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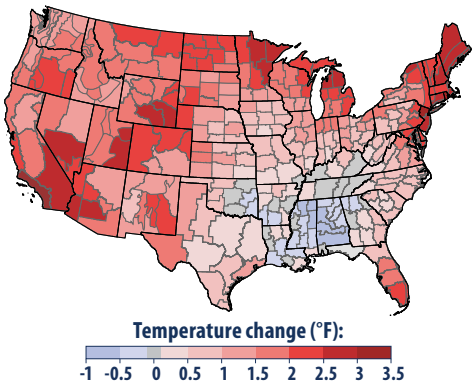
What Climate Change *Means for* Arkansas

In the coming decades, **Arkansas** will become warmer, and the state will probably experience more severe floods and drought. Unlike most of the nation, Arkansas has not become warmer during the last 50 to 100 years. But annual rainfall has increased in much of the state, and more rain arrives in heavy downpours. Changing the climate is likely to increase damage from 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.

Natural cycles and sulfates in the air prevented much of Arkansas from warming during the last century. Sulfates are air pollutants that reflect sunlight back into space. Now sulfate emissions are declining, and the factors that once prevented Arkansas from warming are unlikely to persist.



Rising temperatures in the last century. Arkansas has warmed less than most of the United States, and some parts have cooled. Source: EPA, Climate Change Indicators in the United States.

Heavy Precipitation and Flooding

Changing the climate is likely to increase inland flooding, particularly in communities along major rivers. 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. The risk of flooding along the Mississippi River may also increase because the Midwest, which drains into that river, is also becoming wetter. Both annual rainfall and stream flows in the Midwest are increasing, and that trend is likely to continue. The U.S. Army Corps of Engineers manages dams and reservoirs to control flooding, but these dams cannot prevent all floods.

Floodwaters overwhelmed Bald Knob National Wildlife Refuge after the White River overtopped a levee during the historic floods of May 2011. Credit: U.S. Fish and Wildlife Service.

Drought and Water Resources

Although climate change is likely to increase the risk of flooding, droughts are also likely to become more severe. Average rainfall is likely to decrease during the 21st century, especially in spring and summer. In addition, rising temperatures increase evaporation, which dries the soil and decreases the amount of rain that runs off into rivers. The total amount of water running off into rivers or recharging ground water each year is likely to decline by 5 percent or more. Droughts are likely to be more severe, because periods without rain will be longer and very hot days will be more frequent.

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Droughts pose challenges for water management and river transportation. If the spring is unexpectedly dry, reservoirs may have too little water during summer. During droughts, the Corps of Engineers releases water from dams to maintain navigation on the Arkansas River, where barges carry freight worth more than $4 billion during a typical year. The Corps of Engineers tries to keep channels at least nine feet deep, because lower river levels can force barges to carry smaller loads, leading to increased transportation costs. If droughts become more severe, the Corps of Engineers will face this type of problem more often. Droughts can also restrict shipping on the Mississippi River. The drought of 2012 narrowed navigation channels, forced lock closures, and caused dozens of barges to run aground on the river. The resulting impact on navigation cost the region more than $275 million.

Aquatic Ecosystems

Changing the climate can harm aquatic ecosystems. Warmer water lowers the level of dissolved oxygen in surface water, which can severely limit fish populations. Because fish cannot regulate their body temperatures, warmer water can make a stream uninhabitable for fish that require cooler water. Warmer temperatures can also increase the frequency of algal blooms, which can be toxic and further reduce dissolved oxygen. Summer droughts may amplify these effects, while periods of extreme rainfall can increase the impacts of pollution on streams.

Agriculture

Changing the atmosphere will have both harmful and beneficial effects on farming. Seventy years from now, Arkansas is likely to have 30 to 60 days per year with temperatures above 95°F, compared with 15 to 30 days today. Hot weather causes cows to eat less and grow more slowly, and it can threaten their health. Even during the next few decades, hotter summers are likely to reduce yields of corn and rice. But the higher concentrations of atmospheric carbon dioxide wil increase crop yields, and that fertilizing effect is likely to offset the harmful effects of heat on soybeans and cotton, assuming that adequate water is available. On farms without irrigation, however, increasingly severe droughts could cause more crop failures.

A corn crop in Arkansas is stunted and sparse due to drought conditions. Credit: Tim McCabe, USDA Natural Resources Conservation Service.

Forests

Higher temperatures and changes in rainfall are unlikely to substantially reduce forest cover in Arkansas, although the composition of those forests may change. More droughts would reduce forest productivity, and climate change is also likely to increase the damage from insects and diseases. But longer growing seasons and increased carbon dioxide concentrations could more than offset the losses from those factors. In northern Arkansas, forests are likely to have more pine and fewer hickory trees.

Human Health

Hot days can be unhealthy—even dangerous. High air temperatures can cause heat stroke and dehydration, and affect people's cardiovascular and nervous systems. Certain people are especially vulnerable, including children, the elderly, the sick, and the poor. Warmer temperatures 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 Arkansas 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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