

Out-foxed by Arctic warming



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Summary

• The Arctic Fox is one of the top land-dwelling predators of the Arctic region. It is thought to be one of the first mammals to have colonised Sweden and Finland following the last ice-age.

• As the Arctic region warms, tundra habitat may slowly be replaced by boreal forest from the South. Forest habitat is unsuitable for Arctic Foxes.

• Red Foxes prey on and are superior hunters to Arctic Foxes. Northward encroachment of Red Foxes into the

Arctic Fox's range has already been documented and is likely to continue as the tundra warms.

• Arctic Foxes prey largely on lemmings and voles. Milder and shorter winters are predicted to cause declines in the regularity of these rodents' population cycles, as well as decreases in their overall numbers.

• These factors are likely to cause declines in Arctic Fox numbers and range size. Arctic Foxes highlight the impacts of climate change on the ways that species interact with each other, both through competition and via changes in predator-prey relationships.

The IUCN Red List of Threatened Species ™





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The Arctic Fox (*Alopex lagopus*) is the smaller 'cousin' of the perhaps more familiar Red Fox. As one of the top land-dwelling predators of the Arctic region, it may be regarded as a good indicator of the overall health of the tundra ecosystem.

This species is thought to be one of the first mammals to have colonised Sweden and Finland following the last ice-age. Thick fur, large fat reserves, specialised 'heatretaining' circulatory systems in their feet and an ability to lower their metabolic rate to endure periods of starvation have allowed the Arctic Fox to colonise and prevail in these unforgiving regions.

What do we know about the Arctic Fox?

The Arctic Fox is native to the Arctic tundra and has a circumpolar distribution, occurring in Alaska, Canada, Greenland, Iceland, Russia and Scandinavia.

Arctic Foxes are opportunistic feeders and may both hunt and scavenge, depending on the food sources available. Inland populations prey mainly on lemmings and voles, while those at more coastal locations feed to a greater extent on seabirds and other elements of more 'marinebased' food chains. Additional items in the Arctic Foxes' diet may include Ringed Seal pups, Arctic Hare, fish and carrion.

The health of Arctic Fox populations is believed to be closely linked to that of lemming populations, and their numbers may fluctuate in accordance with the availability of this important prey species. Historically, lemming numbers have peaked every three to five years and then crashed to extremely low levels. Lemmings can reproduce only weeks after being born, so their numbers often increase very quickly. The cause of lemming cycles has long been debated, but is believed to result from the combined effects of pressure from predators, including skuas, owls and foxes, and the length of winter.

Arctic Foxes form monogamous pairs and breed at the end of winter, typically in the treeless high north or at higher altitudes. Birthing takes place in the early summer and the juveniles (or kits) are born in complex underground networks known as dens. A single den may host several generations of foxes. Arctic Foxes' litter sizes are thought to be linked to previous food consumption and so may vary greatly. While reports have been made of litters containing up to 25 kits, numbers between five and ten are more typical.

How is climate change affecting Arctic Foxes?

Regional warming is likely to affect Arctic Foxes in at least three important ways.

Habitat loss:

Perhaps the largest threat to the Arctic Fox arising from climate change is a loss of the tundra habitat that the species inhabits. As warming temperatures allow new plant species from the south to colonise the region, large extents of tundra habitat are expected to slowly be replaced by boreal forest. Forest habitat is known to be highly unsuitable for Arctic Foxes.

Increased competition with Red Foxes:

The Arctic Fox's greatest predator and competitor is the Red Fox. Red Foxes are superior hunters to Arctic Foxes and are known to prey on Arctic Fox kits and adults. While the northern limits of the Red Fox's range are determined by the productivity of the habitat, the southern limits of the Arctic Fox's range are determined



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by the presence of the Red Fox. The encroachment of Red Foxes into more northern areas has already been documented and looks set to continue as the tundra warms.

Changes in prey abundance:

Numbers of Arctic rodents, particularly lemmings, are known to fluctuate greatly, but historically such fluctuations have been fairly regular and cyclical. There is now reason to believe that climate change will lead to instability in the population sizes of these and other important prey species.

Lemmings and voles do not hibernate through the winter. Instead they continue to forage in the space between the frozen ground of the tundra and the snow, almost never appearing on the surface. This is possible because the snow provides good insulation from the severe Arctic winter conditions. Mild weather and wet snow lead to the collapse of these under-snow spaces, destroying the lemmings' burrows, while ice crust formation reduces the insulating properties of the snow pack and may make food plants inaccessible. The combination of milder and shorter winters is predicted to decrease the regularity of lemming cycles, and population peaks in some populations have not occurred since the 1990s.

Any declines of important prey species are likely to have significant impacts on Arctic Fox populations. Declines of Arctic Fox numbers attributable to this very cause have already been observed in certain Scandinavian populations. It is argued by some, however, that although species such as lemmings may decrease in number, other potential prey species may begin to thrive in the new climate. Unfortunately, for the Arctic Fox, the associated arrival of species such as the Red Fox would almost certainly overshadow such benefits.

Arctic Foxes inhabiting coastal regions are likely to be less affected by declines of rodents than inland populations. But because Polar Bears and Ringed Seals are expected to decline due to climate change (see associated information), coastal populations are likely to face reductions in alternative food sources such as Ringed Seal pups and the remains of Polar Bear prey.

Can Arctic Foxes adapt to climate change?

Arctic Foxes are unable to persist in environments other than their native tundra habitat. This means that individuals living in southern parts of the species' range will probably need to move north if they are to survive. Arctic Foxes, however, already occur in some of the most northerly parts of the world and overall, their total available habitat is shrinking. In short, this means that that the number of Arctic Foxes that can be supported worldwide is likely to decrease.

Some positive outcomes of Arctic warming have been suggested for the Arctic Fox. For example, should larger herbivores such as Reindeer and Musk Ox lose potential

forage material as a result of ice crust formation, Arctic Foxes may benefit from an increase in large herbivore carrion. Such benefits would be short-lived however, as the populations of these larger herbivores, along with the carrion they provide, eventually decline.

Arctic Foxes living on Arctic islands may ultimately prove to be the safest of all populations. Such locations are generally at very high latitudes and will be among the last to face changes in tundra habitat and invasion by Red Foxes. Further, the likely loss of the ice sheets currently connecting these islands to the continental landmasses will prevent access of Red Foxes. However, island populations often tend to be more vulnerable to losses of genetic variation and the associated affects on long-term population health. Island populations may also have poor recovery potential from other threats such as hunting and hybridisation with farm-bred foxes, which are currently the largest threats to the species.

At present, the Arctic Fox is classified as 'Least Concern' on the IUCN Red List, although specific populations in Norway, Finland and Sweden are considered 'Critically Endangered'.

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Arctic Fox geographical range – © IUCN Red List