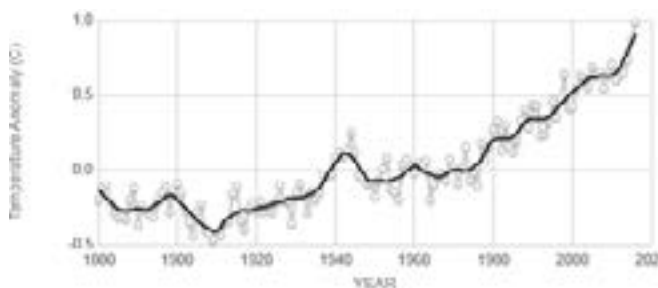


SPECIES AND CLIMATE CHANGE

- The ~1°C rise in mean global temperature is causing serious and often unexpected impacts on species, affecting their abundance, genetic composition, behaviour and survival.
- Species declines threaten the services that nature provides to people, which include functioning as carbon sinks and increasing our resilience to climate change.
- Environmental policies aimed at reducing CO₂ emissions are essential for reducing the impact of climate change on species.
- Prioritising nature conservation and embracing strategies to promote climate change adaptation can enhance species survival.
- Tools are available to support species conservation under climate change, including the IUCN Red List, the IUCN SSC Guidelines for Assessing Species' Vulnerability to Climate Change, and the Integrated Biodiversity Assessment Tool.

What is the issue?

Mean global temperatures have risen ~1°C since pre-industrial times as a result of human activities. In addition to increasing global temperatures, the impacts of climate change include extreme weather events such as drought, hurricanes and rising sea levels.



Source: climate.nasa.gov
Global mean temperature over time since 1880 (NASA, 2017)

Species are already being impacted by anthropogenic climate change, and its rapid onset is limiting the ability of many species to adapt to their environments. Climate change currently affects at least 15,801 species on the IUCN Red List of Threatened Species™, increasing the likelihood of their extinction. The Bramble Cay melomys (*Melomys rubicola*) is the first mammal reported to have gone extinct as a direct result of climate change. Previously found only on the island of Bramble Cay in Great Barrier Reef, its habitat was destroyed by rising sea levels.

Some areas are being affected by climate change more rapidly than others. The Arctic is warming four times faster than other regions, which is causing a loss of sea ice and pushing Arctic seals closer to extinction. Thinning and disappearing sea ice is impacting Arctic seals' ability to breed and raise their pups as well as moult, rest and access foraging areas.

Corals form one of the most biodiverse ecosystems, yet they are among the most rapidly declining species groups due to mass bleaching, disease and die-offs caused by rising ocean temperatures, as well as ocean acidification. Meeting the Paris Agreement's target of less than 2°C rise in global temperatures is essential for the survival of coral reefs.

In addition to increased rates of disease and degraded habitats, climate change is also causing changes in species themselves, which threaten their survival. Rising temperatures have led to ecological changes including the migration of pink salmon (*Oncorhynchus gorbuscha*) to Arctic rivers, while behavioural changes in species include earlier breeding times for North American tree swallows (*Tachycineta bicolor*). Climate change is also causing significant physiological changes. Warmer temperatures during egg incubation are causing imbalanced female to male sex ratios among Vulnerable loggerhead turtles (*Caretta caretta*), with females accounting for 93% of newly hatched turtles on some nesting beaches. Genetic changes attributed to climate change include hybridisation – interbreeding as species' habitats change – affecting species such as the common toad (*Bufo bufo*) and green toad (*Bufo balearicus*) in southern Italy.

Why is this important?

In addition to their intrinsic value, species play essential roles in ecosystems, which in turn provide vital services to humans. Climate change interacts with threats such as habitat loss and overharvesting to further exacerbate species declines. The decline of species and ecosystems can then accelerate climate change, creating a feedback loop that further exacerbates the situation.

Altered food chains

The effects of climate change on even the smallest species can threaten ecosystems and other species across the

food chain. For example, increased sea-ice melt and ocean acidification in the Antarctic Ocean is reducing krill populations, threatening the survival of whales, penguins and seals that depend on krill as a primary food source. Because species lowest in the food chain are often among the first impacted by climate change, the full impacts of species loss may not be seen for decades.

The types and severity of diseases that affect crops are also changing. For example, incidences of Fusarium ear blight on wheat are increasing due to a rise in temperature and rainfall. These can produce mycotoxins that make wheat inedible and cause crop losses of up to 60%.

Invasive alien species

Invasive alien species are among the main causes of biodiversity loss and species extinctions, and the proliferation of invasive species is often exacerbated by climate change. Native to South America, the water hyacinth (*Eichhornia crassipes*) can now be found in parts of every continent except Antarctica, and it is expected to increase its range as the climate warms. The hyacinth deoxygenates rivers, killing fish populations, which in turn reduces income and food supply for local communities.

Carbon sinks become sources

Climate change affects the ability of plant species to sequester carbon, turning carbon sinks into carbon sources. Warmer temperatures are also increasingly leading to tree death caused by disease, drought conditions and an upsurge in the number and severity of forest fires, which leads to an increase in carbon emissions.



Warmer egg incubation periods lead to skewed gender ratios of the Vulnerable loggerhead turtle (*Caretta caretta*) © Howard Hall

What can be done?

Efforts to conserve species and mitigate the impacts of climate change require an approach that includes meeting climate targets, conserving and securing habitats, and helping species adapt.

Reduce CO₂ emissions. Long-term and cohesive actions to meet Paris Agreement targets for emissions reductions can prevent temperature increases from exceeding the critical 2°C threshold. This will have greatest impact on reducing the impacts of climate change on species and ensuring ecosystems continue to provide habitats for species and their wide-ranging services to people.

Help nature to help people. By functioning as carbon sinks, ecosystems like forests, wetlands and tundra combat climate change and play a key role in helping countries meet their Paris Agreement targets. Restoring ecosystems and reforestation in biodiversity-friendly ways with climate-change resilient species can further increase their effectiveness. Nature can also help people adapt. For example, conserving coastal species such as mangroves and coral provides an ongoing source of food and supports livelihoods, while also providing protection from tsunamis, storm surges, and other extreme weather caused by climate change.

Help species cope. Species are the building blocks of ecosystems, and reducing the risks to species posed by climate change is critical. Sound conservation responses include helping species adapt to shifting climates and preparing strategies for coping with extreme weather events such as heat waves, floods and droughts. Minimising non-climate stressors is essential for increasing species' future resilience to climate change. Humans' responses to climate change, including changing land use (e.g. planting biofuels) and building hard infrastructure (e.g. wind turbines and dams), may have negative impacts on species if biodiversity is not considered.

Make use of conservation tools. A variety of useful conservation tools is available. The IUCN Red List provides up-to-date information on species' threat statuses, while the IUCN Species Survival Commission offers guidelines for assessing species' vulnerability to climate change. The Integrated Biodiversity Assessment Tool (IBAT) provides basic risk screening on biodiversity, enabling governments and businesses to mitigate their impacts on species and biodiversity. The US Army, for example, uses IBAT to better understand how potential bases might affect biodiversity.

Where can I get more information?

- [IUCN Red List](#)
- [IUCN SSC Climate Change Specialist Group](#)
- [IUCN Global Standard for Nature-based Solutions](#)
- Foden, W.B. and Young, B.E. (eds.) (2016). [IUCN SSC Guidelines for assessing species' vulnerability to climate change](#). Cambridge, UK and Gland, Switzerland: IUCN Species Survival Commission.
- Gross, J.E., Woodley, S., Welling, L.A., Watson, J.E.M. (eds.) (2016). [Adapting to climate change: Guidance for protected area managers and planners](#). Switzerland: IUCN.