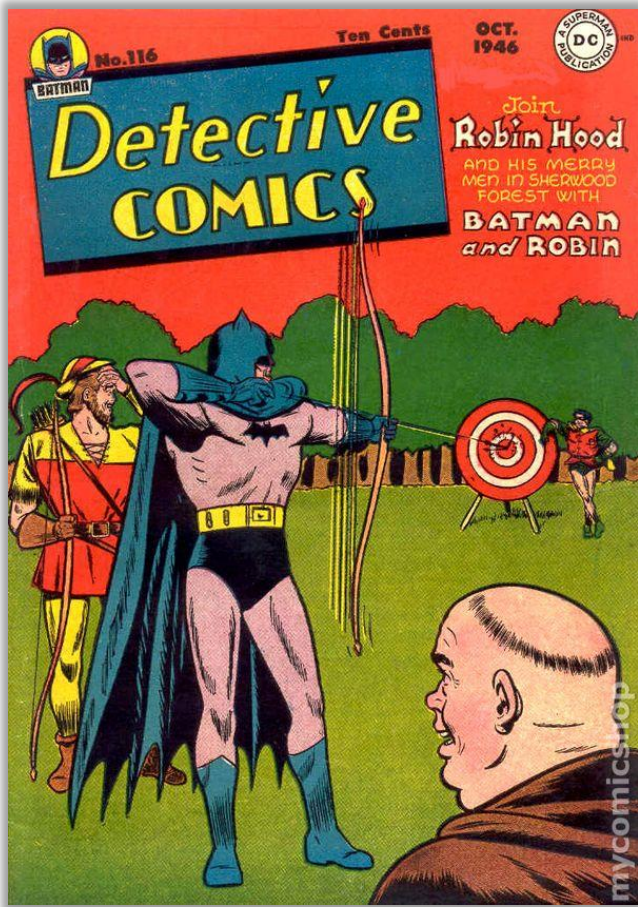


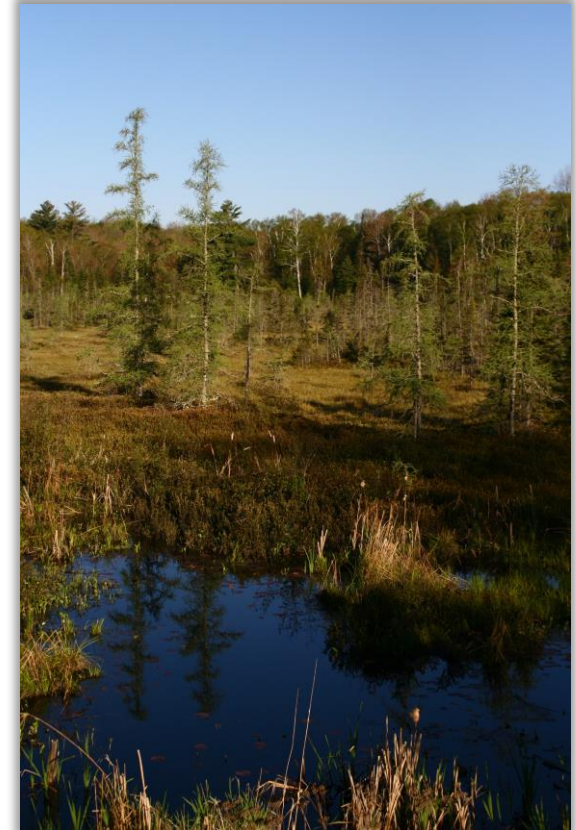
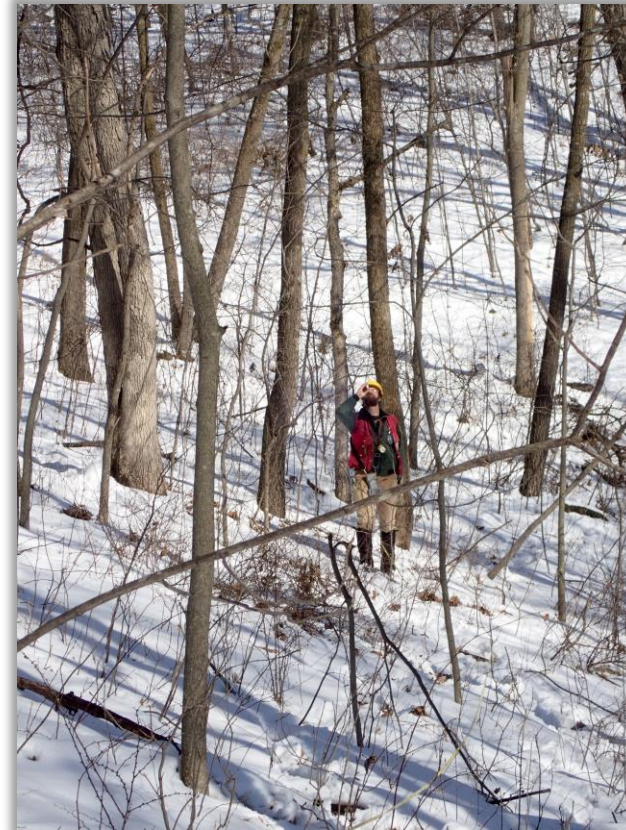
# **Urban and Rural Forest Inventory Analysts (& an Urban Heat Mapping Campaign)**

Dan Buckler, Urban Forest Assessment Specialist

# About me



# Rural Forest Analyst

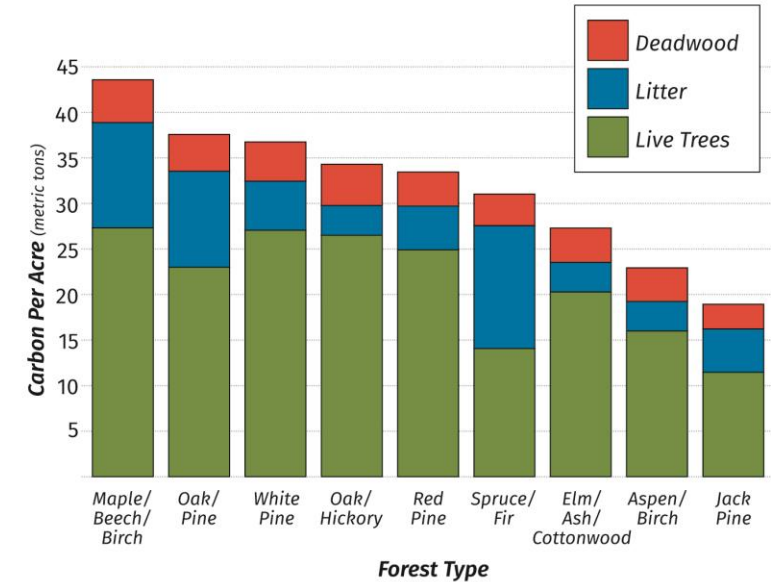


# Forest Inventory and Analysis (FIA)

Table 1. Acres (1,000) of timberland by major forest type and region of the state

Forest type group	North east	North west	Central	South west	South east	Grand Total
Oak-hickory	391	949	1,191	1,306	485	4,322
Maple-beech-birch	1,402	1,421	373	327	188	3,710
Aspen-birch	930	1,468	340	117	54	2,909
Elm-ash-cottonwood	314	466	332	194	333	1,639
White, red and jack pine	469	464	569	82	78	1,663
Spruce fir	633	508	128	8	65	1,342
Oak-pine	143	150	212	29	21	556
Minor types*	36	74	91	45	57	303
<b>Total</b>	<b>4,319</b>	<b>5,501</b>	<b>3,234</b>	<b>2,109</b>	<b>1,282</b>	<b>16,445</b>

\* Includes nonstocked land, exotic hardwoods and exotic softwoods.  
Source: USDA Forest Service, Forest Inventory & Analysis 2018 data



**Carbon Storage Per Acre By Forest Type in Live Tree Carbon Pools:** Carbon per acre is a way to normalize and compare the carbon stored by forest type. Maple/beecech/birch stores the most carbon of any forest type on average when excluding soil carbon. Soil carbon (not included in this figure) remains relatively stable over time when undisturbed. This figure is representative of average stand conditions in each cover type in Wisconsin (i.e., stocking, age, etc.).

# Wisconsin Continuous Forest Inventory (CFI)

Black River State Forest: Area of timberland (acres) by forest type and stand size

Forest Type	Large sawtimber	Small sawtimber	Pole	Sapling	Seedling	Nonstocked	Not Collected	All Size Classes
Aspen	0	120	1,432	0	705	0	0	2,257
Bottomland hardwoods	0	0	165	165	0	0	0	330
White birch	0	0	165	0	0	0	0	165
Central hardwoods	330	165	1,352	0	5,508	0	0	7,355
Lowland brush	0	0	0	0	0	1,127	0	1,127
Misc. Conifers	0	0	165	165	907	0	0	1,237
Misc. Deciduous	0	0	0	0	1,559	0	0	1,559
Red Maple	247	115	1,072	330	9,002	0	0	10,766
Northern hardwoods	73	165	0	83	0	0	0	320
Oak	243	495	165	165	7,420	0	0	8,488
Scrub oak	412	165	462	165	400	0	0	1,604
Red pine	274	2,426	839	0	0	0	0	3,539
White pine	2,202	2,377	2,230	652	8,928	0	0	16,388
Black spruce	0	0	495	0	0	0	0	495
Swamp hardwoods	0	0	165	0	0	0	0	165
Tamarack	0	21	460	330	165	0	0	976
Jack Pine	0	0	590	165	0	0	0	755
Not Collected	0	0	0	0	0	0	679	679
<b>All Forest Types</b>	<b>3,781</b>	<b>6,048</b>	<b>9,757</b>	<b>2,219</b>	<b>34,593</b>	<b>1,127</b>	<b>679</b>	<b>58,203</b>

# Forest Regeneration Monitoring (FRM)





# Assessment of Urban Forest Extent, Composition, Structure and Health





# Assessment of Urban Forest Extent, Composition, Structure and Health

The screenshot displays the 'TREEPLOTTER INVENTORY' web application. The interface includes a top navigation bar with 'HOME', 'HUB', and 'DATA' links, and a 'LOG IN' button. A central map shows Wisconsin with numerous red house-shaped markers indicating tree inventory locations. A legend on the right side, titled 'Wisconsin Community Tree Map', shows a layer for 'Organizations' with 181 of 184 organizations displayed. A search bar and a 'SHOW ALL TREES' button are also present. The left sidebar features a 'WISCONSIN COMMUNITY TREE MAP' header and a section titled 'EXPLORE YOUR URBAN FOREST' with descriptive text and a link to the 'DNR Urban Forestry Program'.

HOME HUB DATA

TREEPLOTTER INVENTORY

LOG IN

WISCONSIN DEPT. OF NATURAL RESOURCES

MAP STATS AND CHARTS ABOUT LOG IN

WISCONSIN COMMUNITY TREE MAP

EXPLORE YOUR URBAN FOREST

The Wisconsin Community Tree Map is a compilation of tree inventories from around the state, displaying thousands of street and park trees. This tool allows users to see what trees are growing where in their community. It also allows users to calculate the benefits that those trees are offering, such as air pollution and stormwater reduction, carbon sequestration and energy savings. Maps, charts and other graphics are exportable for use in your projects.

If interested in more information or if your community wants to pursue a tree inventory, contact the [DNR Urban Forestry Program](#). Organizations with inventories already in the WCTM can request a Read Only account from the DNR.

LEGEND

WISCONSIN DEPT. OF NATURAL RESOURCES

Wisconsin Community Tree Map

Layer: Organizations

Showing 181 of 184 organizations.

Search

SHOW ALL TREES

- Adams
- Allouez
- Antigo
- Antigo (School District)
- Appleton
- Appleton (Area School District)
- Ashland
- Ashwaubenon
- Ashwaubenon (School District)
- Baraboo
- Barron

50 mi Waterloo Dubuque

Google Keyboard shortcuts

# Assessment of Urban Forest Benefits



MyTree Benefits	
Serving size: 1 Elm, Chinese ( <i>Ulmus parvifolia</i> )	
<b>Carbon Dioxide(CO<sub>2</sub>)</b>	<b>\$108.34</b>
CO <sub>2</sub> absorbed each year	2778.08lbs
<b>Storm Water</b>	<b>\$28.63</b>
Rainfall intercepted each year	4618 gal.
<b>Air Pollution removed each year</b>	<b>\$1.82</b>
Ozone	12.00 oz
Nitrogen dioxide	0.48 oz
Sulfur dioxide	0.16 oz
Large particulate matter**	15.20 oz
<b>Energy Usage each year*</b>	<b>\$10.10</b>
Electricity savings(A/C)	96.54 kWh
Fuel savings(NG,Oil)	-13.99 therms
<b>Avoided Emissions</b>	
Carbon dioxide	1223.20lbs
Nitrogen dioxide	0.00 oz

# Data Analysis, Communication, and How-Tos

## City of Elroy # of Trees\* 419

### COMMUNITY TREE MAP INVENTORY

#### SPECIES DIVERSITY

Species diversity is a very important, but often elusive, goal of community foresters. Having a diverse mix of species helps protect your forest from future pests and pathogens.

The charts to the right show the composition of the three most commonly planted species and genera in the community and state. The higher the percentage in the "other" category, the better. It is best practice to have many species and genera, but not large percentages of either.

#### ELROY

**Species Diversity**

- Silver Maple (33%)
- Crabapple (21%)
- Green Ash (9%)
- 42 other spp (37%)

**Genus Diversity**

- Acer (Maple) (30%)
- Malus (Apple) (23%)
- Fraxinus (Ash) (7%)
- 23 other genera (34%)

#### STATEWIDE\*\*

**Species Diversity**

- Norway Maple (23%)
- Green Ash (21%)
- Honeylocust (7%)
- 167 other spp (49%)

**Genus Diversity**

- Acer (Maple) (25%)
- Fraxinus (Ash) (23%)
- Gladiolus (Locust) (7%)
- 63 other genera (45%)

#### SIZE DISTRIBUTION

It is important to manage a forest of mixed ages and sizes. Large trees generally provide more benefits than smaller trees, though a sustainable forest requires a significant percentage of small, young trees in order to replace the old. Charts to the left show the distribution of trees of different diameter classes, a common way of measuring tree size and estimating age.

#### ELROY

#### STATEWIDE\*\*

#### URBAN FOREST BENEFITS\*\*\*

Trees are part of a community's infrastructure, providing valuable benefits:

- Stormwater reduction:** Reduce amount and speed of rain on built infrastructure
- Property value:** Add real estate value
- Energy savings:** Cool buildings, reducing air conditioning costs, and block wind, reducing heating costs
- Air Quality:** Remove pollutants from the atmosphere
- Carbon sequestration:** Capture CO<sub>2</sub> from the atmosphere

#### ELROY

**\$54,070**  
Annual benefits

#### STATEWIDE\*\*

**\$60,274,083**  
Annual benefits

\*Trees incorporated into the Wisconsin Community Tree Map (pg-cloud.com/wisconsin). These are mostly street trees and do not represent all trees in a community. \*\*OR EPA\_BEL trees incorporated into the WCTM. \*\*\*Derived from i-Tree Streets, part of the U.S. Forest Service's i-Tree suite of software calculating the value of ecosystem and infrastructural benefits of trees. For more information on urban forest composition, visit: pg-cloud.com/wisconsin

## City of Rhinelander Tree Canopy 35.9%

### COMMUNITY TREE CANOPY

Land classification derived from 2013 imagery  
Your local municipal forester may have more detailed information

Total municipal area: 5199 acres (8.13 sq. miles)

#### LAND COVER

- Tree / Shrub 35.9% (1866 acres)
- Grass / Plantable 29.6% (1537 acres)
- Impervious / Bare Soil 31.3% (1629 acres)
- Wetland 0.6% (30 acres)
- Water 2.6% (137 acres)

#### STATE COVER\*

- 37.3%
- 28.8%
- 3.6%
- 3.7%
- 26.6%

\*Within Wisconsin municipalities

#### TREE CANOPY

Many communities aspire to expand tree canopy because of the wide array of services trees offer. Knowing your community's tree canopy cover sets a baseline of knowledge to help promote your forest and set canopy goals.

Tree canopy maps also enable identification of underserved areas and areas of potential growth. They help prioritize where communities should focus tree planting activities in the future.

#### ECO-BENEFITS

Trees are part of a community's infrastructure, providing valuable benefits:

- Stormwater reduction:** Prevent rain from burdening infrastructure
- Natural gas savings:** Block wind, reducing winter heating costs
- Property value:** Add real estate value
- Energy savings:** Cool buildings, reducing air conditioning costs
- Air Quality:** Remove pollutants and prevent power plant emissions
- Carbon sequestration:** Capture and store CO<sub>2</sub>

#### CANOPY DATA USES

- Prioritize tree planting locations**
- Set tree canopy goals**
  - Establish your area of interest
  - Identify current tree canopy
  - Assess goal criteria
    - Compare canopy cover
    - Identify where canopy can be expanded
    - Consider budget, staff and time
- Adopt goals based on assessments**
  - Protect and maintain existing trees
  - Plant new trees
  - Promote public awareness

For more information on tree canopy, visit: [dnr.wi.gov/topic/UrbanForests/ufia](http://dnr.wi.gov/topic/UrbanForests/ufia)

## WISCONSIN URBAN TREE KEY Broadleaf & Conifers

### BROADLEAF TREES - IDENTIFICATION METHODS

#### Leaf arrangement

- Alternate
- Opposite

#### Leaf type

- Simple
- Pinnately compound
- Bipinnately compound

#### SAMPLE

Species name

Leaf

Fruit or flower

Leaf length

Color = 100% magnified images from i-Tree Streets

#### OPPOSITE LEAVES

##### Norway Maple

3-6"

petioles are wide, cup-like other maples

##### Silver Maple

4-6"

petioles are narrow

##### Sugar Maple

4-6"

petioles don't produce leafy part

##### Amur Maple

2-2.5"

leaves drop in late spring/flowers

##### Freeman Maple

3-5"

most dark purple fruit

##### Red Maple

2-5"

fruit often reddish

##### Boxelder

2-4" (leaflets)

only maple with one pinnate leaf

##### Japanese Tree Lilac

3-4"

prominent leafstalk on the back

##### Buckeye/Horsechestnut

3-6" (leaflets)

small dark brown spots

##### Northern Catalpa

7-12"

leaves are huge!

##### Green Ash

3-5" (leaflets)

leaflets have very short petioles

##### White Ash

3-5" (leaflets)

5-9 leaflets

#### ALTERNATE LEAVES

##### Honeylocust

0.5-1" (leaflets)

leaves are opposite, but lower alternate

##### Black Locust

2-4" long

leaves are opposite, but lower alternate

##### Kentucky Coffeetree

1-3" (leaflets)

leaves are opposite, but lower alternate

##### Black Walnut

2-4" (leaflets)

leaves have pointed edges

##### Mountain-Ash

3-7" (leaflets)

leaves are opposite, but lower alternate

##### Shagbark Hickory

3-7" (leaflets)

leaves are opposite, but lower alternate

##### Basswood/Am. Linden

1-2" (leaflets)

leaves are opposite, but lower alternate

##### Littleleaf Linden

1-3"

leaves are opposite, but lower alternate

##### Hackberry

2-5"

leaves have simple palm

##### Sumac

2-4" (leaflets)

leaves are opposite, but lower alternate

##### Ironwood/Hophornbeam

2-5"

leaves are opposite, but lower alternate

##### Black Cherry

2-5"

leaves are opposite, but lower alternate

##### Chokecherry

1-3.5"

leaves are opposite, but lower alternate

##### Witchhazel

2.5-6"

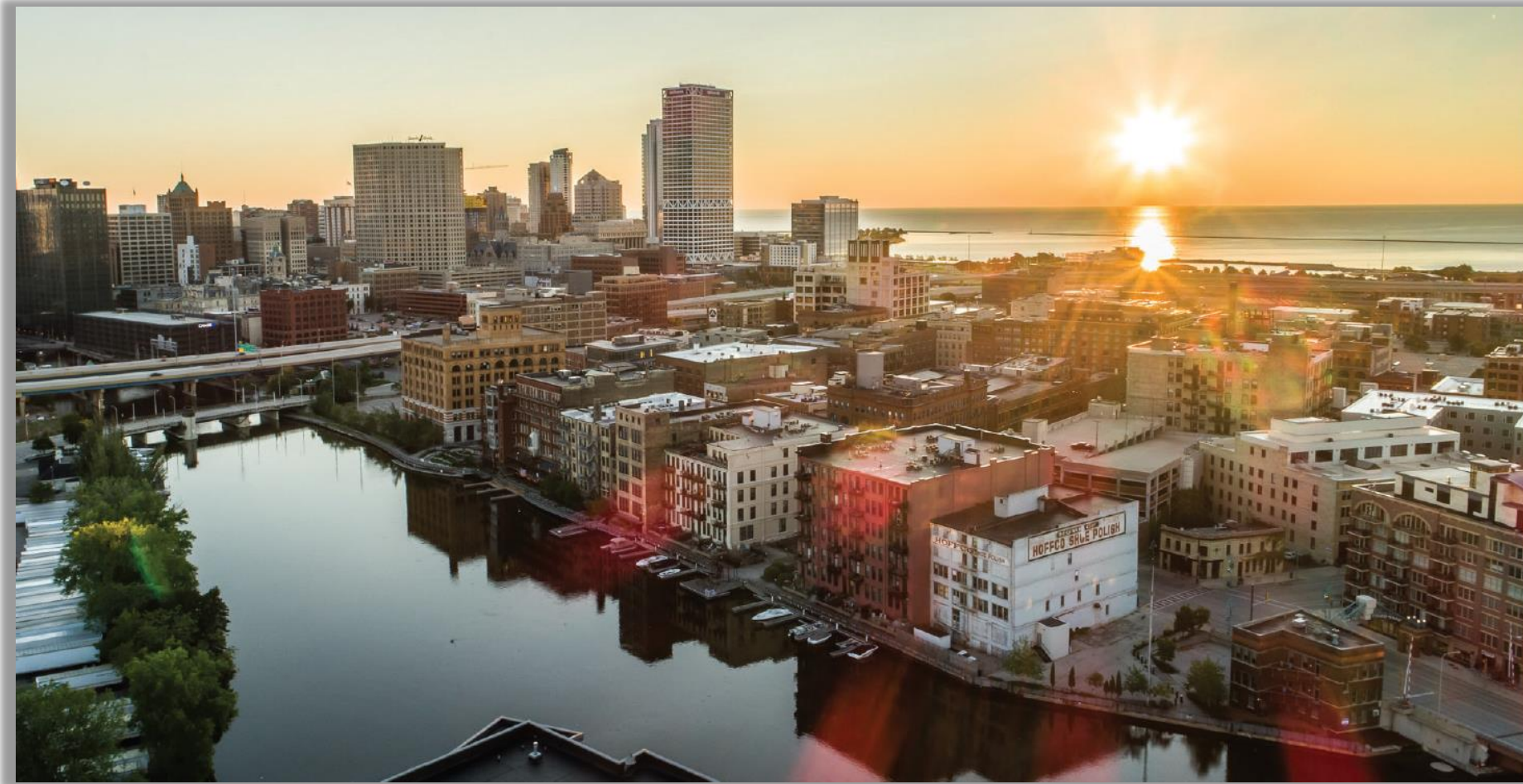
leaves are opposite, but lower alternate

##### Callery Pear

1.5-3"

leaves are opposite, but lower alternate

# Milwaukee Heat Mapping Campaign





Late afternoon temperature °C

# THE LANCET

SERIES | HEAT AND HEALTH | [VOLUME 398, ISSUE 10301, P698-708, AUGUST 21, 2021](#)

## Hot weather and heat extremes: health risks

[Prof Kristie L Ebi, PhD](#)   • [Prof Anthony Capon, PhD](#) • [Peter Berry, PhD](#) • [Carolyn Broderick, PhD](#) •  
[Prof Richard de Dear, PhD](#) • [Prof George Havenith, PhD](#) • et al. [Show all authors](#)

Published: August 21, 2021 • DOI: [https://doi.org/10.1016/S0140-6736\(21\)01208-3](https://doi.org/10.1016/S0140-6736(21)01208-3)

 Check for updates

Rural

Suburban  
Residential

Commercial

City

Urban  
Residential

Park

Suburban  
Residential

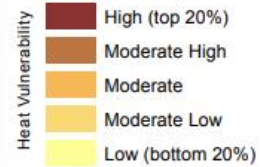
Rural  
Farmland

## Milwaukee County Heat Vulnerability Index

The Milwaukee County Heat Vulnerability\* analysis was created by the Building Resilience Against Climate Effects program within the Wisconsin Department of Health Services. The data displayed in the map is meant to serve as an informational tool to better understand the spatial distribution of human populations most vulnerable to extreme heat related events.

### Milwaukee County Vulnerability (county based quantiles)

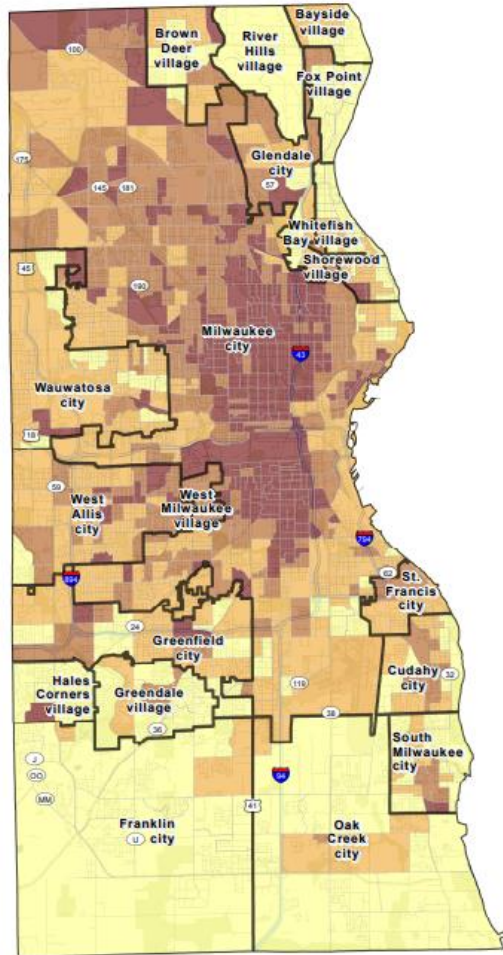
by Census Block Group



\* The Milwaukee County Heat Vulnerability Index is based on the Wisconsin Heat Vulnerability Index\*\* with slight alterations to account for risk factors specific to Milwaukee County. Additional data sets were made available for the Milwaukee study area and incorporated into the analysis. It is representative of the heat vulnerability in Milwaukee County, and is not representative of the vulnerability compared to the other counties in Wisconsin.

\*\* The Wisconsin Heat Vulnerability Index is based on multiple indicators associated with risk for heat-related illness and mortality. The index analysis was created as a measure of vulnerability by U.S. Census block groups during an extreme heat event. The measure includes: health factors, demographic and household characteristics, natural and built environment factors (e.g., air quality, temperature, land cover) and population density.

### Reference Data



Map created by the Bureau of Information Technology Services in cooperation with the BRACE Program, Bureau of Environmental & Occupational Health, Division of Public Health, Department of Health Services, State of Wisconsin - P-01594 (8/2015)

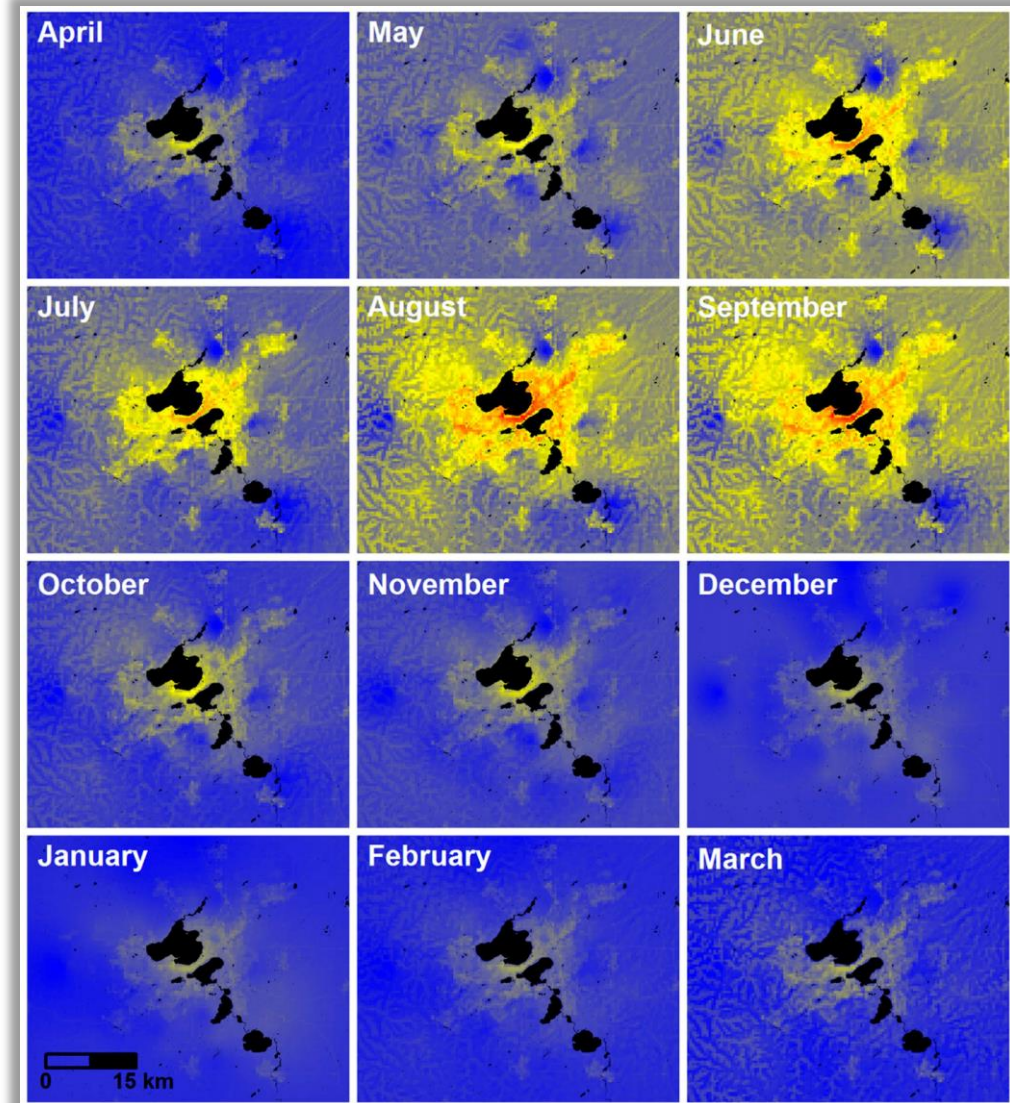
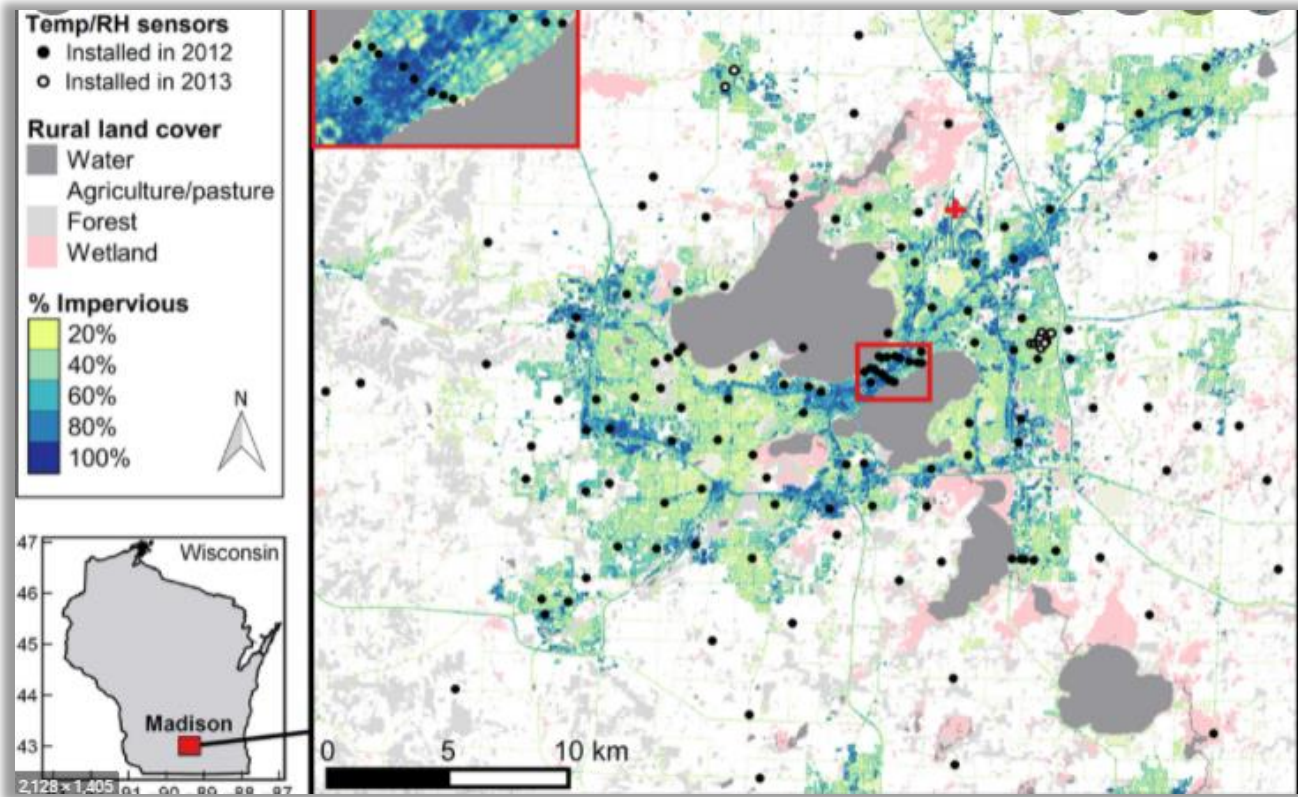
Maps and related information are provided as a public service for informational purposes only. We make no warranties on the accuracy of content. Use of information from this document is at your own risk.



## Excessive Heat Event Coordination Plan

Milwaukee Metropolitan Area  
Heat Task Force

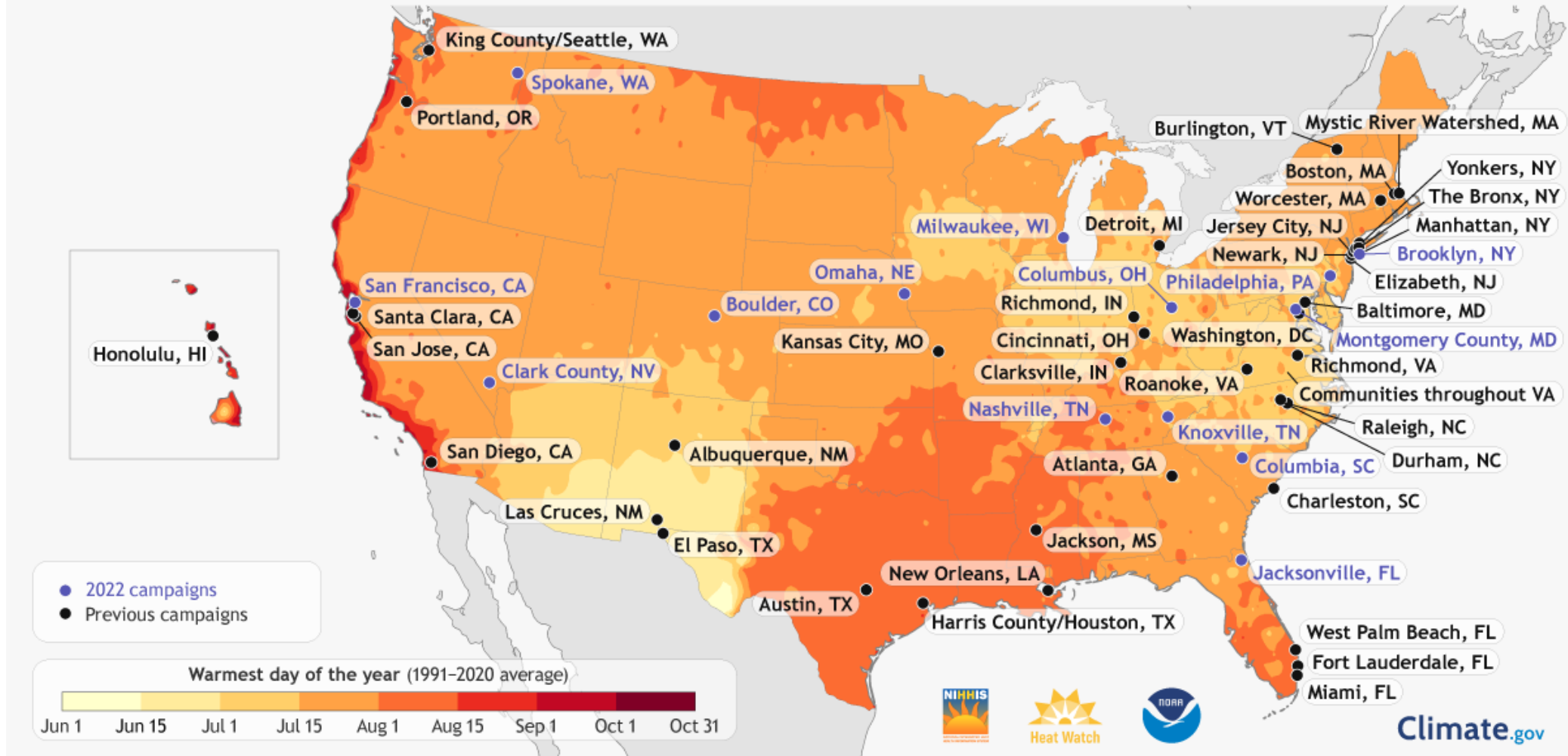
2019







# NOAA Urban Heat Island Mapping Campaigns: All Locations, 2017-2022







DRAFT

96.2 mi<sup>2</sup>

Study Area

43

Volunteers

9

Routes

59,016

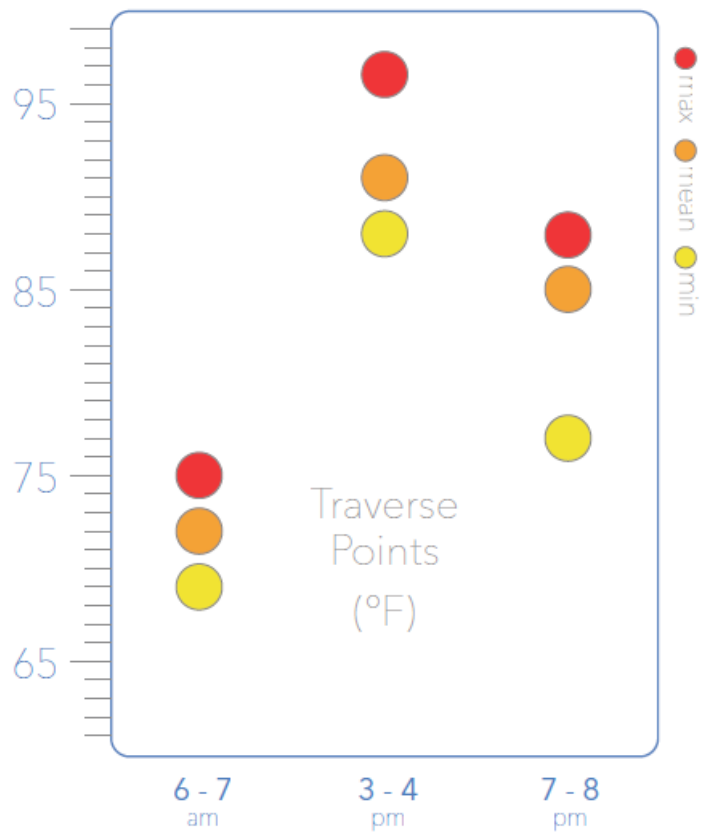
Measurements

96.7°

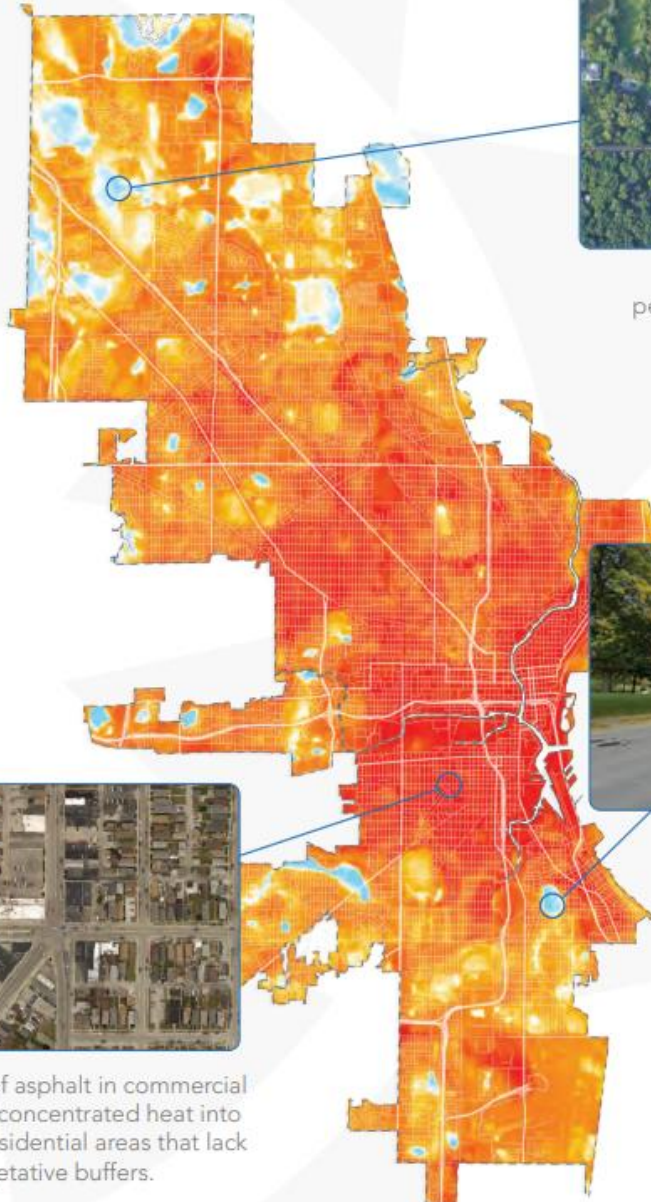
Max Temperature

10.4°

Temperature  
Differential



Large swaths of asphalt in commercial areas can spill concentrated heat into surrounding residential areas that lack protective vegetative buffers.

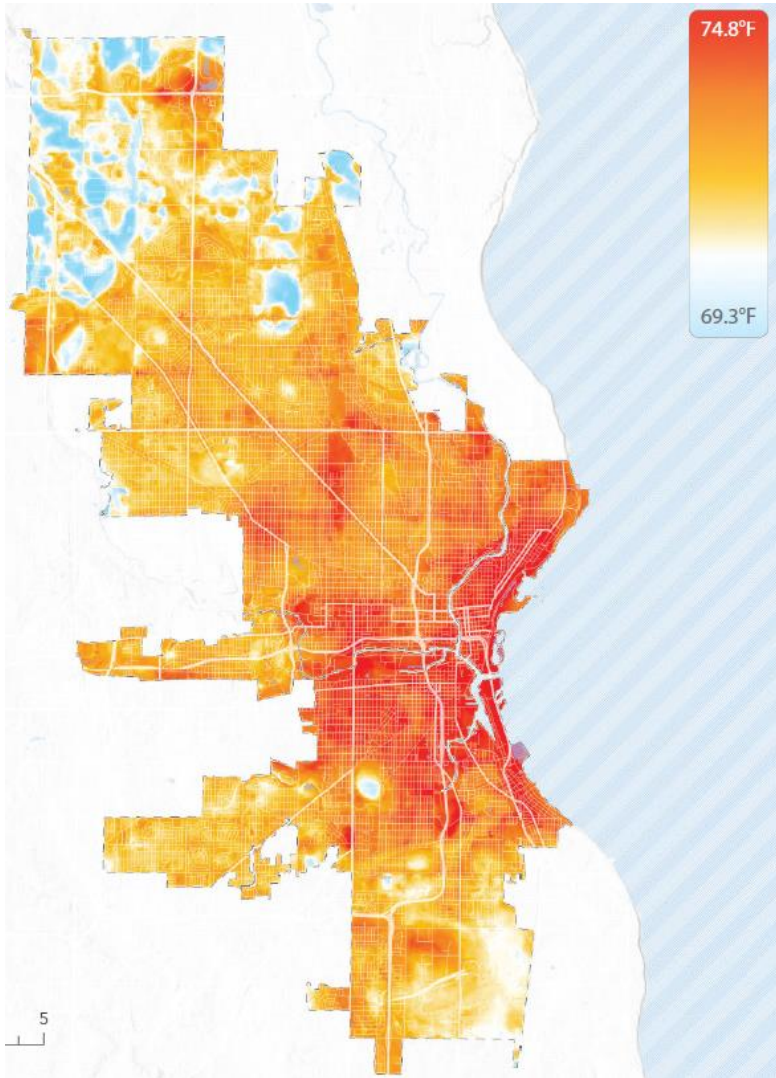


Residential areas with a high percent canopy cover retain less heat throughout the day.

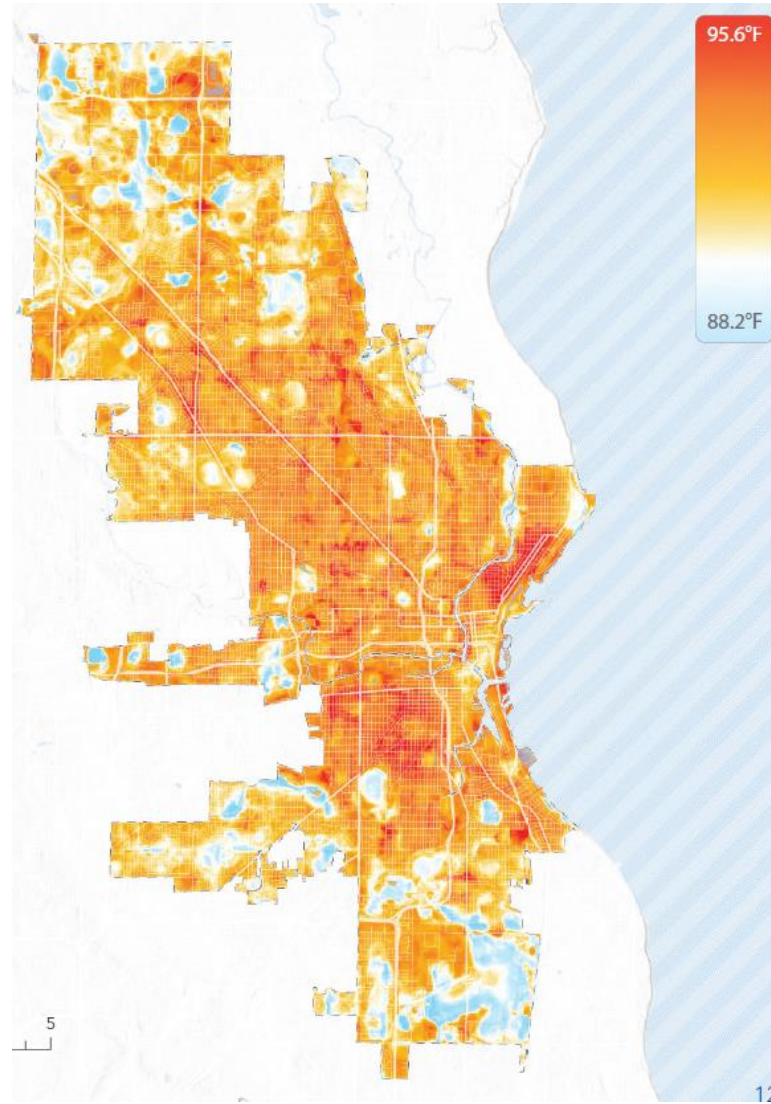


The open space and shade of large parks keep some surrounding residential blocks relatively cooler.

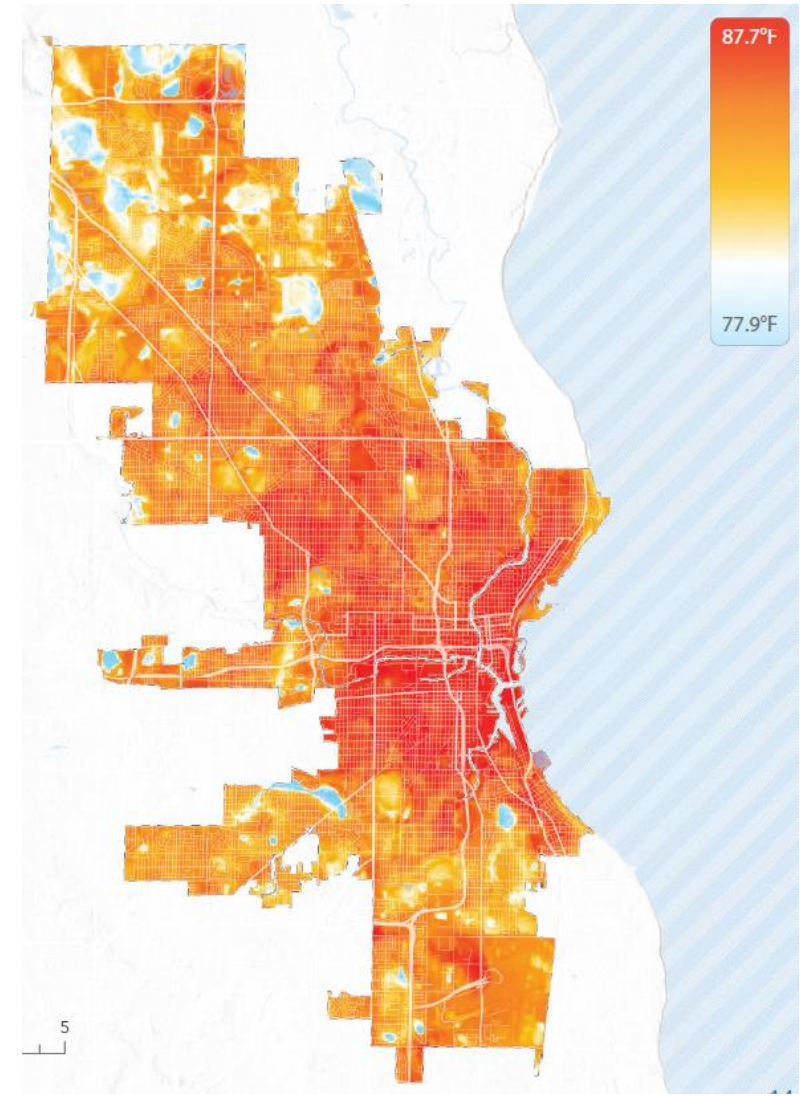
**DRAFT**



6 – 7 AM



3 – 4 PM



7 – 8 PM



**WISCONSIN  
PUBLIC RADIO**

Wisconsin and the World. **npr**



A boat travels on the Milwaukee River on Wednesday, June 23, 2021. Angelo Altomano

### Beating the heat: Milwaukee to join cities across the nation in measuring heat island effect

Doctor predicts public health impact will only 'get worse as temperatures rise with climate change'

**SPECTRUM  
NEWS 1**



### Hot data: Milwaukee to be a part of a hot weather study this week

By **DEBRA HARTWICK** | WISCONSIN  
PUBLISHED 01:48 PM ET, JUL. 26, 2022

MILWAUKEE — Milwaukee residents may soon see cars with devices attached to the top of them. They are a part of a hot weather study taking place this week.

The city of Milwaukee was chosen to be a part of a hot weather study. A team of volunteers will soon take to the streets to find the hottest parts of the city.

**58** WDJT - MILWAUKEE

### Heat is the most common weather-related cause of death nationwide

By: **Tajma Hall** | Facebook | Twitter



**NEW AT 5** Tracking the Heat  
Milwaukee



MILWAUKEE (CBS 58) — Heat is the most common weather-related cause of death nationwide, according to the National Weather Service. Researchers are working to learn how to keep people safe. Milwaukee is one of 14 U.S. cities chosen for a national research project tracking heat trends.



GROUNDWORK  
Milwaukee



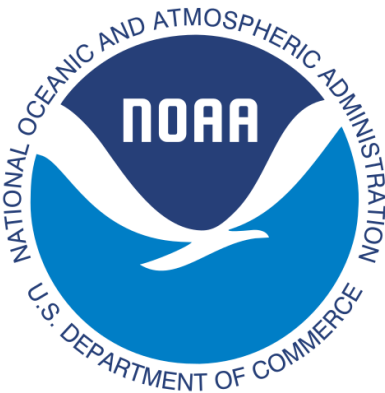
WISCONSIN DEPARTMENT  
of HEALTH SERVICES



Milwaukee County  
**PARKS**



The Nature  
Conservancy



Sixteenth Street  
AT THE HEART OF OUR HEALTHY COMMUNITY



CITY OF MILWAUKEE  
HEALTH DEPARTMENT



Milwaukee  
Water Commons



**Dan Buckler**  
**daniel.buckler@wisconsin.gov**