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EPA United States Environmental Protection Agency

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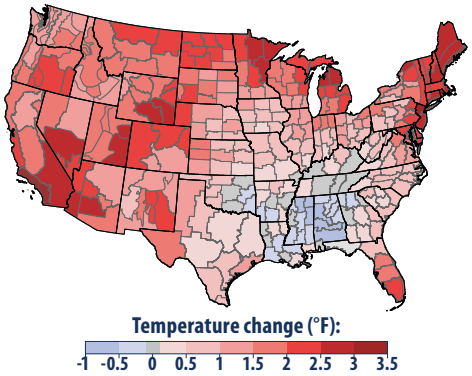
What Climate Change *Means for* Texas

Texas's climate is changing. Most of the state has warmed between one-half and one degree (F) in the past century. In the eastern two-thirds of the state, average annual rainfall is increasing, yet the soil is becoming drier. Rainstorms are becoming more intense, and floods are becoming more severe. Along much of the coast, the sea is rising almost two inches per decade. In the coming decades, storms are likely to become more severe, deserts may expand, and summers are likely to become increasingly hot and dry, creating problems for agriculture and possibly human health.

Our climate is changing because the earth is warming. People have increased the amount of carbon dioxide in the air by 40 percent since the late 1700s. Other heat-trapping greenhouse gases are also increasing. These gases have warmed the surface and lower atmosphere of our planet about one degree during the last 50 years. Evaporation increases as the atmosphere warms, which increases humidity, average rainfall, and the frequency of heavy rainstorms in many places—but contributes to drought in others.

Greenhouse gases are also changing the world's oceans and ice cover. Carbon dioxide reacts with water to form carbonic acid, so the oceans are becoming more acidic. The surface of the ocean has warmed about one degree during the last 80 years. Warming is causing snow to melt earlier in spring, and mountain glaciers are retreating. Even the great ice sheets on Greenland and Antarctica are shrinking. Thus the sea is rising at an increasing rate.



Rising temperatures in the last century. The western part of Texas has warmed twice as much as the eastern part. Source: EPA, Climate Change Indicators in the United States.

Rising Seas and Retreating Shores

Sea level is rising more rapidly along the Texas coast than the rise caused by climate change alone, because the land is sinking, largely because of ground water pumping. If the oceans and atmosphere continue to warm, sea level is likely to rise two to five feet in the next century along much of the Texas coast.

Rising sea level submerges wetlands and dry land, erodes beaches, and exacerbates coastal flooding. Many types of birds and fish depend on tidal wetlands. Shore erosion can eliminate public access along the beach, especially where development is immediately inland.

Coastal Storms, Homes, and Infrastructure

Tropical storms and hurricanes have become more intense during the past 20 years. Although warming oceans provide these storms with more potential energy, scientists are not sure whether the recent intensification reflects a long-term trend. Nevertheless, hurricane wind speeds and rainfall rates are likely to increase as the climate continues to warm.

An eroded beach on North Padre Island impairs public access along the shore. © James G. Titus; used by permission.

Whether or not storms become more intense, coastal homes and infrastructure will flood more often as sea level rises, because storm surges will become higher as well. The rising sea is likely to increase flood insurance rates, while more frequent storms could increase the deductible for wind damage in homeowner insurance policies. Many cities, roads, railways, ports, airports, and oil and gas facilities along the Gulf Coast are vulnerable to the combined impacts of storms and sea level rise. People may move from vulnerable coastal communities and stress the infrastructure of the communities that receive them.

Rainstorms and Tornadoes

Changing the climate is also likely to increase inland flooding. During the last 50 years, the amount of rain falling during the wettest four days of the year has increased about 15 percent in the Great Plains. Over the next several decades, the amount of rainfall during the wettest days of the year is likely to continue to increase, which would increase flooding.

Scientists do not know how the frequency and severity of tornadoes will change. Rising concentrations of greenhouse gases tend to increase humidity, and thus, atmospheric instability, which would encourage tornadoes. But wind shear is likely to decrease, which would discourage tornadoes. Research is ongoing to learn whether tornadoes will be more or less frequent in the future.

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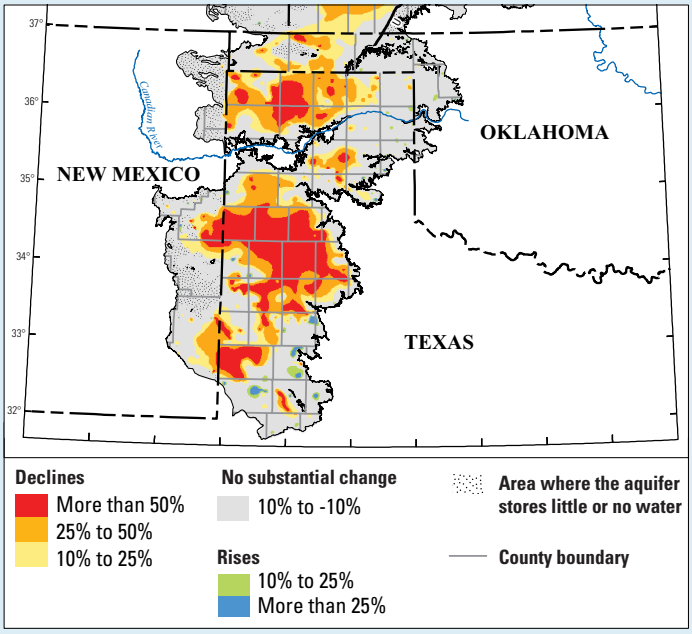
Water Resources

Despite the increase in heavy storms, changing climate is likely to make water less available overall. As warmer temperatures increase evaporation and water use by plants, soils are likely to continue to become drier. Average rainfall is likely to decrease during winter, spring, and summer. Seventy years from now, the longest period without rain each year is likely to be at least three days longer than it is today. Increased evaporation and decreased rainfall are both likely to reduce the average flow of rivers and streams.

Drier soils will increase the need for farmers to irrigate their crops, but sufficient water might not be available. Approximately 14 percent of the farmland in Texas is irrigated; in the Panhandle and the plains to the south, most irrigation water is ground water from the High Plains Aquifer System. As a result, this aquifer is becoming depleted. Since the 1950s, the amount of water stored in the aquifer has declined by more than 50 percent in some parts of the state.



Percent depletion of ground water in the High Plains Aquifer, 1950–2013. Source: USGS.

Agriculture

Increasing droughts and higher temperatures are likely to interfere with Texas's farms and cattle ranches. Hot weather causes cows to eat less, grow more slowly, and produce less milk, and it can threaten their health. Reduced water availability would create challenges for ranchers, as well as farmers who irrigate crops. Yields would decline by about 50 percent in fields that can no longer be irrigated.

Wildfires and Landscape Change

Higher temperatures and drought are likely to increase the severity, frequency, and extent of wildfires, which could harm property, livelihoods, and human health. On average, more than 1 percent of the land in Texas has burned each decade since 1984. Wildfire smoke pollutes the air and can increase medical visits for respiratory and heart problems.

The combination of more fires and drier conditions may expand deserts and otherwise change parts of the Texas landscape. Many plants and animals living in arid lands are already near the limits of what they can tolerate. A warmer and drier climate would generally extend the Chihuahuan desert to higher elevations and expand its geographic range. In some cases, native vegetation may persist and delay or prevent expansion of the desert. In other cases, fires or livestock grazing may accelerate the conversion of grassland to desert in response to the changing climate. For similar reasons, some forests may change to desert or grassland.

The 2011 drought contributed to widespread wildfires in Texas, like this one behind the McDonald Observatory near Fort Davis. Credit: Frank Cianciolo, McDonald Observatory.

Hot Weather, Air Pollution, and Human Health

Hot days can be unhealthy—even dangerous. Seventy years from now, Texas is likely to have three or four times as many days per year above 100°F as it has today. Certain people are especially vulnerable, including children, the elderly, the sick, and the poor. High air temperatures can cause heat stroke and dehydration and affect people's cardiovascular and nervous systems.

Warmer air can also increase the formation of ground-level ozone, a key component of smog. Ozone has a variety of health effects, aggravates lung diseases such as asthma, and increases the risk of premature death from heart or lung disease. EPA and the Texas Commission on Environmental Quality have been working to reduce ozone concentrations. As the climate changes, continued progress toward clean air will be more difficult.

The sources of information about climate and the impacts of climate change in this publication are: the national climate assessments by the U.S. Global Change Research Program, synthesis and assessment products by the U.S. Climate Change Science Program, assessment reports by the Intergovernmental Panel on Climate Change, and EPA's *Climate Change Indicators in the United States*. Mention of a particular season, location, species, or any other aspect of an impact does not imply anything about the likelihood or importance of aspects that are not mentioned. For more information about climate change science, impacts, responses, and what you can do, visit EPA's Climate Change website at www.epa.gov/climatechange.

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