NUNAVUT POLAR BEAR CO-MANAGEMENT PLAN
(to replace existing Memoranda of Understanding)

PREFACE

Management of polar bears in Canada is conducted at the territorial and provincial level. Federal lands, such as Migratory Bird Sanctuaries, National Wildlife Areas and National Parks, are managed for conservation purposes and may include management for polar bears. In addition, there is recognition that management requires coordination of national efforts. In Nunavut, management of wildlife is governed by the Nunavut Land Claims Agreement (NLCA). The NLCA requires that Inuit play an effective role in all aspects of wildlife management. The management of polar bears shall acknowledge the best available scientific knowledge and *Inuit Qaujimajatuqangit* (IQ). The process for decision-making is clearly defined under the NLCA.

The Nunavut Minister of the Environment and the Nunavut Wildlife Management Board (NWMB) hold the ultimate responsibility and primary responsibility for wildlife management, respectively, under the NLCA. The NWMB has the responsibility of approving management plans (Article 5 section 5.2.34 d(i)). This plan has been prepared in cooperation with Nunavut Tunngavik Inc., the Department of Environment, Regional Wildlife Organizations, Hunters and Trappers Organizations, and Inuit community members from throughout Nunavut.

Successful management of polar bears depends on the commitment and cooperation of all co-management partners involved in implementing the directions set out in this plan.

Implementation of this management plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

EXECUTIVE SUMMARY

This management plan has been developed cooperatively by co-management partners to improve the existing polar bear management regime in Nunavut. It replaces the Memoranda of Understanding (MOUs) that have directed management efforts to date. These efforts have been instrumental in facilitating the recovery of polar bear populations from the lows of the1950s, while maintaining harvest opportunities for Inuit.

This intent of this plan is: 1) to provide guidance and direction to co-management partners for decision-making; and 2) identify goals and objectives for polar bear management. Improved communications, co-management partner participation, and cooperation will be fundamental to the plan's success.

Previous management relied heavily on scientific monitoring and modeling to determine sustainable harvest rates. This scientific approach has been effective and will continue, but now allows for full participation of Inuit. Improved collection and use of *Inuit Qaujimajatuqangit* (IQ) and increased Inuit participation in all aspects of management are central to the goals of this plan.

TABLE OF CONTENTS

PREFACE....1
EXECUTIVE SUMMARY....2
TABLE OF CONTENTS....3
ACKNOWLEDGEMENTS....5
1. INTRODUCTION....6
2. GUIDING PRINCIPLES....7
3. GOAL OF THE POLAR BEAR MANAGEMENT PLAN....8
4. SPECIES DESCRIPTION....8
4.1 Status:....8
4.2 General description....8
4.3 Distribution....9
4.3.1 Global range....9
4.3.2 Nunavut range....9
4.4 Biology....10
4.4.1 Life cycle and reproduction....10
4.4.2 Natural mortality and survival....11
4.4.3 Diet....11
4.4.4 Habitat....12
5. BACKGROUND....12
5.1 Historical perspective....12
5.2 The Nunavut perspective....12
5.3 Legislative frameworks and agreements....13
6. POLAR BEAR CO-MANAGEMENT IN NUNAVUT....14
6.1 Nunavut Tunngavik Inc.....14
6.2 NWMB....14
6.3 RWOs....14
6.4 HTOs....14
6.5 Government of Nunavut....15
6.6 Government of Canada....15
7. CONSERVATION THREATS AND CHALLENGES....16
7.1 Industrial activity....16
7.2 Tourism....17
7.3 Pollution/contaminants....17
7.4 Habitat alteration....17
7.4.1 Climate change....17
7.4.2 Denning....18
7.5 Population boundaries....18

7.5 Polar Bears and People 19
7.7 Inter-jurisdictional considerations 19
7.8 Trade 20
8. MANAGEMENT PLAN OBJECTIVES 20
8.1 Harvest management and objectives (Angujaujunnaqtunik Aulattiniq) 21
8.1.1 Harvest Management 21
8.1.2 Selective Harvesting 22
8.1.3 Harvest Reporting and Monitoring 22
8.2 Information and knowledge gathering (*Qanuqtuurniq*) and objectives 24
8.2.1 Gaining knowledge 24
8.2.2 Research 25
8.3 Habitat management and environmental stewardship (*Avatitinnik Kamatsiarniq*) objectives 26
8.4 People and bears (*Inuillu Nanuillu*) and objectives 27
8.5 Working together (*Piliriqatiginniiq*) and objectives 28
8.5.1 Within Nunavut 28
8.5.2 Between jurisdictions 28
8.5.3 Sharing information and knowledge 28
9. IMPLEMENTATION OF THE PLAN 29
9.1 Harvest Management 30
9.2 Information and Knowledge Gathering (Qanuqtuurniq): Actions 30
9.3 Habitat Management and Environmental Stewardship (*Avatitinnik Kamatsiarniq*) Actions 31
9.4 People and Bears (*Inuillu Nanuillu*) Actions 31
9.5 Working Together (*Piliriqatiginniiq*) Actions 32
10. PLAN REVIEW 32
APPENDICES 33
Appendix A - Subpopulation Status Table 33
Appendix B – Subpopulations and Status 41
Appendix B I – Baffin Bay (BB) subpopulation status 41
Appendix B II – Davis Strait (DS) subpopulation status 41
Appendix B III – Southern Hudson Bay (SH) subpopulation status 42
Appendix B IV – Western Hudson Bay (WH) subpopulation status 43
Appendix B V – Foxe Basin (FB) subpopulation status 43
Appendix B VI – Gulf of Boothia (GB) subpopulation status 44
Appendix B VII – M'Clintock Channel (MC) subpopulation status 44
Appendix B VIII – Lancaster Sound (LS) subpopulation status 45
Appendix B IX – Kane Basin (KB) subpopulation status 45
Appendix B X – Norwegian Bay (NW) subpopulation status 46
Appendix B XI – Viscount Melville Sound (VM) subpopulation status 46
Appendix C – Flexible quota system 47

Appendix D – Research Schedule 50
Appendix E - Literature Reviewed 50

ACKNOWLEDGEMENTS

This management plan was developed by a co-management working group consisting of Gabriel Nirlungayuk and Paul Irngaut (NTI), Markus Dyck and Paul Frame (DOE), James Qillaq (QWB), Attima Hadlari (KRWB), Ross Tatty (KWB), and Chris Hotson (Okalik Consulting). Additional review and drafting of text was provided by Lynda Orman (DOE), Andrew Maher (PC), Peter Hale (ECCC), and David Lee (NTI). Significant assistance during consultations was provided by Leetia Janes, Lazarus Arreak, Gailene Pigalak, Jackie Price, Ema Qaggutaq, Leah M. Muckpah, and Jason Mikki.

1. INTRODUCTION

Management of polar bears in Nunavut predates the Nunavut Land Claims Agreement (NLCA) by several decades. In the 1960s and 70s, harvest restrictions were placed on Inuit with little or no consultation. Restrictions (e.g., limiting the number of polar bears harvested per year per subpopulation) were the primary means of population recovery in regions where abundance was reduced as the result of unsustainable harvest. Since then, implementation of the NLCA, and improved research and understanding of polar bear biology has strengthened management and increased Inuit involvement. Over the last 50 years polar bear management has focused on recovery of polar bear numbers, which has largely been achieved. The focus of polar bear management now shifts to maintaining, or reducing numbers in areas where public safety is a concern and/or where there are detrimental effects on the ecosystem due to increased numbers of polar bears. This plan has been developed to guide polar bear management in Nunavut through 2026, and explicitly recognizes the requirement to engage Inuit in polar bear management.

Inuit hunter observations indicate that polar bear numbers have increased from the population lows of the 1950s and 60s. This is confirmed by scientific studies on Most Nunavut subpopulations. During this time period, polar bears did not pose a serious threat to human safety; Inuit did not worry about going camping in those days and life generally existed in seasonal camps where families were safe. Today, however, safety concerns, in part, result from increased polar bear numbers in some Nunavut subpopulations. Increased interactions may also be due to changes in the distribution of bears from being on sea-ice to being on land for longer periods, and change in Inuit settlement away from a dispersed lifestyle to one with established communities.

Despite scientific and traditional knowledge/IQ indicating that polar bear numbers have increased since the 1950s, conflict exists between Inuit observations and public perspective on the status of the species. Pressure to conserve and protect polar bears from national and international environmental and non-governmental organizations, climate change advocates, and the general public at large has created contention about the status of polar bear populations. Inuit believe there are now so many bears that public safety has become a major concern. Public safety concerns, combined with the effects of polar bears on other species that Inuit and scientists are observing (*e.g.*, ringed seal and water fowl populations) suggest that in many Nunavut communities, the polar bear may have exceeded the co-existence threshold of Nunavummiut.

"…in my lifetime we have seen opposite ends of the spectrum where when I was a child we saw no bears and now we can see

40 bears a year near town" Sandy Akavak, Elder, Kimmirut

In Canada, polar bears have been managed to increase populations since the 1970s, largely through sustainable hunting practices. Prior to the fur trade and whaling, polar bears were predominantly harvested by indigenous peoples. The increase in whaling sealing, fur trade and Arctic explorations during the late 1800s and early 1900s resulted in Arctic-wide increases in polar bear hunting by non-indigenous people. The five polar bear range states, Russia, Canada, the United States, Norway and Greenland, agreed that the polar bear needed protection to prevent a further decline, and the Agreement on the Conservation of Polar Bears was signed in 1973. Management of polar bears has since evolved to include setting sustainable harvest levels, maximizing harvest through sex-selective harvesting, reporting and submitting harvest data and samples, as well as non-quota limitations (NQLs) that include protection of family groups. Although seen by some Inuit as restrictive, these NQLs are supported by the Nunavut Hunters and Trappers Organizations (HTOs).

Although Inuit support Nunavut's polar bear management efforts, they are directly affected by increased polar bear abundance from the standpoint of personal safety and property damage (e.g., cabins and food caches). Restrictions such as these, as well as public safety and property damage concerns potentially undermine Inuit support when population numbers are perceived to be high.

2. GUIDING PRINCIPLES

The following principles will guide conservation and management decisions within the framework of the NLCA:

- To integrate Inuit societal values and Inuit traditional knowledge, collectively called Inuit *Qaujimajatuqangit* (IQ), in polar bear management;
- *Inuit Qaujimajatuqangit* and scientific knowledge will be considered in decision-making. Both perspectives, always taken/considered together, will continue to inform decision-making;
- To consider public safety in management actions;
- To consider the ongoing social, cultural, and economic value of the polar bear in decision-making;
- To consider other aspects of the ecosystem when we consider polar bears;
- Polar bears will be managed at the subpopulation level, and their status will be assessed regularly to ensure that information is available for timely conservation, and long-term sustainability;

- Where there are threats of serious or irreparable damage to polar bear populations or habitat, lack of certainty will not be a reason for postponing reasonable or precautionary conservation measures.

3. GOAL OF THE POLAR BEAR MANAGEMENT PLAN

To maintain viable and healthy polar bear subpopulations for current and future generations, and to ensure that polar bears remain an integrated and functioning part of the ecosystem while monitored and appropriate harvests are allowed.

4. SPECIES DESCRIPTION

Inuktitut name – Nanuq, Nanuk
English name – polar bear
French name – Ours blanc
Scientific name – *Ursus maritimus* (Phipps 1774)

4.1 Status:

Canada: Special Concern (*Species at Risk Act*) 2011
IUCN: Vulnerable (2015)
Nunavut Wildlife Act: Not assessed

4.2 General description

The polar bear is a member of the order *Carnivora* and the family *Ursidae*. It is the top terrestrial predator in the arctic marine environment. Polar bear breeding biology is characterized by low reproductive rates, a long life span, and late sexual maturity.

Webbed and enlarged front paws make the polar bear a strong swimmer and its curved claws are well-suited for “hooking” seals, their primary food source. Other adaptations to the Arctic environment include furred pads (improved insulation and traction) on the paws, and black skin (absorb solar energy). Polar bear fur usually appears to be white, but it may also be yellowish or off-white, depending on the time of year and sex. Polar bears exhibit extraordinary strength when crushing through sea ice, digging into birth and haul-out lairs of seals, and moving large boulders to access meat caches. Adult males are larger (up to 300 cm long) and heavier (800-1000 kg) than adult females, which do not usually exceed 400 kg in weight and 250 cm in length.

4.3 Distribution

4.3.1 Global range

Polar bears occur as a circumpolar species in the sub-arctic and arctic regions of the northern hemisphere. It was initially believed that they represented a single population that ranged throughout the Arctic, with animals being carried passively on the sea ice by currents. However, satellite telemetry studies and mark-recapture data have shown that they do not wander throughout the Arctic, but rather show seasonal fidelity to local areas. Movements and distributions are mainly determined by sea ice which is used as a platform for feeding, mating, and denning. Globally, all polar bears are divided into 19 “subpopulations”, 13 (excluding bears of the Arctic Basin) of which are in Canada (Figure 1). There is an estimated world population of about 26,000 (95% Confidence Interval 22,000 – 31,000) polar bears. Approximately 14,000 to 16,000 polar bears are found in Canada (See Appendix A for current status). The majority of Canada’s polar bear subpopulations are found in Nunavut.

4.3.2 Nunavut range

As of 2016, there are 12 recognized subpopulations of polar bear within Nunavut (Baffin Bay, Davis Strait, Southern Hudson Bay, Western Hudson Bay, Foxe Basin, Kane Basin, Lancaster Sound, Norwegian Bay, Gulf of Boothia, M'Clintock Channel, Viscount Melville Sound, and Northern Beaufort Sea). Eight of these subpopulations are shared with other jurisdictions and user-groups and four are entirely within Nunavut (Figure 1). A more detailed background and description of Nunavut’s polar bear subpopulations is provided in Appendix B.

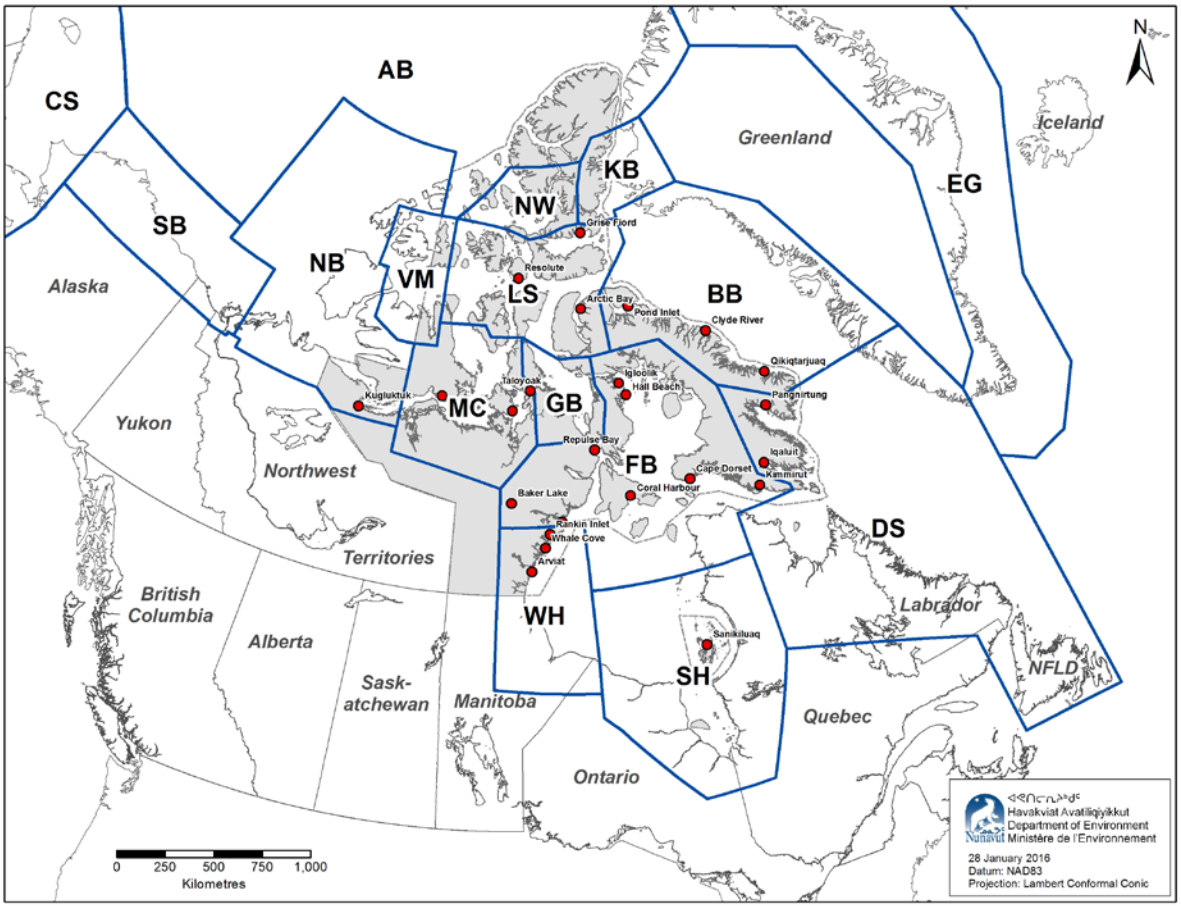

Figure 1. Canadian and Nunavut (dark grey) polar bear subpopulations [BB = Baffin Bay; DS = Davis Strait; SH = Southern Hudson Bay; WH = Western Hudson Bay; FB = Foxe Basin; GB = Gulf of Boothia; MC = M'Clintock Channel; LS = Lancaster Sound; KB = Kane Basin; NW = Norwegian Bay; VM = Viscount Melville Sound; NB = Northern Beaufort Sea; SB = Southern Beaufort Sea.

4.4 Biology

4.4.1 Life cycle and reproduction

Breeding occurs between March and June. When a male mates with a female, ovulation is induced, although implantation of the fertilized egg is delayed until October. Female age at first reproduction ranges between four and seven years of age, with most subpopulations having females producing litters by age six. By age six, male polar bears are normally reproductively mature, however younger males often do not reproduce due to competition from older and bigger males. It appears that most males are entering the reproductive segment of the population between eight and ten years old.

Pregnant females prepare and enter maternity dens in late fall and the cubs, normally one or two, are born between November and early January. IQ suggests that the

timing of birth is later in higher latitudes. In northern subpopulations dens are generally excavated in snow, and are then covered and closed by snowdrifts. They are frequently located on islands or land that is near the coast and adjacent to areas with high seal densities in spring. An anomaly to this pattern of behaviour is the maternity dens for the Western Hudson Bay and Southern Hudson Bay polar bears: their dens are up to 120 km inland at traditional denning areas, and initially dug in soil.

At birth, cubs weigh approximately 0.6 kg. They are nursed inside the den until sometime between the end of February and the middle of April. By this time, cubs weigh 10-12 kg. A new litter is produced after three years of raising cubs, making the average inter-litter interval approximately 3.6 years.

4.4.2 Natural mortality and survival

Aside from humans, polar bears have been observed and documented as posing a threat to other polar bears. Inuit and scientists have observed predation by wolves on polar bear cubs-of-the-year. Walruses have also been reported to kill polar bears in self-defence, but this is infrequent. Every main life history stage of a polar bear has different challenges, such as hunting success and experience, and hierarchical rank; therefore the survival rates vary accordingly. Moreover, the survival rates for these life stages also vary slightly among subpopulations because of the differences in ecosystem productivity and seasonal ice duration.

Biologists recognize four important age categories: 1) cubs-of-the-year; 2) yearlings and sub-adults, 3) prime-age adults, and 4) senescent adults. These categories are also divided by sex because males generally have lower survival rates than females. In the wild, the maximum age is estimated to be 30 years.

Inuit recognize 11 different age categories/class of polar bears. They are 1) *Atiqtaqtaq* – a newborn cub, 2) *Atciqtaq* – a cub, 3) *Piaraq* – a cub that is with its mother, 4) *Advarautaq* – a cub that is about one year old, 5) *Nalitqaihiniq* – when a cub is a little bigger than an *advarautaq* (a bit bigger than a sled dog, about the height of the mother's belly), 6) *Namiaq* – offspring that is the same size as its mother, 7) *Nukaugaq* – a young male, 8) *Tadzaq* – an adult female, 9) *Anguruaq* – a full grown male, 10) *Arnaluit* – a pregnant female, 11) *Piaralik* – a female with cubs. Although some of these age categories are general and specific for the same age, they represent the diverse understanding Inuit have of polar bears.

4.4.3 Diet

Polar bears are carnivorous. Throughout their Nunavut range, ringed, bearded and harp seals make up most of the polar bear's diet. Other species like walrus, beluga whale, narwhal, bowhead whale, birds, and harbour seal are also preyed upon

opportunistically. Polar bear also eat eggs, berries, and seaweed.

Polar bear diet varies throughout the year, and across its range. Primary feeding tends to be in spring when seal pups are abundant; however, polar bears will hunt and scavenge throughout the year, feeding opportunistically on vegetation, berries, eggs, and birds. Fish and ringed seals are also successfully preyed upon when there is little or no sea ice in summer.

Polar bears are well-adapted to times of food abundance and shortages. When food is in high abundance, polar bears can increase their body mass significantly. When food becomes scarce or unavailable, polar bears can live off their stored fat reserves.

4.4.4 Habitat

Polar bears can be found in all coastal and offshore areas of the Canadian subarctic and arctic. Access to land is essential during the ice-free periods, but also for mid-winter denning. They also use the marine environment for hunting marine animals. Polar bears have adapted to all types of sea ice, and are strong swimmers capable of traveling long distances in open water. Inuit have observed that bears can exist in open water and on sea ice for the majority of their lives (the Inuktitut term for this is *tulayuituq*).

In Nunavut, polar bears den mostly on land. Denning sites are locations that have sufficient snow cover in early winter for the construction of the dens. Dens can also be found on moving multi-year ice and areas of annual rough ice. All maternity denning sites are important areas because they provide shelter for the mother and offspring. All maternity denning sites are protected under the Nunavut *Wildlife Act*.

5. BACKGROUND

5.1 Historical perspective

The polar bear management system in Nunavut dates back to the Northwest Territories, prior to the creation of Nunavut. This system includes setting of harvest quotas (now called Total Allowable Harvest or TAH), instituting harvest seasons, and harvest reporting and sample submission. After the creation of Nunavut, memoranda of understanding for each subpopulation were implemented between the DOE and each RWO and HTO to guide harvest and management.

5.2 The Nunavut perspective

Management in Nunavut has focused on sustainable harvest using population estimates derived from scientific studies. Although abundance in most subpopulations was low prior to the 1970s (the reason for the Agreement on the Conservation of Polar Bears), many have recovered or increased since that time. As

of 2016, the statuses of the 12 subpopulations in Nunavut are determined to be: 3 uncertain, 1 likely decline, 4 likely stable, 2 stable, and 2 likely increase (see Appendix A). Nunavummiut believe that polar bears have become less afraid of humans and more likely to damage property, as the result of an apparent increase in polar bears in some areas. In Nunavut, human safety and the right of Inuit to harvest are high priorities. Increased interactions between humans and bears, and a right to protect human safety and property have led to an increase in defence kills. Considering all removals come off the TAH this can lead to a reduction in the community harvest, resulting in a loss of opportunity for traditional harvesting activities.

5.3 Legislative frameworks and agreements

In Nunavut, wildlife is managed according to Article 5 of the Nunavut Land Claims Agreement. Article 5 sets out the creation of the Nunavut Wildlife Management Board (NWMB), which is the primary instrument of wildlife management in Nunavut. It defines the roles of the NWMB, government, Hunters and Trappers Organizations (HTOs), and Regional Wildlife Organizations (RWOs).

The Nunavut *Wildlife Act* sets out harvest management, licensing, reporting and sample submission. Further details on management, including research, harvest, and TAH determinations have been detailed in previous Memoranda of Understanding (MOUs) developed for all subpopulations (12) jointly with RWOs, Hunters and Trappers Organizations HTOs and the Department of Environment (DOE). These MOUs shall be replaced with this management plan. Enforcement provisions are in place in regulations under the *Wildlife Act*.

In Nunavut, each of the co-management partners fulfills its respective role as defined in the NLCA (see Figure 2). This plan applies to the Nunavut Settlement Area as defined in Section 3.1.1 of the NLCA.

In 2011 the polar bear was listed under the federal *Species at Risk Act (SARA)* as a species of special concern. While there are no associated effects on Inuit harvest or management actions, a national management plan must be developed according to SARA legislation in order to prevent a species from becoming threatened or endangered. This Nunavut-based management plan may be adopted, in whole or part, as part of the national plan.

In 1973, Canada was a signatory to the International Agreement on the Conservation of Polar Bears. The Agreement holds member states accountable for taking action to protect the ecosystems in which polar bears live, paying special attention to places where polar bears den, feed, and migrate. Range states also must manage polar bear populations in accordance with proper conservation practices, based on best available scientific data. Recently, range states have agreed to include Inuit

traditional knowledge as part of the body of knowledge to be considered for polar bear conservation and management. There also exist inter-jurisdictional agreements between Canada and Greenland in Davis Straits, Baffin Bay and Kane Basin subpopulations, and Canada and the United States on polar bears in general.

6. POLAR BEAR CO-MANAGEMENT IN NUNAVUT

The following co-management partners participate in polar bear management, their roles are defined in full detail in Section 5 of the NLCA. A brief summary is provided below, however the NLCA is the guiding document. Figure 2 illustrates not only the partners but decision-making process.

6.1 Nunavut Tunngavik Inc.

Nunavut Tunngavik Incorporated represents all Inuit beneficiaries in the Nunavut Settlement Area, in line with the NLCA that was signed in 1993 by the Inuit of Nunavut and the Government of Canada. The NLCA is constitutionally protected under Canada's *Constitution Act*, 1982.

6.2 NWMB

The NWMB's role is defined in the NLCA, sections 5.2.33 and 5.2.34. Its role consists of, but is not limited to, setting Total Allowable Harvest rates (TAH) and Non Quota Limitations (NQLs). In addition, it approves management plans and the designation of rare species.

6.3 RWOs

The role of RWOs is defined in section 5.7.6 of the NLCA. The role of the RWOs includes, but is not limited to, regulating the activities of HTOs in their regions, including allocating TAH among communities, and distributing any accumulated harvest credits (1 un-harvested bear equals 1 credit, see Appendix C) as required to cover accidental, defence, or illegal kills. The RWOs may also return credits annually to augment a community's harvest. Credits may not be transferred between communities that share a population without the written consent of the community that accumulated the credit.

6.4 HTOs

The role of HTOs is defined in sections 5.7.2 and 5.7.3 of the NLCA. These roles include, but are not limited to, regulating the harvesting activities of their members, including all beneficiaries within the community. They allocate tags for species with TAH, and set harvest seasons. As per the NLCA, the HTOs may develop rules for non-quota limitations. They open and close their polar bear hunting seasons to

optimize polar bear hunting for their communities and determine if sport hunts will be allowed in the community.

6.5 Government of Nunavut

The Nunavut Minister of Environment retains the ultimate authority over polar bear management in Nunavut as per the NLCA. DOE staff conduct research, work to collect IQ, and make management recommendations to the NWMB for decision. Conservation Officers enforce the Nunavut *Wildlife Act* and its regulations. DOE implemented new programs starting in 2013 to reduce human-bear conflicts, and to reduce and compensate for damage to property as a result of bears.

6.6 Government of Canada

Under the federal *Species at Risk Act* (SARA), Environment and Climate Change Canada is responsible for completing a national management plan for polar bears, and has responsibilities for the management of listed species where they occur on federal land. The Government of Canada is responsible for managing polar bears and their habitat on federal lands under the jurisdiction of the federal Minister of Environment (National Wildlife Areas and Migratory Bird Sanctuaries, National Parks, National Park Reserves and National Historic Sites). The Government of Canada contributes to scientific knowledge of polar bears through research and helps to coordinate polar bear management across the country. Canada signs international agreements on behalf of all jurisdictions and has responsibilities to coordinate international management actions for polar bears, with the advice of the co-management boards and jurisdictions. It is involved in international polar bear management including the Convention on International Trade in Endangered Species (CITES) and the 1973 *Agreement on the Conservation of Polar Bears.*

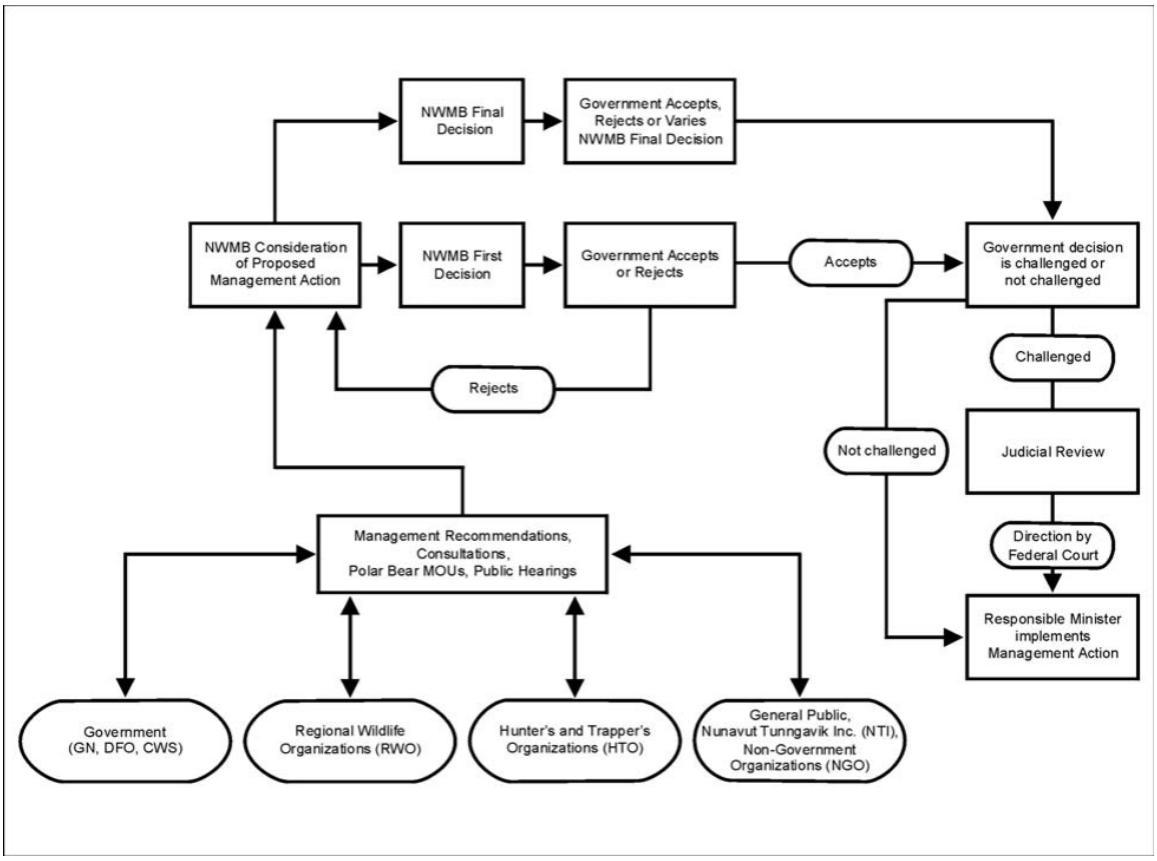

Figure 2. The Co-Management Framework in Nunavut (after Obbard et al. 2010).

7. CONSERVATION THREATS AND CHALLENGES

Nunavut has a management system whereby threats of any kind, including those posed by industrial activity or climate change, can be identified and responded to relatively quickly. For example, if a significant reduction in the body condition, recruitment, or overall abundance of a subpopulation is detected and attributed to a threat, the appropriate action can be taken to implement conservation measures to stop or mitigate these changes. The following are current threats, or threats expected to occur within the 10 year life of this plan.

7.1 Industrial activity

There is considerable potential in Nunavut for industrial activities to be harmful to polar bears and their habitat. There are several active and proposed mines, and other industrial pursuits, that could affect bears directly, or through increased shipping traffic and pollution. Noise and disturbance from humans or exploration activity in any form near dens could cause disturbance, the abandonment of offspring, or the displacement of denning bears if it is not carefully planned and controlled. Any shipping activities through primary feeding areas may lead to

disturbance and reduce the hunting success of polar bears. These activities could also increase the abandonment of seal dens. If industrial activities (e.g., oil or gas exploration and development, shipping, mining exploration and operations) lead to an oil spill in sea ice habitat, polar bears and seals will be directly exposed to oil, with effects ranging from ingestion of oil, hair loss, kidney failure, and ultimately death. Increasing industrial activities may cause an increase in the local human population (both the indigenous population and non-indigenous people), the amount of refuse, and other wildlife attractants. As a consequence, bear-human encounters are also likely to increase, leading to a potential increase of injury and/or mortality.

7.2 Tourism

There always has been a great interest in the Arctic and its resources and wildlife. This interest has recently grown as the result of easier access to remote destinations across the Arctic. Any increase in human activity (e.g. by boat, ATV and snowmobile traffic) increases the amount of disturbance to polar bears. Currently, Nunavut does not have a polar bear viewing tourism industry as sophisticated as Manitoba, but various locations in Nunavut offer similar opportunities that could become focal points for intense polar bear viewing. Although some side effects of tourism can be controlled by proper policies and management, the cumulative impacts of several negative stressors (e.g. disturbance, environmental changes, and contaminants) is not clear and therefore warrant heightened awareness.

7.3 Pollution/contaminants

Polar bears are at the top of the Arctic food chain, and as such accumulate high levels of various environmental pollutants through the food they ingest. A majority of these polluting compounds, mostly organochlorines, reach the Arctic via wind and ocean currents from industrialized areas. These compounds are usually fat soluble and remain in fat tissue, with concentrations accumulating progressively at higher levels throughout the food chain. It has been demonstrated that various organochlorines are passed from mothers to cubs through their milk.

How these pollutants and chemical compounds affect polar bear populations and their health and fitness over the long-term is not well known. However, it is very likely that their survival and their immune and reproductive systems are negatively affected. With new pollutants and uncertain long-term impacts for polar bears, a combined and reinforced response to these stressors is anticipated.

7.4 Habitat alteration

7.4.1 Climate change

Climate change is affecting terrestrial and marine environments in Nunavut. Although there is growing scientific evidence linking the impacts of climate change to reduced

body condition of bears and projections of population declines, no declines have currently been attributed to climate change. IQ acknowledges that polar bears are exposed to the effects of climate change, but suggests that they are adaptable. It is challenging to predict and mitigate the effects of climate change on the polar bears' sea ice habitat. Active management and increasing the frequency of subpopulation assessments will allow for more responsive decision-making in response to climate change. The loss of annual sea ice in southern subpopulations may be offset by improvements to heavy multi-year ice in other portions of the range. Subpopulation boundaries may shift as bears adapt to fluctuations in their environment.

"..people (in the south) think climate change will hurt polar bears but the bears will adapt, and there will always be an arctic and ice"
Leopa Akpalialuk*, Pangnirtung HTO board member*

7.4.2 Denning

Other important habitat includes denning and coastal areas used as summer retreat areas during ice free periods. In Nunavut, most polar bears den on land, either along the slopes of fiords, or on peninsulas or islands. All maternity denning sites are important areas because they provide shelter for the mother and offspring, and contribute to the growth of the population.

A significant amount of polar bear habitat, including known denning areas, are currently within the boundaries of national parks, territorial parks, or other protected areas, such as Migratory Bird Sanctuaries and National Wildlife Areas. Existing protected areas will play an increasingly important role in the face of growing development in the Arctic.

7.5 Population boundaries

The division of polar bears into subpopulations is based on movement patterns estimated from satellite telemetry data, as well as tag returns of harvested bears. Although boundaries are accepted for management purposes, it is understood that bears occasionally move across these artificial boundaries at times, moving and responding to their environment. It is important to recognize that these boundaries have formed the basis for management actions for over four decades, and have been beneficial to managers for setting harvest levels and for researchers focusing their population assessment studies.

Contrary to the scientific view of subpopulations above, Inuit believe that polar bears travel regularly among different geographic areas of Nunavut and that there may be fewer than 13 subpopulations in Canada. As the understanding of the structure of polar bear populations improves, there will be an ongoing need to review current subpopulation delineation. Ongoing studies using satellite telemetry collars may

provide information that could result in boundary changes. It will remain a challenge to balance Inuit perspective on population structure with current subpopulation designations. Maintaining Inuit support for subpopulation boundaries is fundamental to the success of polar bear management in Nunavut. Reconciling IQ with scientific knowledge as it evolves will be a necessary but considerable challenge.

7.5 Polar Bears and People

Inuit and their ancestors have been living in close proximity to polar bears for thousands of years. The human population in Nunavut is currently higher than it has ever been and continues to grow, with most of the population concentrated in 25 communities. At the same time, it is recognized that, in many areas across Nunavut, there are more bears now than 40 or 50 years ago. Human-bear interactions have increased and led to an increase in defence of life and property kills (DLPK) of polar bears.

These DLPKs are included in the TAH and reduce Inuit hunting opportunities. Defence kills occur in communities and on the land in hunting and fishing camps. Inuit have stored meat for centuries in traditional meat caches, both within small traditional camps on the land, and within communities. The loss of nutritious food due to polar bear depredation is a significant cost to Inuit.

Reduced hunting opportunities and associated loss of meat and hide are only part of the impact Inuit feel from harvest restrictions. There is also an impact on the transfer of Inuit knowledge and culture over time when restrictions are put in place.

> *"…it is like ripples in a pond, we lose the hide and the meat and the hunt, but there is also loss of culture and knowledge. We no longer travel to the areas we used to hunt polar bears, so a generation has no knowledge of the land and traditional camping areas, we no longer have sport hunters so we no longer keep dog teams and we cannot pass on that knowledge, we no longer have skins to handle and women cannot pass on the skills to prepare and sew."*
> *David Irqiut, HTO Director and Elder, Taloyoak*

7.7 Inter-jurisdictional considerations

In Nunavut, eight of 12 polar bear subpopulations are shared with other jurisdictions. The shared populations are Northern Beaufort Sea and Viscount Melville Sound (shared with NWT*), Foxe Basin (shared with Quebec*), Southern Hudson Bay (shared with Ontario* and Quebec*), Western Hudson Bay (shared with Manitoba*), Davis Strait (shard with Labrador*, Quebec* and Greenland*), and Baffin Bay and Kane Basin (shared with Greenland). Cooperative efforts on research and consultation between jurisdictions should be encouraged as part of these efforts. Current jurisdictional efforts to consider combined total allowable removal levels

between jurisdictions are a positive step for cooperative management however this remains a significant challenge due to the complexities of multiple jurisdictions and land claims.

(*This denotes a simplified relationship between jurisdictions and does not reflect the respective sub-jurisdictional entities and their stakeholders and boards).

7.8 Trade

The 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) has been in effect in Canada since July 1975. Polar bears are included in *Appendix II* to the Convention which means that trade is allowed under strict conditions including that it must be non-detrimental to the species and CITES permits are required.

As the responsible authority for the implementation of CITES, Environment and Climate Change Canada (ECCC) must determine if the export or import of a species would be detrimental to the survival of that species. Such “non-detrimental findings” (NDFs) are a requirement of the Convention. The international export of polar bears from Canada is considered non-detrimental (with the exception of export of bears harvested from the Baffin Bay subpopulation).

Given the shared jurisdiction for wildlife in Canada, coordination among provincial and territorial jurisdictions is required to ensure that total removals among jurisdictions within shared subpopulations is sustainable and defendable at the national and international level.

Ongoing domestic and international export of polar bear parts, such as hides, depends on sound harvest reporting and sustainable harvest levels. Communities have unanimously supported efforts to maintain international trade options for polar bears as an important component of community economic development. The listing of polar bears on CITES *Appendix I* would have a negative impact on conservation efforts as the economic benefit to communities will be reduced and the incentive to manage for abundant populations will be lost. In September 2015 the Animal Committee of CITES determined that the current trade in polar bear hides and parts is not detrimental to the survival of the species in the wild.

8. MANAGEMENT PLAN OBJECTIVES

The following five main components are considered important for co-management partners to achieve the goal of the management plan:

- Harvest management (*Angujaujunnaqtunik Aulattiniq*)
- Information and knowledge gathering (*Qanuqtuurniq*)
- Habitat management and environmental stewardship (*Avatitinnik Kamatsiarniq*)

- People and bears (*Inuillu Nanuillu*)
- Working together (*Piliriqatiginniiq*)

8.1 Harvest management and objectives (Angujaujunnaqtunik Aulattiniq)

8.1.1 Harvest Management

Legislated harvest restrictions have been the primary management tool used to facilitate the recovery of polar bear populations throughout Nunavut. As new information becomes available, co-management partners work together to establish a Total Allowable Harvest (TAH) for each polar bear population. The TAH represents the total number of polar bears that can be harvested according to the management objective of the subpopulation. These numbers are based on detailed scientific data, population trends, IQ, and past harvest information.

Once the TAH is established, local communities are given the choice whether they wish to harvest the set number of bears for their own needs or to allocate a portion of the total for sport hunts. All bears harvested, whether for subsistence purposes, sport hunts, or in defence of life/property, are accounted for and subtracted from the annual TAH of the nearest community. In the event that human-caused mortality exceeds the annual TAH of a particular community, additional tags will be issued and will be counted as part of the following year's TAH. Any portion of the TAH that goes unused will be counted as credits, which can then be used in subsequent years. This accounting regime is known as the Flexible Quota System – refer to Appendix C for a detailed discussion.

While the TAH for each polar bear population is subject to change, the following harvest restrictions are legislated in the Nunavut *Wildlife Act* and do not vary according population dynamics or annual removals:

1. No person shall harvest a polar bear that is under three years of age unless
    a. It appears to be abandoned by its mother; or
    b. Its mother was killed or harvested as an emergency kill in accordance with section 97 of the Act and there is little likelihood of it surviving.
2. No person shall harvest a female polar bear that is accompanied by a bear that is or appears to be under three years of age (A polar bear is deemed to be three years old on the first day of the January that follows the third summer after its birth).
3. No person shall harvest a female polar that is in a den or that is constructing a den.

The use of Non Quota Limitations, including seasonal harvest restrictions, sex selective harvesting (the harvest of two males for every one female), and the protection of family groups are also important components of Nunavut's polar bear

harvest management regime.

8.1.2 Selective Harvesting

Selective harvesting of wildlife populations is a common management practice whereby individuals of a certain age, sex or body size are selectively harvested in order to achieve a specific management goal. In Nunavut, the use of age and sex selective harvesting has been used to recover polar bear populations, while maximizing harvest opportunities for Inuit.

Sex-Selective Harvesting

Polar bears are a polygynous species, which means that one male often mates with multiple females during a single breeding season. Accordingly, a few male bears are capable of siring many offspring. Females on the other hand generally only mate once every 2-4 years because they must give birth and raise their young alone. Therefore, the number of females in a given population is the most important factor affecting future abundance and population growth.

Scientific modeling has shown that harvesting 2 males for every 1 female is the best way to increase/maintain polar bear populations, while simultaneously maximizing the harvest for Inuit. Harvesting at a ratio of 1 male for every 1 female is possible but would likely require the adoption of lower, more conservative harvest rates for most populations.

Age-Selective Harvesting

As noted above, only those bears that are three years of age and older are allowed to be harvested. This is meant to ensure polar bear populations remain stable via the recruitment of new cubs.

8.1.3 Harvest Reporting and Monitoring

Timely harvest reporting and sample collection are essential components of any wildlife management system. They provide invaluable information about population health, and are required to maintain international trade in polar bear parts. The following body parts shall be collected from each polar bear that is harvested in Nunavut:

(a) lower jaw

(b) baculum (penis bone), as proof of sex in the case of males

(c) ear tags, if present

(d) straight line body length and chest girth

(e) other samples or measurements, as required.

(f) additional samples and measurements (e.g., body condition, body size, etc.)

It is recognized that consultation and training may be required before additional information can be collected. Hunters will be paid for samples at a rate determined by the Department of Environment. In the event of a defence of life or property kill (DLPK) the Superintendent of Wildlife (GN) may authorize payment for samples collected by HTOs or individuals on behalf of the Department in the absence of a Conservation Officer in the community.

The parts that show the age, sex and species of a polar bear are: teeth for the age, the jaw or skull for the species, the baculum for the gender, and a meat sample for genetic identification of the sex if no baculum was provided. DNA determination will constitute evidence of the sex. If the reported sex is different from the genetic result, the genetic result is considered the final sex determination for TAH purposes.

Potential future harvest management actions may include:

1) *If a decline in a population is noted by science/IQ and the objective is to increase or maintain the population, actions may include:*

- Reduce the TAH, or institute a moratorium until the desired target number is reached;

2) *If an increase in a population is noted by science/TK and the objective is to decrease or maintain the population, actions may include:*

- Increase or maintain the TAH; however, If the TAH is increased, appropriate monitoring must be conducted as a follow-up to measure the success of the management action;

3) *If a population is determined to be stable by science/TK and the objective is to maintain the population at the current level actions may include:*

- Maintain the current harvest conditions unless there is evidence of declining body condition, recruitment, etc.

As a future option to address the concerns of public safety and potential new subpopulation management objectives, the following objectives will be considered as new information (subpopulation inventories) becomes available:

1) *When the status, trend, and management objective of a particular population can support it:*

- Eliminate the sex-selective harvest (i.e. harvest 1:1 male to female). As discussed above, harvesting polar bears at a 2 male:1 female ratio maximizes the number of bears that Inuit can harvest; accordingly, switching to a 1:1 harvest will likely result in a reduced TAH. DOE will consider these requests on a case-by-case basis, and only as new information becomes available;

8.2 Information and knowledge gathering (*Qanuqtuurniq*) and objectives

8.2.1 Gaining knowledge

To date, most polar bear research has focused on the estimation of population abundance and trends, and the delineation of population boundaries using physical mark-recapture and telemetry collars. However, Inuit resistance to these research methods has resulted in a shift to less invasive methods, including genetic mark-recapture studies and aerial surveys. These methods do not require the handling of bears, but they must be done more frequently because they do not provide the same degree of detailed information about the individual polar bears or the populations in general.

DOE has implemented various new research methods to monitor Nunavut's polar bear populations that require less or no handling, addressing hunters concerns. That means that a variety of information that biologists previously obtained through research activities is no longer available. Information obtained through prior research on growth, development, and variation of bears across Nunavut can now be collected through hunters. Communities and hunters can provide this information voluntarily to accommodate this loss of data by collecting additional information to supplement population data information. This will aid in understanding polar bear biology and ecology in a broader context.

In addition to ongoing scientific research and monitoring, improvements are being made in the collection of IQ for use in decision-making. Inuit observe bears year round and provide current and historical knowledge that help in decision-making. Harvester observations of body condition can be used to help infer health, as can observations of reproductive success, such as bears with single cubs, twins and triplets. On its own, this information may not be enough for decision-makers, but when used mutually with other sources of knowledge, the decision making process is strengthened.

The following objectives are aimed at providing information that will help in making decisions:

- Increase the frequency of population surveys and monitoring;
- Continue to improve Inuit involvement and participation in research;
- Improve and continue gathering and archiving IQ in relation to polar bears and their habitat;
- Improve and continue to gather supplementary information of harvested bears by hunters;
- Continue to develop and evaluate new and less invasive methods of research;

- Consider not only the effects of ecosystem changes on polar bears, but also how polar bears affect other species, specifically ringed seals and eider ducks;
- Continue genetic research and collaring to clarify potential boundary changes where needed and supported by communities;
- Continue to review developing knowledge when considering boundary changes to reflect Inuit knowledge;
- Improve information reporting related to polar bears and bear-human interactions;
- Improve the analysis of bear-human interactions to determine causes and potential mitigation measures;
- Continue traditional mark-recapture and delineation studies using collars where needed and supported by communities, or when alternative studies do not provide sufficient data for management decisions.

8.2.2 Research

The Department of Environment intends to conduct population inventories of each subpopulation on average every 10 years (depending on the monitoring techniques applied). Harvest statistics and sample collection will be ongoing in order to further aid management decisions. When possible, a concurrent IQ study will be conducted to complement the population inventory. A schedule of subpopulation inventories and IQ studies is found in Appendix D.

Community residents (with priority to HTO members) shall have the opportunity to participate in polar bear research projects. HTOs will have input into the proposed studies and IQ will be used to guide research efforts.

In addition to the ongoing population monitoring conducted by DOE, other partner organizations and individuals conduct research on polar bears throughout Nunavut. Some of these initiatives include research examining the impacts of contaminants and climate change on polar bear populations, ecological studies, feeding studies and many others. The information gathered through these projects will be considered in management decisions as well.

While the Government of Nunavut has invested considerable effort into the development and use of less invasive research methods to study polar bears, there may be instances when collaring and physical mark-recapture studies are needed to collect more detailed information about a particular population or populations. The Government of Nunavut will seek the support of HTOs prior to implementing studies that utilize these methodologies.

Physical mark-recapture and collaring studies require researchers to use immobilizing drugs in order to safely handle polar bears. When a bear has been immobilized within one year of the date of harvest, $1000.00 compensation will be paid to the hunter who harvested the polar bear. HTOs will be consulted and

informed of all research initiatives involving the use of chemical immobilization; harvesters can consult their local Conservation Officer to determine whether a bear has been previously immobilized. Any damage to the hide from research activities will be compensated for based on the reduced amount of the hide's market value. Also, any bear killed during DOE polar bear research activities will receive a tag from the nearest community and the community will be paid $5,000.00 in compensation from the appropriate government authority. These compensation amounts will be reviewed during the 5 and 10 year reviews of the plan. ECCC and Parks Canada also have guidelines for research-related polar bear mortality. HTOs are encouraged to negotiate compensation packages with other researchers or companies that may destroy a bear in defence of life and property when the community reviews the respective research or development permits.

8.3 Habitat management and environmental stewardship (*Avatitinnik Kamatsiarniq*) objectives

Polar bears use most parts of the Arctic and sub-arctic habitat in which they live. From annual and multi-year ice to open water and land, they are always moving. Ensuring that polar bear habitat remains available and usable will take significant effort because of the magnitude of the Arctic and the fact that many threats originate elsewhere. Stewardship can be partially achieved through regulatory processes that occur within Nunavut. However, contaminants that are brought north by wind and ocean currents and climate change are issues that occur far beyond Nunavut.

Current habitat stewardship is further supported by the existing parks and protected areas in Nunavut, including National Parks, Territorial Parks, Migratory Bird Sanctuaries, and National Wildlife Areas.

Objectives that promote stewardship and protect habitat must be local and also consider the broader causes and issues. These objectives include:

- Ensure that stakeholders have the resources and information to participate effectively in regulatory reviews, such as Environmental Impact Assessments;
- Improve monitoring for contaminants in order to respond to potential health concerns resulting from consumption;
- Consider how increasing shipping and resource development activities may affect individual polar bears and populations, both separately and cumulatively;
- Focus research to improve the understanding of climate change impacts, both negative and positive, on ecological conditions that are important to polar bears and that inform conservation and management actions;
- Identify important habitats for polar bears and implement appropriate habitat protection measures through cooperation with appropriate agencies;

- Consider the creation of special management areas, parks, and other land use designations for additional habitat protection and stewardship.

8.4 People and bears (*Inuillu Nanuillu*) and objectives

The polar bear maintains a position of significant cultural importance to Inuit. Harvesting polar bears for meat, tradition, and economic benefit is still very important, and the harvest of one's first bear is a significant milestone in a hunter's life. Minimizing the number of bears that are killed in defence of life and property (DLPK) and maintaining the traditional harvest are important to all communities.

When a DLPK happens, the hide, meat, and all parts of harvested polar bears are turned over to the local HTO after the Conservation Officer has determined that it is a legitimate DLP kill. When there is an irregular or illegal kill, the Conservation Officer will seize the parts of the bear necessary to complete the investigation. The specimens of the killed bear are collected as normal. When it has been determined that the kill was accidental or a DLPK, the Conservation Officer shall ensure that all seized parts from the kill are turned over to the local HTO. The cleaning and drying of the hide is the responsibility of the HTO because the HTO retains the hide. In all cases, the hides in question must be properly stored and preserved and returned to the HTO as soon as possible to prevent damage and loss of economic revenue.

If there is any dispute about the distribution of the hide, meat, or parts of the bear from a DLPK, the decision is deferred to the appropriate RWO. There is no payment to the HTO or the hunter for specimens, or for cleaning and drying the hide of a bear taken illegally. As per the Nunavut *Wildlife Act*, all seized parts from bears taken illegally are disposed of as directed by the judicial authority.

The following objectives are aimed at reducing bear-human conflict and reducing injury/mortality:

- Continue to develop and implement community bear plans;
- Hire bear monitors when needed and train and equip them;
- Continue to develop and improve methods for protecting people, property, and meat caches;
- Ensure that the Wildlife Damage Compensation and Wildlife Damage Prevention Programs are functional and being used;
- Improve communications to the public about bear safety, deterrence, and available programs;
- Work with Hamlets and HTOs to improve local storage for meat in camps and communities as part of the bear-human conflict prevention program.

8.5 Working together (*Piliriqatiginniiq*) and objectives

8.5.1 Within Nunavut

This plan was developed with the direction of a co-management working group and the participation of all HTOs and communities. This is a positive step in improved cooperative management, and the following objectives will help to further improve cooperation within Nunavut:

- Involve Inuit in research, including design, field studies and reporting;
- Improve the collection and archiving of IQ so that it is accessible for planning and decision-making.

8.5.2 Between jurisdictions

Working together should also take place at the inter-jurisdictional level. Polar bear inter-jurisdictional agreements should be developed for all subpopulations that are shared with Nunavut. Domestic agreements are underway for some subpopulations and already exist between Canada and the United States, and Canada and Greenland. User-to-user groups should also pursue agreements on shared populations; one such agreement already exists in the western portion of the Kitikmeot and the Inuvialuit in NWT.

The following objectives will help to foster improved cooperation beyond Nunavut:

- Foster user-to-user agreements between Inuit organizations and other jurisdictions;
- Work toward developing compatible management regimes for shared populations;
- Build cooperative research programs in areas such as population monitoring, contaminants monitoring, and traditional knowledge studies;
- Continue to improve coordination between different levels of government and partners. Environment and Climate Change Canada, Parks Canada, DOE, RWOs and HTOs all have a role and an interest in implementation of this plan;
- Work toward joint decision-making processes involving all the boards linked to a shared subpopulation

8.5.3 Sharing information and knowledge

Simply having knowledge is not enough to manage the species. Ensuring that knowledge and information are shared will help all co-management partners to make better informed decisions. Currently, information flow is sporadic and all parties need to make improvements. This is best done by formalizing information sharing through communications and outreach:

- Develop a communications strategy for sharing information;
- Develop data sharing agreements with other agencies and jurisdictions;
- Ensure that the results of studies, both scientific and IQ, are shared with all co-management partners;
- Continue to contribute to the Polar Bear-Human Interaction Management System, work with the human-bear conflict subcommittee of the Range States and outside organizations to quantify and characterize successful polar bear deterrent measures.

9. IMPLEMENTATION OF THE PLAN

Achieving the objectives identified above will require cooperation of co-management partners, jurisdictions and significant investment of financial and human resources. No changes to existing TAH will occur until new information becomes available, the current management objective of managing for maximum sustainable harvest will continue. New information (see Appendix D) will be presented to the NWMB (when available) along with a review of the management objective for the subpopulation and a review of any new scientific research or IQ study. At that time, a new TAH will be recommended that is consistent with the subpopulation management objective and the objectives of this plan.

The co-management structure in Nunavut requires an NWMB decision for any change to TAH, management objectives, or NQL. It is difficult to predetermine which action, or actions, will be undertaken within the co-management framework and as a result of the NWMB decision-making process as each individual scenario will have its own set of circumstances, including management objective, Inuit Qaujimajatuqangit, population size and trend, as well as population projections under differing harvest scenarios. As the primary decision-making body, the NWMB makes decisions, and no plan or action can be prejudged in this format. This does not mean that action will not be taken, as the goal of the management plan is *"To maintain viable and healthy polar bear subpopulations for current and future generations, and to ensure that polar bears remain an integrated and functioning part of the ecosystem while monitored and appropriate harvests are allowed."*, rather that the outcome will be based on the best available information at the time. In that context, the following are examples, identified by co-management partners, of what actions may be taken in order to implement this plan.

Prior to action being taken, there will be appropriate consultation and dialogue with co-management partners and neighbouring jurisdictions to ensure success.

9.1 Harvest Management

Management Action	Priority	Timeline
Undertake a review of the sustainable removal rates for females	high	3 years
Test revisions to the flexible quota system to ensure they are administratively feasible (revisions will switch to a 1:1 reduction in TAH the following year for overharvest, i.e. if one female is overharvested the reduction will be only one female the following year (If a female overharvest cannot be accommodated through credits or from the following year's TAH than regular flex quota reductions will apply were male credits will go into the bank as opposed to being automatically available).	high	2 year
Expand and increase harvest bio-characteristics reporting upon peer review of research objectives	high	5 year
Improve handling of hides taken as DLPK to ensure no loss in hide value	high	Ongoing
Ensure harvest reporting and sample submission is adequate to address needs	high	Ongoing
Develop a training program for Inuit in communities to establish an Inuit data collection program for hunter effort and interviews and collection of polar bear bio-characteristics	moderate	5 years

9.2 Information and Knowledge Gathering (Qanuqtuurniq): Actions

Habitat Management and Environmental Stewardship (*Avatitinnik Kamatsiarniq*): Actions

Management Action	Priority	Timeline
Develop a knowledge and information sharing framework for co-management partners	High	2 years
Gather local and Inuit knowledge and incorporate into planning and decision-making	High	Ongoing
Strive to increase the involvement of Inuit in research, planning, and decision-making	High	Ongoing
Conduct population assessments as per the	High	Ongoing

inventory schedule and make the results publicly available in a timely manner		
Continue to develop, evaluate and apply research techniques that will provide the essential information with minimal or no impact on polar bears	Medium	Ongoing
Develop a 25 year research strategy for polar bear ecosystem-based monitoring identifying and prioritizing research gaps	Medium	2017
Build partnerships with external researchers and governments to increase DOE capacity both for science and IQ, and implement the 25 year research strategy through outside funding and partnerships	Medium	Ongoing

9.3 Habitat Management and Environmental Stewardship (*Avatitinnik Kamatsiarniq*) Actions

Management Action	Priority	Timeline
Encourage the development, sharing and implementation of best management practices with stakeholders, tourism operators, and industry	Moderate	Ongoing
Seek to build capacity in all co-management organizations to better participate in regulatory review processes	Moderate	Ongoing
Continue to participate in the contaminant monitoring program for polar bears	Moderate	Ongoing
Study effects of marine shipping and development of mitigation measures	Moderate	10 years

9.4 People and Bears (*Inuillu Nanuillu*) Actions

Management Action	Priority	Timeline
Seek program funding to train and equip bear guards	High	Ongoing
Develop educational material (e.g., posters, fact sheets, website material) for communities, tourists, mining camps, etc., on best practices to minimize human-bear interactions	High	Within 2 years
Develop, adopt and implement community bear management plans and community human-bear-interaction protocols	Moderate	Within 3 years
Develop a communications plan and education materials for bear safety	Moderate	Within 3 years

Conduct a review of Damage Compensation and Damage Prevention Programs	Moderate	Within 3 years

9.5 Working Together (*Piliriqatiginniiq*) Actions

Management Action	Priority	Timeline
Seek cooperative research partners to build further capacity in IQ studies and scientific research	High	Ongoing
Build capacity in HTOs to provide support and participation in research projects	High	Within 3 years
Develop a knowledge and information sharing framework for co-management partners	High	2 years
Identify inter-jurisdictional agreements near completion and ensure resources to finalize	High	Ongoing
Identify inter-jurisdictional agreements that need to be pursued and ensure resources to initiate	Moderate	3 years
Explore research agreements with neighboring jurisdictions for shared populations	Moderate	5 years
Improve cooperation with federal agencies such as Parks Canada and Canadian Wildlife Service so that their land management efforts also support this plan	Moderate	5 years

10. PLAN REVIEW

To ensure that the goal and objectives of this management plan have been realized, it is essential to measure progress as the plan is implemented. At 5 and 10 years, a co-management working group will conduct a mid-term review of objectives with respect to progress made. Where objectives have been met, they will be revised according to current needs. Where objectives have not been met, additional actions and new timelines may be identified. Co-management is an ongoing effort that evolves in line with available knowledge and information. The review will consider the number of polar bears in each subpopulation, their health, the trends (population, reproduction, survival rates etc.), the conservation of habitat (largely the sea ice, but also denning areas), the reduction of human-bear conflict occurrences and resulting decrease in DLPKs, and the incorporation of IQ.

APPENDICES

Appendix A - 2016 PBTC Status Table

1. Purpose

Under its Terms of Reference, the Polar Bear Technical Committee (PBTC) is to provide an annual report to the Polar Bear Administrative Committee (PBAC) on the status of each of Canada's 13 sub-populations of polar bears that is based upon the best available scientific information and Traditional Ecological Knowledge.

This document defines the various terms used in the Status Table and the basis on which the status of each sub-population was assessed by the PB TC in February 2014.

2. Definitions

2.1 Population estimate

The most recent estimate of abundance reviewed and accepted by the PBTC.

2.2 Historic Trend

Historic trend is the PBTC's assessment of changes in abundance that a sub-population may have experienced since the signing of the international *Agreement on the Conservation of Polar Bears* (1973), which led to current management practices and research. The most recent population estimate and the first comparable documented historic estimate are examined. If a direct comparison of abundance estimates cannot be made or there is only a single estimate of abundance, other lines of evidence may be used in this assessment.

2.3 Recent Trend (15 Years Ago to Present)

Recent trend is the PBTC's assessment of the direction of abundance over the last 15 years. The objective of this assessment is to inform the P BAC as to whether a sub-population has increased, decreased, or remained stable. Recent trend is assessed by comparing the most recent population estimate to the previous population estimate. If a direct comparison of population estimates cannot be made or is not applicable, other lines of evidence such as population viability analyses, productivity indicators, and recent harvest pressure may be used to infer any changes in recent abundance.

2.4 Local and/or TEK assessment

This column represents known documented traditional ecological knowledge or Inuit Qaujimajatuqangit on the status of each of the polar bear subpopulations.

2.5 Future Trend (Present to 10 Years into the Future)

Future trend is the PBTC's assessment of the anticipated direction of abundance. The objective of this assessment is to inform the PBAC as to whether a sub-population is likely to increase, decrease, or remain stable over the next 10 years. Multiple lines of evidence including but not limited to population estimates, population viability analyses, productivity indicators, harvest pressure, and traditional ecological knowledge may be used in this assessment.

2.6 Potential Maximum Removals

The annual total number of human-caused polar bear mortalities from a sub-population allowed under quota(s), Total Allowable Harvest, Total Allowable Take, and\or voluntary agreements. When the annual harvest is reported it generally include all human caused mortalities including DLPs, mortalities due to research, and mortalities due to human activities e.g. consumption of toxic materials related to development.

3. Historic Trend Assessment

3.1 Steps to Assess Historic Trend

Compare current population estimate with the first documented and comparable historic population estimate. When a current estimate is directly comparable to an historic estimate, a designation without any qualifier (i.e. reduced, stable, or increased) may be used.

If the current estimate is not directly comparable to an historic estimate because of differences in study area, or methods, a comparison may be made but any assessment of changes in abundance are inferred. In this case, a qualifier is required (i.e. likely reduced, likely stable, or likely increased).

When population estimates cannot be compared, other lines of evidence such as the most recent population attributes of the sub-population (e.g. age structure) may be used to infer changes in the abundance of the sub-population. This does not include TEK. Again, a qualifier is required (i.e. likely reduced, likely stable, or likely increased).

When there is insufficient information or lack of confidence in available

information to make an assessment of change in abundance, the sub-population is assessed as uncertain.

Additional text is provided in the comments section of the status table. It includes listing items such as major threats and other lines of evidence that may have been used.

3.2 Status Designations

Reduced	Current population estimate is statistically significantly lower than historic population estimate
Stable	Current population estimate is not different from historic population estimate
Increased	Current population estimate is statistically significantly higher than historic population estimate
Likely Reduced	Current or inferred current population abundance is lower than historic or inferred historic population abundance
Likely Stable	Current or inferred current population abundance is not different from historic or inferred historic population abundance
Likely Increased	Current or inferred current population abundance is higher than historic or inferred historic population abundance
Uncertain	Insufficient information or lack of confidence in available information to make an assessment

4. Recent Trend Assessment

4.1 Steps to Assess Recent Trend

Compare current population estimate with previous population estimate assuming current population estimate is appropriately recent. When a current estimate is directly comparable to its previous population estimate, a designation without any qualifier is made (i.e. reduced, stable, or increased).

If the current estimate is not directly comparable to its previous population estimate because of differences in study area, methods, or is outdated, and cannot be updated by PVA, a comparison may be made but any assessment of changes in recent population abundance are inferred and a qualifier is required (i.e. likely reduced, likely stable, or likely increased).

When population estimates cannot be compared or are not applicable to assess recent trend, other lines of evidence such as the most recent population attributes of the sub-population (e.g. age distribution) may be used to infer any changes in the abundance of the sub-population. This does not include TEK. Again, a qualifier is required (i.e. likely reduced, likely stable, or likely increased).

When there is insufficient information or lack of confidence in available information to make an assessment of changes in population abundance, the sub-population is assessed as uncertain.

Additional text is provided in the comments section of the status table. It includes listing items such as major threats and other lines of evidence that may have been used.

4.2 Recent Trend Designations

Decline	Current population estimate is statistically significantly lower than previous population estimate
Stable	Current population estimate is not different from previous population estimate
Increase	Current population estimate is statistically significantly higher than previous population estimate
Likely Decline	Current or inferred current population abundance is lower than previous or inferred previous population abundance
Likely Stable	Current or inferred current population abundance is not different from previous or inferred previous population abundance
Likely Increase	Current or inferred current population abundance is higher than previous or inferred previous population abundance
Uncertain	Insufficient information or lack of confidence in available Information to make an assessment

5. Future Trend Assessment

5.1 Steps to Assess Future Trend

Compare current population estimate with future population estimate but not exclusive to a population viability analysis (PVA). P VAs are considered in the assessment as long as the data

derived vital rates used to generate the simulations are not older than 15 years. In all these cases, a qualifier is required (i.e. likely reduced, likely stable, or likely increased).

In addition to PVAs, other lines of evidence (e.g. body condition, litter size, sea ice trend, TEK) may be used to predict future trend of a sub-population.

When there is contradictory evidence, insufficient information or lack of confidence in available information to make an assessment of future changes in population abundance, the sub-population is assessed as uncertain.

Additional text is provided in the comments section of the status table. It includes listing items such as major threats and other lines of evidence that may have been used.

5.2 Future Trend Designations

Likely Decline	Future population abundance predicted to be lower than current population abundance
Likely Stable	Future population abundance predicted not to be different from current population abundance
Likely Increase	Future population abundance predicted to be higher than current population abundance
Uncertain	Contradictory evidence, insufficient information, or lack of confidence in available information to make an assessment.

Subpopulation	Estimate	±2 SE or 95% CI	Year of Population Estimate	Method	Historic Trend	Local and/or TEK assessment	Recent trend	Future trend	Historic annual removal (5 yr mean)	Historic annual removal (3 yr mean)	Historic annual removals (last year)	Potential Maximum Removals (last year)	Comments/Vulnerabilities/Habitat	Jurisdiction
Baffin Bay	2,074	1542-2606	1997 1	M\R	likely reduced	stable[2]	likely decline[3]	uncertain 4	146	136	136	133 (NU:65+GL:68)	currently being reassessed, high harvest, decline in sea ice, increased shipping	NU, GL
Davis Strait	2,158	1833-2542	2007 [5]	M\R	likely increased	increased[6]	likely increase[7]	likely decline [8]	110	114	95	QC + 75 (NU:61+NL:12+GL:2)	based upon 2007 survey information, high harvest; decline in sea ice;	NU, QC, NFLD & Lab, GL
Foxe Basin	2,580	2093-	2009-10 [9]	A	stable	increased[10]	stable[11]	likely	106	103	114	QC + 123	long term decline in sea ice; potential for increased shipping for mineral extraction	NU, QC
Gulf of Boothia	1,592	870-2314	2000 [13]	M\R	likely stable	increasing[14]	likely stable[15]	likely stable [16]	60	62	67	74	Current and projected habitat change may affect productivity of ecosystem. Subpopulation has high vital rates and low harvest.	NU
Kane Basin	164	94-234	1997 [17]	M\R	likely reduced	Increasing [18]	Uncertain [19]	uncertain [20]	5	5	3	11 (NU:5+GL:6)	currently being reassessed, likely a sink population connected with Baffin Bay, small population, decline in sea ice;	NU, GL
Lancaster Sound	2,541	1759-3323	1995-7 [21]	M\R	likely stable	Increasing [22]	Uncertain [23]	uncertain [24]	87	85	80	84	historic sex-skewed harvest, habitat decline, potential for increased shipping for mineral extraction	NU
M'Clintock Channel	284	166-402	2000 [25]	M\R	likely reduced	stable [26]	likely increase[27]	uncertain [28]	3	4	5	5	increasing oil/gas development; loss of multi-year ice; currently being reassessed	NU
Northern Beaufort Sea	1,291*	n/a	2006 [29]	M\R	likely stable	stable [30]	likely stable[31]	likely stable [32]	43	39	35	77 (NU:6+ NWT:71)	TEK study complete; increasing oil/gas development; decline in sea ice;	NU, NWT
Norwegian Bay	203	115-291	1997 [33]	M\R	uncertain	stable [34]	uncertain [35]	uncertain [36]	2	2	1	4	small, isolated population	NU
Southern Beaufort Sea	1,215*	n/a	2006 [37]	M\R	uncertain	stable [38]	likely decline[39]	likely decline [40]	40	32	22	56 (US:35 + ISR:21)	Bromaghin et al. 2015 under review by Polar Bear Technical Committee - more indepth discussion to happen in 2017; annual variability in ice conditions results in changes in density; bears are shifting to NB because of ice conditions; TK study completed; potential for oil/gas development	US, YK, NWT
Southern Hudson Bay	943	658-1350	2012 [41]	A	stable	stable James Bay; increased in East Hudson Bay [42]	stable [43]	uncertain [44]	59	46	43	45 (NU:20 + QC:24 + ON:1)	Uncertain due to contradictory lines of evidence: large declines of body condition, declines in survival rates yet no change in abundance, TEK indicates winter body condition has not changed, TEK indicates that reproductive rates have improved, TEK and science indicate changes in sea ice, ice free season increased by 30 days between 1980-2012. recent high harvest, habitat decline; decline of permafrost-based denning habitat; revised voluntary harvest agreement of 45 currently in effect.	NU, QC, ON

Viscount Melville Sound	161	93-229	1992 [45]	M\R	likely reduced	increased [46]	likely stable [47]	uncertain [48]	5	5	2	7(NU:3 +NWT:4)	currently being reassessed	NU, NWT
Western Hudson Bay	1,030	754-1406	2011 [49]	A	likely reduced	increased [50]	likely stable[51]	likely decline [52]	25	28	28	24 (NU) + Manitoba	sea ice decline; harvest; declines in body condition and lower productivity compared to adjacent Foxe Basin and South Hudson Bay subpopulations; historic decline in abundance from late 1980s through late 1990s linked to reduced survival due to timing of sea ice breakup; recent analysis indicated relative stability in subpopulation from 2001-2010, a period during which there was no significant trend in sea ice freeze up or breakup; continued linkage between female survival and sea-ice conditions.	MB, NU

From the Polar Bear Technical Committee, 2016 (this document is revised annually by the PBTC, the most current version will always be considered as relevant at the time)

Notes

M/R - Physical Mark Recapture Survey

A - Aerial survey

n/a - not available

* The revised estimates for NB and SB is the result of management boundary change. It is based on a USGS analysis.

2016 PBTC Status Table Footnotes

1. Taylor et al. 2005
2. Dowsley 2005a; Dowsley 2005b; Dowsley 2007; Dowsley and Taylor 2006; Nunavut Wildlife Management Board (NWMB) Public Hearing minutes and submissions for April 2008, September 2009;
3. Combined harvested considered unsustainable: Taylor et al. 2005 plus simulations in PBSG 14 and 15 proceedings suggest abundance of 1,546 in 2004
4. Vital rates for Riskman PVA are 18 years old; TEK indicates population is stable; there is current research and ongoing assessment
5. Peacock et al. 2013
6. Kotierk 2010a, 2010b
7. Peacock et al. 2013; Stirling 1980.
8. The impact of a TAH increase on the population has not been modeled; predicted trend after survey was completed at harvest levels in 2007 was considered stable (Peacock et al. 2013); NWMB Davis Strait public hearing submissions May 16-17, 2011
9. Government of Nunavut (GN) final report 2012
10. Sahanatien pers. com. 7 Feb 2013; Dyck pers. com. 7 Feb 2013; Canadian Wildlife Service Nunavut consultation report 2009
11. GN report 2012; Atkinson et al. 2010; Taylor et al. 2006; Taylor and Lee 1995
12. No signs of deteriorating body condition or litter size (GN report 2012)
13. Taylor et al. 2009
14. Keith et al. 2005; Canadian Wildlife Service Nunavut consultation report 2009
15. For the period 2000–2015, assuming all sources of removals in the population sum to 74 bears/yr, the population can be expected to persist at a stable population size (Taylor et al. 2009)
16. Hunters in area reporting ice conditions have improved productivity, harvest levels remain stable (Dyck pers com. 2013)

17. Taylor et al. 2008
18. Canadian Wildlife Service Nunavut consultation report 2009
19. Population simulations of existing data suggest that only a very small quota (<2) may be sustained for this subpopulation (Taylor et al. 2008).
20. Vital rates for PVA are 17 years old, current research and ongoing assessment
21. Schwinsburg et al. 1980; Taylor et al. 2006; Taylor et al. 2008
22. Canadian Wildlife Service Nunavut consultation report 2009
23. For the period 1997-2012, the population would be expected to be stable under the historical harvest regimen (1993-97). At the current mean harvest rate of 78 bears/yr (2002-2006), we estimate that the population is more likely to decline than to increase (Taylor et al. 2008).
24. Vital rates for Riskman PVA are 16 years old
25. Taylor et al. 2006
26. Inuit report that bears are moving to neighbouring areas throughout the region. (Keith et al. 2005; CWS Nunavut consultation report 2009)
27. Likely an increase based on quantitative assessment of growth rate (Taylor et al. 2006)
28. Vital rates for PVA are 14 years old; several research planning consultations has been completed; further consultations ongoing.
29. Griswold et al., unpublished; Stirling et al. 2011
30. Pokiak pers. comm. 7 Feb 2013; Carpenter pers. com. 7 Feb 2013
31. Population size used for management was historically adjusted to 1,200 due to bias in population estimate (Amstrup et al. 2005; Stirling et al. 2011).
32. Durner et al. 2009, Stirling et al. 2011, and TEK (Joint Secretariat, unpublished) indicate stable population and habitat conditions may improve in short-term
33. Taylor et al. 2006; Taylor et al. 2008
34. Canadian Wildlife Service Nunavut consultation report 2009
35. Vital rates for Riskman PVA are 17 years old and vital rates were substituted from other populations (Taylor et al 2008); no recent work in the area
36. Vital rates for Riskman PVA are 17 years old and vital rates were substituted from other populations (Taylor et al. 2008)
37. Griswold et al., unpublished; USGS 2010
38. Pokiak pers com. 7 Feb 2013; Carpenter pers. com. 7 Feb 2013
39. Population estimate is lower but not statistically different from previous population estimates (Amstrup et al. 1986, Regehr et al. 2006).
    Quotas were based on the understanding that the total harvest of independent females would not exceed the modeled sustainable maximum of
    1.5% of the population (Taylor et al. 1987) and that a 2:1 ratio of males to females would be maintained in the total quota harvested (Stirling 2002)
40. Based on sea ice declines (Durner et al 2009), changes in body conditions measured in Alaska (Rode et al. 2010) and modeling (Regehr et al. 2010)
    Estimated risk of future decline is based on vital rates estimated from 2001-2006 data used in demographic models that incorporate sea ice forecasts.
41. Obbard et al. 2013
42. NMRWB Public Hearing Inukjuak February 2014
43. Based on comparison with previous subpopulation estimates (Obbard et al. 2013; Obbard 2008; Kolenosky 1994).
44. Body condition decline, vital rate declines and changes in ice conditions; Inuit observations show no decline in body condition or abundance (Obbard pers. com. 2014, Obbard et al. 2013, NMRWB, unpublished)
45. Taylor et al. 2002
46. Canadian Wildlife Service Nunavut consultation report 2009; community consultations in 2012 and 2013
47. Harvest managed for population growth since last survey including a 5 year moratorium; comparable litter size in 2012 (GNWT unpublished)
48. Vital rates for Riskman PVA are 22 years old; population reassessment currently in process

49. Stapleton et al. 2014
50. Canadian Wildlife Service Nunavut consultation report 2009, Kotierk 2012, NWMB Public Hearing minutes 2005; Tyrrell 2006
51. Lunn et al. 2014 Unpublished Report
52. Based on body condition, abundance estimates, reduced reproductive productivity, and changes in ice conditions (Stirling and Parkinson 2006, Stapleton et al. 2014, Lunn pers. com.)

Appendix B – Subpopulations and Status

Appendix B I – Baffin Bay (BB) subpopulation status

Brief history

A 1989 subpopulation estimate of 300-600 bears was based on mark-recapture data in which the capture effort was restricted to shore-fast ice and the floe edge off northeast Baffin Island. However, Inuit knowledge indicated that an unknown proportion of the subpopulation is typically offshore during the spring and was unavailable for capture. A second study (1993-1997) was carried out during September and October, when all polar bears were on land and the estimated number of polar bears in BB was 2,074. In 2004, abundance estimates were revised to fewer than 1,600 bears, based on population viability simulations using vital rates from the capture study and new information that included Greenland's harvest records. This resulted in significant reductions in TAH that are still in place in 2016. A genetic mark-recapture survey was completed in 2013 and a new population estimate will be available in late 2016.

Current Status: 2,074 bears (1997)
Science – reduced
IQ – stable
current TAH – Nunavut 65
– Greenland 67

Subpopulation recommendations:

- Maintain current population abundance and review management objectives and TAH when the new inventory study is complete.
- Communities believe that the population size is sufficient and should not be managed for increase. New combined TAH for Nunavut and Greenland will be based on new population estimates and recommendations from scientific working groups on what a sustainable harvest would be to keep the population stable at that level.
- Upon receipt of the new population assessment and establishment of a sustainable TAH seek a review of the non-detrimental findings to allow for the export of hides and other bear parts.
- Re-assess the population boundary between BB and KB
- Increase cooperation between all jurisdictions that share this population to ensure a sustainable harvest

Appendix B II – Davis Strait (DS) subpopulation status

Brief history

The initial subpopulation estimate of 900 bears for DS was based on an estimated correction from the original mark-recapture calculation of 726 bears, which was felt to be too low. In 1993, the estimate was increased to 1,400 bears and then to 1,650 in 2005. These

increases were to account for the bias as a result of springtime sampling, the fact that the existing harvest appeared to be sustainable and was not having a negative effect on the age structure, and traditional knowledge that suggested more bears had been seen over the last 20 years. The most recent inventory of this subpopulation was completed in 2007; the new subpopulation estimate is 2,158. The population is characterized by low recruitment rates and high population density where sea ice conditions are deteriorating and variable. A new 2-year study is planned to begin in 2017.

Current status: 2,158 bears (2007)
Science – not reduced
IQ – increased
current TAH – Nunavut = 61
– Nunavik = 32
– Nunatsiavut = 12
– Greenland = 3

Subpopulation recommendations:

- Maintain current population abundance and review management objective and TAH when a new inventory study is complete.
- Re-assess the FB/DS boundary near Kimmirut.
- Increase cooperation among all jurisdictions that share this population to ensure a sustainable harvest
- Hold joint hearings of relevant boards
- Encourage inter-jurisdictional discussions between user groups to identify appropriate allocation between regions

Appendix B III – Southern Hudson Bay (SH) subpopulation status

Brief history

The initial estimate of population numbers came from a three-year (1984-1986) mark-recapture study, conducted mainly in the Ontario portion of the subpopulation. This study and the more recent telemetry data have documented seasonal fidelity to the Ontario coast during the ice-free season, and some intermixing with the Western Hudson Bay and Foxe Basin subpopulations during winter months. In 1988, a population-modeling workshop suggested an increase in the calculated subpopulation estimate from 900 to 1,000 bears, because portions of the eastern and western coastal areas were not included in the area during original sampling. Additionally, the area away from the coast may have been under-sampled due to difficulties in locating polar bears inland (i.e., below the tree line). Thus, some classes of bears, especially pregnant females, were believed to be under-sampled. A new analysis of the 1984-1986 capture data produced an estimate for the study area of 634 and, for 2003-2005, 673. In addition, there are some areas in which it is unsafe to capture bears. An aerial survey conducted between 2011 and 2012 by Ontario estimates the SH abundance at 951 bears. A voluntary inter-jurisdictional harvest agreement was agreed upon which expires in 2016.

Current status: 943 bears (2016)
Science – stable
IQ – increasing
current TAH – Nunavut = 25 (Voluntary agreement reduced it to 20 expires 2016)
– Ontario = 3
– Quebec = 22

Subpopulation recommendations:

- Maintain current population abundance and review management objective and TAH when a new inventory study is complete.
- Increase cooperation among all jurisdictions that share this population to ensure a sustainable harvest
- Help Quebec to develop a management plan and system to ensure that TAH is respected and followed and all harvesting is reported.
- Continue with inter-jurisdictional user-to-user discussions to ensure agreement on the fair allocation of the agreed TAH.

Appendix B IV – Western Hudson Bay (WH) subpopulation status

Brief history

The subpopulation was estimated to be 1,194 in 1987 and 935 in 2004. Before 1998, the subpopulation had apparently remained the same, indicating that DOE research conducted in 2011 using aerial surveys provided a new estimate of 1,030 bears. However, this estimate and the previous one have overlapping confidence intervals, suggesting no change, although techniques of past research projects differed. A recent new analysis by Environment and Climate Change Canada also confirmed that the population remained stable at least for the past 10 years.

Current status: 1,030 bears (2013)
Science – stable
IQ – increase
current TAH – Nunavut = 28
– Manitoba = 8

Subpopulation recommendations:

- Maintain current population abundance and review management objectives and TAH when a new inventory study is complete.
- Increase cooperation with Manitoba

Appendix B V – Foxe Basin (FB) subpopulation status

Brief history

A total subpopulation estimate of 2,119 was developed in 1996 using mark-recapture analysis based on tetracycline biomarkers. IQ suggests that the subpopulation of polar bears has increased (GN consultations in FB communities 2004-2009); the subpopulation estimate was increased to 2,300 bears in 2005 based on IQ. The 2009-2010 aerial surveys produced a new population estimate of 2,580, indicating that the population has remained relatively stable over time.

Current status: 2,580 bears
Science – stable
IQ – increasing
current TAH – Nunavut = 123
– Nunavik = 7

Subpopulation recommendations:

- Maintain current population abundance and review management objectives and TAH when a new inventory study is complete.
- Increase cooperation among all jurisdictions that share this population to ensure a sustainable harvest
- Hold joint board hearings and meetings

Appendix B VI – Gulf of Boothia (GB) subpopulation status

Brief history

Based on IQ, a recognition of sampling deficiencies, and polar bear densities in other areas, an interim subpopulation estimate of 900 was established in the 1990s. After a mark-recapture survey between 1998 and 2000, the subpopulation was estimated to number 1,592. The status of GB is stable, or slightly increasing. A new 3-year population study began in 2015.

Current status: 1,592 bears (2000)
Science – not reduced
IQ – increasing
current TAH – Nunavut = 74

Subpopulation recommendations:

- Maintain current population abundance and review management objectives and TAH when the new inventory study is complete.

Appendix B VII – M'Clintock Channel (MC) subpopulation status

Brief history

An estimate of 900 bears was derived from a six-year study undertaken in the mid-1970s. Following the completion of a mark-recapture inventory in the spring of 2000, the subpopulation was estimated to number 284. A moratorium was put in place, followed by a significantly reduced harvest that was in place until 2015/16 where an increase in TAH

occurred. The management objective for this population is recovery. A genetic mark-recapture study was started in 2014 and will be completed by 2017. Communities indicate that there has been a recovery in the bear population since the TAH reduction and that bears are seen in areas now where in previous years none were present. The number of bears currently in MC was deemed to be "about right" by locals, with few if any individuals supporting an increase above the current population level. The new estimate will likely be available in 2017.

Current status: 284 bears (2000)
Science – reduced, but likely increasing
IQ – increasing
current TAH – Nunavut = 12

Subpopulation recommendations:

- Maintain current population abundance and review management objectives and TAH when the new inventory study is complete.

Appendix B VIII – Lancaster Sound (LS) subpopulation status

Brief history

The subpopulation estimate of 2,541 is based on an analysis of both historical and current mark-recapture data up to 1997. This estimate is considerably larger than a previous estimate of 1,675 that included Norwegian Bay. Currently, there are no data available to assess the population size.

Current status: 2,541 bears (1998)
Science – stable
IQ – n/a
current TAH – Nunavut = 85

Subpopulation recommendations:

- Maintain current population abundance and review management objectives and TAH when a new inventory study is complete.

Appendix B IX – Kane Basin (KB) subpopulation status

Brief history

The size of the subpopulation was estimated to be 164 bears, based on a mark-recapture study undertaken between 1994 and 1998. The small population was believed to be in decline due to overharvesting, and a collaborative study between Greenland and Nunavut was begun in 2011 to examine population boundaries and abundance. The final year of a genetic mark-recapture study was completed in the spring of 2014. A new estimate will be available in 2016.

Current Status: 164 bears (1997)

Science – reduced
IQ – stable
current TAH – Nunavut = 5
Greenland = 3

Subpopulation recommendations:

- Maintain current population abundance and review management objectives and TAH when the new inventory study is complete.
- Re-assess population boundaries between BB and KB
- Work closely with Greenland to ensure that a sustainable harvest occurs

Appendix B X – Norwegian Bay (NW) subpopulation status

Brief history

The current (1993-97) estimate is 203. Data collected during mark-recapture studies and from satellite radio tracking of adult female polar bears, indicate that most of the polar bears in this subpopulation are concentrated along the coastal tide cracks and ridges along the north, east, and southern boundaries. This population is genetically distinct compared to other polar bear populations.

Current status: 203 bears (1998)
Science – data deficient
IQ – n/a
current TAH – Nunavut = 4

Subpopulation recommendations:

- Maintain the current population abundance and review management objectives and TAH when the new inventory study is complete.

Appendix B XI – Viscount Melville Sound (VM) subpopulation status

Brief history

The current subpopulation estimate of 161 was based on a mark recapture survey completed in 1992. GNWT is currently completing a mark-recapture study and a new estimate should be available in 2017.

Current status: 161 bears (1992)
Science – data deficient
IQ – increasing
current TAH – Nunavut = 3
– NWT = 4

Subpopulation recommendations:

- Maintain the current population abundance and review management objectives and TAH when the new inventory study is complete.

- Increase cooperation among all jurisdictions that share this population to ensure a sustainable harvest.

Appendix B XII – Northern Beaufort Sea (NB) subpopulation status
Brief history
The 1998 subpopulation estimate was 1,200 bears. A 2006 mark-recapture survey suggested that the size of the NB subpopulation has remained stable at approximately 980 bears.

Current status: 980 bears (2006)
Science – stable
IQ – increasing
current TAH – Nunavut = 6
– NWT = 71

Subpopulation recommendations:
- Maintain the current population abundance and review management objectives and TAH when the new inventory study is completed.
- Increase cooperation among all jurisdictions that share this population to ensure a sustainable harvest.

Appendix C – Flexible quota system

Rationale and administration of the flexible quota system

INTRODUCTION
The flexible quota system for polar bears assumes that the annual maximum sustainable yield of males and females for a given population has been divided among the communities that share the population. Each community receives its share of the maximum sustainable harvest of males and females as an annual baseline allocation. For polar bears, the maximum harvest that can be sustained is realized when the harvest is two males for every female. However, not every community can harvest exactly two males per female every year. In some years, the full allocation may not be taken. In other years, the kill may exceed the annual base allocation of males or females. The flexible quota calculation takes these variations into account:

1) Any “credits” from previous years when not all the bears were harvested,

2) The total number of males killed or removed from the population, and;

3) The total number of females killed or removed from the population.

ADMINISTRATION/ACCOUNTING
The flexible quota system is nothing more than a system for administering the portion of the total population maximum sustainable yield. First, the sustainable yield of males and females for a given population must be identified. If a subpopulation has management

objective that requires a TAH to be above the maximum sustainable yield to reach a specific objective then that must first be identified. Then the base annual allocation for each subpopulation is established and the flexible quota system is used to adjust the TAH as required to keep the harvest within the management objective.

Simulation modelling has shown that, for polar bear populations, about twice as many males as females can be harvested. The sustainable number of females is defined as the number that can be removed without causing a decline in the number of females in the population (generally considered to be approximately 1.5 % of the population). However, it is different for the males. Because the males do not produce the cubs, twice as many can be taken. A 2M:1F harvest sex ratio does reduce the number of males in the population to about 70% of the number that would be present if the harvest were unselective. The mean age of the males in the population is also reduced by about two years. However, this has the effect of focusing the harvest on younger males in the more abundant age classes. We assume that the females can still find mates and that younger bears mate just as successfully as older bears. The available data support this. There is no evidence of diminished reproduction, even in populations where it is clear that over-harvesting has depleted the males. Males are reproductively mature by the time they are between 4 and 5 years old, and on average females are only available to mate every two years because of extended parental care.

The annual base allocation value is an annual allotment that does not vary. However, if a community over-harvests either males or females in a given year, that over-harvest must be compensated for by reducing the annual actual allocation.

The actual sex ratio is only taken into consideration when the kill of females has exceeded the sustainable number (i.e., the actual allocation for that year). The reason is to avoid penalizing a community that shuts down the harvest when the last female has been taken. It is the number of bears taken that really matters. The proportion of females in the harvest is only an indication of what the sex ratio for the next year will be. As long as a community has not exceeded the allowable kill of males or females, there is no reduction in TAH, regardless of the sex ratio of the kill.

Credit is given for any unused current allocation of males and females. The credits can be either male or female. Credits are specific to a given subpopulation and cannot be used for other subpopulations. Credits shall be administered by the responsible RWO and the RWO shall make the allocation of credits as appropriate. If a female credit is requested, there must be a male credit available to exchange, because there cannot be more negative male credits than positive female credits. It is sustainable to over-harvest the males as long as an equivalent number of females is under-harvested. As long as there is at least one positive female credit for each negative male credit, there is no reduction to the TAH. This means that as long as the total TAH is not exceeded, and as long as the females are not over-harvested, the TAH for the following year will stay at the maximum base allocation.

Credits are a special case because they represent individuals that were not taken, so they are in addition to the estimated population. Credits are administered separately. Credits

accumulate until the next population inventory, and then they are zeroed because the total population is taken into effect when a new TAH is determined.

1. All human-caused mortality to polar bears will be taken from the TAH of the nearest community. In the event that the human-caused mortality exceeds the TAH, extra tags will be issued and the TAH for the following year will be correspondingly reduced in line with the flexible quota system.

2. A naturally abandoned cub will be counted as a natural death and not counted against the TAH.

3. Any bear that is found near death can be killed as a humane action and, once the Conservation Officer has certified that the bear was near death, the humane kill will not be counted against the TAH.

4. When a Nunavut beneficiary kills a bear, the tag will come from that person's home community if that community has a TAH in the population that the bear was harvested from. Otherwise, the nearest community must provide the tag.

5. When a female with cubs, yearlings, or juveniles is killed, the cubs, yearlings and juveniles are also regarded as killed (even if they run away). For TAH determination purposes, the cubs and yearlings are counted as males and only ½ tag each. The juveniles are counted as whole tags of whatever sex they are. If the cubs run away after the female is killed, the cubs are counted as ½ tag and all male, however the yearlings and the juveniles are each counted as whole tags and the sex is counted as ½ male and ½ female.

6. If credits are available, they may be used to address all types of kills, including accidental, illegal, and defence kills.

7. If a community shuts down its harvest after exceeding the maximum allowable females, the unused tags are counted as harvested males **for calculating the proportion of females only** so as not to penalize the community for shutting down the harvest before filling all the tags. If a community does not exceed the current allocation for females, for TAH calculation purposes the harvest sex ratio is assumed to be 0.33 (i.e., 2 males:1 female).

8. Subpopulation credits accumulate until the next population inventory results are final. Then all credits are set back to zero because the new TAH is based on the new population information, and the entire sustainable take is allocated to the new TAH. Any credits will be realized as TAH increases if the population information was accurate and the credits are not used. The communities then resume collecting credits from the new start, as before.

Appendix D – Research Schedule

Proposed schedule to conduct subpopulation status by scientific method and collection of IQ, as of 2016

Subpopulation	Previous survey year and method	Next survey year and method	Previous IQ survey	Proposed IQ survey
Baffin Bay	2011-2013 Genetic mark-recapture	2021 To be determined	2015	2022
Davis Strait	2005-2007 Mark- recapture	2017-18 Genetic mark-recapture	2007-2008	2018
Foxe Basin	2010-2011 Aerial survey	2017 Aerial survey	2008-2009	2018
Gulf of Boothia	1998-2000 Mark -recapture	2015-2017 Genetic mark-recapture	n/a	2017
Kane Basin	2012-2014 Genetic mark recapture and aerial survey	2021 To be determined	n/a	2024
Lancaster Sound	1997 Mark-recapture	2018-20 To be determined	n/a	2019
M'Clintock Channel	1998-2000 Mark-recapture	2014-2017 Genetic mark recapture	2002-2006	2016
Northern Beaufort Sea	2006 Mark-recapture	2019	n/a	TBD
Norwegian Bay	1998 Mark-recapture	2018 To be determined	n/a	2018
Southern Hudson Bay		2016 Aerial survey	2013	TBD
Viscount Melville	2012-2014 Mark-recapture	TBD	n/a	TBD
Western Hudson Bay and Southern Hudson Bay	2011 Aerial survey	2016 Aerial survey	2011-2012	2021

This schedule is tentative and assumes full availability of funds and human resources. The priorities and needs may shift over the coming years, which will affect timing of this schedule. TBD-To be determined

Appendix E - Literature Reviewed

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