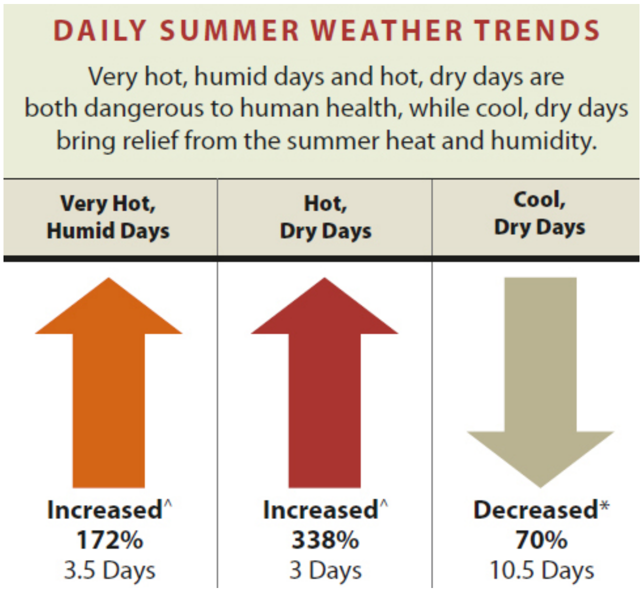
The Potential Impacts of Climate Change on Detroit, Michigan

GLISA
GREAT LAKES INTEGRATED SCIENCES + ASSESSMENTS

Prepared in partnership with the
Detroit Climate Action Collaborative



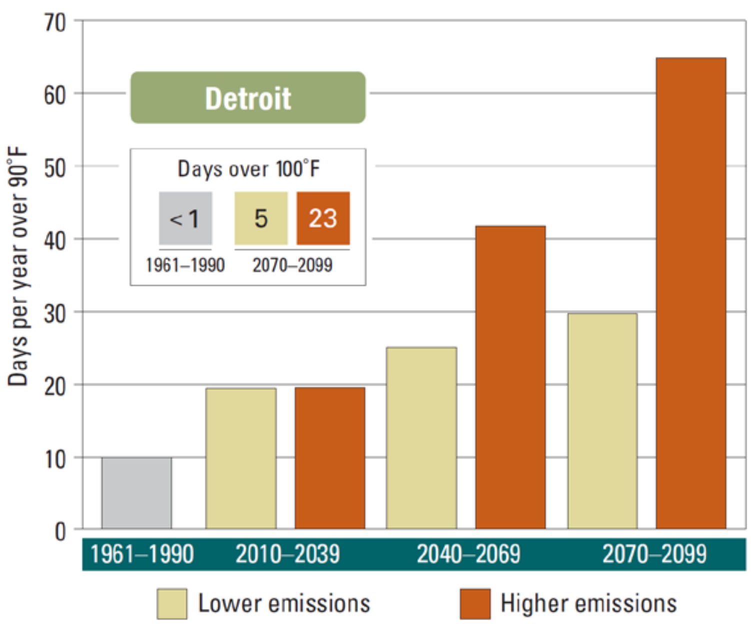
The changing frequency of summer weather patterns from 1959-2011. A "^" denotes the trend was significant with 90% confidence. A "" denotes 95% confidence. (UCS 2012)*

Average temperatures are rising.

- The 30-year average annual temperature increased for Detroit by 1.4°F from the period 1961-1990 to the period 1981-2010.
- From 1959-2011, average overnight temperatures on hot, dry days warmed 4.3°F.
- The number of days per year with a high temperature above 90°F is projected to increase from 15 at present to between 36 and 72 by the end of the century.

More frequent, intense heat waves increase the risk of heat-related illness.

- Rising overnight temperatures during heat waves increase the risk for severe illnesses and death, since residents are less able to find relief from sweltering temperatures.
- People of lower socioeconomic status living in areas of high population density are at greater risk of exposure to extreme heat.
- Warmer temperatures increase ground-level ozone production. As ozone levels rise, so too will the number of hospitalizations for respiratory and cardiovascular conditions.
- Soot particles increase the severity of respiratory ailments. Rising demand for electricity to run air conditioners increases, coal-fired power plants generate more soot.



Detroit is projected to see a dramatic increase in the number of hot days exceeding 90°F (inset, 100°F), assuming current global greenhouse gas emissions trends continue (higher emissions). Assuming greenhouse gas emissions are significantly curtailed (lower emissions), the number of hot days will still increase but will be far fewer than under a high emissions scenario. (UCS 2012, modified)

Projected Annual Heat-related Deaths	
2020-2029	**255**
2045-2055	**291**
2090-2099	**701**

Projected average annual number of heat-related deaths for Detroit assuming a high (A1F1) emissions scenario. Source: Greene et al., 2011.

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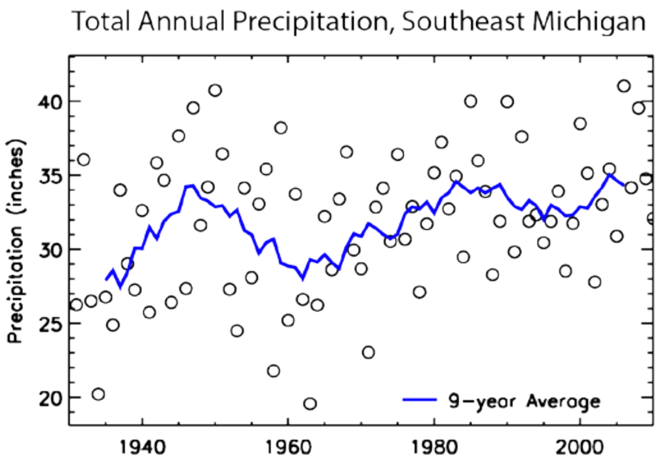
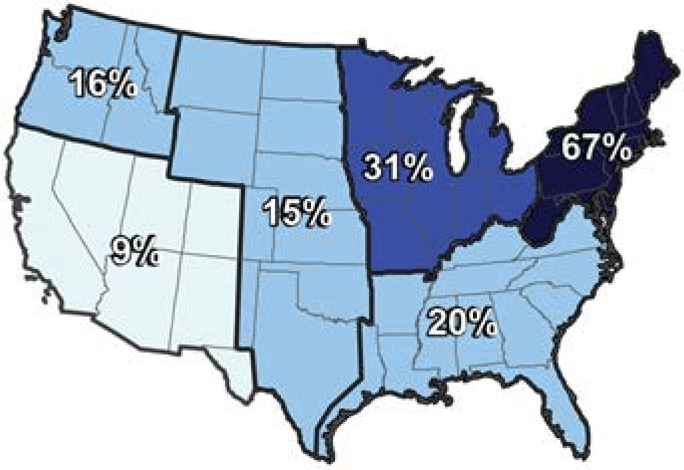


Total Annual Precipitation from Southeast Michigan, 1930-2010. Open circles represent annual totals. The solid blue line is the 9-year running average. Total annual precipitation increased by 11% from the 1961-1990 average to the 1981-2010 average. Data source: NCDC Michigan Climatic Division 10 provided by MRCC.



The Midwest has seen a 31% increase in the heaviest 1% of precipitation events from 1958 to 2007. (Groisman et al.)

Total precipitation has increased while severe storms have become stronger and more severe.

- Southeast Michigan has seen an 11% increase in total annual precipitation from the 1961-1990 average to the 1981-2010 average and most models project this trend to continue.
- With warmer temperatures, more precipitation will fall in the form of rain rather than snow.
- Extreme precipitation events have become more frequent and more intense. Most models project that these trends will continue.

Changes in precipitation can amplify existing vulnerabilities of flooding, water contamination and infrastructure damage.

- With more intense and more frequent severe storms, Detroit will see more combined sewage overflows, increasing the risk for waterborne disease outbreaks when untreated sewage is released into surface water.
- Throughout the year, projected changes in the timing, form, frequency, and intensity of precipitation could amplify existing inland flooding risks.
- Land use changes can drastically alter the potential of impacts due to climate change. Proper management of impervious surfaces, infrastructure, and natural resources can alleviate the risks from climate change, but inappropriate land use changes can amplify the negative impacts.

The effect of climate change on Great Lakes lake levels remains uncertain.

- Changing lake levels pose numerous challenges, including shoreline erosion, the operation of coastal facilities, and reduced shipping efficiency in navigation channels.
- Most scientists agree that climate change is a significant driver of lake levels. There are other confounding factors, however, and it remains unclear how much of the recent trend in lake levels may be attributed to climate change.
- Future projections of lake levels for the Great Lakes vary, though most indicate a greater decline in lake levels with increasing greenhouse gas emissions.