Indiana’s Past & Future Climate

Indiana Water Summit
August 13, 2018 | Indianapolis, IN

Photo of St. Joseph River flooding, Feb 2018
Courtesy of Alan Hamlet

Melissa Widhalm
Purdue Climate Change Research Center
Global Average Temperature

Difference from long-term average

Temperature (°F)

1.80 1.60 1.40 1.20 1.00 0.80 0.60 0.40 0.20 0.00 -0.20 -0.40 -0.60

1880 1900 1920 1940 1960 1980 2000

CO₂ Concentration

45%

Since 1800

Image by Adam Nieman
Climate change made Hurricane Harvey's rainfall worse, study finds

By Brandon Miller, CNN Meteorologist

3x more likely
15% more intense

2017 European Heatwave
10x more likely

Climate change made Lucifer heatwave far more likely, scientists find

Damian Carrington  Environment editor

Wed 27 Sep 2017
It’s happening now...

...it’s hurting Hoosiers
Indiana is getting warmer

- Longer frost-free season
- Fewer cold days
- Significantly warmer overnight temperatures

Per Decade

Spring Low Temps

0.6°F
Indiana is getting wetter

Annual Total Precipitation, Indiana

5.6” Since 1895
Heavy rainfall events are increasing in frequency and intensity.

- 53% increase in the occurrence of 2-day total, 5-year return.
- 42% increase in the amount of rain falling in heavy downpours.

What is Indiana’s Water Future?
Technical contributions from:

- Purdue Climate Change Research Center
- University of Notre Dame
- IUPUI
- Indiana University
- Indiana University Northwest
- Ball State University
- Indiana State University

- Purdue University Northwest
- Midwest Regional Climate Center
- U.S. Forest Service
- Northern Institute of Applied Climate Science
- Indiana Department of Natural Resources
- Marion County Public Health Department
- Mesh Coalition
- U.S. Geological Survey
Annual Statewide Average Temperature

Temperature Change (°F)

Observations
Modeled Historical
Higher Emissions
Lower Emissions

Year

1900 1925 1950 1975 2000 2025 2050 2075 2100

Higher Emissions
Lower Emissions

INDIANA
Seasonal Analogs
Based on seasonal average temperature and precipitation

Statewide Average
2050s represents average from 2041 to 2070
2080s represents average from 2071 to 2100

Base map shows 1981 to 2010 average seasonal temperature from PRISM archive
Seasonal Analogs
Based on seasonal average temperature and precipitation

Statewide Average
2050s represents average from 2041 to 2070
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Base map shows 1981 to 2010 average seasonal temperature from PRISM archive
Days Above 90 °F

Annual Count

PAST
1915-2013

20

FUTURE
2050s

57-70

Future data for medium and high emissions scenario
2050s represents 30-year period 2041 to 2070

Tippecanoe County, Indiana
ANNUAL RAINFALL
6 to 8%
Future data based on medium and high emissions scenario

WINTER
16 to 20%

SPRING
13 to 16%

SUMMER
-2 to -3%

FALL
-2%

Statewide Average
2050s represents average from 2041 to 2070

2050s
Relative to 1971-2000 average

Future data based on medium and high emissions scenario
Declining crop yields
Change in dryland crop yield at mid-century

<table>
<thead>
<tr>
<th>Crop</th>
<th>Yield Change (bushels per acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>-25 to -31</td>
</tr>
<tr>
<td>Soybean</td>
<td>-5 to -6</td>
</tr>
<tr>
<td>Wheat</td>
<td>-3 to -5</td>
</tr>
</tbody>
</table>

Projections based on currently available varieties with no management changes

Future data based on medium and high emissions scenario;
Mid-century represents average from 2041 to 2070;
Percent change is relative to 1984-2013 average

Central Indiana Average
Increasing Spring Drainage

Amount of water flowing from subsurface tile drains from March to May

- +40-70% by Mid-Century
- +29-47% by Mid-Century
- +26-28% by Mid-Century

Historical period is from 1981 to 2010. Mid-century represents the period from 2041 to 2070. Range of results based on medium and high emissions scenarios.
More Water Entering Our Rivers in 2050s

Change in total runoff

Annual Change

6 to 8%

Future data based on medium and high emissions scenario;
Percent change is relative to 1981 to 2010 average

PRELIMINARY DATA

West Central Indiana Average
Seasonal Patterns of Runoff

Winter Change 7 to 8%
Spring Change 21 to 27%
Summer Change -4 to -5%
Fall Change -10 to -11%

West Central Indiana Average

Future data based on medium and high emissions scenario;
Percent change is relative to 1981 to 2010 average
PRELIMINARY DATA
Peak Annual Streamflow

Observations for St. Joseph River at Niles, MI

Data courtesy of Alan Hamlet, Notre Dame
Projected Changes in the Magnitude of the 100-yr Flood

100-yr event increases 35% by the 2050s
Water resource management is critical

- Indiana is getting warmer and wetter
- Extreme heat & heavy rainfall will challenge us
- Seasonal changes are critical to managing risks

Where we end up depends on the choices we make!
Annual Statewide Average Temperature

How can we build resilience to a changing climate?

While avoiding the most severe impacts?
Stay informed, stay connected

http://IndianaClimate.org

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