

LOUISVILLE METRO REGION

CLIMATE CHANGE TRENDS & PROJECTIONS

Louisville, Kentucky has already warmed significantly. The region is expected to experience substantial impacts brought on by climate change. These impacts affect all sectors of our communities, including human health, natural resources, infrastructure, emergency response, economics, and others. Those who are already vulnerable in our communities will be impacted the most.

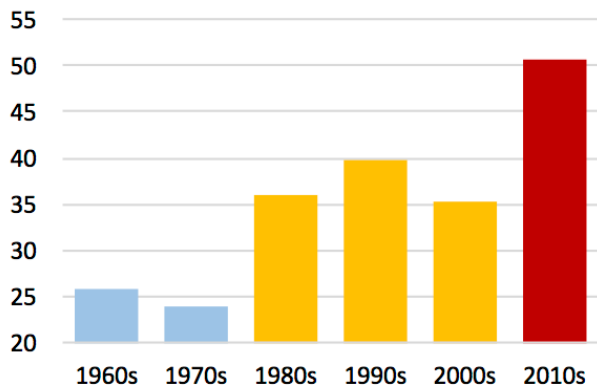


Figure 1. The average number of days per year above 90° F has increased in Louisville (data from the Louisville Airport weather station).

Historical Trends

- Temp. ↑ 2.2° F since 1961-90
- Precip. ↑ 9% since 1961-90
- Amount of rain during a heavy storm ↑ 27% since 1958
- Frost free season ↑ 2 weeks
- Change in plant hardiness zone from 6 to 7

Likely Future Trends

- Temp. ↑ 5-8° F by 2050s
 - Temp. ↑ 7-12° F by 2080s**
 - Summer temp. ↑ 4-11° F by 2050s and ↑ 7-17° F by 2080s
 - Extreme max. temp. ↑ 3-14° F by 2050s and ↑ 5-20° F by 2080s
 - Precipitation ↓ 6% to ↑ 16% by 2050s (uncertain)
 - Precipitation ↓ 2% to ↑ 21% by 2080s (uncertain)
 - Drought stress ↑ 6%-88% by 2050s and ↑ 3%-124% by 2080s
 - ↑ Larger extreme storms and more drought
 - Frost free days ↑ 53-75 days by 2080s
- ** Warming limited to 5-8° F if emissions are sufficiently reduced

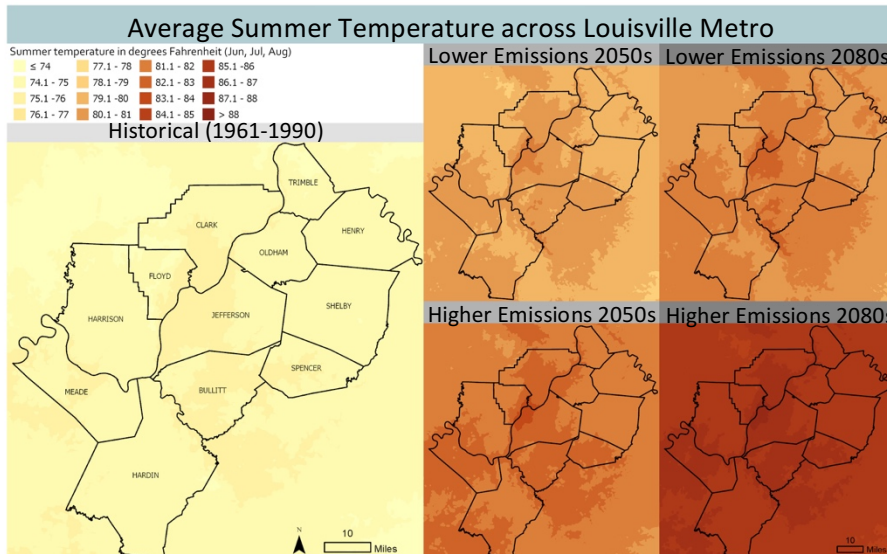


Figure 2. Historical and future projected summer temperature across Jefferson County and the surrounding region, based on a lower emissions scenario (RCP 4.5) and continued higher emissions (RCP 8.5). Data from 15 model ensemble available through ClimateNA version 5.21.²

WHAT DOES CLIMATE CHANGE MEAN FOR LOUISVILLE?

The climate is what defines any given locality and, for many of us, makes it home. There are many vulnerabilities associated with climate change, some more predictable than others. Some predicted impacts of continued climate change in Louisville include:

- ✓ In 60 years, Louisville to experience a climate similar to today's Bastrop, LA, Jackson, MS, or Montgomery, AL³
- ✓ Continued increase in severity and frequency of severe storms and flooding causing impacts to property, health, and safety⁴
- ✓ Risks to streamflow, aquatic habitat, and water quality⁴
- ✓ Warmer waters increasing the incidence of vector- and water-borne disease, including Zika, West Nile virus, Dengue, and chikungunya⁴
- ✓ Disruption and damage to transportation infrastructure, energy infrastructure, and real estate from heat and flooding⁴
- ✓ Increased disruptions in electric supply with heat waves and drought⁵
- ✓ Greater incidence of drought, leading to loss of commercial river transportation and revenue⁵
- ✓ Reduced air quality as heat increases ground level ozone, which is associated with heart and respiratory disease⁴
- ✓ Longer and more severe heat waves affecting the elderly, outdoor workers, infants, and others
- ✓ Exacerbated stress and increased incidence of mental illness, especially associated with prolonged periods of heat, flooding, and other extreme events⁴
- ✓ Loss of fish and wildlife habitat and forest diversity⁴
- ✓ Loss of important benefits from natural systems, including water filtration, flood abatement, timber, and recreational opportunities⁴

REFERENCES

¹ USGCRP, 2017: *Climate Science Special Report: Fourth National Climate Assessment, Volume I* [Wuebbles, D.J., et al. (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 470 pp.

² Wang, T., A. Hamann, D. L. Spittlehouse, and C. Carroll. 2016. Locally downscaled and spatially customizable climate data for historical and future periods for North America. *PLoS One* 11:e0156720.

³ Fitzpatrick, M. C. and R. R. Dunn. 2019. Contemporary climate analogs for 540 North American urban areas in the late 21st century. *Nature Communications* 10:614.

⁴ Carter, L., A. Terando, K. Dow, K. Hiers, K. E. Kunkel, A. Lascrain, D. Marcy, M. Osland, and P. Schramm. 2018: Southeast. In *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., et al. (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 743–808.

⁵ EPA. 2016. What Climate Change Means for Kentucky. EPA 430-F-16-019.

