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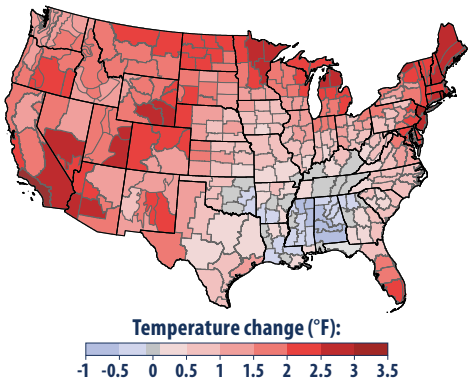
What Climate Change *Means for* Louisiana

In the coming decades, **Louisiana** will become warmer, and both floods and droughts may become more severe. Unlike most of the nation, Louisiana did not become warmer during the last century. But soils have become drier, annual rainfall has increased, more rain arrives in heavy downpours, and sea level is rising. Our changing climate is likely to increase damages from floods, reduce crop yields and harm fisheries, increase the number of unpleasantly hot days, and increase the risk of heat stroke and other heat-related illnesses.

The climate is changing because our planet 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 the earth 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 Louisiana. 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.



Rising temperatures in the last century. Louisiana has warmed less than most of the United States, and part of the state has cooled. Source: EPA, Climate Change Indicators in the United States.

Rising Seas and Retreating Shores

Rising sea level is likely to accelerate coastal erosion caused today by sinking land and human activities. The sediment washing down the Mississippi River created the river delta that comprises most of coastal Louisiana. These sediments gradually compact, so the land sinks about one inch every three years. Historically, the river would occasionally overflow its banks and deposit enough new sediment to allow the land surface to keep pace with rising sea level and the delta's tendency to sink. But today, river levees, navigation channels, and other human activities thwart this natural land-building process, so coastal lands are being submerged. Louisiana has been losing about 25 square miles of land per year in recent decades.

If temperatures continue to warm, sea level is likely to rise one to three feet during the next century. Rising sea level has the same effect as sinking land, so changing climate is likely to accelerate coastal erosion and land loss. Federal, state, and local governments have ongoing projects to slow land loss in Louisiana, but if the sea rises more rapidly in the future, these efforts will become increasingly difficult.

Tropical Storms

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.

Most of New Orleans was flooded when rising water overtopped levees and floodwalls during Hurricane Katrina in 2005. Credit: LtCdr. Mark Moran, NOAA Corps

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Increased Flooding

Whether or not tropical storms become more frequent, rising sea level makes low-lying areas more prone to flooding. Many coastal roads, railways, airports, and oil and gas facilities are vulnerable to the impacts of storms and sea level rise. Louisiana is especially vulnerable, because much of New Orleans and other populated areas are below sea level, protected by levees and pumping systems that remove rainwater, which cannot drain naturally. With a higher sea level, these levees may be overtopped more readily during storms. Severe flooding can disrupt the economy of a city by inducing people to move away, which occurred after Hurricane Katrina in New Orleans. The greater flood risk is also likely to increase flood insurance rates.

Changing climate is also likely to increase the risk of inland flooding. Since 1958, the amount of precipitation falling during heavy rainstorms has increased by 27 percent in the Southeast, and the trend toward increasingly heavy rainstorms is likely to continue. Moreover, the amount of rainfall in the Midwest is also likely to increase, which could worsen flooding in Louisiana, because most of the Midwest drains into the Mississippi River.

The Port of New Orleans is vulnerable to river floods that shut down traffic on the Mississippi River, as well as coastal storms that can flood port facilities. In 2011, high water levels on the Mississippi River led the U.S. Army Corps of Engineers to divert water through the Morganza Spillway to the Atchafalaya River to prevent serious flooding of Baton Rouge and New Orleans. The resulting high water on the Atchafalaya flooded small towns and about 1,000 square miles of agricultural land, and required temporary levees to protect Morgan City. Although major flooding on the Mississippi River was avoided, high water levels still caused a barge collision that led the Corps to close the river near Baton Rouge for four days.

Heavy rains flooded Franklinton in March 2016. Credit: Sgt. Cody Westmoreland, Louisiana Army National Guard.

Agriculture, Forests, and Fisheries

Changing climate will have both harmful and beneficial effects on farming. Seventy years from now, Louisiana is likely to have 35 to 70 days 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 and rice. 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 and cotton—if adequate water is available. On farms without irrigation, however, increasingly severe droughts could cause more crop failures. Higher temperatures are also likely to reduce livestock productivity, because heat stress disrupts the animals' metabolism.

Higher temperatures and changes in rainfall are unlikely to substantially reduce forest cover in Louisiana, 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 increased concentrations of carbon dioxide could more than offset the losses from those factors. Forests cover about half of the state, with loblolly-shortleaf pine forests most common outside of wetland areas. Changing climate may cause the loblolly and shortleaf pine trees to give way to oak-pine forests.

Rising sea level and higher temperatures threaten Louisiana's fisheries. Coastal wetlands account for most of the land that the state has been losing. Those wetlands support shrimp, oyster, crab, crawfish, menhaden, and other fisheries–about 75 percent of the state's total commercial fisheries. Rising temperatures may also harm fish by reducing levels of dissolved oxygen in the water, promoting harmful algal blooms, bacteria, and other factors that contribute to diseases in coastal waters.

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 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 Louisiana 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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