

Climate Change and Ecosystems

Climate change will affect nature's ecosystems and the habitats that support life—from oceans to grasslands to forests. Changes are expected to alter the makeup and functioning of ecosystems, as well as some of the critical benefits that ecosystems provide to people. Climate change can threaten ecosystems that have already been weakened by other human activities such as pollution, development, and overharvesting. This fact sheet describes some of the ways that climate change affects ecosystems.

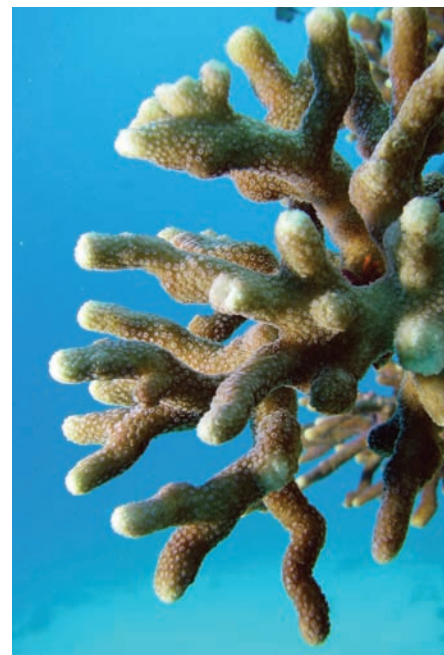
Biodiversity

Climate change can have broad effects on biodiversity (the number and variety of plant and animal species in a particular location). Although species have adapted to environmental change for millions of years, a quickly changing climate could require adaptation on larger and faster scales than in the past. Those species that cannot adapt are at risk of extinction. Even the loss of a single species can have cascading effects because organisms are connected through food webs and other interactions.

Oceans

The oceans and the atmosphere are constantly interacting—exchanging heat, water, gases, and particles. As the atmosphere warms, the ocean absorbs some of this heat. The amount of heat stored by the ocean affects the temperature of the ocean both at the surface and at great depths. Warming of the Earth's oceans can affect and change the habitat and food supplies for many kinds of marine life—from plankton to polar bears.

The oceans also absorb carbon dioxide from the atmosphere. Once it dissolves in the ocean, carbon dioxide reacts with sea water to form carbonic acid. As people put more carbon dioxide into the atmosphere, the oceans absorb some of this extra carbon dioxide, which leads to more carbonic acid. An increasingly acidic ocean can have negative effects on marine life, such as coral reefs.



Forests

Although some forests may derive near-term benefits from an extended growing season, climate change is also expected to encourage wildfires by extending the length of the summer fire season. Longer periods of hot weather could stress trees, and make them more susceptible to wildfires, insect damage, and disease. Climate change has likely already increased the size and number of forest fires, insect outbreaks, and tree deaths, particularly in Alaska and the West. The area burned in western U.S. forests from 1987 to 2003 is almost seven times larger than the area burned from 1970 to 1986. In the last 30 years, the length of the wildfire season in the West has increased by 78 days.

What Is an Ecosystem?

An ecosystem is an interdependent system of plants, animals, and microorganisms interacting with one another and with their physical environment. An ecosystem can be as large as the Mojave Desert or as small as a local pond. Ecosystems provide people with food, goods, medicines, and many other products. They also play a vital role in nutrient cycling, water purification, and climate moderation.



Habitat

Most plants and animals prefer to live in a particular habitat with a specific temperature range and amount of precipitation. Climate change will alter, and in some cases destroy, certain types of habitats. For example, melting sea ice is eliminating an important habitat for several Arctic species. Mangroves and other coastal wetlands, which are critical to many species, are at risk of disappearing because of sea level rise. Some species will be able to adapt to changing habitats—for example, by shifting their range northward or to higher altitudes in order to adjust to rising temperatures. Others, however, might not be able to adapt fast enough to keep pace with the rate of climate change.

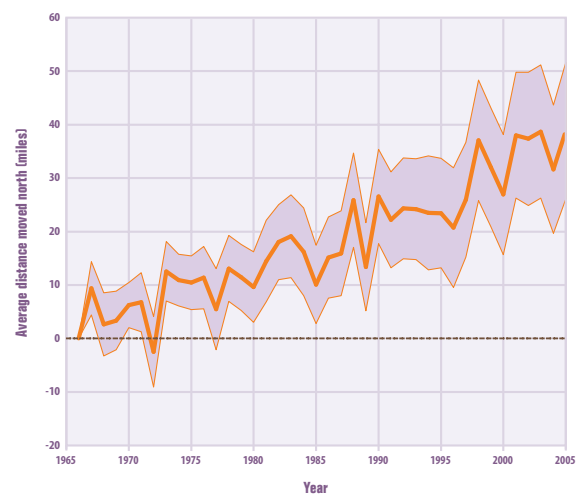
Invasive Species

As temperature, precipitation, and other conditions change, the species best suited to the new conditions will thrive, often taking food and resources away from others. Some of the species that thrive might be invasive (not native to a region) and could gradually drive out or even kill native species.

Migrations and Life Cycle Events

The timing of many natural events, such as flower blooms and animal migrations, is linked to climate factors such as temperature, moisture availability, and amount of daylight. Changes in weather patterns and extreme events associated with climate change can disrupt these natural patterns. These disruptions, in turn, can affect seasonal behavior and interactions among species. For example, if birds migrate and lay eggs too early, hatchlings might not have an adequate food supply. While some animals and plants will successfully adjust life-cycle patterns to changing weather pattern cues, others might not be so successful.

Northward Shift of Bird Migrations, 1966–2005



Source: National Audubon Society, 2009. www.audubon.org/bird/bacc/techreport.html

Hundreds of species of birds in North America are wintering farther north in recent years.

For More Information

For detailed information about greenhouse gas emissions, the effects of climate change, EPA efforts underway, and tips on what you can do, visit EPA's Climate Change Web site at www.epa.gov/climatechange.

