



## MONARCH BUTTERFLIES & CLIMATE CHANGE

Monarch butterflies are directly threatened by climate change – Photo: Monarch © Bark

### ABOUT THE MONARCH BUTTERFLY

**Names:**

Scientific: *Danaus plexippus*

English: Monarch Butterfly

French: Papillon monarque

Spanish: Mariposa monarca

The Monarch Butterfly is most commonly found in North America with additional populations in Central and South America, East and Southeast Asia, Australia, New Zealand, some Pacific Islands and Western Europe. The migrating North American populations, however, will be the focus of this fact sheet. The Monarch Butterfly is part of the 'milkweed butterfly family' and lays its eggs on various species of milkweed (*Asclepias spp.*), the source of food for its caterpillar phases. Eating the milkweed provides a chemical 'shield' for the butterflies due to an alkaloid in the plant that is extremely distasteful to predators.

Monarch Butterflies are sensitive to the cold winters of the northern regions, which they occupy for part of the year. Therefore, to complete their lifecycle, the butterflies must migrate at the beginning of autumn to areas with a more moderate climate. It is within these southern areas that they hibernate during the winter months, awaiting the warmer temperatures of spring. When spring arrives, the butterflies begin their return to northern regions. The butterflies track the blooming of milkweed plants and produce multiple generations along the way. When the days start to shorten in their northern habitats, the 'sun compasses' and the butterflies' molecular clocks prompt them to return to southern regions to hibernate. This impressive annual migration is one of the most spectacular of any species.

### Threats due to climate change

Monarch Butterflies are very sensitive to changes in temperature as they rely heavily on this factor to prompt migration, hibernation and reproduction. Thus, changes in temperature due to climate change are expected to influence and potentially disrupt these critical stages of the butterflies' life cycle. For example, it has been discovered that exposure to cold temperatures at overwintering sites is the key factor in determining a switch in the direction of the migration from southward to northward in overwintering butterflies. This suggests that warmer temperatures at the overwintering sites could potentially significantly modify or even prevent the return trip north of the butterflies in spring. It also suggests that unseasonal cold episodes during the autumn could have serious consequences on the migration of Monarchs undertaking their southward migration. Temperature also influences the butterflies' hibernation period. The butterflies need to overwinter in forests where the temperature is reasonably low so that their metabolism is not too demanding, but not so low that they freeze. Therefore, higher temperatures and erratic freezing events due to climate change threaten the butterflies' ability to survive hibernation.

Higher than normal temperatures also hinder the growth and quality of milkweed, the plant that Monarch caterpillars feed on. Current predictions indicate that milkweed populations will need to shift further north to find the appropriate growing conditions. This raises the current concerns about whether the Monarch Butterflies will be able to adapt successfully to these changing sites and environments. Furthermore, it is thought that if the milkweed's range expands further from the hibernation/breeding grounds then the butterflies' reproductive activity will decline. This would consequently mean that the butterflies would need to migrate longer distances, reducing the time spent at the breeding grounds.

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## Threats due to climate change

Not only are temperatures rising in some regions of the Monarch's range, but levels of precipitation are also increasing. Increased rainfall has been found to reduce the amount of time that the butterflies spend on laying their eggs. In addition, when the moisture coincides with colder temperatures in their overwintering grounds (which has been the case in recent years), it is extremely difficult for Monarchs to endure these harsh conditions for more than a few hours. Conversely, more frequent droughts could have a negative impact on milkweed abundance. Extreme weather events, such as the severe 2002 storm in Mexico, which killed almost 80 per cent of the overwintering population, are also becoming more common.

Climate change has significant potential to alter the migration, hibernation and reproduction of *Danaus plexippus*. However, the degradation of breeding habitats due to urban development and intensive agriculture, and the loss of overwintering habitats mainly caused by commercial logging and land cultivation, also pose a major threat to the North American populations. The impacts of climate change, coupled with shrinking habitats, wildfire, parasites and pathogens, and the use of agrochemicals such as neonicotinoid, present a concerning combination of factors with potential direct consequences for the future of the Monarch Butterfly.

## Species Listing

*Danaus plexippus* was placed on Appendix II of the Convention on the Conservation of Migratory Species of Wild Animals (CMS) in 1979 and is currently the only insect species covered by the Convention. In 2021, the global and Mediterranean populations were assessed by the IUCN and included in the Red List of Threatened Species as Least Concern. Key overwintering sites for the Monarch Butterfly in Mexico are protected by the Monarch Butterfly Biosphere Reserve, declared by the United Nations Educational, Scientific and Cultural Organization (UNESCO) a World Heritage Site.



Photos: The Monarch Has Returned © Yes It's Hot; African Monarch Butterfly Caterpillar © Brian Garrett

## About CMS

The Convention on the Conservation of Migratory Species of Wild Animals (CMS), also known as the Bonn Convention, works for the conservation of a wide array of endangered migratory animals worldwide through negotiation and implementation of agreements and species action plans. It has 133 Parties (as of 1 March 2022).

CMS engages all relevant stakeholders in addressing threats to migratory species in concert with all other aspects of wildlife conservation and management.

## CMS Instruments

Animals receive protection under CMS through listing on its two Appendices, through global or regional agreements and through action plans.

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