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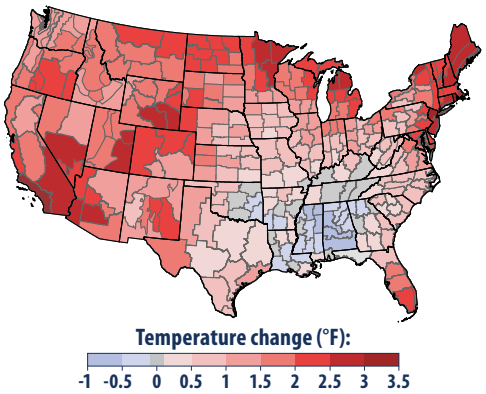
What Climate Change *Means for* Mississippi

In the coming decades, **Mississippi** will become warmer, and both floods and droughts may be more severe. Unlike most of the nation, Mississippi did not become warmer during the last 50 to 100 years. But soils have become drier, annual rainfall has increased, more rain arrives in heavy downpours, and sea level is rising about one inch every seven years. The changing climate is likely to increase damages from tropical storms, reduce crop yields, harm livestock, increase the number of unpleasantly hot days, and increase the risk of heat stroke and other heat-related illnesses.

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 (F) 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. While most of the earth warmed, natural cycles and sulfates in the air cooled Mississippi. Sulfates are air pollutants that reflect sunlight back into space. Now sulfate emissions are declining, and the factors that once prevented the state from warming are unlikely to persist.

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.



Changing temperatures in the last century. While most of the nation has warmed, Mississippi and a few other states have cooled. Source: EPA, Climate Change Indicators in the United States.

Rising Seas and Retreating Shores

Sea level is rising more rapidly in Mississippi than most coastal areas because the land is sinking. If the oceans and atmosphere continue to warm, sea level along the Mississippi coast is likely to rise between twenty inches and four feet in the next century. Rising sea level submerges wetlands and dry land, erodes beaches, and exacerbates coastal flooding. Coastal communities along Mississippi Sound are protected by undeveloped barrier islands, so erosion of those islands could threaten communities on the mainland.

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.

Hurricane Katrina's storm surge and high winds destroyed the homes on these three lots in Long Beach, and many others. Credit: John Fleck, FEMA.

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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. Rising sea level 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.

Flooding and River Transportation

Changing the climate is also likely to increase inland flooding. Vicksburg and Natchez are vulnerable to high water levels on the Mississippi River. Since 1958, the amount of precipitation during heavy rainstorms has increased by 27 percent in the Southeast, and the trend toward increasingly heavy rainstorms is likely to continue. Moreover, streamflows in the Midwest are increasing, and the amount of rainfall there is also likely to increase, which could increase flooding in Mississippi, because most of the Midwest drains into the Mississippi River.

Droughts create a different set of challenges. During severe droughts in the Mississippi River's watershed, low flows can restrict commercial navigation. For example, low water in 2012 forced the U.S. Army Corps of Engineers to reduce allowable barge sizes on the Mississippi River and close the river at Greenville for more than a week, which delayed approximately 100 barges.

The Mississippi River flooded parts of Vicksburg in May 2011, including the old railroad depot shown here. Credit: Patrick Moes, U.S. Army Corps of Engineers.

Agriculture

Changing the climate will have both harmful and beneficial effects on farming. Seventy years from now, Mississippi is likely to have 30 to 60 days per year with temperatures above 95°F, compared with about 15 days today. Even during the next few decades, hotter summers are likely to reduce yields of corn. But higher concentrations of atmospheric carbon dioxide increase crop yields, and that fertilizing effect is likely to offset the harmful effects of heat on soybeans, cotton, wheat, and peanuts—if enough water is available. More severe droughts, however, could cause crop failures. Higher temperatures are also likely to reduce livestock productivity, because heat stress disrupts the animals' metabolism.

Forest Resources

Higher temperatures and changes in rainfall are unlikely to substantially reduce forest cover in Mississippi, although the composition of trees in the forests may change. More droughts would reduce forest productivity, and climate change is also likely to increase the damage from insects and disease. But longer growing seasons and higher carbon dioxide concentrations could more than offset the losses from those factors. Forests cover almost two-thirds of the state. Oak, hickory, and white pine trees are most common in the northern part of the state, except along the Mississippi River delta. In the southern part of the state, loblolly and longleaf pines are most common. As the climate warms, forests in southern Mississippi are likely to have more oaks and white pines, and fewer loblolly and longleaf pines.

Human Health

Hot days can be unhealthy—even dangerous. 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 cardio-vascular 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 Mississippi Department of Environmental Quality have been working to reduce ozone concentrations. As the climate changes, continued progress toward clean air will become 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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