



# Climate Change and Wildlife Conservation

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**ABSTRACT:** Sea levels are rising and oceans are becoming warmer. Longer, more intense droughts threaten crops, wildlife and freshwater supplies. From polar bears in the Arctic to marine turtles off the coast of Africa, our planet's diversity of life is at risk from the changing climate. Climate change poses a fundamental threat to the places, species and people's livelihoods WWF works to protect. To adequately address this crisis we must urgently reduce carbon pollution and prepare for the consequences of global warming, which we are already experiencing. WWF works to advance policies to fight climate change, engage with businesses to reduce carbon emissions & help people and nature adapt to a changing climate. Changes in climate and extreme weather events have already begun to affect people and nature across the globe. And climate change exacerbates other threats like habitat destruction, overexploitation of wildlife, and disease. From the shrinking habitat of the polar bear to increased water scarcity driving human-wildlife conflict, these changes will become more pronounced in years to come. WWF is working to better understand how a changing climate impacts species, and we are developing and implementing solutions to help them adapt to these changes. We are assessing our priority species to determine traits that make them resilient or vulnerable to changes in climate, funding projects through our Wildlife Adaptation Innovation Fund, and crowdsourcing data and implementing projects for people and nature.

Climate change is among the greatest threats to biodiversity on our planet. It is already having devastating effects on both human and natural communities. Extreme weather events like heat waves, intense storms and prolonged droughts are on the rise, taking scores of lives and causing billions of dollars in damage each year. Wildlife are also experiencing new and intensified threats.

Habitats around the world are beginning to shift, shrink, melt and even disappear entirely from climate change. Intense storms can destroy nesting trees, drown animals, spread invasive species and damage aquatic ecosystems. Unusual heat and droughts stress plants and animals alike. And increasingly, animals' life cycles are out of sync with plant growth and seasonal changes.

Oceans are also changing rapidly - high temperatures lead to the bleaching of coral reefs, which countless marine species depend on for food and shelter. Warmer waters also cause changes in ocean currents, altering migration patterns and shifting feeding areas away from traditional breeding areas. In addition, increased ocean acidification is expected to interfere with marine organisms' ability to generate calcium shells, which threatens marine life from the tiniest plankton to sea otters and whales.

Nowhere are the effects of a climate change more apparent than in the Arctic, where rapid warming is altering tundra, boreal forest, and permafrost. Vanishing sea ice could be devastating for wildlife that depend on it: polar bear, Pacific walrus, several species of seals (bearded, harp, spotted, ribbon and ringed) and large cetaceans (bowhead, gray, North Pacific right and killer whales), and seabirds.

Defenders is working with wildlife and natural resource managers and agencies to address the impacts of climate change by developing and implementing adaptive conservation plans.

To conserve wildlife and habitat in a changing climate, we must use the best available science to understand the specific threats that wildlife and ecosystems are expected to face—such as sea level rise, higher temperatures, and more frequent storms and droughts—and develop measures to mitigate these impacts or provide opportunities for species and habitats to shift in response.

Defenders is working with planners and managers to incorporate these measures into their management plans for public lands, waters and wildlife, including imperiled species. We are also assisting states, tribes and private landowners to do the same. And Defenders is a leading advocate on Capitol Hill for increased funding for programs to better understand and combat climate change.



Defenders of Wildlife also recognizes that we must reduce harmful emissions by rapidly developing clean renewable energy, and that we must do this without harming sensitive wildlife and habitat. Defenders is a conservation leader in ensuring that new wind and solar projects are sited and operated “Smart from the Start.”

## I. INTRODUCTION

The research, published in the **journal Nature Climate Change**, estimates that 47 per cent of mammals and 23 per cent of birds on the International Union for Conservation of Nature’s (UCN) Red List of Threatened Species have been negatively affected by climate change.

A team of researchers from Australia, Italy and Britain went through 130 studies (published between 1990 and 2015) that documented a species that was affected or not by changes in climate. Each of those more than 2,000 species was categorised based on the effect: negative, positive, unchanged or mixed.[1]

Of the 873 mammal species studied, 414 were affected by climate change. Elephants, primates and marsupials were among the most vulnerable. Out of 1,272 bird species looked at, 298 birds are found experiencing negative effects. Birds living at high altitudes are among the hardest hit.

Number of species studied	Number of species affected
Mammal - 873	414
Birds – 1,272	298
Total – 2,145	712

It is to be noted that mammals and birds represent only a small percentage of the biodiversity on Earth. Climate change is quickly becoming the biggest threat to the long-term survival of America’s wildlife. No longer is climate change something only facing future generations—changes to our climate are being documented all across the planet today, and people, animals, and plants are already feeling the heat. This warming signal is also found in ocean temperatures, soil temperatures, melting glaciers, and melting polar ice caps. It has been linked to widespread impacts on ecosystems around the planet. This preponderance of evidence all points to the conclusion that our planet is warming, and natural systems are struggling to keep up.

**Temperatures are increasing:** The most striking evidence of a climate change trend is closely scrutinized data that show a relatively rapid and widespread increase in temperature during the past century. Average temperatures in the United States over the last century have already increased by more than one degree Fahrenheit, and the Earth’s atmosphere has warmed by 1.5 degrees Fahrenheit since 1900. The 10 warmest years on record have all occurred since 1998, with 2016 being the warmest year on record. The rising temperatures observed since 1978 are particularly noteworthy because the rate of increase is so high and because, during the same period, the energy reaching the Earth from the Sun had been measured precisely enough to conclude that Earth’s warming was not due to changes in the Sun.[2]

**Sea levels are rising:** Global sea level has increased by roughly eight inches over the past century, and the rate of increase is accelerating. Climate change causes sea level rise in two ways: ocean water is expanding as it warms, and land-based ice in glaciers and ice sheets is melting. Sea level rise has been happening even faster than scientists anticipated a few years ago. If recent projections are accurate, 2 to 3 degrees Fahrenheit warming could bring about three feet of global sea level rise by 2100, displacing approximately 56 million people in 84 developing countries around the world. Coastal habitats also face major changes as low-lying areas are inundated with saltwater.

**Sea ice is melting:** Declining sea ice is one of the most visible signs of climate change on our planet. Since 1979, Arctic sea ice extent in September (when the annual minimum is reached) has declined by more than 30 percent, according to the National Snow and Ice Data Center. The ice extent has been declining in other seasons too. Despite slightly larger ice extents in 2009, recent observations indicated the ice is thinner and much younger (less multi-year ice) than it used to be. Covering an average of 9.6 million square miles, these areas of ice floating on ocean waters play



an important role in regulating our climate, by reflecting some sunlight back to space, and in the life cycles of many polar species, such as polar bears, seals, and walruses.[3]

**Precipitation patterns are changing:** Some places are getting more rainfall and others are getting less. Nearly everywhere is experiencing more heavy rainfall events, as warmer air is able to hold more water vapor. Right here in the United States, we are already seeing some important trends in precipitation. The Southwest appears to be shifting to a more arid climate, in which Dust Bowl conditions will become the new norm. Annual precipitation totals in the Northeast, Midwest, and Plains have increased by 5 to 20 percent during the last 50 years. The southeastern United States is having both more drought and more floods. Read more about how climate change is causing extreme weather.

**Oceans are acidifying:** The ocean has absorbed a large fraction of the carbon dioxide that fossil fuel burning has pumped into the atmosphere, slowing the rate of climate change. But all this extra carbon dioxide is impacting the ocean, too. The pH of surface seawater has decreased by 0.1 units since 1750 and is projected to drop another 0.5 units by 2100 if no action is taken to curb fossil fuel emissions. These changes would take tens of thousands of years to reverse.

### Human Impact

Climate change is caused by humans. Scientists have concluded that most of the observed warming is very likely due to the burning of coal, oil, and gas. This conclusion is based on a detailed understanding of the atmospheric greenhouse effect and how human activities have been changing it. At the same time, other reasonable explanations, most notably changes in the sun, have been ruled out.[4]

The atmospheric greenhouse effect naturally keeps our planet warm enough to be livable. Sunlight passes through the atmosphere. Light-colored surfaces, such as clouds or ice caps, radiate some heat back into space. But most of the incoming heat warms the planet's surface. The earth then radiates some heat back into the atmosphere. Some of that heat is trapped by greenhouse gases in the atmosphere, including carbon dioxide.

Human activity—such as burning fossil fuels—causes more greenhouse gases to build up in the atmosphere. As the atmosphere "thickens" with more greenhouse gases, more heat is held in. Fossil fuels such as oil, coal and natural gas are high in carbon and, when burned, produce major amounts of carbon dioxide. A single gallon of gasoline, when burned, puts 19 pounds of carbon dioxide into the atmosphere.

The role of atmospheric carbon dioxide in warming the Earth's surface was first demonstrated by Swedish scientist Svante Arrhenius more than 100 years ago. Scientific data have since established that, for hundreds of thousands of years, changes in temperature have closely tracked with atmospheric carbon dioxide concentrations. Since the Industrial Revolution, the burning of coal, oil and natural gas has emitted roughly 500 billion tons of carbon dioxide, about half of which remains in the atmosphere. This carbon dioxide is the biggest factor responsible for recent warming trends.

### Additional Threats to Wildlife

**Loss of wetlands:** Higher temperatures will lead to drier conditions in the Midwest's Prairie Pothole region, one of the most important breeding areas for North American waterfowl.

**Sea level rise:** Sea-level rise will inundate beaches and marshes and cause erosion on both coasts, diminishing habitat for birds, invertebrates, fish, and other coastal wildlife.

**Invasive species and disease:** Higher average temperatures and changes in rain and snow patterns will enable some invasive plant species to move into new areas. Insect pest infestations will be more severe as pests such as mountain pine beetle are able to take advantage of drought-weakened plants. Pathogens and their hosts that thrive in higher temperatures will spread to new areas.[5]

## II. DISCUSSION

Altered climate conditions have already been linked to changes in wildlife distribution, reproduction and behavior. As temperatures continue to warm and precipitation patterns shift, these fluctuations will continue. Enhancing connectivity and "conserving the stage" are critical conservation objectives that can help species adapt to changing conditions.

Resource stewards can address impacts to species by addressing vulnerable wildlife and ecosystems in their conservation work. For example, the Vermont Land Trust executed a targeted 163 acre land acquisition to help struggling black bears move between the Green Mountain and Taconic ranges. Working to connect these vast open



spaces in Vermont and New York enhances the ability of bears to move from their home ranges to feeding habitat, and increases connectivity for a variety of wildlife and the ecosystem functions they depend on for survival.

Many conservation programs are driven by objectives to manage wildlife, so existing species-focused programs can support ecosystem protection and enhancement efforts. Increasingly we are learning how interconnected animal species can be to their landscapes. Maintaining migration corridors and critical habitat for animals also protects ecosystem processes and furthers land-focused management objectives.[6]

By planning for climate change today, land trusts help priority species weather the effects of climate change tomorrow. Land trusts may consider the following actions:

- Protect the connectivity of important wildlife habitats.
- Enhance resilience of biodiversity by “conserving the stage“.
- Assess the vulnerability of priority species or habitats.
- Anticipate and plan for uncertainty through scenario planning and/or adaptive management practices.
- Manage priority habitats for climate change resilience.
- Support mitigation policies and actions to reduce the potential extent of future climate change today.

Global deforestation has massive repercussions and is a huge contributor to the climate crisis, delivering a twofold assault: at the present rate, deforestation results in more emissions than all the cars and trucks on Earth combined, while also accelerating species extinction rates. At the same time, having fewer forests means less carbon dioxide is absorbed and removed from the atmosphere. In this way, restoring and conserving forests, along with the wildlife that maintain proper ecosystem function, is an essential, untapped solution in the fight against the climate crisis. In the northeast region of the Democratic Republic of Congo (DRC), the Okapi Wildlife Reserve is an ancient, tropical rainforest and is home to its namesake (okapi) and a plethora of biodiversity. In 1992, the Okapi Conservation Project (OCP) played a crucial role in protecting the rainforest and establishing the Reserve. Their continued conservation efforts there have been indispensable for the Reserve and the climate.

As the most biologically diverse country in Africa, the DRC makes up 70% of tropical forests on the continent, and these forests offer an essential service for the atmosphere far beyond the DRC. These tropical forests function as an oxygen-source and as a climate change combatant for a sizable slice of the planet. Preserving these forests is vital.

In this way, wildlife conservation is a productive avenue for curtailing climate change. OCP’s efforts to conserve the unique okapi, also known as the “forest giraffe,” necessitates protecting its habitat. Preserving that habitat also saves a multitude of other species, including forest elephants and chimpanzees, and ensures a healthy ecosystem. Indeed, maintaining a flourishing and functioning habitat for wildlife also yields critical mitigation of a warming atmosphere. While climate change poses a threat to wildlife, in saving wildlife we may find a solution to climate change. Just as the okapi has served to protect expanses of forests in the DRC, other species, like cotton-top tamarins and elephants, serve as ambassadors for the preservation of their respective habitats. Proyecto Tití has been instrumental in protecting Colombian dry tropical forests for cotton-tops and is leading reforestation projects for this critically endangered primate. In the savannah of northern Kenya, Save the Elephants has been working tirelessly to protect elephants who play a crucial role in the development of trees and foliage. Healthy elephant populations create a healthy environment which can mitigate climate change.[7]

The climate crisis bearing down on the natural landscape is fueled not only from our global culture of fossil fuel dependence, billowing global waste, and a rampant plastic pandemic, but also from counterproductive actions taken by leaders and policymakers. For example, undercutting legislation like the Endangered Species Act presents grave consequences for the conservation of threatened wildlife that serve as ambassadors for their habitats. Weakening such cornerstone conservation law will impede the tools necessary to conserve biodiversity and combat the environmental impacts of climate change. Climate change threatens the entire planet, but to both preserve species and restore their environments, one solution is clear: protecting wildlife and their habitats across land and sea is vital for a functioning planet and is urgent to win the battle against the climate crisis.[8]



### III. CONCLUSION

**Wildlife Conservation Society (WCS)** is implementing conservation programs all over the world to mitigate the impacts of CO<sub>2</sub> emissions, and help affected people adapt to climate change. We are protecting large swaths of tropical and boreal forest that sequester carbon through our work to protect intact forests and a mechanism called REDD+. We are helping to restore degraded forest lands in areas of high conservation significance and where this can bring benefits to local people.[9]

We partner with local communities and governments to find science-based solutions for adapting to the immediate and projected impacts of climate change. WCS has become one of the world's most respected institutions for climate science on the effects of climate change on biodiversity. In addition:

1. Our science drives:
2. Ecosystem-based adaptive management and disaster risk reduction in the tropical Pacific Islands.
3. Leading-edge techniques for mapping ecosystem vulnerability to climate change.[10]
4. Climate change and wildlife connectivity in the Albertine Rift region of Africa.
5. Pioneering research on climate impacts and adaptation strategies for protecting coral reefs in the western Indian Ocean.
6. Climate adaptation solutions in New York's Adirondack Mountains.
7. Thought-leading science on projecting how human responses to climate change will impact biodiversity.[11]

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