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

Projected Trends % CHANGE BY 2100 ● Models vary

▼▼	▼	–	▲	▲▲
< -30%	-30% to -5%	-5% to +5%	+5% to +30%	> +30%

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)

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