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What Climate Change *Means for* Kansas

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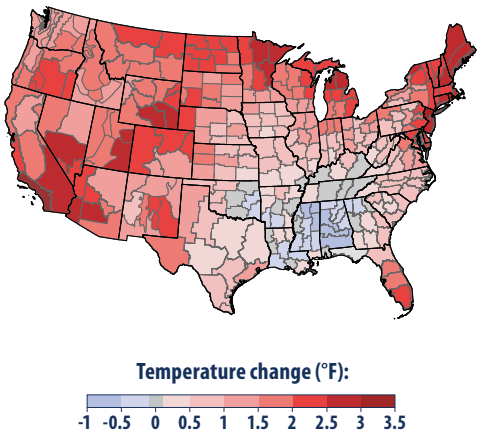
Kansas's climate is changing. In the past century, most of the state has warmed by at least half a degree (F). The soil is becoming drier. Rainstorms are becoming more intense, and floods are becoming more severe. Warming winters and changes in the timing and size of rainfall events have altered crop yields. In the coming decades, 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.



Rising temperatures in the last century. All parts of Kansas have warmed. Source: EPA, Climate Change Indicators in the United States.

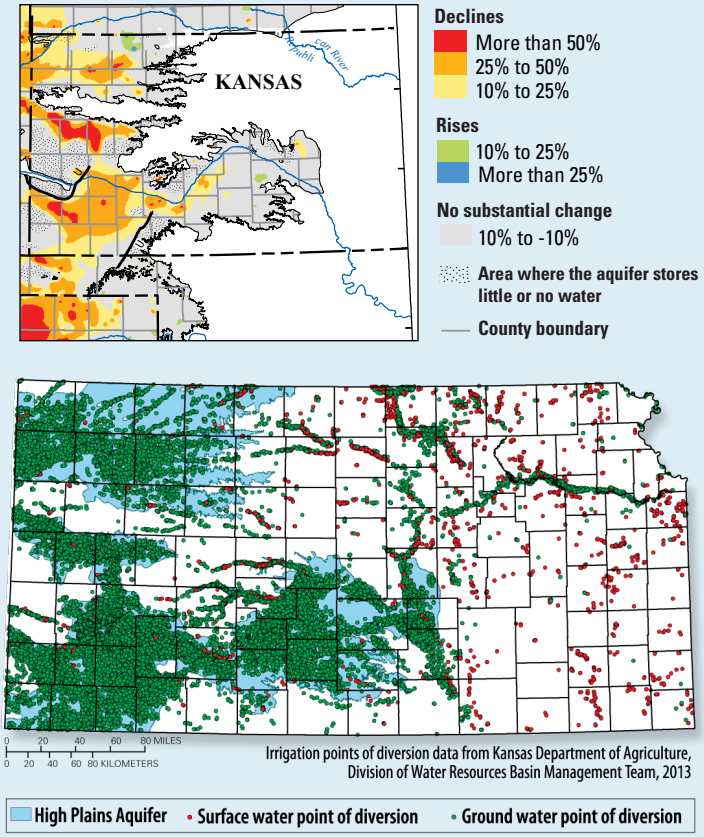
Precipitation and Water Resources

Changing climate is likely to increase the demand for water but make it less available. Soils have become drier over the last several decades, and they are likely to continue to become drier as warmer temperatures increase evaporation and water use by plants. Average rainfall during the summer is likely to decrease. Seventy years from now, the longest period without rain each year is likely to be three or four days longer than today. Warmer temperatures and drier soils are also likely to decrease the average flow of rivers and streams, because drier soil retains more water when it rains.

Drier soils will increase the need for farmers to irrigate their crops, but sufficient water might not be available. Approximately 22 percent of the farmland in Kansas is irrigated, mostly with 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 25 percent in many parts of the state. (See map on back page.)

Decreased river flows can create problems for navigation, recreation, public water supplies, and electric power generation. Commercial navigation can be suspended during droughts when there is too little water to keep channels deep enough for barge traffic. Decreased river flows can also lower the water level in lakes and reservoirs, which may limit municipal water supplies and impair swimming, fishing, and other recreational activities. Although the state has only one hydroelectric dam, conventional power plants also need adequate water for cooling. Compounding the problem, rising temperatures are expected to increase the demand for electricity for air conditioning.

A very low flow of water on the Arkansas River at Great Bend during a drought. July 12, 2013. Credit: Nathan Sullivan, USGS.



Ground water accounts for 96 percent of the water used for irrigation in Kansas. Most of it comes from the High Plains Aquifer. Top: Percent depletion of ground water in the High Plains Aquifer, 1950–2013. Bottom: Irrigation trends in Kansas, 1991–2011. Source: USGS.

Agriculture

Rising temperatures, drier soils, and decreasing water availability are likely to present challenges for Kansas's farms. Yields would decline by about 50 percent in fields that can no longer be irrigated. Even where ample water is available, higher temperatures would reduce yields of corn. Increased concentrations of carbon dioxide, however, may increase yields of wheat and soybean enough to offset the impact of higher temperature. Although warmer and shorter winters may allow for a longer growing season, they may also promote the growth of weeds and pests, and shorten the dormancy for many winter crops, which could increase crop losses during spring freezes.

A center-pivot irrigation system in western Kansas. Credit: Lori Marintzer, USGS.

The early flowering of winter wheat could have negative repercussions on livestock farmers who depend on it for feed. Livestock themselves may also be affected by more intense heat waves and lack of water. Hot weather causes cows to eat less, grow more slowly, and produce less milk, and it can threaten their health.

Rainstorms and Tornadoes

Although summer droughts are likely to become more severe, floods may also intensify. 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. River levels associated with flooding have increased in eastern Kansas. 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.

A worker measures the overflow of the Smoky Hill River along old U.S. Route 40 during a record flood near New Cambria. May 25, 2007. Credit: USGS, Kansas Water Science Center.

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. Because Kansas experiences about 100 tornadoes a year, such research is closely followed by meteorologists in the state.

Hot Weather and Human Health

Hot days can be unhealthy—even dangerous. By 2050, Kansas is likely to have four times as many days above 100°F. Certain people are especially vulnerable, including children, the elderly, the sick, and the poor. The elderly may be particularly prone to heat stress and other heat-related health problems, including dehydration, cardiovascular strain, and respiratory problems. Those with low incomes may be particularly vulnerable due to a lack of air conditioning. Power failures due to severe weather can also present risks, especially in lightly populated areas where access to the necessary support services may be limited.

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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