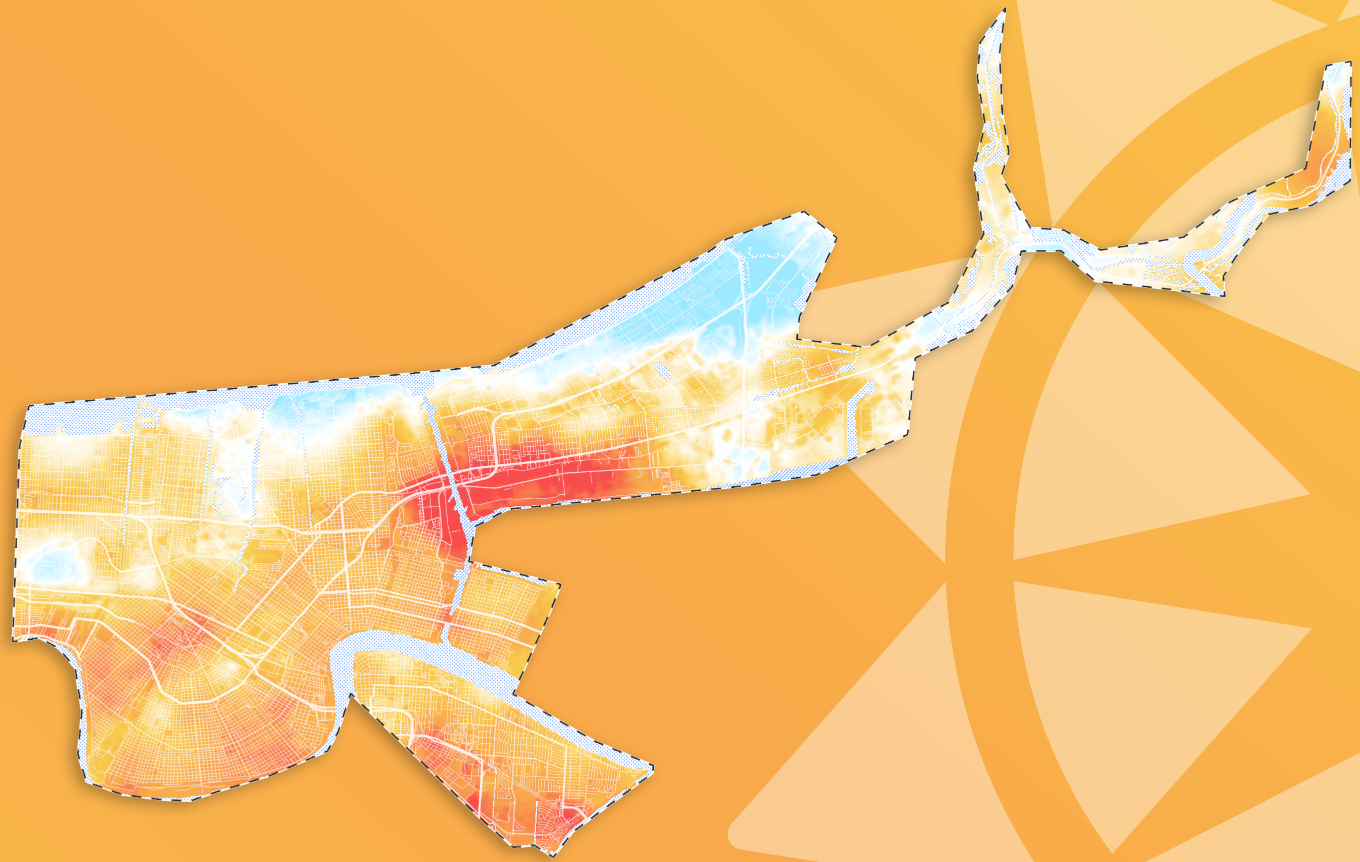


Heat Watch

New Orleans, Louisiana

Community Heat Mapping Campaign

CAPA

Acknowledgements

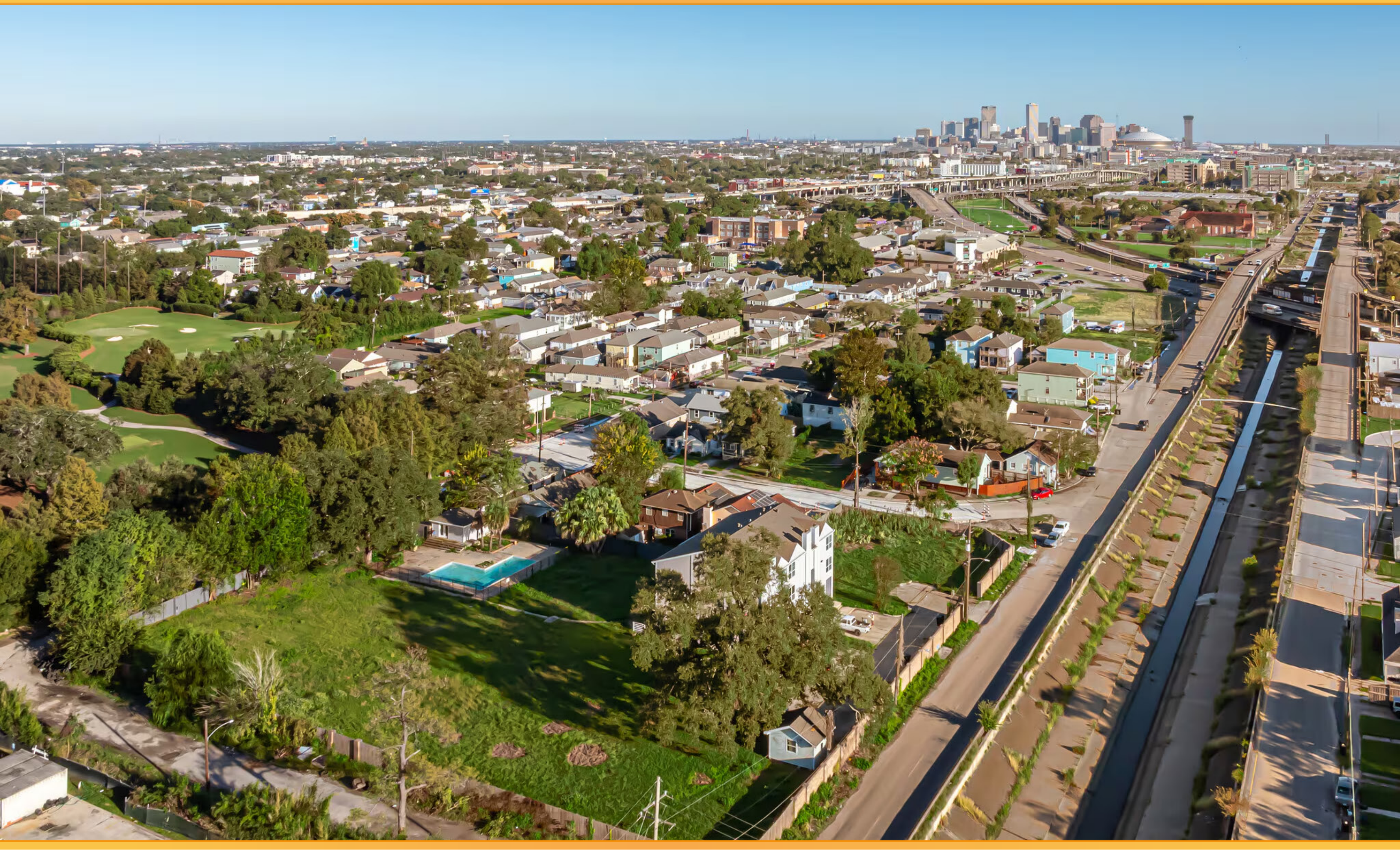
CAPA Strategies extends its gratitude to all partners at the Center for Collaborative Heat Monitoring, led by the Museum of Life and Science in Durham, North Carolina, for their leadership, guidance and commitment to this project. Their support was instrumental, along with that of the regional hubs at Museum of Science (Boston), the Oregon Museum of Science and Industry, and the Arizona Science Center, technical partners at AQUEHS Corp, the North Carolina State Climate Office and Utah State University, and the National Integrated Heat Health Information System. This project would not have been possible without their collective efforts.

The CAPA Heat Watch program, equipment, and all related procedures referenced herein are developed through over a decade of research and testing with support from national agencies, partnerships and universities. Most importantly, these include partners at the the National Integrated Heat Health Information System, the National Oceanic and Atmospheric Administration's Climate Program Office, the National Weather Service (including local weather forecast offices at each of the campaign sites), The Science Museum of Virginia, and U.S. Forest Service. Past support has come from Portland State University, the Climate Resilience Fund, and the National Science Foundation.

This report was prepared by CAPA Strategies, LLC

October 2025

Table of Contents



Overview

Extreme heat is the deadliest of all natural disasters, and its impacts fall unevenly across communities. Location matters. Neighborhoods with limited greenspace, fewer resources, and higher rates of health vulnerability face greater risk, while critical infrastructure systems, such as energy and transportation, strain under high temperatures. Understanding where and when heat concentrates in cities is essential for protecting public health, guiding interventions, and building resilience.

Addressing this need, organizers at Hollygrove-Dixon Neighborhood Association, in partnership with the Center for Collaborative Heat Monitoring, CAPA Strategies, and local community members, conducted a HeatWatch campaign to map heat across their region. Aiming to capture typical hot weather conditions, community data collectors mounted sensors to their vehicles and drove pre-planned routes to measure air temperature and relative humidity across varying land uses, land covers, and points of interest. Using these collected data, CAPA Strategies generated high-resolution models of ambient air temperature and heat index, employing a method that improves upon traditional satellite-based descriptions of urban heat.

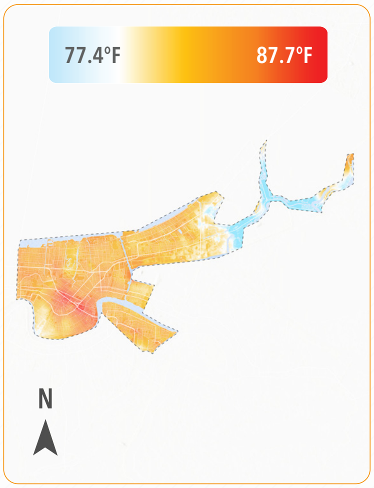
During the campaign's planning stages, project partners worked together to recruit community members to serve as data collectors, coordinated logistics for their campaign day event, and designed driving routes to sample key areas for heat mapping. Campaign participants received training on the Urban Heat Island (UHI) effect, helping to increase awareness of the issue and its impacts. The campaign also garnered media attention, further raising awareness about the project and the UHI effect.

In short, the project team achieved two main objectives:

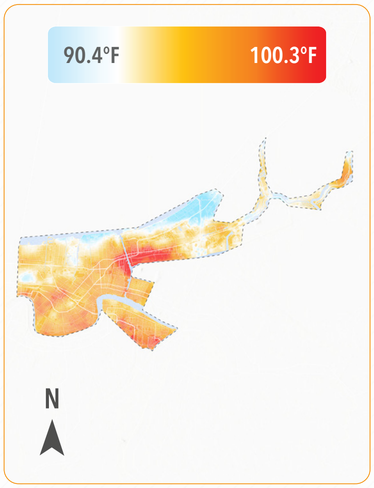
1. Developed high-resolution maps showing the distribution of air temperature and humidity (heat index) across the study area.
2. Built local partnerships that help communities better understand and address the inequitable risks of extreme heat.

The results offer a foundational snapshot of how urban heat varies across the study area and how landscape features influence local temperature and humidity patterns. This report presents the campaign process, methodology, results, and initial data observations from the CAPA team, highlights community engagement aspects and media coverage, and makes recommendations for how to build on these new findings and resources.

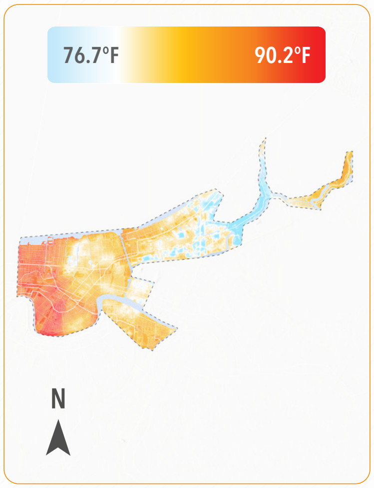
Executive Summary



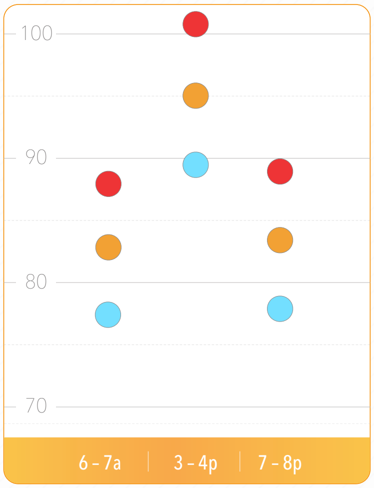
Morning Area-Wide Model (6–7 am)



Afternoon Area-Wide Model (3–4 pm)



Evening Area-Wide Model (7–8 pm)



Traverse Points (°F)

Data Collection & Results

On July 29th, 2025, 44 community data collectors successfully completed The Heat Watch New Orleans campaign by collecting over 65,000 unique measurements of air temperature and relative humidity along 11 routes spanning 112 square miles of study area. Data collectors measured a maximum temperature of 101.2°F during the afternoon traverse, and a maximum temperature differential (the range between the hottest and coolest measurement collected at the same time) of 11.6°F in the afternoon.

The resulting area-wide maps describe the modeled distribution of air temperature across the study area at each time period. In the morning, heat concentrates in the city center along I-10 and Highway 61/Tulane Avenue. Cooler areas include Audubon Park, City Park, and the northeastern region with Bayou Sauvage. An afternoon northeastern wind brings cool air from Lake Pontchartrain. Hot spots are noted in the industrial area from the Desire Area east along Highway 90, and in areas dense with impervious surfaces in Gert Town, Algiers, and Jefferson neighborhoods. A brief rain event around 6 PM cools the city before evening. The evening map shows a strong west-to-east temperature gradient, with cool spots in vegetated areas and warmer temperatures in developed areas.

This summary report presents maps of the processed traverse points and area-wide models for the morning, afternoon and evening periods, as well as specific maps for Hollygrove and Dixon neighborhoods. Provided with this report are the resulting datasets, which include the processed traverse points (as vector shapefiles), area-wide maps (as geotiff rasters) and supporting meta-data. A corresponding web map provides an open and accessible format, allowing the user to interact with the results. While this report focuses on the air temperature results, the relative humidity and heat index results are available in the datasets and web map.

07/29/25
Study Date

112 mi²
Study Area

11
Routes

65,686
Measurements

101.2°F
Max Traverse Temperature

11.6°F
Max Temperature Differential

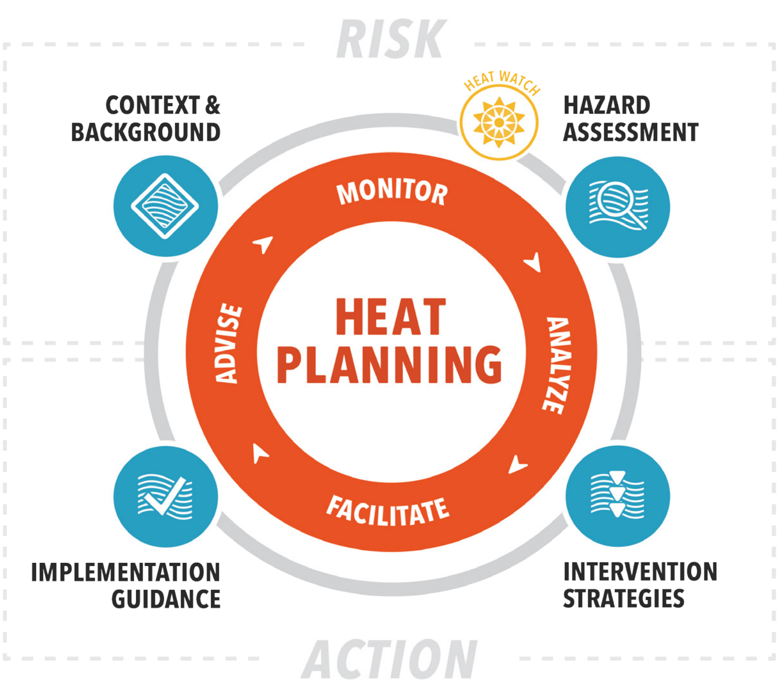
Next Steps

With these new datasets, project partners and local decision makers can better identify the people and places facing greater levels of exposure to extreme heat. To deepen the understanding of heat risk and prioritize locations for interventions, project partners may analyze the Heat Watch results using sociodemographic information about heat-vulnerable populations, land cover data describing areas lacking tree canopy and facing excessive amounts of impervious surfaces, heat-health incident data, and many other sources of information. Heat Watch data and related analyses can inform heat-related policies, heat action plans and heat emergency response protocols.

Heat Watch products can also continue to serve as a means for engagement with community members by sharing out the results of the project and organizing discussions or workshops that leverage the maps and findings. Media channels may also continue to cover the campaign activities and revisit the project as the next heat season approaches. Throughout these follow-up activities, the CAPA Strategies team will be available to support local interests with technical advising, past project examples, and additional monitoring, analysis and resilience planning services.

About CAPA Strategies

CAPA Strategies is a team of social and environmental scientists that generates data, develops tools, and designs actionable strategies to accelerate community adaptation to climate change. Heat Watch is one service within CAPA's broader 'heat planning' framework, which offers a comprehensive approach to heat adaptation by systematically identifying risks and guiding locally-relevant climate action. Through holistic, data-driven, and equity-focused approaches such as this, CAPA envisions communities, cities and regions that are connected, informed and climate resilient.



CAPA Strategies developed the Heat Watch campaign process over several iterations, with methods well established through peer-reviewed publications, testing, and refinement.

The current campaign model requires leadership by local organizers, who engage community groups, new and existing partner organizations, and the media in generating a dialog about effective solutions for understanding and addressing extreme heat.

CAPA provides training, sensor equipment, and support to local partners and their campaign participants as they prepare to collect primary temperature and humidity data across a metropolitan region.

The diagram to the right summarizes the seven main steps of the campaign process. Later in this report is an overview of the analytical methodology, which was developed in part through peer-reviewed publications.

1. Goal Setting

Campaign organizers determine the extent and focus of their mapping effort, prioritizing environmental justice areas and places undergoing change.

2. Engagement

Organizers recruit data collectors through non-profits, universities, municipal staff, youth groups, friends, family, and peers. Meanwhile, CAPA designs the data collection routes by incorporating important places of interest such as schools, parks, and community centers.

3. Training

Data collectors attend a training session to learn about the why and how of the project and how to conduct their roles as data collectors. Participants sign a liability and safety waiver, complete a knowledge check, and organizers assign teams to each route.

4. Activation

With the help of local forecasters, organizers aim to identify a suitable campaign day with an expected daily high within the top 10% of annual averages, low chances of precipitation, low cloud cover and low wind speed. CAPA ships the sensor equipment.

5. Execution

Data collectors drive along planned routes at set hours, using sensor equipment to collect measurements every second on air temperature, relative humidity, GPS coordinates and speed.

6. Analysis

Organizers gather the sensors and upload the data to CAPA's server. CAPA analysts then apply quality control procedures to process the data and integrate satellite data to create area-wide models of air temperature and heat index for each traverse hour.

7. Implementation

Campaign organizers and participants review the Heat Watch outputs (datasets, maps, and report), and campaign teams meet with CAPA to discuss the results and next steps for addressing extreme heat in their community.

See more details on next page.

[1] The most relevant and recent publications to the Heat Watch campaign process include:

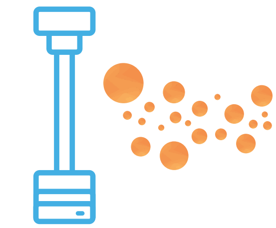
Shandas, V., Voelkel, J., Williams, J., & Hoffman, J., (2019). Integrating Satellite and Ground Measurements for Predicting Locations of Extreme Urban Heat. Climate, 7(1), 5. https://doi.org/10.3390/cli7010005

Voelkel, J., & Shandas, V. (2017). Towards Systematic Prediction of Urban Heat Islands: Grounding Measurements, Assessing Modeling Techniques. Climate, 5(2), 41. https://doi.org/10.3390/cli5020041

Modeling Method

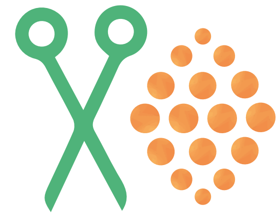
Below are the three key steps and geospatial processes that CAPA analysts use to transform traverse point data into area-wide models of air temperature.

1 Download & Filter



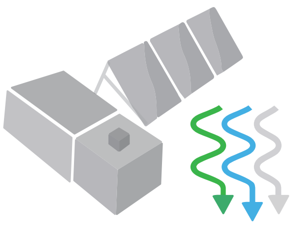
Download raw heat data from cloud storage

Compare data with field notes and debrief interview

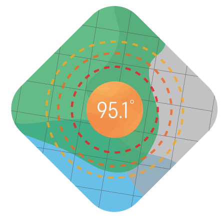


Trim data to proper time window, speed, and study area

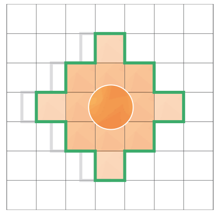
2 Integrate & Analyze



Download multi-band land cover rasters from Sentinel-2 satellite

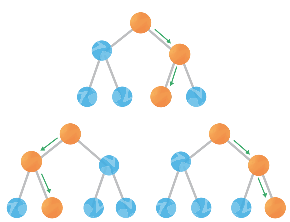


Calculate spectral indices reflecting land cover features

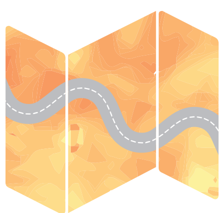


Transform land cover rasters using a moving window analysis

3 Predict & Validate



Combine heat and land cover data in geostatistical model



Create predictive raster surface models of each period

Perform random sub-sampling validation method

The most relevant and recent publications include:

Shandas, V., Voelkel, J., Williams, J., & Hoffman, J., (2019). Integrating Satellite and Ground Measurements for Predicting Locations of Extreme Urban Heat. Climate, 7(1), 5. https://doi.org/10.3390/cli7010005

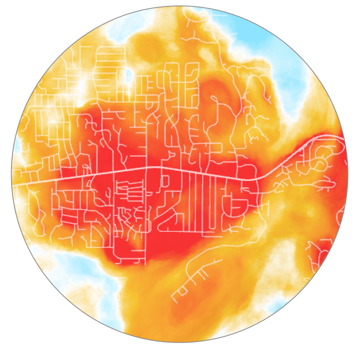
Voelkel, J., & Shandas, V. (2017). Towards Systematic Prediction of Urban Heat Islands: Grounding Measurements, Assessing Modeling Techniques. Climate, 5(2), 41. https://doi.org/10.3390/cli5020041

About the Maps

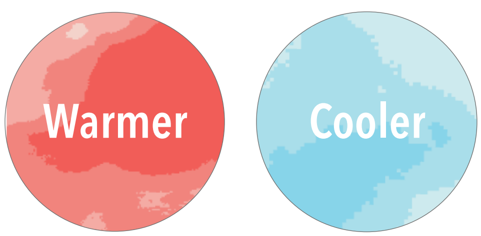
The following sections present results from the campaign: traverse point measurements and area-wide models at morning, afternoon and evening. Below are several key details to keep in mind while viewing the results.

Each map uses a unique color ramp to emphasize the distribution of temperatures within each time period and allow comparison of relative hot spots and cool spots between time periods.

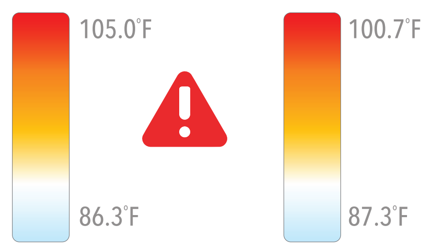
Traverse point maps present the air temperature measurements gathered during the campaign, filtered to usable data for modeling.



Area-wide maps present high resolution models of air temperature across the study area based on the traverse points and Sentinel-2 spectral imagery.



Classifications using natural breaks help to illustrate the variation between warmer (red) and cooler (blue) areas across the map.



Note that the ranges are different between the traverse point and area-wide maps due to the predictive modeling process.

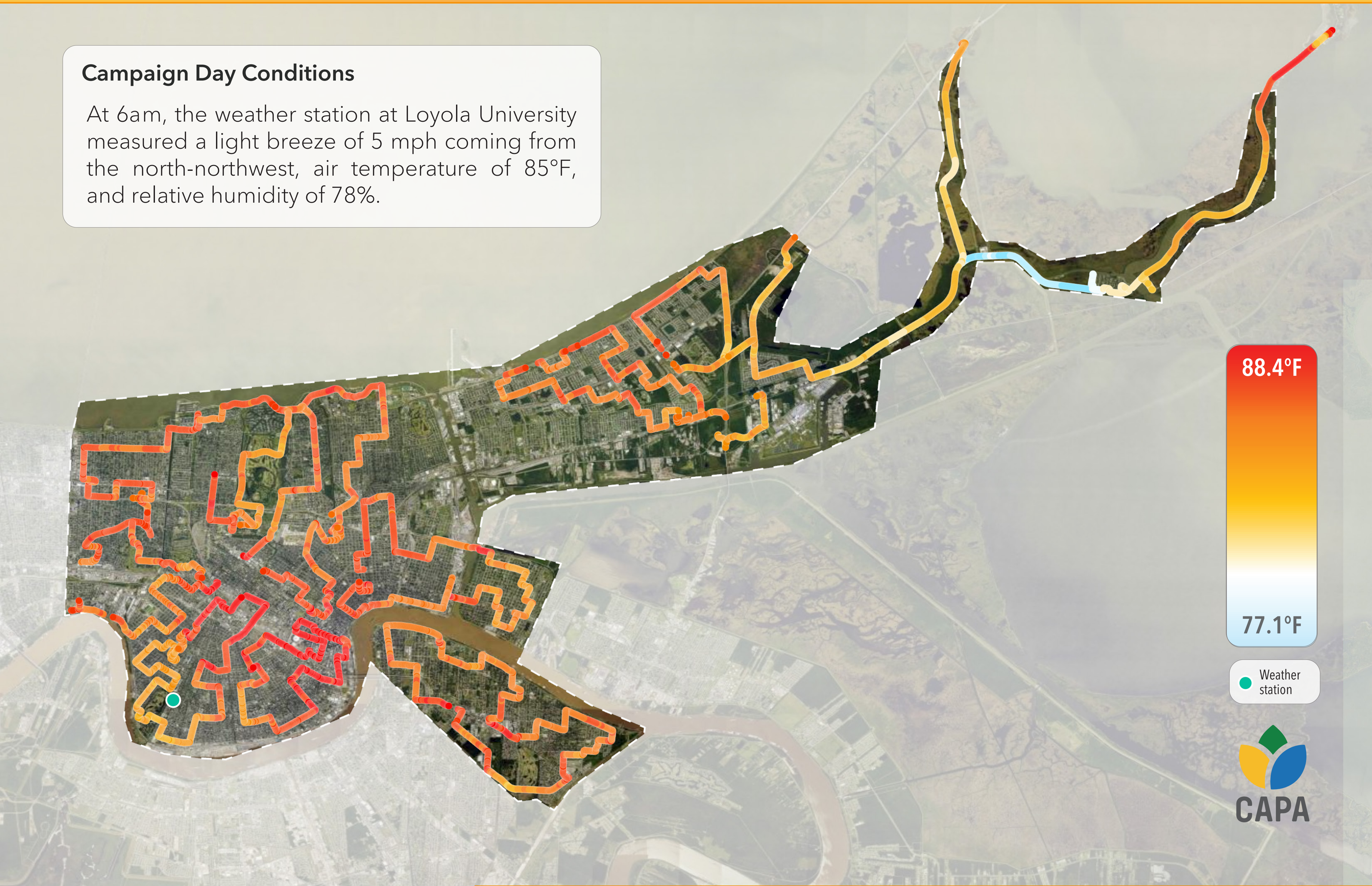
How does your own experience with heat in these areas align with the map?

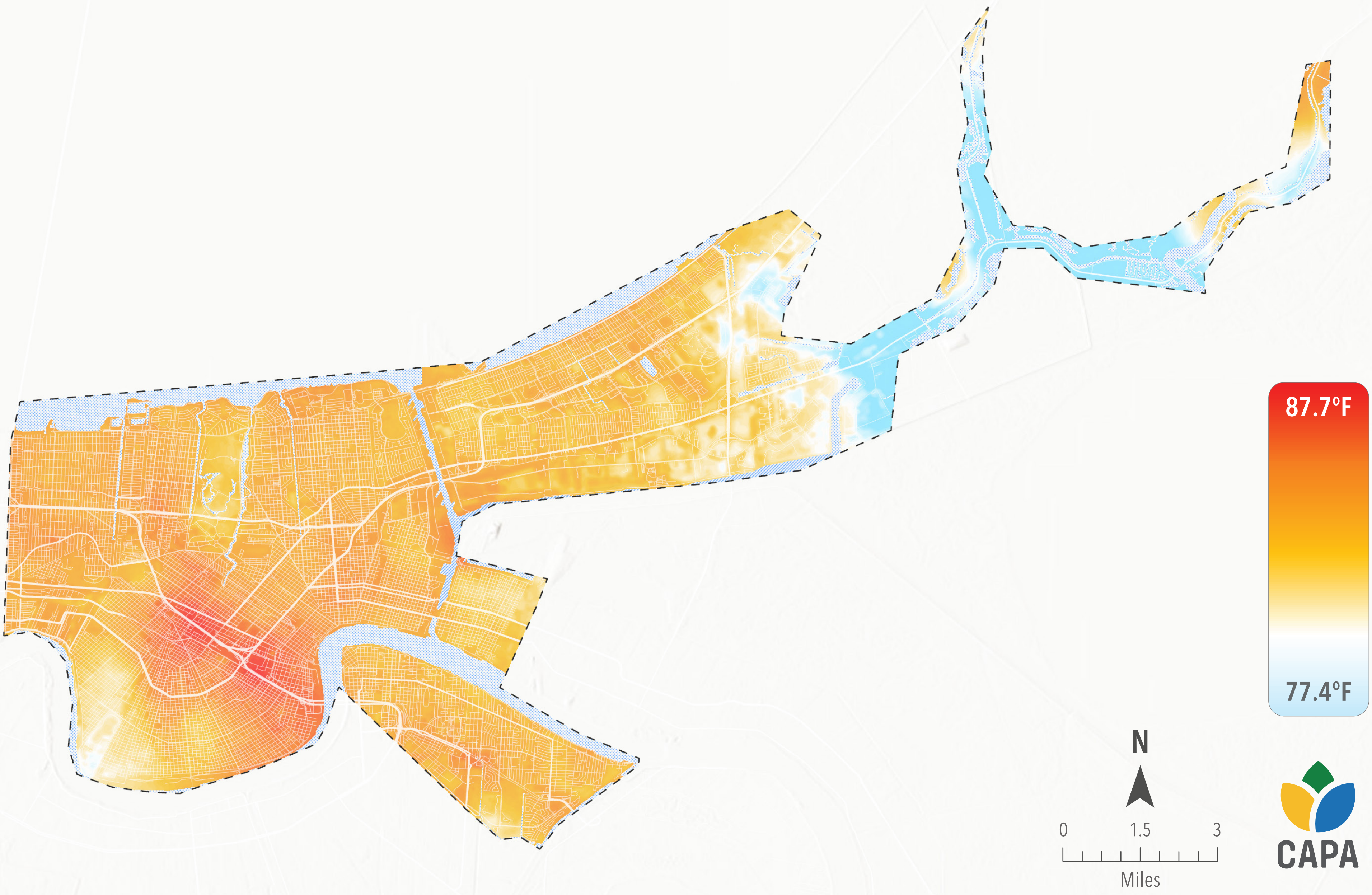
Find your home, place of work, or favorite park on the maps and compare the heat throughout the day to your personal experience.

What about the landscape (trees, concrete buildings, riverside walkway) do you think might be influencing the heat in this area?

Campaign Day Conditions

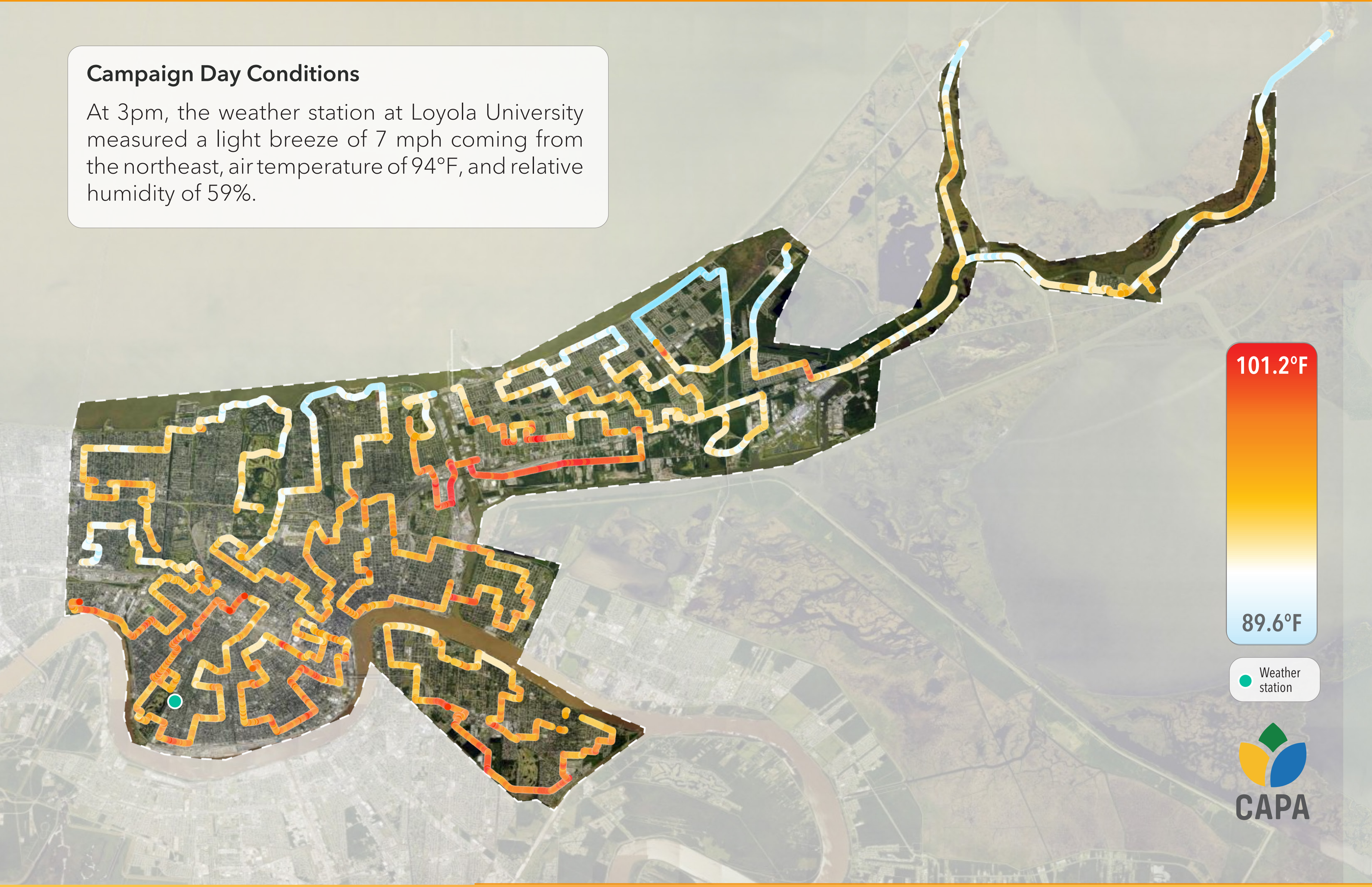
At 6am, the weather station at Loyola University measured a light breeze of 5 mph coming from the north-northwest, air temperature of 85°F, and relative humidity of 78%.

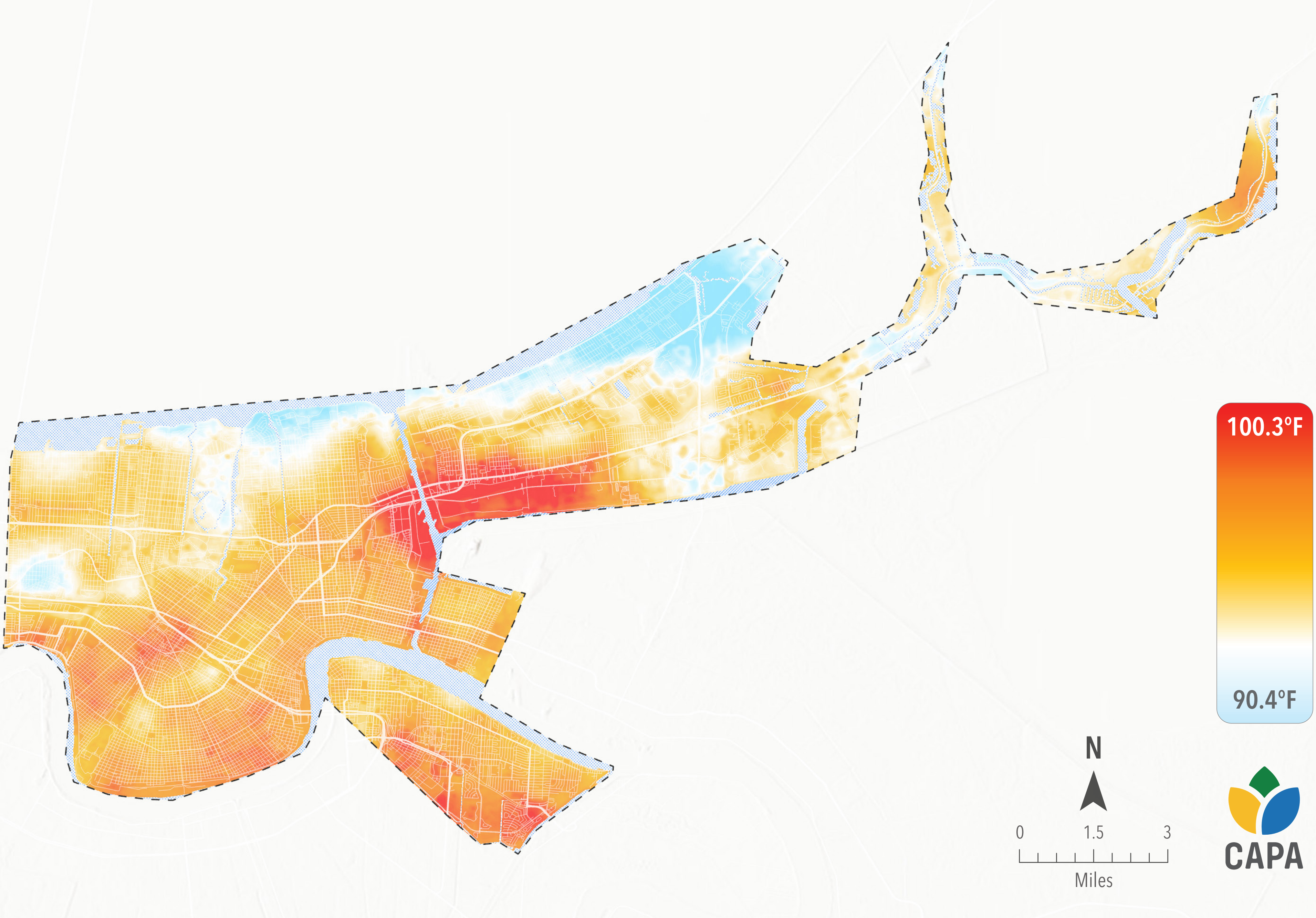



87.7°F
77.4°F
N
0
1.5
3
Miles

Campaign Day Conditions

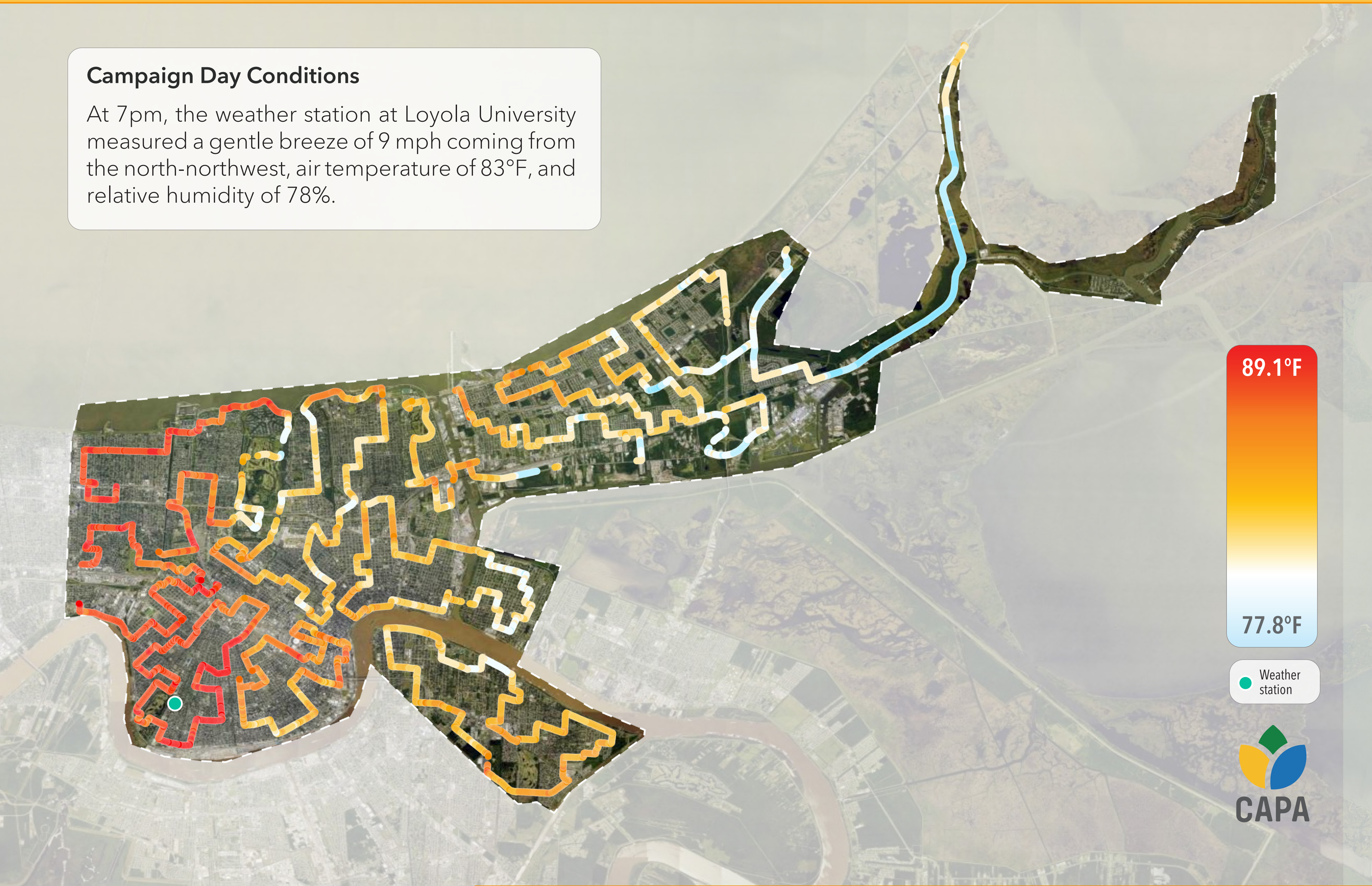
At 3pm, the weather station at Loyola University measured a light breeze of 7 mph coming from the northeast, air temperature of 94°F, and relative humidity of 59%.



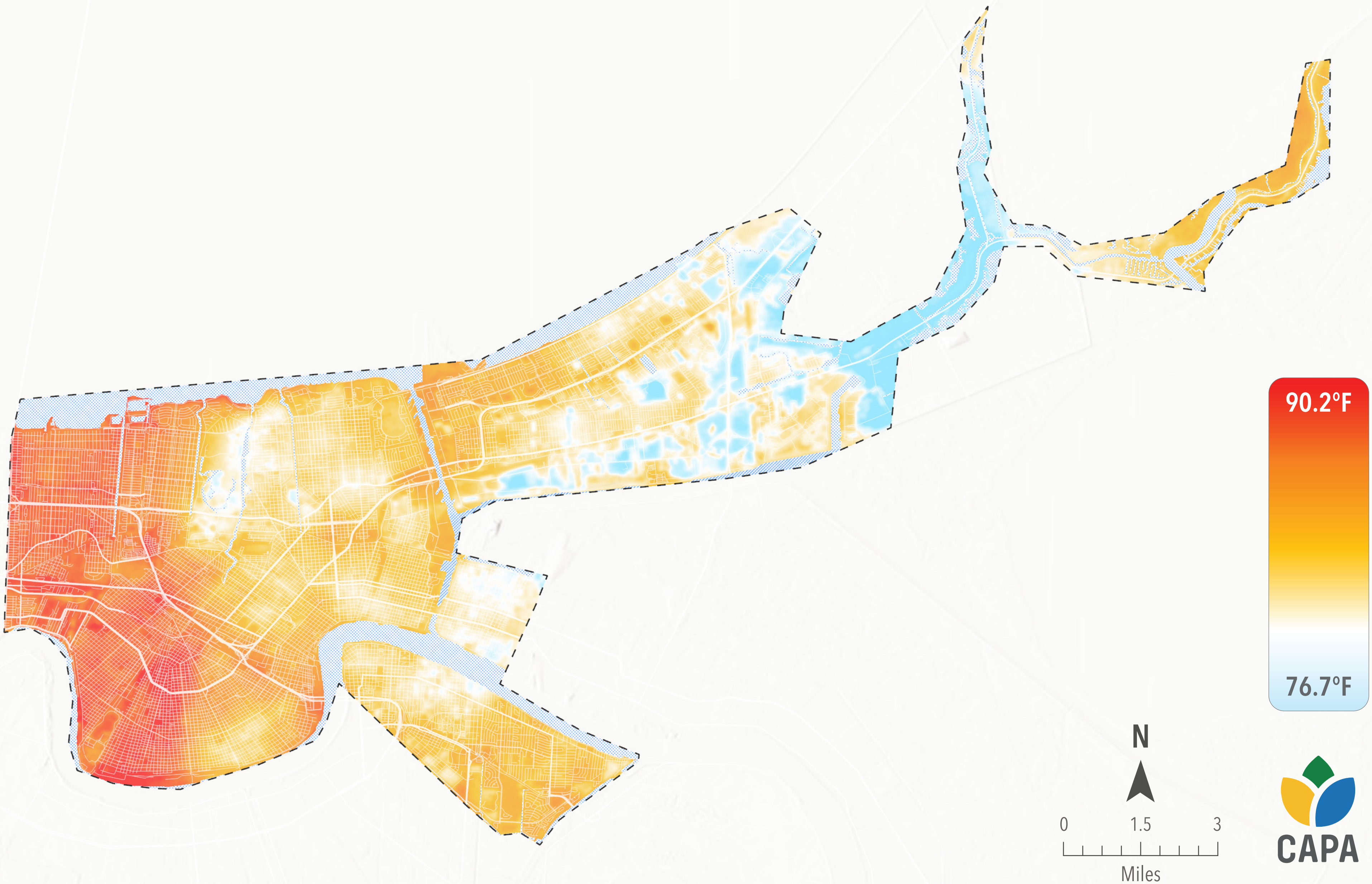

100.3°F
90.4°F
N
0
1.5
3
Miles
CAPA

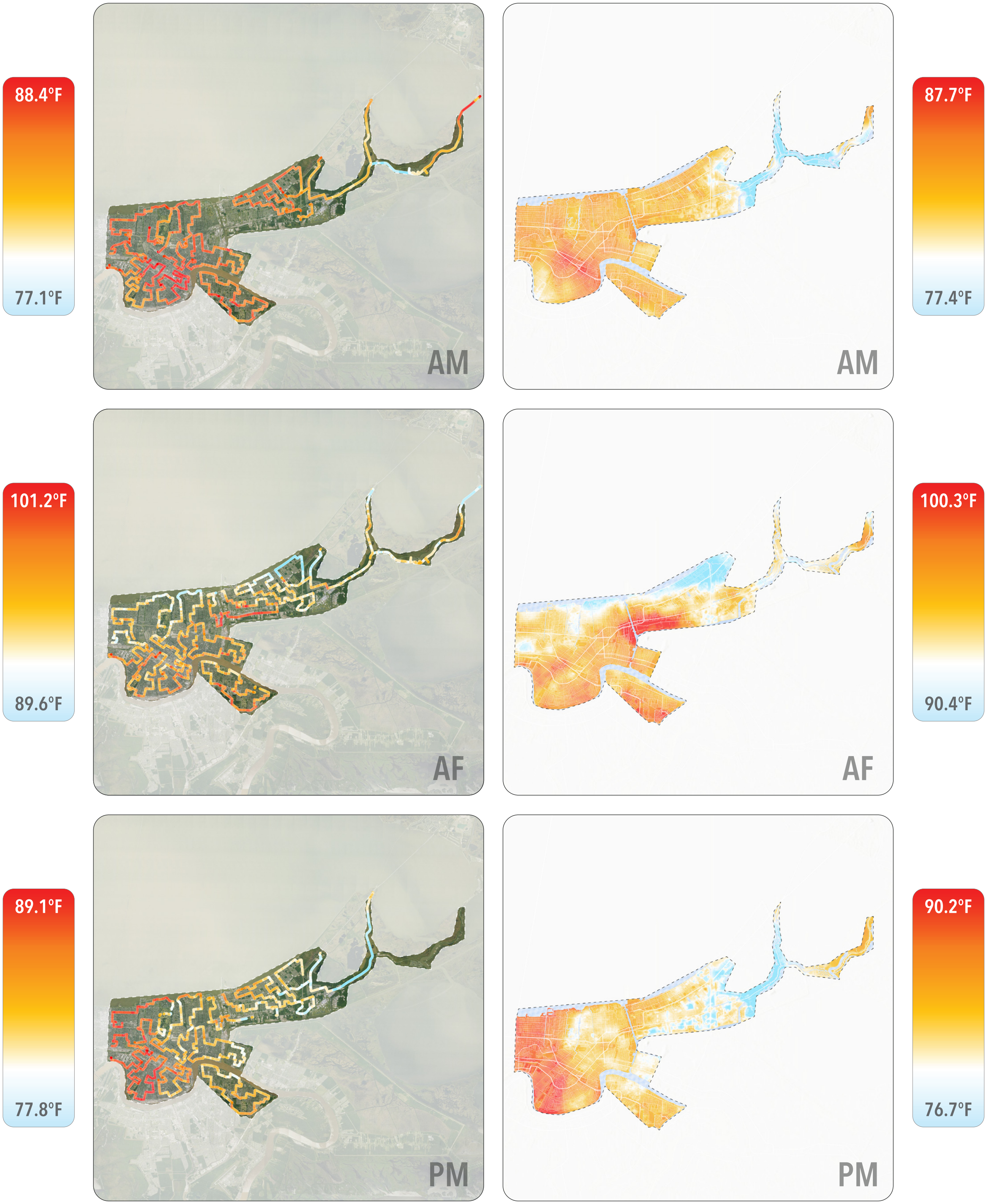
Campaign Day Conditions

At 7pm, the weather station at Loyola University measured a gentle breeze of 9 mph coming from the north-northwest, air temperature of 83°F, and relative humidity of 78%.

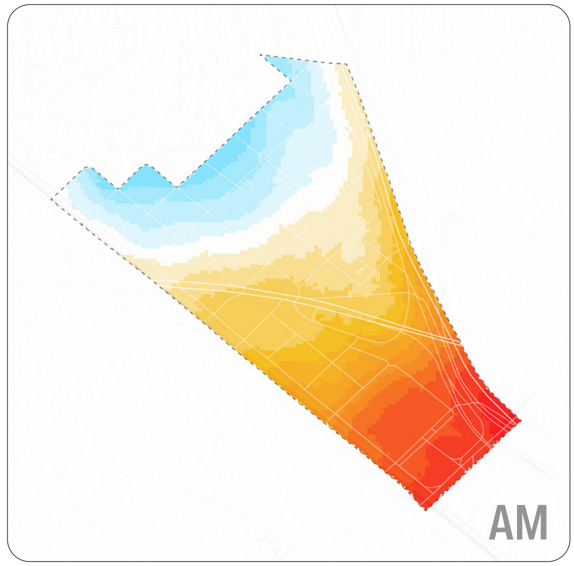


CAPA


90.2°F
76.7°F
N
0
1.5
3
Miles
CAPA

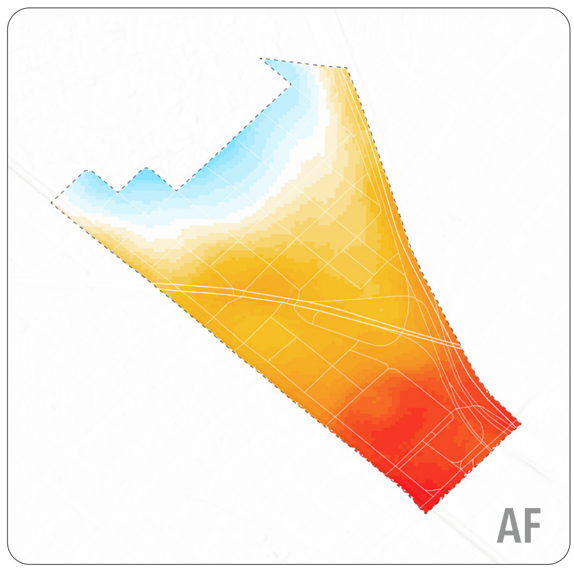

88.4°F
77.1°F
AM
AM
87.7°F
77.4°F
101.2°F
89.6°F
AF
AF
100.3°F
90.4°F
89.1°F
77.8°F
PM
PM
90.2°F
76.7°F

87.4°F
84.9°F



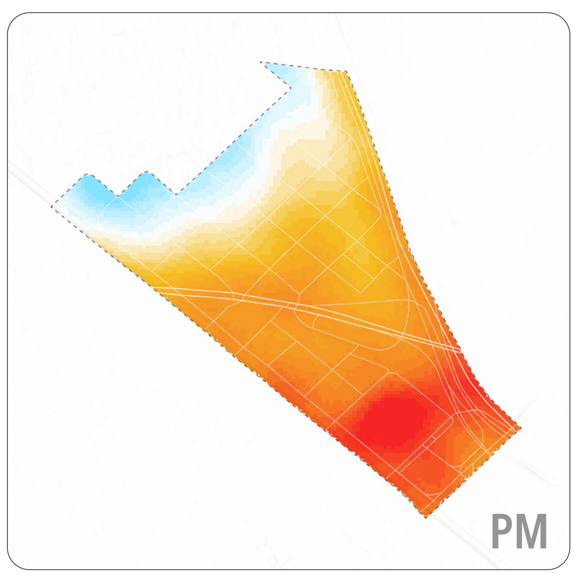
87.2°F
85.4°F

97.4°F
94.0°F

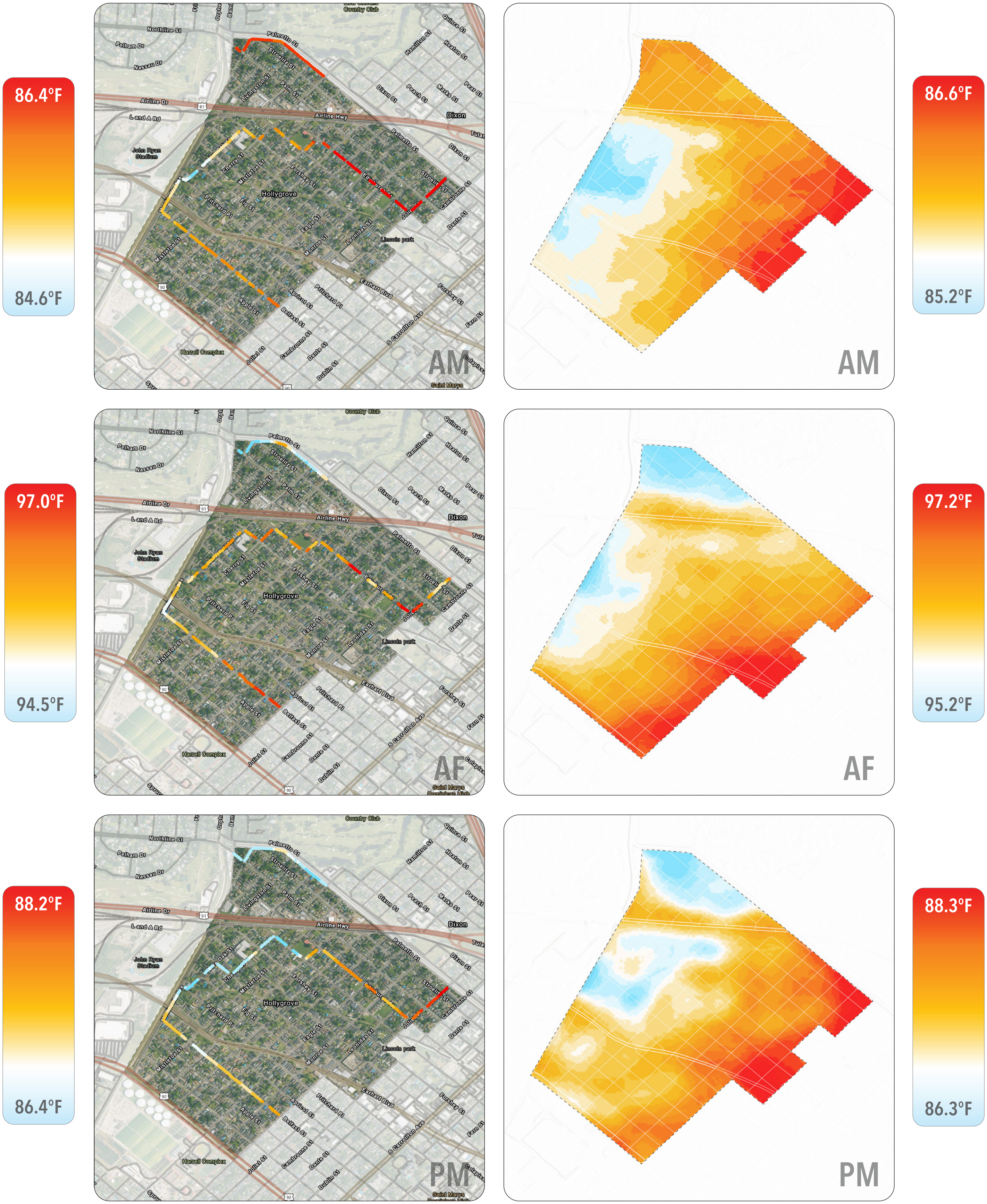


97.2°F
94.6°F

88.6°F
85.2°F



88.7°F
85.9°F


86.4°F
84.6°F
AM
AM
86.6°F
85.2°F
97.0°F
94.5°F
AF
AF
97.2°F
95.2°F
88.2°F
86.4°F
PM
PM
88.3°F
86.3°F
Hollygrove
Airline Hwy
Lincoln park

Accuracy Assessment*	
Model Period	Adjusted R-Squared
6 - 7 am	0.96
3 - 4 pm	0.82
7 - 8 pm	0.95

Accuracy Assessment

To assess the strength of the predictive models, CAPA analysts use a method called repeated random sub-sampling validation. This process is repeated 10 times for all six temperature and heat index models. In each repetition, the model is trained on a random 10% of the field data, and its performance is then tested by predicting the values for the remaining 90% of the data. The final accuracy score reported is the average of the performance metrics from all 10 repetitions. This approach provides an estimate of the model's predictive power. For validation, the metric used is R-squared (R2), where a value of 1.0 indicates perfect predictability and a value of 0 indicates a total lack of predictive ability.

Field Data

Like all field campaigns, Heat Watch collects temperature and humidity data using a defined set of protocols and experimental controls, including outlier detection and removal. If errors go unreported or undetected during data collection, they may reduce the accuracy of the resulting datasets and models. Viewers should keep this inherent limitation of field data collection in mind when interpreting the results.

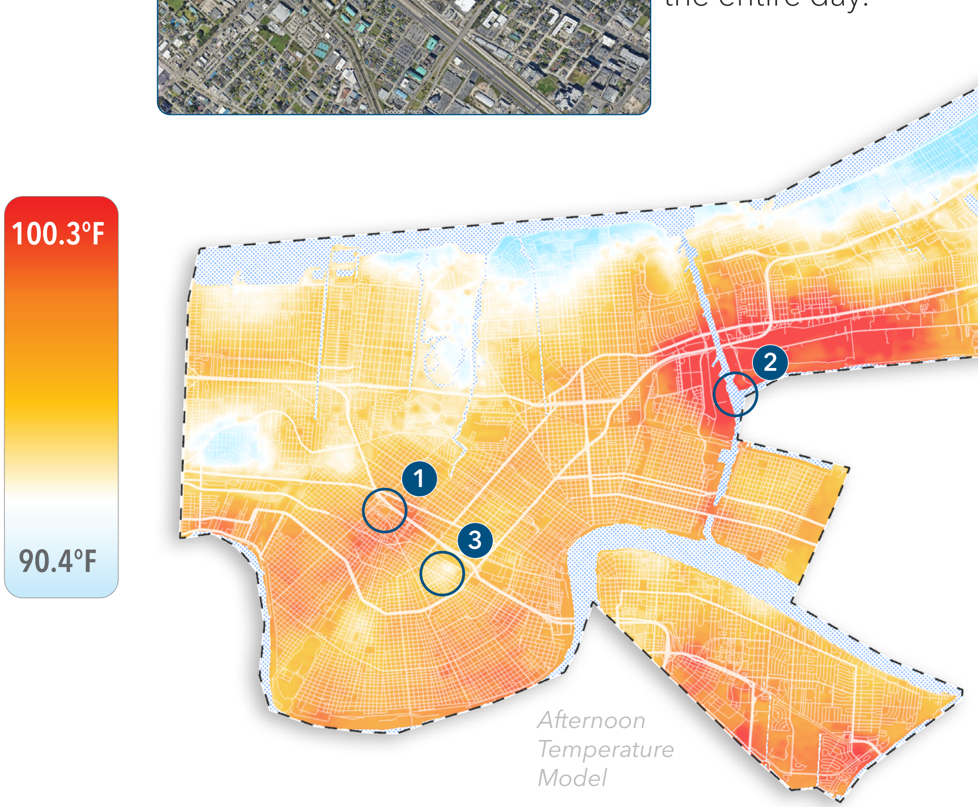
Prediction Areas

The traverse points used to generate the area-wide models do not cover every square mile of the studied area—rather, a sampling approach gathers representative measurements across the diversity of land-use, land-cover, and biophysical attributes of each study area. A geostatistical model then uses these observed heat and land cover associations to make predictions for areas not directly covered by the routes. The final prediction map is not the result of a single model run. Instead, it is the average of the 10 separate models generated during the validation process. This method, known as ensembling, produces a more stable and reliable spatial prediction of temperature and heat index across the entire study area.

The distribution of heat across an urban area varies in part due to land use and land cover features. Below are several initial observations of this phenomenon occurring in the results.

1

The area around the intersection of I-10 and Highway 61 features wide swaths of impervious surfaces that remain hot throughout the entire day.



3

Despite its neighboring industrial land, this small park appears to provide a cool spot with open space and tree shade.

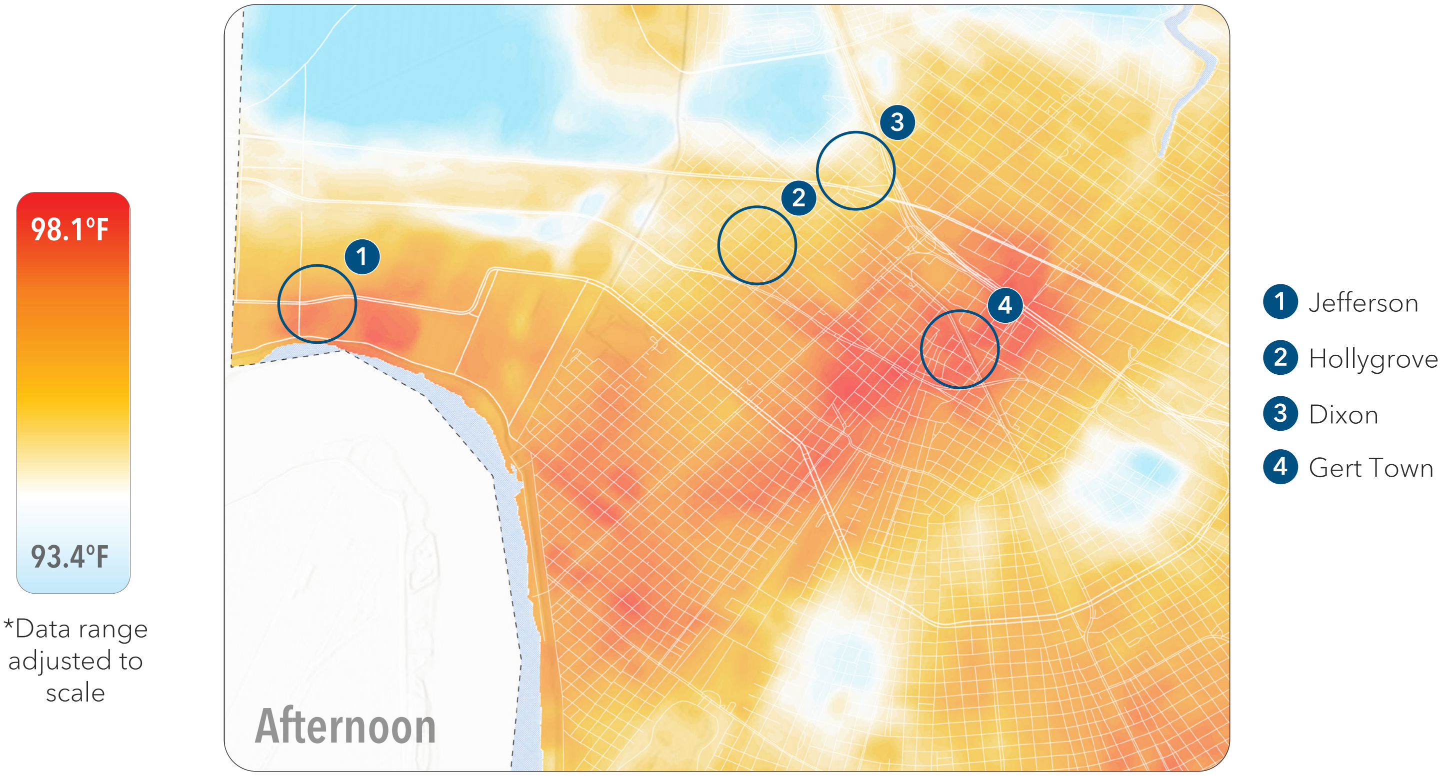
2

Industrial land uses in this area appear to concentrate heat in the afternoon, warming surrounding residential areas.

Daily Weather Patterns

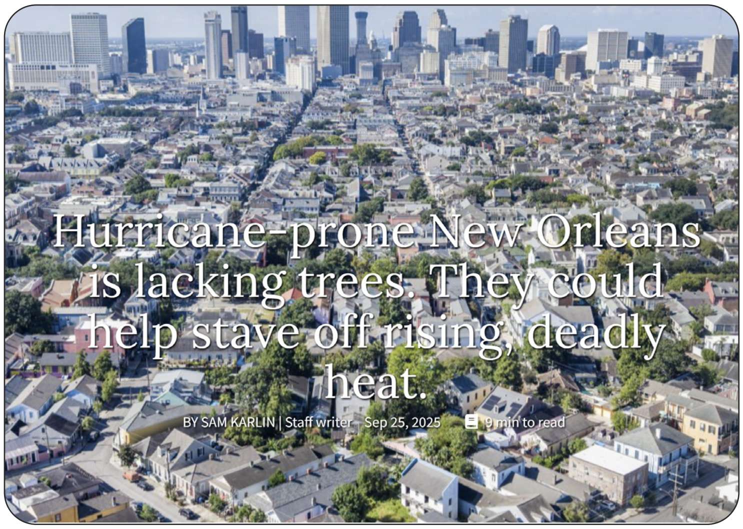
Along with land cover and geography, heat distribution also varies across urban areas throughout the day due to diurnal shifts in solar radiation and wind. Morning Heat Watch maps reveal patterns in the heat absorbed by materials of the built environment during the previous day and dissipated into the ambient environment throughout the nighttime. Winds tend to be calmest during the early morning, concentrating warmer air in the urban environment. By the afternoon, surfaces and materials like asphalt and concrete have warmed significantly from the sun's radiation, and warm air can become trapped in dense urban areas, whereas areas with more trees and green space may stay cooler due to shade and evapotranspiration. In the evening, the urban environment is beginning to cool, though at different rates based on the various land covers present.

In the morning in New Orleans, temperatures are already high, with heat concentrating in the center of the city along I-10 and Highway 61 / Tulane Avenue. Within this central region of the city, areas with more vegetation such as Audubon Park and City Park are relatively cooler. Morning temperatures are coolest in the northeastern region of the study area, where Bayou Savauge and other natural areas and water bodies are located. In the afternoon, a northeastern wind appears to bring cool air from Lake Pontchartrain into the northern lakefront part of the city. A notable patch of heat appears across the industrial area that spans from the Desire Area east along Highway 90. Hot spots also appear in places with high amounts of impervious surfaces around Gert Town, Algiers, and Jefferson neighborhoods. Around 6pm, a brief rain event appeared to cause temperatures to drop across the city before the evening route. A strong temperature gradient from west to east is present in the evening temperature map. Distinct cool spots appear in areas with dense canopy cover and vegetation while highly developed areas remain relatively warmer.



*Data range adjusted to scale

@capastrategies www.capastrategies.com



2025 Community Science Partners

@capastrategies www.capastrategies.com

Thank you to all of the organizers, coordinators, drivers, and navigators who supported Heat Watch New Orleans. This effort would not have been possible without your time, energy, and commitment!

In addition to this summary report, the campaign results include processed datasets and metadata, hosted on the Open Science Framework (link), as well as an interactive web app, hosted on ArcGIS Online (link). CAPA provides these products directly to campaign leaders, who serve as the long-term stewards of these results. With these resources in hand, several next steps are recommended:

1 Review and Discuss Findings

Organizing partners should first review the results, including this report, web-maps and datasets, and note any questions for CAPA about the analytical processes and map outputs. The Frequently Asked Questions section in the report appendix addresses several common questions. Campaign leaders are encouraged to meet with the CAPA team to discuss impressions, questions, and possible follow-up steps.

2 Share with Participants and the Community

Campaign leaders may share the results with project participants, governmental and non-governmental partners, and the broader public. Releasing results first to Heat Watch participants provides an opportunity for participants to reflect on the findings and offer input on their meaning and application. This has been shown to forward the engagement process and honor their participation. CAPA can also attend presentations and events virtually to provide technical commentary and support.

3 Plan Strategic Media Outreach

Since results typically arrive in the fall, campaign teams may wish to time releases of the results to media for winter or early spring—aligning with preparations for the coming heat season. Teams might also reconnect with local news outlets that previously covered the campaign. CAPA's Media Guide offers recommendations on communicating results, including how to extract map pages from the report and replicate map color ramps in GIS. Please reach out to CAPA if you have questions on how to extract maps and related materials, and be sure to provide appropriate citations and access to the results.

4 Apply and Build on the Data

Heat Watch data can be used immediately to identify people and places most exposed to extreme heat. To deepen understanding and guide interventions, partners can compare Heat Watch results with sociodemographic data on heat-vulnerable populations, land cover and canopy data, health incident records, and related data sources, and examine patterns across scales from the neighborhood level to Census geographies. These insights can inform policies, heat action plans, and emergency response protocols. CAPA will remain available to support local partners with technical advising, examples from past projects, and additional services for monitoring, analysis, and resilience planning. As land cover and weather patterns change, remapping is recommended every 3–5 years to track progress and update datasets.

5 Continue Engagement and Collaboration

Heat Watch maps and findings can serve as ongoing tools for engagement through workshops, public meetings, and community discussions. CAPA invites partners to continue sharing about how the data are being applied by sharing links, reports, and publications so that others can learn from their progress. Project partners are encouraged to stay connected with resources from NOAA and NIHHIS, such as the Heat Beat Newsletter and social media accounts @heatgov, as well as resources from CAPA, including the Climate Current Newsletter, Cooling Conversations Webinars, and social media accounts @capastrategies on Instagram, LinkedIn and Twitter/X.

Conclusion

By continuing to apply, share, and build on these results, campaign teams can ensure that Heat Watch data become a catalyst for stronger, more collaborative, and more equitable responses to extreme heat. Together, local leaders, residents, and their partners can turn these findings into action, shaping healthier, more resilient communities for the seasons ahead.

CAPA

A. Data and Access

A1. How can I access the data from Heat Watch?

All Heat Watch data (traverses, models and metadata) are available here. When first delivered to campaign leaders, the OSF page is provided as a view-only link; once the results are approved by the local team, CAPA will update the OSF page to be publicly accessible. All Heat Watch data, this summary report, and metadata will then be available for download and use by the public.

A2. In what format are the data provided?

The traverse point data from each time period (morning, afternoon and evening) are provided as vector shapefiles.The models from each time period are provided as geo-tiff rasters at 10-meter resolution. In order to view and manipulate these data, GIS software is needed.

A3. What is the accuracy of the traverse point temperature measurements?

The Heat Watch sensor includes a temperature probe that is accurate to ±0.5°F. The response time (the amount of time it takes for the sensor to accurately measure a change in temperature) is 1 second.

A4. If the study area warms or cools over the hour, how is this effect accounted for in the data processing?

This area warming or cooling effect is accounted for in several ways. The majority of the data collection routes are circuitous, as in they start and stop in roughly the same location. This design helps to inform the estimated linear rate of change of temperature in each route. CAPA analysts develop a linear regression model for each route to detect and remove the warming or cooling trend from the measurements.

Heat Watch routes (or "traverses") are designed in compliance with the WHO's Guidance on Measuring, Modelling and Monitoring the Canopy Layer Urban Heat Island (CL-UHI), Subsection 5.3.2 Traverse approach.

A5. Why only one day for data collection? Does this reflect the variation of heat distribution during the summer time?

The campaign day is selected strategically based on historical climate data and forecasted weather conditions that indicate high temperatures, low wind, low cloud cover and little to no precipitation to provide a "baseline" or "snapshot" of urban heat distribution. Differing weather conditions, such as wind speed and direction, may slightly influence the spatial distribution of heat, and these variations are not accounted for in the current Heat Watch model.

Heat Watch provides a spatially-rich approach that requires extensive logistical planning and intensive community engagement to conduct; other, more temporally-rich forms of monitoring, such as stationary monitoring, are more suitable for tracking variations and patterns over time, although they are more diffuse in spatial coverage.

B. Relative Humidity and Heat Index

B1. Where are the relative humidity and heat index results, and why are only the temperature results displayed in this report?

The relative humidity measurements and heat index calculations are provided in the traverse shapefiles for each time period; heat index models are provided with the rasters. Temperature data is the focus of this report because it is the most plainly understood variable and based more on direct measurements of the environment. Temperature then provides the basis for incorporating relative humidity to calculate heat index.

B2. What is the accuracy of the relative humidity measurements?

The accuracy of the relative humidity sensor is ±3%.

B3. What is heat index and how is it calculated?

Heat index is an approximation of the heat felt when the presence of humidity is felt in combination with temperature. The heat index combines the measured traverse point temperature with its corresponding relative humidity measurement, using the same equations as advised by the National Weather Service. Note that there are multiple ways of calculating heat index at various thresholds. To learn more, visit https://www.weather.gov/safety/heat-index.

B4. Where can the relative humidity and heat index data be accessed?

All results are available through OSF, and the relative humidity and heat index data can be viewed and manipulated using GIS software.

C. Maps and Visualization

C1. How can I visualize the data and make maps similar to the report?

You can extract and print any map from this pdf report to use in media and other products. If you wish to visualize the data in similar style (colors, breaks, etc.) using a GIS tool, please see the CAPA Heat Watch Style Guide.

C2. Why do the maps show the temperature range of just that period (e.g. morning minimum temperature to morning maximum temperature), instead of the entire day (i.e. overall minimum to overall maximum)? Wouldn't this allow better visualization of how heat shifts throughout the day?

Presenting the temperature range of each time period emphasizes the distribution of heat within that specific time period. While the data can be visualized differently with the range from the entire day, the differences across the area then become much less apparent in the maps.

C3. Why are the ranges between traverses and models slightly different?

You may notice that for instance the maximum temperature in a traverse point dataset is 94.1°F, whereas the maximum temperature from its corresponding area-wide model is 94.5°F. The reason for this slight discrepancy is inherent to predictive modeling – all models introduce some degree of uncertainty and error. The best-fit model consists of many input variables that may produce a slightly higher or lower prediction of temperatures than measured by the traverses.