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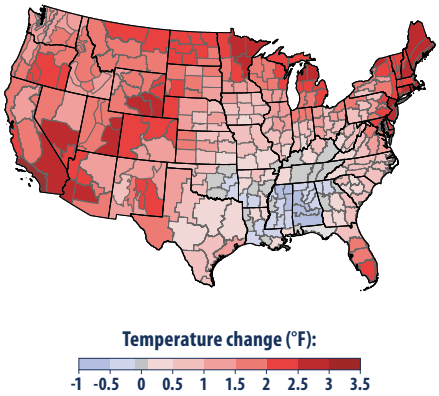
What Climate Change *Means for* Missouri

Missouri's climate is changing. Most of the state has warmed one-half to one degree (F) in the last century, and floods are becoming more frequent. In the coming decades, the state will have more extremely hot days, which may harm public health in urban areas and corn harvests in rural areas.

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.



Rising temperatures in the last century. Missouri has warmed less than most of the United States. Source: EPA, Climate Change Indicators in the United States.

Heavy Precipitation and Flooding

Changing the climate is likely to increase the frequency of floods in Missouri. Over the last half century, average annual precipitation in most of the Midwest has increased by 5 to 10 percent. But rainfall during the four wettest days of the year has increased about 35 percent, and the amount of water flowing in most streams during the worst flood of the year has increased by more than 20 percent. During the next century, spring rainfall and average precipitation are likely to increase, and severe rainstorms are likely to intensify. Each of these factors will tend to further increase the risk of flooding.

Mississippi and Missouri Rivers

Flooding occasionally threatens navigation and riverfront communities, and greater river flows could increase these threats. In April and May 2011, a combination of heavy rainfall and melting snow caused a flood that closed the Mississippi River to navigation, threatened Caruthersville, and prompted evacuation of Cairo, Illinois, due to concerns that its flood protection levees might fail. To protect Cairo, the U.S. Army Corps of Engineers opened the Birds Point-New Madrid Floodway, which lowered the river by flooding more than 100,000 acres of farmland in Missouri. Later that spring, heavy rains and rapid snowmelt upstream led to flooding along the Missouri River, which damaged property and closed the river to navigation.

Heavy rain led to flooding around St. Louis in December 2015, including this area in Valley Park. Credit: Cpl. Alex Flynn, Missouri Army National Guard.

Although springtime in Missouri is likely to be wetter, summer droughts are likely to be more severe. Higher evaporation and lower summer rainfall are likely to reduce river flows. The drought of 2012 narrowed navigation channels, forced lock closures, and caused dozens of barges to run aground on the Mississippi River along the Missouri shoreline. The resulting impact on navigation cost the region more than $275 million. The drought of 2012–2013 also threatened municipal and industrial water users along the Missouri River.

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Tornadoes

Scientists do not know how the frequency and severity of tornadoes will change. Increasing 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. Because Missouri experiences about 50 tornadoes a year, such research is closely followed by meteorologists in the state.

Forests

Higher temperatures and changes in rainfall are unlikely to substantially reduce forest cover in Missouri, 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 diseases. But longer growing seasons and increased carbon dioxide concentrations could more than offset the losses from those factors. Forests cover about one-third of the state, dominated by oak and hickory trees. As the climate changes, the abundance of pines in Missouri's forests is likely to increase, while the population of hickory trees is likely to decrease.

Agriculture

Changing the climate will have both harmful and beneficial effects on farming. Seventy years from now, Missouri is likely to have more than 25 days per year with temperatures above 95°F, compared with 5 to 15 today. Hot weather causes cows to eat less, produce less milk, and grow more slowly—and it could threaten their health. 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, assuming that adequate water is available. On farms without irrigation, however, increasingly severe droughts could cause more crop failures. More severe droughts or floods would also hurt crop yields.

Air Pollution and Human Health

Changing the climate can harm air quality and amplify existing threats to human health. Higher temperatures can increase the production of ground-level ozone, a pollutant that can cause lung and heart problems. Ozone also harms plants. In some rural parts of Missouri, ozone levels are high enough to significantly reduce yields of soybeans and winter wheat. EPA and the Missouri Department of Natural Resources have been working to reduce ozone concentrations. As the climate changes, continued progress toward clean air will become more difficult.

Climate change may also increase the length and severity of the pollen season for allergy sufferers. For example, the ragweed season in Kansas City has grown 18 days longer since 1995, because the first frost in fall is later.

A photo of a ragweed plant, a common source of allergens in Missouri. Like many crops and pollen sources, ragweed will have a longer growing season as temperatures rise. Stock photo.

Hot days can be unhealthy—even dangerous. High air temperatures can cause heat stroke and dehydration, and affect people's cardiovascular and nervous systems. Midwestern cities like St. Louis are vulnerable to heat waves, because many houses and apartments lack air conditioning, and urban areas are typically warmer than their rural surroundings. In recent decades, severe heat waves have killed hundreds of people across the Midwest. Heat stress is expected to increase as climate change brings hotter summer temperatures and more humidity. Certain people are especially vulnerable, including children, the elderly, the sick, and the poor.

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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