## Observed/Projected Climate Changes and Associated Impacts for Kalamazoo, Michigan

<table>
<thead>
<tr>
<th>Climate Changes</th>
<th>Metric</th>
<th>Trend</th>
<th>Observed/Projected Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air temperature</strong></td>
<td>Minimum temperature AVG DAILY MIN TEMP (°F)</td>
<td>▲</td>
<td>43.9°F (+4.8°F) by 2050 and 50.2°F (+11.1°F) by 2100&lt;sup&gt;1&lt;/sup&gt; compared to historical average of 39.1°F from 1961–1990</td>
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<tr>
<td></td>
<td>Maximum temperature AVG DAILY MAX TEMP (°F)</td>
<td>▲</td>
<td>64.4°F (+5.2°F) by 2050 and 70.8°F (+11.6°F) by 2100&lt;sup&gt;1&lt;/sup&gt; compared to historical average of 59.2°F from 1961–1990</td>
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<tr>
<td><strong>Extreme heat</strong></td>
<td>Days over 90°F # OF DAYS WITH MAX TEMPS &gt;90°F</td>
<td>▲▲</td>
<td>44.9 days (+340%) by 2050 and 90.9 days (+791%) by 2100&lt;sup&gt;1&lt;/sup&gt; compared to historical average of 10.2 days per year from 1961–1990</td>
</tr>
<tr>
<td><strong>Precipitation</strong></td>
<td>Annual precipitation AVG INCHES PER YEAR</td>
<td>—</td>
<td>38.2 in (+3.5%) by 2050 and 40.8 in (+10.6%) by 2100&lt;sup&gt;1&lt;/sup&gt; compared to historical average of 36.9 inches per year from 1961–1990</td>
</tr>
<tr>
<td></td>
<td>Seasonality</td>
<td>▲▼</td>
<td>Significant increase in winter and spring precipitation (up to 20–30%); very slight increases are possible in fall and slight decreases in summer&lt;sup&gt;2&lt;/sup&gt;</td>
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<tr>
<td><strong>Snow</strong></td>
<td>Lake-effect snow</td>
<td>▲</td>
<td>Significant upward trend in lake-effect snow for the Lake Michigan snowbelt since ~1900, likely due to warmer surface waters and reduced lake ice cover&lt;sup&gt;3&lt;/sup&gt; Increases in temperature past the freezing threshold would likely result in more precipitation falling as rain or freezing rain&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Extreme precipitation</strong></td>
<td>Intensity 99th PERCENTILE DAILY PRECIP TOTAL</td>
<td>▲▲</td>
<td>+42% in extreme precipitation total from the heaviest rain events in the Midwest from 1958–2016&lt;sup&gt;2&lt;/sup&gt; +40% or more additional increase by 2100 (compared to 1986–2015)&lt;sup&gt;5&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Frequency # OF 2-DAY EVENTS THAT EXCEED THE 5-YEAR RETURN INTERVAL</td>
<td>▲▲</td>
<td>+150% or more in the number of extreme precipitation events between 2006 and 2100&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Severe storms</strong></td>
<td>Frequency</td>
<td>▲</td>
<td>Increased likelihood of severe thunderstorms, particularly in the spring (up to +2.4 days per season by 2100)&lt;sup&gt;6&lt;/sup&gt; Possible increase in days with conditions supportive of tornadic storms&lt;sup&gt;6&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Drought</strong></td>
<td>Frequency &amp; intensity</td>
<td>▲</td>
<td>Likely increase in prolonged dry periods, particularly by late century&lt;sup&gt;7&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

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<sup>1</sup> U.S. Climate Resilience Toolkit Climate Explorer [https://crt-climate-explorer.nemac.org](https://crt-climate-explorer.nemac.org), generated using the high-emissions (RCP 8.5) scenario for the average of 2041–2049 and 2091–2099 time periods compared to historical conditions (average of 1961–1990).  
<sup>7</sup> GLISA, Extreme Precipitation [https://glisa.umich.edu/resources-tools/climate-impacts/extreme-precipitation/].
### Likely Impacts Associated with Projected Climate Changes

**Connected Communities**
- Increased risk of damage to housing, roads, and other critical infrastructure (e.g., utilities) following storms, floods, and extreme heat
- Road blockages and loss of access following extreme events, impacting evacuation routes, emergency access, and other critical travel
- Increased heat stress in developed areas, exacerbated by large areas of impervious surfaces and lack of vegetation
- Slower travel or road closures due to melting asphalt, overheating engines, and other impacts associated with extreme heat
- Increased energy demand during heat waves, straining electrical grids and potentially resulting in power outages
- Extreme heat and flooding exacerbate existing patterns of inequity for low-income neighborhoods and other vulnerable communities more likely to experience heat island effect and poor drainage

**Food Security & Agriculture**
- Increased length of the growing season and potential increases in heat stress, disease, and insect pests, impacting growth and productivity of agricultural crops
- Increased presence of weeds and fungi that compete with crops for light, water, and nutrients
- Current crops may not be suited for new conditions, requiring changes in crops and equipment needed for new crop cultivation and processing
- Economic impacts of crop failures and damage to agricultural operations following extreme events (e.g., floods), which may increase the cost of food
- Increased health risks for agricultural workers exposed to extreme temperatures, vector-borne diseases, and other outdoor hazards exacerbated by climate change

**Habitat Conservation & Biodiversity**
- Reduced growth and productivity of native vegetation due to heat stress and increases in evapotranspiration
- Expansion of non-native invasive plants and insect pests as temperatures increase (particularly winter temperatures)
- Increased flooding and erosion, impacting native plant communities as well as access to greenspace
- Increased soil erosion and nutrient runoff into rivers and streams during heavy rainfall, reducing water quality
- Increased concentration of contaminants and increased risk of algal blooms in water sources during hot/dry periods, impacting aquatic organisms as well as recreational use
- Potential increase in insect pests and diseases, with associated impacts to native plants and wildlife
- Increased risk of wildfire during severe droughts, impacting native plants and animals

### Resources:
- U.S. Climate Resilience Toolkit Climate Explorer ([https://crt-climate-explorer.nemac.org](https://crt-climate-explorer.nemac.org))
- Great Lakes Integrated Sciences and Assessments ([https://glisa.umich.edu/resources-tools/](https://glisa.umich.edu/resources-tools/))

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*All icons from the Noun Project: (1) Housing icon created by Carlos Dias; (2) Road icon created by Jorge Namis; (3) Agriculture icon created by Vectors Point; (4) Biodiversity icon created by Nithinan Tatah*