Condition	E. Peacock	No specific funding	Mar-07	On-going	
Modeling Climate Change into RISKMAN	M. Taylor	No specific funding	Mar-07	On-going	This work is done in collaboration with E. Peacock and M.Kuc
Polar Ecosystems in Transition	E. Peacock	IPY	Mar-07	On-going	This work is done in collaboration with M. Dyck, R. Lecture, and M. Kotierek.

Characteristics of Problem Polar Bear Kills in the Nunavut Settlement Area, 1970 – 2000	M. Taylor	DoE, Arctic College	Sep-03	Jul-04	Dyck. M. (2006) Ursus 17:52-62

Appendix III. **Methodology for estimating the demand for wildlife for Nunavut communities** (Tables 11a, b, and c)

The abundance of wildlife populations and their trends are derived from the scientific literature, manuscript reports, unpublished data, professional opinion, and available local knowledge (population estimate, rate of growth, trends, recruitment, etc.). Demand is defined as the need to fulfill subsistence harvest activities. Subsistence is defined as: "… subsistence refers to noncommercial, customary and traditional use of fish, game, and wild plants for food, fuel, tools, clothing, handicrafts and sharing" (Fall 1999). Subsistence harvest is the amount required for the activities under the above definition. Commercial demand is not included in this definition.

The amount of meat needed for subsistence was taken as 400g of meat per person per day (Canadian Food Guide 1997). This amount of meat is also consistent with the weight of "bush meat" per day per person reported by Berkes et al (1994) for the Cree living in the Hudson Bay-Bay James area. Usher (2002) reports that the amount of country food available per capita in the Inuvialuit Settlement Area is 115.8kg/year which translate to 317g per day. The amount of meat needed by a community or a region (Table 12a, b, and c) was calculated for a year with the following equation: Community need (meat in kg) = Number of inhabitants x 0.4 kg x 365. The number of inhabitants is based on the current estimate of a community's population, 0.4 kg is the amount of meat needed per person per day, and 365 is the number of days in a year.

For each harvested species, the weight of edible meat was extracted from Usher (2000) or was qualitatively estimated based on comparisons of edible meat return from similar size species contained in Usher (2000). There is variance between communities that derives from differing traditional practices in how country food is used. For example, communities with a large proportion of non-beneficiaries may need less wild meat because people's have less access to wild meat or culturally are more inclined to eat store bought meat. In some communities, the younger generations have in some case opted for a mixed diet where the proportion of store bought food has increased. Additionally, although the resource may be sufficient to satisfy the needs, the distribution of the

animals (e.g. when caribou are moving far from a community) or the cost of harvesting wildlife may present a logistic barrier to meeting community needs.

The forecast of demand (Table 11a, b, and c) is based on community or regional population growth (Statistics Canada), the given wildlife species or population current estimate, trend and growth rate (GN-DoE data), the current proportion of the weight of edible meat from the given wildlife species or population in the harvest compared to the total weight of edible meat from subsistence harvest for a given community or region. The adequacy of the resource to meet the demand is presented as the order of the difference between needs (weight of meat) and the weight of edible meat from the current or forecasted harvest. Semi-quantitative assessment of the amount of wastage occurring in each community is taken into account as well (GN-DoE Conservation Officers data and personal communications). Currently, store bought food is an integral part of the northern diet and even with access to country food; people will continue to buy a certain amount of meat, fish and poultry from the store. Based on a survey of women's food habits in Kugaaruk (DIAND 2003), we estimate overall that 60% of the meat comes from country food and 40% is bought from the store. Although only 60% of the meat coming from country food may under-estimate country food use in some communities, the number of full-time hunters is decreasing; and younger generations tend to eat more and more store bought food including meat.

In the Kivalliq Region several caribou herds overlap in some communities hunting areas. These communities include: Arviat, Whale Cove, Rankin Inlet, Baker Lake, Chesterfield Inlet, Repulse Bay and Coral Harbour. In all these communities caribou represent the dominant food type and are derived from 6 main herds; the Qamanirjuaq, Beverly, Lorillard, Ahiak, Wager and Southampton herds. For the purposes of estimating the demand on each of these herds, proportions of use by community were developed using both reports, and oral information (Table 12). These proportions were used to calculate herd demand in Tables 11a and 12).

In the Kitikmeot Region several caribou herds overlap in some communities hunting areas. These communities include: Kugluktuk, Bathurst Inlet, Umingmaktok, Cambridge Bay, Gjoa Haven, Taloyoak, and Kugaaruk. In all these communities' caribou represent the dominant food type and are derived from 6 main herds: the Dolphin and Union Herd, Bluenose East Herd, Bathurst Herd, Ahiak Herd, Wager Herd, and Island Caribou. For the purposes of estimating the demand on each of these herds, proportions of use by community were developed using both reports, and oral information (Table 13). These proportions were used to calculate herd demand in Tables 11b and 13.

Table 11a. Estimated demand for wildlife based on the proportions calculated from the NWMB harvest study (2004). Edible weight of meats for specific wildlife genera (Usher 2000), projected population growth within Kivalliq communities (Statistics Canada 2001) and estimated weights of daily meat ration of 0.4kg/person/day.

*Proportions calculated using maximum wildlife harvesting years listed in the Nunavut Wildlife Harvest Study for each community for all years. Additional calculations were made using the total number of animals recorded multiple by their estimated edible weight of meat (Usher, 2000) taken as a percentage of the total harvested meat equivalent (kg) harvested by the community for the species listed

Community	Growth Rate (%)	Pop. 2006 (estimate)	Pop. 2011 (estimate)	Annual Meat Req. (based on 0.4kg/person/day	Other Meat - Country Food**		Caribou (based on est. edible meat weight of 35kg/animal)		Seals (based on est. edible meat weight of 13kg/animal)		Fish (based on est. edible meat weight of 1.32kg/animal)		Birds (based on est. edible meat weight of 1.57kg/animal)		Whale*** (based on est. edible meat weight of 50kg/animal)		Muskox (based on est. edible meat weight of 58kg/animal)	
					% in Diet	% in Diet	% in Diet	Total # of Animals	% in Diet	Total # of Animals	% in Diet	Total # of Animals	% in Diet	Total # of Animals	% in Diet	Total # of Animals	% in Diet	Total # in Animals
Arviat	21.8	2313	2817	411313	2	38	47.6	5594	2.4	756	4.1	12682	1.6	4244	4.2	233	0.1	5
Whale Cove	1.3	309	313	45695	2	38	47.6	621	1.8	65	4.7	1630	0.6	166	5.2	32	0.2	1
Rankin Inlet	5.8	2303	2437	355781	2	38	45.5	4622	3.4	925	5.5	14824	0.4	929	4.9	231	0.2	9
Chesterfield Inlet	2.4	353	362	52817	2	38	47.2	712	2.8	114	7.5	29845	0.7	229	1.8	12	0.1	1
Baker Lake	8.8	1640	1784	2604450	2	38	54.8	4081	0	6	4.7	9313	0.3	448	0.0	0	0.2	7
Repulse Bay	9.5	670	734	107135	2	38	37.8	1158	8.2	673	8.9	7215	0.1	68	4.9	70	0.1	2
Coral Harbour	6.4	758	806	1176834	5	30	38.8	1304	8.1	731	6.7	6000	8.0	6012	3.4	53	0.0	0
TOTALS		**8346**	**9253**	**1350875**				**18092**		**3270**		**54650**		**12096**		**631**		**25**

**Other meat includes meats such as chicken, pork, and beef as well as additional wild meats generally making up <2%/species of the diet

***Whale meat estimated as finished muktaaq with the fat trimmed

Table 11b. Estimated demand for wildlife based on the proportions calculated from the NWMB harvest study (2004). Edible weight of meats for specific wildlife genera (Usher 2000), projected population growth within Kitikmeot communities (Statistics Canada 2001) and estimated weights of daily meat ration of 0.4kg/person/day.

Community	Growth Rate (%)	Pop. 2006 (estimate)	Pop. 2011 (estimate)	Annual Meat Req. (based on 0.4kg/person/day	Other Meat-Non-Country Food**	Caribou (based on est. edible meat weight of 35kg/animal)		Seals (based on est. edible meat weight of 13kg/animal)		Fish (based on est. edible meat weight of 1.32kg/animal)		Birds (based on est. edible meat weight 1.57kg/animal)		Whale*** (based on est. edible meat weight of 50kg/animal)		Muskox (based on est. edible meat weight of 58kg/animal)		Other Large Mammals+ (based on est. edible meat weight of 100kg/animal)		Other Medium Mammals++ (based on est. edible meat weight of 0.6kg/animal)	
					% in Diet	% in Diet	Total # of Animals	% in Diet	Total # of Animals	% in Diet	Total # of Animals	% in Diet	Total # of Animals	% in Diet	Total # of Animals	% in Diet	Total # of Animals	% in Diet	Total # of Animals	% in Diet	Total # of Animals
Kugluktuk	9	1350	1472	214839	40	41	2543	3	459	13	20946	2	2517	<1	2	<1	13	1	11	<1	547
Cambridge Bay	6	1400	1484	216664	40	39	2403	2	287	15	25006	2	2320	0	0	2	74	1	12	<1	71
Gjoa Haven	16	1120	1299	189683	40	27	1475	2	299	28	40012	1	991	0	0	1	46	1	13	<1	10
Taloyoak	18	850	1003	146438	40	22	920	6	642	29	32714	1	679	<1	14	<1	8	2	33	<1	37
Kugaaruk	27	770	978	142773	40	24	995	9	953	23	25238	0	42	<1	21	1	14	2	32	<1	9
Bathurst Inlet	-20	4	3	467	40	31	4	1	<1	25	88	1	3	0	0	1	0	1	<1	1	5
Bay Chimo	-20	4	3	467	40	41	5	1	<1	17	60	1	2	0	0	0	0	1	<1	<1	4
TOTALS		**5498**	**6242**	**911332**							**144063**		**6554**		**37**		**155**		**101**		**684**

*Proportions calculated using maximum wildlife harvesting years listed in the Nunavut Wildlife Harvest Study for each community for all years. Additional calculations were made using the total number of animals recorded multiple by their estimated edible weight of meat (Usher, 2000) taken as a percentage of the total harvested meat equivalent (kg) harvested by the community for the species listed **Percentage of other meat includes meats such as chicken, pork, and beef as well as additional wild meats generally making up 40% (DIAND 2003)

***Whale meat estimated as finished Muktaaq with the fat trimmed

+Other large mammals include moose, Grizzly bear, and polar bear

++Other medium mammals include muskrat and ground squirrel

Table 11c. Estimated demand for wildlife based on the proportions calculated from the NWMB harvest study (2004). Edible weight of meats for specific wildlife genera (Usher 2000), projected population growth within Baffin communities (Statistics Canada 2001) and estimated weights of daily meat ration of 0.4kg/person/day.

Community	Growth Rate (%)	Pop. 2006 (estimate)	Pop. 2011 (estimate)	Annual Meat Req. (based on 0.4kg/person/day	Other Meat - Country Food**	Other Meat- Non-Country Food **	Caribou based on est. edible meat weight of 35kg/animal		Seals based on est. edible meat weight of 13kg/animal		Fish based on est. edible meat weight of 1.32kg/animal		Birds based on est. edible meat weight of 1.57kg/animal		Whale*** based on est. edible meat weight of 50kg/animal		Muskox based on est. edible meat weight of 58kg/animal		Walrus based on est. edible meat weight of 600kg/animal	
					% in Diet	% in Diet	% in Diet	Total # of Animals	% in Diet	Total # of Animas	% in Diet	Total # of Animals	% in Diet	Total # of Animals	% in Diet	Total # of Animals	% in Diet	Total # of Animals	% in Diet	Total # of Animals
Arctic Bay	1.1	654	662	96652	2	38	22.6	624	15.9	1182	11.4	8347	1.3	800	7.3	94	0.1	2	1.5	2
Cape Dorset	2.7	1179	1211	176806	2	38	11.9	601	10.0	1360	12.2	16341	6.2	6982	2.6	61	0.0	0	17.2	51
Clyde River	10.9	871	966	141036	2	38	13.2	532	28.7	3114	12.6	13463	2.5	2246	2.3	43	0.0	0	0.7	2
Grise Fiord	10.1	180	199	29054	2	38	5.4	45	38.1	852	3.2	704	2.1	389	5.3	21	5.9	30	0.0	0
Hall Beach	12.2	684	768	112128	2	38	16.0	513	5.4	466	5.4	4587	0.6	429	0.5	7	0.0	0	32.1	60
Igloolik	9.5	1409	1543	225278	2	38	18.1	1165	7.5	1300	5.6	9557	0.4	574	0.6	18	0.0	0	27.7	104
Iqaluit	24.1	6498	8064	1177346	2	38	31.6	10630	4.1	12770	4.1	36569	2.6	19497	1.7	267	0.0	0	5.9	116
Kimmirut	9.1	473	517	75482	2	38	19.1	412	20.0	1161	10.4	5947	6.7	3221	1.8	18	0.0	0	2.0	3
Pangnirtung	2.7	1311	1347	196662	2	38	18.9	1062	21.9	3313	13.9	20709	1.1	1378	1.8	47	0.0	0	2.5	8
Pond Inlet	5.7	1290	1364	199144	2	38	30.6	1741	3.5	2068	7.6	11466	1.1	1395	5.7	151	0.0	0	1.4	5
Qikiqtarjuaq	6.4	553	589	85994	2	38	4.2	103	39.1	2586	11.0	7166	0.7	383	2.6	30	0.0	0	2.4	3
Resolute Bay	8.6	234	255	37230	2	38	2.0	21	27.4	785	4.0	1128	2.6	617	10.4	52	2.9	19	10.7	7
Sanikiluaq	8.4	742	805	117530	2	38	1.2	40	16.7	1510	22.1	19677	11.8	8833	4.0	63	0.0	0	4.3	8
TOTALS		16078	18290	1958301				17489		32466		155662		46745		872		51		368

*Proportions calculated using maximum wildlife harvesting years listed in the Nunavut Wildlife Harvest Study for each community for all years. Additional calculations were made using the total number of animals recorded multiple by their estimated edible weight of meat (Usher, 2000) taken as a percentage of the total harvested meat equivalent (kg) harvested by the community for the species listed

**Other meat includes meats such as chicken, pork, and beef as well as additional wild meats generally making up <1%/species of the diet

***Whale meat estimated as finished Muktaaq with the fat trimmed

Table 12. The estimated proportion of caribou harvested from the respective caribou herds is listed by Kivalliq communities (Arviat, Whale Cove, Rankin Inlet, Baker Lake, Chesterfield Inlet, Repulse Bay and Coral Harbour). The estimates are subjective in that they are derived from expert consensus rather than harvest data.

Caribou Herd	***Community***	***Harvest Proportions (%)***
Qamanirjuaq Herd	Arviat	100
	Baker Lake	30
	Chesterfield Inlet	30
	Rankin Inlet	100
	Whale Cove	100
Beverly Herd	Baker Lake	20
Lorillard Herd	Baker Lake	20
	Chesterfield Inlet	60
Wager Herd	Baker Lake	10
	Chesterfield Inlet	10
	Repulse Bay	100
Ahiak Herd	Baker Lake	10
Southampton Island Herd	Coral Harbour	100

Table 13. The estimated proportion of caribou harvested from the respective caribou herds is listed by Kitikmeot communities (Kugluktuk, Bathurst Inlet, Umingmaktok, Cambridge Bay, Gjoa Haven, Taloyoak, and Kugaaruk). The estimates are subjective in that they are derived from expert consensus rather than harvest data.

Caribou Herd	***Community***	***Harvest Proportions (%)***
Dolphin and Union Herd	Kugluktuk	20
	Cambridge Bay	95
	Bathurst Inlet	40
	Umingmaktok	75
Bluenose East Herd	Kugluktuk	75
Bathurst Herd	Kugluktuk	5
	Bathurst Inlet	60
Ahiak Herd	Umingmaktok	25
	Cambridge Bay	5
	Gjoa Haven	80
Wager Herd	Gjoa Haven	15
	Taloyoak	90
	Kugaaruk	95
Island Caribou	Gjoa Haven	5
	Taloyoak	10
	Kugaaruk	5