

# Climate Change Adaptation in the Detroit Region's Urban Forest: Key Climate Change Trends, Projections, & Impacts

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Detroit's urban areas are strongly influenced by past and current climate, and future changes will likely have far-reaching impacts. Decision-making around which trees and other vegetation to plant in developed areas is strongly influenced by temperature and precipitation requirements for certain vegetation. Using observed climate trends and projections, we can predict physical and biological impacts on Detroit's trees and green spaces.

## Temperature

- Detroit has been warming at a rate of about **0.4°F/decade** since 1960.
- The last 2 decades have been the warmest on record for Detroit and 7 of the hottest 10 years have occurred between 2000 and 2019.
- From 1959 to 2011, average overnight temperatures increased by **4.3°F**, the number of hot, humid summer days increased by **3.5** (172%), the number of hot, dry summer days increased by **3** (338%) and the number of cool, dry days decreased by **10.5** (70%).
- Climate models agree temperatures will rise in Detroit, and could increase by **5°F** to **13°F** by the end of this century compared to the 1980-2009 average.

## Precipitation

- Precipitation in Detroit has been increasing by about **1 inch/decade** since 1960.
- June is Detroit's wettest month, while January and February are the driest months.
- Comparing the 1961-1990 average to the 1981-2010 average, the total annual precipitation in southeast Michigan increased by **11%**.
- In the SEMCOG region, precipitation has increased in each season from 1960-2019. The increasing trend is the greatest in March to May (**+0.42 inches/decade**) and September to November (**+0.43 inches/decade**), and the least in June to August (**+0.15 inches/decade**).
- Average annual precipitation is expected to increase by **16%** on average, equivalent to about **5 inches**. While the amount of increase varies by season and climate scenario, spring precipitation is projected to increase in each scenario. Higher summer temperatures may also reduce late season moisture availability.

## Extreme Events

- Extreme heat and heavy precipitation events causing inland flooding are expected to increase in intensity and become more frequent. Increased flooding may stress trees, causing defoliation, leaf yellowing, crown dieback, and potential mortality.
- By the end of the century, Detroit could no longer have any days below zero in an average year, compared to the current average of **4.3 days**.
- By the end of the century, Detroit could experience up to **3 months** of days above **90 degrees**, compared to a current average of just over **one week**.
- Heavy rain events (**≥1 inch per day**) are projected to become more frequent on average.

## Soils & Hydrology

- Detroit will experience more soil erosion and nutrient runoff due to heavy rain events.
- A combination of increased precipitation and soil moisture can lead to loss of soil carbon and surface water quality and waterlogged soils will lead to a reduction in planting season work days.
- Soils typically insulated by snowpack may freeze due to the lack of cover, which has the ability to kill thin roots, decrease in plant productivity, and alter nutrient and water cycling.

## Shifts in Heat & Hardiness Zones

- Heat and hardiness zones are geographic areas that define the range of zones in which a species is considered suitable for planting and survival.
- Assuming a drastic reduction in global GHG emissions, the hardiness zone is projected to shift from **zone 6** (-23.3°F to -17.8°F) to **zone 7** (-17.7°F to -12.2°F) by mid-century and the heat zone is projected to shift from **zones 4 and 5** (>14-30 and >30-45 days exceeding 86°F) to **zone 7** (>61-90 days exceeding 86°F) by mid-century.
- Under a business-as-usual scenario, the hardiness zone is projected to shift to **zone 8** (-12.1°F to -6.7°F) by the end of the century and the heat zone is projected to shift to **zone 9** (>21-150 days exceeding 86°F) by the end of the century.

## Human Health

A changing climate has the potential to worsen existing health issues and create new issues, such as:

- The presence and intensity of allergens, biogenic volatile organic compounds, and pests and pathogens
- Heat-related illnesses and mortality
- Flooding and extreme weather events
- Increases in food prices
- Social, mental, and physical human impacts

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