

## Section 11.02 *Extreme Heat*

### Overview

Excessive heat kills more people in the U.S every year than all other types of severe weather.<sup>1</sup> The term “excessive heat”, also called “extreme heat”, is defined as two or more days of temperatures above 90°F.<sup>2</sup> The impacts of excessive heat is amplified by high humidity and full sun exposure. Under these conditions, the human body needs to work harder to maintain a normal body temperature because the evaporation of sweat is slowed. This leads to heat exhaustion, heatstroke, and possibly death.<sup>3</sup> Anyone can be affected by extreme heat, but the hazard often disproportionately impacts certain populations based on their physical characteristics or inability to escape the heat. Climate change is projected to increase the number, severity, and duration of extreme heat events.<sup>4</sup> New research shows that high overnight temperatures can have a higher negative health impact than daytime temperatures. There has been more research recently on the impact of heat on both pregnancy and mental illness. More people are expected to be affected by extreme heat due to climate change, but individuals, organizations, and agencies can help people adapt.

### Secondary Data

The health impacts of extreme heat are already significant and are expected to become worse as climate change drives temperatures higher. Between 2010 and 2020, there were an estimated 12,000 premature deaths in the United States due to extreme heat, more than all other extreme weather hazards combined including tornadoes, flooding, hurricanes, wind, cold, lightning, and winter storms.<sup>5</sup> There are an estimated 3,000 heat-related illness emergency department visits every summer in North Carolina.<sup>6</sup> Currently, approximately 250 heat-related deaths occur annually in North Carolina.<sup>7</sup> There were 74 heat related Emergency Room visits in Durham County in 2022 and 50 such visits in 2023. This represents a little more than 0.11% of all Emergency Room visits.<sup>8</sup>

Often called a silent killer, extreme heat approaches without the dramatic warning signs of other storms such as whipping winds, heavy rains, or rushing rivers. Instead, periods of extreme heat feel like ordinary hot days until the unusually hot temperatures begin to affect the body. In mild cases, extreme heat causes dehydration and lack of energy. In more severe cases it causes heat exhaustion, heatstroke, hyperthermia, and in the worst cases, death. Extreme heat deaths occur not just on the hottest days, but at warm temperatures as well.<sup>9</sup> When night temperatures stay above 75°F, it is harder for the human body to cool down, increasing the chances of adverse heat effects.<sup>10</sup> This is particularly concerning in areas of energy poverty where individuals may lack efficient air conditioning or housing insulation. Extreme heat also makes pre-existing conditions such as mental illness, asthma, diabetes, and cardiovascular disease worse.<sup>9</sup>

Heat exposure has different impacts across Durham County. In urban areas, temperatures stay warmer overnight due to the “urban heat island” effect.<sup>11</sup> A heat-mapping campaign in July 2021, measured a 10.4°F maximum intensity difference between the hottest and coolest areas of Durham.<sup>12</sup> This is caused by certain areas having more heat-trapping buildings and paved surfaces as well as the lack of vegetation. Building materials like brick, concrete, and asphalt absorb heat during the day and release it slowly overnight to the surrounding air. This means that these areas do not have a chance to cool off before the sun comes up again. Fewer trees, meadows, and vegetative ground cover in urban areas mean less natural cooling. Plants create natural cooling systems. Water that evaporates from plant leaves during photosynthesis harnesses heat energy that transforms liquid water into vapor, cooling the plant’s surroundings.<sup>13</sup> Additionally, plants create pockets of shade and microclimates

that circulate cooled air as a result of the evaporation process.<sup>14</sup>

Periods of extreme heat are sometimes accompanied by power blackouts due to high demand for energy or other weather-related hazards such as hurricanes and thunderstorms.<sup>15</sup> In these situations, all residents of Durham would be at high risk for heat health problems. During COVID-19 or possible future pandemics, the use of air conditioning in shared indoor rooms or cooling stations may present a secondary health risk of contracting a serious virus or disease.<sup>16</sup>

Under different greenhouse gas emissions scenarios, Durham County is projected to experience 60 to 70 extreme heat days over 90°F a year by 2030, increasing to 95 to 120 days by 2080 (Figure 11.01(b)). Durham County is also projected to experience approximately 10 nights over 75°F a year by 2030, increasing by 20 to 60 nights by 2080 (Figure 11.01(c)).

**Projected Days Per Year Above 95°F, Durham County, 1950-2100**

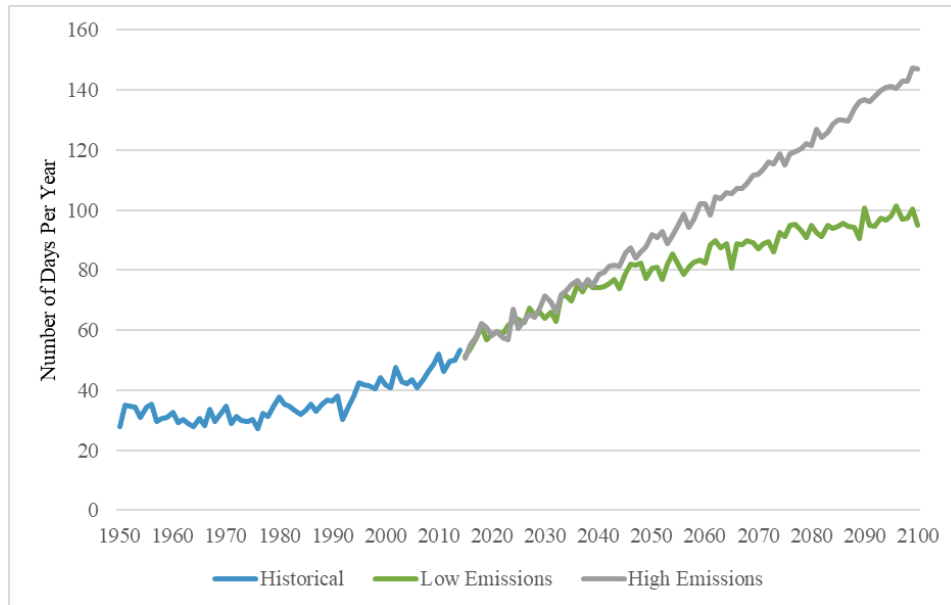


Figure 11.01(b): Projected Days in Durham County over 95 Degrees Fahrenheit

### Projected Nights Per Year Above 75°F, Durham County, 1950-2100

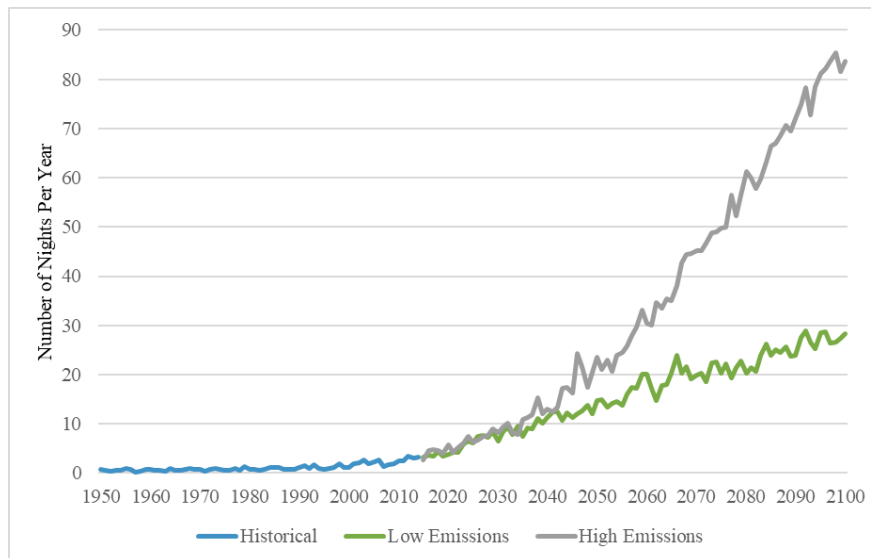


Figure 11.01(c): Projected Nights in Durham County over 75 Degrees Fahrenheit<sup>17, 18</sup>

Figure 11.1(b) shows the projected number of days per year that Durham County is expected to reach 95°F or more. Figure 11.1(c) shows the projected number of nights per year that Durham County is expected to remain over 75°F. The blue line represents simulated historical values. The green line and gray line represent average maximum daily temperatures if humans reduce greenhouse gas emissions to meet reduction targets or continue to emit high levels of greenhouse gases, respectively.

The increasing number of days with persistently high overnight temperatures are particularly concerning for health outcomes as well as increasing rates of preterm birth.<sup>10</sup> When overnight temperatures remain over 75°, the human body lacks the ability to recover from daytime exposures, especially for those who cannot afford to adequately cool their homes or lack access to air conditioning. This exposure further exacerbates health inequities.

### Interpretations: Disparities, Gaps, and Emerging Issues

Extreme heat can affect anyone. However, certain demographics are more susceptible to its adverse effects.<sup>19</sup> The vulnerable categories encompass:

- **Occupational Exposure:** Those subjected to prolonged high temperatures in their workplaces, such as outdoor workers, are at a heightened risk.
- **Pre-existing Health Conditions:** Individuals with conditions like heart disease, diabetes, mental illness, or asthma face exacerbated threats as these conditions can deteriorate under heat stress. This also includes those who take certain prescription medications intended to manage a variety of chronic conditions.
- **Mobility and Social Challenges:** Certain groups, including those with physical disabilities or those experiencing social or language isolation, might face obstacles in relocating to cooler environments.
- **Physiological Vulnerabilities:** Specific demographics, such as individuals with severe obesity, pregnant persons, those under the age of four, or those above 65 years old, have bodies that may struggle to regulate temperature effectively.

Importantly, rural areas of Durham County are not exempt from the risks associated with extreme heat. In rural settings, the lack of immediate access to medical care, longer distances to cooling centers, and occupations that require prolonged outdoor exposure, such as farming, can exacerbate the effects of extreme heat. While urban areas have infrastructure challenges, rural communities grapple with accessibility challenges that require unique mitigation strategies.

When possible, people in the above categories should mitigate health impacts by avoiding exposure to extreme heat and finding a cooler environment. However, this is not possible for some residents, either because they cannot afford air conditioning and/or landlords do not provide it, their physical condition makes it difficult to move to a cooler environment, or because their transportation options or work conditions expose them to heat. During extreme heat events, Durham County Libraries typically serve as cooling centers, operating during daytime hours. Increasing temperatures, particularly overnight, may necessitate extending cooling center availability. The unhoused or those who have unstable housing may need increased access to shelter during periods of extreme heat. In the next decade, the ability to find a cooler environment will increasingly emerge as a determinant of health. Residents who do not have access to cooling resources such as air-conditioning, a cool car, or the ability to take a day off work on an extremely hot day are more likely to experience heat sickness or heat-related death.<sup>20</sup>

Historical practices such as redlining have left legacies of structural racism, rendering certain communities more susceptible to extreme heat owing to infrastructural inadequacies. These former redlined neighborhoods have fewer street trees and more paved surfaces, resulting in localized temperatures on average 7°F hotter than non-redlined districts.<sup>21</sup> Additionally, as a result of policies deliberately restricting access to financing to people of color, these neighborhoods have a higher number of non-white residents who live below the federal poverty line, cannot afford reliable air conditioning and rely on the bus or walking for transportation, even on extremely hot days.<sup>22</sup>

The Justice 40 Initiative (J40) is a federal government initiative to identify Disadvantaged Communities (DACs) and ensure at least 40% of federal funding for climate change, clean energy and energy efficiency, and other environmental projects is directed toward these DACs. In Durham County there are 20 census tracts out of 60 designated J40 DACs. These tracts include formerly redlined neighborhoods and non-urban tracts. More than 86% of the DACs and formerly redlined tracts have at least six out of twelve characteristics that lead to higher vulnerability to excessive heat. These characteristics include tree canopy coverage, housing units that are rentals, people of color, people without health insurance, households with no car, and families in poverty.<sup>23</sup> Place-based interventions to mitigate the effects of extreme heat such as planting trees and adding cooling stations should consider the diversity of DACs to ensure that the people most at risk receive appropriate support.

## Recommended Strategies

### Mitigate Exposure to Extreme Heat

- Develop and adopt a heat action plan outlining protocols and strategies for a timely and appropriate response when dangerous heat is forecasted.
- Adopt a county-wide standard for indoor temperatures, specifying a maximum permissible temperature for residences when the outdoor thermometer exceeds 90°F. This proposal mirrors existing regulations that set minimum indoor temperatures for colder temperatures.<sup>24</sup>
- Increase green infrastructure such as trees, meadows, vegetated areas, and green roofs,

prioritizing the historically redlined census tracts if this is also wanted by the communities in each census tract.<sup>24</sup>

- Create design standards, incentives, and education to increase light-colored cooling surfaces such as roofs, parking lots, plazas, etc.<sup>25</sup>
- Advocate for state and national requirements to protect outdoor workers' health and safety related to extreme heat.

#### Mitigate Health Impacts

- Implement a heatwave alert, education, and response system through the Durham County Emergency Management Division based on EPA guidance.<sup>26</sup> This includes partnering with formal and informal social service systems to educate the public about extreme heat dangers and mitigation techniques.<sup>27</sup>
- Establish Resilience Hubs in areas with high percentages of vulnerable populations to build physical and social resilience to extreme heat.
- Collaborate with the Durham healthcare community to connect residents to mitigation measures for extreme heat.
- Plan for long-term heat events with established cooling stations, shelters with overnight options, and enhanced social infrastructure.<sup>28</sup>
- Plan for additional funding for electricity assistance during heat waves and expansion of fan programs to include all vulnerable populations regardless of age.<sup>29</sup>

### Current Initiatives & Activities

#### ***Operation Fan Heat Relief Program***

The North Carolina Department of Health and Human Services provides free fans to senior citizens and eligible adults with serious health conditions. The Center for Senior Life administers this program in Durham County (919)-688-8247. <https://www.ncdhhs.gov/divisions/aging-and-adult-services/operation-fan-and-heat-relief>

#### ***Increasing Urban Forest Cover Through Tree Planting***

The City of Durham, Keep Durham Beautiful, and Trees Durham collectively plant about 1,500 trees per year. The city's Urban Forestry Management Plan aims to increase the tree canopy from 42% to 45% and plant 85% of new street trees in areas that have been underserved. [https://durhamnc.gov/DocumentCenter/View/32533/UFMP\\_GSD\\_9-18](https://durhamnc.gov/DocumentCenter/View/32533/UFMP_GSD_9-18)

#### ***CDC Communication toolkit on Climate Change, Extreme Heat***

The Center for Disease Control provides information on heat stress illnesses and links to federal government resources on extreme heat. <https://ephtracking.cdc.gov/showHeatStressIllnessResources>

#### ***NC Department of Health and Human Services***

The North Carolina Department of Health and Human Services offers climate and health information on extreme heat. <https://publichealth.nc.gov/chronicdiseaseandinjury/heat.htm>

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