

# Polar Bear

WWF WILDLIFE AND CLIMATE CHANGE SERIES



*This assessment is one in a series resulting from a WWF study that assesses the vulnerability of numerous species to the effects of climate change. For each species, we also recommend climate-adaptive management strategies.*

**POLAR BEARS** (*Ursus maritimus*) are the poster child for the impacts of climate change on species, and justifiably so. To date, global warming has been most pronounced in the Arctic, and this trend is projected to continue. There are suggestions that before mid-century we could have a nearly ice-free Arctic in the summer. This increases the urgency with which we must act to reduce our greenhouse gas emissions to delay or avoid some of the worst consequences of climate change.

Polar bears have relatively high genetic diversity within the species and can disperse over very long distances, suggesting that they may have some capacity to adapt to the ongoing changes in the Arctic.

However, their dependence on sea ice makes them highly vulnerable to a changing climate. Polar bears rely heavily on the sea ice environment for traveling, hunting, mating, resting, and in some areas, maternal dens. In particular, they depend heavily on sea ice-dependent prey, such as ringed and bearded seals. Additionally, their long generation time and low reproductive rate may limit their ability to adapt to changes in the environment.

Priorities for climate-informed polar bear conservation should include identifying and protecting the “last ice areas,” the parts of the Arctic that are projected to retain sea ice farthest into the future. It is also important to increase monitoring of polar bear populations, particularly their responses to declining sea ice. And as polar bears spend more time on land, we need to be prepared to manage for increased human-polar bear conflict.



Polar bear range

## DETERMINING SPECIES VULNERABILITY

*The study identified which biological traits and other factors make the species vulnerable or resilient to changes in climate based on the following:*

**SENSITIVITY:** the inability of the species to persist, as is, under changing climatic conditions. Species with high sensitivity are more vulnerable to climate change. For example, if the species has high freshwater requirements, it is sensitive to declining water availability.

**ADAPTIVE CAPACITY:** the ability of the species to respond to changes in climate either through dispersing to a more favorable habitat or its potential to evolve in response to changing climatic conditions. For example, a species with a low reproductive rate and a long generation time has low adaptive capacity, and is likely to be more vulnerable to changes in climate.

**EXPOSURE:** the extent of climatic change and variation that the species encounters and is projected to encounter.

**OTHER THREATS:** any other relevant threats, such as habitat destruction, poaching, human-wildlife conflict, and pollution, as well as the human responses to climate change that exacerbate these threats.

*For more information on the methodology used, please download the Species Assessment Tool at [worldwildlife.org/wildlife-and-climate](http://worldwildlife.org/wildlife-and-climate), or view the Wildlife and Climate Change course at [wwfadapt.org](http://wwfadapt.org).*

# RATING THE CLIMATE VULNERABILITY OF THE POLAR BEAR

**H** = High **M** = Medium **L** = Low **U** = Unknown

**H** indicates high vulnerability to climate change, and **L** indicates low vulnerability—and therefore greater resilience.

## SENSITIVITY

### **M** IUCN Red List Status Vulnerable<sup>1</sup>

### **M** Geographic Range

**Medium.** Found throughout the ice-covered waters of the Arctic (from 51°N to the North Pole), with their range limited by the southern extent of sea ice (Hudson Bay, Canada).<sup>1</sup> Range countries are Canada, Greenland (Denmark), Norway, Russia, and the USA.<sup>1</sup>

### **M** Population Size

**Medium.** 22,000-31,000 individuals found in 19 subpopulations.<sup>1</sup> As of 2014, 3 populations are declining, 6 are stable, 1 is increasing, and 9 are data deficient.<sup>2</sup>

### **M** Temperature Tolerance

**Medium.** Polar bears lose over 10 times more heat than they produce when they are wet,<sup>3</sup> and young bears in particular are more susceptible in water close to freezing temperatures.<sup>4</sup> Susceptible to heat stress due to their low surface-area-to-volume ratio. However, they do appear to thermoregulate effectively during the summer months,<sup>3</sup> resting on snow to stay cool.

### **H** Does the species rely on environmental cues for reproduction?

**Yes.** Breeding occurs from March to May,<sup>1</sup> the fertilized egg attaches and begins development sometime between September and October (delayed implantation), and females give birth to cubs between late November and early January.<sup>5</sup> Females show high fidelity to denning sites (usually on land), the distribution of which is changing as sea ice decreases.<sup>5</sup> As a result, females are now expending more energy reaching denning sites when sea ice forms late, thus affecting their fitness and denning success.<sup>6</sup> When sea ice breaks up early, females emerging with cubs may be forced to spend the summer on land, where food is scarce.

### **H** Does the species rely on environmental cues for migration?

**Yes.** The timing of seasonal movement is linked to sea ice dynamics, and the bears who spend the summers on land have already been documented arriving earlier, and departing later, in response to changes in sea ice.<sup>7</sup>

### **M** Does the species rely on environmental cues for hibernation?

**No.** Does not hibernate, but pregnant females occupy snow dens for 5-6 months,<sup>1</sup> while fasting.<sup>5</sup> During this time they exhibit a reduced metabolic rate and a drop in core body temperature.<sup>3</sup> During the summer, bears exhibit moderate declines in activity and body temperature, due to limited access to food.<sup>3</sup>

### **H** Does the species have any strong or symbiotic relationships with other species?

**Yes.** Polar bears and ringed seals (their primary prey) are intimately connected ecologically.<sup>8</sup>

### **H** Diet

**Specialist.** Polar bears prey mostly on ringed and bearded seals.<sup>9</sup> A 200 kg bear needs 2 kg of blubber per day.<sup>11</sup> They feed intensively on seals for a brief period in the spring during the seal pupping season, replenishing fat reserves used up during the winter.<sup>5</sup> Pregnant females may not have fed for up to 8-9 months at this point.<sup>12</sup> However, polar bears can be opportunistic eaters, and occasionally feed on other seals, belugas, narwhals, walrus, birds, bird eggs, fish, animal carcasses, kelp, food waste from human settlements, and even other polar bears in a few instances.<sup>5,10</sup>

### **M** Abundance of Food Source

**Medium.** Individuals that have continuous access to sea ice are able to hunt throughout the year, but those in areas where sea ice melts completely each summer are forced to fast on land using stored fat reserves.<sup>1</sup> Foraging opportunities on land are limited, and it is thus unlikely that bears can replace lost access to marine mammals with land-based prey.<sup>13</sup> The highest hunting success is between April and July, when ringed seals use the ice for rearing pups and molting.<sup>14</sup> Ringed and bearded seals are also heavily dependent on sea ice and those populations may experience rapid decline due to declining sea ice.

### **L** Freshwater Requirements

**Low.** Rarely drink freshwater, but rely instead on the water they produce as a byproduct of fat metabolism from their diet.

### **H** Habitat Specialization

**Specialist.** Rely heavily on the sea ice environment<sup>1</sup> for traveling, hunting, mating, resting, and in some areas, maternal dens.<sup>5</sup> They are most abundant in shallow water areas near shore,<sup>1</sup> or near the highly productive sea ice areas over the continental shelves.<sup>15</sup> When sea ice retreats north in the summer, polar bears either follow the ice, or go on land until the sea ice returns.<sup>5</sup> Over most of their range, they remain on the sea ice year-round; however, they are spending increasing amounts of time on land in the summer due to declining sea ice.<sup>1</sup> Even those that stay on land for longer periods still depend on the sea ice for hunting.<sup>5</sup> Over the past hundreds of millennia, polar bears have been exposed to temperatures higher than those they presently experience, and also to extreme periods of cooling,<sup>5</sup> but there hasn't been an ice-free Arctic in the last 800,000 years.<sup>24</sup>

### **L** Susceptibility to Disease

**Low.** Polar bears are currently not very prone to disease, though there are some known parasitic (e.g., *Trichinella* sp.)<sup>16</sup> and viral (e.g., morbilliviruses)<sup>17</sup> infections. As they spend more time on land, extended periods in close proximity to other polar bears may increase their susceptibility to disease.

## ADAPTIVE CAPACITY

### **M** Dispersal Ability

**Medium.** Wide-ranging and highly mobile animals, though their movement is largely dictated by sea ice dynamics.<sup>5</sup> Males are known to wander over vast distances; females are more restricted, as they den once every 3 years to give birth. On average, the range of female polar bears is 125,100 km<sup>2</sup>,<sup>18</sup> but it can be as great as 600,000 km<sup>2</sup>.<sup>19</sup> Polar bears can swim long distances, but can drown if they have to swim too far.<sup>20</sup>

### **H** Generation Time

**Long.** Approximately 15 years.<sup>21</sup> Age at first reproduction is 5-6 years.<sup>1</sup>

### **H** Reproductive Rate

**Low.** Litter size is 1 to 2 cubs, most often 2, and occasionally 3.<sup>1,5</sup> Females typically keep offspring for 2.5 years, and therefore breed every third year.<sup>5</sup> Cub mortality rates can be as high as two-thirds.<sup>5</sup> If the body mass of a female drops below 189 kg, she will be unable to reproduce successfully.<sup>22</sup>

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## **M** Genetic Variation

**Medium.** Polar bears have relatively high genetic diversity within the species. Genetic data suggest that populations are divided into six clusters (the Hudson Bay Complex, the Western and Eastern Canadian Arctic Archipelago, the Western and Eastern Polar Basin, and Norwegian Bay), though gene flow among subpopulations appears to be limited.<sup>23</sup>

## EXPOSURE

### **H** What level of change in temperature and precipitation is projected across the species' range?

**High.** There has been substantial warming in the Arctic over the last 50 years. Arctic sea ice extent in September, the month of each year's minimum extent, has declined 13.4% per decade from 1979 through 2015.<sup>28</sup> Future warming is projected to be highest in the Arctic, well above that of the projected global average. There will be further thinning and retreat of Arctic sea ice, and a nearly ice-free Arctic in the summer (September) is likely before mid-century.<sup>25</sup>

## OTHER THREATS

### **M** Other Threats

**Medium.** Environmental toxins (e.g., persistent organic pollutants), shipping, tourism, oil and gas exploration and development, and poaching and overharvesting. Longer ice-free seasons could increase shipping activity, resource exploration, and development. Additionally, an increase in the number of polar bears occurring near or on land has resulted in increased human-wildlife conflict.<sup>5</sup>

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For more information, please contact Nikhil Advani at [nikhil.advani@wwfus.org](mailto:nikhil.advani@wwfus.org).

For this and other species assessments, visit [worldwildlife.org/wildlife-and-climate](http://worldwildlife.org/wildlife-and-climate).



## RECOMMENDED CLIMATE-ADAPTIVE MANAGEMENT STRATEGIES

Based on the vulnerability assessment and in line with WWF's Species Action Plan, we recommend these climate-adaptive management strategies for polar bears:

1. Identify and protect key areas which might remain viable for polar bears in the long term. This includes seasonal habitat areas, suitable sites for denning, and movement corridors. Efforts should focus on regions that are projected to retain ice habitat farther into the future than other areas. The "last ice area" is projected to remain in northeastern parts of the Canadian Archipelago and northern Greenland,<sup>26</sup> and adjacent parts of the polar basin.<sup>27</sup>
2. As the Arctic becomes increasingly more accessible due to ice loss, it is critical to ensure that appropriate policies and legislation are in place to safeguard polar bear populations and their habitat from industrial activities, including shipping, oil and gas, and mining.
3. Increase monitoring of population range shifts, changes in phenology, changes in polar bear and prey abundance, and the correlation of any of these with changes in sea ice. It is important to detect declines as early as possible, and make needed management adjustments before critical thresholds are overshot. Different subpopulations may respond in different ways, and it is important to better understand this.<sup>20</sup>
4. Manage increasing human-polar bear interactions and conflict in Arctic communities. As melting sea ice forces polar bears to spend more time on land, best management practices are needed to deter bears from entering communities. This would improve safety for humans, property, and the bears themselves.
5. Ensure that human use does not threaten the long-term survival of polar bears through regular monitoring of subpopulations and sound management of harvest and trade.

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