

EXTREME HEAT

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The [Climate Change in Columbus Ohio](#) report identified increasing temperatures as one of the two conditions that have and will likely continue to affect our city.¹ From 1951 to 2012, the average annual temperature for Columbus warmed by 2.3°F, which was faster than both the national and global rates. This trend is expected to continue, with average annual temperatures projected to rise by an additional 3-5°F by mid-century. Increasing temperatures result in several impacts – deteriorated air quality, stress on vegetation, increased demand for water and energy – that can negatively affect our community. One of the most concerning effects is the projected increase in extreme heat events.

Extreme heat refers to air temperatures that are much hotter than average over a period of time. Extreme heat events are generally characterized by consecutive days of excessively hot weather, often including elevated moisture and warm nighttime temperatures. The lack of cooling at night leads to higher heat indices, which represents the greatest concern to health. These events are already occurring throughout the country and are expected to increase in severity and frequency as the climate continues to change. The projected increase in extreme heat events may lead to more heat-related illnesses and deaths in Columbus.

To combat the risks associated with extreme heat, two necessary actions and two aspirational actions are proposed. These actions provide ways for the public to avoid the negative effects of extreme heat, and they ensure that best practices will be utilized for anyone that has to spend time outdoors on dangerously hot days. Additionally, these actions focus on providing resources for vulnerable populations who are disproportionately affected by heat-related illnesses, often due to limited mobility, lack of access to residential air conditioning, and/or failure to be a part of a community that can provide support during an emergency (e.g., faith community, neighborhood group, senior citizen center). Many groups of people are especially vulnerable to heat-related illness, including infants and young children, the elderly, people with chronic medical conditions, low-income households, and outdoor workers. If the proposed actions are taken, Columbus can minimize the serious risks posed by continuously rising temperatures.

¹ Great Lakes Integrated Sciences and Assessment (GLISA) and the University of Michigan Climate Center. “*Climate Change in Columbus Ohio: An assessment of Columbus’ Key Climate Changes, Impacts, and Vulnerabilities of Concern.*” March 2016.

http://research.bpcrc.osu.edu/education/greenteam/FINAL_ColumbusFinalReport_3.0.pdf. Accessed Dec. 2017.

N1. ESTABLISH A LARGER, BETTER COORDINATED AND MORE RESPONSIVE NETWORK OF COOLING CENTERS AND DRAFT CLEAR GUIDELINES FOR NETWORK MEMBERS

Cooling centers provide air-conditioned facilities that are open to the public during extreme heat events. By simply providing an air-conditioned environment, these facilities can significantly reduce the risk of heat-related illness, especially for the members of the community that do not have access to household cooling.² Additionally, many of these facilities provide water to protect against dehydration. This action proposes to establish additional cooling centers throughout the city of Columbus, in order to account for the projected increase in the frequency and severity of extreme heat events. Plans should include methods of effectively communicating information about forecasted heat waves and the locations of cooling centers to those vulnerable populations most at risk.

Of the 34 cooling centers in Franklin County, 32 of them are located in the city of Columbus.³ The majority of these facilities are community centers run by the CRPD, and they only operate as cooling centers from 8 a.m.–5 p.m. when the NWS issues a heat advisory.⁴ The other facilities operate during limited hours and under varying heat conditions. Only 3 of the 34 centers are open every day of the week, and only 5 operate on the weekends. While these buildings are geographically distributed and often in close proximity to transit routes, there are no options open 24-hours a day. This action would not only establish sufficient cooling centers, it would ensure that all of the facilities operate as part of a coordinated network under guidelines that are responsive to the needs of the community. These guidelines should establish the requirements necessary for each of the facilities to operate as a cooling center, the hours of operation, and the additional services offered (e.g., water, shelter for pets). Likewise, facilities with backup power generation, in the event of a power failure, should be provided in the network.

Another reason to establish a network of cooling centers is that while a list of “formal” cooling centers can be provided to citizens, many residents might also seek cooling in other “informal” locations such as retail centers, churches, libraries, and public transportation. There are ample opportunities for local businesses, faith communities, and community assets to participate in the cooling network. Residents will turn to trusted locations, regardless of their identified status as “formal” cooling centers. Therefore, it is logical to involve these facilities in the planning and communication to efficiently extend the coverage of this important resource throughout Franklin County. Under the Extreme Heat Plan, FCEM&HS will coordinate information flow between various agencies, community partners, and the general public during an extreme heat emergency, but the responsibility of opening and managing cooling centers will fall to local governments and non-profit organizations.⁵ Updated plans for a network

² “Natural Disasters and Severe Weather: Frequently Asked Questions About Extreme Heat.” CDC. <https://www.cdc.gov/disasters/extremeheat/faq.html>. Last updated Sep. 30, 2015. Accessed Oct. 13, 2017.

³ “Online Directory of Human Services.” *Hands On Central Ohio*. <https://www.211centralohio.org>. Accessed Jan. 2018.

⁴ “Heat Safety Resources.” *National Oceanic and Atmospheric Administration: National Weather Service*. <http://www.nws.noaa.gov/om/heat/www.shtml>. Accessed Jan. 2018.

⁵ Franklin County Emergency Management and Homeland Security. “*Franklin County Emergency Operations Plan*.” Document not available to the general public.

of cooling centers during extreme heat events will also draw from and inform plans for heating centers during extreme cold events.

N2. IMPLEMENT EDUCATIONAL CAMPAIGN, HEALTH ADVISORIES, AND BEST PRACTICES FOR TIME SPENT OUTDOORS IN EXTREME HEAT

According to the NWS, heat remains the number one single weather-related cause of death in the United States.⁶ In 2016, 94 people died as a result of extreme heat. Though the most vulnerable are those living in permanent homes with little to no air conditioning, loss of life can include others as well. Individuals engaging in strenuous outdoor work during acute periods of high temperatures are at increased risk as well as those that are socially isolated and unable to cool themselves during widespread heat waves. Of particular note is the loss of life that occurred during the summer of 1995 in Chicago, where more than 700 individuals were estimated to have died in an extended heat wave.⁷ Similar events have been documented within the United States and around the globe.⁸

Already noted is the need for a network of cooling centers to provide emergency cooling for vulnerable populations. A proactive educational campaign should be offered to the population as a whole, but especially target those individuals working outdoors (e.g., construction workers, yard/tree care professionals, and roofers), those supervising children (e.g., summer camp supervisors and coaches), and those caring for senior citizens (e.g., social workers, nursing homes, and faith communities). This campaign should clearly articulate ways to reduce risk by stressing sufficient hydration, reducing strenuous activities outdoors during the hottest hours of the day, and encouraging frequent cooling breaks (defined by target audiences) when working outdoors.

Likewise, a reactive educational campaign should be prepared and ready for distribution when a heat wave is imminent. Such a campaign should include information on the predicted duration and intensity of the heat wave and the recommended actions for the general population to take to mitigate the impacts (largely the same as those of the proactive campaign). Specific reminders should be included for individuals to look after high-risk populations (those working outdoors, those supervising children, and those caring for/looking after senior citizens). These reminders empower individuals to take action, thus reducing the likelihood of someone with high risk being overlooked and making it less likely that emergency services will be overtaxed. Educational campaigns need to take into account the methods of reaching particular audiences (e.g., television, radio, and print media), languages spoken within all communities (e.g., English, Spanish, and others), literacy status, and trusted information sources within neighborhoods/populations (e.g., faith communities and neighborhood centers).

To have maximum impact and avoid duplication of services, efforts of the City of Columbus should be coordinated through FCEM&HS and the Extreme Heat Plan updated in 2017. For instance, FCEM&HS has already identified conditions that would activate their plan, developed a list of community partners that would be engaged, and specified communication methods that would be employed.

⁶ National Weather Service Office of Climate, Water, and Weather Services. "Summary of Natural Hazard Statistics for 2016 in the United States." <http://www.nws.noaa.gov/om/hazstats.shtml>. Accessed Jan. 2018.

⁷ Eric Klinenberg. Heat wave: a social autopsy of disaster in Chicago. (Chicago: University of Chicago Press, 2002).

⁸ J.-M. Robine, S. L. K. Cheung, S. L. Roy, H. V. Oyen, C. Griffiths, J.-P. Michel, and F. R. Herrmann. "Death toll exceeded 70,000 in Europe during the summer of 2003." *Comptes Rendus Biologies* 331, no. 2 (2008): 171-178. <https://doi.org/10.1016/j.crv.2007.12.001>

A1. INTERNALIZE CLIMATE RESILIENCE PRACTICES IN CITY PLANNING TO REDUCE THE URBAN HEAT ISLAND

The urban heat island (UHI) is defined as a city/metropolitan area that is warmer than its surrounding rural region as a result of human activities and has long been established as an accepted phenomenon.⁹ Reduced vegetation and pervasive use of asphalt and concrete lead to heat absorption and reduced evapotranspiration, while tall buildings and narrow streets restrict air flow. Together, these effects often cause a significant increase in air temperature within the city. The difference between urban and rural areas is generally greatest after sunset, and in a study of 60 major US cities including Columbus, the difference was as much as 27°F.¹⁰ Columbus had the 8th most intense UHI, with summers averaging 4.4°F higher in the city compared to rural areas, and the fastest-growing UHI (0.84°F per decade increase since 1970). This phenomenon has many negative impacts, including increased energy consumption and reduced air and water quality, and it exacerbates the risks associated with extreme heat for those who live in, or spend most of their time in the city.¹¹ Especially at risk are the vulnerable populations discussed above, and those who do not have or cannot afford to run air conditioning.

Establishing a more robust cooling center network and greater awareness of the health impacts of extreme heat will help to combat the negative impacts of this phenomenon. Additionally, actions can be taken to reduce the intensity of the UHI in Columbus. One of the most important strategies is to increase the amount of vegetation and tree coverage throughout the city.¹² This also includes “green roofs,” a strategy that lowers temperatures by providing shade and cooling through evapotranspiration. In 2015, Branch Out Columbus began an initiative to grow the urban tree canopy by planting 300,000 trees by 2020.¹³ Increased efforts should be taken to achieve this goal, as fewer than 30,000 new trees (10% of the 2020 goal) have been planted to date.

Another strategy to reduce the UHI involves utilizing reflective and permeable materials on new or rehabilitated roofs and paved surfaces.¹⁴ These materials lead to cooling by reflecting heat and sunlight away from buildings and pavement, and permeable materials have the added benefit of reducing stormwater runoff. Some roofing materials are even independently certified through the

⁹ T. R. Oke. “City size and the urban heat island.” *Atmospheric Environment* (1967) 7, no. 8 (1973): 769-779. [https://doi.org/10.1016/0004-6981\(73\)90140-6](https://doi.org/10.1016/0004-6981(73)90140-6).

¹⁰ A. Kenward, D. Yawitz, T. Sanford, and R. Wang. “Summer in the city: Hot and getting hotter.” *Climate Central*. Aug. 2014. <http://assets.climatecentral.org/pdfs/UrbanHeatIsland.pdf>. Accessed Jan. 2018.

¹¹ “Heat Island Impacts.” *U.S. Environmental Protection Agency*. <https://www.epa.gov/heat-islands/heat-island-impacts>. Accessed Jan. 2018.

¹² J. Rogan, M. Ziemer, D. Martin, S. Ratick, N. Cuba, and V. DeLauer. “The impact of tree cover loss on land surface temperature: A case study of central Massachusetts using Landsat Thematic Mapper thermal data.” *Applied Geography* 45, (2013): 49-57. <https://doi.org/10.1016/j.apgeog.2013.07.004>.

¹³ “Branch Out Columbus.” *City of Columbus, Office of Sustainability*. <https://www.columbus.gov/branch-out/>. Accessed Jan. 2018.

¹⁴ S. A. Epstein, L. Sang-Mi, A. S. Katzenstein, M. Carreras-Sospedra, X. Zhang, S. C. Farina, P. Vahmani, P. M. Fine, and G. Ban-Weiss. “Air-quality implications of widespread adoption of cool roofs on ozone and particulate matter in southern California.” *PNAS* 114, no. 34 (2017): 8991-8996, <http://pnas.org/content/114/34/8991.abstract>.

Energy Star Program.¹⁵ Not all surfaces are suitable for implementing these materials, but they should at least be considered in new construction projects. This would apply to any projects requiring approval by the city. These types of strategies will not only reduce the UHI effect, but they can also reduce energy costs and the risks of extreme heat, leading to an increased quality of life for Columbus residents.

A2. PROVIDE PROGRAMS TO DISTRIBUTE FANS, AIR CONDITIONERS, AND WATER TO VULNERABLE POPULATIONS

A number of social service organizations have campaigns during the summer to provide fans, and in more limited cases, air conditioning to their constituent audiences. A program that is designed should draw from already existing initiatives and fill identified gaps. For instance, some particular audiences might not currently be served. With warmer conditions expected, particularly warmer nighttime lows coincident with higher humidity, fans may not provide sufficient cooling for the elderly or those with certain medical conditions. The same is true for individuals who need air filtration during hot days with air quality alerts. However, there are some special considerations that must be made with air-conditioner distribution (e.g., additional load on the household grid, ability to enclose a room for cooling, and affordability of a higher electric bill for the resident). Efficient distribution of fans and air conditioners (where appropriate) could reduce demand on cooling centers. A program to distribute fans and air conditioners could replicate the network model described for cooling centers. Information on agencies providing distribution of fans and those entities that could be engaged to expand efforts in an emergency is available in the FCEM&HS Extreme Heat Plan, which was updated in 2017.¹⁶

In addition to fans and air conditioners, drinking water distribution programs could be established to ensure sufficient hydration during extreme heat events. Columbus Public Health distributed water to citizens affected by nitrate contamination of the drinking water in some parts of the city in 2016. Likewise, the Toledo region had to respond to a water crisis that impacted over 500,000 people in the summer of 2014, resulting in a response from local and state government and the Ohio Public Private Partnership.¹⁷ These two events were on opposite ends of a delivery spectrum. While hot days require consumption of additional water by residents, there is no anticipated shortage of water as long as water supplies are not contaminated. Fortunately, Columbus has an inherent resilience due to three separate water supplies, one of which is groundwater, but algal blooms are becoming an increasingly common occurrence in many waterways in Ohio.¹⁸ Therefore, the hazard exists for water contamination that could impact a larger population and result in the need for widespread distribution of water. As with many hazards, this would impact vulnerable populations the most. A plan to distribute water should integrate with any plans already developed by the FCEM&HS.

¹⁵ "Roof Products." *Energy Star Program*. https://www.energystar.gov/products/building_products/roof_products. Accessed Jan. 2018.

¹⁶ Franklin County Emergency Management and Homeland Security. "Franklin County Emergency Operations Plan." Document not available to the general public. REPEATED

¹⁷ Tom Henry. "Water crisis grips hundreds of thousands in Toledo area, state of emergency declared." *The Blade*. Aug. 3, 2014. <http://www.toledoblade.com/local/2014/08/03/Water-crisis-grips-area.html>. Accessed Jan. 2018.

¹⁸ "Harmful Algal Blooms (HAB). *Ohio Environmental Protection Agency*. <http://epa.ohio.gov/ddagw/hab.aspx>. Accessed Jan. 2018.