Written Testimony of Dr. Steven C. Amstrup
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before the Subcommittee on Energy and Mineral Resources
of the Committee on Natural Resources
United States House of Representatives
legislative hearing on
"The Need to Protect the Arctic National Wildlife Refuge Coastal Plain"
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Introduction

Chairman Lowenthal, Ranking Member Gosar, members of the subcommittee, thank you for the opportunity to speak to you today on this very important piece of legislation, the Arctic Cultural and Coastal Plain Protection Act.

My name is Steven C. Amstrup, and I am the Chief Scientist for Polar Bears International (PBI), a global resource collecting and dispersing information on how to preserve polar bears and their habitat. At PBI, I advise and conduct research, publish in scientific outlets, and make sure PBI's education and outreach efforts are based on the best available science. I put the latest scientific information about threats to polar bears from global warming and threats from on the ground threat multipliers, into language and context understandable by the general public. I also communicate that information to media, and in a variety of speaking and writing formats.

Prior to joining PBI, I was Polar Bear Project Leader for the U.S. Geological Survey (USGS) between 1980 and 2010. I am a past chairman of the International Union for the Conservation of Nature (IUCN) Polar Bear Specialist Group and have been an active member of this international group of polar bear experts since 1980. During my 30 years directing and conducting polar research in Alaska I authored or co-authored over 150 scientific papers many of which addressed basic questions about movements,

distribution, and population dynamics of Alaskan polar bears. I observed that they only reliably catch their prey (principally 2 species of seals) from the surface of the sea ice, I documented seasonal movements including where polar bears go to give birth to their cubs, and I discovered that retreating sea ice was impacting their welfare. In 2007, I spearheaded the USGS research effort informing Secretary of the Interior Dirk Kempthorne whether to list the polar bear under the U.S. Endangered Species Act (ESA). In response to the research I led, Secretary Kempthorne decided to list polar bears as a Threatened Species in spring of 2008. With his action, Secretary Kempthorne made polar bears the first species ever listed under protections of the ESA because of threats to their future existence from anthropogenic global warming. In a conference call with my entire research team, Secretary Kempthorne candidly admitted that the Bush Administration did not want to list polar bears, but that our evidence had convinced him that it was his only choice, and that it was the right thing to do.

As I explain in this testimony, it is vital to protect the Coastal Plain from oil and gas development. Oil and gas development on the Arctic National Wildlife Refuge Coastal Plain will accelerate the decline of the region's already imperiled polar bear population. This development will exacerbate the current trends in our climate and further sea ice loss. Sea ice is where polar bears catch their food and is the crux of their livelihood. On the ground impacts of oil and gas development will multiply threats from habitat losses caused by a warming climate and will make it more difficult to stop the extirpation of threatened polar bears from the United States. Until society takes the necessary actions to halt the rise of atmospheric greenhouse gas concentrations, which is the only way to stop warming and stabilize sea ice, conserving onshore habitat for polar bears will be of utmost importance to preserving this species.

The Arctic Refuge Coastal Plain provides critical onshore habitat where threatened polar bears establish maternal dens in the winter. With recent warming, traditional summer foraging on the sea ice is no longer possible and an increasing number of bears also use the Coastal Plain as resting habitat during the ever longer ice-free season. As the world continues to warm and sea ice continues to decline, this area will

only become more important to polar bears and their cubs during both the summer and winter months. Oil and gas activities such as seismic exploration, and subsequent leasing and development, will cause disturbance and potential direct lethal impacts to polar bears on the Coastal Plain. Past experiences confirm we do not have methods or technology to avoid these impacts. Much like the original listing of polar bears by Secretary Kempthorne, protecting the Arctic Refuge Coastal Plain is a politically charged issue, but it is the right thing to do in light of the evidence and importance of conserving polar bears.

WHY IS THIS LEGISLATION IMPORTANT?

BACKGROUND:

Polar bears depend on sea ice for catching their prey

Polar bears inhabit most ice-covered seas of the Northern Hemisphere. They are circumpolar in distribution but limited to areas covered by sea ice for most of the year. They occur in 19 identified populations (http://pbsg.npolar.no/en/status/status-table.html) all of which feed principally on ringed (*Pusa hispida*) and bearded seals (*Erignathus barbatus*) (Amstrup 2003). Polar bears can predictably catch seals only from the surface of the sea ice, establishing a fundamental link between sea ice availability and polar bear welfare (Amstrup 2003, Rode et al. 2015). The fossil record verifies the polar bear's reliance on adequate sea ice cover. During Pleistocene glacial periods, sea ice extended farther south than it has in recent history. At the end of the last continental glaciation (approximately 10,000 years ago) polar bears occurred as far south as the Baltic Sea (Ingólfsson and Wiig 2008). As the world warmed and ice cover in the Baltic became less reliable, polar bears did not adopt another way of making a living, they simply disappeared from the region.

Sea Ice Extent is directly related to Global Mean Temperature

There is a linear but inverse relationship between sea ice extent and global mean temperature (Amstrup et al 2010). This relationship means, as anthropogenic global warming continues, sea ice extent can only be further reduced and polar bear

distribution and abundance can only continue to decline. On the other hand, the linear relationship means there is not a tipping point or threshold temperature beyond which loss of sea ice becomes irreversible and unstoppable. It also means that more sea-ice habitat could be retained if the increase in greenhouse gases is mitigated, and that the extent to which sea ice is preserved depends on how quickly we address global warming. Therefore, continuing declines in polar bear distribution and numbers are not unavoidable, and polar bears can still be preserved across much of their current range with prompt societal action stabilizing atmospheric greenhouse gas concentrations.

Climate Models accurately predict Global Mean Temperatures

Over the period during which we have observational data, climate models have been extremely accurate in projecting global mean temperature. The mean or average of estimates from 40 accepted models closely overlaps the global mean temperature observed between ~1880 and the present (Figure 1). Therefore, it is reasonable to assume that the mean of future global temperature projections accurately represents what the earth will experience. The mean of the projected future temperatures, like all averages, is composed of a number (40 in Figure 1) of individual projections. Each of these 40 climate model outcomes, represent different possible realizations of the future global temperature. We of course will only get to experience one realization of the future. When looking over multiple decades, the greatest likelihood is that earth's future temperatures will approximate the mean of these projected realizations. On shorter time scales (years to perhaps two decades), some of these modeled futures are likely to be closer to what we experience than others, and the realized temperatures in a particular time frame could be near the extremes of the range of predictions.

Deviations from the mean trend line, caused by the natural chaotic fluctuation in the climate system, are the "uncertainties" in climate predictions people often speak about. Earth has always experienced these short-term variations in the climate. Climate fluctuations caused by El Ninõ, the Pacific Decadal Oscillation, or the Arctic Oscillation can impact temperatures for up to many years, while shifts in the Polar Jet Stream or the Trade Winds often cause more localized and shorter-term shifts. During the last

several thousand years, when atmospheric greenhouse gas concentrations were relatively stable, the mean of these fluctuations was a flat or horizontal baseline—with no increasing or decreasing trend on a multi-centennial scale.[1] With greenhouse gas concentrations constantly increasing these fluctuations continue to occur, but the average of all of the fluctuations now compose a steadily climbing trendline. Whereas the extremes (severe cold or hot spells) in the natural fluctuations often get our attention, it is that rising trend line, or average of the fluctuations, that is important. Note that Figure 1 does not include any model outcomes suggesting temperature stabilization or decreases in the future. This is because climate physics require that the earth's average temperature can only increase as long as atmospheric greenhouse gas concentrations rise (Schneider 1989). At this point in our warming of the world, we are still low enough on that rising trend line that some extreme cold events still overlap with our historic flat baseline. When this happens, it provides momentary doubt about the rising average temperature. But whereas we used to experience the same number of record hot and record cold spells; record hot spells are now twice as frequent as record cold spells. And by the latter part of this century, on our current path, we'll see 50 record hot periods for every record cold (Meehl et al. 2009), And, summer temperatures over most of the world will be higher than anything we've ever experienced (Lehner et al. 2016).

Earth's future temperature is most likely to be near the mean or average of predictions in Figure 1, but because all predictions are for a much warmer earth, whether or not our true realization is near mean or the extremes, continuing on our current course will lead to a very different world than that in which polar bears (and humans) have thrived.

[1] The baseline or average of temperatures over the past several thousand years was actually declining as earth has gradually received less energy from the sun (Marcott et al. 2013). When viewed over time scales of 1000 years or less however, the trend appears essentially flat.

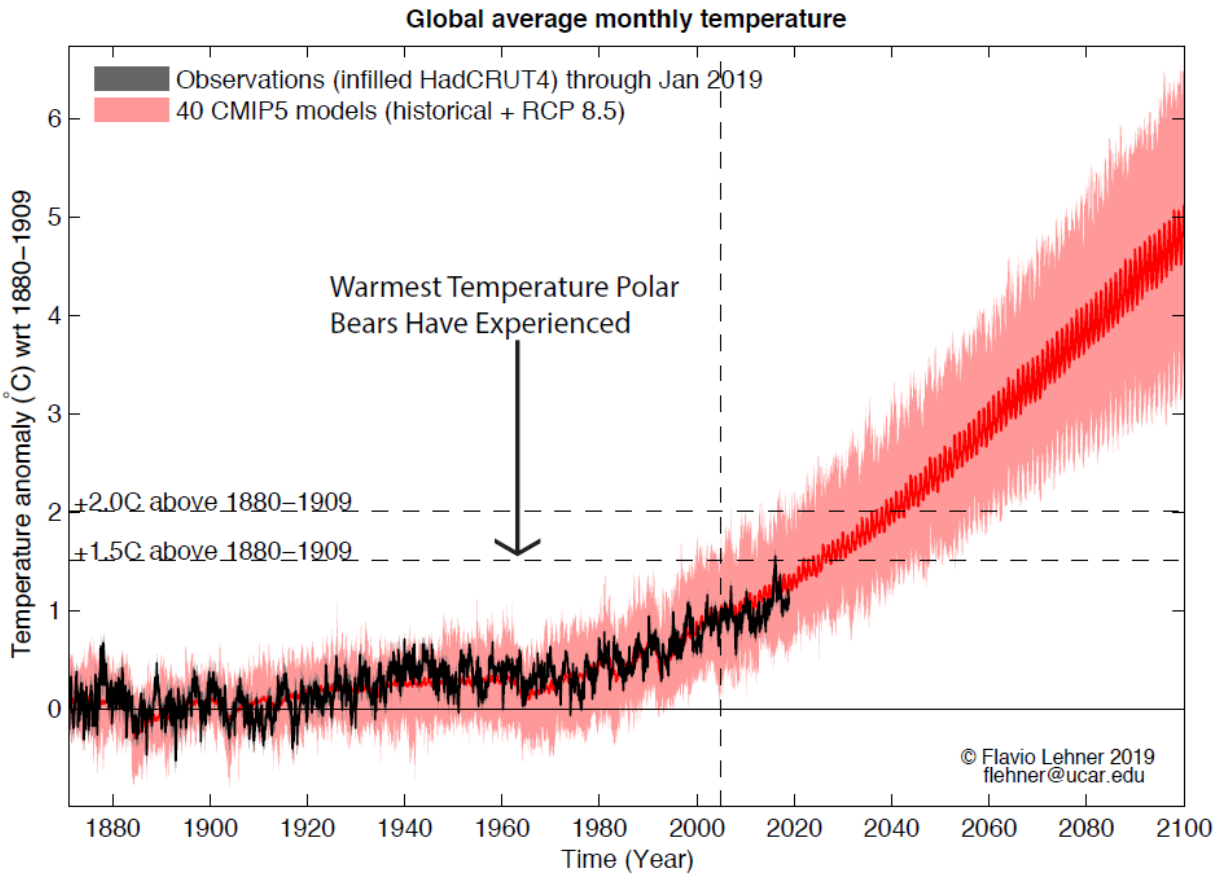

Figure 1. Observed and projected change in mean monthly global temperatures. Vertical axis illustrates the difference between the mean annual temperature for the preindustrial period of 1880-1909) and monthly average temperatures from the late 19th century through January 2019, Note that the warmest periods polar bears may have experienced during their evolutionary history may have been only about 1.5° C than the preindustrial mean.

The inverse relationship between global mean temperature and sea ice extent means that the polar bear's sea ice habitat can only continue to decline as temperatures continue to increase. The warmest global mean temperature polar bears have experienced since they separated from a common ancestor with the current brown bear was probably only 1°-1.5° C higher than preindustrial average. Earth's temperature could exceed that as early as next year, or as late as 2050 depending on which realization of the future we actually experience. The greatest likelihood, however, is that global mean temperature will be higher than anything in the polar bear's evolutionary history by approximately 2030 (Figure 1). Crossing that evolutionary threshold is

unlikely to spell the immediate demise of polar bears. But, because of the linear relationship between global mean temperature and sea ice extent, we can be assured that average annual sea ice extent will be lower at that time than it is now. We can also be assured that polar bears will experience a greater frequency of "bad" ice years during that decade than they do now, emphasizing the importance of maximizing protections from on the ground disruptions.

Polar bears of the Southern Beaufort Sea are the most urgently threatened

Anthropogenic global warming has caused an average decline in summer sea ice extent of 20.5% per decade in the Southern Beaufort Sea—the greatest ice retreat experienced by any of the 19 polar bear populations (http://pbsg.npolar.no/en/status/status-table.html). In the Southern Beaufort Sea, the productive continental shelf, on which polar bears historically foraged through summer is very narrow and most polar bears historically spent summer on sea ice relatively near shore (Amstrup et al. 2004, Atwood et al. 2016). Because of retreating summer sea ice, this former summer hunting habitat is now unavailable. In response, polar bears are either forced onto land or onto remaining sea ice over the deep and unproductive waters of the polar basin. Whether on land or over the deep water of the polar basin, food is relatively unavailable (Atwood et al. 2016, Whiteman et al. 2018). In response to this decline in available habitat, the Southern Beaufort Sea population has declined ~40% in recent years, making it the world's most rapidly declining population yet documented.[2] A major contributor to the observed decline is poor cub survival (Bromaghin et al. 2015).

If temperatures are allowed to continue to rise, polar bears ultimately will disappear

The rapid sea ice decline, and the limited area of productive habitat means polar bears in the Southern Beaufort Sea are among the most vulnerable to continued rising

[2] The Western Hudson Bay population has declined approximately 30% (Lunn et al. 2016) and the Southern Hudson Bay population has declined by about 17% (Obbard et al. 2018).

temperatures. Unless the rise in atmospheric greenhouse gas concentrations is quickly abated, Southern Beaufort Sea polar bears are likely to be the first polar bear population to disappear. If temperature rise and sea ice loss continue, polar bears throughout their range also will be gone.

Current evidence suggests polar bears broke away from a common ancestor with the brown bear around a million years ago. The warmest periods experienced during their evolutionary history were less than a degree warmer than current temperatures (Hanson et al. 2013, Marcott et al. 2013). We know from the fossil record that polar bears disappear from areas without sufficient sea ice cover (Ingolfsson and Wiig 2009). Without significant mitigation (see Figure 1) the world will be warmer within the next 2 or 3 decades than at any time during the polar bear's evolutionary history, and sea ice extent will be lower than anything polar bears ever have experienced. Therefore, we need to move swiftly toward sustainable energy sources if we are serious about preserving polar bears. Failure to act virtually assures polar bears in Alaska, and ultimately across their range, will follow the path of polar bears in the Baltic region and simply disappear.

WHY IS THIS LEGISLATION IMPORTANT?

Specific reasons oil and gas development of the Arctic Refuge must not proceed:

Oil and Gas Extraction on the Coastal Plain will perpetuate unsustainable dependence on fossil fuels

Weaning society from fossil fuel dependence is critical to future polar bear persistence in the United States and throughout their current range in the circumpolar Arctic. Greenhouse gas emissions from extraction and combustion of the oil and gas that may lie under the Coastal Plain can only contribute to additional sea ice loss, compounding risks to Southern Beaufort Sea polar bears and accelerating polar bear declines worldwide. Recognizing that polar bears cannot survive unless global temperature is stabilized, the U.S. Fish and Wildlife Service Polar Bear Conservation Management Plan (U.S. Fish and Wildlife 2016) recommends swift action to mitigate rising

concentrations of greenhouse gases in the atmosphere. The Conservation Management Plan is intended to delineate reasonable actions that U.S. Fish and Wildlife Service believes will contribute to the conservation of polar bears and was developed in response to the polar bear's listing as a threatened species under provisions of the ESA. Development of the hydrocarbon reserves that may lie under the Arctic National Wildlife Refuge would contribute additional greenhouse gas emissions that are contrary to goals of maintaining a climate on earth that will allow polar bears to survive. Avoiding fossil fuel extraction, on the other hand helps mitigate greenhouse gas rise, and will benefit polar bears and their sea ice habitat. Because polar bears are sentinels of the Arctic marine ecosystem, trends in their sea-ice habitats foreshadow global changes. Therefore, we cannot overlook the fact that mitigating greenhouse gas emissions to improve polar bear status will have conservation benefits throughout and beyond the Arctic.

Developing oil and gas reserves that may lie under the Coastal Plain of the Arctic National Wildlife Refuge is inconsistent with the need to halt greenhouse gas rise and move society to sustainable energy sources. The Arctic Cultural and Coastal Plain Protection Act (H.R.1146) will assure the oil and gas under the environmentally sensitive Arctic Refuge Coastal Plain does not contribute to ongoing sea ice loss.

Development would remove protections of critically important onshore polar bear habitat

The U.S. Fish and Wildlife Service Conservation Management Plan (U.S. Fish and Wildlife 2016) recognizes the need for "on the ground" protections to assure as many polar bears as possible persist until sea ice is stabilized. The catastrophic rate of decline in the Southern Beaufort Sea polar bear population is driven by reduced survival, particularly of cubs. In fact, only 2 of 80 cubs captured between 2003 and 2007 are known to have survived to enter older age classes (Bromaghin et al. 2015). This makes it clear that maximizing survival potential for every single cub is essential in maximizing opportunity for polar bears in this region to persist. Because the frequency of bad ice years can only increase as temperatures continue to warm, more such years

of poor cub survival are assured. It is critical, therefore, that polar bear onshore habitat is protected from activities that will further compromise cub survival, and that direct human-caused mortalities, from polar bear/human conflict and industrial activities, be eliminated where-ever possible. The most important actions that will aid polar bear population persistence are: a) affording protection to maternal denning areas where polar bears go to give birth to their cubs, and; b) minimizing human/polar bear conflict situations that often result in polar bears being shot. Exploration and development of the Arctic Refuge Coastal Plain is inconsistent with both imperatives.

Risks to maternal denning bears

Preventing disturbance of habitats on the Arctic Refuge Coastal Plain where pregnant female polar bears give birth to their cubs is vital to the future welfare of the Southern Beaufort Sea polar bear population. Polar bear cubs are born very undeveloped (altricial) and unable to survive the rigors of the Arctic winter outside the shelter of the den. Amstrup and Gardner (1994) reported mortalities of cubs born to radio-collared polar bears that were forced from their dens prematurely, and we know mother bears that are able to stay in dens for longer periods have greater early cub survival (Amstrup and Gardner 1994, Rode et al. 2018). Therefore, disruption of maternal denning must be avoided wherever possible.

Pregnant female polar bears excavate snow dens in early winter. They give birth in midwinter and emerge in spring when cubs are approximately three months old. (Amstrup and Gardner 1994, Amstrup 2003). In northern Alaska, snow accumulation sufficient for denning is confined to narrow linear segments of coastal and stream bank habitats (Amstrup and Gardner 1994, Durner et al. 2001, 2003), and there is more of these suitable denning habitats on the Arctic Refuge Coastal Plain than other parts of northern Alaska. Although it composes only about 10% of the coastal area of northern and northwestern Alaska,[3] 22% of pregnant female polar bears in the Southern Beaufort

[3] Estimated by measuring approximate coastal extent, where polar bear dens have been observed, from the Canadian border to the north edge of Kotzebue Sound with Google Earth ruler tool.

Sea den there each winter according to the *Coastal Plain Oil and Gas Leasing Program Draft Environmental Impact Statement* (DEIS, see Vol. 1, 3-128)
. The distribution of suitable maternal denning habitats is essentially uniform across the Coastal Plain (Durner et al. 2006), but the more variable orientation of bank and drainage habitats also makes their distribution more complex. With more abundant and more complex denning habitat, identifying den locations on the Arctic Refuge Coastal Plain when they are totally covered by winter snow, presents an especially difficult challenge.

Polar bears in northern Alaska may enter dens as late as mid-December and can remain in dens until mid-April (Amstrup and Gardner 1994). Throughout most of this time they are invisible under the snow. Industry practice purports to avoid denning polar bears by aerial survey implementing Forward Looking Infrared ("FLIR") technology to detect dens in advance of on-the-ground activities. Once dens are identified, oil and gas activities will generally observe established "buffer zones" around dens to avoid disturbance or chorusing of the den. I conducted the original testing of whether FLIR imaging could detect otherwise invisible dens in mid-winter and meet the challenge of locating dens so that they can be protected from possible industrial disturbances (Amstrup et al. 2004b). Whereas FLIR imagery can detect many dens under the snow, I emphasized that it cannot detect all dens and that it has many shortcomings, and subsequent research emphasized those shortcomings (Robinson et al. 2014). The track record of FLIR use in active oil field areas west of the Arctic Refuge verifies significant limitations. Between 2004 and 2016, FLIR surveys conducted in advance of various oil field operations along Alaska's North Slope correctly identified 12 maternal dens but missed 11 dens (essentially a 50% detection rate) that were within the survey areas (Smith et al. *In Prep*). The denning habitat on the Arctic Refuge Coastal Plain is more expansive and far more complex than other areas of Alaska's North Slope where oil and gas development has occurred—and where FLIR has been used to find dens. Therefore, it is unlikely detection rates on the Arctic Refuge Coastal Plain will be any higher than the ~50% historic record.

With a population of ~236 females (Bromaghin et al. 2015), and an estimated breeding rate or probability of ~0.55[4] we could expect ~131 bears to be denning each winter. If the statistics in the DEIS are correct and 22% of pregnant bears choose to den on the Arctic Refuge Coastal Plain, 29 (22% of 131) pregnant females could be expected to den there each winter. With a ~50% detection rate for FLIR, half or approximately 15 of the dens annually expected to occur on the Coastal Plain are likely to be undetected before any oil and gas activities take place.

Considering varying assumptions and current and future conditions, future annual denning on the Arctic Refuge is likely to exceed the 22% or 29 dens that DOI estimates currently occur each year on the Arctic Refuge Coastal Plain. The proportion of female polar bears choosing to den on land as opposed to sea ice has continued to increase, from 46% in the 1980s to 77% between 2000 and 2010 (Durner et al. 2010). The breeding probability is likely to increase in the near future as nutritional stress results in more females becoming pregnant but fewer being able to keep their cubs. Finally, summer-time land use has increased three-fold (Atwood et al. 2016) in recent years, and the number of bears on land in summer is expected to continue to increase. Because there are few nutritious foods available on land, a majority of the Southern Beaufort Sea polar bears that spend all or part of summer on land take advantage of supplemental food in the form of whale remains at the “bone pile” near the village of Kaktovik (Atwood et al. 2016).[5] Higher numbers of bears supplementing their pre-denning foraging near Kaktovik is likely to translate into higher numbers of bears denning on the adjacent Arctic Refuge Coastal Plain close to this food source. Therefore, it is most reasonable to assume 29 or more pregnant mother polar bears will den on the Coastal Plain each year as we go into the future.

[4] See my March 8, 2019 analysis of the DEIS. Because the breeding interval does not account for litter size, and because proportions of cubs in the population represent some litters of multiple (usually 2) cubs. The actual breeding probability is most probably higher than 0.55. So this estimate must be considered conservative.
[5] The “bone pile” is where remains (not consumed by people) of bowhead whales (*Balaena mysticetus*) harvested by residents of the Kaktovik community are deposited.

I understand that the Tax Cuts and Jobs Act of 2017 authorized an oil and gas leasing program for the Coastal Plain, and that separately the Bureau of Land Management is considering a seismic survey application from SAExploration. Given the high density and largely uniform distribution of maternal denning habitat on the Arctic Refuge Coastal Plain, industrial operations like seismic testing, road and pad building, exploration and production drilling, and maintenance pose significant threats to denning polar bears (Amstrup 1993, Amstrup and Gardner 1994). Seismic exploration is an especially significant threat to denning success. Seismic work must be done in winter, when the ground is frozen enough and the snow is deep enough to protect the tundra from the 45-ton trucks that vibrate the ground to create sonic images that may detect subsurface fossil fuel sources.

SAExploration's proposed 200-meter by 200-meter grid of 3D seismic testing[6] on the Coastal Plain exemplifies the risks from oil and gas activities to denning mother bears (Figure 2). Tracks remaining on the tundra, after recent seismic surveys, reveal that seismic testing vehicles actually make 2 or more passes along grid lines leaving an approximately 15-meter vehicle footprint (Walker et al. 2019).[7] With a 15-meter wide footprint, over 14% of the Arctic Refuge Coastal Plain denning habitat within the bounds of a seismic survey would be "run over" by seismic vehicles, essentially crushing any dens in these pathways, and 92% of the denning habitat would be within 65 meters of vehicle paths, a proximity that can cause a mother polar bear to open her den prematurely, with potential negative consequences for cub survival.[8] If as estimated, there are 15 undetected maternal dens on the Arctic Refuge Coastal Plain each year, such surveys would have a 90% probability of running over one or more occupied maternal dens with probable fatal consequences.[9] And on average (if such a survey were repeated multiple times) each survey would result in vehicles running over two

[6] Because BLM has failed to provide the public with further information about pending Coastal Plain seismic survey proposals, this analysis considers the most recent proposal from SAExploration that BLM did make public.
[7] http://fairbanksfodar.com/science-in-the-1002-area
[8] Based on prior information suggesting many denning females will emerge from dens if seismic vehicles approach to within 65 meters of the den site (Amstrup 1993).
[9] See my March 8, 2019 analysis of the DEIS (Pages 13-21) for computations.

maternal dens. These outcomes do not include the additional (and *a priori* inestimable) risk from numerous cross-grid tracks that characterize recent seismic surveys.

The above analysis makes it clear that exploration of the Arctic Refuge Coastal Plain is virtually assured to negatively impact reproductive success of polar bears in the Southern Beaufort Sea population, and additional negative impacts would be sure to follow if development were approved. Current mitigation measures and den detection techniques are not sufficient to identify polar bear dens in advance of industrial activity. Because industry activities cannot avoid dens which they cannot locate in advance, reliance on these avoidance measures does not protect bears. Given that reproductive success in the Southern Beaufort Sea polar bear population is already severely compromised, added impacts on reproductive success of denning females, such as seismic exploration and oil and gas development, would surely exacerbate the ongoing decline of this imperiled population. The Arctic Cultural and Coastal Plain Protection Act (H.R.1146) would prevent disruptions of polar bear maternal denning.

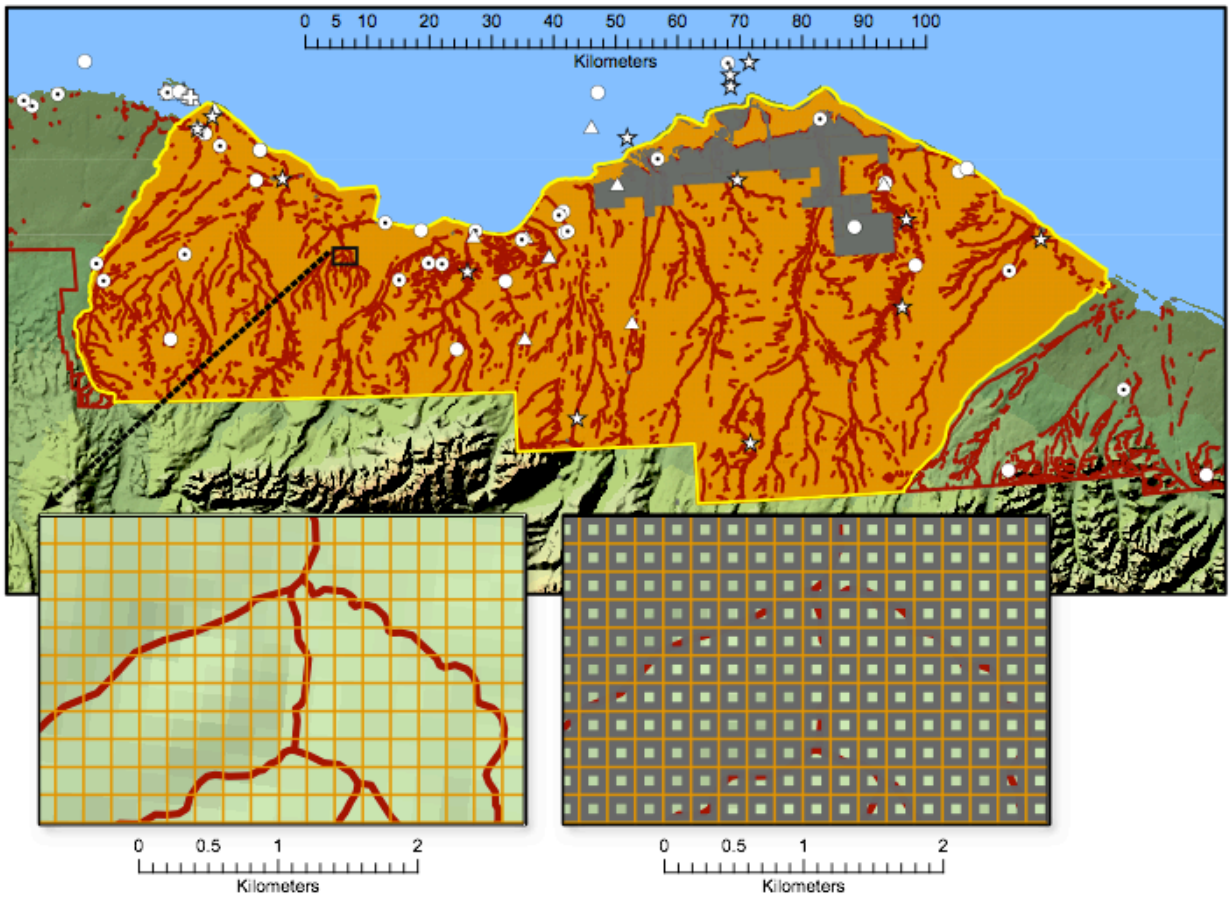

Figure 2. Map of the Arctic Refuge Coastal Plain (1002 area) showing denning habitat (narrow red polygons, Durner et al. 2006), and proposed 200 x 200-meter seismic survey grid (pale orange lines). The grid is so closely spaced it appears merely as shading at the scale of the entire Coastal Plain. The left inset illustrates the seismic grid spacing (orange lines) and a small area of denning habitat (red polygons) at much larger scale. The right inset shows the same larger scale view of the seismic grid plus a 65-meter zone of disturbance (grey-green shading) either side of the survey line. Blue-green squares in the right-hand inset are "doughnut holes" not within the 65-meter zone of influence. Red bands in these doughnut holes reveal how little denning habitat could escape potential disturbance[10]. The dark grey polygon illustrates the Kaktovik Inupiat Corporation lands, which are not included in this analysis because they were not part of the seismic survey application proposed to BLM.

[10] Denning females > 65 meters from transect also may be disturbed. Dens within the doughnut holes, therefore, are not protected from disturbance, but may experience a reduced likelihood of disturbance.

Other Negative Impacts

Direct Polar Bear/Human Conflicts—Polar bear/human conflicts often result in direct mortalities of polar bears, and they always result in disruptions of normal bear activities. Any exertion bears make that would not normally be required means bears will incur additional energy costs. Arctic wide, polar bear/human conflicts have increased as sea ice has declined (Towns et al. 2009, Atwood et al. 2017), and further increases are virtually assured as temperatures continue to warm and sea ice extent declines even farther. During the past 15 years, the numbers of bears spending summer on land in Alaska has tripled (Atwood et al. 2016). A majority of bears stuck on land during summer in Alaska spend much of their time on and adjacent to the Arctic Refuge Coastal Plain. There always have been higher numbers of mother bears seeking to den on the Refuge Coastal Plain than in other parts of Alaska's Arctic, and we expect that number to grow, increasing potential conflict between humans and pregnant bears seeking den sites. Climate change is bringing more bears to shore for longer periods (hence reducing food available to those bears). If development proceeds, interactions between polar bears and oil-field workers will be more frequent, and more severe. Greater numbers of emaciated bears are likely to threaten workers, and such interactions are more likely to lead to the killing of bears in defense of life and property. These higher numbers of polar bears combined with intensive human activities related to hydrocarbon development could only increase the number of bear/human conflicts. With this population already in severe decline, additional mortalities, and additional stressors experienced by bears, can only add to declining numbers.

Habitat fragmentation and cumulative effects—Currently oil and gas developments extend across approximately 185 kilometers of Alaska's north slope—from the Colville Delta to Pt. Thompson. Development of the Arctic Refuge Coastal Plain would extend that development corridor another approximately 90 kilometers to the vicinity of Barter Island. This expansion would mean that essentially half of the northern coast of Alaska has some form of industrial development. Assessing cumulative impacts is difficult and studies have not been done to estimate whether the expansion of oil-field activity in Alaska may have contributed to declining trends in polar bear welfare. We do know, however, that polar bears and all animals operate on an energy budget. We also know

that unnatural and hence unnecessary movements and activities add to the energy costs that animals normally face. The greater the number of novel and unnecessary energy expenditures a polar bear needs to make, the greater the likelihood of going into a negative energy balance. Polar bears in the Southern Beaufort Sea are increasingly in negative energy balance, as reflected by declining survival rate of cubs and reduced population size. Although these negative trends can largely be attributed to warming temperatures and declining sea ice availability, they also have coincided with major expansion of the oil and gas development footprint along the coast of northern Alaska. Currently, the Arctic National Wildlife Refuge is truly a refuge from the structures and disruptions present in coastal areas to the west. Preventing the fragmentation that has occurred along much of the northern Alaska coast from reaching this refuge is critical to supporting persistence of Southern Beaufort Sea polar bears. This legislation will prevent further fragmentation of vital Arctic Refuge polar bear habitats.

Conclusions

Evidence suggests activities and structures related to exploration and development of oil and gas reserves on the Arctic Refuge Coastal Plain will negatively affect the polar bear's use of their designated critical denning habitat and are virtually assured of impacting denning females with likely fatal consequences (see my March 8, 2019 analysis of the DEIS: http://polarbearsinternational.org//media/3383/amstrup-comments-on-the-anwr-deis.pdf). Polar bear/human conflict situations are only likely to increase in frequency and severity as intensive human activities overlap with an increasing number of bears spending summer and autumn on and adjacent to the Arctic Refuge Coastal Plain. These conflict situations will exacerbate the ongoing decline in the Southern Beaufort Sea population. Simultaneously, greenhouse gas emissions from extraction and combustion of the oil and gas that may lie under the Coastal Plain will contribute to additional sea ice loss compounding risks to Alaska's polar bears and accelerating polar bear declines worldwide. An oil and gas program on the Arctic Refuge Coastal Plain is in direct conflict and incompatible with current scientific understandings of actions needed to assure a future for polar bears in Alaska and elsewhere. In the current administrative planning process for potential oil development in the Arctic Refuge, the Bureau of Land Management (BLM) should strive to eliminate all possible negative

impacts on polar bears and meet the objectives of the Conservation Management Plan for polar bears (U.S. Fish and Wildlife 2016). Congress should not allow BLM to implement an oil and gas leasing program that its own DEIS admits will compromise those protections.

Action by Congress and this Subcommittee is essential to protecting the polar bears on the Coastal Plain. As my testimony makes clear, protecting the Coastal Plain of the Arctic Refuge from oil and gas development is vital to the conservation of the imperiled polar bear. For this reason, I support passage of the Arctic Cultural and Coastal Plain Protection Act (H.R.1146).

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