Photo: Martyn Obbard

Polar Bear

(Ursus maritimus) in Ontario

Ontario Recovery Strategy Series

Recovery strategy prepared under the *Endangered Species Act, 2007*

Natural. Valued. Protected.

Ministry of Natural Resources

Ontario

About the Ontario Recovery Strategy Series

This series presents the collection of recovery strategies that are prepared or adopted as advice to the Province of Ontario on the recommended approach to recover species at risk. The Province ensures the preparation of recovery strategies to meet its commitments to recover species at risk under the Endangered Species Act (ESA) and the Accord for the Protection of Species at Risk in Canada.

What is recovery?

Recovery of species at risk is the process by which the decline of an endangered, threatened, or extirpated species is arrested or reversed, and threats are removed or reduced to improve the likelihood of a species' persistence in the wild.

What is a recovery strategy?

Under the ESA, a recovery strategy provides the best available scientific knowledge on what is required to achieve recovery of a species. A recovery strategy outlines the habitat needs and the threats to the survival and recovery of the species. It also makes recommendations on the objectives for protection and recovery, the approaches to achieve those objectives, and the area that should be considered in the development of a habitat regulation. Sections 11 to 15 of the ESA outline the required content and timelines for developing recovery strategies published in this series.

Recovery strategies are required to be prepared for endangered and threatened species within one or two years respectively of the species being added to the Species at Risk in Ontario list. There is a transition period of five years (until June 30, 2013) to develop recovery strategies for those species listed as endangered or threatened in the schedules of the ESA. Recovery strategies are required to be prepared for extirpated species only if reintroduction is considered feasible.

What's next?

Nine months after the completion of a recovery strategy a government response statement will be published which summarizes the actions that the Government of Ontario intends to take in response to the strategy. The implementation of recovery strategies depends on the continued cooperation and actions of government agencies, individuals, communities, land users, and conservationists.

For more information

To learn more about species at risk recovery in Ontario, please visit the Ministry of Natural Resources Species at Risk webpage at: **www.ontario.ca/speciesatrisk**

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Cette publication hautement spécialisée Recovery strategies prepared under the *Endangered Species Act, 2007*, *n'est disponible qu'en anglais en vertu du Règlement 411/97 qui en exempte l'application de la Loi sur les services en français. Pour obtenir de l'aide en français, veuillez communiquer avec Cathy Darevic au ministère des Richesses naturelles au 705-755-5580.*

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DECLARATION

The recovery strategy for the Polar Bear has been developed in accordance with the requirements of the *Endangered Species Act,* 2007 (ESA). This recovery strategy has been prepared as advice to the Government of Ontario, other responsible jurisdictions and the many different constituencies that may be involved in recovering the species.

The recovery strategy does not necessarily represent the views of all of the individuals who provided advice or contributed to its preparation, or the official positions of the organizations with which the individuals are associated.

The goals, objectives and recovery approaches identified in the strategy are based on the best available knowledge and are subject to revision as new information becomes available. Implementation of this strategy is subject to appropriations, priorities and budgetary constraints of the participating jurisdictions and organizations.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy.

RESPONSIBLE JURISDICTIONS

Ontario Ministry of Natural Resources
Environment Canada – Canadian Wildlife Service

EXECUTIVE SUMMARY

Polar Bears (*Ursus maritimus*) or *Wabusk* in Cree, are the largest terrestrial carnivores in the world and occur throughout the circumpolar Arctic of the northern hemisphere. The coastal areas of Hudson and James Bay in Ontario have approximately 900 individuals and these bears comprise the southernmost population of Polar Bears in the world. Polar Bears are listed as threatened on the Species at Risk in Ontario (SARO) List and as special concern under the federal *Species at Risk Act* (SARA).

The distribution of Polar Bears in Ontario is influenced primarily by two factors: the type and distribution of sea ice and the density and distribution of seals. While Polar Bears live on land during part of the year, they carry out several critical life functions such as feeding and mating on sea ice. Maternal denning sites, spring feeding areas and fall staging areas are the three most critical components of Polar Bear habitat. Spring feeding areas are on sea ice whereas denning sites and staging areas occur on land. Polar Bears are found in high densities along the Ontario coast of Hudson Bay and the western coast of James Bay north of Attiwapiskat during the ice free season, typically between mid-July and November. This area is critically important for staging and resting for males and non-pregnant females. For denning, Polar Bears in Ontario commonly use palsas, eskers, elevated beach ridges and peat banks within 120 kilometres inland of the coastline. Research indicates there is some fidelity to general denning areas, though not necessarily to individual dens.

The greatest threats to Ontario's Polar Bears are habitat alterations due to climate change and an increase in mortality resulting from human-bear interactions. Climate change will result in a loss of sea ice habitat and maternal denning habitat. These changes will have the greatest impact on the survival of cubs and older bears. A loss of habitat and food sources because of climate change will increase the number of human-bear encounters. These encounters can threaten the safety of both Polar Bears and humans. Although current harvest levels of Polar Bears appear to be sustainable, there is potential for the harvest to become unsustainable in the Southern Hudson Bay subpopulation.

The recovery goal for the Polar Bear in Ontario is to have a viable sub-population that can persist in a changing environment and supports traditional uses of Polar Bears by coastal Cree communities.

The recovery objectives are to:

- reduce the impact of global climate change within Ontario;
- identify, protect and adaptively co-manage Polar Bear habitat in Ontario;
- conduct research to fill knowledge gaps that will aid in the recovery and protection of Polar Bears and their habitat;
- maximize Cree and Ontario's participation in inter-jurisdictional Polar Bear management and research in the Hudson and James Bay eco-region;

- develop and implement effective monitoring strategies for Polar Bear, including community based monitoring;
- minimize incidental mortalities of Polar Bears;
- enhance communication and information sharing with coastal Cree communities and stakeholder groups on Polar Bear biology and management; and
- explore viable, sustainable and complementary activities to existing traditional harvesting of Polar Bear.

It is recommended that the Ontario coastline from the Manitoba border to Ekwan Point in James Bay, and extending 5 kilometres inland, be prescribed as habitat in the habitat regulation for Polar Bears under the *Endangered Species Act, 2007*. The community of Fort Severn, including a 5 kilometre area around it, should be excluded from the area prescribed in the habitat regulation since this represents unsuitable habitat for Polar Bears due to human development (i.e., housing and community infrastructure, airport and landfill).

Beyond the coastline, active dens and features that are unoccupied but appear suitable for denning should also be prescribed as Polar Bear habitat. Palsas over 1.5 metres tall, eskers, elevated beach ridges and peat banks surrounding lakes within 120 kilometres of the coast should be prescribed as habitat. It is also recommended that 500 metres around active dens also be prescribed as Polar Bear habitat so as to minimize the potential for den abandonment. The area between the Winisk and Severn Rivers is of particular importance for denning due to the high density of suitable palsas in the area.

The habitat needs for Polar Bears are expected to shift with a changing climate. Their reliance on terrestrial areas is expected to increase with earlier melting of sea ice in summer and later forming of sea ice in fall. Key aspects of the terrestrial habitat that are expected to change are the melting and inability of palsas to form and an increase in the frequency and intensity of wildfires. Therefore, it is recommended that the use of habitat by Polar Bears be reviewed every fifteen years with scientific experts and coastal Cree communities.

Guidance from coastal Cree communities based on their unique knowledge, perspectives and practices will be important to Polar Bear protection and recovery activities. In implementing the recommendations of this recovery strategy, Ontario should be mindful of Aboriginal and treaty rights protected under section 35 of the *Constitution Act, 1982* and meet any obligations to consult with Aboriginal peoples where its actions may adversely affect an established or asserted Aboriginal or treaty right.

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1.0 BACKGROUND INFORMATION

1.1 Species Assessment and Classification

COMMON NAME: Polar Bear

SCIENTIFIC NAME: *Ursus maritimus*

SARO List Classification: Threatened

SARO List History: Threatened (2009), Special Concern (2004)

COSEWIC Assessment History: Special Concern (2008, 2002, 1999, 1991), Not at Risk (1986)

SARA Schedule: Schedule 1, Special Concern (2011)

CONSERVATION STATUS RANKINGS:

GRANK: G3	NRANK: N3	SRANK: S3

The glossary provides definitions for the abbreviations above.

1.2 Species Description and Biology

Species Description

Polar Bears (*Ursus maritimus*) or *Wabusk* in Cree, are the largest terrestrial carnivores in the world and the largest species in the bear (Ursidae) family (Stirling 1988; Stirling 1992). There is marked sexual size dimorphism in Polar Bears, with males weighing up to 800 kg and reaching 2.6 m in total length[1] (DeMaster and Stirling 1981, Derocher et al. 2005) and females up to 400 kg and 2.5 m in length (Amstrup 2003).

Polar Bear fur lacks pigment, but appears white because their hairs reflect light (DeMaster and Stirling 1981). During summer months Polar Bear coats often appear yellow or off-white due to oxidation from the sun or staining (DeMaster and Stirling 1981). Polar Bears have black skin which may help to absorb heat from the sun (Stirling 1988). Polar Bears are further distinguished from other bear species by their more elongated body, long neck, small ears, narrow head and snout, and by the elevated cusps on their molariform teeth (Stirling 1988).

[1] standard total length measurements for mammals are nose tip to tail tip

Species Biology

Polar Bears have been described as sea-ice obligates – depending on sea ice for feeding, breeding, and movement (Gleason and Rhode 2009). In more northern regions Polar Bears can forage year round on ice floes. In their southern range Polar Bears are forced on shore during an ice free season (usually mid-July until November). The Southern Hudson Bay sub-population[2] is considered the most southern population of Polar Bears in the world, and is required to seek summer refuge on the Ontario mainland on the southern shores of Hudson Bay, or islands in James Bay. They are strong swimmers (Stirling 1988, Ferguson et al. 2001, Amstrup 2003, Gleason and Rode 2009, Regehr et al. 2010), but are rarely seen swimming far from land or ice [ranging from 4.9-75.3 km and 22-349 km respectively (Monnett and Gleason 2006)].

Polar Bears are the most carnivorous of all bear species (Stirling 1988). Their primary prey are Ringed and Bearded Seals (*Pusa hispida* and *Erignathus barbatus*, respectively) (Stirling 1974, Stirling and McEwan 1975, Smith 1980, Stirling and Øritsland 1995, Derocher et al. 2002, Thiemann et al. 2008, Cherry et al. 2011), although other marine prey have been documented (Russell 1975, Smith 1985, Calvert and Stirling 1990, Smith and Sjare 1990, Stirling and Øritsland 1995, Reynolds and Rommel 1999, Derocher et al. 2002, Dyck and Kebreab 2009). Thiemann et al. (2008) found that the diet of Southern Hudson Bay Polar Bears is primarily Ringed Seals (over 80%) followed by smaller proportions of Bearded and Harbour Seals (*Phoca vitulina*) (10–15%). The density of Ringed Seals has been shown to be positively correlated with Polar Bear density (Stirling and Øritsland 1995).

When on land, Polar Bears rely largely on fat reserves for energy. However, their diet is supplemented with terrestrial food sources including a variety of berries, American Beaver *(Castor canadensis),* Canada Goose (*Branta canadensis*) and Snow Goose (*Chen caerulescens*) (Russell 1975, Derocher et al. 1993, Kakekaspan et al. 2010, Lemelin et al. 2010). Although there are some exceptions, it appears that little terrestrial food is incorporated into Polar Bear tissues (Ramsay and Hobson 1991, Hobson and Stirling 1997, Hobson et al. 2009, Peacock et al 2010).

Although Polar Bears hunt throughout the year, techniques and rates of success vary depending on the season (COSEWIC 2008). They are most active during spring and early summer when seals, particularly juveniles, are most abundant on the sea ice. Ringed Seals construct birth lairs by excavating snowdrifts that develop over breathing holes. Pups are born from late March to early April (Smith 1987). Although the snow structures conceal Ringed Seals from other predators, Polar Bears detect lairs by smell and dig into them to capture seals and pups (Smith and Stirling 1975, 1978). During winter, when juvenile seals are less abundant, Polar Bears are less active, probably as a means of conserving energy (Ferguson et al. 2001). In summer and autumn when

[2] Note: There are 19 different Polar Bear populations world-wide (explained in full in section 1.3). In Ontario, most Polar Bears belong to the Southern Hudson Bay sub-population with a small percentage belonging to the Western Hudson Bay sub-population (Figure 1).

Hudson Bay is ice free, Hudson Bay Polar Bears[3] move onto the mainland and Akimiski Island (Nunavut), where seals are generally thought to be inaccessible. However, there are observations of Polar Bears successfully hunting seals from the Hudson Bay shores (George Kakakespan pers. obs). During ice-free periods when Polar Bears cannot access seals, they must largely rely on fat reserves for approximately four to five months until freeze up occurs. Pregnant females are food deprived for eight months while they remain on land in maternal dens where they nurse their young (Ramsay and Stirling 1986, Peacock et al. 2010). They remain in these dens until the cubs are large enough to travel onto sea ice in late February through late March (Ramsay and Stirling 1986, Peacock et al. 2010).

Polar Bears are long-lived and have a low rate of reproduction (Simmond and Isaac 2007). Mating occurs from late March to late May when females come into estrus (Reynolds and Rommel 1999). Implantation of the fertilized egg is delayed until late September to early October (Derocher et al. 1992) when pregnant females move to dens on land; the rest of the population (males, subadult and non-breeding females with offspring) remains active (COSEWIC 2008). Active gestation lasts about 60 days with cubs being born between late November and early January (Derocher et al. 1992, Obbard pers. comm. 2010). At birth, cubs weigh on average 0.6 kg and are covered in extremely fine hair with their eyes closed (COSEWIC 2008). Almost 70 percent of litters consist of two cubs, 25 to 30 percent are singletons, and small percentages are triplets (Ramsay and Stirling 1988). Cubs are nursed inside the den and remain with their mothers until they are two-and-a-half years of age (Amstrup 2003).

Female Polar Bears in Hudson Bay become sexually mature after four or five years and produce cubs at age five or six (Stirling et al. 1980, 1984, Furnell and Schweinsburg 1984, Ramay and Stirling 1988). Upon reaching sexual maturity, females generally reproduce once every three years (Reynolds and Rommel 1999). Males are thought to become reproductively mature between the ages of 8 and 10 years (Ramsay and Stirling 1988, Derocher and Stirling 1998). Polar Bears can live up to 25 years; however there is evidence their ability to reproduce declines after age 20 (Ramsay and Stirling 1998).

Throughout most of the year, Polar Bears are solitary, except for females accompanied by cubs or yearlings. The large home ranges of individuals may overlap but they do not defend territories (Ferguson et al. 1999, Parks et al. 2006). The adult sex ratio is 1:1 in un-harvested populations (COSEWIC 2008) but most populations in Canada are skewed towards more females due to hunting pressures on males (Derocher et al. 1997). As females generally reproduce once every three years, only a third of the adult females are sexually receptive in each breeding season. This can result in intense competition between males for mates (Derocher et al. 2010). In Ontario, the Polar Bear is protected under the *Endangered Species Act, 2007* (ESA). Polar Bears are also protected under the *Ontario Fish and Wildlife Conservation Act*, 1997, and there is no hunting or trapping season. Under Treaty 9, First Nation people residing along the

[3] Polar bears in Hudson Bay are assigned to three sub-populations, Foxe Basin (FB), Western Hudson Bay (WH), and Southern Hudson Bay (SH).

Hudson Bay and James Bay coast are permitted to harvest Polar Bears, including females with cubs and bears in dens.

Other than humans, Polar Bears do not have predators. However, they can be cannibalistic, occasionally killing cubs, yearlings and adult females, although the extent and population impact of this behaviour has not been well quantified (Derocher and Wiig 1999, Dyck and Daley 2002, Amstrup et al. 2006).

To date, a variety of diseases and parasites have been recorded to affect Polar Bears. Polar Bears are especially susceptible to the parasitic roundworm *Trichinella*, which they contract by feeding on infected seals (Forbes 2000). *Trichinella* larvae are commonly found in muscle tissue but can be found in various other parts of their body. If enough larvae encyst in one area, such as the heart, the tissue becomes severely damaged and death may result (Forbes 2000). Other illnesses known to affect Polar Bears, although less common, include bacterial leptospirosis, rabies and morbillivirus (Taylor et al. 1991, Garner et al. 2000, Quakenbush et al. 2009). Contaminants in Arctic ecosystems (expanded upon in Section 1.5) can further compromise the health of Polar Bears and have been purported to make Polar Bears more susceptible to disease and parasites (Sonne 2010).

Studies on the impact of indirect effects of climate change on wildlife health suggest that the overall health of an individual animal is the result of complex interactions among immune status, body condition, pathogens and their pathogenicity, toxicant exposure, and the various environmental conditions that interact with these factors (Burek et al. 2008). See Section 1.5 for more details on threats to Polar Bear populations.

1.3 Distribution, Abundance and Population Trends

Polar Bears range throughout the circumpolar Arctic of the northern hemisphere. They are generally limited to marine environments where the sea is ice-covered most of the year (Amstrup 2003). The distribution of Polar Bears generally responds to changes in the type, quality and extent of sea ice cover (Amstrup 2003). The current global distribution is thought to correspond to the historic distribution (COSEWIC 2008) with the exception of some recently noted shifts in the Western Hudson Bay subpopulation (Towns et al. 2010). Shifts in population ranges have been linked to changes in sea ice cover – both timing of ice formation, ablation, type of ice and percent cover (Gleason and Rode 2009, Towns et al. 2010).

The International Union for Conservation of Nature/Special Survival Commission (IUCN/SSC) Polar Bear Specialist Group has identified 19 different sub-populations of Polar Bears in the Arctic, covering five countries: Canada, United States of America (Alaska), Russia, Norway (Svalbard) and Greenland (Figure 1). Boundaries of the Southern Hudson Bay subpopulation are based on observed movements of marked bears, tag returns from harvested animals, capture and recapture studies as well as radio and satellite telemetry studies (Kolenosky and Prevett 1983, Kolenosky et al.

1991, Taylor and Lee 1995, Bethke 1996, Taylor et al. 2001). Genetic studies have documented gene flow between all sub-populations, even over thousands of kilometres (Paetkau et al. 1995, Paetkau et al. 1999, Cronin et al. 2006, Crompton et al. 2008), which is likely a result of large home range sizes, high mobility and variations in sea ice and seal distributions. However, recent analysis of the most southerly sub-populations in Hudson Bay and James Bay (Foxe Basin, Davis Strait, Western Hudson Bay and Southern Hudson Bay) has revealed greater genetic differences in the James Bay group than previously thought, suggesting some degree of site fidelity to on-ice breeding areas (Crompton et al. 2008).

The current overall global abundance estimate is 20,000 to 25,000 individuals (Obbard et al. 2010). The Canadian population is currently estimated at 15,000 (Lunn et al. 2002, COSEWIC 2008). Thirteen of the nineteen sub-populations occur either wholly or partially in Canada, ranging from the Ontario shores of James Bay north to Ellesmere Island, Nunavut, and from northern Yukon in the west to Labrador in the east (Figure 2) (COSEWIC 2008, OMNR 2008, York 2009).

Ontario Polar Bears are the most southern breeding in the world (Obbard et al. 2007, Regehr et al. 2007, OMNR 2008) and are primarily from the Southern Hudson Bay sub-population with a small portion of the Western Hudson Bay sub-population in the northwestern corner of the province. They occur over James Bay and Hudson Bay in winter and are found within the traditional territory of the Cree of Ontario and Quebec and the Inuit of the Belcher Islands during the summer (Figure 3) (COSEWIC 2008, OMNR 2008, IUCN 2010, Lemelin et al. 2010, Peacock et al. 2010). They are regularly seen in the areas of Fort Severn, Peawanuck and Attawapiskat and are only occasionally seen in southern James Bay near the communities of Kashechewan, Fort Albany, Moosonee and Moose Factory (COSEWIC 2008, OMNR 2008, IUCN 2010a, Lemelin et al. 2010, Peacock et al. 2010)

The Western Hudson Bay sub-population is estimated at 1,000 individuals with shared management responsibility with Manitoba and Nunavut. The Southern Hudson Bay subpopulation is estimated at about 900 individuals (Obbard et al. 2007). Data suggest that gene flow occurs among the Foxe Basin, Davis Strait, Western Hudson Bay and Southern Hudson Bay sub-populations (Figure 2) (Crompton et al. 2008).

The Western Hudson Bay sub-population has experienced a decline of 22 percent from 1,194 individuals [95% Confidence Interval (CI) = 1,020 - 1,368] in 1987 to 935 individuals [CI = 794 - 1,076] in 2004 (Regehr et al. 2007). Population numbers for reproductive adults from the Western Hudson Bay sub-population are thought to be stable because they have better body conditions (measured as mass of fat and skeletal muscle relative to body size) than older and younger age classes, and thus are better able to sustain themselves in times of nutritional stress (Regehr et al. 2007).

Population estimates for the Southern Hudson Bay sub-population have remained relatively unchanged over the past 20 years. Theories on why the number of individuals are stable include: that harvest levels were at sustainable levels during the 1990s and

2000s and changes in sea ice distribution and duration have not happened as rapidly in the range of the Southern Hudson Bay sub-population as it has for the Western Hudson Bay sub-population; and that Polar Bears are long-lived animals so changes due to declining resource availability may be detected at the individual level before they are detectable at the population level (see Regehr et al. 2007 for example). Combined, these theories may explain why no change in abundance has been detected between the 20 year sampling period (Obbard pers. comm.).

While there has been no observed population decline in the Southern Hudson Bay sub-population, a significant decrease in overall body condition has been documented in all age and sex classes [2000–2005: Body Condition Index (BCI) = +0.03±0.03, n = 450; 1984–86: BCI = +0.84±0.04, n = 298 (Obbard et al. 2006)]. Also, despite the sub-population remaining relatively unchanged, the survival rates for all age and sex classes has decreased [subadults and adult females were 94% (95% CI = 68%, 100%) in 1984-1985 to 89% (95% CI = 79%, 99%) in 2003-2005; subadults and adult males were 88% (95% CI = 77%, 100%) in 1984-1985; 81% (95% CI = 66%, 96%) in 2003-2005 (Obbard et al. 2007)[4]]. Due to this decrease in body condition, and the documented declines in survival, this sub-population is thought to be at an ecological "tipping point," and is predicted to undergo a rapid decline in the near future (Obbard pers. comm. 2010).

The community of Fort Severn has reported an increase in Polar Bear sightings and encounters in recent years (Miles pers. comm. 2010). The Peawanuck First Nation has reported seeing fluctuating population numbers through the years (community meeting with Chris Chenier 2010). Observations of an increasing population are consistent with other jurisdictions such as Nunavut (Dowsley 2007). Theories for the reported increase include: an increasing population (Miles pers. comm. 2010); immigration from adjacent sub-populations; increased hunting ranges by coastal Cree community members [i.e., people covering more ground and in turn seeing more bears (Lemelin pers. comm. 2010)]; and habitat changes due to climate change [e.g., location of the first ice floes in the fall may have changed the distribution of where Polar Bears are observed (Dowsley 2007)].

[4] Imprecision by overlap of the confidence intervals in this study could not conclude whether declines in survival were not a chance occurrence.

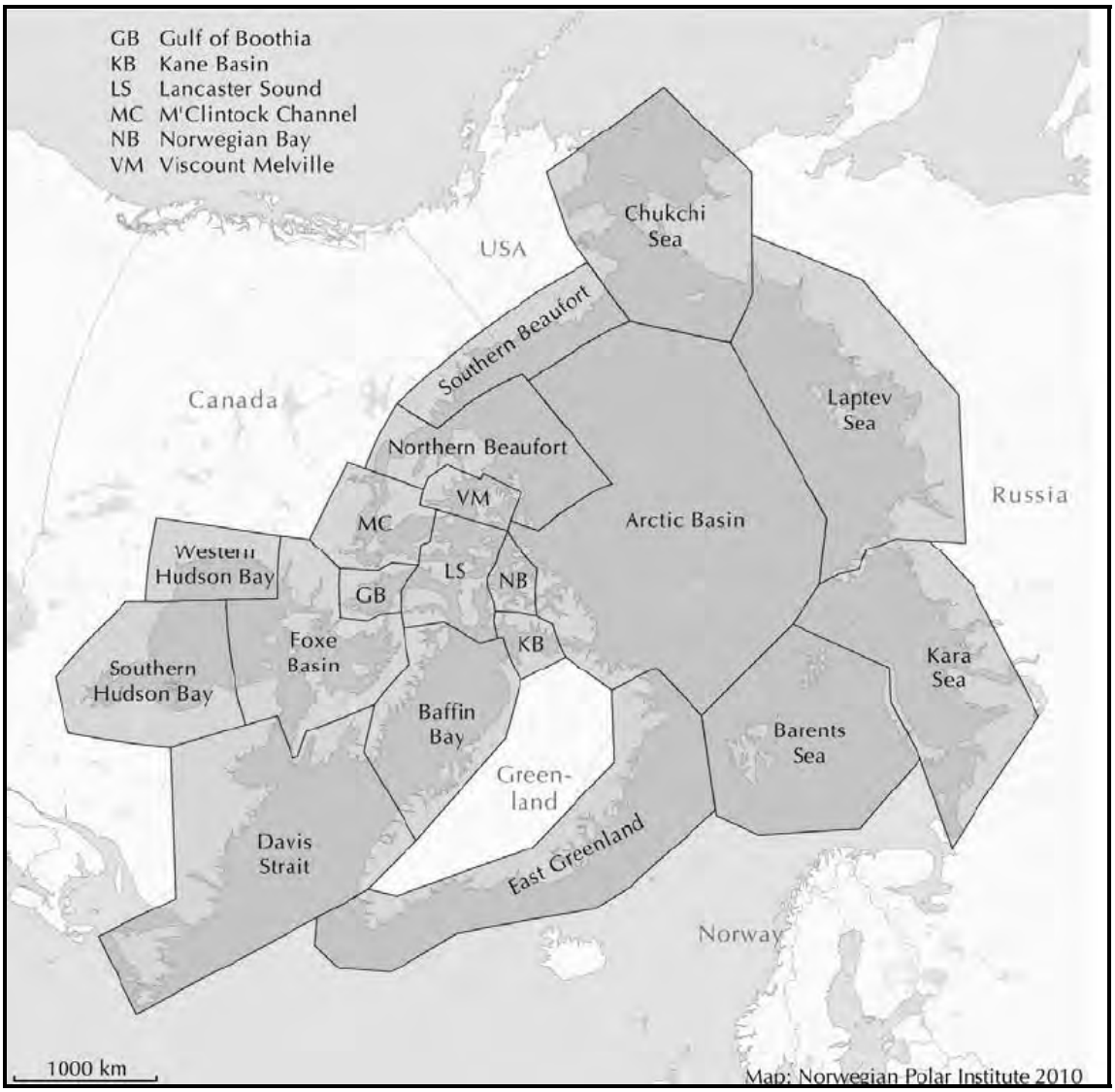

Figure 1. Global distribution of Polar Bear Sub-populations.
Abbreviations include: Gulf of Boothia (GB), Kane Basin (KB), Lancaster Sound (LS), M'Clintock Channel (MC), Norwegian Bay (NB), Viscount Melville Sound (VM) (Obbard et al. 2010 [used with permission]).

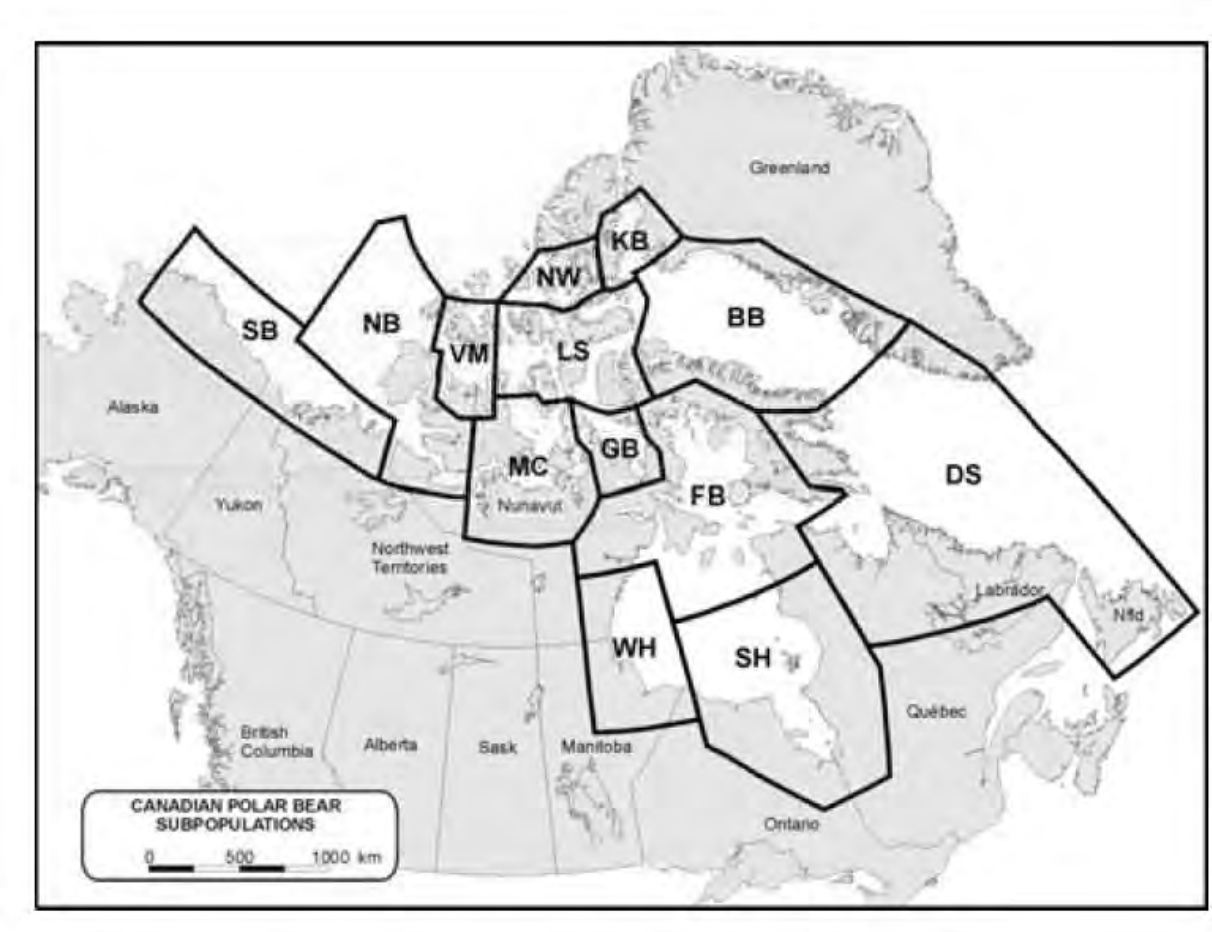

Figure 2. Canadian distribution of Polar Bear sub-populations. Abbreviations include: Baffin Bay (BB); Davis Strait (DS); Foxe Basin (FB); Gulf of Boothia (GB); Kane Basin (KB); Lancaster Sound (LS); M'Clintock Channel (MC); Northern Beaufort Sea (NB); Norwegian Bay (NW); Southern Beaufort Sea (SB); Southern Hudson Bay (SH); Viscount Melville Sound (VM); Western Hudson Bay (WH) (Obbard et al. 2010 [used with permission]).

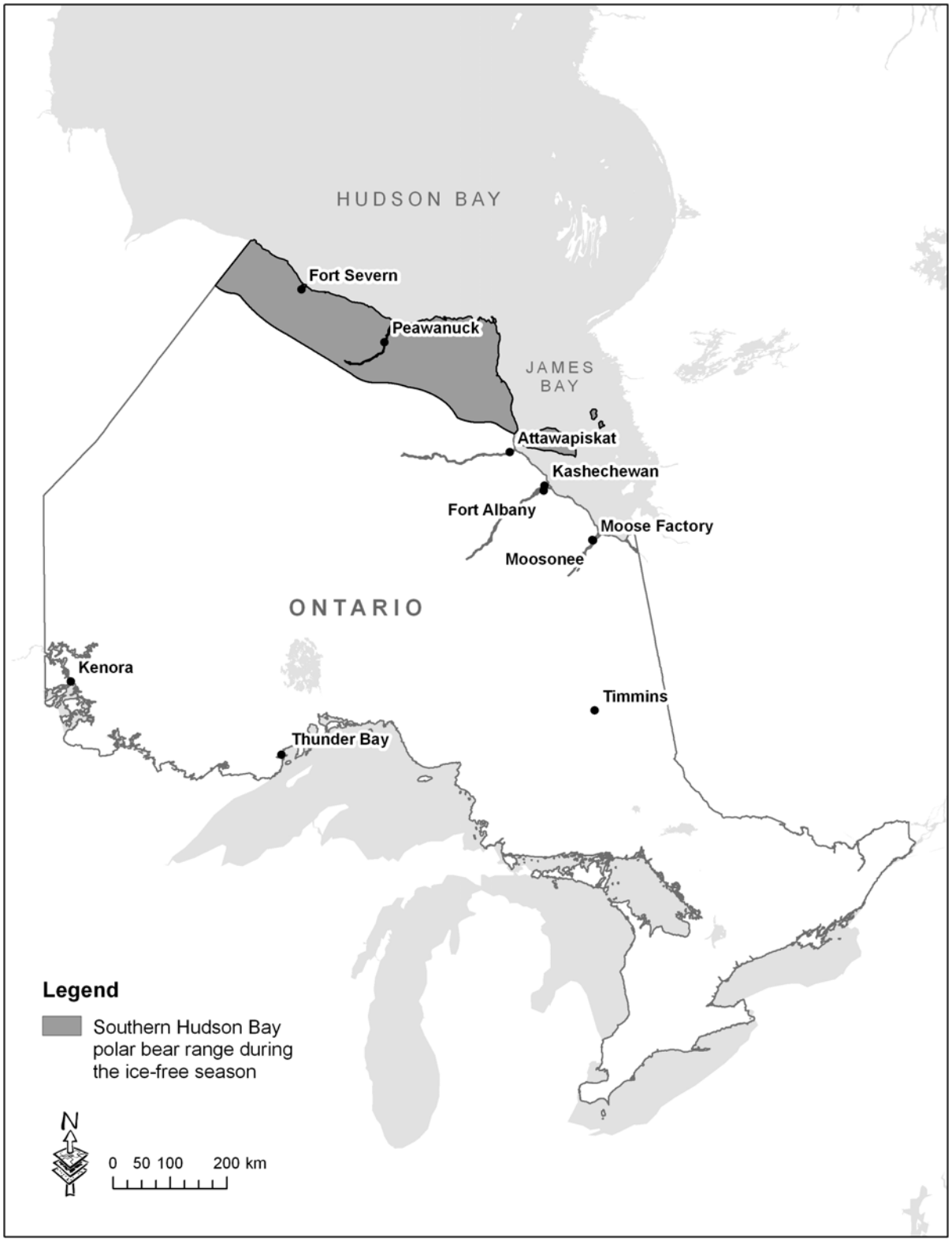

Figure 3. Current distribution of Polar Bears in Ontario (adapted from OMNR 2008).

1.4 Habitat Needs

The distribution of Polar Bears in Ontario is primarily influenced by two factors: the type and distribution of sea ice and the density and distribution of seals (COSEWIC 2008). Polar Bears live on land during part of the year, but they carry out critical life functions such as feeding and mating on sea ice (Stirling and Smith 1975, Pomeroy 1997, Stirling 1997, Amstrup 2003). Polar Bears are found in the highest densities on sea ice, shore leads (the open area between the pack ice and shore) and polynyas (open areas of water surrounded by sea ice) where active sea ice and higher primary productivity attract prey (Amstrup 2003). There is evidence for a high degree of site fidelity to terrestrial areas used during the summer and some degree of site fidelity to on-ice mating areas (Derocher and Stirling 1990, Crompton et al. 2008, Towns et al. 2010).

Although home range size varies between individuals, Polar Bears in northern populations (Northern and Southern Beaufort Sea sub-populations) typically have larger home ranges (greater than 600,000 km^2) (Derocher unpub. data) and spend almost all of their time on multi-year sea ice (Ferguson et al. 2000, Mauritzen et al. 2001, Towns et al. 2010). Polar Bears in the Southern Hudson Bay sub-population have considerably smaller home ranges (166,000 km^2) that encompass land and sea ice (Parks et al. 2006). Smaller home ranges are most likely related to the unique aspect of Hudson Bay being ice-free for extended periods. The most southerly Polar Bears in James Bay have even smaller ranges of 45,000 km^2 (Obbard unpub. data 2010).

Females with cubs and subadults appear to avoid or at least minimize interactions with adult males, to decrease the chance of predation; as such they are typically associated with different habitat types (Amstrup et al. 2006). During the ice-free season males are frequently observed along coastal shorelines, whereas females and subadults are often found inland (Derocher and Stirling 1990, Lemelin et al. 2010, Towns et al. 2010). In Ontario, pregnant females typically den on land within 50 km of the coast (Kolenosky and Prevett 1983, Peacock et al. 2010) due to the availability of preferred natural denning features (listed below), but have been known to travel 120 km inland (OMNR 2008). One female was observed over 340 km inland (Obbard pers. comm. 2010). Coastal Cree harvesters have reported Polar Bears traveling up to 200 km inland into the muskeg during ice-free periods (Lemelin et al. 2010).

Maternal denning sites, spring feeding areas and staging areas are the three most critical components of Polar Bear habitat (Harington 1968, Stirling et al. 1984, Stirling 1990, Obbard and Walton 2004). Spring feeding areas are on sea ice whereas denning sites for Ontario sub-populations occur on land (Peacock et al. 2010). Aside from the regular use of dens by females with cubs, dens are occasionally used by solitary males and females during unfavourable weather (COSEWIC 2008). Southern Hudson Bay Polar Bears are found in high densities along the Ontario coast of southern coast of Hudson Bay and western coast of James Bay north of Attiwapiskat, during the ice-free season, typically between May and December. This area is important for staging and resting for males and non-pregnant females as they wait for freeze-up to occur.

In Ontario pregnant Polar Bears construct maternal dens in treed areas, peat banks along the edges of creeks, rivers and lakes adjacent to open lichen tundra sites, gravel ridges and palsas greater than 1.5 m in height (Kolenosky and Prevett 1983, Obbard and Walton 2004, OMNR 2008). Successful denning requires a sufficient amount of snow accumulation to ensure the den remains covered for the majority of the winter. In Hudson Bay, the denning time period is generally from November through to March (Richardson et al. 2005). Individual females demonstrate fidelity to general denning areas, though not necessarily to individual dens (Ramsay and Stirling 1990, Richardson et al. 2005).

1.5 Threats to Survival and Recovery

Threats to Polar Bears in Ontario were identified based on modified International Union for Conservation of Nature (IUCN 2010b) threat categories[5] to ensure the full spectrum of potential threats were considered, and to facilitate comparisons with Polar Bear recovery planning documents from other jurisdictions. The identification and assessment of threats included both threats currently facing Polar Bears in Ontario and potential threats which could affect populations in the next 5 to 10 years and beyond.

Threats to Polar Bears rarely act in isolation. Polar Bears are exposed to threats linked to multiple human activities, land uses and climate change that directly or indirectly affect habitat and populations. Though many of the identified threats in this section do not pose a serious and immediate threat on their own, their combined or cumulative effects can have a more significant impact. Many of the threats to Polar Bears are also highly linked. For example, mineral exploration and consequently road development may directly reduce habitat available to Polar Bears, but it is also an underlying cause in increasing the threat of human-bear interactions which may result in more problem bears and more bear deaths.

Cumulative impacts can be difficult to quantify and predict, particularly when they are caused by a combination of land use, human activities and climate change. Overall, the greatest threats to Polar Bear are habitat alterations due to climate change and an increase in human-bear interactions (Table 1). Human-bear interactions are predicted to increase because of the impacts of climate change, such as a reduction in sea ice and consequently more time spent on land and increased development pressures.

[5] International Union for Conservation of Nature IUCN categories were developed “to improve objectivity and transparency in assessing the conservation status of species, and ultimately to improve consistency and understanding among users” (IUCN Standards and Petitions Subcommittee 2010b).

Table 1. Threats to Polar Bear survival and recovery in Ontario

Threat	Very High	High	Medium	Low
Habitat alterations due to Climate Change and Severe Weather				
• Reduction of mating and primary feeding habitat through loss of sea ice	X			
• Loss of permafrost, peat and maternal den sites in terrestrial habitats	X			
• Loss of prey species - Reduction and alteration of prey habitat	X			
• Alteration of land and sea-based habitat from temperature extremes	X			
• Higher energetic requirements from heat and extreme wind events		X		
• Increased fire events			X	
Bear-Human Interactions				
• Increased human-polar bear conflicts and damage to property		X		
Natural Resource Exploration and Production				
• Oil and gas exploration and production			X	
• Mining development and exploration			X	
• Wind turbines/Wind farm development				X
• Hydroelectrical development				X
Marine Transportation and Commercial Fishing				
• Shipping lanes within Polar Bear sea ice habitat			X	
• Incidental or accidental mortality from fishing and harvesting aquatic resources				X
Terrestrial Transportation and Service Corridors				
• Seasonal and permanent roads				X
Marine and Airborne Pollutants				
• Contaminants including Persistent Organic Pollutants (POPs), mercury and, hexachlorocyclohexanes (HCHs), perfluorochemicals (PFC), and Polychlorinated biphenyls (PCBs), etc.			X	
• Oil Spills			X	
Biological Resource Use				
• Potential for unsustainable harvest of Polar Bears[6]			X	
• Poaching				X
Cumulative Effects of Threats				
• Cumulative effects of combinations of threats	X			

[6] Note: Current harvest rates in Ontario are considered sustainable.

Climate Change and Severe Weather

Reduction of Mating and Primary Feeding Habitat through Loss of Sea Ice

Effects of climate change are considered the most significant threat to Canadian Polar Bear sub-populations (Stirling and Parkinson 2006, Durner et al. 2009, Hunter et al. 2010). Research suggests that by the mid-21st century, two-thirds of the world's Polar Bear sub-populations will be extirpated, mainly due to loss of sea ice as a direct result of climate warming (Amstrup et al. 2009). In Hudson Bay, later freeze-up dates and earlier thawing result in shorter periods of on ice activity. Climate change models estimate that the Southern Hudson Bay and Western Hudson Bay sub-populations will become extirpated within the next 45 years (Amstrup et al. 2007). Because Polar Bears depend on sea ice, changes in ice distribution and abundance can have significant impacts on individual and population conditions (Stirling and Derocher 1993, Derocher et al. 2004, Stirling 2006). A reduction in sea ice means fewer opportunities to efficiently catch seals. This results in increased fasting periods, and an increased need for and use of stored fat reserves. These factors may lead to a reduction in reproductive rates, reduced size and number of young and increased mortality in all age classes (Regehr et al. 2007, Schliebe et al. 2008, Hunter et al. 2010).

Other anticipated effects of reduced sea ice habitat include an expansion of summer habitat beyond the traditional range (recent observations have shown Polar Bears as much as 300 to 400 km inland) (Derocher et al. 2004), and larger home range sizes (Ferguson et al. 1999, Towns et al. 2010). There is some debate as to whether increased movement patterns of Polar Bears is an adaptive behaviour of climate change, resulting in bears exploring more inland areas for food. Declining body conditions and population size in the Western Hudson Bay sub-population has been correlated with earlier sea ice break-up (Stirling et al. 1999, Regehr et al. 2007). Similar body condition trends have been detected in the Southern Hudson Bay sub-population (Obbard et al. 2006). Longer movements over rougher sea ice and more open water could also increase risk of injury or death (Monnett and Gleason 2006), especially for cubs (Hunter et al. 2010).

Changes in climate also impact Polar Bear denning. As the distance between the edge of the sea ice and the shore increases, it becomes progressively more difficult for female Polar Bears to reach their preferred denning locations (Derocher et al. 2004, Bergen et al. 2007). Higher energy demands to reach denning sites can result in lower survival and reproduction rates (Derocher et al. 2004) by reducing fat reserves and thus affecting body condition (Stirling et al. 1999).

Loss of Permafrost, Peat and Maternal Denning Habitat

In Ontario palsas are an important component of Polar Bear denning habitat (Obbard and Walton 2004). Numerous studies have documented the vulnerability of palsas to climate fluctuations (Laberge and Payette 1995, Sollid and Soebel 1998, Zuidhoff and Kolstrup 2000) since they are a permafrost feature. In addition to providing den site stability, the presence of permafrost also provides a cool microenvironment for pregnant females, allowing them to conserve energy and avoid warm ambient temperatures and

insects in the summer (Richardson et al. 2007). A change in climate and increased precipitation will result in geomorphological changes in permafrost and palsas, thus ultimately reducing the availability of these preferred maternal denning features.

Research also suggests that climate change will result in an increase in the frequency of forest fires caused by lightning strikes (Flannigan et al. 2000) and an extended fire season (Richardson et al. 2007). Fires affect maternal denning habitat by altering microhabitat features, such as removing vegetation in the area (namely trees), which aid in the stability and insulation of dens (Richardson et al. 2007). Fires also cause permafrost to melt, leading to palsa degradation, slumping of banks and decreased stability of sites resulting in a net-loss of maternal denning habitat. Black substrates that remain following fire absorb more solar radiation than vegetated areas, leading to a warmer microclimate that may prove unsuitable for Polar Bears (Richardson et al. 2007). In the Western Hudson Bay sub-population approximately five percent of existing suitable denning habitat was lost due to forest fires between 1998 and 2003 (Richardson et al. 2007).

Loss of Prey Species - Reduction and Alteration of Prey Habitat

Loss of sea ice will not only affect Polar Bears but will also impact the abundance and distribution of their main prey sources: Ringed Seals and Bearded Seals. Like Polar Bears, these two prey species are very sensitive to changes in sea ice cover and thickness (Tynan and DeMaster 1997, Derocher et al. 2004, Laidre et al. 2008). Observed impacts of warmer temperatures and increased precipitation include the collapse and decreased insulation of birth lairs as well as increased exposure of seal pups to predation (Stirling and Smith 2004). Polar Bears are most successful when hunting from the sea ice platform and are rarely successful in open water (Stirling and Smith 2004, York et al. 2009).

Higher Energetic Requirements from Extreme Wind Events

Climate change has contributed to the overall severity of storm impacts on coastal areas, resulting in high winds, storm surges, flooding and shoreline erosion (BESIS 1997, Cohen 1997, Griffin et al. 2010, Pryor and Barthelmie 2010). Resulting extreme winds are predicted to reduce ice thickness and increase ice drift. It is expected that increased ice movements will increase energetic requirements and could potentially reduce growth and reproductive rates in Polar Bears (Schliebe et al. 2008).

Polar Bear-Human Interactions

Increased Human/Polar Bear Conflicts

Human-bear interactions can result in disturbance, destruction or loss of property and/or the destruction of the Polar Bear or loss of human life. Time of year can greatly influence the number of human-bear interactions. Research conducted in Nunavut determined that the highest time for “defense of life or property” interactions (i.e., humans defending life or property, resulting in the kill of a bear) were between August and November (64%) while Polar Bears were waiting for sea ice to form (Dyck 2006). Due to fasting and limited feeding opportunities, Polar Bears may take greater risks for food during the fall than at other times of the year. Further to this, a recent study in the

town of Churchill observed an increase in the number of problem[7] Polar Bears with later sea ice freeze-up (Towns et al. 2009). Generally, subadult males (less than six years of age) are more curious and less cautious than other age-gender classes. While Polar Bears of any age class may be involved in human-bear interactions (Dyck 2006), subadult males are most often involved in these occurrences (Towns et al. 2010). An increase in the number of human-bear interactions will most likely result in higher numbers of problem bears being killed.

Northern communities in Ontario have reported a similar increase in encounters with problem Polar Bears in recent years (Lemelin et al. 2010). Some coastal Cree communities in the Hudson Bay area have reported increasingly aggressive and habituated Polar Bears in their communities (McDonald et al. 1997, Dyck 2006, Lemelin et al. 2010). Increased time on land and increased human-bear interactions will likely result in an increased number of defences of property and kills of Polar Bears if proper deterrent programs[8] are not adopted (Stirling and Derocher 1993, Derocher et al. 2004, Peacock et al. 2010).

Natural Resource Exploration and Production

Oil and Gas Exploration and Production/ Mining Development and Exploration

In the Arctic, natural resource exploration and activity has expanded rapidly during the last 40 years (UNEP 2001), ultimately posing risks to Polar Bears and their terrestrial habitats (Øritsland et al. 1981, Hurst and Øritsland 1982, Griffiths et al. 1987). Exploration, transportation and processing for gas, oil and minerals can result in fragmented habitats (Fiori and Zalba 2003) and an increased level of pollutants in the environment (Olsgard and Gray 1995). Furthermore, there is potential for displacement of Polar Bears from resting and terrestrial feeding areas as well as a disruption to maternal den sites, resulting in premature abandonment of dens and/or offspring (Linnell et al. 2000). Climate change could also provide greater industrial access to resources, resulting in an increase in the frequency of human-bear interactions and conflicts (Dyck 2006).

Wind Turbine/Wind Farm Development

The shores of Hudson and James Bay in northern Ontario have excellent potential for wind power. Considerable winds blow over approximately 1,500 islands on the eastern side of Hudson Bay as well as along the western coast of Quebec along Hudson Bay and James Bay. The potential development of wind farms in Ontario would require high-powered, long distance transmission lines and thus would fragment Polar Bear habitat, particularly during ice-free periods when Polar Bears are forced on land. Another

[7] Problem Polar Bear would be one that poses an immediate threat to human safety or one that has developed a pattern of behaviour that makes it a long term risk to safety or property. Not all human-bear interactions result in problem bears.

[8] In Ontario it is legal for anyone to attempt to deter, and if necessary destroy, a Polar Bear in defense of life or property. Any bear killed must be reported to the nearest district Ministry of Natural Resources office. Possible deterrent methods include, but are not limited to: warning shots, cracker shells, screamers/bangers, flare guns, plastic slugs, rubber bullets, electric fences, bear spray, vehicles, air horns, dogs and bear monitors.

potential concern would be the impacts of functioning turbines and disrupting maternal den sites, resulting in den abandonment.

Hydroelectical Development
Many rivers flowing from Hudson Bay are being harnessed (or explored) for hydroelectrical development to meet southern Ontario energy demands (CARC 2002). Hydroelectric development in the Moose River basin on the Ontario side of James Bay started in 1910 (CARC 2002). In the Moose River Basin, the Abitibi and Mattagami Rivers have been the main river systems to be developed (Stokes et al. 1999), supplying power to mining and pulp and paper communities (Brousseau and Goodchild 1989, Poehlmann and Associates 1997). Current and proposed projects currently extend below ranges of Southern Hudson Bay Polar Bears, however with increasing energy demands from the south, hydroelectric development along other tributaries of James and Hudson Bays may increase. With these developments, an increase in the frequency of human-bear interactions and conflicts may arise.

Biological Resource Use
Potential for Unsustainable Harvest
In 1976, the Ontario government established harvest quotas of 30 bears per year through an informal agreement with Fort Severn, Peawanuck, Attawapiskat, Fort Albany and Kashechewan. Since then, research and monitoring has revealed that bears from the Southern Hudson Bay subpopulation are also harvested in Nunavut and Quebec. Kolenosky et al. (1992) calculated a maximum sustainable yield of 48 Polar Bears annually for this subpopulation by Aboriginal hunters in Nunavut, Quebec as well as Ontario. However, there is some concern that these harvest levels would likely be too high for the long-term sustainability of this sub-population (OMNR 2008). Annual minimum harvest levels in Ontario generally range between 8 and 13 Polar Bears (Lemelin et al. 2008, Kakekaspan et al. 2010). In 2011, larger than usual harvest (45 - 60 bears) from the Southern Hudson Bay sub-population by Northern Quebec hunters was reported (CBC 2011). Thus, the potential for unsustainable harvest in this sub-population is a valid concern over the long term.

The reporting of the harvest is voluntary in Ontario but is considered to be generally reliable because Polar Bear skins cannot be sold until they have been authorized and ‘sealed’ by the province. Quotas for each community that harvests Polar Bears have been enforced by the denial of the provincial seals that ensure the legal sale of hides. The Hunters and Trappers Association of Sanikiluaq has an annual quota of 25 Polar Bears through a Memorandum of Understanding with the Nunavut Department of Environment. Because Polar Bears in the Southern Hudson Bay sub-population mix with Polar Bears in other sub-populations (Stirling et al. 2004) it is difficult to determine what proportion of the Southern Hudson Bay sub-population is actually harvested, especially in Quebec (OMNR 2008).

Continued sustainable harvest of Polar Bears by First Nations is important to ensure that the devaluation[9], or a reduction in traditional uses of the species does not occur. Harvested Polar Bears in Ontario are used for crafts, subsistence purposes, traditional and ceremonial purposes (Lemelin et al. 2010, George Hunter pers. comm. 2010). The meat is eaten (by sled dogs and sometimes humans) and the hide is used to make mittens, mukluks, fur ruffs for parkas and fur pants, as well as small crafts that are used locally or sold (Kakekaspan et al. 2010). Polar Bear bones are a preferred tool to scrape caribou hides in some communities (George Hunter pers. comm. 2010).

Note regarding sustainable Aboriginal harvests in Ontario
Current harvest levels by members of Treaty 9 in Ontario are permitted and considered sustainable based on population estimates (Lunn et al. 2006). Province-wide, under a long-standing agreement with the coastal Cree communities, up to 30 hides can be sealed for sale annually [12 to Fort Severn, 12 to Winisk (Peawanuck), 6 shared between Attawapiskat, Fort Albany and Kashechewan] (OMNR 1980, OMNR 2008). During the 1970s and 1980s annual Ontario harvests averaged 20.7 individuals (Kolenosky et al. 1992). In recent years, Ontario's harvest has been considerably lower, averaging 8.8 Polar Bears annually of skins sealed and sold (Obbard 2007).

Marine Transportation and Commercial Fishing
Shipping Lanes within Polar Bear Sea Ice Habitat
Climate change and environmental change will likely increase the duration of shipping and fishing seasons and open up previously un-navigable routes in the Arctic. Disturbance associated with increasing levels of shipping activity, including commercial fishing[10], community re-supply, industrial shipping and tourism would present increasing threats to Polar Bears. Consequences are likely to include directing Polar Bears into ports and coastal communities, fragmenting sea ice (by keeping lanes open with ice-breakers), disturbing prey, potential fuel oil spills and introduction of pollution and possibly exotics in ballast water. Impacts will vary depending on season, type and speed of vessel and time of day (Ward et al. 2005).

Terrestrial Transportation and Service Corridors
Seasonal and Permanent Roads
Roads and railways are generally known to interrupt habitat connectivity and to affect the hydrological regimes of terrestrial ecosystems (McPherson et al 2005). In addition to habitat fragmentation, roads can create easier access to Polar Bear habitat for humans.

Currently there is one seasonal road, which connects the communities of Peawanuck and Fort Severn. This road is a winter road and therefore requires annual construction and maintenance. The road intersects an area considered to be prime Polar Bear denning habitat. Direct impacts of this road include habitat fragmentation, increased

[9] The devaluation of a species is considered a reduction in the value in commercial and cultural significance.
[10] Commercial fishing is minimal in James Bay at this time and there is a low likelihood of it increasing considerably in the next 5 to 10 years.

access to previously inaccessible habitat and potential disturbance to maternal dens. Increased mineral, oil and gas exploration and extraction is expected to increase road and railway networks in the Hudson Bay Lowlands to allow for improved access, and therefore may become a higher threat in the future.

Marine and Airborne Pollutants

Contaminants

As top predators, Polar Bears are exposed to high levels of pollutants through the food chain via biomagnification and bioaccumulation. Main toxins in the Arctic are persistent organic pollutants (POPs) and hexachlorocyclohexanes (HCHs). Persistent organic pollutants include a wide range of poisonous substances such as heat resistant chemicals (e.g., PCBs), flame retardants, industrial by-products such as dioxins and furans and pesticides like DDT, dieldrin and lindane (York et al. 2009). Mercury levels have also been noted to be increasing in Arctic waters (Lu et al. 2001), and Hudson Bay in particular (Kirk and St. Louis 2009).

Known effects of these toxins include organ failure, brain damage to young bears and disrupted sperm production (Sonne 2010). Pollutants such as POPs tend to persist in the environment and resist degradation (Lipnick 2000). High levels of POPs have been documented in seal blubber (Kucklick et al. 2006). Due to bioaccumulation, Polar Bears are particularly susceptible to the effects of POPs (Kucklick et al. 2002, CARC 2010).

Many of the high pollutant levels in Polar Bears appear to be from long range atmospheric transport from low latitude sources outside of the Arctic environment. These long range pollutants are negatively affecting Polar Bear growth patterns, reproduction (through delayed implantation which may lead to vulnerability through hormone disruption) and survival rates (decreased in lifespan, as well as cub sizes) (Skaare et al. 2002, Derocher et al. 2003, Schliebe et al. 2008). Polychlorinated biphenyls (PCBs) in particular are thought to be degrading Polar Bear immunity by disrupting a group of proteins that function as antibodies. The effects of long range transport may be enhanced as a result of climate change (CARC 2010) due to the melting of snow and ice caps (Barrie et al. 1985).

Oil and Gas Spills

Direct contact with oil and gas spills can reduce the insulating effect of Polar Bear fur (Hurst and Øritsland 1982, Hurst et al. 1991), resulting in higher energetic demands to keep warm thus forcing individuals to compensate for energy loss by increasing caloric intake (Hurst et al. 1991). Oil on the fur can also lead to decreased body temperature and be absorbed through the skin to the gastrointestinal tract (Engelhardt 1983). Given that Polar Bears in Ontario fast for extended periods of time, an increased demand for food, particularly if prey items have also been affected, may result in starvation and kidney failure due to bears ingesting oil while self grooming.

1.6 Knowledge Gaps

The following areas have been identified as knowledge gaps.

Natural Life History Information

- Distribution and abundance information on prey populations, mainly Ringed Seal and Bearded Seal.
- Annual variation in foraging (terrestrial and marine) by individual Polar Bears based on quantitative fatty acid signature analysis.
- Adjustments to annual foraging patterns (5-10 year comparisons) due to potential increased time spent on land.
- Examination of paleoecological data to provide a historical background to the environmental changes that Polar Bears have endured to date.

Distribution and Population Trends

- Distribution and movement of Polar Bears of the Southern Hudson Bay sub-population through satellite-telemetry.
- Population size and trend information including vital rates (survival, reproduction) through capture recapture techniques (approximately every 15 years) and standardized monitoring programs in coastal Cree Communities, to understand how vital rates will vary in the future with climate change[11].

Habitat Needs

- Response of Polar Bear habitat (e.g., denning and staging areas) to various forms of anthropogenic disturbance to inform best practices for development and exploration activities.
- Description of important Polar Bear habitat at fine spatial scales including denning and breeding areas using such data as Digital Elevation Models (DEM), airplane and helicopter surveys and satellite-telemetry coordinates.
- Significance of protected areas (e.g., Polar Bear Provincial Park) to the conservation of Polar Bears.

Climate Change Data

- Climate change data from northern Ontario that can be used to monitor changes in pack ice patterns and its relationship to Polar Bears and prey habitats.

First Nation Knowledge, Perspectives and Practices

- Cultural, spiritual, ecological and socio-economic significance of Polar Bears to coastal Cree communities.
- Traditional ecological and local knowledge of Polar Bear populations, management and harvesting practices.

Research Impacts

- Impacts from handling and other research effects on Polar Bears.

[11] These gaps will be difficult to address due to substrate wetness and dense tree cover which, in the past, have limited field work opportunities.

Human-Bear Interactions

- Quantified data on human-bear conflicts to compliment qualitative information, including cause of interaction (e.g., presence of attractant, proximity to human dwelling or structure, proximity to denning site) and harvest, if applicable.
- Relationship between sea ice reduction/decreased body condition and human-bear interactions.
- Socio-economic role of Polar Bears to coastal Cree communities (e.g., crafts from hides).
- Impacts of the Polar Bear tourism industry and domestic traffic [e.g., effects of all-terrain vehicle (ATV) and snow machine activity] on Polar Bear behaviour.

Emergency Response Plan

- Scenario-based emergency response plans, similar to marine mammal stranding network guidelines (e.g., Geraci and Lounsbury 2005). To be put in place if and/or when emergency scenarios come to fruition. Scenarios requiring emergency response may include massive die-offs due to drastic loss of habitat, prey availability, etc (see Peacock et al. 2011).

1.7 Recovery Actions Completed or Underway

- Identifying annual variation in foraging by individuals and between years based on quantitative fatty acid signature analysis.
  - Underway: collaboration between researchers at the Ontario Ministry of Natural Resources (OMNR) and York University 2007-2011 (Obbard pers. comm. 2010).
  - Cherry et al. (2011)

- Determining and describing important Polar Bear habitat, including denning and breeding areas, through airplane and helicopter surveys and radio-telemetry techniques.
  - Kolenosky and Prevett (1983).
  - Obbard and Walton (2004).
  - Underway: additional analysis of recent data from GPS-collared Polar Bears 2007-2011 (Obbard pers. comm. 2010).

- The significance of protected areas (e.g., Polar Bear Provincial Park) to the conservation of Polar Bears through radio telemetry techniques.
  - Obbard and Walton (2004).
  - Underway: additional analysis of recent data from GPS-collared Polar Bears 2007-2011 (Obbard pers. comm. 2010).

- Coastal Cree knowledge, perspectives and practices.
  - Lemelin et al. (2010).
  - Kakakespan et al. (2010).

  - Interviews/community focus groups (Martha Dowsley, R. Harvey Lemelin and Dave Finch pers. comm. 2010).

- Estimating and monitoring Polar Bear numbers through capture-recapture techniques.
  - Obbard et al. (2007).

- Defining the distribution and movement of Polar Bears of the Southern Hudson Bay sub-population through radio-telemetry and genetic techniques.
  - Crompton (2008).
  - Underway: research on movement patterns of GPS-collared Polar Bears 2007-2011 (Obbard pers. comm. 2010).

- Communication materials produced such as:
  - OMNR Climate Change Research Information Note No. 3 (Obbard et al. 2006) (Collaboration with OMNR and partners).
  - State of the Resources Reports: Polar Bears. Status of Southern Hudson Bay sub-population (Obbard et al. 2007) [collaboration with OMNR, the United States Geological Survey (USGS) and other partners].
  - State of the Resources Reporting (2008) in both English and Cree (OMNR).
  - Ontario Biodiversity Strategy Status Report 2005-2010 (collaboration with OMNR and partners).
  - Our Incredible World internet newsletter (www.incredibleworld.ca) (Funded by multiple partners including OMNR and Environment Canada).
  - Webcasts by Polar Bears International about Polar Bear research (www.polarbearsinternational.org/research/scientists).
  - Expert Panel on Climate Change Adaptation report “Adapting to Climate Change in Ontario” (Pearson and Burton 2009) (collaboration with Ontario Ministry of the Environment and partners).
  - Far North Science Advisory Panel Report “Science for a Changing Far North” (The Far North Science Advisory Panel, 2010) (collaboration with OMNR and partners).
  - Ontario’s Climate Change Adaptation Strategy (www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/stdprod_085423.pdf)

- Participation in inter-jurisdictional meetings such as:
  - IUCN/SSC Polar Bear Specialist Group.
  - Canadian Federal/Provincial/Territorial Polar Bear Technical Committee.
  - Canadian Federal/Provincial/Territorial Polar Bear Administrative Committee.
  - 2011 Meeting with Quebec, Nunavut, Ontario and Cree First Nations

- Climate change initiatives such as:
  - Ontario Green Energy Act 2009.

  - Expert Panel on Climate Change.
  - Far North Science Advisory Panel.
  - Ontario's Action Plan on Climate Change.

- Scenario-based reaction plans.
  - MNR Cochrane District response plan to orphaned Polar Bear cubs (2010).

2.0 RECOVERY

2.1 Recovery Goal

The recovery goal for Polar Bears in Ontario is to have a viable sub-population that can persist in a changing environment and supports traditional uses of Polar Bears by coastal Cree communities.

2.2 Protection and Recovery Objectives

Table 2. Protection and recovery objectives.

No.	Protection or Recovery Objective
1	Reduce the impact of global climate change within Ontario.
2	Identify, protect and adaptively co-manage Polar Bear habitat in Ontario.
3	Conduct research to fill knowledge gaps that will aid in the recovery and protection of Polar Bears and their habitat.
4	Maximize Cree and Ontario's participation in inter-jurisdictional Polar Bear management and research in the Hudson and James Bay eco-region.
5	Develop and implement effective monitoring strategies for Polar Bear, including community based monitoring.
6	Minimize incidental mortalities of Polar Bears.
7	Enhance communication and information sharing with coastal Cree communities and stakeholder groups on Polar Bear biology and management.
8	Explore viable, sustainable and complementary activities to existing traditional harvesting of Polar Bear.

2.3 Approaches to Recovery

Table 3. Approaches to recover Polar Bear in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
1. Reduce the impact of global climate change within Ontario				
Critical	*Ongoing*	*Stewardship*	**1.1** Promote and set greenhouse gas reduction targets in Ontario • Promote and take action to achieve Ontario's Greenhouse Gas (GHG) targets of 15% below 1990 levels by 2020 and 80% below 1990 levels by 2050 (see www.gogreenontario.ca). • Support green energy initiatives in Ontario while limiting cumulative effects. • Follow recommendations for climate change adaptation including the completion of a provincial strategy and action plan (Pearson and Burton 2009) including such actions as outlined in The Known and Potential Effects of Climate Change on Biodiversity in Ontario's Terrestrial Ecosystems: Case Studies and Recommendations for Adaptation, MNR Climate Series Reports (Varrin et al. 2007). • Work with Far North communities to undertake ecosystem vulnerability analyses to help plan and enable flexible and adaptive management approaches into Polar Bear management as well as broader resource management and policy in areas of Polar Bear habitat.	*Threats:* • Climate Change

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
Beneficial	*Short-term*	*Management*	**1.2** Review current environmental legislation regarding pollution control and develop new initiatives and targets to ensure best practices are in place • Implement recommendations from the report "Adapting to Climate Change in Ontario" (Pearson and Burton 2009). • Implement recommendations from the report "Science for a Changing Far North" (The Far North Science Advisory Panel 2010).	*Threats:* • Climate Change
Beneficial	*Ongoing*	*Management*	**1.3** Create regional strategic visions or regional strategic environmental assessments to help address the impacts/goals of multiple policies • Use a standardized method such as the Strategic Environmental Assessment (SEA; www.sea-info.net) to ensure sustainable development through public planning and policy.	*Threats:* • Climate Change • Cumulative Effects
2. Identify, protect and adaptively co-manage Polar Bear habitat				
Critical	*Ongoing*	*Protection* *Management*	**2.1** Develop guiding documents to help inform management and policy decisions within Polar Bear habitat • Develop and circulate best management practices to reduce the impacts of development activities, such as mineral exploration, within Polar Bear habitat.	*Threats:* • Bear-human interactions • Potential for Unsustainable Harvest • Residential and Commercial Development *Knowledge Gaps:* • All Knowledge Gaps

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
Necessary	*Ongoing*	*Research* *Monitoring and Assessment* *Protection* *Management*	**2.2** Spatially assess cumulative impact of threats to Polar Bear in Ontario • Develop spatial risk model to estimate areas where Polar Bear habitat is most likely to be compromised from threats and cumulative effects. • Perform risk assessment of cumulative impacts resulting from development (and associated roads) within the Hudson Bay lowlands to inform environmental assessments and land use planning initiatives. • Collaborate with coastal Cree communities and integrate information into community plans and provincial documents.	*Threats:* • All Threats *Knowledge Gaps:* • All Knowledge Gaps
Necessary	*Ongoing*	*Research* *Monitoring and Assessment* *Protection* *Management*	**2.3** Continue research to refine knowledge of the use of dens and resting areas by Polar Bear • Describe known maternal denning and resting habitat. • Map known distribution of denning and resting habitat. • Review habitat use every fifteen years with scientific experts and coastal Cree communities and revise habitat regulation as necessary.	*Threats:* • All Threats *Knowledge Gaps:* • Natural Life History • Current Distribution and Population Trends • Habitat Needs • Human-Bear Interactions
Critical	*Short-term*	*Research* *Management*	**2.4** Refine assessment of climate change impacts on the persistence of Polar Bear in Ontario • Create or obtain analysis of climate models for the Southern Hudson Bay sub-population to inform management and land use planning decisions.	*Threats:* • Climate Change • Cumulative Effects *Knowledge Gaps:* • Current Distribution • Habitat Needs • Emergency Response Plan

3. Conduct research to fill knowledge gaps that will aid in the recovery and protection of Polar Bears and their habitat				
Critical	*Short-term*	*Research* *Protection*	**3.1** Investigate the effects of research methods that address population dynamics and habitat monitoring on Polar Bears • Further investigate potential research implications (e.g., drugging, handling) on Polar Bears. • Explore alternative methods to address population dynamics and habitat monitoring.	*Knowledge Gaps:* • Research Impacts
Critical	*Ongoing*	*Research* *Protection*	**3.2** Conduct research to address knowledge gaps and continue with population dynamics and habitat monitoring. • Continue to use GPS collars to determine and/or refine research on denning areas and monitor individual movement and on/off ice dates. • Determine survival rates of Southern Hudson Bay sub-population Polar Bears to help monitor population trends.	*Threats:* • Human-bear Interaction *Knowledge Gaps:* • All Knowledge Gaps
Critical	*Ongoing*	*Research*	**3.3** Investigate the socio-economic impacts of the Polar Bear decline • Conduct research to identify use and economic reliance of coastal Cree communities on Polar Bear. • Encourage ongoing collection of Aboriginal Traditional Knowledge	*Knowledge Gaps:* • Socio-economics
Necessary	*Short-term*	*Research* *Management* *Protection*	**3.4** Continue to identify key research needs and knowledge gaps to ensure the best scientific and Aboriginal traditional knowledge is used in the co-management of Polar Bear	*Threats:* • All Threats *Knowledge Gaps:* • All Knowledge Gaps

Necessary	*Short-term*	*Research* *Management* *Protection*	**3.5** Through a co-management group develop guidelines for tourism operators interacting with Polar Bears • Proactively create guidelines and best management practices in the anticipation of Polar Bear-based tourism activities (e.g. the Manitoba Resource Tourism Operators Act (C.C.S.M. c.R119.5). • Research if there are any potential impacts of tourism on Polar Bears. Include findings in tourism best management practices.	*Knowledge Gaps:* • Tourism
Necessary	*On-going*	*Research* *Management* *Protection*	**3.6** Research annual variation in terrestrial foraging by Polar Bears. • Research changes in terrestrial food sources, opportunistic feeding, aquatic foraging and incidences of cannibalism.	*Knowledge Gaps:* • Natural Life History Information
4. Maximize Cree and Ontario's participation in interjurisdictional Polar Bear research and management in the Hudson Bay eco-region				
Critical	*Ongoing*	*Communication* *Management*	**4.1** Enhance Ontario and Cree's participation in interjurisdictional Polar Bear management and monitoring. • Organize and participate in face to face meetings with the partners (i.e. coastal Cree communities and all levels of governments) to discuss Polar Bear management, needs and interactions with the communities. • Continue to participate in interjurisdictional meetings with the goal of coordinating research and joint monitoring.	*Threats:* • All Threats *Knowledge Gaps:* • All Knowledge Gaps

Necessary	*Short-term*	*Communication* *Management*	**4.2** Increase communication and collaboration with jurisdictions that co-manage the Southern Hudson Bay and Western Hudson Bay sub-populations of Polar Bears • Coordinate long-term monitoring and science efforts between jurisdictions. • Initiate consensus building between jurisdictions around determining population numbers in Southern Hudson Bay and Western Hudson Bay and the coordination of harvest management for each sub-population.	*Threats:* • All Threats *Knowledge Gaps:* • All Knowledge Gaps
Beneficial	*Short-term*	*Monitoring and Assessment* *Research*	**4.3** Assess biological linkages between the Southern Hudson Bay sub-population and the Western Hudson Bay and Foxe Basin sub-populations.	*Threats:* Potential for Unsustainable Harvest *Knowledge Gaps:* • Current Distribution and Population Trends

5. Develop and implement effective monitoring strategies for Polar Bear, including community-based monitoring.				
Critical	*Ongoing*	*Research* *Monitoring*	**5.1** Intensify monitoring of body condition, population trends and population size • Investigate alternative methods to assess body condition, population trends and population size. • Coordinate with the Federal-Provincial-Territorial Polar Bear Technical Committee (PBTC) as well as Cree, Nunavut and Quebec governments to analyze harvest data for the Southern Hudson Bay sub-population. • Conduct regular monitoring to follow trends in changing body conditions especially female reproduction and cub survival. • Establish a baseline disease and parasite exposure dataset. • Intensify sampling for heavy metals and POPs in Polar Bear habitat and Polar Bear fat tissues. • Continue to communicate research findings through such venues as the State of the Resource Reporting by the Ontario Ministry of Natural Resources in both English and James Bay Cree.	*Threats:* • All Threats *Knowledge Gaps:* • All Knowledge Gaps
Critical	*Short-term*	*Management*	**5.2** Co-management team (i.e. Ontario and Cree coastal Cree communities) develop scenario-based planning • Develop a scenario-based reaction plan for coordinated reaction, monitoring, research and determination of sudden events or mortality events (e.g., drastic decline in body condition, mass mortality events, oil or gas spills, etc.). • Explore protection and compensation measures	*Threats:* • All Threats *Knowledge Gaps:* • Emergency Response Plan

Necessary	*Ongoing*	*Research*	**5.3** Establish a community-based monitoring program • Establish a program to quantify, monitor and map Polar Bear encounters throughout their range. • Record Polar Bear body condition using a standardized protocol developed with local Aboriginal Traditional Knowledge (e.g. of a chart developed by Polar Bears International and World Wildlife Fund (WWF) body condition chart (Appendix Two)). • Record spatial-temporal distribution, habitat use, movement and numbers of Polar Bears in Ontario. • Establish a community-based reporting program for harvest over and above harvest reported to and funded by MNR through pelts sealed for sale. • Create a monitoring program in collaboration with Quebec, to monitor the number of polar bear killed annually for the harvest and incidental purposes.	*Threats:* • All Threats *Knowledge Gaps:* • All Knowledge Gaps
Necessary	*Short-term*	*Management*	**5.4** Co-management team to develop a best management practice document or guideline to inform development activities (i.e., mineral exploration and development), within Polar Bear habitat. This document should include a component on removing or reducing Polar Bear attractants.	*Threats:* • All Threats

6. Minimize incidental mortalities of Polar Bears.				
Necessary	*Short-term*	*Management* *Communication*	**6.1** Support coastal Cree communities in the development and implementation of community-based management plans and best management practices to reduce the frequency of human-bear interactions. • Establish a joint Ontario-First Nation community action team. • Develop a best practices guide to reduce incidental take of Polar Bears including attractant management, deterrence and property protection. • Ontario to support the development of community response plans, individualized for each community. Create a compensation program for property damage caused by Polar Bears.	*Threats:* • Human-bear Interaction *Knowledge Gaps:* • All Knowledge Gaps
Necessary	*Short-term/ Ongoing*	*Management* *Outreach and Communication*	**6.2** Create local patrol and management groups to minimize incidental mortalities • Work with northern communities to identify current approaches and needs for dealing with human-bear interactions. • Support local representatives in the development and delivery of education programs on methods to protect people while Polar Bears are on land. • Engage experts to demonstrate techniques used to reduce incidental take in coastal Cree communities.	*Threats:* • Human-bear Interaction *Knowledge Gaps:* • Human-bear Interactions • Emergency Response Plan

Necessary	*Short-term*	*Management*	**6.3** Work with residents of mining camps, communities and other stakeholders to evaluate Polar Bear use of landfill sites, and, if necessary, develop protocols to reduce any actual issues • Develop attractant and landfill management protocols. • Implement improved standards at landfills within the Polar Bear range to reduce human-bear conflicts, including at temporary camps, stations and communities.	*Threats:* • Human-bear Interaction *Knowledge Gaps:* • Human/Bear Interactions
7. Enhance communication and information sharing with coastal Cree communities and stakeholder groups on Polar Bear biology and management.				
Critical	*Ongoing*	*Education and Outreach*	**7.1** Work with coastal Cree communities, government agencies and researchers to create a Polar Bear co-management committee.	*Threats:* • Bear-human interactions • Potential for Unsustainable Harvest • Residential and Commercial Development *Knowledge Gaps:* • All Knowledge Gaps

Necessary	*Ongoing*	*Education and Outreach*	**7.2** Explore opportunities with coastal Cree communities to develop a local outreach and engagement program • Initiate a forum for regular information sharing between Ontario and northern coastal Cree communities. • Support the important cultural, spiritual and economic values of Polar Bear to coastal Cree communities. • Work with communities to ensure reporting of all human-caused mortality of Polar Bears (e.g., protection of property) in addition to harvest captured through sealing and sale of hides. • Work with coastal Cree communities and inter-jurisdictional governments to protect female Polar Bears occupying or constructing a den and/or any bear that is part of a family group. Initiate an agreement for not harvesting females in dens and family groups (i.e., females with cubs and/or yearlings) throughout the Southern Hudson Bay and Western Hudson Bay sub-populations range.	*Threats:* • Bear-human interactions • Potential for Unsustainable Harvest • Residential and Commercial Development *Knowledge Gaps:* • All Knowledge Gaps

Beneficial	*Short-term*	*Education and Outreach*	**7.3** Develop province-wide Polar Bear outreach and education programs to broaden the understanding of threats to Polar Bear and emphasize what actions individuals can take to help reduce threats to Polar Bear • Promote information dissemination through various mediums, including new technology and social networks. • Create curriculum-based materials for schools using local Aboriginal Traditional Knowledge and science. • Identify actions that individuals can take to help reduce threats to Polar Bear. Translate outreach materials into Cree and French for maximum effectiveness.	*Threats:* • All Threats
Beneficial	*Short-term*	*Communication Research*	**7.4** Encourage partnership between coastal Cree communities and government agencies to develop "Green Coastal Communities" pilot initiative to explore viable green initiatives in the northern environment • Identify reasonable renewable energy alternatives for northern communities. • Initiate an incentive program for northern communities to lessen the costs of changing from non-renewable technology to renewable energy alternatives.	*Threats:* • Climate Change
8. Explore viable, sustainable and complementary activities to existing traditional harvesting of Polar Bear.				
Beneficial	*Short-term*	*Protection* *Education and Outreach*	8.1 Develop and manage a Polar Bear viewing industry in collaboration with the Ontario Government within interested First Nation communities (e.g., Fort Severn).	*Threats:* • Biological Resource Use

2.4 Area for Consideration in Developing a Habitat Regulation

Under the ESA, a recovery strategy must include a recommendation to the Minister of Natural Resources on the area that should be considered in developing a habitat regulation. A habitat regulation is a legal instrument that prescribes an area that will be protected as the habitat of the species. The recommendation provided below by the authors will be one of many sources considered by the Minister when developing the habitat regulation for this species.

The Ontario Ministry of Natural Resources is committed to working respectfully and collaboratively with First Nations on the protection of Polar Bear habitat in Ontario. In implementing the requirements of the ESA, Ontario will respect the exercise of constitutionally protected Aboriginal and treaty rights and meet any obligations to consult. The protection of Polar Bear habitat in Ontario will be consistent with the recognition and affirmation of existing Aboriginal and treaty rights in section 35 of the Constitution Act, 1982, including the duty to consult.

Ontario's Polar Bears are dependent on sea ice as habitat, especially for hunting and mating (approximately November to June) as recognized by scientists and coastal Cree communities. However, Ontario does not have jurisdiction over waters of either Hudson Bay or James Bay. Polar Bears are also dependent on terrestrial habitat during the ice-free season or for maternity denning – areas where Ontario does have jurisdiction. Therefore, this recommendation is confined to Polar Bear habitat in terrestrial areas of Ontario.

Polar Bears are found in high densities along the Ontario coast of Hudson Bay and the western coast of James Bay north of Attawapiskat during the ice-free season, typically between July and December (Obbard and Walton 2004, Stirling et al. 2004, Obbard pers. comm. 2010). This area is critically important as summer retreat and resting habitat for subadults, adult males, family groups and non-pregnant females and contains locations where Polar Bears stage in advance of ice forming in the fall. It is anticipated that terrestrial land use will become even more important given expected changes in the timing and extent of summer sea ice in this region (Durner et al. 2009). Therefore, it is recommended that the Ontario coastline from the Manitoba border to Ekwan Point in James Bay and extending 5 km inland, be prescribed as Polar Bear habitat in a habitat regulation for Polar Bears under the ESA. A distance of 5 km was derived from aerial surveys and capture data which show high concentrations of staging Polar Bears within 5 km of the shoreline (Obbard unpub. data). The community of Fort Severn, including a 5 km area around it (i.e., the boundary of the community plus 5 km), should be excluded from the area prescribed in the habitat regulation since this represents unsuitable habitat for Polar Bears due to human development (i.e., housing and community infrastructure, airport, landfill). Other coastal Cree communities such as Peawanuck, Attawapiskat, Fort Albany, Kashechewan and Moosonee/Moose Factory are excluded from the habitat regulation recommendation as they are greater than 5 km inland from the coastline or are south of Ekwan Point.

Beyond the 5 km coastal area, active dens and features that are unoccupied but appear suitable for denning should also be prescribed as Polar Bear habitat. Palsas over 1.5 m tall, eskers, elevated beach ridges and peat banks surrounding lakes within 120 km of the coast should be prescribed as habitat. It is also recommended that 500 m around active dens also be prescribed as Polar Bear habitat so as to minimize disturbance and the potential for den abandonment. The area between the Winisk and Severn Rivers is of particular importance for denning due to the high density of suitable palsas in the area (Obbard and Walton 2004).

There is little information on sensitivity of denning Polar Bears to disturbance (Blix and Lentfer 1992, Armstrup 1993). As such, the following recommendation is based on research from Polar Bears as well as similar species, such as Grizzly and Black Bears (*Ursus arctos* and *U. americanus* respectively). Depending on the activity, most bears respond to disturbance between 200 m and 1 km of the den (Linnell et al. 2000), with Polar Bears responding to disturbance up to 500 m of a denning site (Blix and Lentfer 1992, Amstrup 1993). Therefore, it is recommended that a 500 m radius around active dens is also prescribed as habitat.

The habitat needs for Polar Bears will undoubtedly shift with a changing climate. Their reliance on terrestrial areas is expected to increase with earlier melting of sea ice in summer and later forming of sea ice in fall. Key aspects of the terrestrial habitat itself are forecast to change, sometimes dramatically (melting of palsas, inability of palsas to form, increased frequency/intensity of wildfires). Therefore, it is recommended that the habitat regulation be reviewed on a regular basis with scientific experts and coastal Cree communities and that a monitoring program is developed to track key parameters and trends relating to Ontario Polar Bears and their habitat.

GLOSSARY

Ablation: the opposite of accumulation—refers to all processes that remove snow, ice, or water from a glacier or snowfield.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC): The committee responsible for assessing and classifying species at risk in Canada.

Committee on the Status of Species at Risk in Ontario (COSSARO): The committee established under section 3 of the *Endangered Species Act, 2007* that is responsible for assessing and classifying species at risk in Ontario.

Conservation status rank: A rank assigned to a species or ecological community that primarily conveys the degree of rarity of the species or community at the global (G), national (N) or subnational (S) level. The national and subnational levels are provided for Canada and Ontario respectively. These ranks, termed G-rank, N-rank and S-rank, are not legal designations. The Conservation status of a species or ecosystem is designated by a number from 1 to 5, preceded by the letter G, N or S reflecting the appropriate geographic scale of the assessment. The numbers mean the following:

1 = critically imperilled
2 = imperilled
3 = vulnerable
4 = apparently secure
5 = secure

Endangered Species Act, 2007 (ESA): The provincial legislation that provides protection to species at risk in Ontario.

Fidelity: the degree to which an organism stays in one type of environment.

Habitat fragmentation: the emergence of discontinuities (fragmentation) in an organism's preferred environment or habitat. The term habitat fragmentation includes the following: (1) reduction in the total area of the habitat; (2) decrease of the interior : edge ratio; (3) isolation of one habitat fragment from other areas of habitat; (4) breaking up of one patch of habitat into several smaller patches; (5) decrease in the average size of each patch of habitat.

Palsa: permafrost landforms that range in height from 1 to 10 metres and protrude above the ground of boreal and subarctic peatlands

Species at Risk Act (SARA): The federal legislation that provides protection to species at risk in Canada. This act establishes Schedule 1 as the legal list of wildlife species at risk to which the SARA provisions apply. Schedules 2 and 3 contain lists of species that at the time the act came into force needed to be reassessed.

After species on Schedule 2 and 3 are reassessed and found to be at risk, they undergo the SARA listing process to be included in Schedule 1.

Species at Risk in Ontario (SARO) List: The regulation made under section 7 of the *Endangered Species Act, 2007* that provides the official status classification of species at risk in Ontario. This list was first published in 2004 as a policy and became a regulation in 2008.

Subnivean: The zone or layer under snow.

Viable: A population that has the estimated numbers and distribution of reproductive individuals to ensure the continued existence of the species throughout its existing range in a planning area.

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APPENDIX 1

IUCNb Ranking Categories for Threats

Severity of Damage: Level of damage that can reasonably be expected.

Very High	The threat is likely to *destroy or eliminate* Polar Bear populations and/or habitat over some portion of the target's occurrence
High	The threat is likely to *seriously degrade* Polar Bear populations and/or habitat over some portion of the target's occurrence
Medium	The threat is likely to *moderately degrade* Polar Bear populations and/or habitat over some portion of the target's occurrence
Low	The threat is likely to only *slightly impair* Polar Bear populations and/or habitat over some portion of the target's occurrence

Scope of Damage: The geographic scope of impact on Polar Bears within their range in Ontario that can reasonably be expected.

Very High	The threat is likely to be very *widespread or pervasive* in its scope, and affect Polar Bears throughout the Polar Bears occurrence within Ontario
High	The threat is likely to be *widespread* in its scope, and affect Polar Bears at many of the Polar Bears occurrences within Ontario
Medium	The threat is likely to be *localized* in its scope, and affect the Polar Bears at some of the Polar Bears occurrences within Ontario
Low	The threat is likely to be *very localized* in its scope, and affect Polar Bears at a limited portion of the Polar Bears occurrences within Ontario

Severity and Scope of Damage Ranking Chart

	Severity			
Scope	**Very High**	**High**	**Medium**	**Low**
Very High	Very High	High	Medium	Low
High	High	High	Medium	Low
Medium	Medium	Medium	Medium	Low
Low	Low	Low	Low	Low

Irreversibility: The reversibility of the threat.

Very High	The threat is *not reversible*, for all intents and purposes
High	The threat is *reversible*, but *not practically affordable*
Medium	The threat is *reversible* with a *reasonable commitment of additional resources*
Low	The threat is *easily reversible* at relatively *low cost*

Overall Threat Magnitude per Biodiversity Target

	Irreversibility			
Severity & Scope	**Very High**	**High**	**Medium**	**Low**
Very High	Very High	Very High	Very High	High
High	Very High	High	High	Medium
Medium	High	Medium	Low	Low
Low	Medium	Low	Low	Low

APPENDIX 2

Body Condition Chart produced by Polar Bears International and World Wildlife Fund