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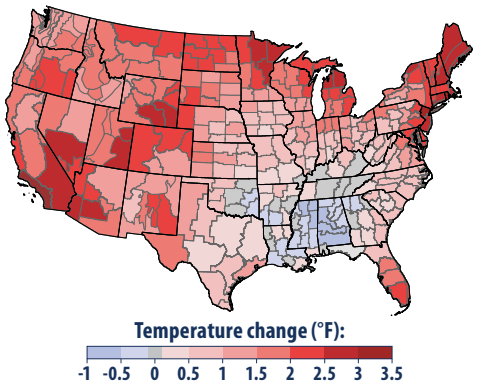
What Climate Change *Means for* Nebraska

Nebraska's climate is changing. In the past century, most of the state has warmed by at least one degree (F). The soil is becoming drier, and rainstorms are becoming more intense. In the coming decades, flooding is likely to increase, yet summers are likely to become increasingly hot and dry, which would reduce yields of some crops, require farmers to use more water, and amplify some risks to 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. The Panhandle has warmed more than the rest of Nebraska. Source: EPA, Climate Change Indicators in the United States.

Precipitation and Water Resources

Changing the climate is likely to increase the demand for water but make it less available. Soils will probably continue to become drier, because warmer temperatures increase evaporation and water use by plants, and average rainfall during summer is likely to decrease. More evaporation and less rainfall would reduce the average flow of rivers and streams.

Decreased river flows can create problems for navigation, recreation, public water supplies, and electric power generation. Commercial navigation can be suspended during droughts (or floods) 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. Lower flows during a summer drought can reduce hydroelectric power generation at a time of year when warmer temperatures increase the demand for electricity for air conditioning. Conventional power plants also need adequate water for cooling.

The severe drought of 2012 led to low flow in rivers across Nebraska. This photo shows the nearly dry riverbed of the Big Nemaha River near Falls City. Credit: Mike Andersen, USGS.

Higher temperatures and drier soils are likely to increase the use of water by more than 25 percent during the next 50 years, mostly because of increased irrigation. Approximately one-third of the farmland in Nebraska is irrigated with ground water, most of which comes from the High Plains Aquifer System, and municipal water supplies also reply primarily on ground water. In Nebraska, the aquifer is only being depleted in a few western areas. But water levels are declining throughout much of Kansas, where the average temperature today is similar to what the average temperature of Nebraska is likely to be 70 to 100 years from now.

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Agriculture

Rising temperatures and changes in rainfall are likely to have both negative and positive effects on Nebraska's farms and ranches. Hot weather causes cows to eat less and grow more slowly, and it can threaten their health. Increased winter and spring precipitation could leave some fields too wet to plant, and warmer winters may promote the growth of weeds and pests. Hotter summers and drier soils would cause droughts to become more intense. Over the next 70 years, the number of days per year above 100°F is likely to double. Increased drought, along with a greater number of extremely hot days, could cause crop failures. 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 temperatures. Warmer and shorter winters may allow for a longer growing season, which could allow two crops per year instead of one in some instances. Increased precipitation at the beginning of the growing season could also be beneficial to some crops.

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 during floods have become higher in eastern Nebraska. Over the next several decades, heavy downpours will account for an increasing fraction of all precipitation, and average precipitation during winter and spring is likely to increase. Both of these factors would further increase flooding.

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.

The Fort Calhoun Nuclear Power Plant in eastern Nebraska was surrounded by a Missouri River flood in June 2011. Credit: U.S. Army Corps of Engineers.

Research is ongoing to learn whether tornadoes will be more or less frequent in the future. Because Nebraska experiences more than 50 tornadoes a year, such research is closely followed by meteorologists in the state.

Human Health

Hot days can be unhealthy—even dangerous. 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. Climate change may also increase the length and severity of the pollen season for allergy sufferers. For example, the ragweed season near Omaha has grown 10 days longer since 1995, because the first frost in fall is later.

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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