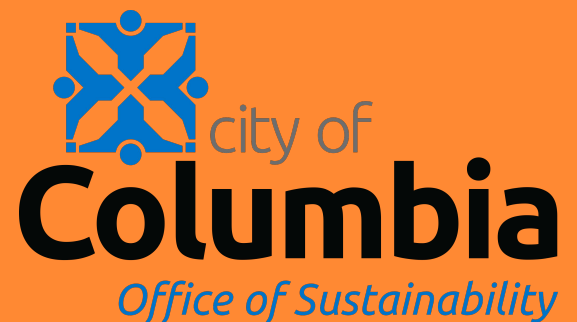




SHOW ME THE HEAT





Progress Report

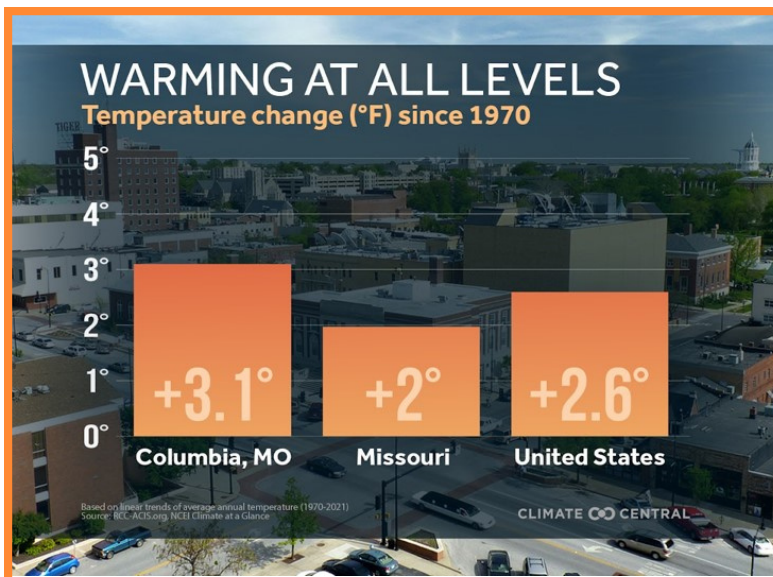


INTRODUCTION

Show Me the Heat kicked off with Columbia Heat Map 2022, a one-day community science campaign. Thirty-six volunteers drove one-hour routes across Columbia, collecting 30,000+ data points. The data were analyzed and used to create high-resolution heat distribution maps of the City of Columbia. This report outlines the development of the campaign, discusses the preliminary results, and next steps for the project.

Objectives

-  Educate our community about the causes and impacts of urban heat in Columbia;
-  Collaborate with community members and partners to develop local solutions to urban heat;
-  Prepare Columbia, both socially and physically, for increased risk and exposure to extreme heat; and
-  Inform planners and decision-makers about heat-related vulnerabilities to guide future development and infrastructure projects.



The annual average temperature in Columbia is 1.1°F greater than the state of Missouri and 0.5°F greater than the entire United States (Figure 1). This large increase in annual average temperature compared to the rest of the state is likely due to the urban heat island effect.

Figure 1. Data: NOAA, 2022. Image: Climate Central

The Urban Heat Island Effect

The urban heat island effect (UHI) occurs when the temperature of the city is consistently warmer than surrounding suburban and rural areas. The concentration of roads, parking lots and buildings make the city warmer than surrounding areas where vegetation is more abundant and buildings not so dense (Figure 2).

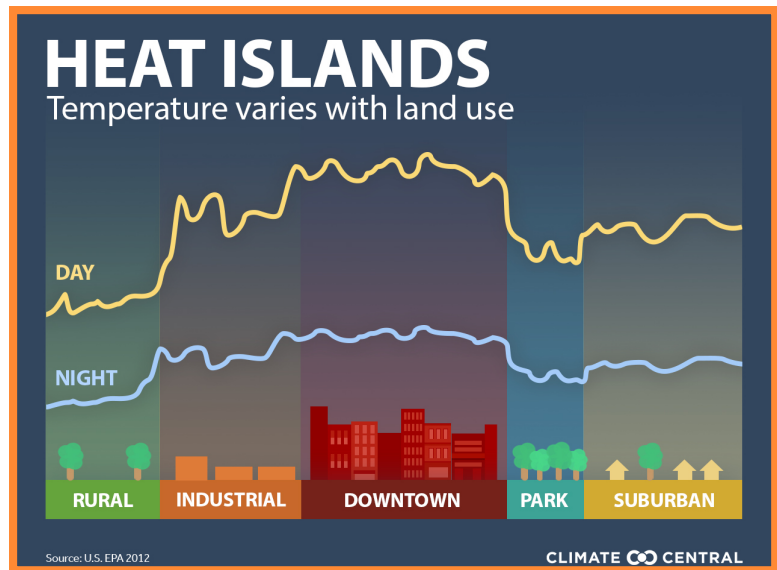


Figure 2. Image: Climate Central.

Heat Vulnerability

On average, heat exposure kills more people in a year than any other weather phenomena in the United States of America (National Weather Service, 2021). People exposed to heat can suffer from such as heat exhaustion and heat stroke.

In Boone county, from 1999 to 2022, three people died, and sixty-three people experienced injuries related to heat exposure (National Center for Environmental Information). These recorded incidents were traced to people who live in mobile homes, work outdoors, could not afford air conditioning, were unsheltered, or were 65+ years old.

Higher temperatures in a city (UHI) accentuates the problem by causing even higher temperatures.

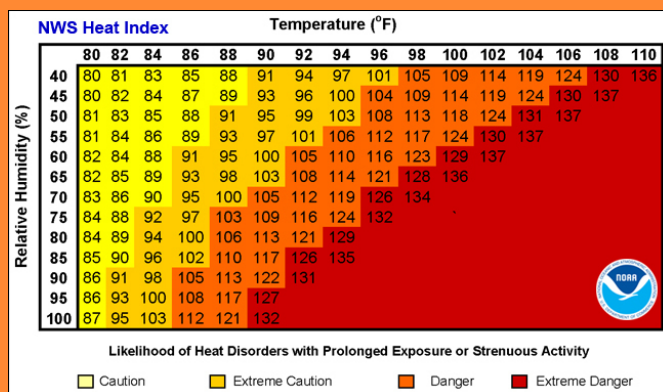
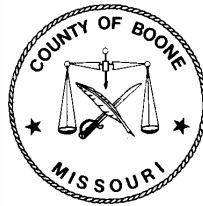
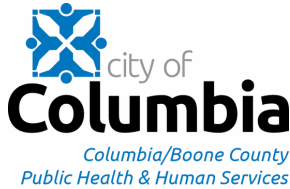


Figure 3. Young children and infants, older adults, people with chronic medical conditions and pregnant women are at high risk of heat exhaustion, heat stroke, or other complications, including death, when exposed to temperatures as low as 80°F coupled with high humidity (Gamble et al. 2016). Image: NOAA, 2022.

Heat-related injuries and deaths are preventable. Understanding the distribution of heat across our city and identifying the most intense heat islands allows us to prioritize services in areas of greatest risk and to the people who need them most.

PARTNERS

This project was possible with the technical, logistical, and financial support of our partners and sponsors. The USDN-sponsored Carbon Management Tool for Urban Lands was used to prioritize sampling routes for Show Me the Heat.



SPONSORS



HEAT MAP CAMPAIGN 2022


Volunteer Recruitment

Using data from the U.S. Census Bureau and the Environmental Protection Agency, the City and our partners identified census tracts where the majority of residents experience several barriers to prosperity. Barriers to prosperity include but are not limited to racism, low income, housing instability, unemployment, and food insecurity.

While the entire City of Columbia was included in the project area and outreach effort, our approach focused on people facing multiple barriers because they are impacted more by urban heat than people facing fewer barriers.

Volunteer Engagement

Our marketing approach allowed us to work with people at the greatest risk of urban heat.

 *Connected with 220 community members*

 *Trained 100 volunteers*

 *41% of volunteers live in high heat risk areas*



Image 1. Volunteers Joe Barnett and Odie Swanegan go over their route with city staff before campaign day.

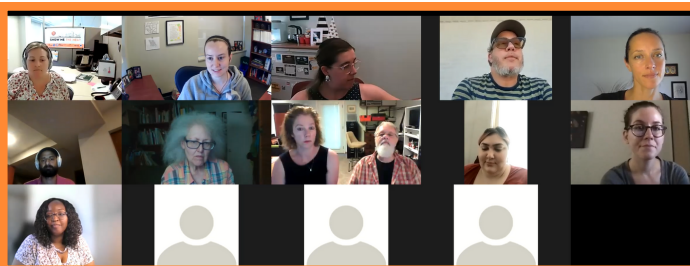


Image 2. View of online training participants and instructors.

We hosted a hybrid training session at Columbia/Boone County Public Health and Human Services. The training was recorded for the volunteers' convenience, we compensated people for their time, food was provided to in-person participants, and several staff members were available to assist.

Volunteer Engagement

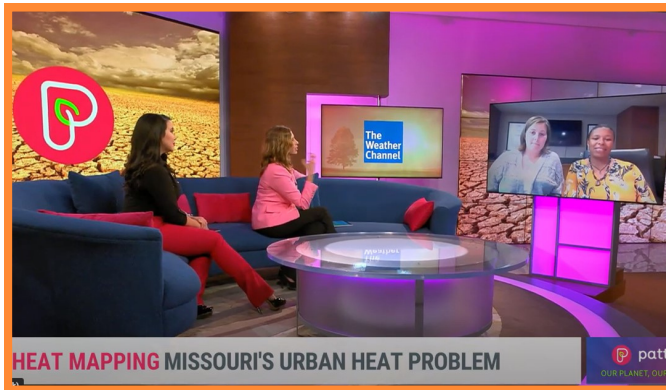


Image 3. City staff member, Danielle Fox and Show Me The Heat volunteer, Corrina McClee were interviewed by The Weather Channel's Pattn Show about the heat mapping project.

Staff and volunteers regularly communicated via email, text, and phone calls; and provided joint interviews to promote the project and educate the greater community about urban heat (Image 3).

This regular engagement built relationships with many volunteers who had not participated in other sustainability or City projects.

Campaign Day

On August 6, 2022, we launched Show Me the Heat. Our campaign is one of sixty across the globe. CAPA Strategies, Inc. created the Heat Watch service and guided our campaign team.

- 36 Volunteers
- 6 Routes
- 30k+ Data Points

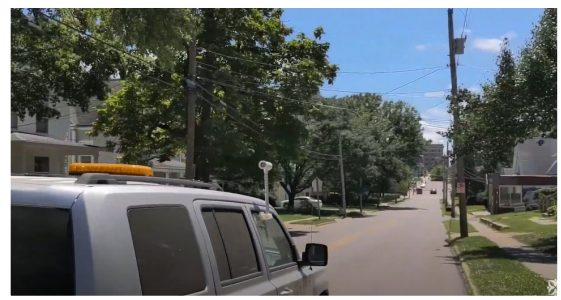


Image 4. Volunteers attached a sensor to their vehicles to collect ground temperature, relative humidity, and location data every few seconds.

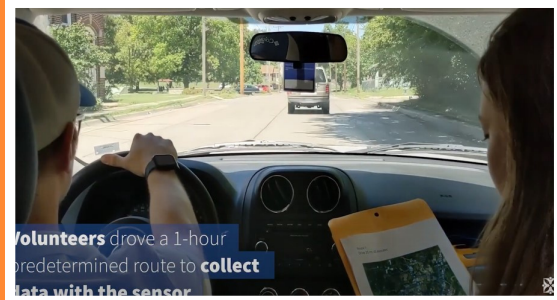


Image 5. Volunteers drove a 1-hour predetermined route to collect data three times throughout one of the hottest, driest, and most cloudless days.



Image 6A-C. At the launch party on the morning of Campaign Day, anyone could grab a donut; learn about heat safety, the impacts of transportation and heat on people or how a weather balloon works; and help paint the community mural. Over 75 people attended the launch party helping us spread the word about the project and how to prepare for urban heat.



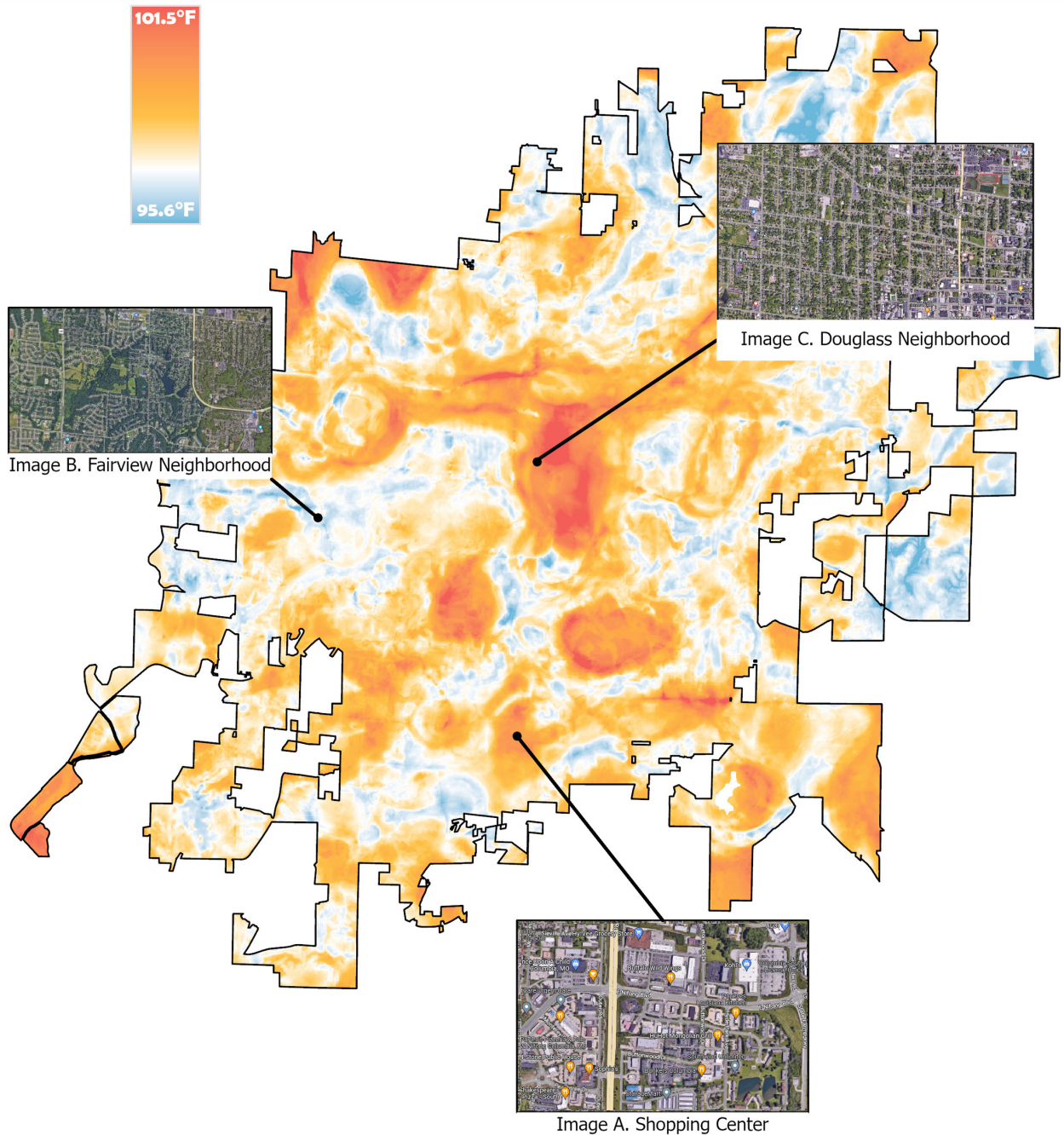
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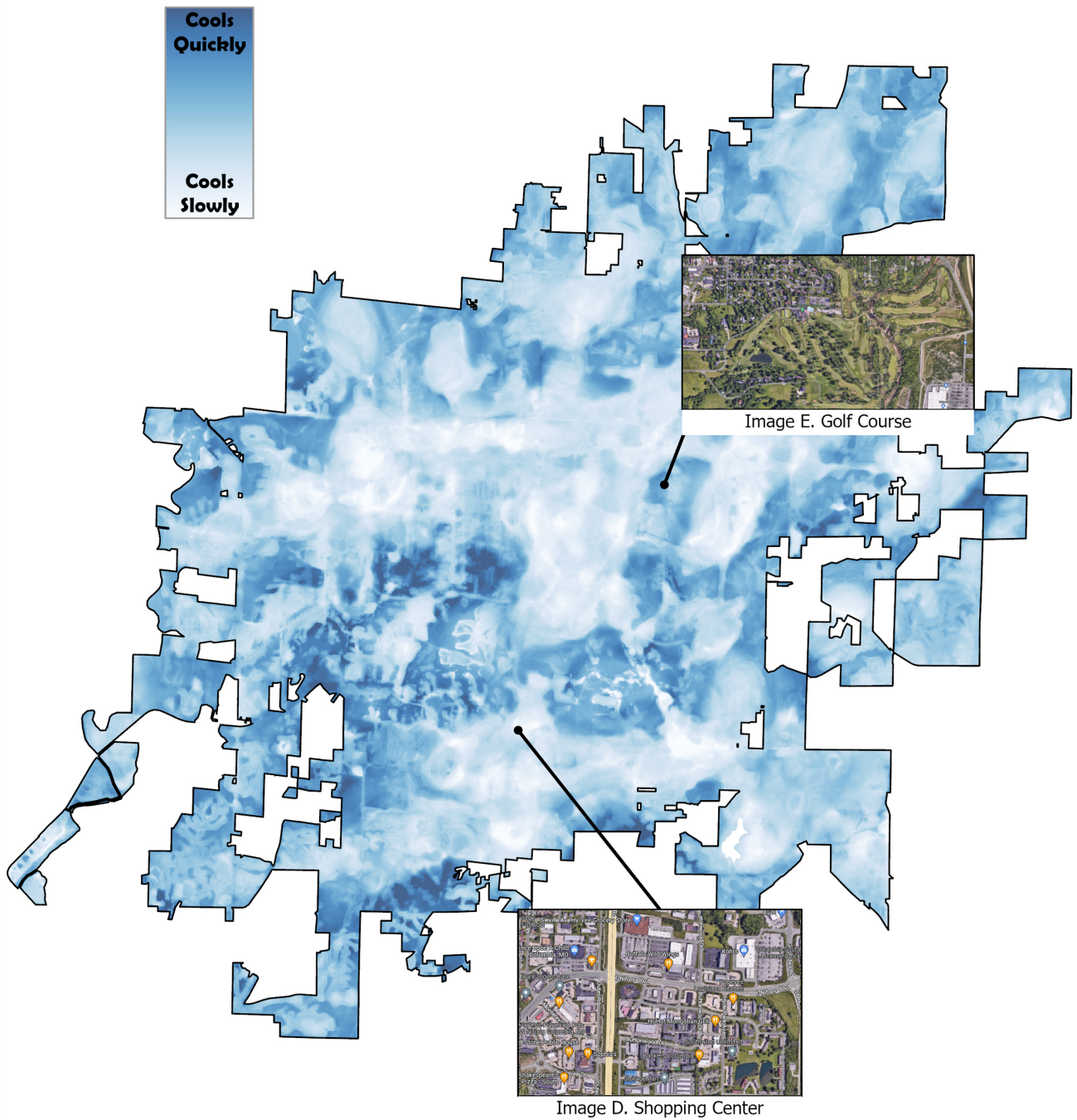
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Data Analysis & Interpretation

The study identifies the most intense heat islands in Columbia using an average heat index (Map 1) and a nighttime cooling analysis (Map 2). Additional maps and analyses comparing the heat index map to land cover, environmental justice and other information will be available at [Show Me the Heat at CoMoClimateAction.Org](http://ShowMeTheHeat.CoMoClimateAction.Org).



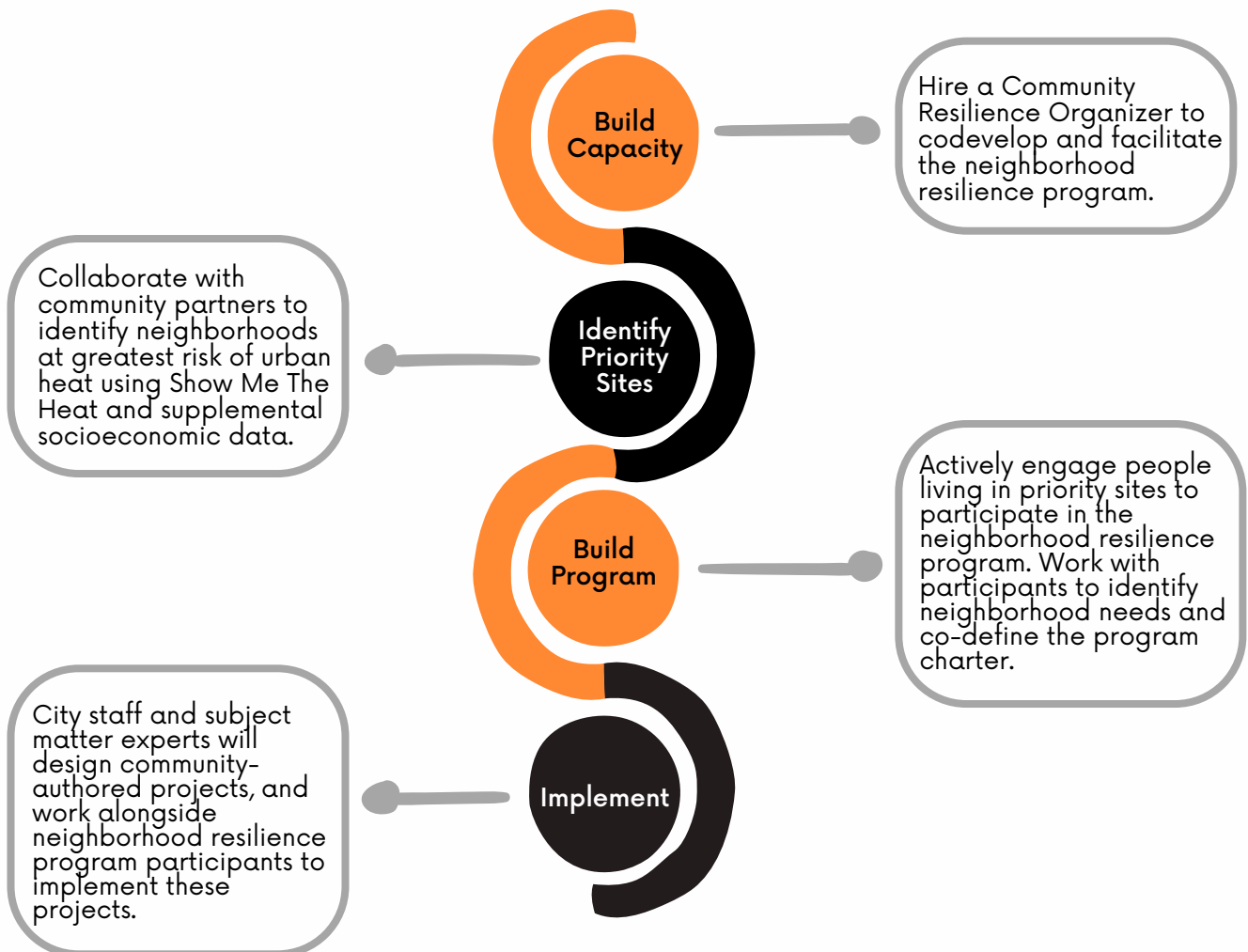
Map 1. Average heat index identifies areas that stay hot throughout the day. *Orange* areas with dense buildings, roads, and parking lots are the hottest (Image A). Neighborhoods with large trees stay cooler throughout the day (Image B). Neighborhoods with large trees and adjacent to urban heat islands are much warmer than similar neighborhoods that are farther away from a heat island (Image C).



Map 2. Dark blue areas cool quickly compared to sites that cool slowly (white). This difference is affected by the surface materials present. Generally, open spaces with more vegetation, such as a golf course (Image E), cool quickly compared to densely built urbanized areas, such as shopping centers, that cool slowly.

NEXT STEPS

Heat mitigation and preparedness projects cover many topics, including tree plantings, household energy efficiency, and preparedness planning. These are all services the City and our partners currently provide, and could implement immediately. The process described below centers the voices of people living in the most intense urban heat islands in the ideation and implementation of neighborhood heat resilience projects and provides a framework for subsequent partnership in other climate change issues.





Community mural completed by:

WildysnWorld!

CITATIONS

Gamble, J.L., J. Balbus, M. Berger, K. Bouye, V. Campbell, K. Chief, K. Conlon, A. Crimmins, B. Flanagan, C. Gonzalez-Maddux, E. Hallisey, S. Hutchins, L. Jantarasami, S. Khoury, M. Kiefer, J. Kolling, K. Lynn, A. Manangan, M. McDonald, R. Morello-Frosch, M.H. Redsteer, P. Sheffield, K. Thigpen Tart, J. Watson, K.P. Whyte, and A.F. Wolkin, 2016: Ch. 9: Populations of Concern. The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. U.S. Global Change Research Program, Washington, DC, 247–286. <http://dx.doi.org/10.7930/JoQ81BoT>