The Geography of Climate Inequity

Jeremy S. Hoffman, Ph.D.

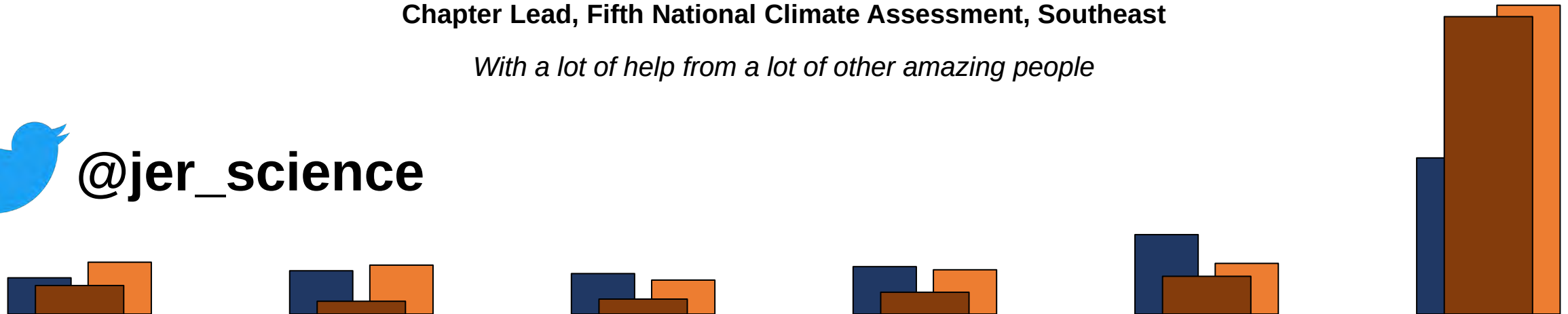
Director of Climate Justice and Impact, Groundwork USA

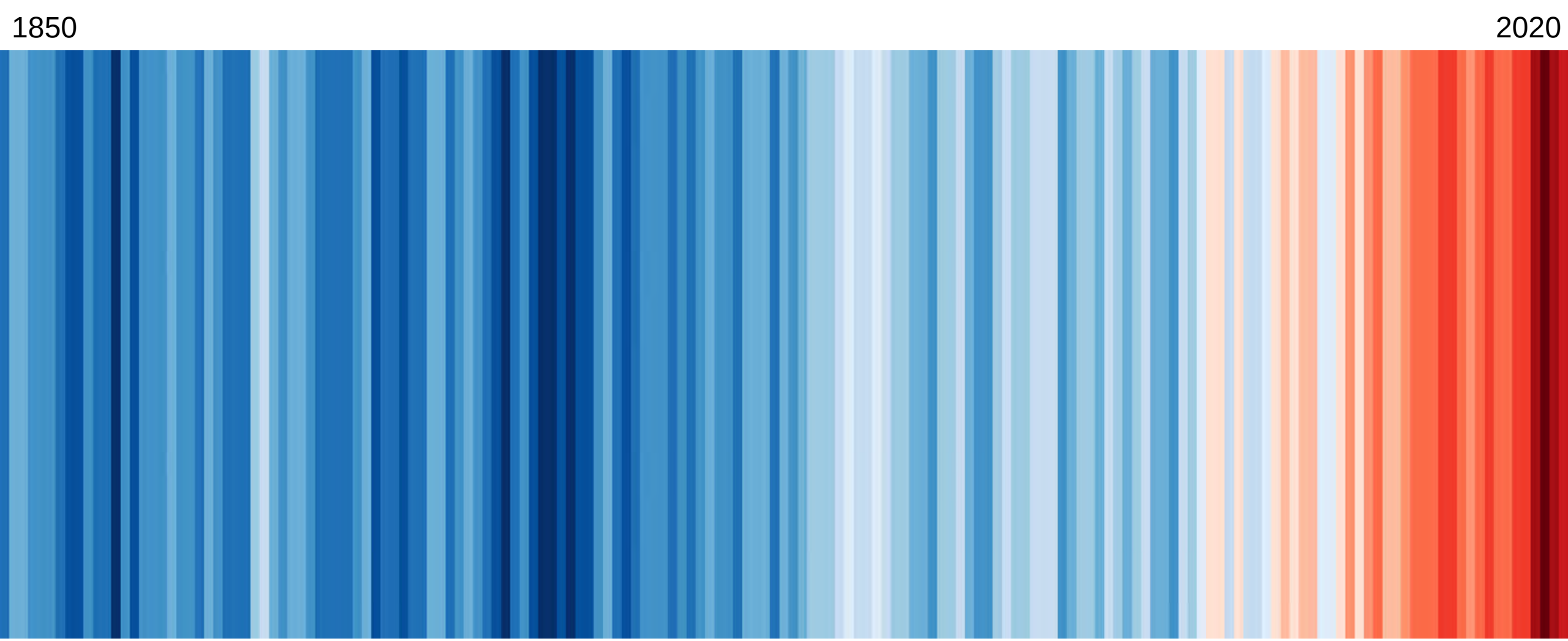
Affiliate Faculty, Virginia Commonwealth University/University of Richmond

Chapter Lead, Fifth National Climate Assessment, Southeast

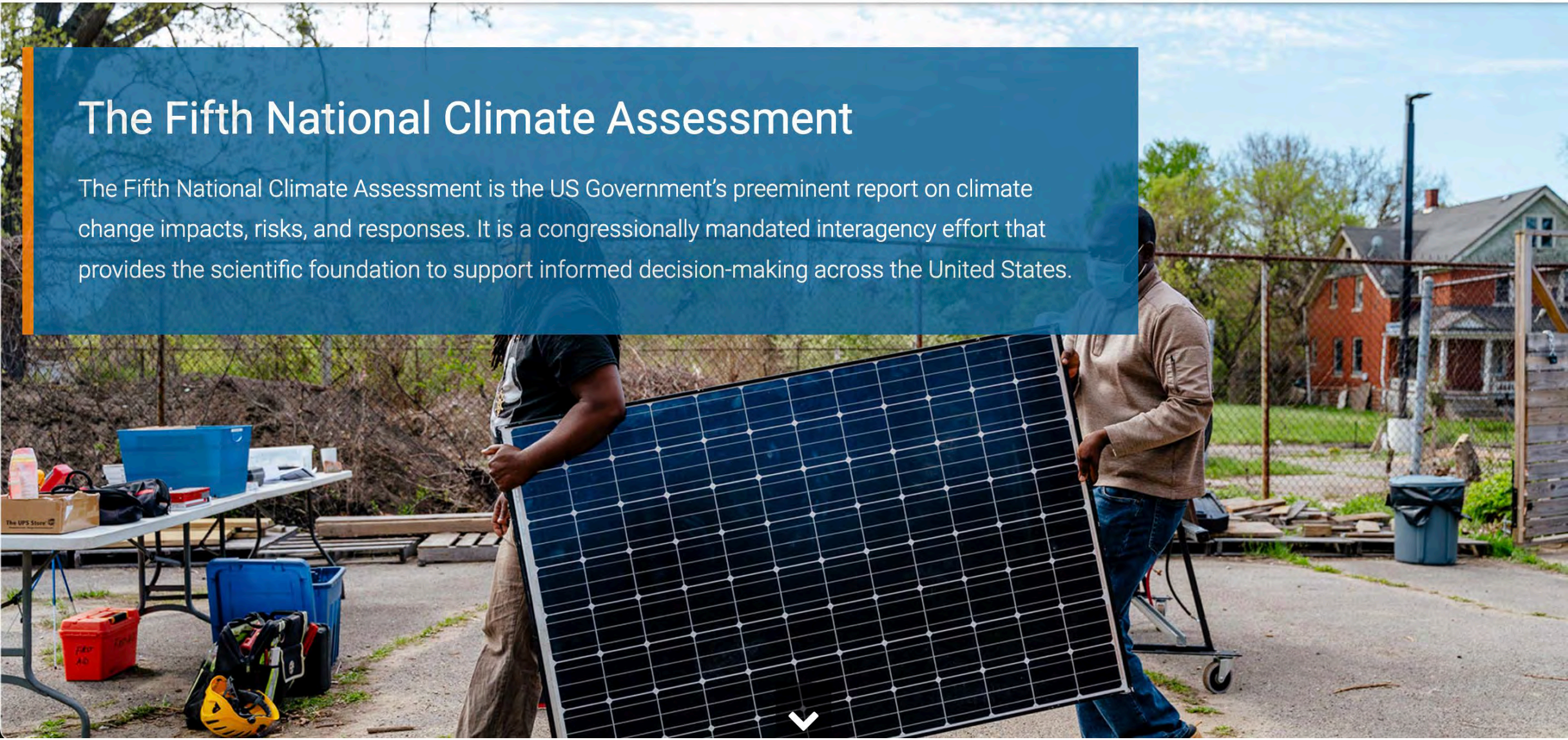
With a lot of help from a lot of other amazing people

@jer_science



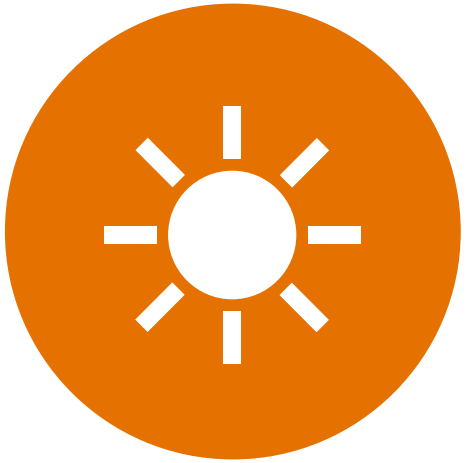


Climate lab book



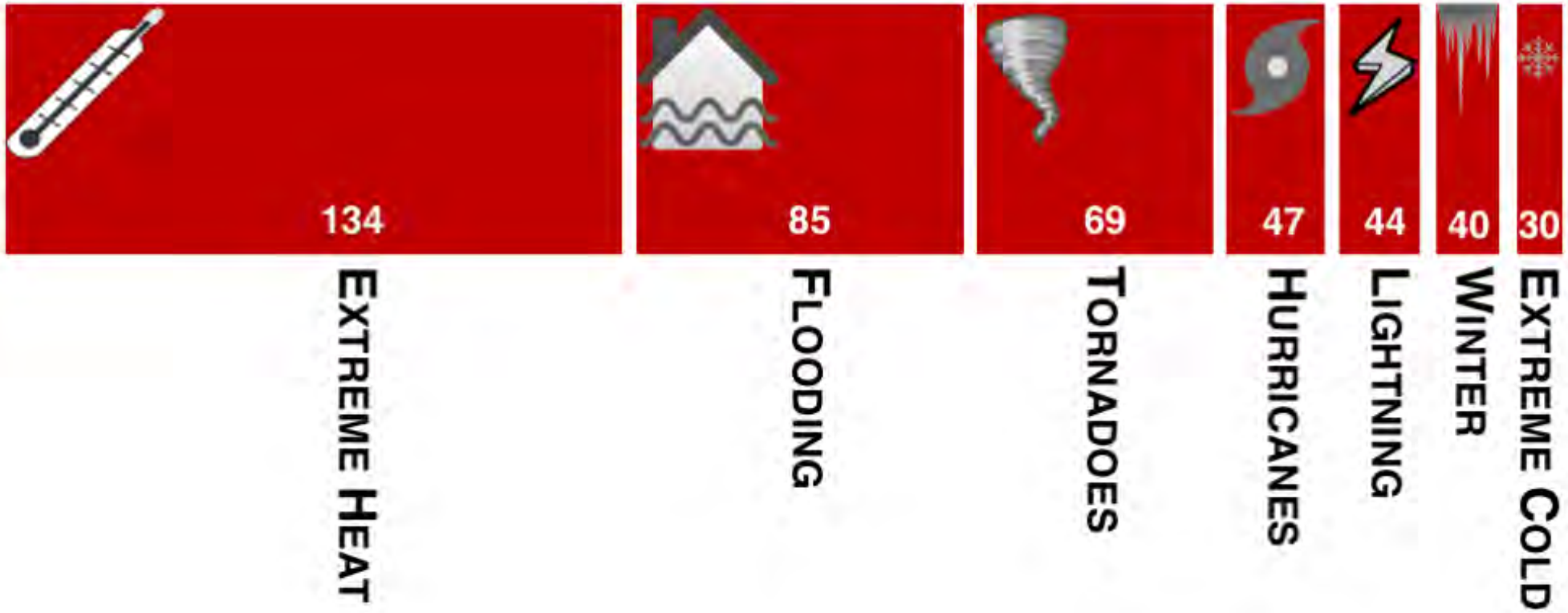
nca2023.globalchange.gov

Already experiencing & expecting a: hotter, wetter, sneezier and wheezier climate


DEADLIEST WEATHER-RELATED HAZARDS

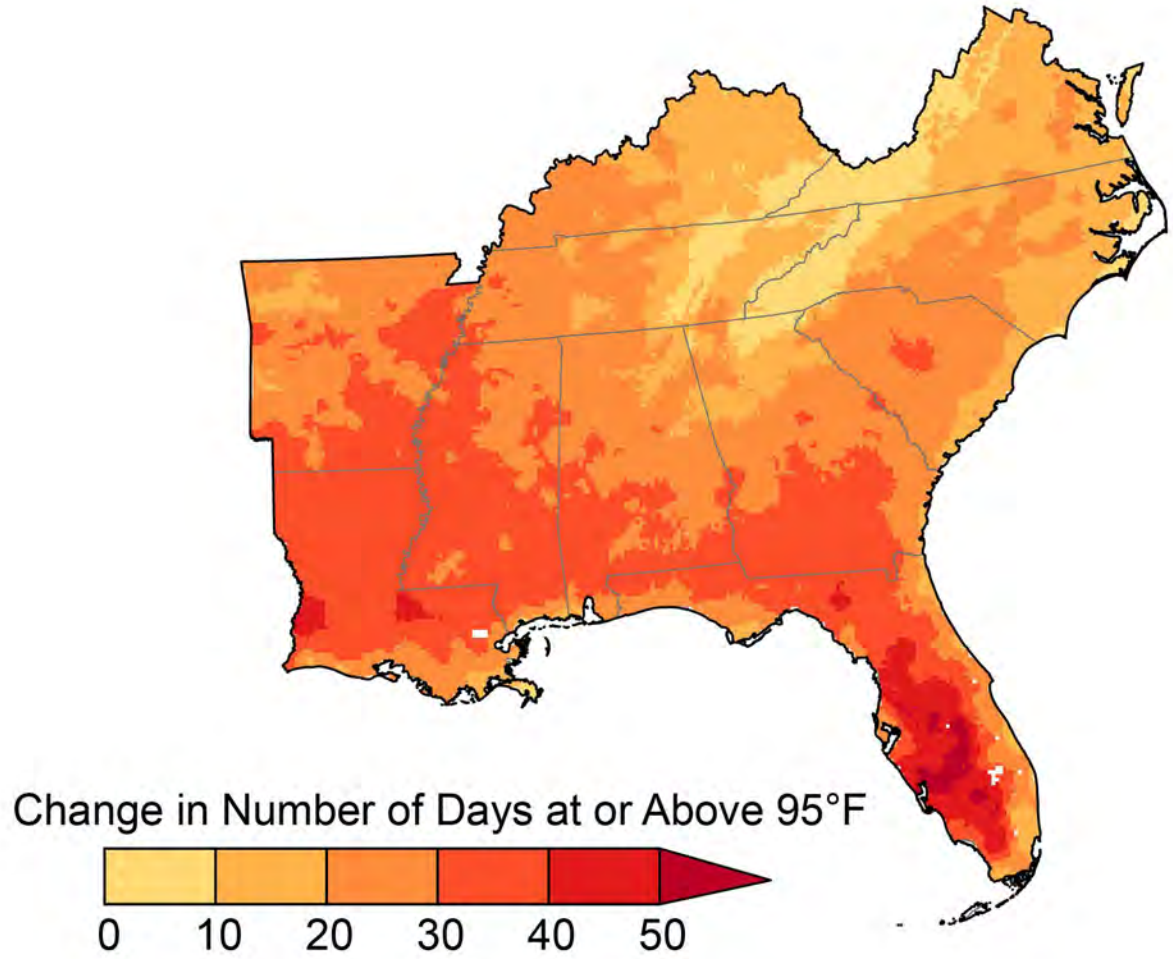
AVERAGE NUMBER OF PEOPLE KILLED PER YEAR (1988-2017)



Source: National Weather Service Office of Climate, Water, and Weather Services, National Hazard Statistics

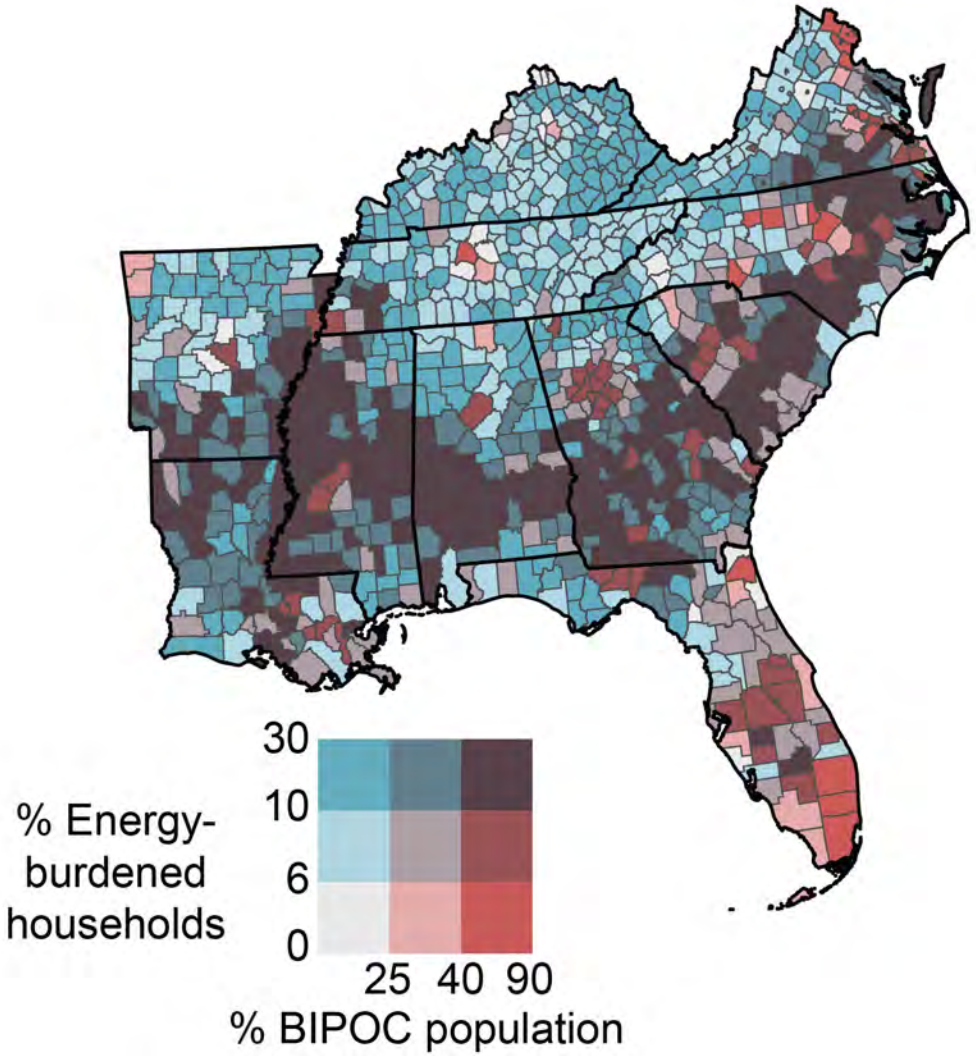
Inequitable Heat Burden and Future Heat Exposure

b) Projected change in extreme heat days, 2050 compared to 1991–2020

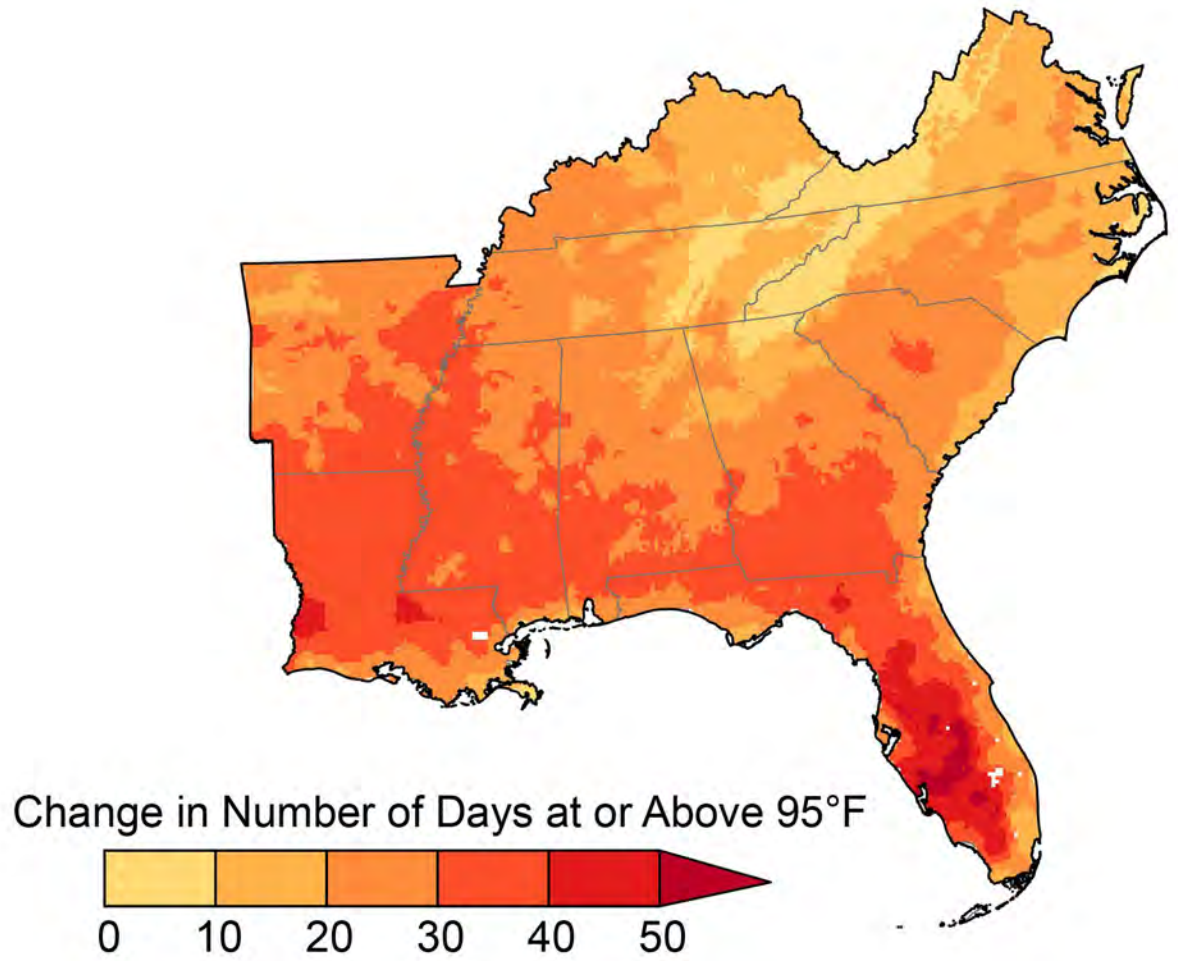


Inequitable Heat Burden and Future Heat Exposure

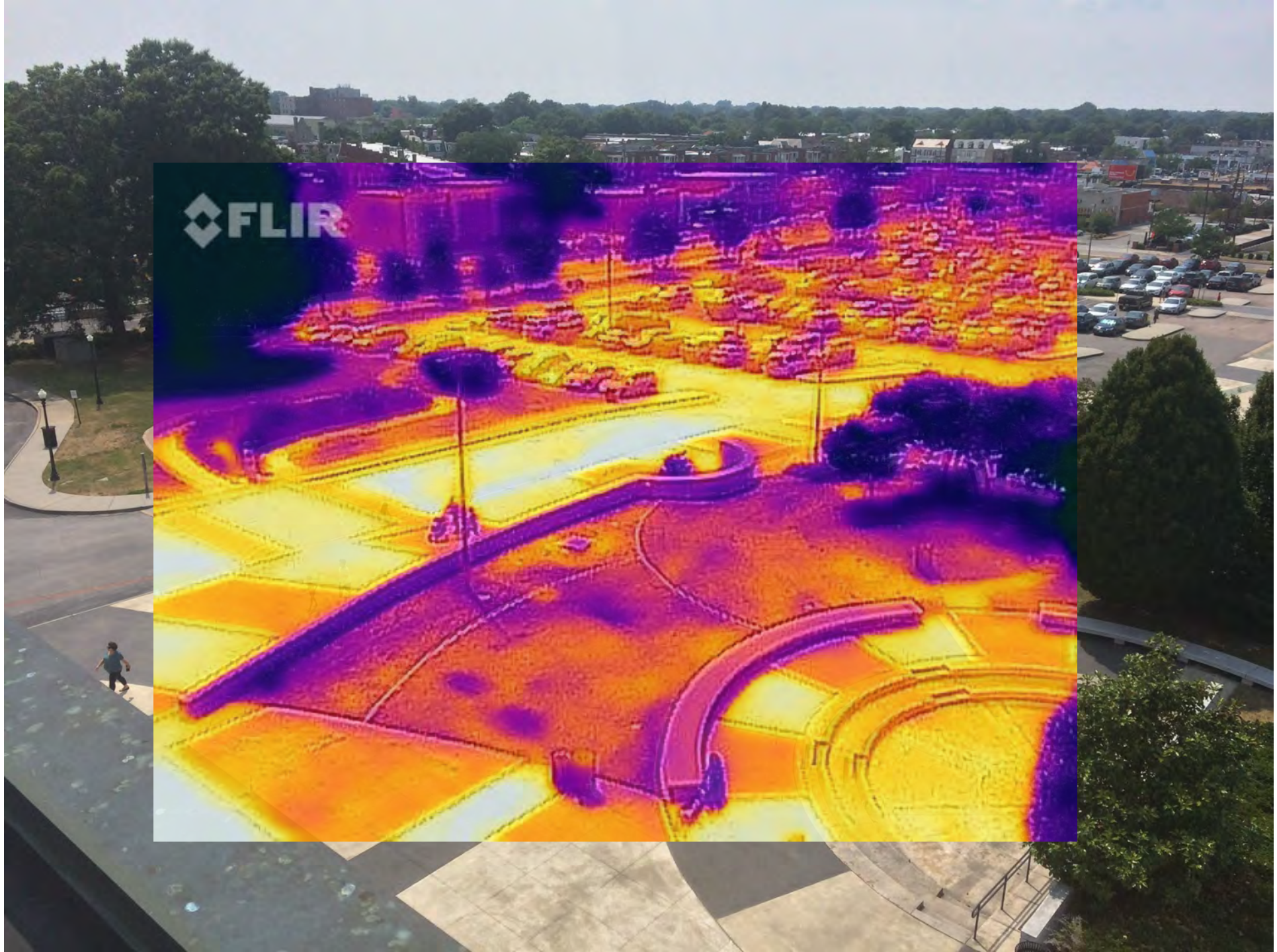
a) Energy-burdened households overlap with communities of color

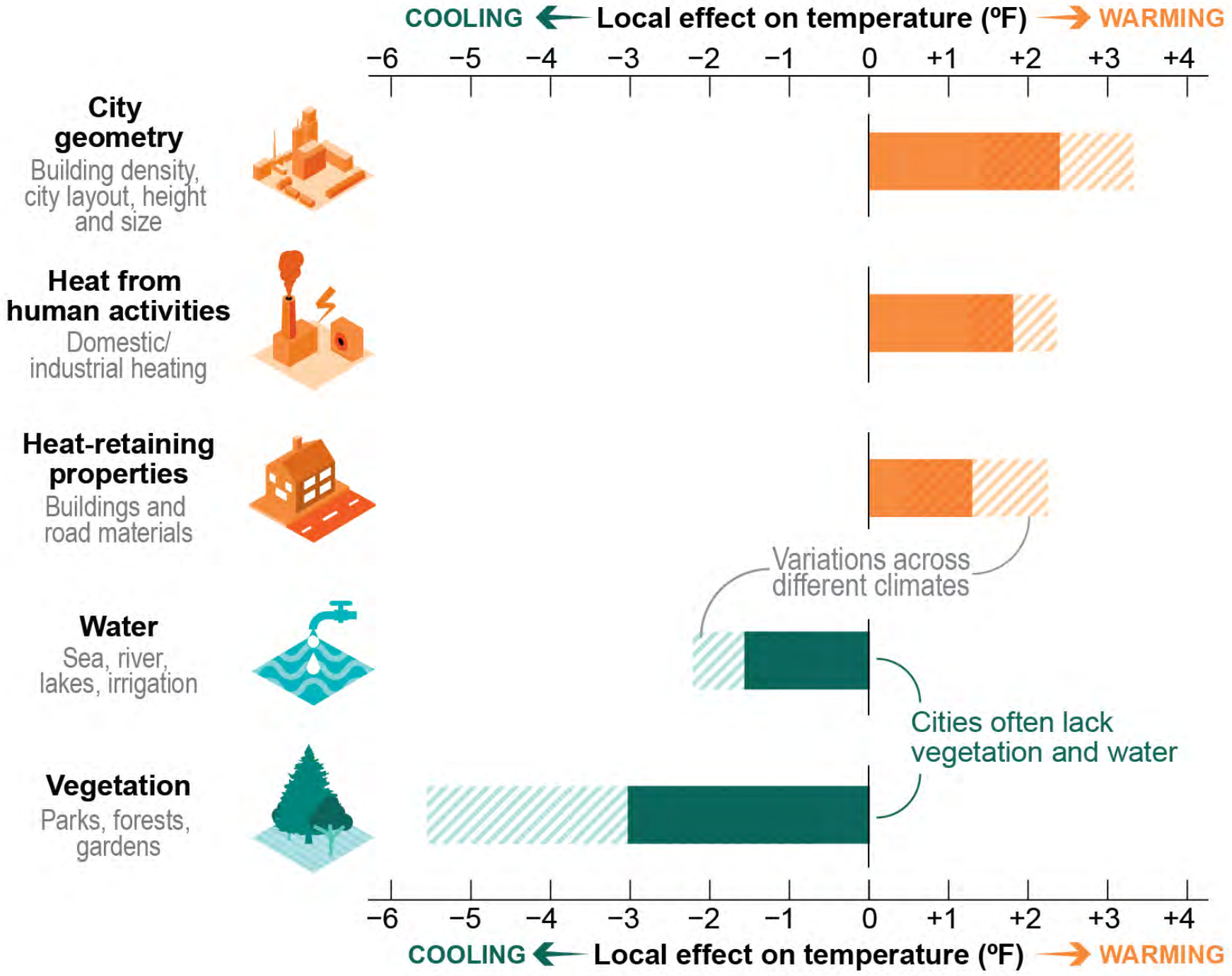


b) Projected change in extreme heat days, 2050 compared to 1991–2020



Walter Kale, Chicago Tribune


FLIR


COOLING
Local effect on temperature (ºF)
WARMING
−6 −5 −4 −3 −2 −1 0 +1 +2 +3 +4
City geometry
Building density, city layout, height and size
Heat from human activities
Domestic/ industrial heating
Heat-retaining properties
Buildings and road materials
Variations across different climates
Water
Sea, river, lakes, irrigation
Cities often lack vegetation and water
Vegetation
Parks, forests, gardens
−6 −5 −4 −3 −2 −1 0 +1 +2 +3 +4
COOLING
Local effect on temperature (ºF)
WARMING

NCA5

Vivek Shandas, PhD

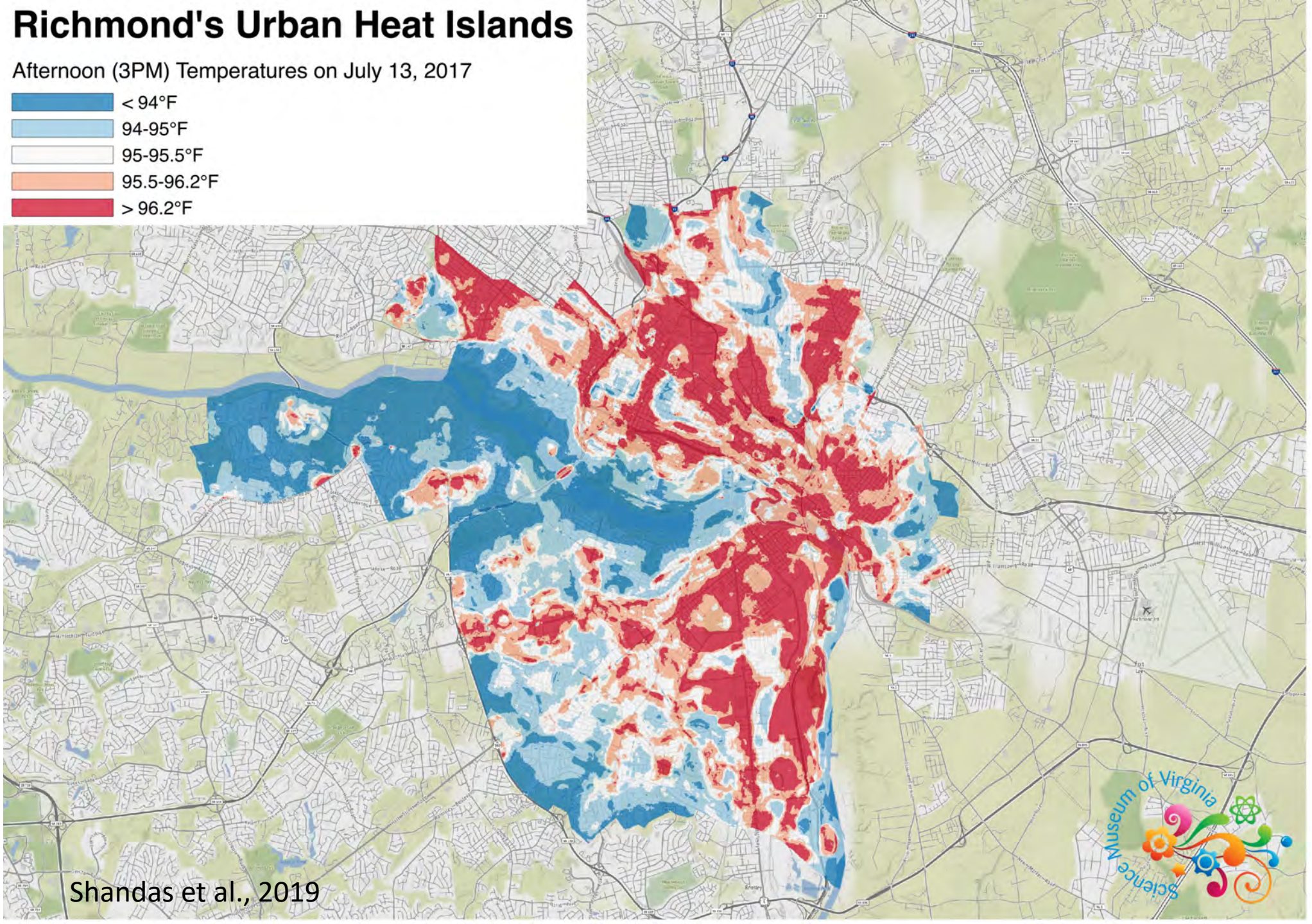
[Shandas et al., 2019: https://www.mdpi.com/2225-1154/7/1/5/htm]

Shelby Lum, RTD

Richmond's Urban Heat Islands

Afternoon (3PM) Temperatures on July 13, 2017

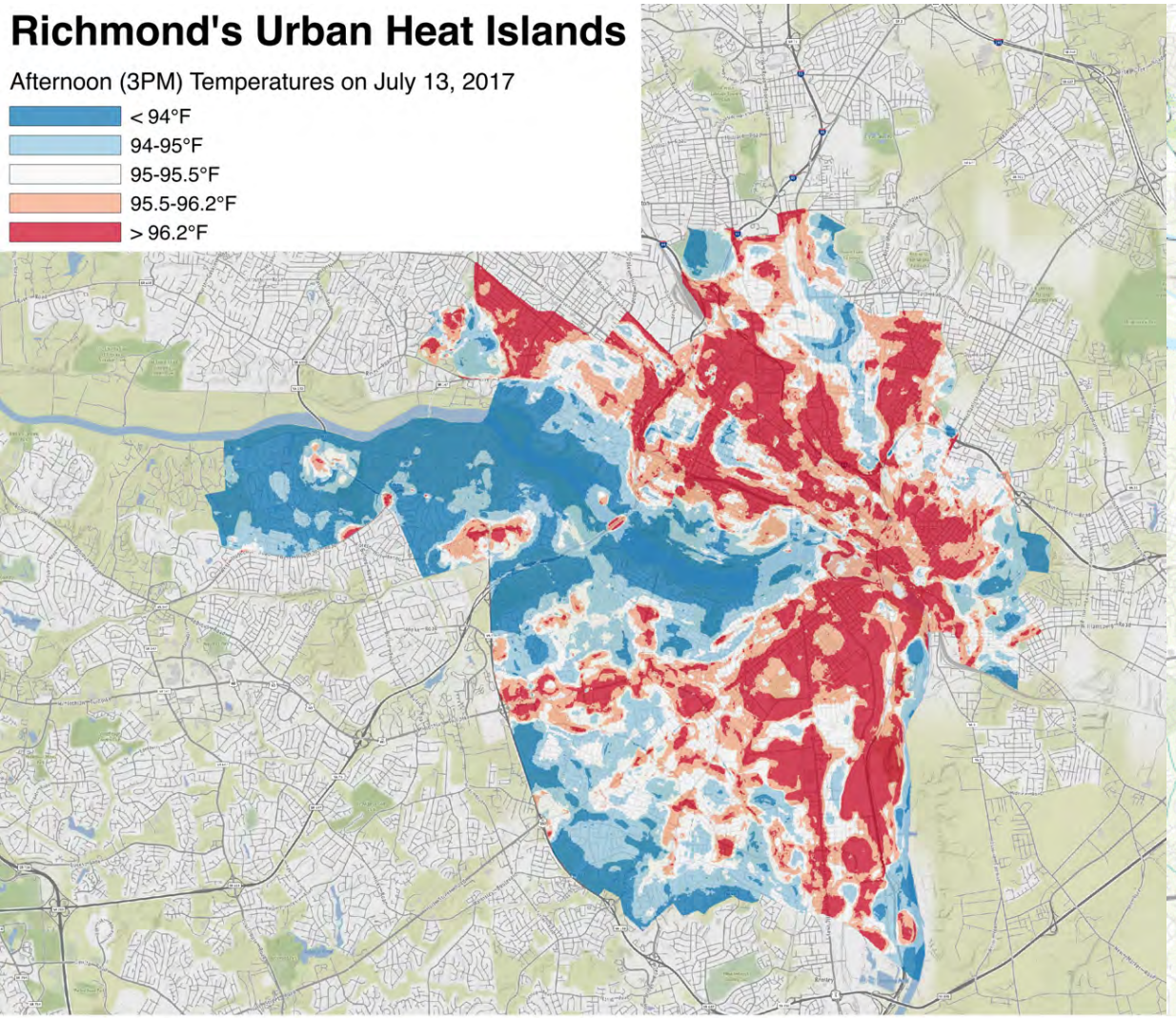
- < 94°F
- 94-95°F
- 95-95.5°F
- 95.5-96.2°F
- > 96.2°F



Shandas et al., 2019

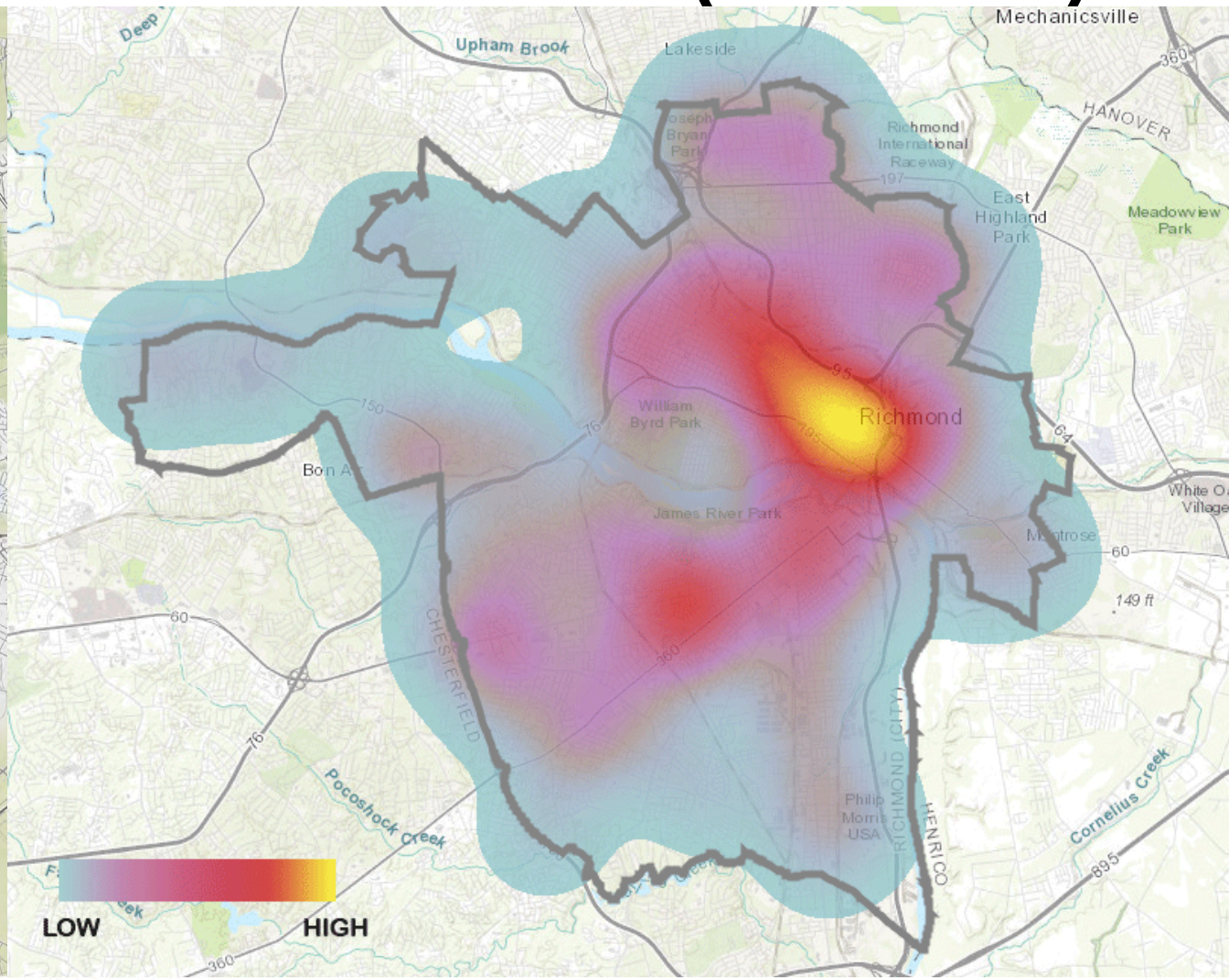
Museum of Virginia Science

EXTREME HEAT (2017)

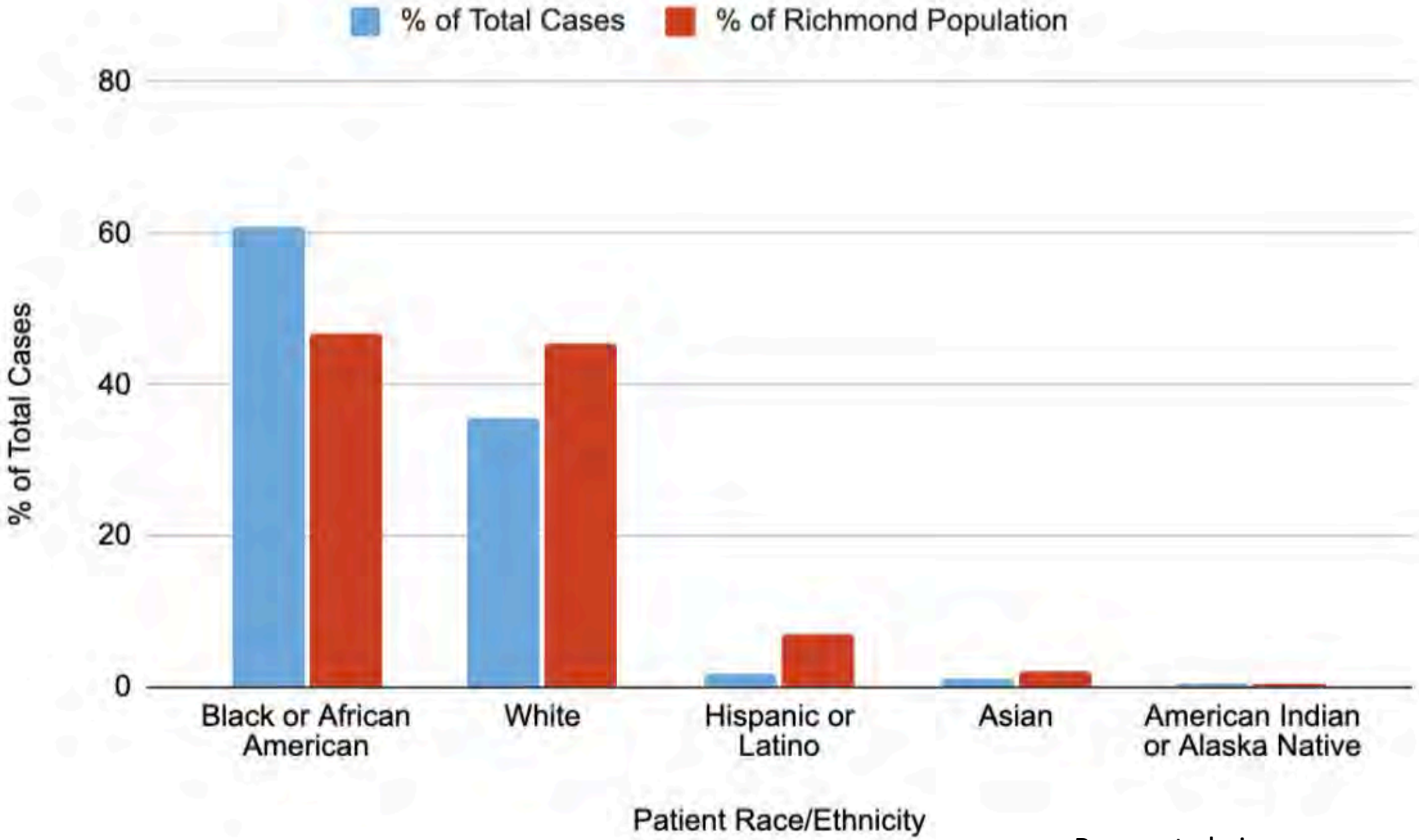


Shandas et al., 2019

AMBULANCE RESPONSES FOR HEAT ILLNESS (2015-2019)



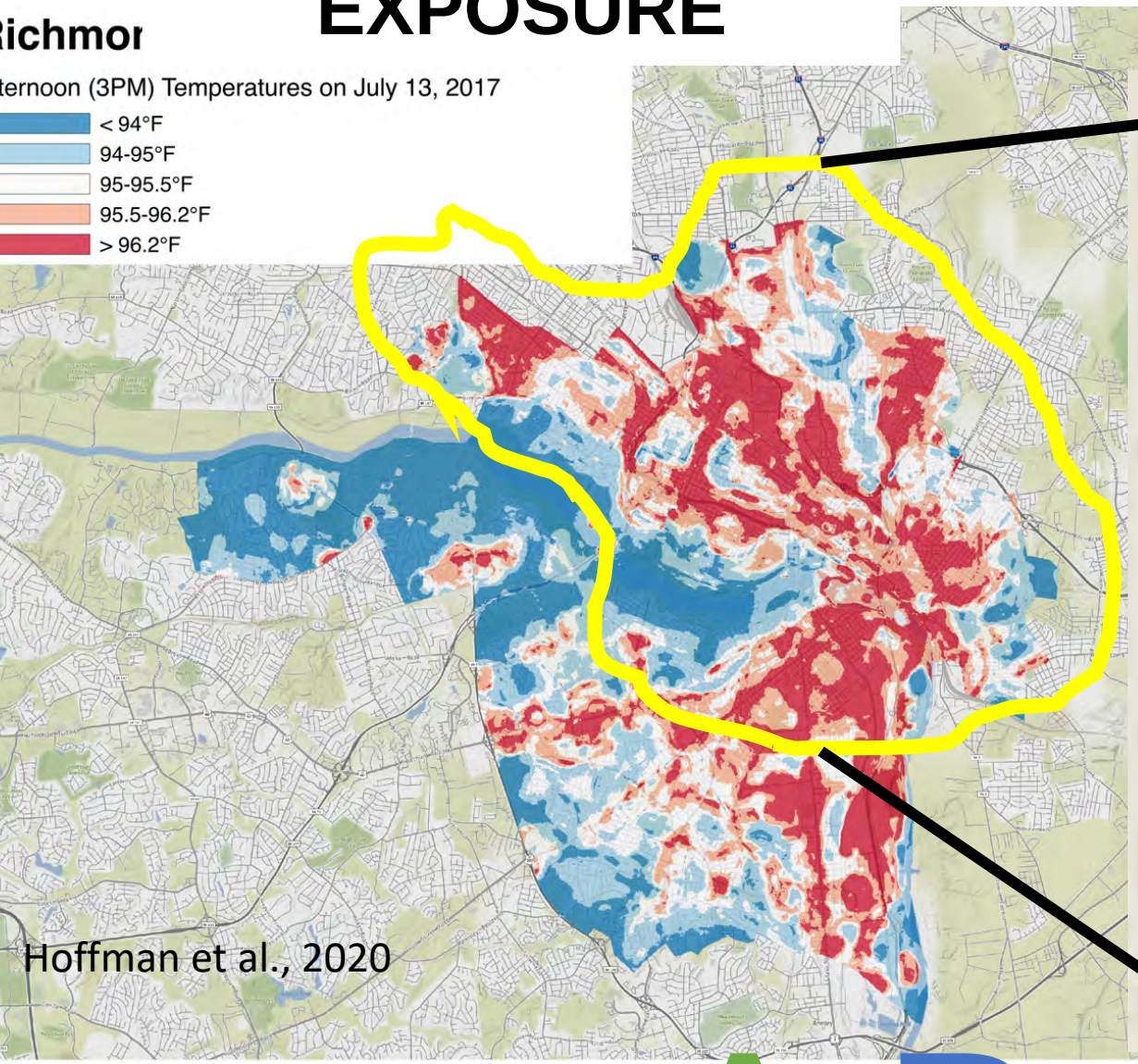
Data: Richmond Ambulance Authority



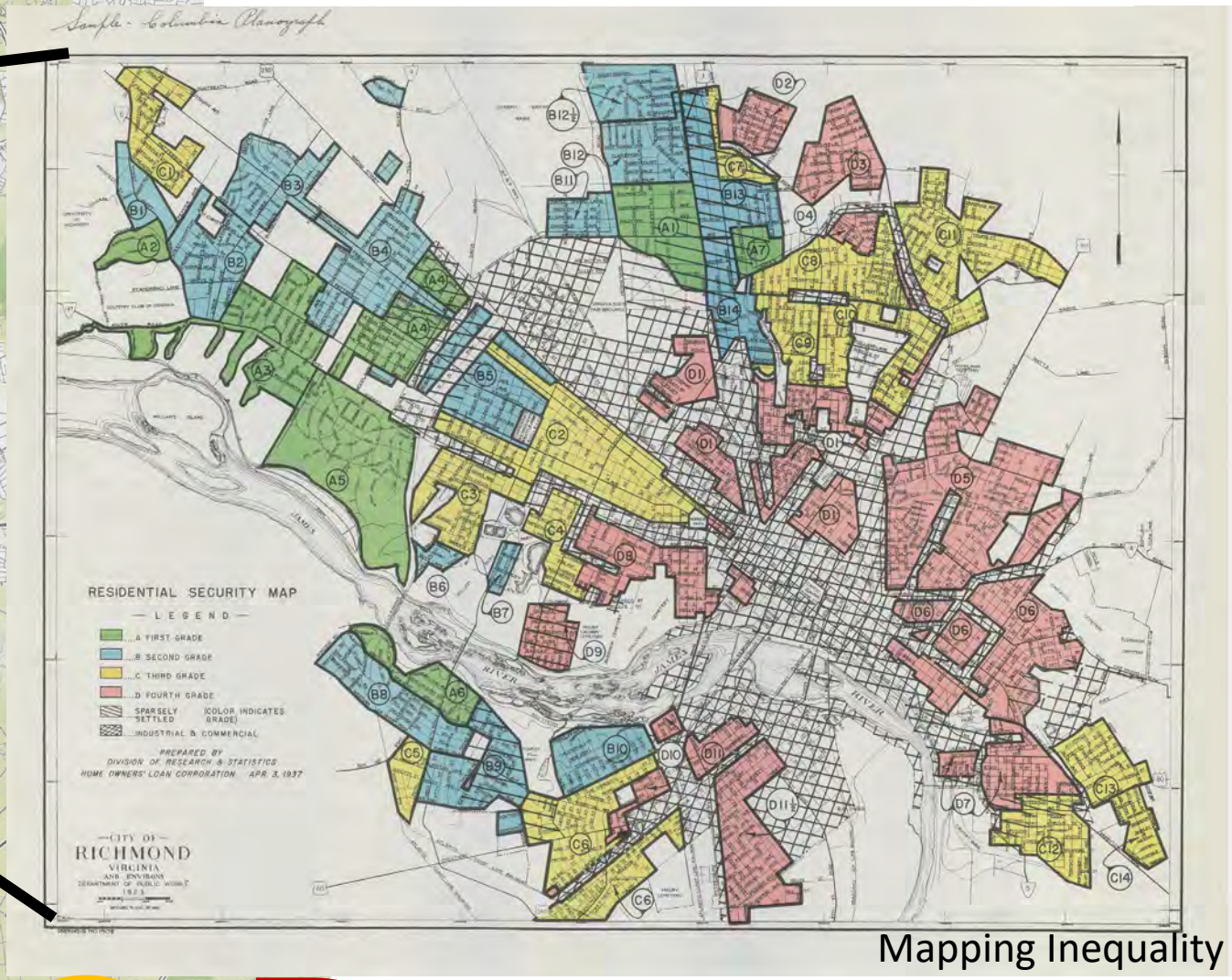
Braun et al., in prep

EXPOSURE

REDLINING MAP (1937)



Hoffman et al., 2020



Mapping Inequality

A B C D

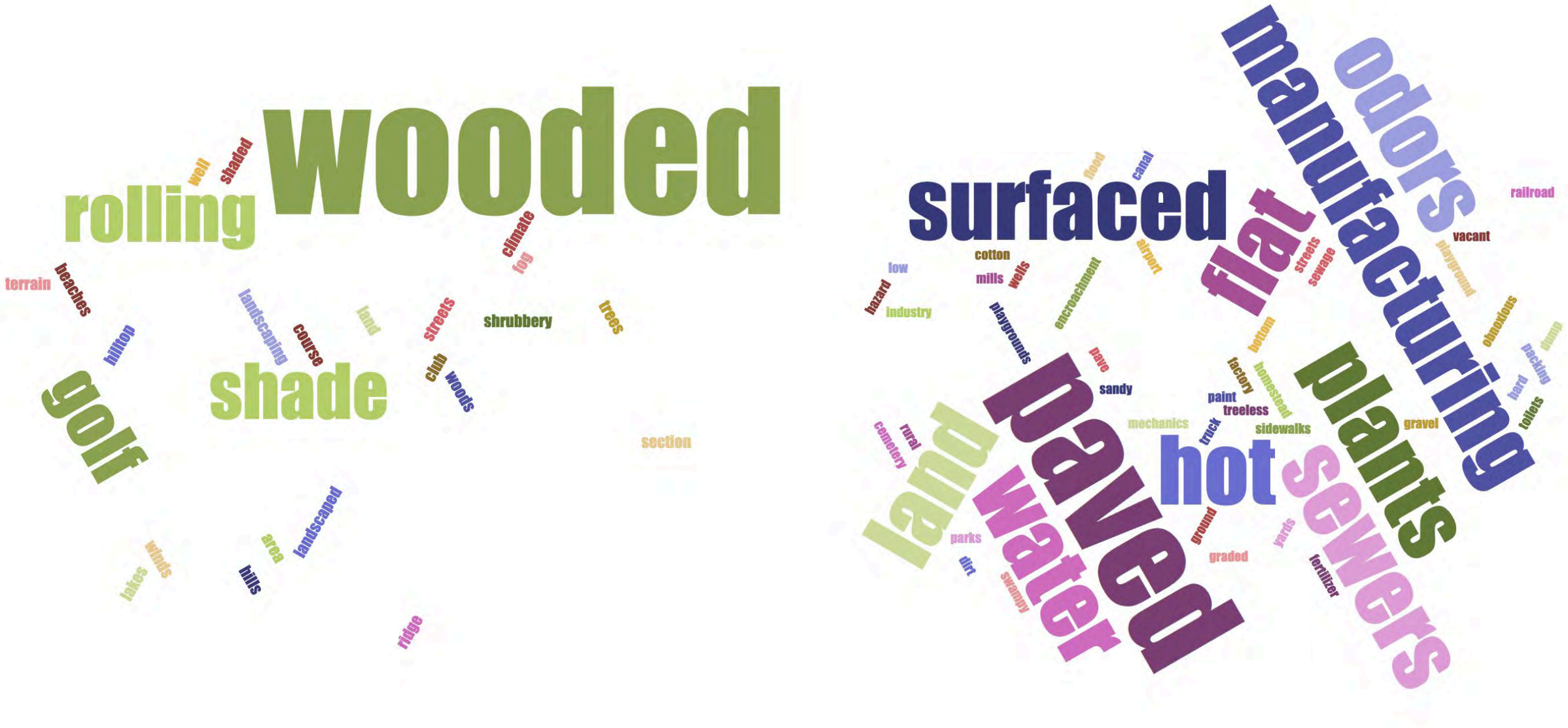
Regional Science and Urban Economics

Volume 86, January 2021, 103622

The long-run effects of the 1930s HOLC "redlining" maps on place-based measures of economic opportunity and socioeconomic success ☆

Daniel Aaronson [a] ✉, Jacob Faber [b] ✉, Daniel Hartley [a] ✉, Bhashkar Mazumder [c, d] ✉, Patrick Sharkey [e] ✉

Descriptions of A & B neighborhoods



Descriptions of C & D neighborhoods

MAPPING INEQUALITY
REDLINING IN NEW DEAL AMERICA

Explore the Maps

Search the Area Descriptions

Read about Redlining –

Introduction

How and Why the Home Owners' Loan Corporation Made Its Redlining Maps

Hotter, Wetter, Sneezier, & Wheezier: Present-day Environmental Disparity Among HOLC Neighborhoods

Redlining and Health

Further Reading

Hotter, Wetter, Sneezier, & Wheezier

Present-day Environmental Disparity Among HOLC Neighborhoods

J.S. Hoffman

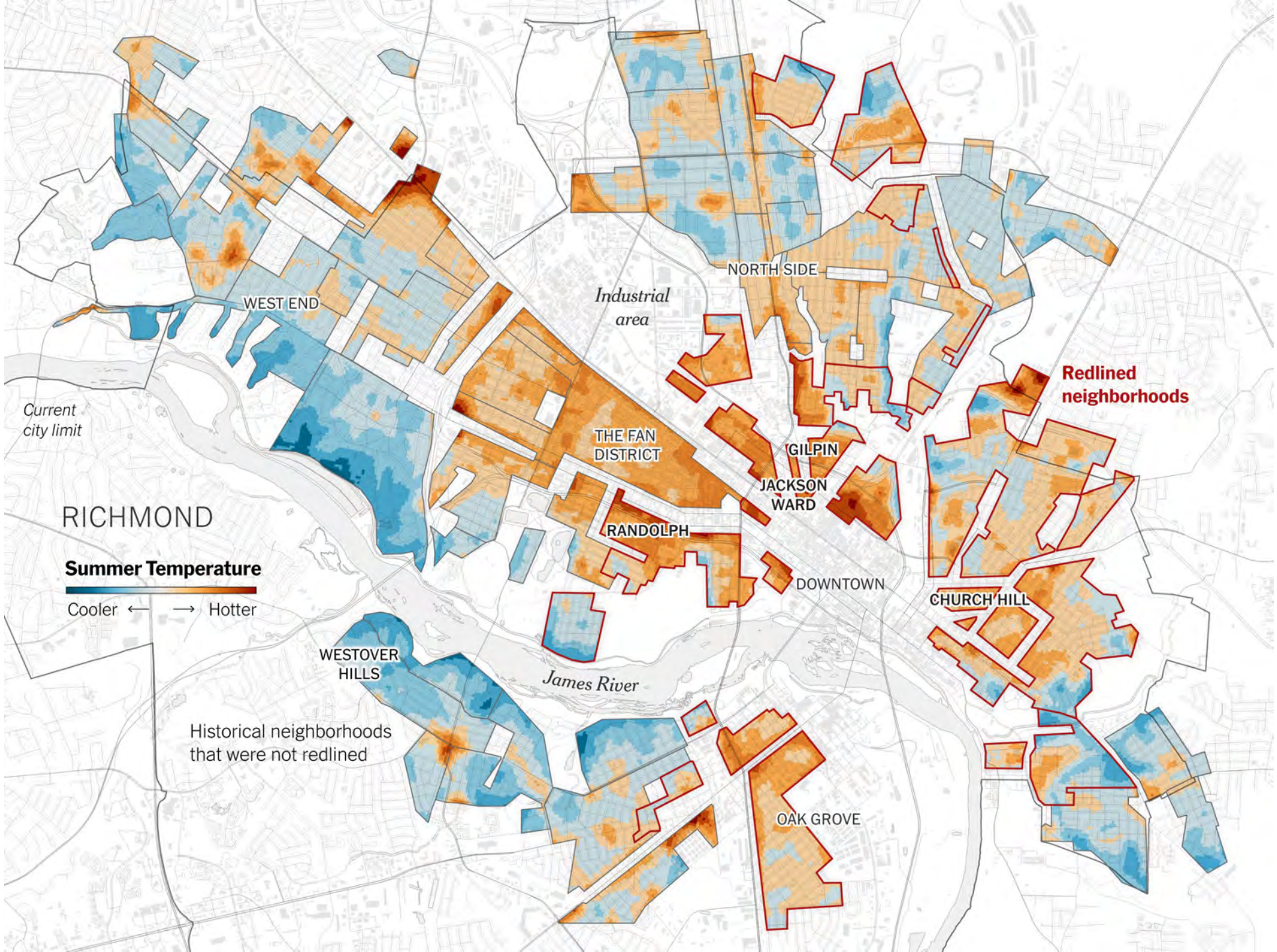
Whether they're walking, biking, bussing, or driving through virtually any city in the United States, people tend to make the same sorts of observations when considering any particular neighborhood's environmental quality: wealthy areas—which tend to have disproportionately monolithic non-Hispanic white populations—are quiet, shaded by mature trees, and defined by large single-family houses occupying larger-than-average tracts of land, while just a few blocks away, poorer neighborhoods—which also happen to be communities of color—have many fewer trees, tend to have more multifamily dwellings, and are choked with traffic (or, are at least more

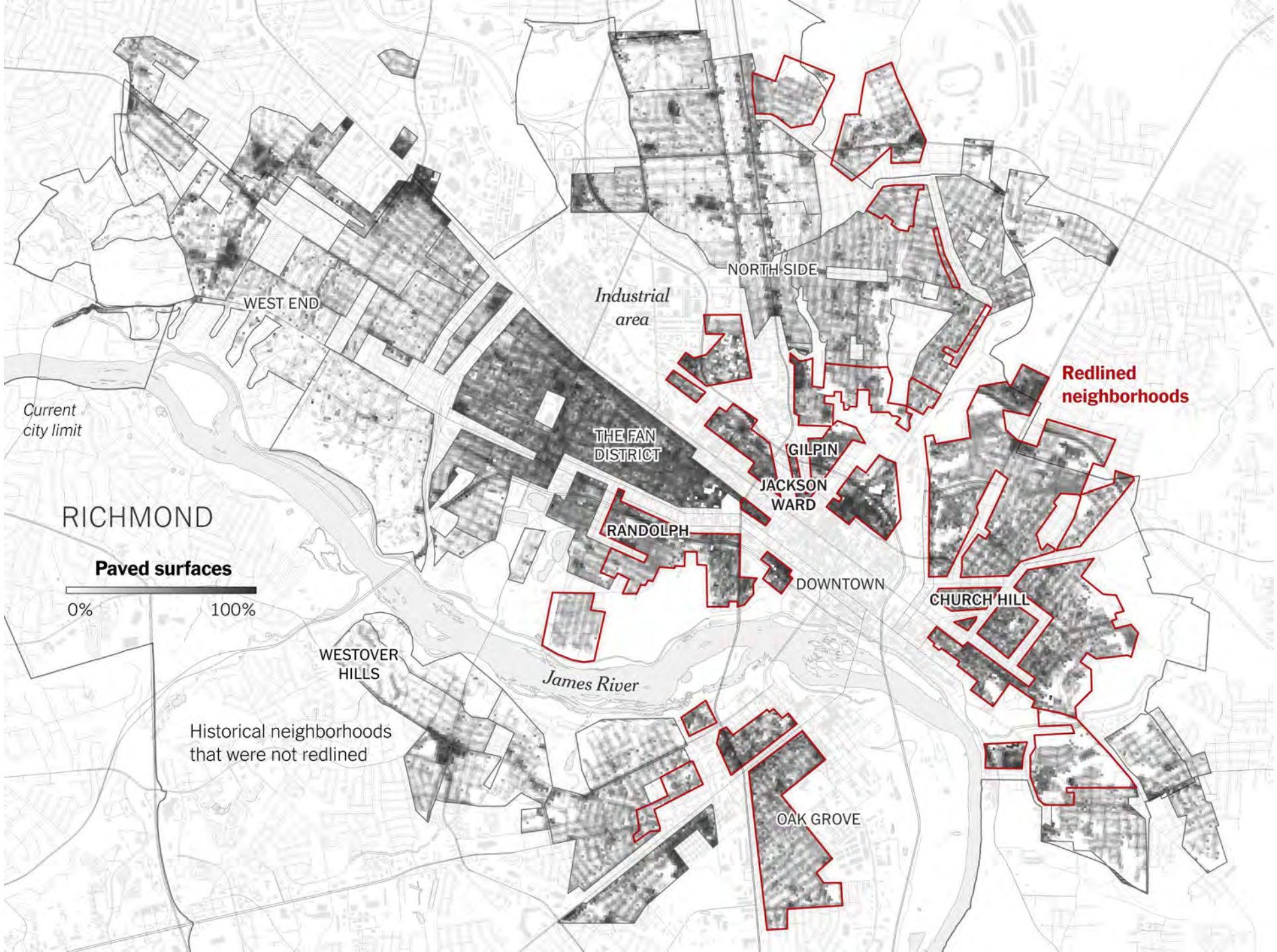
https://dsl.richmond.edu/panorama/redlining/environment

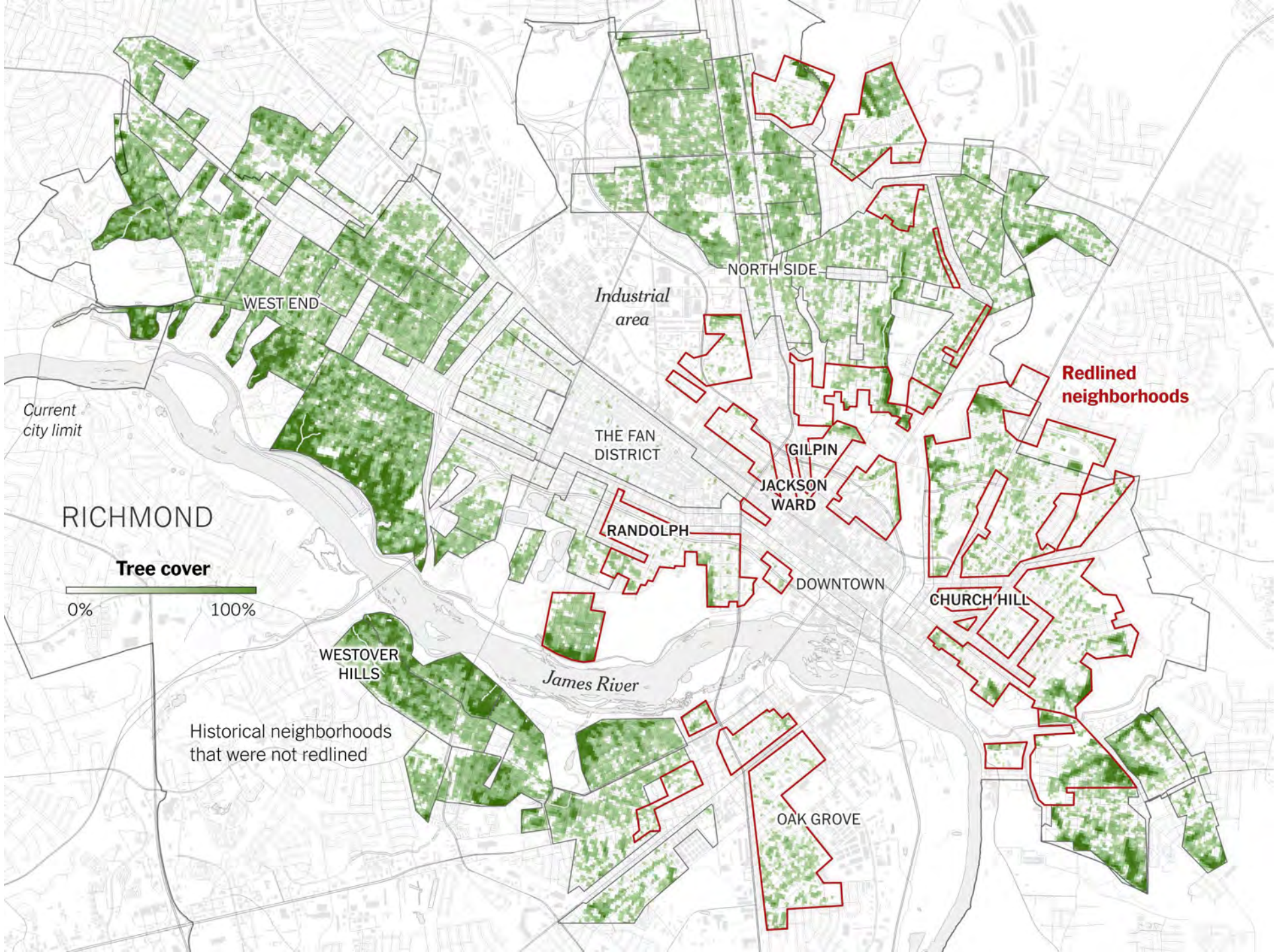

Stephen DeBerry | TED2018
Why the "wrong side of the tracks" is usually the east side of cities
Share
Add to list
Like
Recommend
4:41

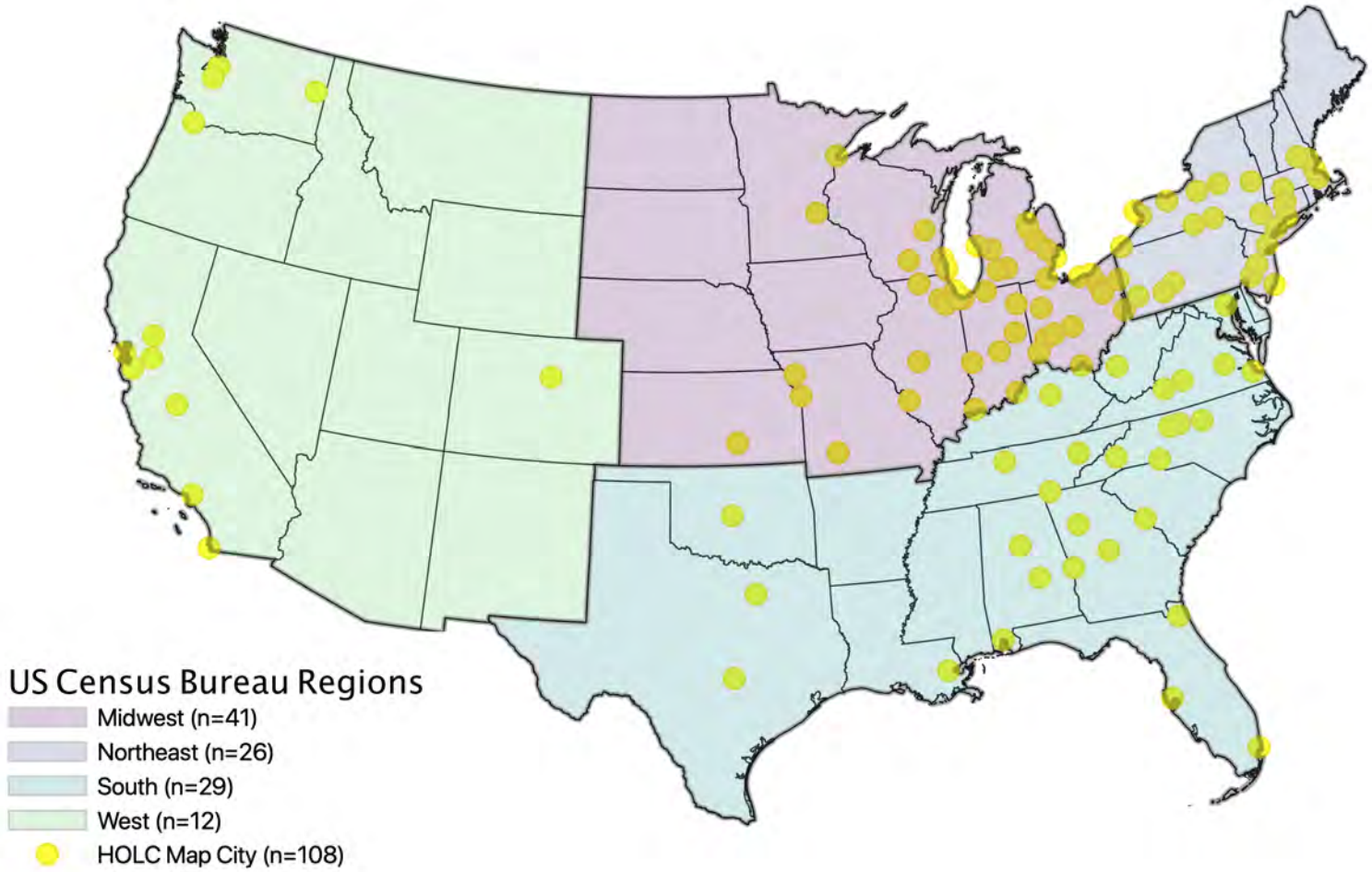
How Decades of Racist Housing Policy Left Neighborhoods Sweltering

By Brad Plumer and Nadja Popovich
Photographs by Brian Palmer Aug. 24, 2020


WEST END
Industrial area
NORTH SIDE
Redlined neighborhoods
Current city limit
THE FAN DISTRICT
GILPIN
JACKSON WARD
RANDOLPH
RICHMOND
Summer Temperature
Cooler ← → Hotter
DOWNTOWN
CHURCH HILL
WESTOVER HILLS
James River
Historical neighborhoods that were not redlined
OAK GROVE


WEST END
Industrial area
NORTH SIDE
Redlined neighborhoods
Current city limit
THE FAN DISTRICT
GILPIN
JACKSON WARD
RANDOLPH
RICHMOND
Paved surfaces
0%
100%
DOWNTOWN
CHURCH HILL
WESTOVER HILLS
James River
Historical neighborhoods that were not redlined
OAK GROVE

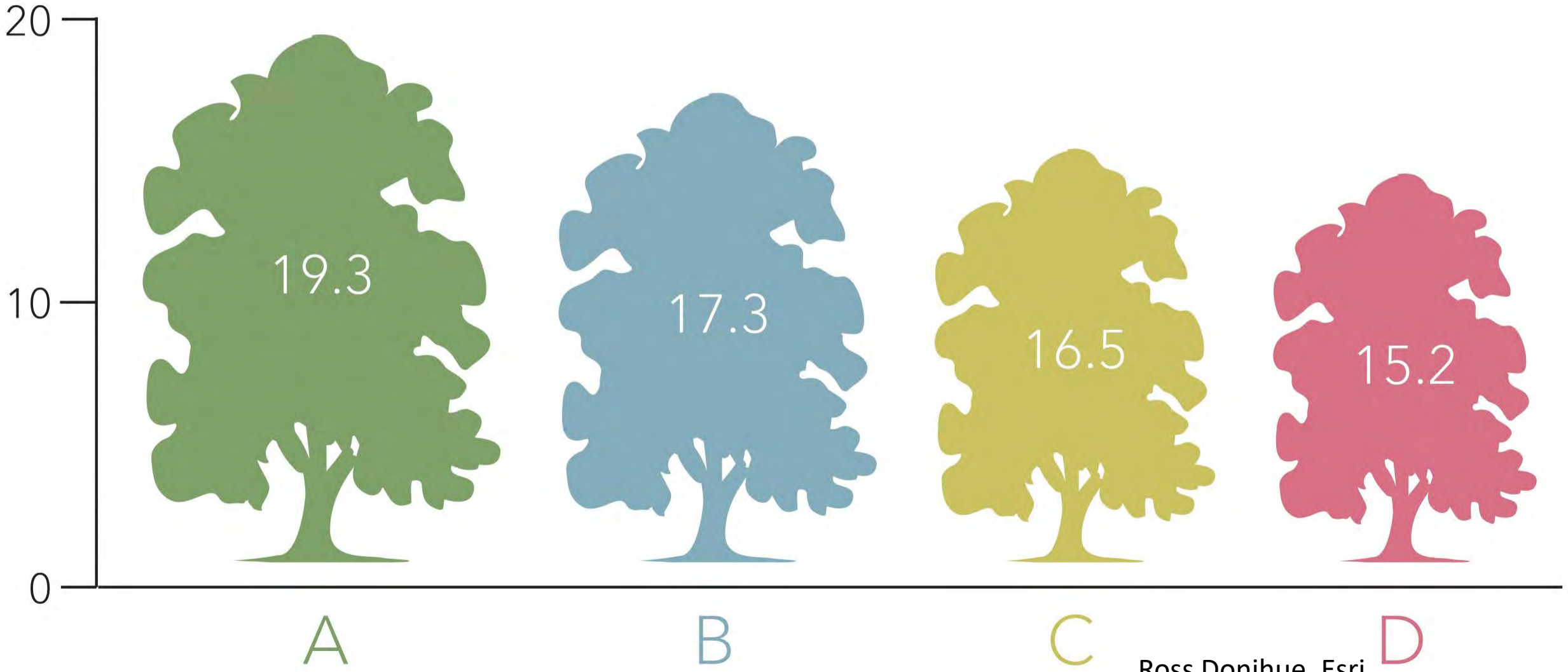

WEST END
Industrial area
NORTH SIDE
Redlined neighborhoods
Current city limit
THE FAN DISTRICT
GILPIN
JACKSON WARD
RANDOLPH
RICHMOND
Tree cover
0%
100%
DOWNTOWN
CHURCH HILL
WESTOVER HILLS
James River
Historical neighborhoods that were not redlined
OAK GROVE



In 94% of the cities studied, this pattern was observed.

Hoffman et al., 2020

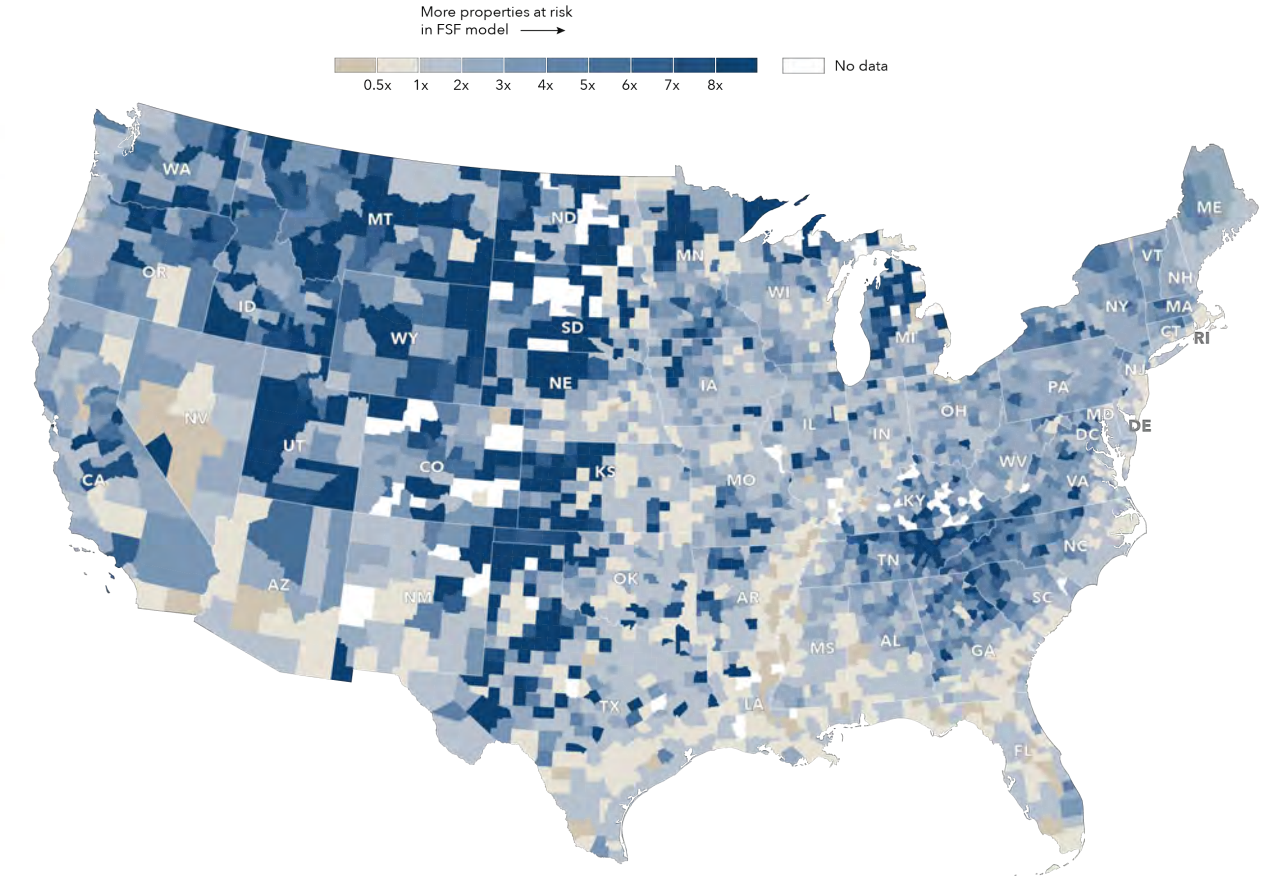
Average Tree Height in Meters by HOLC Grade

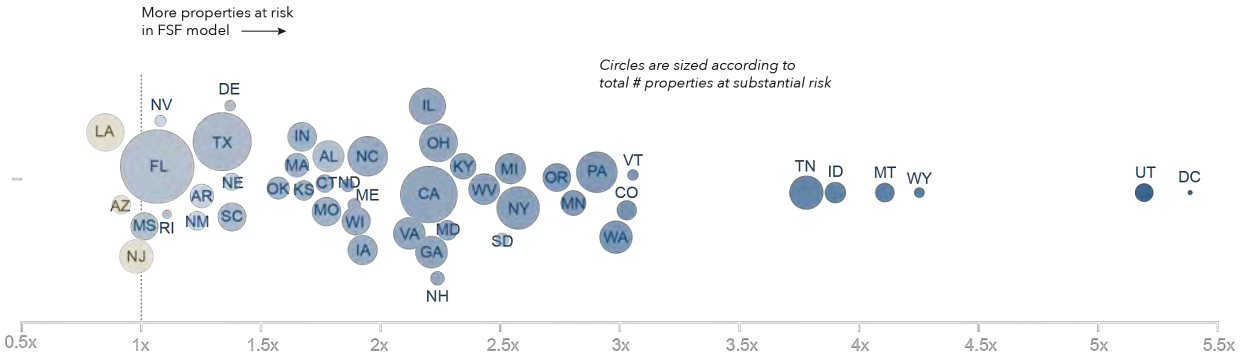


Ross Donihue, Esri

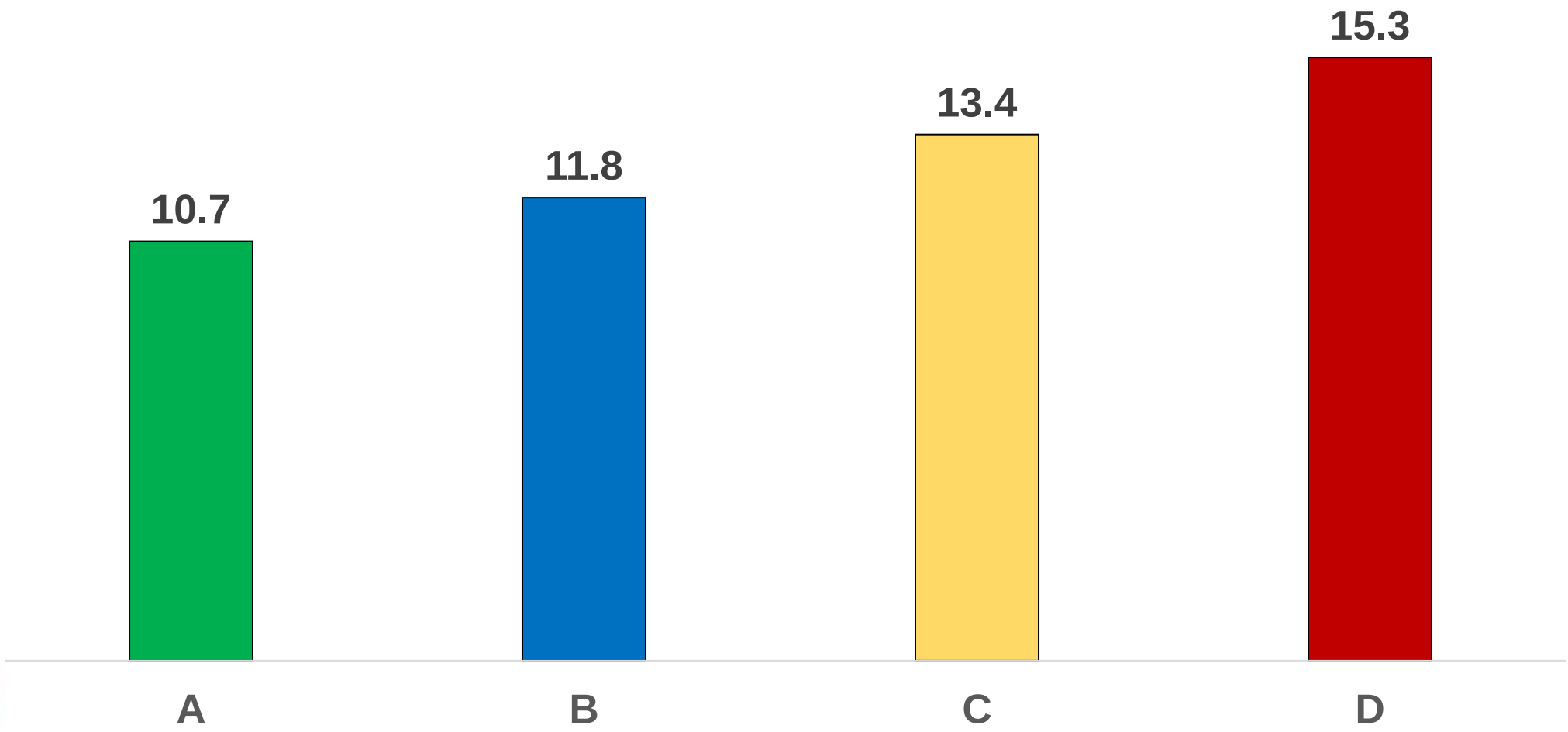
Flood Factor™

Difference in number of properties at *substantial flood risk** (FSF) compared to FEMA





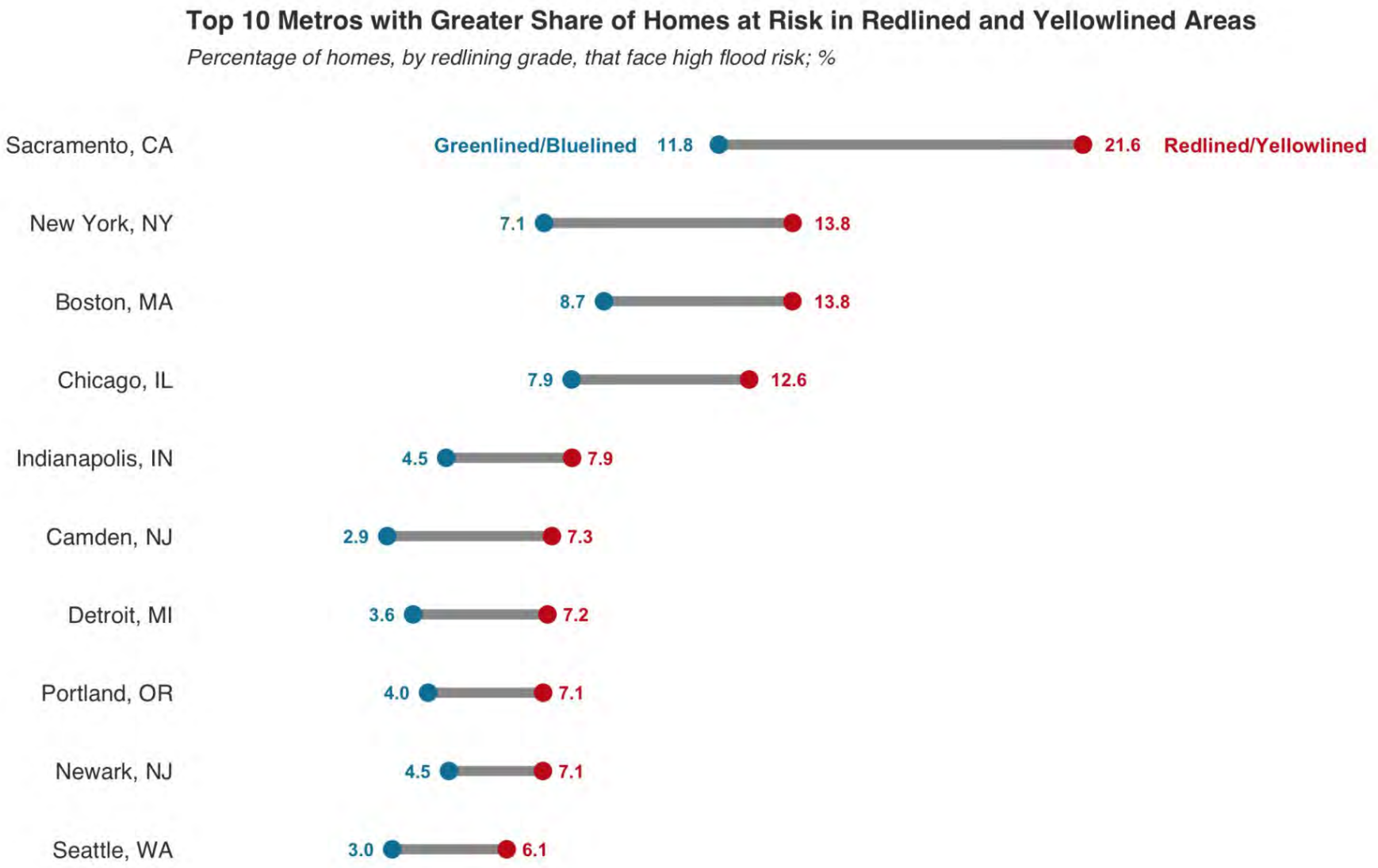
% Parcels with High Flood Risk



Flood Factor™

Data from Jeremy Porter

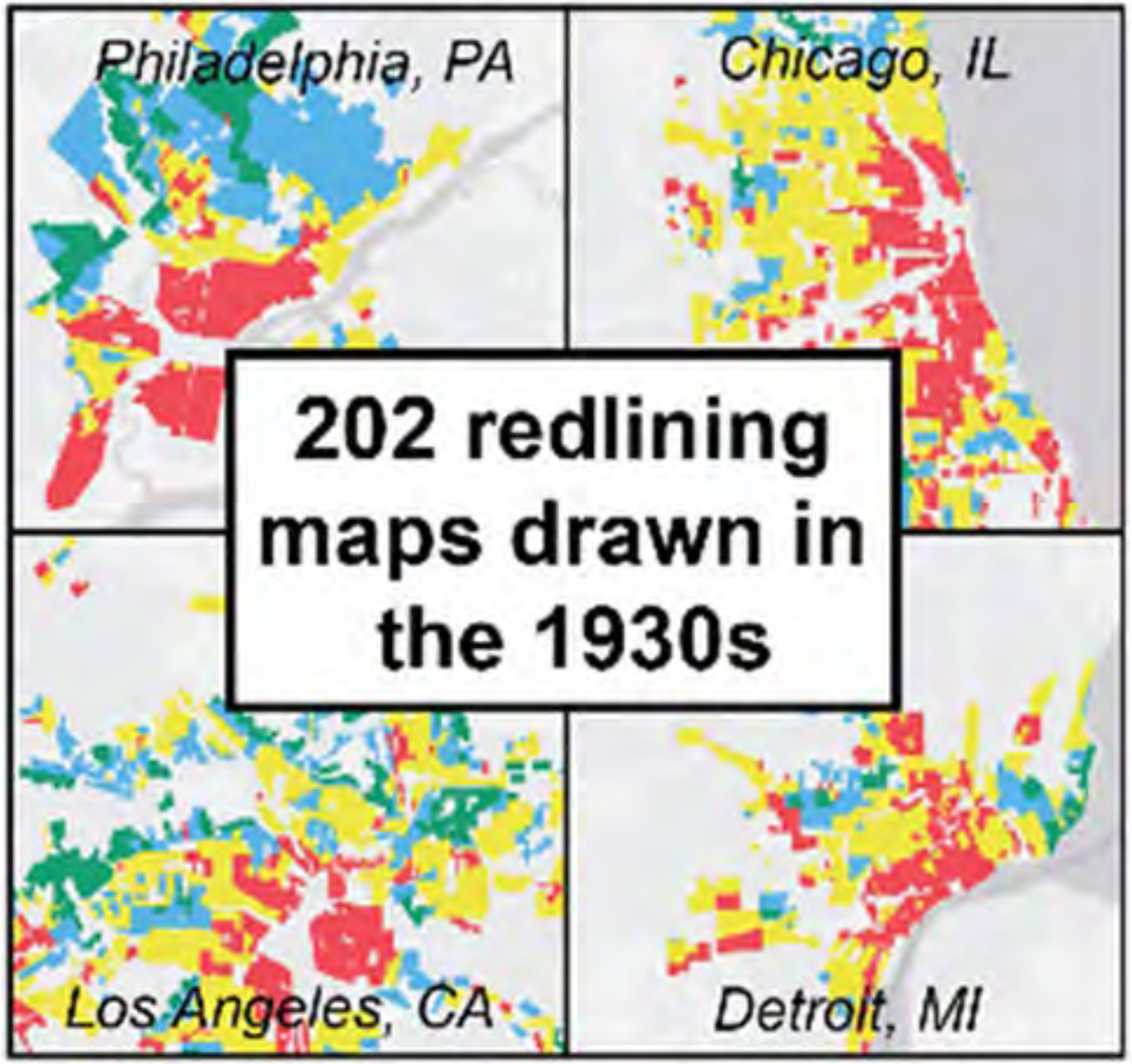
Higher flood risks in formerly redlined areas

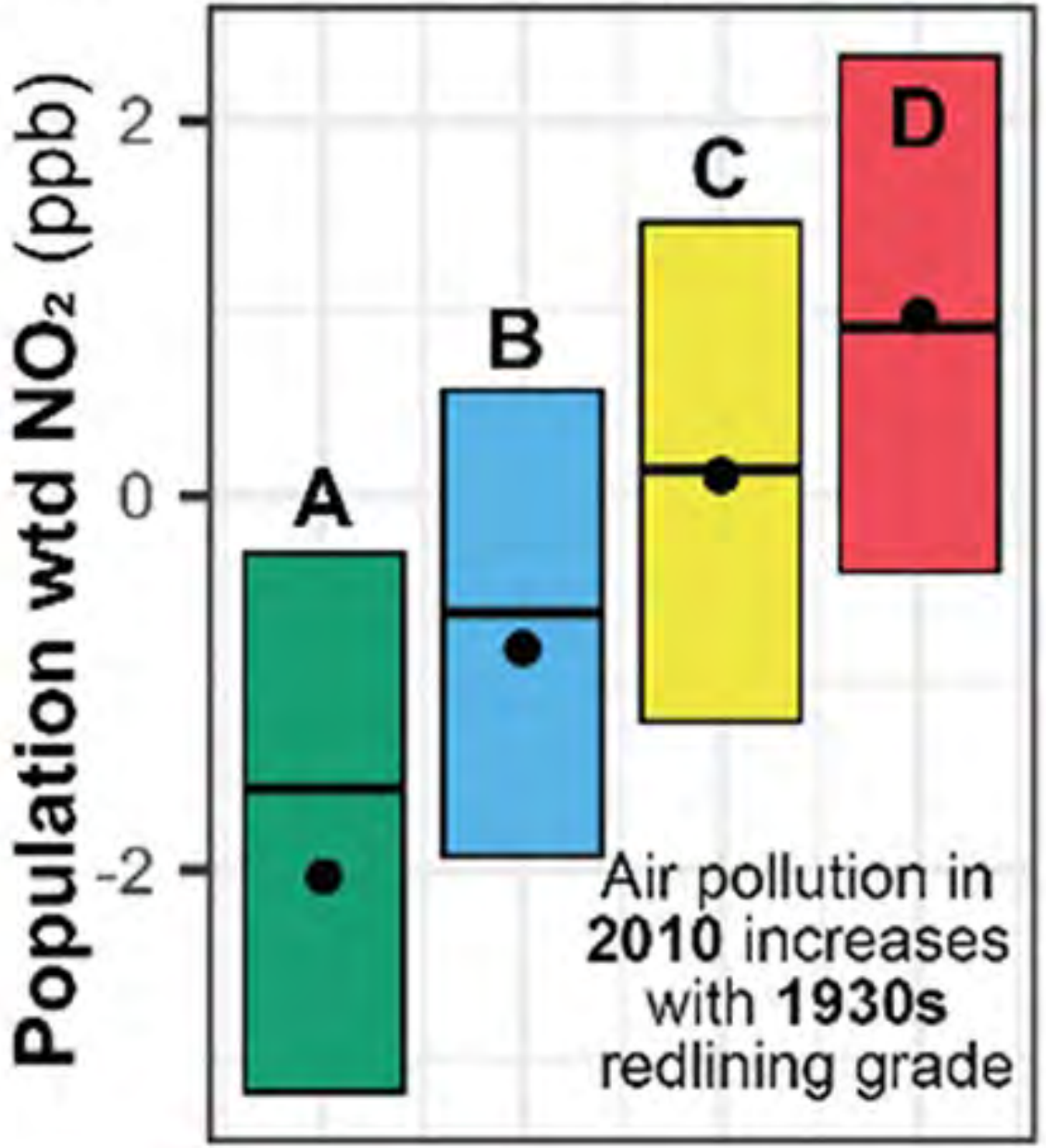


Source: Redfin analysis of First Street Foundation flood risk data (FSF) and HOLC redlining maps

REDFIN

Modern air pollution disparities in historically redlined areas



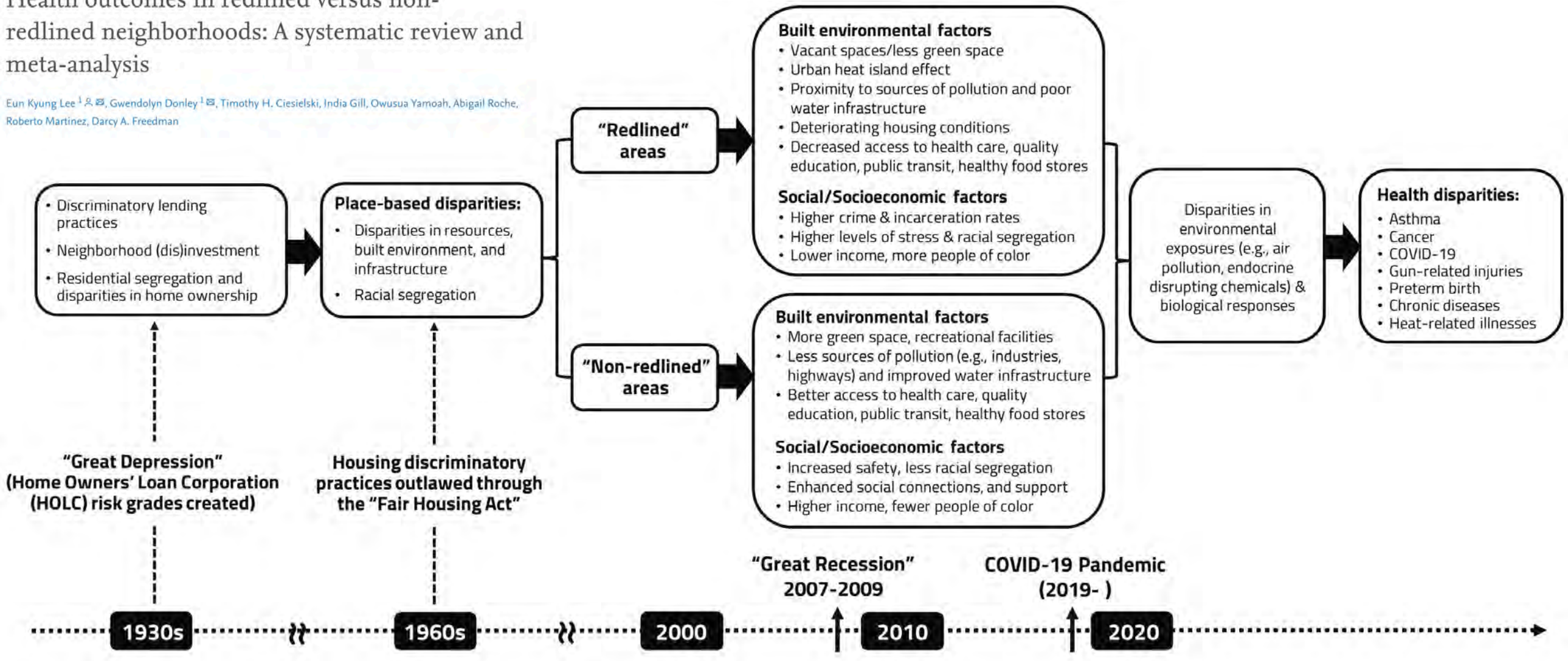


Lane et al., 2022

Social Science & Medicine
Volume 294, February 2022, 114696

Health outcomes in redlined versus non-redlined neighborhoods: A systematic review and meta-analysis

Eun Kyung Lee [1], Gwendolyn Donley [1], Timothy H. Ciesielski, India Gill, Owusua Yamoah, Abigail Roche, Roberto Martinez, Darcy A. Freedman



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Health outcomes in redlined versus non-redlined neighborhoods: A systematic review and meta-analysis

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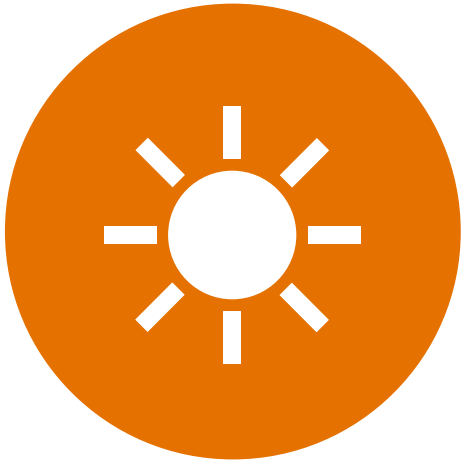
Disparities in environmental exposures (e.g., air pollution, endocrine disrupting chemicals) & biological responses

Health disparities:

- Asthma
- Cancer
- COVID-19
- Gun-related injuries
- Preterm birth
- Chronic diseases
- Heat-related illnesses

Our neighbors are already experiencing a: hotter, wetter, sneezier and wheezier climate


So what do we do now?

PAS REPORT 600

PLANNING FOR URBAN HEAT RESILIENCE

Ladd Keith, PHD, and Sara Meerow, PHD

Solutions

Heat mitigation

Reducing the built environment's contribution to urban heat

+

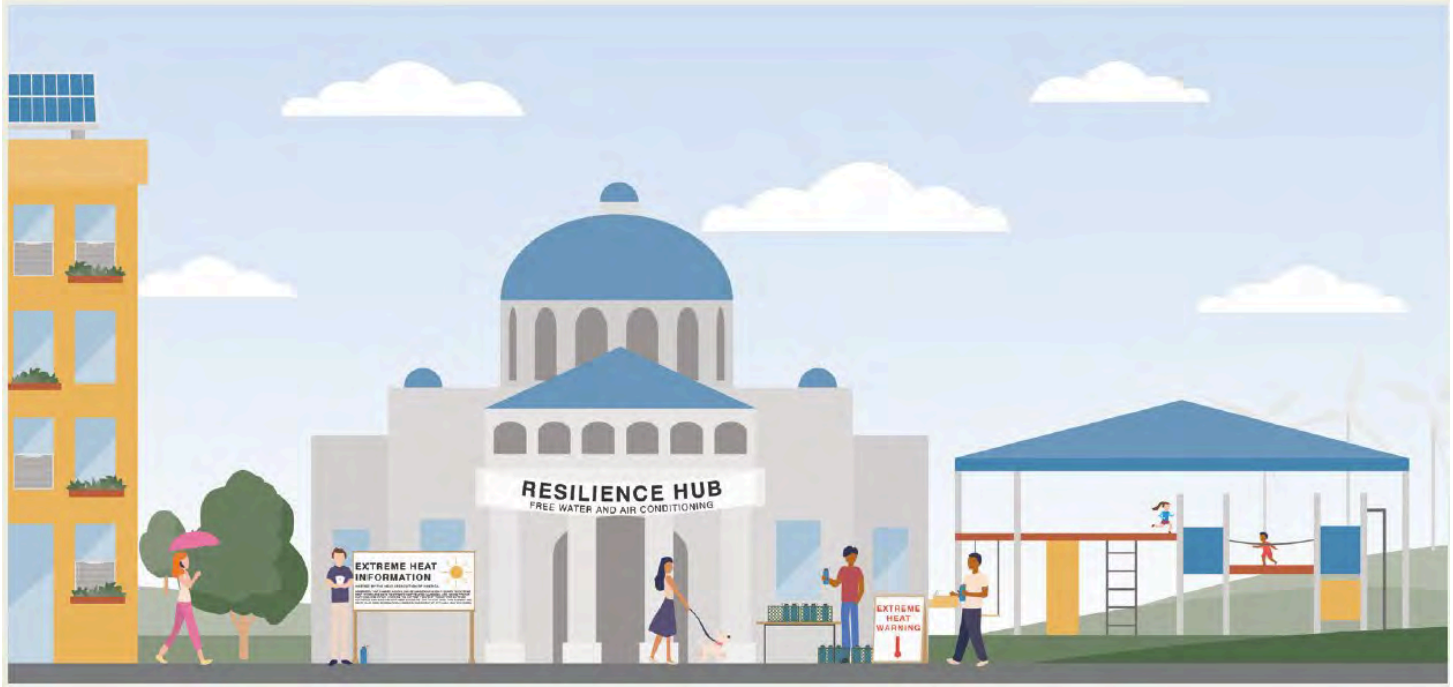
Heat management

Preparing and responding to chronic and acute heat risk

=

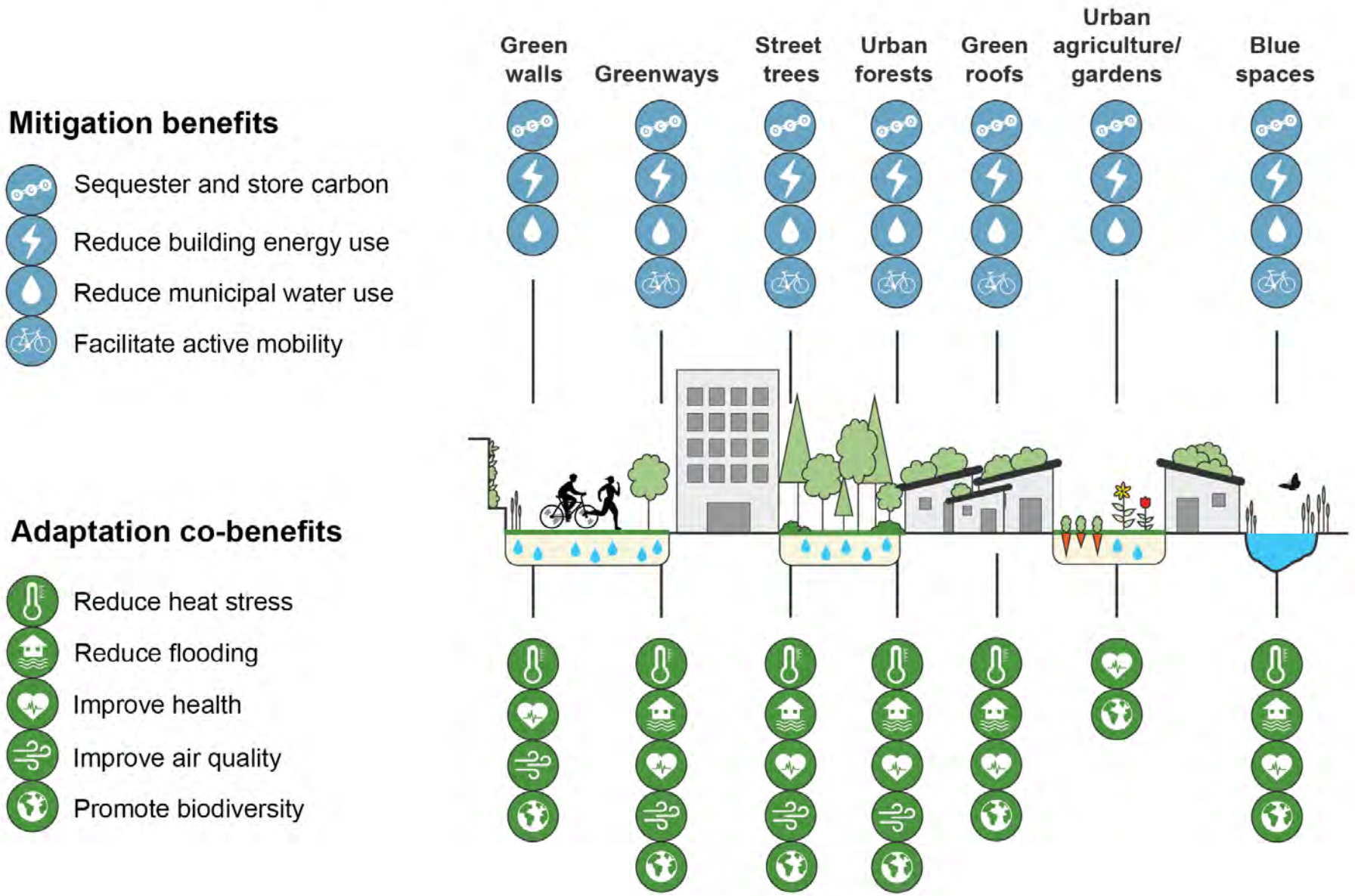
Heat-resilient communities


N MAIN ST

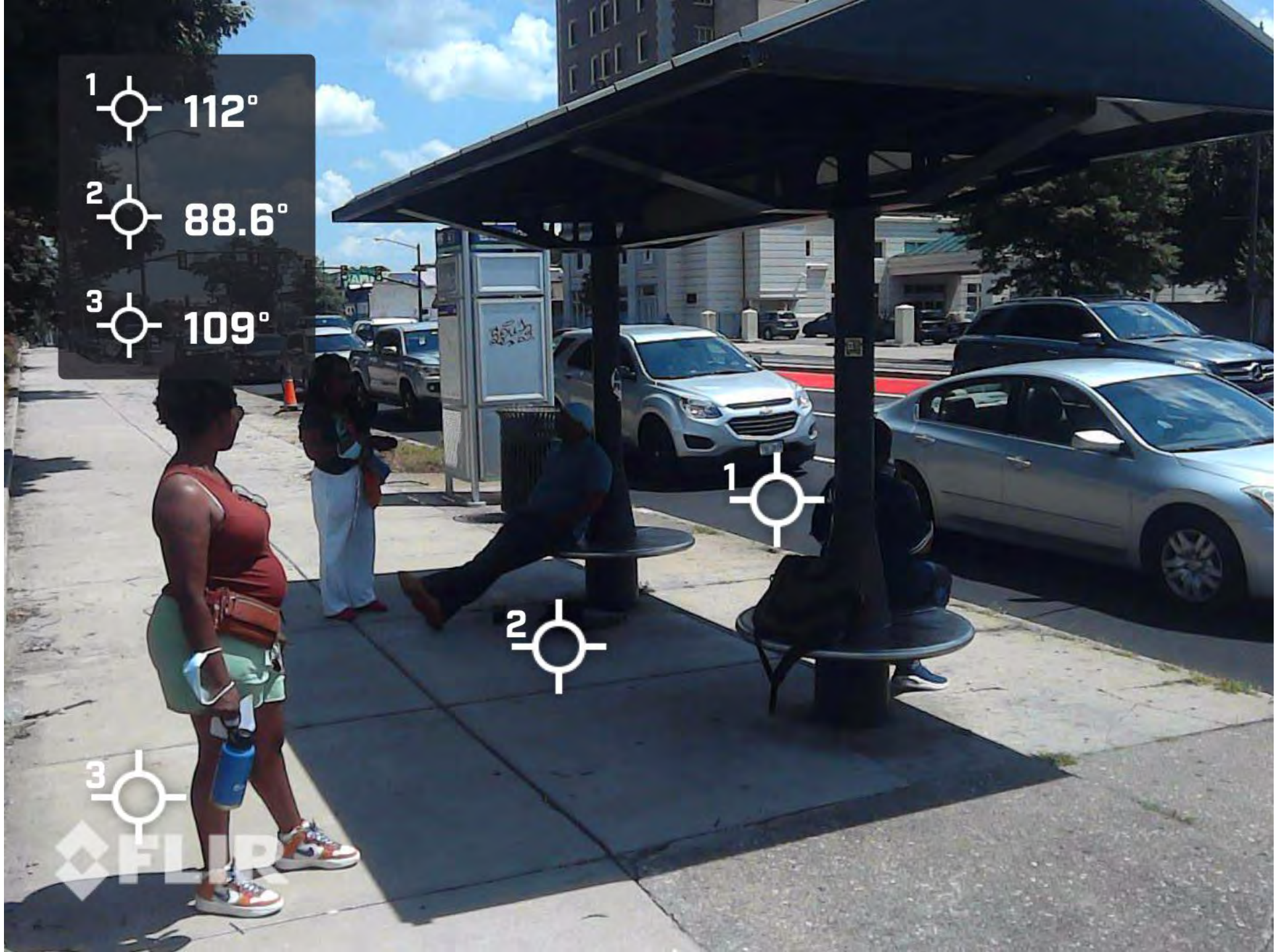

RESILIENCE HUB
FREE WATER AND AIR CONDITIONING
EXTREME HEAT INFORMATION
EXTREME HEAT WARNING

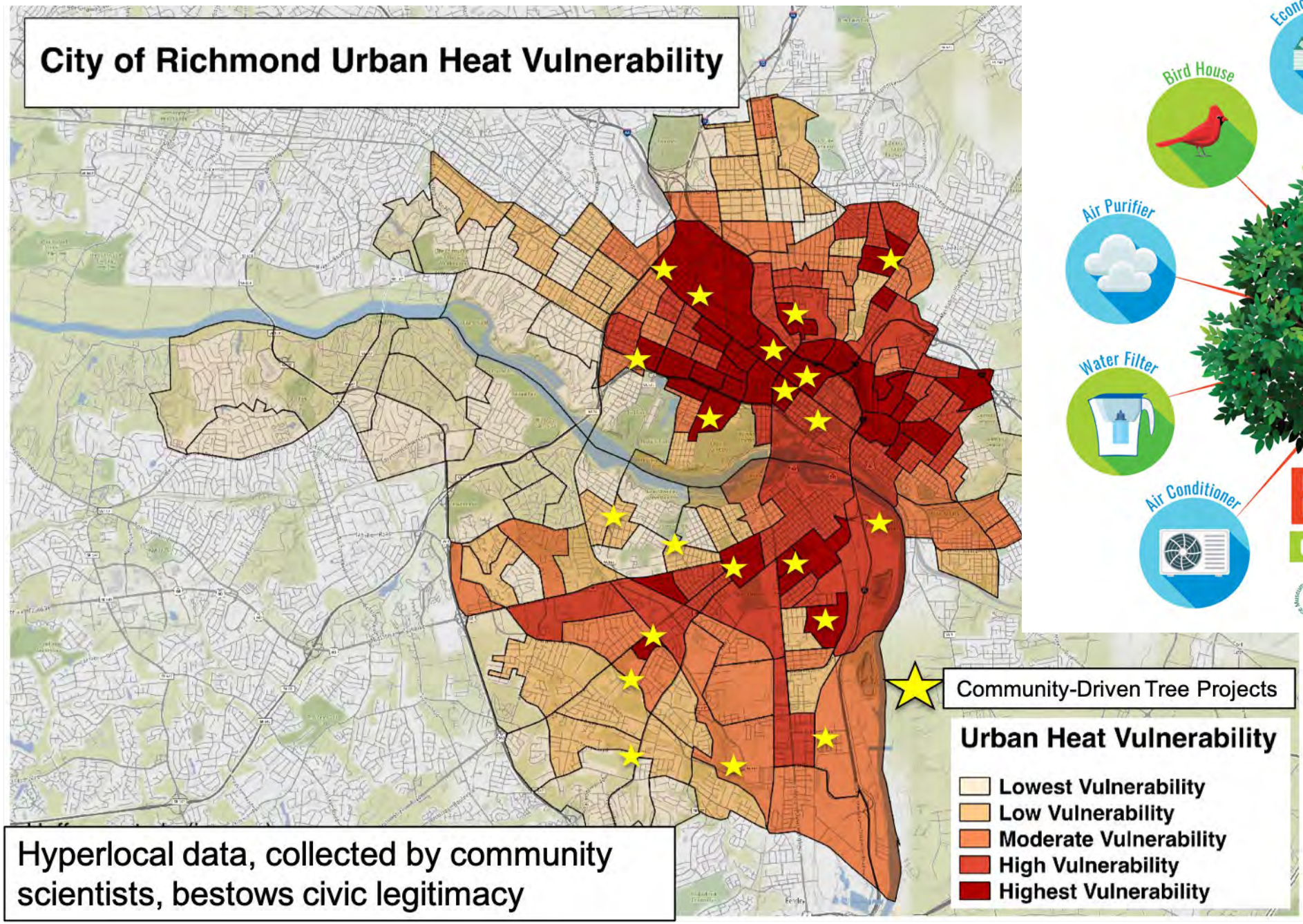
Climate-Resilient Neighborhood Design

Mitigation and Adaptation Benefits of Natural Infrastructure in Cities



NCA5 DELIBERATIVE ONLY


1 112°
2 88.6°
3 109°
1
2
3
FLIR



Hyperlocal data, collected by community scientists, bestows civic legitimacy

12 ABOUT TOWN

Mayor Stoney announces 5 new green spaces in Richmond's southside

Mayor Levar Stoney (Source: NBC12)

Climate Safe Neighborhoods

UNPACK HISTORY

Understand why our neighborhoods look the way they do- this is no accident.

PRIORITIZE CHANGES

Data informed, resident led changes to built environment

INTERVENE IN SYSTEMS

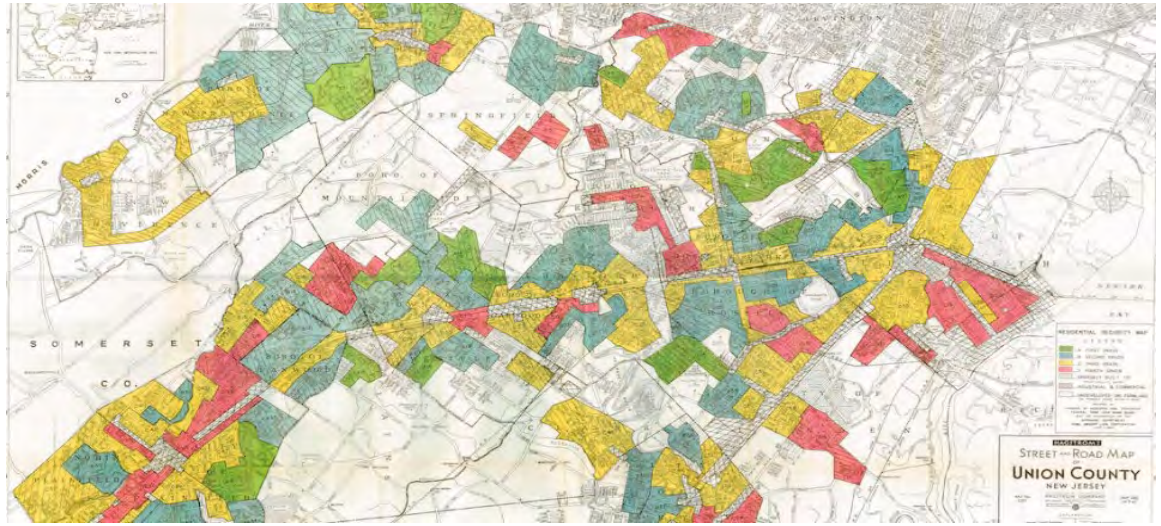
Build the capacity of residents to self advocate for more equitable distribution of resources

THREE PRONGED STRATEGY OVER FOUR YEARS

Climate Safe Neighborhoods

Kresge Foundation | The JPB Foundation |
RI Department of Health

Developing a community-based approach for addressing the climate safety needs of urban communities disproportionately impacted by extreme heat and increased urban flooding due to the legacy of redlining and housing discrimination.



Climate Safe Neighborhoods

Identified heat islands and places of interest on paper maps

Outreach and installing raised bed gardens and rain barrels at homes

Community-led tree planting at schools and homes

Thanks!

Jeremy@groundworkusa.org
@jer_science