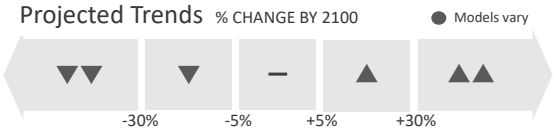
OBSERVED/PROJECTED CLIMATE CHANGES AND ASSOCIATED IMPACTS FOR CHATTANOOGA, TENNESSEE



CLIMATE CHANGES	METRIC	TREND	OBSERVED/PROJECTED CHANGES
Air temperature	Minimum temperature AVG DAILY MIN TEMP (°F)	▲	51.4°F (+3.9°F) by 2050 and 56.4°F (+8.9°F) by 2100[1] COMPARED TO HISTORICAL AVERAGE OF 47.5°F FROM 1961–1990
	Maximum temperature AVG DAILY MAX TEMP (°F)	▲	74.3°F (+4.3°F) by 2050 and 79.5°F (+9.5°F) by 2100[1] COMPARED TO HISTORICAL AVERAGE OF 70.0°F FROM 1961–1990
	Frost days DAYS WITH MIN TEMP < 32°F	▼▼	59.1 days (–21%) by 2050 and 39.2 days (–48%) by 2100[1] COMPARED TO HISTORICAL AVERAGE OF 75.1 DAYS FROM 1961–1990
Extreme heat	Days over 95°F # OF DAYS WITH MAX TEMPS >95°F	▲▲	34.8 days (+470%) by 2050 and 84.3 days (+1,281%) by 2100[1] COMPARED TO HISTORICAL AVERAGE OF 6.1 DAYS PER YEAR FROM 1961–1990
Precipitation	Annual precipitation AVG INCHES PER YEAR	▲	60.0 in (+5.4%) by 2050 and 61.9 in (+8.8%) by 2100[1] COMPARED TO HISTORICAL AVERAGE OF 56.9 INCHES PER YEAR FROM 1961–1990
	Seasonality	▲▼	Slight increase in spring (+7%) and fall (+6%) precipitation, with little to no change in winter or summer rainfall[2]
Extreme precipitation	Frequency # OF DAYS WITH 2" RAIN IN 24 HOURS	▲	2.3 days (+9.5%) by 2050 and 2.8 days (+33.3%) by 2100[1] COMPARED TO HISTORICAL AVERAGE OF 2.1 DAYS PER YEAR FROM 1961–1990
	Amount 20-YEAR RETURN PERIOD TOTAL	▲	+12% increase in precipitation amount during 20-year events projected by 2050 and 21% by 2100[3]
Storms & flooding	Frequency & severity	▲▲	Likely increase in occurrence of severe thunderstorms, including tornadoes[4] Increases in flood frequency, severity, and area vulnerable to flooding[5,6]
Drought	Frequency & severity	▲	Likely increases in drought frequency and severity due to longer periods without rain and increased temperatures that enhance evapotranspiration[7,8]
Wildfire	Fire potential	▲	Increased fire potential in the summer and fall due to drier conditions[7,8]
	Season length TIME W/ HIGH OR EXTREME FIRE POTENTIAL	▲	Increased length of the fire season from 1 month to 2 months by 2070[7]

[1] U.S. Climate Resilience Toolkit Climate Explorer (https://crt-climate-explorer.nemac.org), county-scale projections generated using the high-emissions (RCP 8.5) scenario for the average of 2040–2049 and 2090–2099 time periods compared to historical conditions (average of 1961–1990).
[2] J.R. Alder, J. R. and S. W. Hostetler, 2013. USGS National Climate Change Viewer. US Geological Survey (https://doi.org/10.5066/F7W9575T), county-scale projections generated using the high-emissions (RCP 8.5) scenario for late-century (average of 2075–2099) time periods compared to recent conditions (average of 1981–2010).
[3] D. R. Easterling et al., in Climate Science Special Report: Fourth National Climate Assessment, Volume I, D. J. Wuebbles et al., Eds. (U.S. Global Change Research Program, Washington, DC, 2017; https://science2017.globalchange.gov/chapter/7/), pp. 207–230.
[4] N. S. Diffenbaugh, M. Scherer, R. J. Trapp, PNAS. 110, 16361–16366 (2013).
[5] P. D. Bates et al., Water Resources Research, 57, e2020WR028673 (2021).
[6] O. E. J. Wing et al., Nat. Clim. Chang. 12, 156–162 (2022).
[7] Y. Liu, S. L. Goodrick, J. A. Stanturf, *Forest Ecology and Management*. **294**, 120–135 (2013).
[8] R. J. Mitchell *et al.*, *Forest Ecology and Management*. **327**, 316–326 (2014).

LIKELY IMPACTS ASSOCIATED WITH PROJECTED CLIMATE CHANGES*

 **Public Health**	• Increased occurrence of respiratory illnesses and other health concerns due to heat stress, reduced air quality, and increased allergens • Likely increase in the incidence of Zika and other vector-borne diseases due to increasingly suitable conditions for mosquitoes • Increased risk of water-borne or mold-related problems due to flooding • Increases in the intensity/frequency of extreme events (e.g., flooding) may overwhelm emergency systems, block emergency access or evacuation routes, or damage/disrupt emergency shelters • Increased vulnerability among those with existing chronic health conditions as well as children, the elderly, pregnant individuals, low-income residents, and anyone lacking access to health services and/or adequate health insurance
 **Transportation**	• Damage to transportation infrastructure (e.g., roads, bridges, culverts) following storms, floods, and extreme heat events • Road blockages and loss of access following extreme events, impacting evacuation routes, emergency access, and other critical travel • Loss of electricity due to flooding or heat waves, limiting use of electric vehicles and impacting public transit • Slower travel or road closures due to melting asphalt, overheating engines, and other impacts associated with extreme heat
 **Housing**	• Increased risk of damage to housing and critical infrastructure (e.g., utilities) following storms, floods, and extreme heat • Increased heat stress in developed areas, exacerbated by large areas of impervious surfaces and lack of vegetation • Increased energy demand during heat waves, straining electrical grids and potentially resulting in power outages and increased costs • 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 and unable to afford increasing energy bills
 **Natural Resources**	• 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 public and management access to greenspace • Likely increases in the demand for groundwater (i.e., for municipal or agricultural use) as traditional surface water sources dry up earlier in the season and during longer periods of drought • Increased concentrations of contaminants, increased risk of algal blooms, and decreased dissolved oxygen concentrations in water sources during hot/dry periods, impacting aquatic organisms as well as recreational use • Increased risk of wildfire during severe droughts, impacting native plants and animals • Altered or decreased ecosystem functioning on conservation lands due to changes in hydrology, thermal regime, and plant species composition and distribution

* All icons from the Noun Project: (1) Public health icon created by Pete Fecteau; (2) Road icon created by Jorge Namos; (3) Housing icon created by Carlos Dias; (4) Trees icon created by David Khai

Resources:

- U.S. Climate Resilience Toolkit Climate Explorer (https://crt-climate-explorer.nemac.org)
- Southeast Chapter of the Fourth National Climate Change Assessment (https://nca2018.globalchange.gov/chapter/19/)
- FEMA's National Flood Map Hazard Viewer (https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd)
- SGSF Wildfire Risk Assessment Portal (https://www.southernwildfirerisk.com/Map/Public/#whats-your-risk)
- EPA's Environmental Justice Screening and Mapping Tool (https://ejscreen.epa.gov/mapper/)
- Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts (https://www.epa.gov/cira/social-vulnerability-report)
- Cleveland Racial Equity Tool (helps assess whether adaptation strategies will be equitable; https://www.sustainablecleveland.org/racial-equity)

This material is based upon work supported by the National Science Foundation under Grant No. 1811534. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.