Exhibit G:

Center for Biological Diversity Comments on Proposed Order Amending Schedule 1 for Polar Bears (Aug. 1, 2011). [Attachment omitted, but included as Ex. C]

CENTER *for* BIOLOGICAL DIVERSITY

August 1, 2011

Comments sent by email to mary.taylor@ec.gc.ca

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Re: Proposed Order To List The Polar Bear Under SARA As A Species Of Special Concern, As Stated In Order Amending Schedule 1 To The Species At Risk Act; Published in *Canada Gazette*, Part I, Ottawa, Saturday, July 2, 2011.

Dear Ms. Taylor,

Thank you for the opportunity to comment on the proposed Order to add the Polar Bear to Schedule 1 of the Species At Risk Act ("SARA") as a species of special concern, as outlined in the *Canada Gazette*, Part I, July 2, 2011. These comments are submitted on behalf of the Center for Biological Diversity ("Center"). The Center works to secure a future for all species hovering on the brink of extinction, through science, law, and creative media with a focus on protecting the lands, waters, and climate that species need to survive. The Center has over 315,000 members and online activists in the United States, Canada, and around the world.

The proposal to list the polar bear as a "species of special concern" is based on a status assessment and listing process that are scientifically unsound and that violate SARA. The polar bear in Canada clearly meets the definition of an endangered species and not a species of special concern. The listing proposal violates SARA by failing to use the best-available scientific information (SARA 15(2)), because it relies upon a fundamentally flawed status assessment, fails to incorporate new information that has become available in the three years since the status assessment was released, and fails to follow the SARA criteria for classifying species. The 2008 Committee on the Status of Endangered Wildlife in Canada ("COSEWIC") status assessment is deficient in several ways, including the fact that it ignores and/or misrepresents numerous studies showing the grave and imminent threat that climate change poses to polar bears. The status assessment also fails to consider designatable units of the polar bear species, despite the fact that leading polar bear experts have identified such units and have concluded that "the continued consideration of polar bears as a single biological unit is untenable." (Thiemann et al.

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2008:512). The Minister of the Environment has also failed to incorporate critical new information on polar bear status and threats in Canada published in the three years since the status assessment was completed. This information adds to the evidence that the polar bear is endangered by climate change. The listing proposal also fails to follow the COSEWIC criteria and guidelines for assigning listing status for assessed wildlife species. Under these criteria, the polar bear in Canada clearly meets the definition of an endangered species and not a species of special concern. These deficiencies fatally compromise the listing proposal and are addressed in detail below.

The Canadian Government is obligated under both domestic and international law to utilize the best available information and comply with all of its obligations pursuant to the SARA statute and regulations. In order to provide the polar bear with the protection it deserves and comply with these legal obligations, we recommend that the Canadian Government act immediately to list the polar bear as endangered under SARA.

I. The Listing Proposal Violates SARA because the 2008 COSEWIC Status Assessment and 2011 Proposal are not Based on the Best Information and Knowledge Showing the Polar Bear is Endangered by Climate Change.

SARA requires that the Wildlife Species Listing Process be based on the "best information and knowledge." SARA 15(2). Specifically, SARA states that "COSEWIC must carry out its functions on the basis of the best available information on the biological status of a species, including scientific knowledge, community knowledge and aboriginal traditional knowledge." SARA 15(2). COSEWIC's Assessment Process and Criteria (COSEWIC 2010:3) further provides that each Status Report shall be "an up-to-date compilation and analysis of all relevant, available, and credible biological information concerning a wildlife species and its status in Canada." Further, COSEWIC states that it "will be guided by the precautionary approach as set out in the Accord for the Protection of Species at Risk in Canada."[1]

However, as detailed below, the COSEWIC status assessment ignored and misrepresented the best-available scientific information on the current and future threat that climate change poses to the polar bear. Further, the proposed order issued three years after the publication of the status assessment does not incorporate the large body of new scientific information that provides further evidence that the polar bear should be listed as endangered. These studies must be assessed and incorporated into the listing proposal. To date, the approach by COSEWIC and the ministers has been anything but precautionary.

A. The COSEWIC Status Assessment Ignored and Dismissed the Best Available Scientific Information.

The COSEWIC status assessment ignored and dismissed the best-available science projecting polar bear population status under climate change (e.g., Amstrup et al. 2007, Hunter et al. 2007) and instead used a population viability assessment ("PVA") RISKMAN model that did not take continuing climate change and sea-ice loss into account. The resulting determination

[1] *See, e.g.*, COSEWIC "Mode of Operation" at http://www.cosewic.gc.ca/eng/sct6/sct6_2_e.cfm.

that the polar bear is not endangered, based largely on the RISKMAN models, is scientifically invalid because it ignores the impacts of continuing climate change on the polar bear.

An overwhelming body of scientific studies, including status assessments by the International Union for the Conservation of Nature Polar Bear Specialist Group ("IUCN PBSG") and U.S. wildlife agencies (e.g., U.S. Fish and Wildlife Service and U.S. Geological Survey), has found that climate change poses a severe and accelerating threat to the polar bear's survival. As discussed above, scientific studies available during the COSEWIC status assessment clearly indicate that the polar bear is endangered due to current and continuing sea-ice loss. Thus, the COSEWIC status assessment's use and reliance on RISKMAN PVA models that **do not include future changes in the sea-ice due to climate change** to project polar bear population status over the next 36 years and to determine the polar bear's listing status are not scientifically appropriate or valid, and violate SARA.

The status assessment acknowledges that the RISKMAN models do not incorporate effects of continuing climate change on polar bear demography (i.e., survival, reproduction) and are relevant only in the very short term:

> Simulations are presented using rates of survival and reproduction that were estimated within the past 10 years, and therefore assume effects of climate change leading to today's climatic conditions only. RISKMAN does not incorporate effects of directional environmental or habitat change or demographic parameters. Thus, regardless of length of simulation, results are relevant for near-term status assessments only. (Status Assessment: 37)
>
> "[A]s stated above, due to unknown effects of directional climate change on survival and recruitment, results should be used to interpret current and short-term likelihoods of decline only." (Status Assessment: 37)
>
> The Reason For Designation stated that quantitative projections of polar bear abundance did not account for the possible effects of climate change. As COSEWIC's species status report makes clear, this means that estimates of population growth rate (lambda) for each of the subpopulations did not account for the potential influence of climate warming on age-specific survival, litter size, and age-specific probabilities of litter production. (Although projections for the Western Hudson Bay subpopulation did include a range of survival rates that may reflect responses to climate change, equivalent data are not available elsewhere.) What is needed are data that link these demographic parameters to changes in the seasonal availability of summer sea ice. (COSEWIC Explanatory Note: Reason for Designation for Polar Bear, published 2008-05-06, http://www.cosewic.gc.ca/eng/sct0/sct0_200804_e.cfm).

Additionally, the RISKMAN population projections are particularly conservative and inappropriate because they are based on older demographic data (pre-2000s) for most populations (i.e., 7 of 11 populations assessed) and thus do not even reflect changes to

demographic rates due to the profound and accelerating loss of sea ice that occurred in the past decade. See Table 1 below.

Table 1. Date ranges for demographic data used in RISKMAN PVA models for polar bear populations in Canada, based on information in Table 6 of the status assessment and studies cited in this table.

Population	Study cited by Table 6 in COSEWIC status assessment	Date range for survival data used	Date range for reproductive data range
Baffin Bay	Taylor et al. (2005)	1994-1997	
Gulf of Boothia	Taylor et al. (2008c)	1976-2000	1994-2000
Kane Basin	Taylor et al. (2008a)	1992-1997	1992-1997
Lancaster Sound	Taylor et al. (2008b)	1993-1997	1993-1997
M'Clintock Channel	Taylor et al. (2006a)	1972-2000	1998-2000
Northern Beaufort Sea	Stirling et al. (2007)	1971-2006	
Norwegian Bay	Taylor et al. (2008b)	1993-1997	1993-1997
Southern Beaufort Sea	Regehr et al. (2006)	2001-2006	
Southern Hudson Bay	Obbard et al. (2007)	1984-2005	
Viscount Melville	Taylor et al. (2002)	1974-1992	1989-1992
Western Hudson Bay	Regehr et al. (2007a)	1984-2004	

Finally, the status assessment's interpretation of the RISKMAN model results is misleading and inconsistent, and contributes to the erroneous designation of "special concern" for the polar bear. Table 6 of the status assessment reports the results of simulation runs using the RISKMAN model and the proportion of runs resulting in >30% population decline after 36 years. The Table states that only 4 populations comprising 28% of Canada's polar bears—Baffin Bay, Kane Basin, Southern Beaufort Sea, and Western Hudson Bay—are considered to have a high risk of declining by 30% or more over the next 36 years, while 7 populations are considered stable or increasing (43% of bears) with 2 populations being data deficient (29% of bears). However, an examination of the Table reveals that four populations were judged to be "stable" when the RISKMAN simulations indicate that they have a high likelihood of declining. For example, Southern Hudson Bay had a 67% probability of a greater than 30% decline in the next 36 years; Northern Beaufort Sea had a 42% of a greater than 30% decline; Norwegian Bay had a 44% chance of a greater than 30% decline; and Lancaster Sound had 26% chance of a greater than 30% decline. Certainly these RISKMAN results do not lend confidence that these populations are "stable."

B. The Status Assessment Failed to Include or Discuss Available Studies that Document Harms to Polar Bears from Climate Change.

The Status Assessment failed to assess and/or discuss a number of available studies that documented negative and significant impacts to polar bears from climate change, thereby

violating the best-available science standard of SARA and serving to minimize the threats that climate change poses to polar bears. Examples of scientific findings related to Canadian polar bear populations that were available in 2008 but were either not included or not adequately discussed in the status assessment include the following: (a) a significant decrease in the proportion of polar bear maternal dens on pack ice between 1985 and 2005 in the Southern Beaufort Sea related to delays in autumn freeze-up, reductions in stable old ice, increases in open water, and reductions in snow cover on pack ice (Fischbach et al. 2007); (b) degradation of land denning habitats by coastal erosion of shorelines due to climate change (Durner et al. 2006); (c) drowning and stress from increased open water swimming due to sea-ice loss (Monnett and Gleason 2006); (d) observations of cannibalism (Amstrup et al. 2006) and starvation (Regehr et al. 2006); (e) declines in mass and body condition of subadult males, declines in growth of males and females, and declines in cub size in the Southern Beaufort Sea, suggesting that bears are experiencing lower nutritional status due to reduced foraging habitat availability (Rode et al. 2007). Thus the status assessment's coverage of the threats posed by climate change is clearly inadequate.

C. The 2011 Listing Proposal does not Incorporate the Findings of Important New Studies Published Since the 2008 Status Assessment.

In the three years since the release of the Status Assessment, many additional scientific studies demonstrating the dire threat to polar bears have become available. Yet the 2011 proposal to list polar bears as a species of special concern does not incorporate these critical new scientific findings, resulting in a scientifically unsound listing proposal and violating SARA's best-available science mandate. Examples of recent studies published in 2008 or afterward pertaining to Canadian polar bear populations that were not incorporated into the finding include the following: (a) Schliebe et al. (2008) documenting a significant shift in polar bear den distribution from offshore pack ice to coastal areas due to sea-ice retreat in the Southern Beaufort Sea; (b) Molnar et al. (2011) predicting climate-warming induced declines in litter size that jeopardize population viability in the Western Hudson Bay population and likely one-third of the global polar bear population, including failure of 40% to 73% of pregnant females to reproduce if spring sea-ice breakup occurs 1 month earlier than during the 1990s and failure of 55% to 100% if breakup occurs 2 months earlier; (c) Molnar et al. (2010) predicting the death of 28% to 48% of adult males in the Western Hudson Bay population due to starvation if climate change increases the summer fasting period to 180 days, predicting significant declines in mating success of Lancaster Sound females with increases in habitat fragmentation due to sea-ice loss, and concluding that "failure to incorporate climate change effects into population projections can result in flawed conservation assessments and management decisions"; (d) Cherry et al. (2009) documenting a significant increase in polar bears that were in a physiological fasting state from all sex, age, and reproductive classes in 2005 and 2006 compared with 1985 and 1986, which corresponded with broad-scale sea-ice loss leading to likely nutritional stress during this period; (e) Stirling et al. (2008) reporting unusual and energetically inefficient foraging behaviors of polar bears in the springs of 2004 through 2006 in the Southern Beaufort Sea attributed to sea-ice loss and corresponding food stress; (f) Durner et al. (2011) documenting the 687-km, 9-day continuous swim of a female polar bear to reach the sea-ice edge in the Southern Beaufort Sea, after which she lost 22% of her body weight and her yearling cub, providing a striking example of the high energetic and reproductive costs of increased open-water swimming; (g) Pagano et al.

(2011) documenting increased cub mortality in the Southern Beaufort Sea when cubs are forced to make long-distance swims due to sea-ice loss; (h) Stirling et al. (2011) finding that the survival of polar bears in the Northern Beaufort Sea varies with changes in sea-ice habitat, where increases in sea-ice concentration over continental shelf waters during a particular year increased survival of all age classes; (i) the published versions of most of the 2007 U.S. Geological Survey ("USGS") reports in eminent scientific journals (Durner et al. 2009, Amstrup et al. 2010, Hunter et al. 2010, Rode et al. 2010); and (j) the Proceedings of the 2009 15th working meeting of the IUCN PBSG concluding that 7 Canadian polar bear populations are declining (e.g., Baffin Bay, Kane Basin, Southern Beaufort, Western Hudson, Davis Strait, Lancaster Sound, Norwegian Bay) and 3 are stable (Obbard et al. 2010), which stands in sharp contrast to the COSEWIC Status Assessment conclusion that only 4 Canadian polar bear populations are declining while 7 are stable.

In addition, numerous studies on Arctic climate change, and particularly on sea-ice loss, are not incorporated or discussed in the listing proposal, but add to the overwhelming scientific evidence that climate change endangers the polar bear. For example, Stroeve et al. (2007) and Perovich and Richter-Menge (2009) found that September sea-ice extent in 2007 reached a level that the Intergovernmental Panel on Climate Change ("IPCC") ensemble mean projected would not be reached until 2050. Arctic summer sea ice has not recovered from the 2007 record low; the minimum sea-ice extent for September 2010 was the third lowest in the satellite record, behind the second lowest on record in September 2008 (NSIDC 2010). Overall, September sea-ice extent during 1979 to 2010 declined at a rate of 81,400 km^2 (31,400 mi^2) per year, or 11.5% per decade relative to the 1979 to 2000 average (NSIDC 2010). Many studies now project that Arctic summer sea ice will disappear almost completely in the 2030s (Stroeve et al. 2008, Lindsay et al. 2009, Wang and Overland 2009, Zhang 2010).

D. The Status Assessment did not Rely on the Best-Available Science to Identify Designatable Units under SARA.

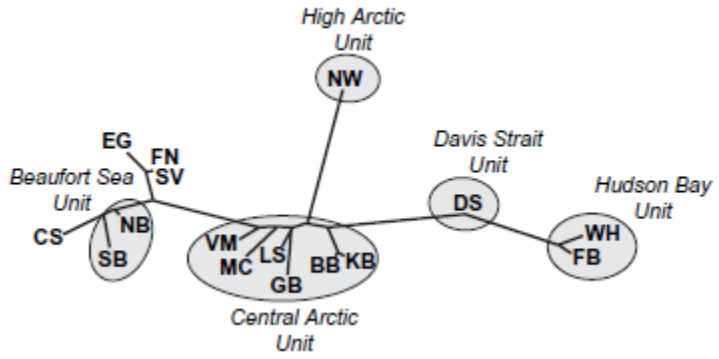
Under SARA, separate legal protection may be afforded to "distinct populations of wildlife" within a species, called "designatable units" ("DUs"), which are defined as intraspecific groups that are genetically, geographically, and ecologically distinct. Designatable units are recognized on the basis of any one of the four criteria, in order of precedence: (1) established taxonomy, (2) genetic evidence, (3) range disjunction, and (4) biogeographic distinction:

> (1) Established taxonomy: named subspecies of animals or varieties of plants
> (2) Genetic evidence: units identified as genetically distinctive: "evidence of genetic distinctiveness including, but not limited to, appropriate inherited traits (morphological, life history, behaviour) and/or genetic markers (e.g. allozymes, DNA microsatellites, DNA restriction fragment length polymorphisms (RFLPs), DNA sequences, etc.)."
> (3) Range disjunction: units separated by major range disjunction: "disjunction between substantial portions of the species' global geographic range such that dispersal of individuals between separated regions has been severely limited for an extended period of time and is not likely in the foreseeable future."

(4) Biogeographic distinction: units identified as biogeographically distinct: "occupation of differing eco-geographic regions that are relevant to the species and reflect historical or genetic distinction, as may be depicted on an appropriate ecozone or biogeographic zone map" (COSEWIC 2005).

In a publication entitled "Polar bear *Ursus maritimus* conservation in Canada: an ecological basis for identifying designatable units," Thiemann et al. (2008) identified five DUs in Canada that are "genetically, geographically, and ecologically separable" and "capture broad patterns of polar bear biodiversity." In terms of genetic evidence, Thiemann et al. (2008) found that conditions exist for groups of polar bears to have developed distinct genetic adaptations to local environmental conditions due to polar bear fidelity to denning, summer refugia, and foraging areas and limited long-distance migration between populations. Based on the genetic study of Paetkau et al. (1999), the polar bear researchers proposed five distinct genetic units: Beaufort Sea (southern and northern Beaufort Sea), Central Arctic, High Arctic, Hudson Bay/Fox Basin, and Davis Strait (Figure 1). They noted that genetic distances between polar bear groups are small, but that differences in important adaptive traits may exist between polar groups: "Because microsatellite sequences are neutral genetic markers they reflect the amount of time that groups have been separated, rather than the amount of evolutionary adaptation that has occurred. Other phenotypic differences may reflect recent adaptive genetic diversity." (p. 507).

Figure 1. Graphical representation of genetic distances between polar bear subpopulations from Paetkau et al. (1999). Clustering is based on the genotype likelihood ratio distance and represents relative patterns of similarity among subpopulations. CS=Chukchi Sea, SB=South Beaufort, NB=North Beaufort.
Source: Thiemann et al. (2008a): Figure 2.



Thiemann et al. (2008) also found that "inherited characters such as morphology, life history and behaviour provide evidence of genetic distinctiveness between groups (COSEWIC, 2005)." The researchers identified patterns in geography, sea-ice conditions, productivity and prey diversity, morphology, ecology and life history that supported their proposed DUs, and concluded that "the use of DUs provides a biologically sound framework for the conservation of polar bears." These experts further concluded, "[c]onsidering the vast geographic distribution of the species and the spatially variable ecological impacts of climate change, the continued

consideration of polar bears as a single biological unit is untenable." (Thiemann et al. 2008:512) (emphasis added).

Despite the published scientific evidence presented by foremost polar bear researchers supporting the designation of DUs in Canada, the COSEWIC status assessment cursorily determined that DUs were not warranted without any supporting explanation. The assessment simply stated that "identified subpopulations cannot be considered Designatable Units as per COSEWIC guidelines" (p. 13) without providing any rationale. This unsupported determination is arbitrary and capricious and fails to meet the best-available science standard under SARA.

II. The Listing Proposal Violates SARA by Failing to Follow the COSEWIC Criteria and Guidelines that Clearly Categorize the Polar Bear in Canada as an Endangered Species.

The COSEWIC quantitative criteria and guidelines are based on the IUCN Redlist criteria, and an assessed species must be placed in the highest category of threat for which it qualifies (COSEWIC 2010:8). The polar bear clearly meets the definition of an endangered species under both Indicator E and Indicator A of the COSEWIC quantitative criteria for determining listing status, as discussed below.

Indicator E specifies that a Quantitative Analysis (Population Projection) showing that the probability of extinction in the wild is at least 20% within 20 years or 5 generations (whichever is longer, up to a maximum of 100 years) qualifies the species as endangered, whereas a probability of extinction in the wild of 10% within 100 years qualifies the species as threatened.

As discussed above, the COSEWIC status assessment did not identify "designatable units" for protection, despite identification, by several of the world's leading polar bear specialists in a peer reviewed journal article, of five designatable units, and their conclusion that "the continued consideration of polar bears as a single biological unit is untenable." (Thiemann et al. 2008:512). Moreover, the COSEWIC status assessment used a generation time of 12 years, despite the uniform use of a 15-year generation time by the IUCN, PBSG, and U.S. Fish and Wildlife Service. While we believe that COSEWIC's failure to address the identified designatable units and use of a 12-year generation time is unsupportable, the polar bear must be classified as Endangered even under these improper assumptions. Even when considered as a single biological unit, the polar bear would be classified as endangered if a quantitative analysis found that the **probability of extinction is at least 20% within 60 years, using the COSEWIC generation time, and within 75 years using the generation time determined by IUCN PBSG.**

Two available studies (Amstrup et al. 2007, Amstrup et al. 2010) meet the definition of "quantitative analysis" under SARA and must be used in the SARA listing process.[2] Both

[2] A quantitative analysis is defined as "An estimate of the extinction probability of a taxon based on known life history, habitat requirements, threats and any specified management options. Population viability analysis (PVA) is one such technique. Quantitative analyses should make full use of all relevant available data. If there is limited information, available data can be used to provide an estimate of extinction risk (for instance, estimating the impact

Amstrup et al. (2007) and (2010) make full use of all relevant available data and fully disclose the assumptions, data used, and the uncertainty in the model results. While the underlying modeling is not a PVA and does not include standard confidence intervals, there can be no question that the work meets the SARA definition of a "quantitative analysis" and must be considered in the SARA listing process. Indeed, the robustness of the study that was first discussed in Amstrup et al. (2007) was confirmed by the later publication of that work (Amstrup et al. 2010) as the cover story in *Nature*, one of the world's most elite scientific journals. This work clearly shows that the polar bear meets the COSEWIC definition of endangered, both at the global level and when only Canadian populations are considered. These two studies—a USGS study by Amstrup et al. (2007) entitled *Forecasting the Range-wide Status of Polar Bears at Selected Times in the 21st Century*, and an expanded version of this study by Amstrup et al. (2010) published in *Nature* and co-authored by seven polar bear experts and climate scientists clearly establish that the polar bear merits listing as endangered under SARA.

At the global level, Amstrup et al. (2007) found that two-thirds of the world's polar bears will likely be extinct in 45 years under a middle-of-the-road A1B emissions scenario: "Our modeling suggests that realization of the sea ice future which is currently projected, would mean loss of ≈ 2/3 of the world's current polar bear population by mid-century." (Amstrup et al. 2007: 2). Specifically, Amstrup et al. (2007) found that the probability of extinction within 45 years under the mean sea-ice projection is 77% in the Seasonal Ice Ecoregion and 80% in the Divergent Ice Ecoregion, which comprise two-thirds of the world's polar bears. Within 75 years, the probability of extinction for polar bear populations worldwide ranges from 37% to 88%, exceeding the SARA endangered threshold of 20%.

When only Canadian polar bear populations are considered, more than two-thirds (68% or 10,439 of 15,361) of Canada's polar bears have a probability of extinction of at least 35% within 45 years under the ensemble mean sea-ice projections. (This includes all bear populations in the Seasonal, Divergent, and Convergent ecoregions; Archipelago populations have an 11% probability of extinction within 45 years.) (Table 2). Moreover, all of Canada's polar bears have a probability of extinction of at least 37% within 75 years (Table 2). Although Amstrup et al. (2007) does not provide extinction probabilities at 60 years, it appears that Archipelago populations will exceed a 20% probability of extinction within 60 years based on extinction probabilities at 45 years and 75 years. Certainly, using the precautionary approach, as COSEWIC states it must, would classify polar bears in the Archipelago region as endangered under these circumstances. Thus, all of Canada's polar bears will have at least a 20% probability of extinction within 75 years and almost certainly within 60 years, qualifying the species for endangered status in Canada under the COSEWIC criteria.

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of stochastic events on habitat). In presenting quantitative analyses, the assumptions, the data used and the uncertainty in the data or quantitative model must be documented. (Source: adapted from IUCN 2001)." (COSEWIC 2010:18).

Table 2: Probability of Polar Bear Extinction; data from Amstrup et al. (2007:66 (Table 8)) and COSEWIC status assessment

Ecoregion (Canadian populations within the ecoregion)	Number of Bears in Canadian populations based on Table 6 in COSEWIC status assessment	Probability of Extinction Year 45	Probability of Extinction Year 75
Seasonal (SH, WH, FB, DS, BB)	7,713	77.19%	88.15%
Divergent (SB)	1,526	80.33%	86.55%
Convergent (NB)	1,200	35.06%	76.23%
Archipelago (GB, MC, LS, VM, NW, KB)	4,922	10.56%	37.30%

Amstrup et al. (2010) reported extinction probabilities consistent with Amstrup et al. (2007). This study found that under an A1B emissions scenario two-thirds of the world's polar bears would disappear by mid-century. The study estimated an ~80% to 85% extinction probability in the Divergent and Seasonal Ecoregions, an ~40% extinction probability in the Convergent ecoregion, and an ~20% extinction probability in the Archipelago Ecoregion within 50 years (see Figure 4 of Amstrup et al. 2010). Thus, all polar bears in Canada meet the COSEWIC endangered standard under Indicator E well-within the 5 generation timeframe, according to Amstrup et al. (2010).

Adding to the scientific evidence that the polar bear is endangered in Canada, the extinction probabilities in Amstrup et al. (2007, 2010) likely underestimate the actual extinction risk to polar bears for two main reasons. First, the climate model projections on which the projections are based all project a much slower melting trend for sea ice than what has actually been observed (Stroeve et al. 2007). For example, there was less ice in the Arctic in September 2007 than the mean IPCC model ensemble projected for 2050 (Stroeve et al. 2007). The most hopeful finding was that some polar bears could survive in the Archipelago Ecoregion through the end of the century in reduced numbers. However, the authors noted that such optimism may be unwarranted as "[t]he southern portion of the Archipelago Ecoregion . . . was clear of sea ice by 23 August 2007 (Figure 15). [This] calls into question a main conclusion of our modeling effort: that polar bears in the Archipelago Ecoregion may be insulated from sea ice change for many decades." (Amstrup et al. 2007:35).

Second, the projections were based on assumptions about future greenhouse gas emissions that underestimate current trends. Since future emissions levels are not yet known, climate modeling is conducted based on a range of possible future values. Standardized emissions scenarios released by the IPCC in 2000 range from the low end "B1" scenario, in

which atmospheric carbon dioxide concentrations reach 549 parts per million ("ppm") by 2100, to the mid range "A1B" scenario, in which they reach 717 ppm by 2100, to the high end "A2" scenario, in which they reach 856 ppm by 2100. Amstrup et al. (2007) used the mid-range A1B scenario. As it turns out, carbon dioxide emissions have increased far faster than anticipated by the IPCC, and emissions have matched levels projected for the *highest* IPCC scenario (Raupach et al. 2007).

Hunter et al. (2007) adds to the evidence presented in Amstrup et al. (2007) that Canadian polar bear populations merit listing as endangered under SARA. Hunter et al. (2007) used a population dynamics modeling approach to project the population growth rate and extinction risk of the Southern Beaufort Sea population under changing sea ice conditions. In a stochastic environment in which good (2001-2003) and bad (2004-2005) years occurred at the frequency (21%) observed between 1979-2006, the Southern Beaufort Sea polar bear population declined at a rate of about 1% per year, and would likely reach quasi-extinction (defined as 1.5 to 15 polar bears) before the end of the century. Thus, under sea-ice conditions observed between 1979 and 2006, the polar bear population would decline towards extinction before the end of the century. Importantly, however, the frequency of bad sea-ice years has been increasing, and the researchers used a more realistic scenario using sea-ice projections from a suite of 10 global climate models ("GCMs"). In a stochastic environment described by these GCM forecasts, the Southern Beaufort Sea polar bear population had an extinction probability of ~45% to 75% in the next 50 years and ~75% to 95% by the end of the century, which clearly meets the definition of endangered under SARA.

Despite the clear evidence for an endangered listing, the COSEWIC status assessment gives only a cursory discussion of Amstrup et al. (2007) and Hunter et al. (2007) and dismisses these studies without justification. The assessment notes that "[l]ike Population Viability Analysis (PVA; Section 7), the outputs of these models [e.g., Amstrup et al. (2007) and Hunter et al. (2007)] depend on inputs and assumptions" (p. 19). However, the assessment does not provide any rationale for why these studies should be discounted in favor of the highly problematic and inappropriate RISKMAN analyses (see discussion *supra*) that the authors use as the basis for assessing the polar bear as a "species of special concern." Amstrup et al. (2007) and six other USGS reports that have since been published in leading scientific journals represent the best-available science on polar bear status and provide overwhelming evidence for an endangered listing under SARA.

While the polar bear must be listed as endangered based on Indicator E, we note that the polar bear also qualifies for endangered status under Indicator A. The polar bear qualifies under Indicator A3: "A reduction in total number of mature individuals, projected or suspected to be met within the next 10 years or 3 generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1" of greater than 50% (COSEWIC 2010:8). Factors (b) to (e) under A1 are in turn:

(b) an index of abundance appropriate to the taxon

(c) a decline in index of area of occupancy, extent of occurrence and/or quality of habitat

(d) actual or potential levels of exploitation

(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites (COSEWIC 2010:8).

As discussed above, the best available information demonstrates that all of the Canadian bears in the Seasonal Ice Ecoregion (Southern Hudson Bay, Western Hudson Bay, Foxe Basin, Davis Strait, and Baffin Bay populations) and all the bears in the Divergent Ice Ecoregion (Southern Beaufort population) are most likely to become extinct by mid-century, a loss of nearly 9,000 bears. By mid-century, the outcomes for the Convergent Ice Ecoregion (Northern Beaufort population) are nearly evenly split between a population that is smaller than now, rare (much smaller than now) and extinct (Amstrup et al. 2007:67). By mid-century for the Archipelago Ecoregion (Gulf of Boothia, M'Clintock Channel, Lancaster Sound, Viscount Melville Sound, Norwegian Bay, and Kane Basin populations), populations are most likely to be smaller than now, but could also be rare, extinct, or the same size, though this last outcome seems to be extremely unlikely given the wealth of data indicating that the risk projections in Amstrup et al. 2007 and 2010 are conservative. While the information in Amstrup et al. (2007, 2010) is easiest to align with the SARA criteria for Canadian polar bear populations overall, it is supplemented by and consistent with the results of the many other studies discussed above.

The definition of "mature individual,"[3] which excludes adult bears that are unable to reproduce, is also relevant to this analysis because female polar bears in some areas may be unable to raise young before the population is actually extirpated. (*See, e.g.*, USFWS 2008:28266 (cub production in Western Hudson Bay "will probably be negligible within the next 15-25 years.")))

Thus because Canadian polar bear populations are almost certain to be reduced by more than 50% over the next three generations, they more than meet the SARA criteria for a population size reduction of greater than 50% that is "projected or suspected to be met" within that timeframe and must be listed as Endangered. The same results are reached, once again, when considering area of occupancy under SARA factor A(4)(c) "a decline in area of occupancy, extent of occurrence and/or quality of habitat."

III. Conclusion

Neither the status assessment nor the listing recommendation to list the polar bear as merely a "species of special concern" is supported by the best available information as required by SARA. In order to fulfill its obligations under both domestic and international law, we recommend that the Government of Canada act immediately to list the polar bear as an endangered species under SARA, as required by the statute and the best available information.

Thank you very much for your consideration of these comments. Please contact Kassie Siegel at (760) 366-2232 or at ksiegel@biologicaldiversity.org if you have any questions.

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[3] The definition of "mature individual" includes the following:

> The number of mature individuals is the number of individuals known, estimated or inferred to be capable of reproduction. When estimating this quantity, the following points should be borne in mind:
>
> - Mature individuals that will never produce new recruits should not be counted (e.g. densities are too low for fertilization)….(COSEWIC 2010:17).

Sincerely,

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Encs: The papers marked with an asterisk (*) below are discussed extensively above and are attached for your convenience.

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