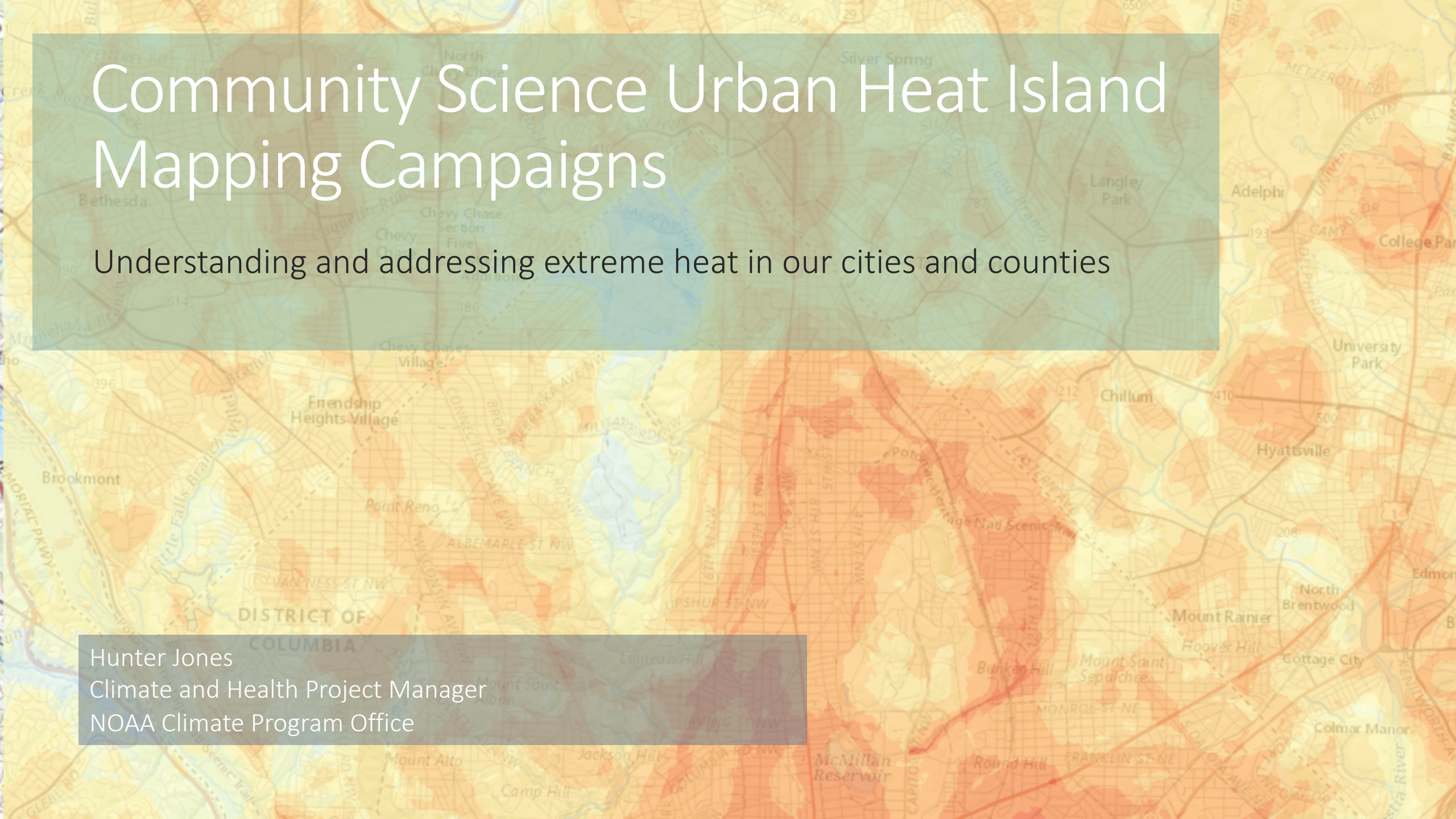
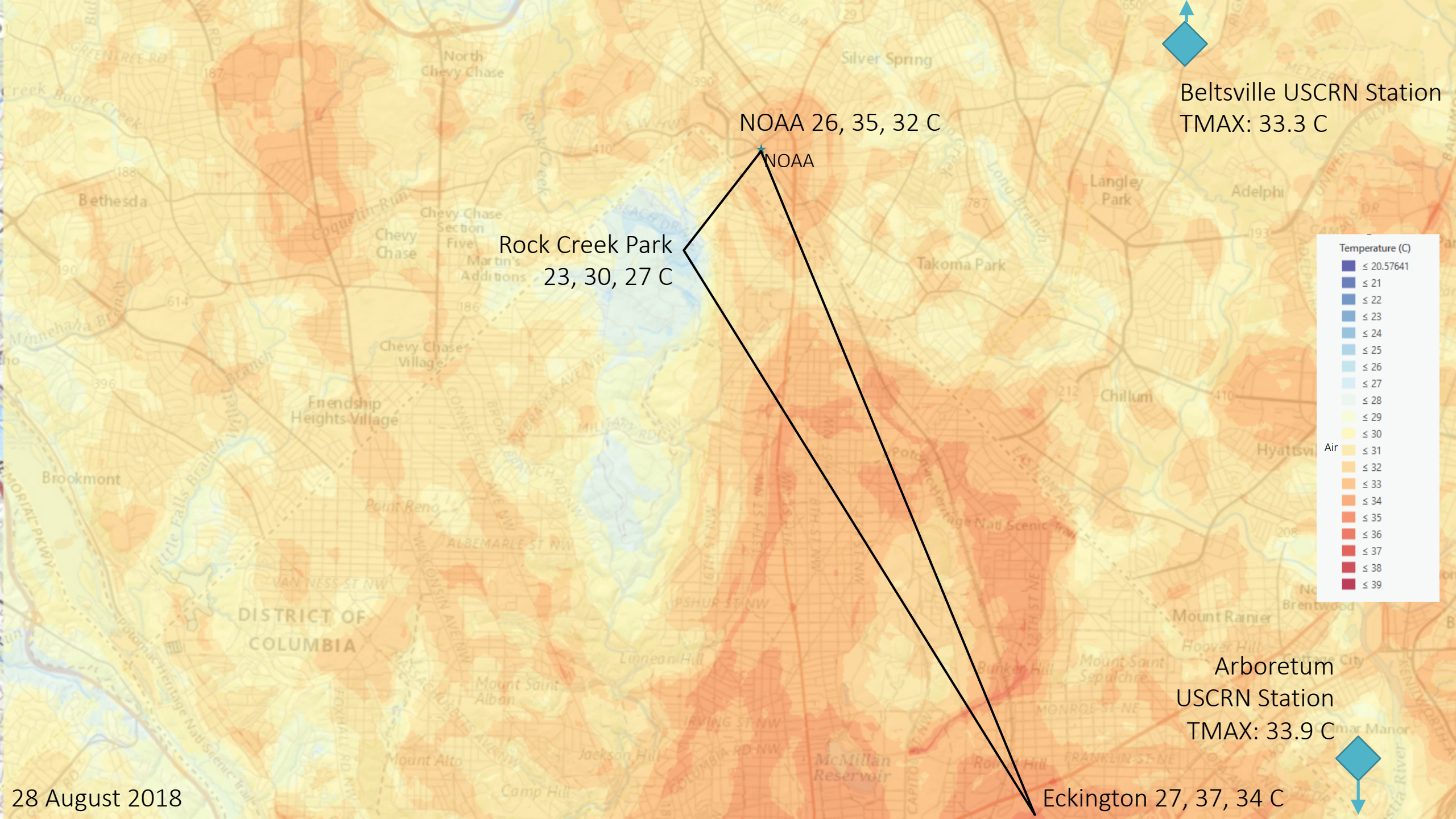
Community Science Urban Heat Island Mapping Campaigns

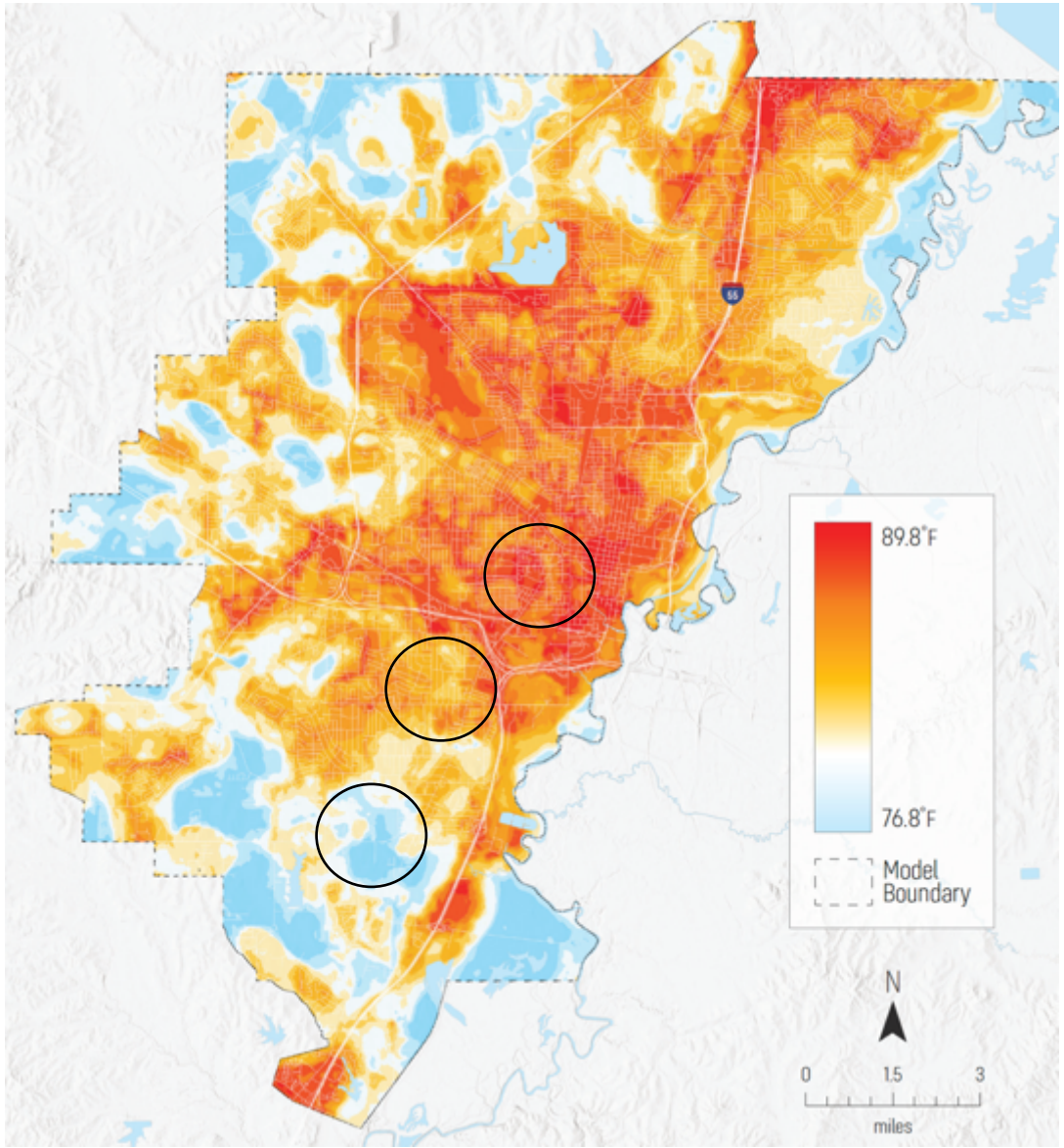
Understanding and addressing extreme heat in our cities and counties



Hunter Jones
Climate and Health Project Manager
NOAA Climate Program Office

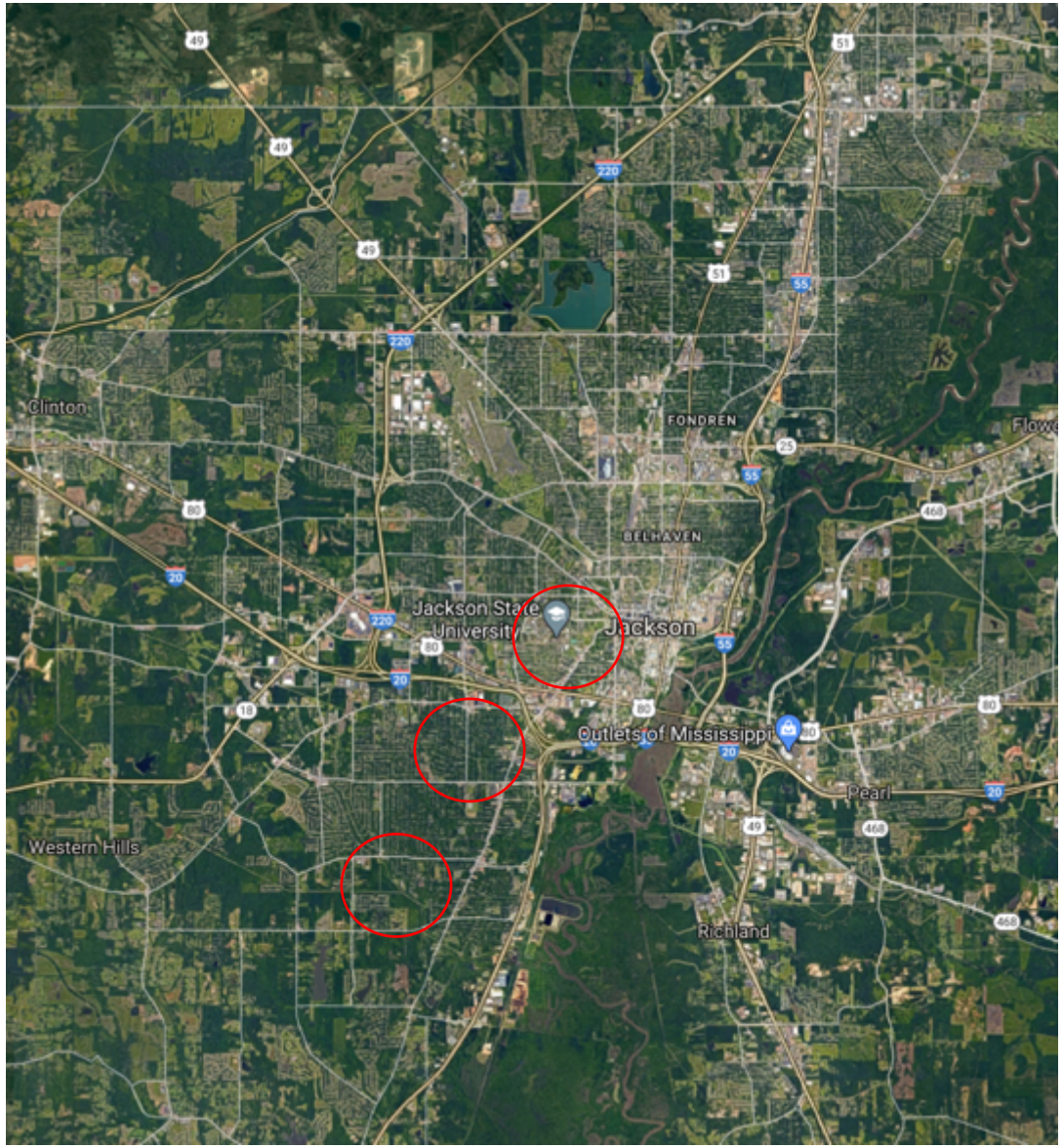

Beltsville USCRN Station
TMAX: 33.3 C
NOAA 26, 35, 32 C
NOAA
Rock Creek Park
23, 30, 27 C
Temperature (C)
≤ 20.57641
≤ 21
≤ 22
≤ 23
≤ 24
≤ 25
≤ 26
≤ 27
≤ 28
≤ 29
≤ 30
≤ 31
≤ 32
≤ 33
≤ 34
≤ 35
≤ 36
≤ 37
≤ 38
≤ 39
Air
Arboretum
USCRN Station
TMAX: 33.9 C
Eckington 27, 37, 34 C
28 August 2018

CAPA Strategies Heat Watch Evening Temperature Model



From CAPA Heat Watch Report, 2020

Satellite Image from Google



Jackson, Mississippi

Historical Housing Policies and Inequity in Urban Heat Exposure

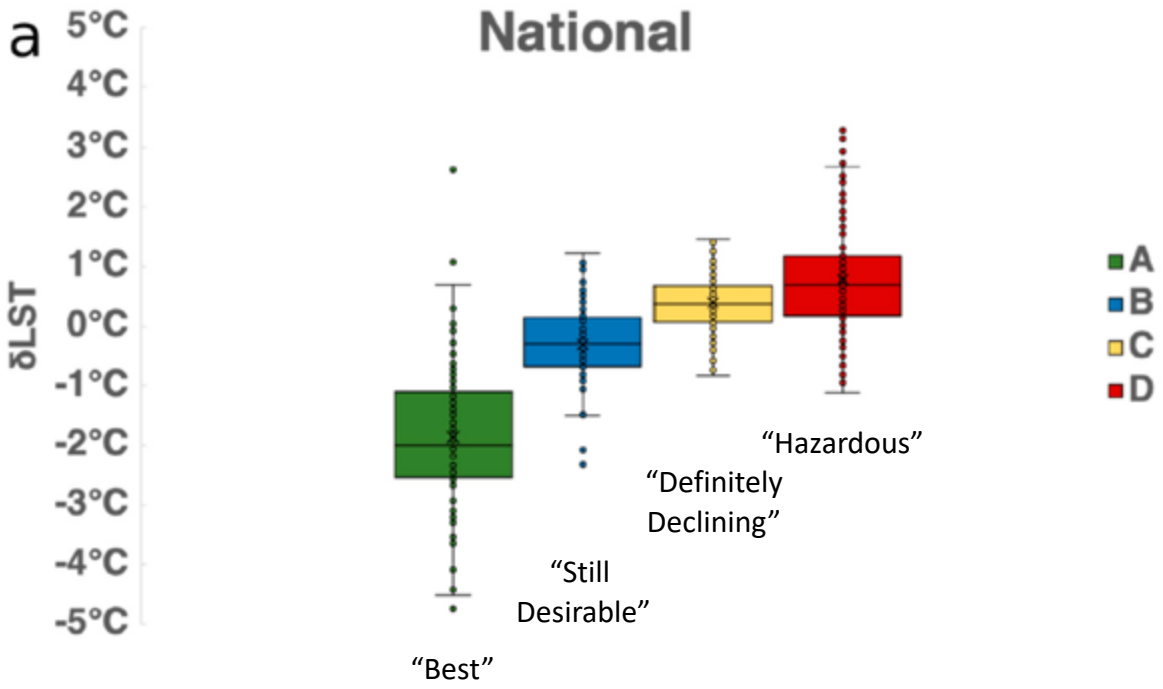


Figure 3. Land Surface Temperature (LST) anomalies binned by HOLC classification

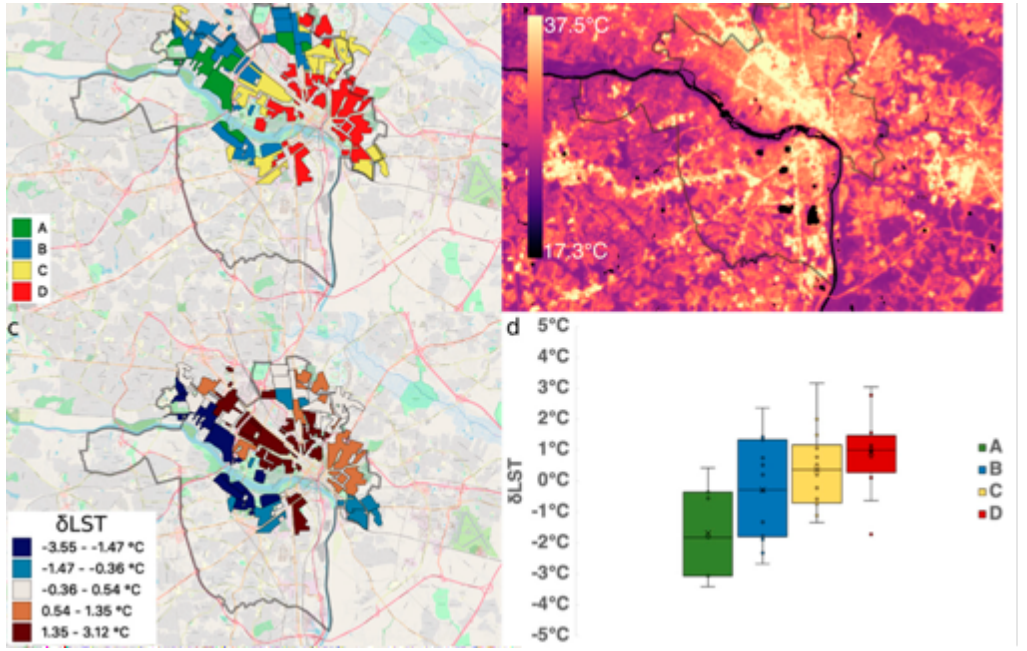


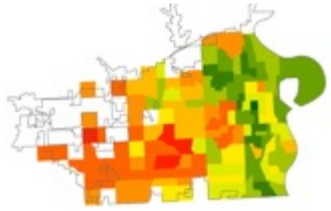
Figure 2. HOLC classification and LST in Richmond, VA

Hoffman et al., 2020

Trees and Vegetation

Green Roofs

Cool Roofs & Pavements



Targeted Early Warning

Smart Growth

Weatherization

Green Building Programs and Policies

Sun Shades

Mobile Cooling Vans

Spray Parks

Communication and Education

Energy Assistance Programs

Enabling Urban Solutions with Better Urban Heat Island Information

Many of the existing actions and interventions used to reduce the health impacts of extreme heat can be informed by detailed urban heat island information. They can be targeted to the hottest areas in the short-run, and cities can be better designed to manage UHIs in the long-run.

The National Integrated Heat Health Information System (NIHHIS)

- NOAA and CDC launched the National Integrated Heat Health Information System (NIHHIS) in June of 2015 to address heat risk planning, preparedness, and response.
- NIHHIS develops new integrative information products and coordinates programmatic activities with an **interagency working group**.
- NIHHIS has also launched **local pilots and urban heat island mapping campaigns** to understand local decision-making context and information needs, and to improve the information available for heat health risk mitigation.

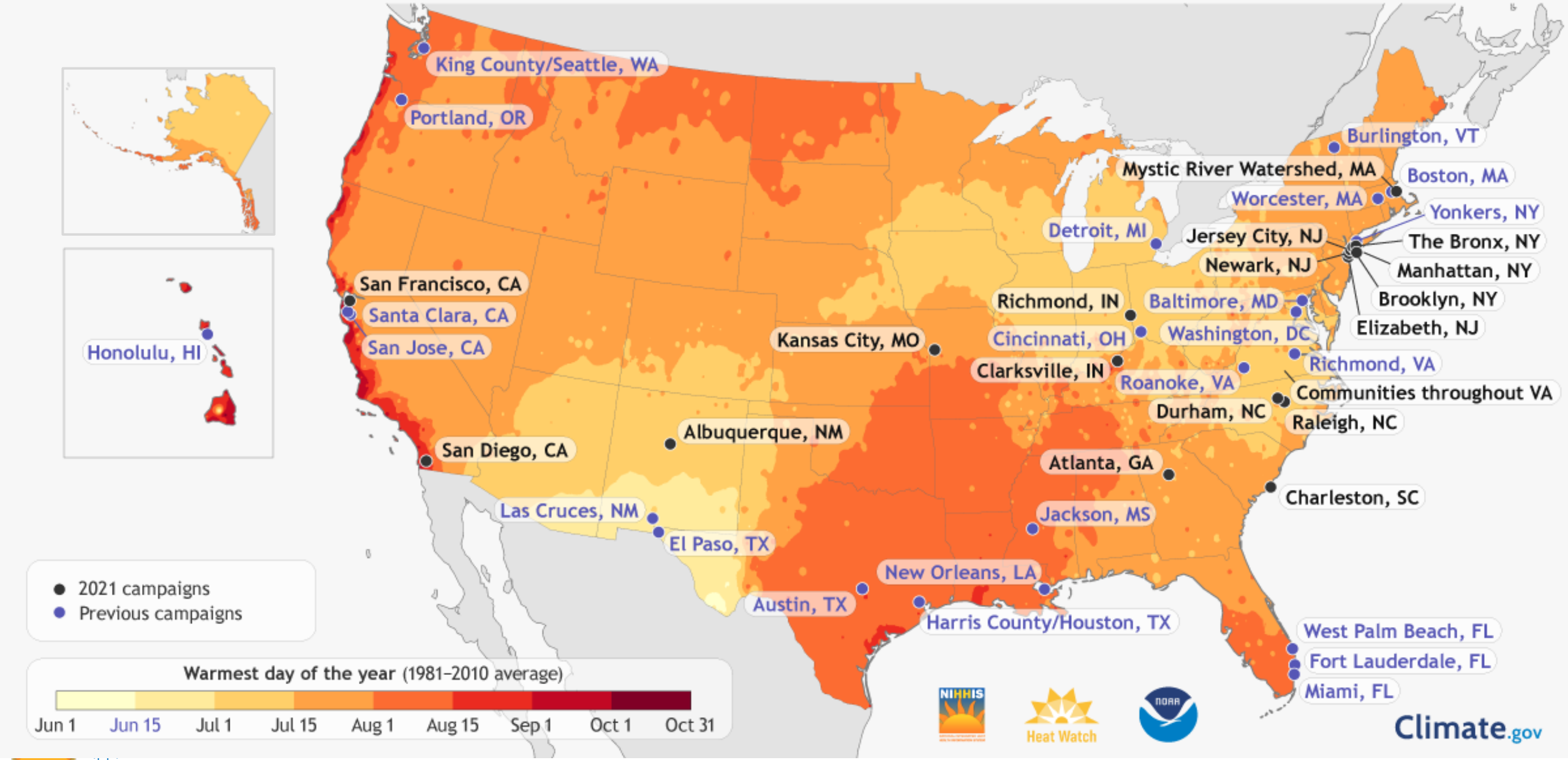
Ongoing activities include:

- Prototyping new integrated climate-health products such as the NIHHIS extreme heat vulnerability tool, the climate and health monitor and outlook, and informative story maps.
- Developing Masterclasses through the Global Heat Health Information Network to increase capacity across the world.

NIHHIS operates according to a common framework of core questions under the following thematic areas: capacity & partnership, heat-health parameters & outcomes, data and forecast products, communication, intervention effectiveness

NIHHIS will facilitate an integrated approach to providing a suite of decision support services to reduce heat related illness and death

NOAA Urban Heat Island Mapping Campaigns: All Locations, 2017-2021



nihhis.cpo.noaa.gov

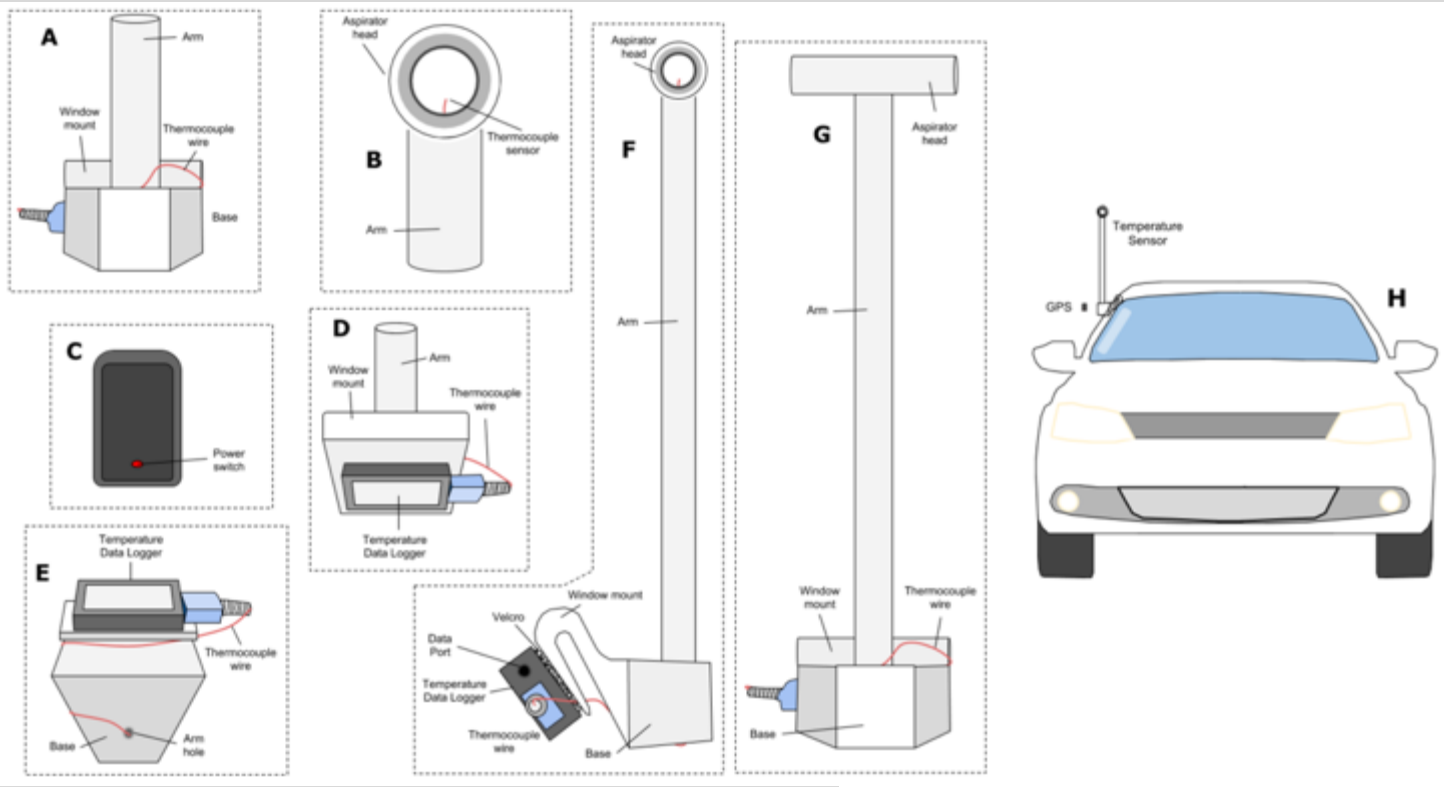


Figure 2 Rendering of Sensor Setup. (A) Front of base; (B) Aspirator detail; (C) GPS unit; (D) Back of base; (E) Bottom of base; (F) Profile of device; (G) Front of device; (H) Approximate scale of device and GPS unit (GPS unit kept inside of vehicle).

From Voelkel and Shandas 2017; adapted with permission from Makido et al., 2016.

The Field Campaign

The day prior:

Volunteers collect the gear and receive training on how to install it and operate it. They also get a science lesson on UHI.

The day of:

Volunteers run their assigned transect routes in the morning, afternoon, and evening.

The sensors log the temperature and humidity every second, along with GPS location.

Later this year:

The CAPA Strategies team combines the transects & landcover data from Landsat via a machine learning (random forest) process to generate heat intensity surfaces.

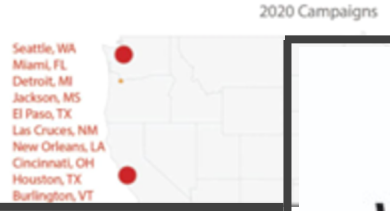
*Voelkel, J.; Shandas, V. Towards Systematic Prediction of Urban Heat Islands: Grounding Measurements, Assessing Modeling Techniques. Climate **2017**, 5, 41.*

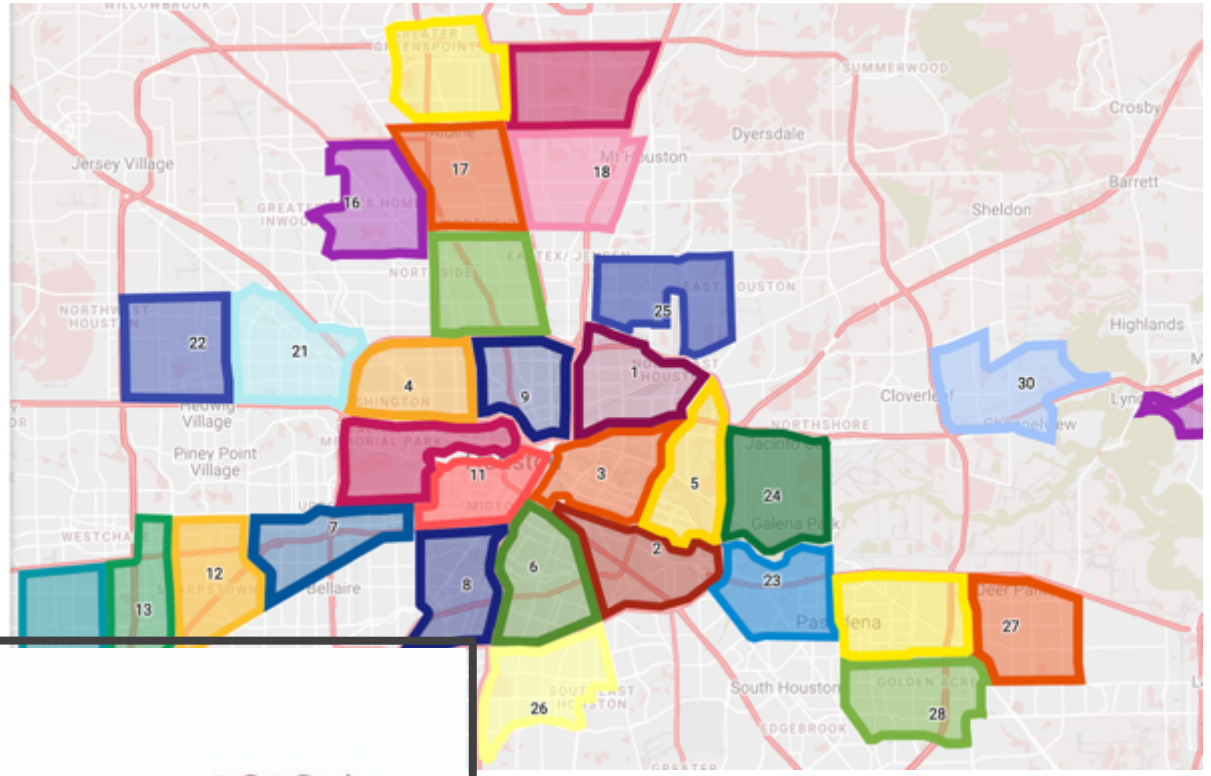
HEAT BEAT
newsletter

Timely information for people and communities who are working to address local concerns about heat health.

NOAA-funded 2020 Heat Campaign Cities Announced

Through a peer-review process, NOAA's Climate Program Office (CPO) selected thirteen community partners in cities across the U.S. to receive funding support to perform a community science urban





Organizer Training for CAPA Heat Watch
197 views • Mar 25, 2020
CAPA Strategies
3 subscribers

CAPA Heat Watch

Organizer Timeline

1. Set Goals
Determine the timing of your Heat Watch campaign and set up your team with partner organizations and a lead campaign "organizer".
10-12 weeks pre-campaign
4-5 hours by Organizer

2. Establish
Get to know the Heat Watch process, begin volunteer engagement with provided outreach materials, and schedule a kickoff meeting with the CAPA team.
6-10 weeks pre-campaign
4-5 hours by Organizer

3. Prepare
Ensure volunteers are ready for their important role as data collectors with a training session, knowledge check, and route assignment.
2-6 weeks pre-campaign
4-5 hours by Organizer
0.5-1 hour by Volunteer

4. Activate
Finish preparatory steps by finalizing a campaign date, notifying volunteers and distributing CAPA-provided equipment.
1-2 weeks pre-campaign
4-5 hours by Organizer
0.5-1 hour by Volunteer

5. Execute
Conduct a successful campaign, mapping the distribution of heat across your city at morning, afternoon and evening. Participants can connect via social media to share their
Campaign Day
4 hours by Organizer
4 hours by Volunteer

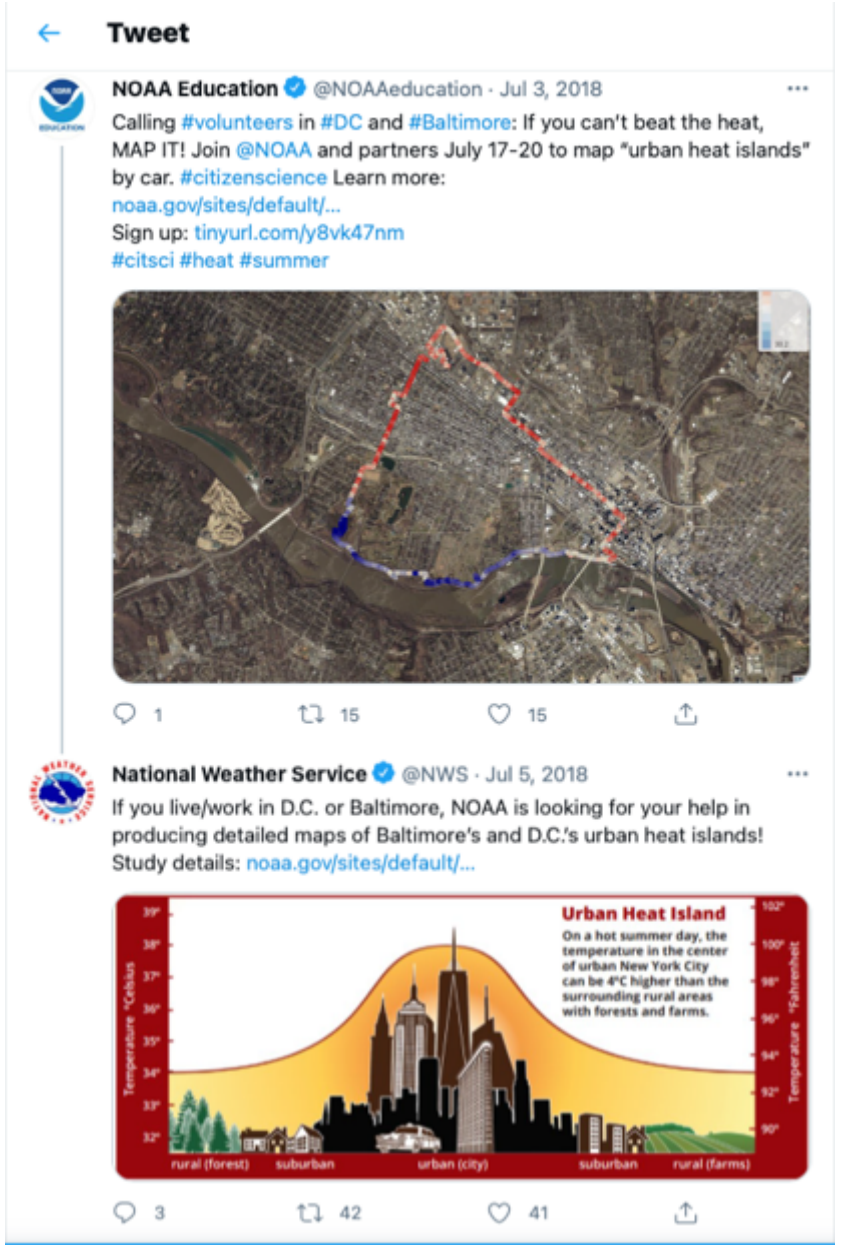
HARC
Harris County Public Health
Building a Healthy Community
The Nature Conservancy
RESILIENT HOUSTON

HOUSTON HARRIS HEAT ACTION TEAM (H3AT)

NIHHIS
nihhis.cpo.noaa.gov

Urban Heat Island (UHI) Campaign City Location	NWS Site	WPC Forecast Maximum Temperature and UHI Weather Criteria Assessment (Highly Favorable) (Favorable) (Less Favorable) SAT SUN MON TUE WED	Average Summer igh	Average Summer Record High	Average Annual 90° Days	Average Annual 95° Days	Average Annual 100° Days
Seattle, WA	SEA	76°F 83°F 89°F 85°F 80°F	74°F	92°F	4	1	0
San Jose/Santa Clara, CA	SJC	Outside Local Campaign Window	83°F	101°F	18	7	2
Las Cruces, NM	LRU	Local Campaign Complete	94°F	106°F	107	59	18
El Paso, TX	ELP	Local Campaign Complete	94°F	106°F	115	68	25
Austin, TX	AUS	Outside Local Campaign Window	94°F	104°F	114	64	21
Houston, TX	IAH	Outside Local Campaign Window	93°F	103°F	111	49	7
New Orleans, LA	MSY	87°F 88°F 88°F 88°F 89°F	90°F	98°F	86	17	0
Jackson, MS	JAN	93°F 94°F 93°F 92°F 90°F	91°F	103°F	86	28	3
Miami, FL	MIA	Local Campaign Complete	90°F	96°F	91	4	0
Roanoke, VA	ROA	Outside Local Campaign Window	86°F	100°F	30	6	0
Cincinnati, OH	LUK	92°F 93°F 93°F 89°F 87°F	84°F	100°F	22	4	0
Detroit, MI	DTW	Outside Local Campaign Window	82°F	98°F	13	2	0
Burlington, VT	BTV	Outside Local Campaign Window	79°F	95°F	8	1	0
Providence, RI	PVD	Outside Local Campaign Window	81°F	97°F	11	3	0

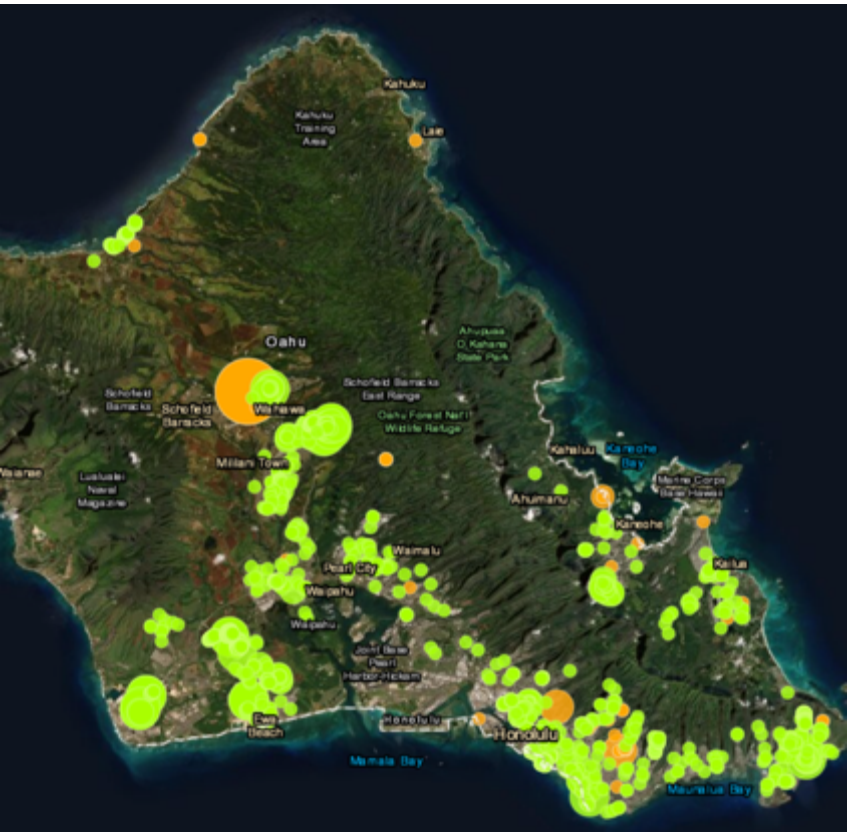
2020 Campaign Support from the NOAA Weather Prediction Center
& Weather Forecast Offices

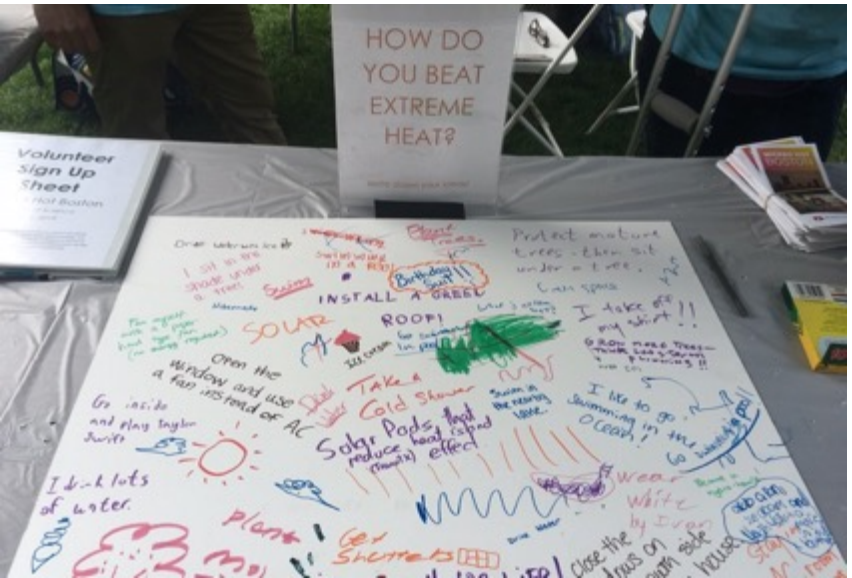


Why run these campaigns as community science initiatives?

From the 2020 Campaign:

Over **1 million** measurements taken by **375 volunteer** citizen scientists plying **173 transects** in **13 communities**





Involvement and Outcomes

Clockwise from upper-left:

- 10,000 Trees Honolulu (NGOs)
- Houston Resilience Plan (city & county government)
- Worcester Polytechnic Institute Bachelor of Science Qualifying Student Project (educational institutions)
- Museum of Science Boston, Wicked Hot Boston (museums)

2021
Campaign Timeline

- Late fall - Applications opened for NOAA/NIHHIS support
- Early spring – Heat Watch onboarding for cities with CAPA Strategies; Communities join NIHHIS urban heat cohort, get connected to local National Weather Service forecast offices, develop volunteer outreach and complementary activities.
- Late spring – CAPA + NOAA Weather / Climate Prediction Center plan logistics to move sensors cross-country; communities activate volunteers; cohort calls continue
- Summer – Volunteers fan out across their communities with sensors, driving transects, taking readings and having fun!
- Fall – CAPA Strategies processes results into GIS layers and a report for cities to use.

Photo from CAPA Heat Watch Report