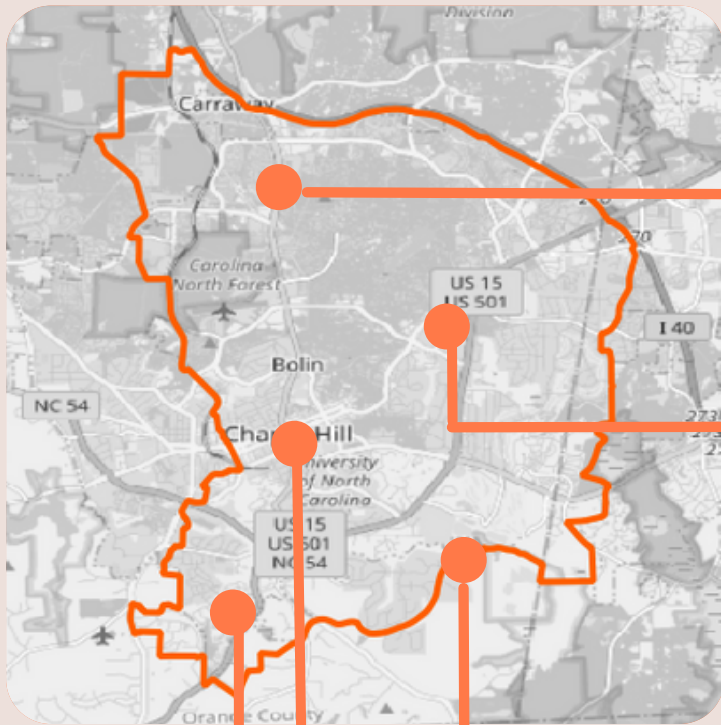


CHAPEL HILL HEAT WATCH 2021 CAMPAIGN REPORT

INSIGHTS AND BETA DATA RELEASE FOR
CHAPEL HILL 2021 UHI MAPPING CAMPAIGN



Traverse Map
in Chapel Hill



Neighborhood scale
data visualization



Case studies and
insights of
Neighborhood vs.
city



Provide open
access to data
collected



Summary

On August 28, 2021, we sent nearly 40 volunteers with handheld sensors, smartphones, and smartwatches to collect urban heat data around Chapel Hill. Throughout the day, our volunteers mapped nine routes in five different hotspots, collecting data on individual-scale temperature, humidity, location, and more across town. By the end of the day, our volunteers had collected 56 temperature data files and 104,764 data points.

The Chapel Hill Heat Watch 2021 campaign was conducted by the Data-Driven EnviroLab at the University of North Carolina at Chapel Hill in partnership with the NC Museum of Life and Science and the Town of Chapel Hill.

KEY FACTS

AUGUST 28, 2021
CHAPEL HILL, NC

5

STUDY SITES

40

VOLUNTEERS

104,764

MEASUREMENTS

71~93°F

WEATHER



Study Background

What is the Urban Heat Island (UHI)?

How might UHI affect my life?

Why does this happen?



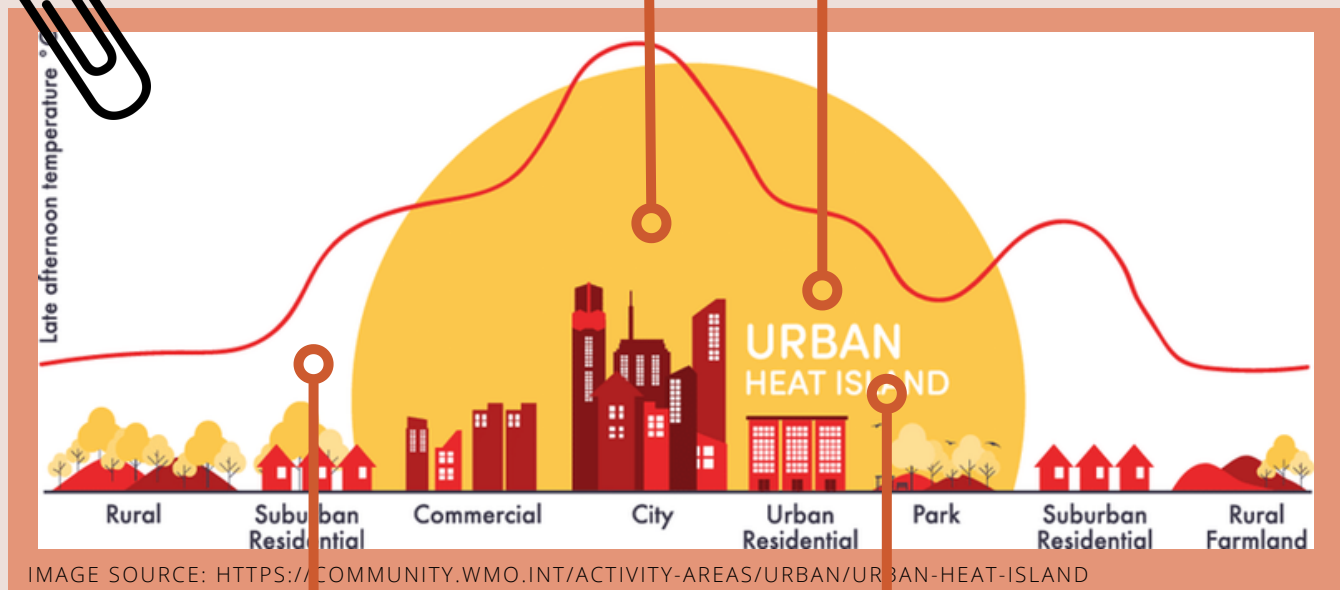
What did the campaign accomplish?

What are the next steps?

Study Background

The UHI effect is a phenomenon where cities or urban areas experience much hotter temperatures than nearby rural areas.

This is because impervious surfaces, like roads and buildings, absorb and re-emit more heat than natural surfaces, like grass and trees.



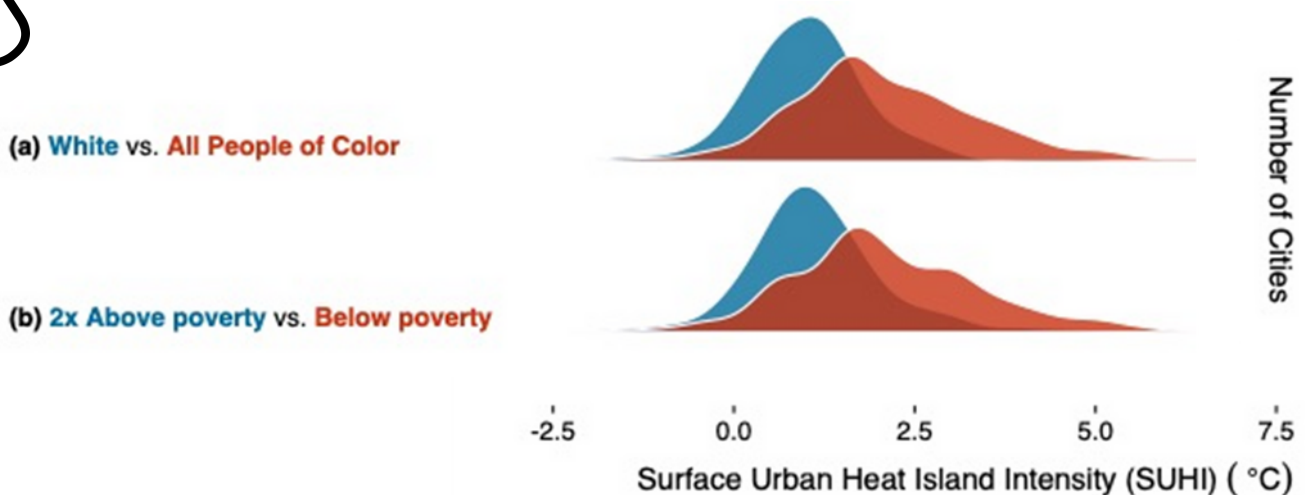
Having a lot of people and cars concentrated in an area can generate heat, too.

And as climate change increases the likelihood of heatwaves, the UHI effect is being worsened.

Previous Study

A previous study from the Data-Driven EnviroLab found that the UHI effect does not impact everyone equally.

Our research showed that people of color have higher urban heat island exposure than non-Hispanic white people in 97% of cities and that people living in poverty have higher urban heat island exposure than people with moderate or higher income in 70% of cities.



In almost every city we evaluated, the average person of color had about the same exposure to the urban heat island effect as the average person living in poverty, even though most people of color are not living in poverty.

Campaign Design



1. Connect with researchers and local government representatives

We reached out to NC Museum of Life and Science, Town of Chapel Hill, North Carolina Climate Office, and other local organizations and institutions to garner interest and support from the local community and government.

2. Identify UHI Hotspots

Based on the Town of Chapel Hill's Extreme Heat Resiliency Assessment map, we identified five neighborhoods at high risk of heat exposure based on built environment and tree cover.



3. Design Mapping routes

Our analysts designed one or two routes for each of these hotspots: Chapel Hill North, Franklin Street, University Place Mall, Glenwood Square/Meadowmont, or Southern Village. Each route was about 2-3 miles.

4. Collect Heat Data

Our volunteers were equipped with handheld PocketLab sensors to record the temperature and humidity along the mapping routes. They also collected heat comfort data with the app Cozie, using it to track if they were hot, warm, or comfortable at different times.



Analyze Heat Data

After the campaign, our analysts cleaned and standardized the heat data, then created traverse maps and visualizations. The collected data will be also used as training data to model heat all over Chapel Hill, even where we didn't have citizens map.



Traverse Map of Chapel Hill

Afternoon 2-3 pm



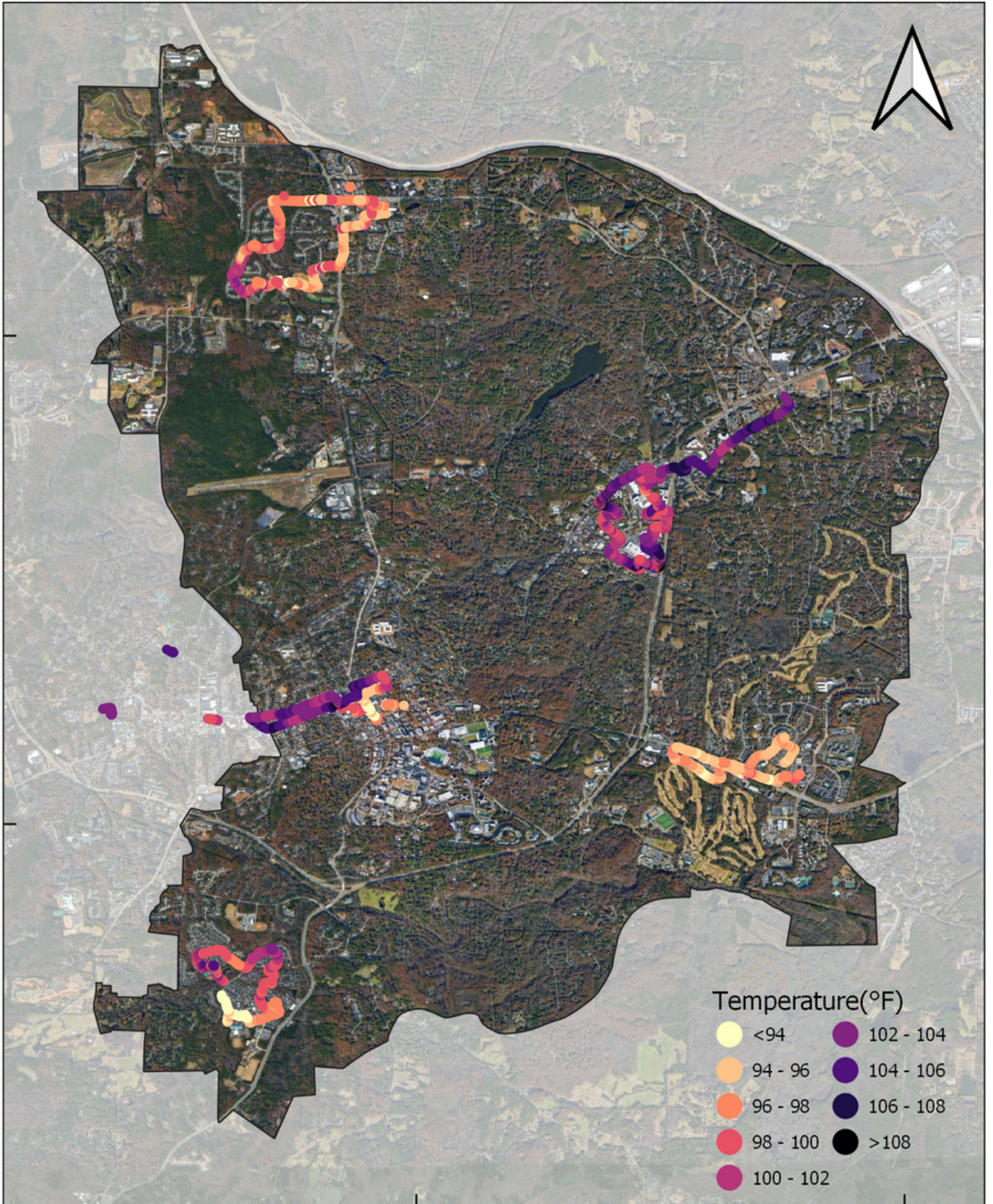
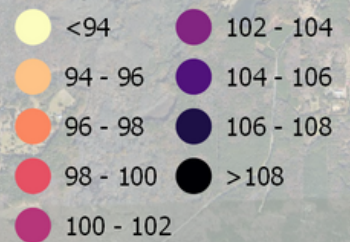
35.950

35.900

-79.050

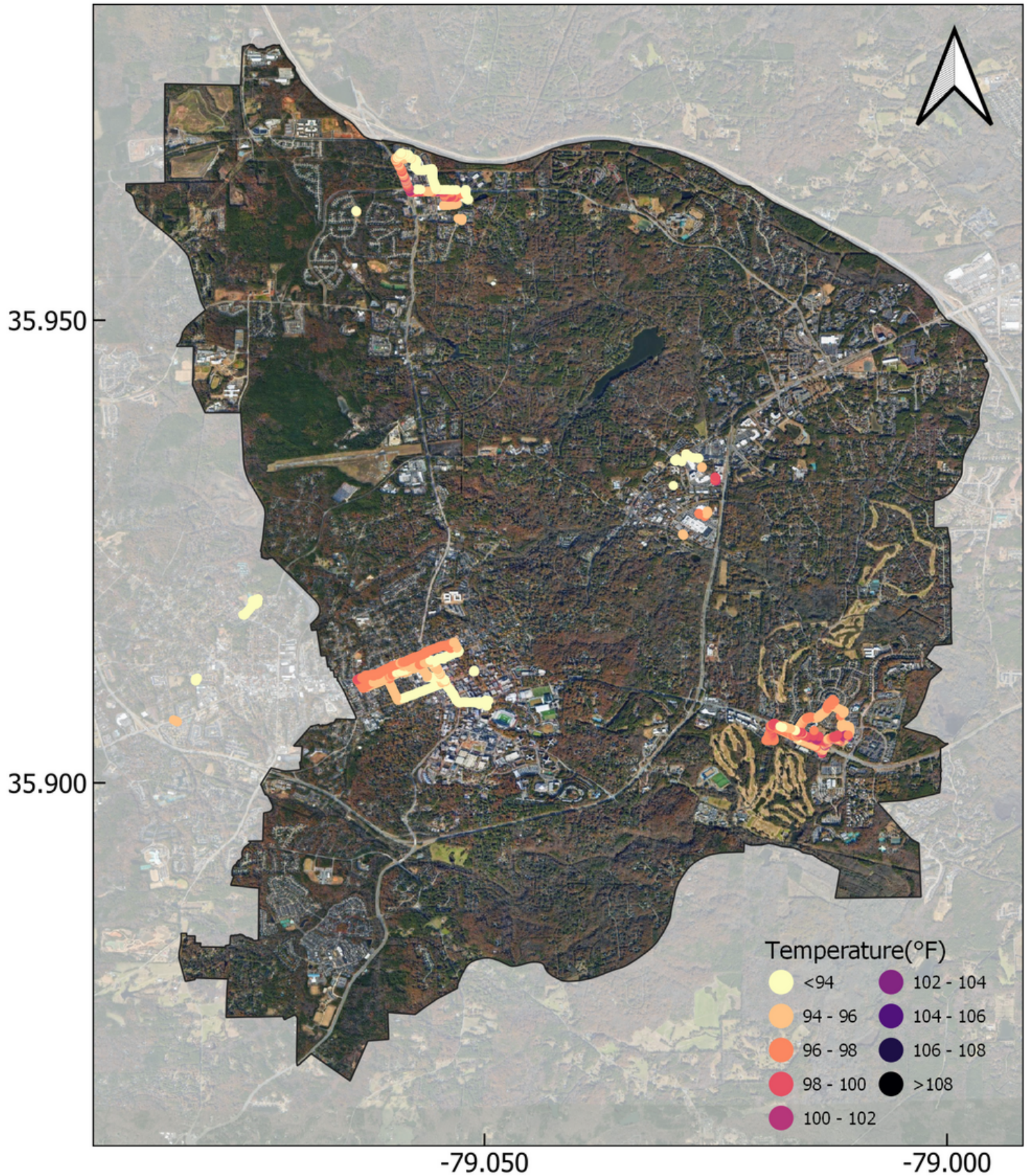
-79.000

Temperature(°F)

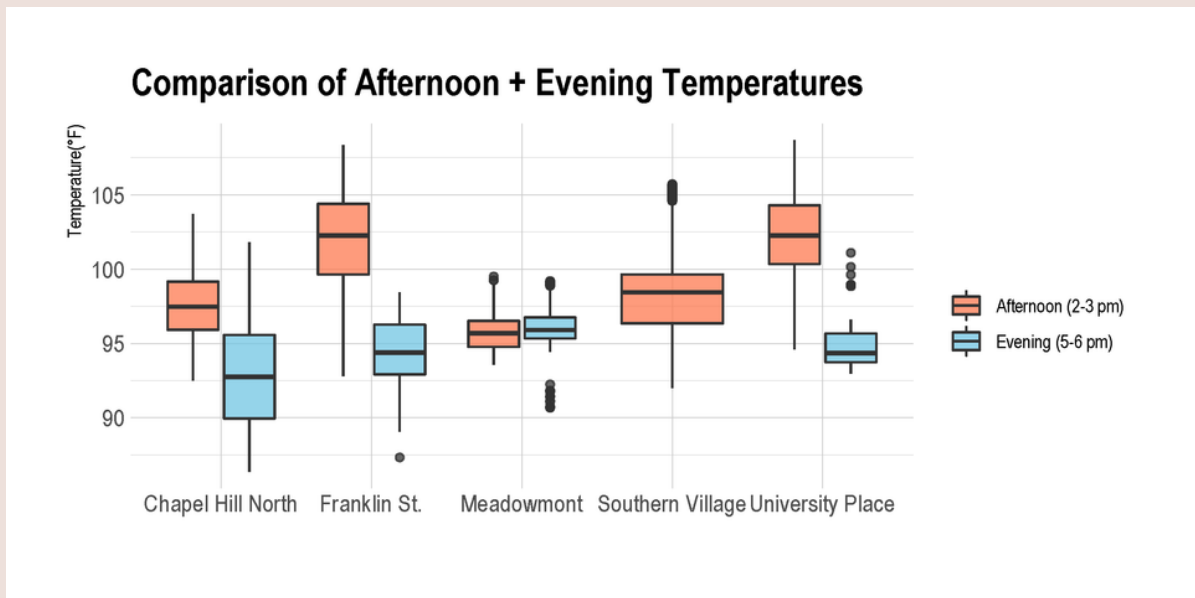


Traverse Map of Chapel Hill

Night 5-6 pm



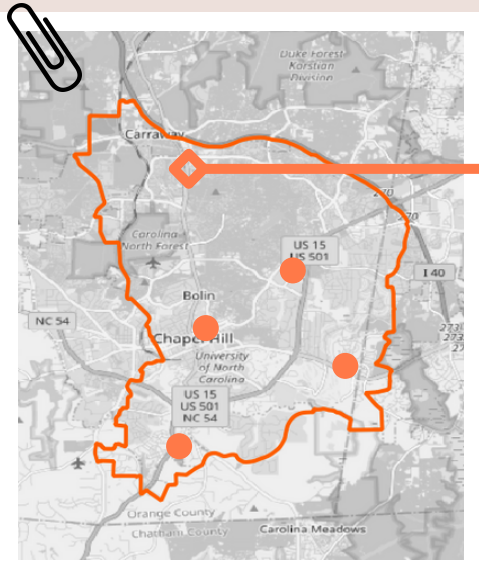
Temperature Differences in and between Neighborhoods



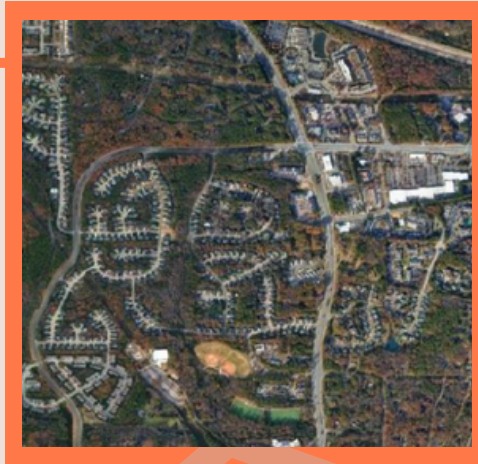
As these photos from various Chapel Hill neighborhoods show, land cover, the availability of shade, and extent of built land cover vary significantly. These differences translate to varying heat exposure for residents living or working in these areas. The neighborhoods of Franklin Street and Chapel Hill North exhibit some of the greatest differences between cooler and hotter areas. University Place and Franklin St. exhibit some of the greatest differences between afternoon and evening temperatures.



Chapel Hill North and Timberlyne



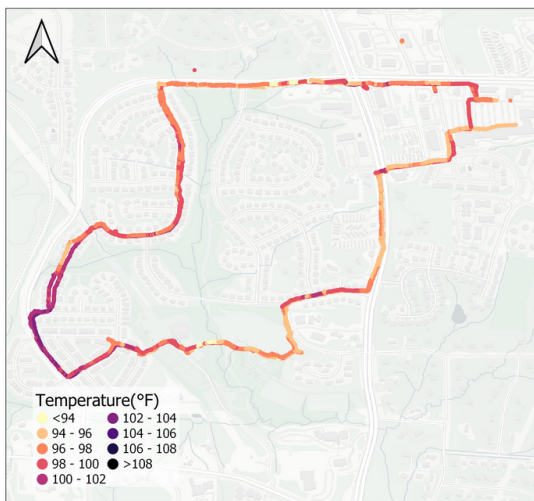
SATELLITE IMAGE



Chapel Hill North and Timberlyne route are located in the north part of Chapel Hill. On this route, participants passed by a variety of urban land cover, including built-up area in the plaza, sidewalks, and the residential area on the west of the plaza.

AFTERNOON 2-3PM
MAX: 103.7°F; MIN: 92.5°F

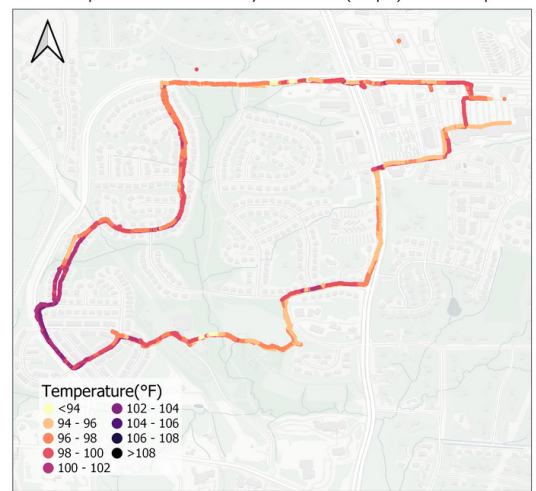
NEIGHBORHOOD TRAVERSE MAP



In the afternoon, the routes covered the southwest of the plaza, which are mostly residential. From the heat distribution below, the measured temperature of this hub is about 3 °F higher than the town average.

NIGHT 5-6PM
MAX: 101.8°F; MIN: 86.3°F

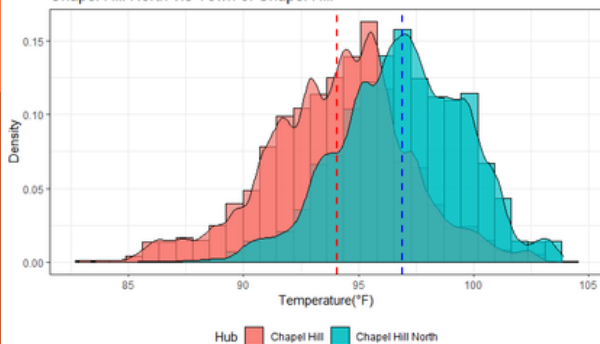
NEIGHBORHOOD TRAVERSE MAP



At the night session, the participants mapped the northeast of the plaza. The temperature of this area dropped down to 93.9 °F on average, and it is about 1 °F different from the town average

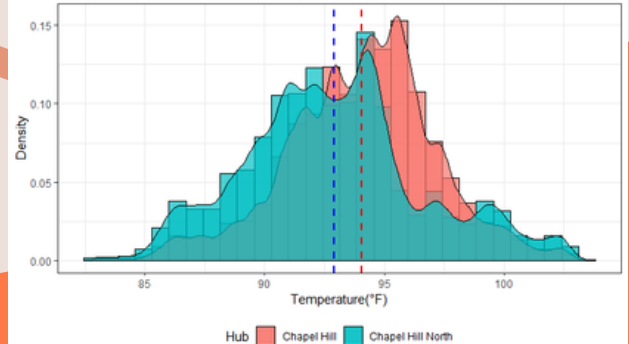
HEAT DISTRIBUTION

Chapel Hill North v.s Town of Chapel Hill



HEAT DISTRIBUTION

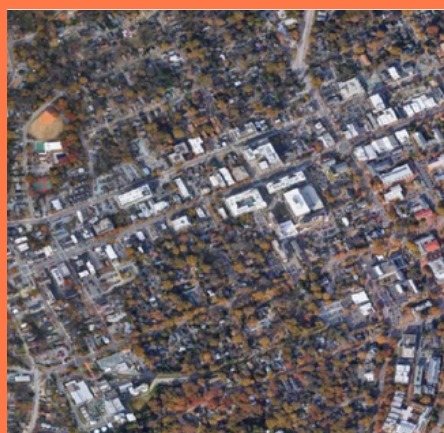
Chapel Hill North v.s Town of Chapel Hill



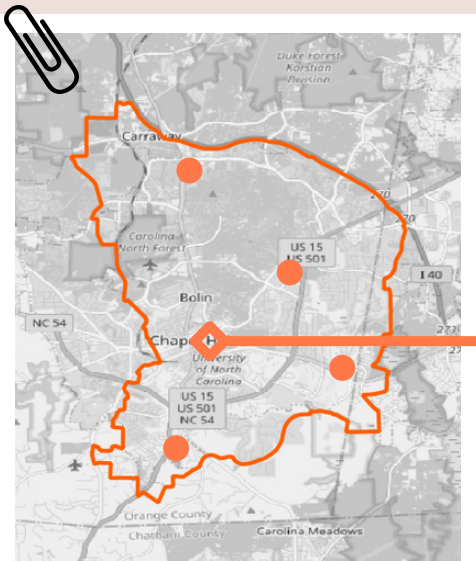
Franklin Street/Downtown



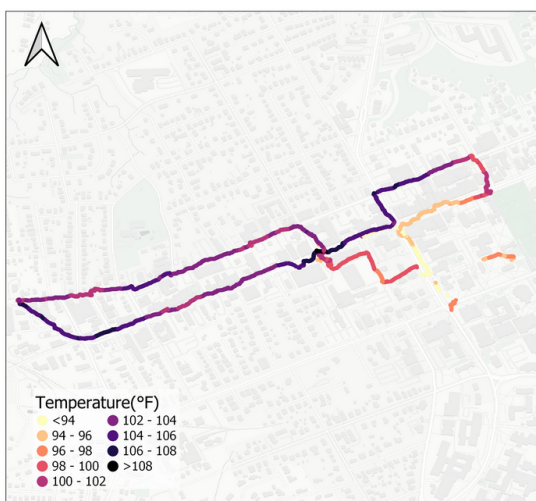
SATELLITE IMAGE



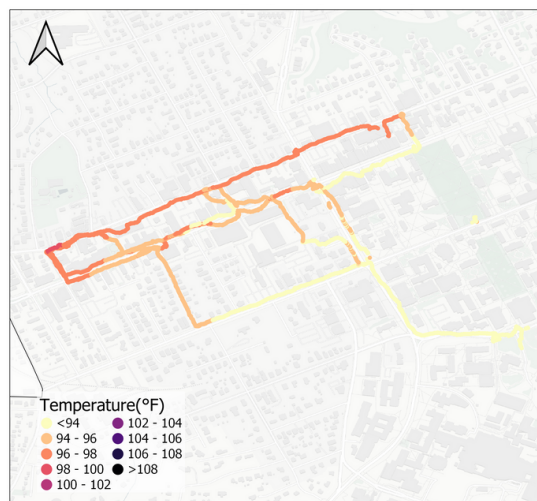
Franklin Street is one of the most developed areas in terms of buildings and impervious surface (e.g. parking lot, paved road, etc.) Participants at this hub mostly walked along Franklin Street, one of the busiest areas of Chapel Hill on a Saturday afternoon and night.



AFTERNOON 2-3PM MAX: 108.4°F; MIN: 92.8°F NEIGHBORHOOD TRAVERSE MAP



NIGHT 5-6PM MAX: 98.5°F; MIN: 87.3°F NEIGHBORHOOD TRAVERSE MAP

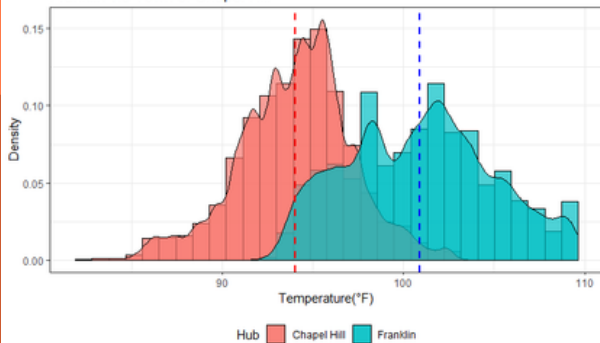


From both the traverse map and the heat distribution plot, we found out that this area is extremely hot in the afternoon. Approximately 7°F higher than average of all hubs, it was one of the "hottest" routes on the campaign day.

At night session, the temperature dropped down to 94.4°F on average. But it was still one of the hottest areas among all hubs at the same time.

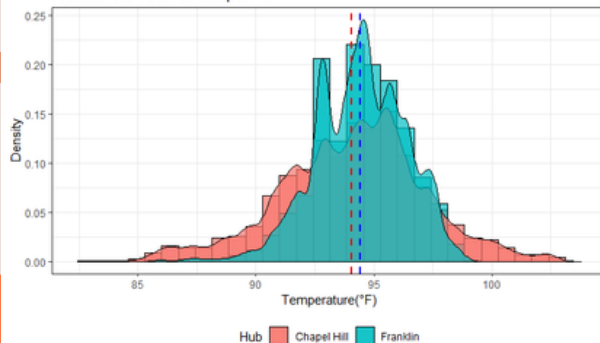
HEAT DISTRIBUTION

Franklin v.s Town of Chapel Hill



HEAT DISTRIBUTION

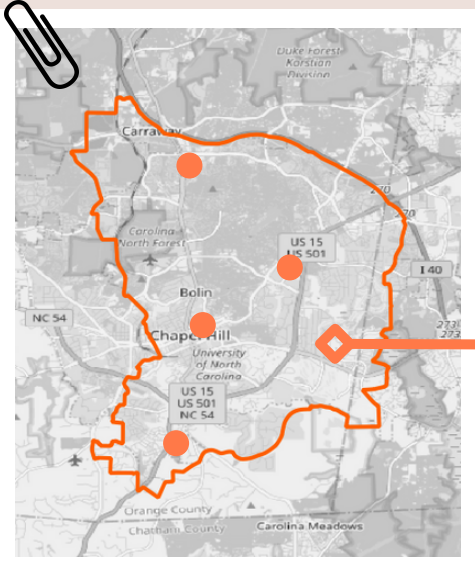
Franklin v.s Town of Chapel Hill



Glenwood Square and Meadowmont



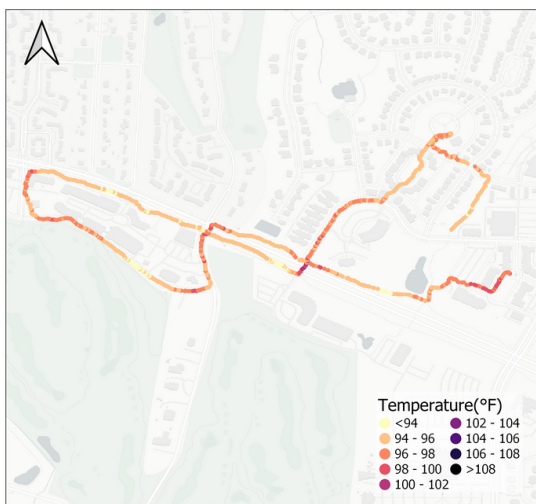
SATELLITE IMAGE



Glenwood Square and Meadowmont are located on the east side of Chapel Hill. At these sites, participants walked/biked on a hiking trail that from the residential area at north, along highway NC-54, to the gas station on the west. Most of the hiking trail has a nice tree coverage, which makes this route cooler on a such hot day!

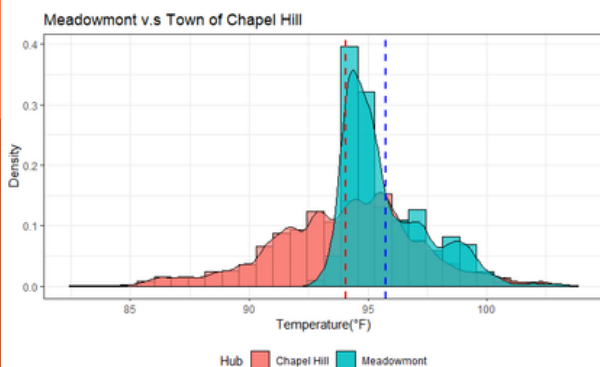
AFTERNOON 2-3PM
MAX: 99.5°F; MIN: 93.6°F

NEIGHBORHOOD TRAVERSE MAP



Compared to the measurements from Franklin street, the Meadowmont neighborhood is much cooler. The heat distribution below also tells us there are less extreme hot spots in this neighborhood.

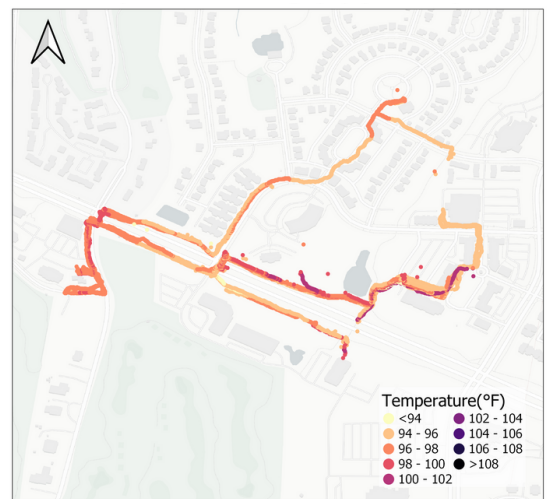
HEAT DISTRIBUTION



NIGHT 5-6PM

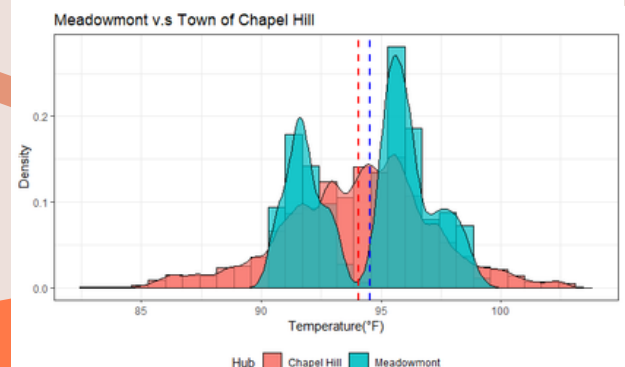
MAX: 99.2°F; MIN: 93.6°F

NEIGHBORHOOD TRAVERSE MAP

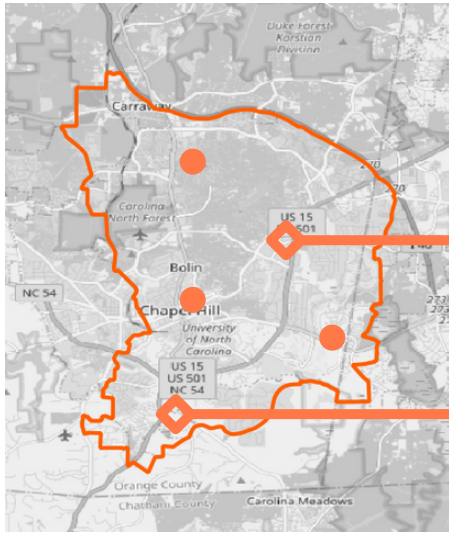


In general, the temperature of the Meadowmont neighborhood during the night session is moderate. However, we see some interesting patterns in the night heat distribution. Participants might experience quite different heat exposure along the route.

HEAT DISTRIBUTION



University Place Mall and Southern Village



UNIVERSITY PLACE MALL



University Place Mall is right next to U.S 501. With a large parking lot and commercial buildings, the temperature here is much higher than its counterpart -- Southern Village, which is mostly residential.

SOUTH VILLIAGE

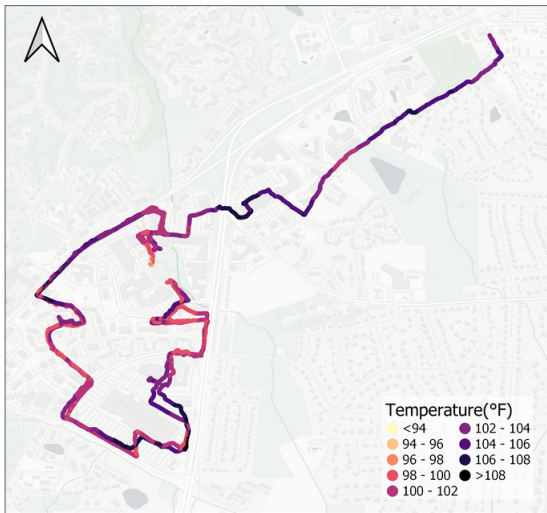


** Due to limited number of measurements, only the **afternoon** traverse maps are available for these two hubs

UNIVERSITY PLACE MALL

MAX: 108.7°F; MIN: 94.6°F

NEIGHBORHOOD TRAVERSE MAP

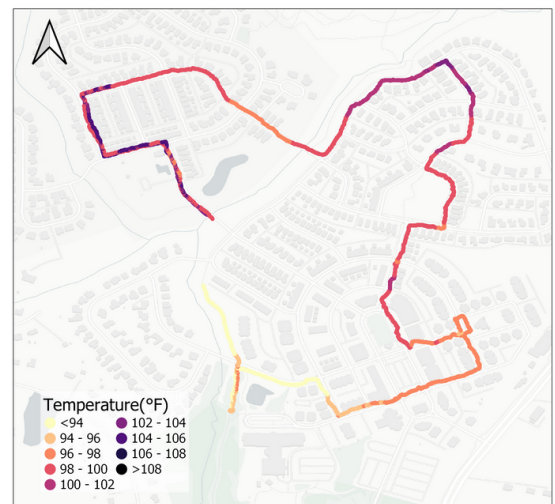


University Place Mall is another area where people may be exposed to extreme heat. With 8°F higher than average of all hubs, University Place Mall is the hottest area in the afternoon session.

SOUTHERN VILLAGE

MAX: 105.7°F; MIN: 92.1°F

NEIGHBORHOOD TRAVERSE MAP

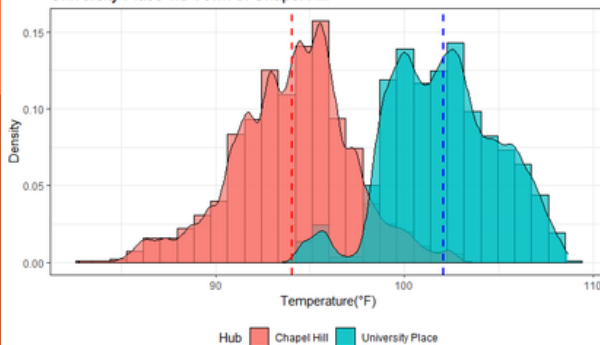


Southern Village contains a variety of land-use types, such as business area, residential area, etc.

We found a wider heat distribution in this neighborhood, from areas cooler than 94°F to almost 106°F at the northwest side.

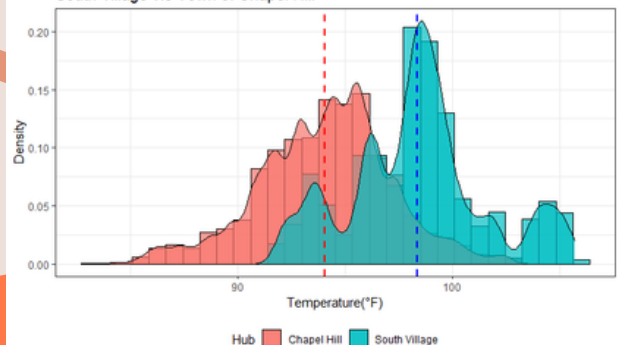
HEAT DISTRIBUTION

University Place v.s Town of Chapel Hill



HEAT DISTRIBUTION

South Village v.s Town of Chapel Hill



Campaign Highlights



Next Steps

As part of our next steps to understanding the UHI effect in the Triangle, you can join Data-Driven EnviroLab and the NC Museum of Life and Science at the HeatHack Data Science Collabathon during the 2022 NC Science Festival.



This hybrid in-person/remote one-day hackathon will bring together coders, programmers, data visualization whizzes, and environmental enthusiasts to help us discover actionable insights, develop engaging data visuals, and create action plans to address the growing and intensifying challenge of climate change and urban heat in the Triangle.



Teams will have the opportunity throughout the day to ask for feedback as they develop their ideas and final products, and at the end, a panel of judges composed of community stakeholders will provide feedback and award prizes for the winning entries.

Several webinars will be hosted ahead of the event that bring climate and data scientists to provide free community data science training.



Organizers & Sponsors



If you may have any questions or are curious about our following study and events, please email us at datdrivenlab@gmail.com