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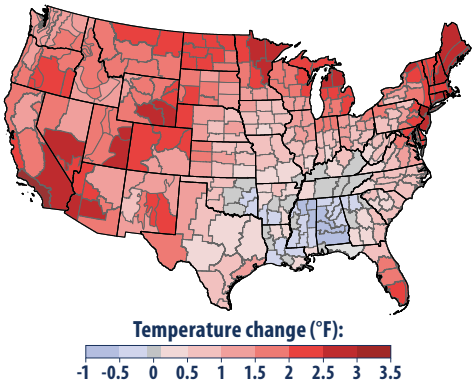
What Climate Change *Means for* Illinois

Illinois's climate is changing. Most of the state has warmed by about one degree (F) in the last century. Floods are becoming more frequent, and ice cover on the Great Lakes is forming later or melting sooner. 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.

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 also warmed about one degree during the last 80 years. Although warmer temperatures cause sea level to rise, the impact on water levels in the Great Lakes is not yet known. Warmer air also melts ice and snow earlier in spring.



Rising temperatures in the last century. Northern Illinois has warmed more than southern Illinois. Source: EPA, Climate Change Indicators in the United States.

Heavy Precipitation and Flooding

Changing climate is likely to increase the frequency of floods in Illinois. 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.

Illinois, Ohio, and Mississippi Rivers

Flooding occasionally threatens both navigation and riverfront communities, and greater river flows could increase these threats. In 2011, a combination of heavy rainfall and melting snow caused a flood that closed the Ohio and Mississippi rivers to navigation and prompted evacuation of Cairo 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 Mississippi River by flooding more than 100,000 acres of farmland in Missouri. The flood caused $360 million of damage to infrastructure, property, and agricultural yields upstream.

The Mississippi River flooding at the Quincy Lock and Dam 21 in Quincy in June 2008. The lock is submerged in the foreground and the dam is visible to the left. Credit: USGS, Advanced Hydrological Prediction Service.

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Although springtime in Illinois 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 along the Illinois shoreline of the Mississippi River, all of which delayed shipping. The Corps of Engineers estimates that the drought's impact on navigation cost the region more than $275 million. Both floods and drought can cause problems for the Illinois Waterway, which carries 25 million tons of cargo per year between Chicago and the Mississippi River.

One advantage of climate change is that warmer winters reduce the number of days that ice prevents navigation.

Great Lakes

The ice-free season along the Great Lakes is also becoming longer. Between 1994 and 2011, reduced ice cover lengthened the shipping season on the lakes by eight days. The Great Lakes are likely to warm another 3° to 7°F in the next 70 years, which will further extend the shipping season.

In Lake Michigan, changing climate is likely to harm water quality. Warmer water tends to cause more algal blooms, which can be unsightly, harm fish, and degrade water quality. Severe storms also increase the amount of pollutants that run off from land to water, so the risk of algal blooms will be greater if storms become more severe. Increasingly severe rainstorms could also cause sewers to overflow into the lake more often, threatening beach safety and drinking water supplies.

Agriculture

Changing climate will have both beneficial and harmful effects on farming. Longer frost-free growing seasons and higher concentrations of atmospheric carbon dioxide would increase yields for some crops during an average year. But increasingly hot summers are likely to reduce yields of corn and possibly soybeans. Seventy years from now, southern Illinois is likely to have 15 to 20 more days with temperatures above 95°F than it has today. More severe droughts or floods would also hurt crop yields.

Parched and stunted corn during a summer drought in Illinois. Credit: USGS.

Air Pollution and Human Health

Rising temperatures can harm air quality and amplify existing threats to human health. Warmer weather can increase the production of ground-level ozone, a pollutant that causes lung and heart problems. Ozone also harms plants. In rural Illinois, ozone levels are high enough to significantly reduce yields of soybeans and winter wheat. U.S. EPA and the Illinois EPA have been working to reduce ozone concentrations. As the climate changes, continued progress toward clean air will become more difficult.

Hot days can be unhealthy, even dangerous. High air temperatures can cause heat stroke and dehydration, and affect people's cardiovascular and nervous systems. Northern cities like Chicago are vulnerable to heat waves, because many houses and apartments lack air conditioning, and urban areas are typically warmer than their rural surroundings. Heat waves kill approximately 50 people per year in Chicago. In the next 70 years, climate change is likely to substantially increase heat-related deaths. 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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