

Shading Dade

# HEAT RESOURCE GUIDE SUMMER 2021



### **INTRODUCTION**

Here at Shading Dade, we hope this finds you well and most especially cool! It is an unfortunate truth that temperatures are rising around the world, and are heavily felt by those living in tropical and heat-familiar places like South Florida.
The warming caused by climate change not only affects natural environments and wildlife, but also people and their health.

We have put together this *Heat Resource Guide* to provide you with some of our favorite resources regarding heat. Our goal as professionals in the science field is to increase knowledge and awareness among citizens; we are at the forefront of research and know the importance of bringing forth information to hopefully better your understanding of climate issues and your quality of life. This is a living document and will continue to be developed and expanded as we further our research and network.

Grab a cool glass of water and enjoy the guide!



#### SHADING DADE

Shading Dade is a citizen science heat monitoring project in Miami-Dade County launched by Florida International University's Sea Level Solutions Center in the Institute of Environment, the Department of Journalism and Media and Catalyst Miami

This heat resource guide is brought to you by the Urban Heat Research Group of the Resilient305 Collaborative. The Resilient305 Collaborative is a partnership formed out of a 2016 Memorandum of Understanding among City of Miami, City of Miami Beach, Miami-Dade County, Florida International University, Miami-Dade College, and University of Miami to support the implementation of the Resilient305 Strategy.





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\*Articles, reports, guides, and scientific paper titles are hyperlinked in their sections for direct access. You can also find full URLs in the "Resource Links" section.





### SHADING DADE

#### <u>Overview</u>

How hot is it, really, in Miami-Dade? Our citizen science project is trying to find out! In 2018, FIU's Sea Level Solutions Center in the Institute of Environment, the Department of Journalism and Media, and Catalyst Miami launched the initiative "Shading Dade" which uses dime-sized heat sensors to record temperatures and humidity at specific locations.

Students, faculty, and citizens deploy tiny heat-sensing iButtons among the diversity of Miami-Dade's communities, along streets, and in parks, among other locations. The primary focus of locations are areas where residents are most likely to congregate, such as bus stops, parking lots and garages, shopping centers, and open public spaces. To get a hyperlocal look into these areas' felt-temperatures, other characteristics such as tree canopy, infrastructure type, and areas of more vulnerable populations, are considered during deployment. This study will identify specific urban heat "hot spots" and will investigate the different factors that reduce or increase heat such as shading and vegetation.

#### Example Findings

One finding of the project comes from a 2019 deployment across the Lincoln Road Mall in Miami Beach. The research team expected to find cooler temperatures at the east end of the mall which is close to the ocean and experiences a steady sea breeze, and hotter temperatures at the west, more inland end of the mall. Instead, the team discovered that the west end of the mall also saw cooler temperatures. While further investigation is needed to confirm the results, preliminary analysis suggests that water and vegetation features, which mimic a cypress pond and mangrove forest, may be providing a significant hyperlocal cooling effect on that west end. Once confirmed, this can emphasize the benefits of nature-based and nature-inspired solutions combating heat.

#### **Quote from Miami-Dade County Chief Heat Officer**

"As co-chair of Miami-Dade County's new *Heat Health Task Force,* I'd like to emphasize how important the collection and analysis of scientific data is to our community work and individual health. The data collected through the Shading Dade initiative will enhance our understanding of how buildings, pavements, tree canopy and other green infrastructure can influence ambient air temperature and humidity. This is critical as we update our streetscape design standards, as well as land use and zoning policies." *Jane Gilbert, Miami-Dade County Interim Chief Heat Officer* 





### SHADING DADE

#### **Ambassadors**

Thank you so very much to our Shading Dade Ambassadors!! The wonderful citizen scientists who have participated as deployers and retrievers, those who make this project possible.

#### Partners & Stakeholders

Florida International University (Sea Level Solutions Center in the Institute of Environment and Department of Journalism and Media), University of Miami (Rosenstiel School of Marine and Atmospheric Science), Catalyst Miami, Miami-Dade County, City of Miami, City of Miami Beach, Family Action Network Movement, Florida Clinicians for Climate Action, Human Rights Watch, The Women's Fund and many dedicated and engaged citizens of Miami-Dade County

#### Additional Information

- <u>GET INVOLVED!!</u> Shading Dade is a collaborative citizen science effort that features the participation of volunteers to assist with deployment and retrieval of sensors, as well as other aspects of the project. This is an ongoing project and an evolving process. We encourage your involvement to help inform how hot it really is in Miami-Dade, as well as learn about how climate change and heat is impacting us, and what we can do about it.
  - Join our project as a Shading Dade Ambassador!
     SIGN-UP HERE: http://miamistories.net/shading-dade/
- You can find more information about the Shading Dade project and previous deployments at the link above.
- For any questions regarding the project, please contact Alyssa Hernandez (*alyherna@fiu.edu*) with the email subject "Shading Dade Project".







### **QUOTES & TESTIMONIES**

**DOCTOR** -- "My 2016 "aha" moment: A patient came in for an early refill on her breathing medicines made worse by heat, ground-level ozone, mold and mildew. She asked me to sign a form asking the power company not to cut her off for lack of payment, because if she didn't run her air conditioner, she could not breathe. Now I see patients with the similar problems nearly every week." *Cheryl Holder, MD, FACP (The Hill, April 2021)* 

**YOUTH** – "Because I'm a kid, I like to go outside and play. But sometimes it's so hot that I tell my parents I don't want to go outside, even if to do a short walk. My little brother who is 4 years old complains during his soccer games that he is too sweaty to play. Also, when it is super hot, I don't see a lot of people hanging out in parks. I hardly go to playgrounds anymore because many times when I grab the rails or use the slides, I burn myself. There's no fun in that! We went to California this summer, and the first thing I said when we got back is "Miami is too hot!" It makes me a little sad that we do less family walks, playground days, or even outside birthday parties because of the heat." Lyla Arana, 9 years old

**ELDERLY** – "As an elderly person, many things can slow me down, but the heat has truly been at the top of these factors. I can no longer walk unaccompanied to the corner to get cafecito without worrying that I will feel dehydrated or faint, or not even have the energy to make it back home. I made the connection that my arthritis would worsen when I spend some time outside on my patio. After speaking with my doctor, I was advised to stay indoors to not exacerbate the pain. At first, I thought to myself, how can I stop enjoying the outside?! Then I realized nowadays outside is not so enjoyable, simply because of the heat." *Zoila Rodriguez, 95 years old* 

**BEYOND MIAMI-DADE** – "This summer I stayed in a more rural part of Washington state where temperatures got to 110°F. There is a large low-income and immigrant population in that part of the state who live in trailers and informal housing that most probably lack A/C. Even a lot of the coffee shops and businesses do not have A/C, and it was clear that the workers were struggling in the conditions. Beyond health, it was baffling how the heat touched everything. We have an apple tree and all the apples on the top half of the canopy fried and have since gone rotten. We also have a Port Orchard Cedar, a heat sensitive variety, which crisped up in the heat. I recently chatted with a Park Ranger at Mt. Rainier National Park who told me that a huge amount of snow and ice melted off the mountain much earlier than usual because of the heat. Although it is critically important that health is centered, I think people don't realize how all-encompassing the impacts were." *Lynee Turek-Hankins* 

<u>SCIENTIST</u> – "It is really important to understand how people are exposed to heat when they are walking around on the ground, taking public transportation, waiting at a bus stop, or with their kids at a playground. By solidifying this understanding, citizens can be informed on how they can better protect themselves from the increasing effects of climate change." *Tiffany Troxler, PhD* 



### **Recent Heat Trends & Urban Heat Island Effect**

ClimateCentral.org



*EXTREME HEAT DAYS*: Miami's number of days with a heat index of 90°F (1979-2020)





DOWNTOWN

HEAT ISLANDS: Urban Heat Island (UHI) average day and night temperature variations over different land use types



INDUSTRIAL

# HEAT ISLAND

ALBEDO

CLIMATE CO CENTRAL

**FACTORS:** 

PARK

GREENSPACE

POPULATION DENSITY

**BUILDING HEIGHT** 

INTENSITY SCORE 7.2°

<u>ښ</u>

NIGHT

RURAL

Seurou: Climate Central analysis based on Sanaiorgia (2020) DOI: 10.1038/s41398-020-75018-4 and Demozere (2020) DOI: 10.1038/s41397-020-00605-a

CLIMATE CO CENTRAL

# ARTICLES

#### 1) Every climate solution is a health solution – both are badly needed (The Hill, April 2021)

Miami-Dade County's very own Dr. Cheryl Holder wrote this op-ed article to shed light on the health impacts and racial disparities related to heat from the perspective of a physician. She states that "according to the Union of Concerned Scientists, Miami will go from having just one day per year with a heat index of 105 degrees to having 59 days per year that "feel like" 105 degrees heat by midcentury... At a heat index of 105 degrees, anyone could be at risk of heat-related illness — or even death — if they stay outside too long."

# 2) <u>Cities Must Protect People From Extreme Heat (The International Journal of Science - Nature, July 2021)</u>

Recent heatwave consequences to cities around the world have heightened awareness and emphasized the need for developmental action to protect against these deadly disasters. Effective plans such as Medellin, Colombia's planting of trees in low-income neighborhoods most affected by temperature increase has resulted in a decrease of 2°C, an effort that could have tremendous effects in other parts of the world.

# 3) <u>Workers Grapple with Health Threats posed by Climate Change and Heat (The Washington Post, July 2021)</u>

Considerations for policy creation at a national level that combat climate change-related heat surges have been submitted to President Biden to protect workers from experiencing heat-related illnesses and/or death. The current inadequacy of protections related to this issue has led to hospitalizations and have even cost the lives of many employees who have migrated to the United States in hopes of achieving a better future for themselves and their families.

#### 4) The Deadly Impact of Urban Heat (Springer Nature, July 2021)

Thorough analysis on different sections of cities experiencing heat-rising effects brought on by climate change has shown the disproportion existent between low and high-income neighborhoods, stressing the need for improvement in sustainable development and access to resources for marginalized members of the community. The partiality of developmental policies and regulations that negatively affect the Brown, Black, and Hispanic people groups can be traced back heavily to the start of the twentieth century and must be rapidly changed.

#### 5) <u>Like in 'Postapocalyptic Movies': Heat Wave Killed Marine Wildlife en Masse (The New York Times,</u> July 2021)

The gravity of recent heat waves has caused detrimental effects to the Pacific waters of the Western U.S. coast, including the death of millions of marine animal species that will surely grow to become millions more if climate action is not soon taken. Studies show that these animals are dying at growing rates which takes a heavy toll on biodiversity, as deaths of "creatures that live in mussel beds and on the shore" have been recorded to reach more than a billion.



## **REPORTS & GUIDES**

#### 1) Southeast Florida Climate Indicators (Southeast Florida Regional Compact Climate Change, 2020)

Temperature, high tide flooding, and sea surface temperature are just a few of the chosen key indicators of climate change effects in Florida southeastern counties, serving as a basis to be studied from in order to adequately predict and plan for impacts to the environment. The accelerated rate at which sea levels have risen over the past decade due to climatic changes has correlated with the frequency of king tide-associated flooding. These same climatic changes have also demonstrated a clear effect on the frequency and severity of heat waves that have led to hospitalizations and/or deaths around the southeast.

#### 2) Hot Zones: Urban Heat Islands (Climate Central, July 2021)

Due to many components that make up or are found in the most urbanized regions of cities, the phenomenon "urban heat island" consisting of extreme heat in a centralized area, is becoming more and more experienced throughout the United States and impacting an increasing amount of communities more gravely and disproportionately. Some solutions that can help navigate through this occurrence include creating mitigation strategies and involving the community members to raise awareness and take environmentally sustainable action.

#### 3) <u>Extreme Heat and Equity: Best Practices, Challenges, and Potential Next Steps in Miami-Dade County,</u> <u>Florida (Ludovica Martella, June 2021)</u>

The environmental issue of climate change is found to affect various communities of people differently in our society due to social and economic disparities, therefore, it is necessary to identify the issues clearly and establish solution strategies to bridge the societal and environmental gaps that can help us move forward towards a more sustainable direction. Throughout this report, the solutions found to help bridge the gap mentioned include: increasing public access, growing tree canopy, developing cooling centers, and augmenting solar panel installation.

#### 4) <u>Killer Heat in the United States: Climate Choices and the Future of Dangerously Hot Days (Union of</u> <u>Concerned Scientists, July 2019)</u>

An analysis shared by the UCS demonstrating the trend of increasing frequency in extreme heat days around the world proves to show that people's lives are becoming endangered and also serves as valuable information that can be distributed to raise awareness for necessary change to be made. The analysis explains that with the continuing of current climatic patterns, more than one-third of the earth's population will be exposed to heat at a measure so severe that many lives will greatly suffer from it.

#### 5) Climate Change and Extreme Heat: What You Can Do to Prepare (EPA & CDC, October 2016)

This guide created by the EPA and CDC not only provides information about extreme heat in a changing climate, but also identifies steps that you can take to prepare you and your loved ones for extreme heat. It provides figures such as global annual average temperatures and U.S. temperature change, as well as an infographic of heat-related illness symptoms and treatments. The resource also highlights how extreme heat events will become more common, more severe, and last longer.



# **SCIENTIFIC PAPERS**

#### 1) <u>Magnitude of Urban Heat Islands Largely Explained by Climate and Population (Nature, September</u> 2019)

The climatic effect of "urban heat islands" is observing a prevalent impact on the indexes of heat-related mortality, therefore, further study on how its impact relates to climate and population across cities and regions can inform society on how to stray away from worsening the effect. Based on previously found patterns within urban communities in relation to global temperature warming, it is important to understand how to introduce more heat stress relief in the process of urban planning and become more efficient in the creation and implementation of mitigation strategies.

# 2) <u>The Burden of Heat-Related Mortality Attributable to Recent Human-Induced Climate Change (Nature Climate Change, May 2021)</u>

Studies conducted and explained through this report indicate the ways in which the rising heat indexes have specific consequences on human health and how mortality likeliness can be predicted based on temperature recorded at certain areas around the globe. An estimated index conclusion that 0.58% of deaths during the warmest season of the year are attributed to the climate change experienced translates to an average of 9,702 deaths in more than 700 locations worldwide.

#### 3) <u>Learning is Inhibited by Heat Exposure, Both Internationally and Within the United States (Nature</u> <u>Human Behaviour, October 2020)</u>

The increase in global temperatures has been found to affect student performance after analyses suggest cognitive efficiency is decreased through school assignments and overall learning in contrast to cooled temperature seasons. Between the years of 2009 to 2015 in the United States, every day that temperatures where 26.7°C or warmer proved to show that student performance was lowered by about 0.04% of a standard deviation.

#### 4) <u>Urban Street Tree Biodiversity and Antidepressant Prescriptions (Scientific Reports, December 2020)</u>

Trees planted throughout urban communities have been previously linked to fighting climate change and benefitting area aesthetics, but recent studies have worked to identify the links between them and human mental health, an increasingly important topic within modern society. Even with influential factors such as socio-economic status and types of environments, results determined that the probability of antidepressant prescriptions were much higher where street tree density was lower, confirming a belief that more green space correlates to a healthier mental health.

#### 5) <u>Climate Change Adaptation to Extreme Heat: A Global Systematic Review of Implemented Action</u> (Oxford Open Climate Change, June 2021)

Extreme heat is being experienced at a growing rate by different societal groups and resulting in different effects, which is why it is deemed important to understand the adaptive responses to these occurrences by the groups and learn how to effectively plan for better future outcomes. Disproportionate access to resources, wealth and health have been found to cause the disparity of heat adaption between regions; Livelihood, economic stability and socio-cultural support have been found to be greatly affected by heat impacts; Government and civil society have been found to be the actor groups most influential in heat adaptation.



## **WEBSITES**

- Miami Dade County's Interim Chief Heat Officer and Heat Health Task Force
  - News Release: <u>https://www.miamidade.gov/releases/2021-04-30-mayor-chief-heat-officer.asp</u>
  - Press Conference: <u>https://www.facebook.com/WPLGLocal10/videos/928696904628045</u>
- Miami-Dade County: Safety Tips for Summer Weather
  - o <u>https://www.miamidade.gov/global/fire/safety-summer-weather.page</u>
- City of Miami: Miami's Vulnerability to Extreme Heat
  - <u>https://www.miamigov.com/My-Government/ClimateChange/Heat</u>
  - City of Miami: Extreme Heat Warnings and Safety
    - <u>https://www.miamigov.com/My-Home-Neighborhood/Hurricane-Guide/After-a-</u> <u>Storm/Extreme-Heat-Warnings-and-Safety</u>
- Florida Department of Health: Climate and Health
  - o <u>http://www.floridahealth.gov/environmental-health/climate-and-health/index.html</u>
- Environmental Protection Agency (EPA) Heat Island Newsletter
  - o Sign-up here: https://www.epa.gov/heatislands/forms/heat-island-newsletter-signup
  - Environmental Protection Agency (EPA): What Climate Change Means for Florida
    - o <u>https://www.epa.gov/sites/default/files/2016-08/documents/climate-change-fl.pdf</u>
- Climate Central: States At Risk
  - o <u>https://statesatrisk.org/florida/all</u>
- Center for Disease Control and Prevention (CDC): Heat Stress
  - o https://www.cdc.gov/niosh/topics/heatstress/default.html
- Center for Disease Control and Prevention (CDC): Heat Response Plans
  - o https://www.cdc.gov/climateandhealth/docs/HeatResponsePlans\_508.pdf

# **INTERACTIVE TOOLS**

- U.S. Climate Resilience Toolkit (United States Global Change Research Program and NOAA's National Centers for Environmental Information)
  - Heat Mapping: <u>https://toolkit.climate.gov/#steps</u>
  - Union of Concerned Scientists: Killer Heat in the US Future of Dangerously Hot Days
    - <u>https://ucsusa.maps.arcgis.com/apps/MapSeries/index.html?appid=e4e9082a1ec343c794d</u>
       <u>27f3e12dd006d</u>
- Union of Concerned Scientists: Killer Heat– How often will you endure extreme heat where you live?
  - o https://www.ucsusa.org/resources/killer-heat-interactive-tool?location=miami--fl
- National Integrated Heat Health Information System (National Oceanic and Atmospheric Administration (NOAA) and Center of Disease Control (CDC))
  - Heat Forecasts: <u>https://nihhis.cpo.noaa.gov/</u>
  - Extreme Heat Vulnerability Map Tool: <u>https://nihhis.cpo.noaa.gov/vulnerability-mapping</u>
  - NOAA National Weather Service: Heat Index Calculator
    - <u>https://www.wpc.ncep.noaa.gov/html/heatindex.shtml</u>
- Ready.gov: Extreme Heat Safety Social Media Toolkit
  - <u>https://www.ready.gov/extreme-heat-safety-social-media-toolkit</u>



# **RESOURCE LINKS**

#### **FIGURES**

- 1) <u>https://medialibrary.climatecentral.org/resources/heat-and-hospitalizations</u>
- 2) <u>https://medialibrary.climatecentral.org/resources/2021-summer-package</u>
- 3) <u>https://medialibrary.climatecentral.org/resources/urban-heat-islands</u>

#### **ARTICLES**

- 1) Every climate solution is a health solution both are badly needed (The Hill, April 2021)
  - <u>https://thehill.com/opinion/energy-environment/551179-every-climate-solution-is-a-health-solution-both-are-badly-needed?rl=1</u>
- 2) Cities Must Protect People From Extreme Heat (The International Journal of Science Nature, July 2021)
   <u>https://www.nature.com/articles/d41586-021-01903-1</u>
- 3) Workers Grapple with Health Threats posed by Climate Change and Heat (The Washington Post, July 2021)
  - https://www.washingtonpost.com/business/2021/07/19/heat-wave-workers-climate-change/
- 4) The Deadly Impact of Urban Heat (Springer Nature, July 2021)
  - https://www.nature.com/articles/d41586-021-01881-4
- 5) Like in 'Postapocalyptic Movies': Heat Wave Killed Marine Wildlife en Masse (The New York Times, July 2021)
  - https://www.nytimes.com/2021/07/09/climate/marine-heat-wave.html

#### **REPORTS & GUIDES**

- Southeast Florida Climate Indicators (Southeast Florida Regional Compact Climate Change, 2020)
   <u>https://southeastfloridaclimatecompact.org/wp-content/uploads/2021/06/2020-Climate-Indicators-2.pdf</u>
- 2) Hot Zones: Urban Heat Islands (Climate Central, July 2021)
  - https://medialibrary.climatecentral.org/uploads/general/2021 UHI Report.pdf
- 3) Extreme Heat and Equity: Best Practices, Challenges, and Potential Next Steps in Miami-Dade County, Florida (Ludovica Martella, June 2021)
  - https://drive.google.com/file/d/1Yr\_5lea2XT4dga9SqZ\_3b-5MmxjyR-TN/view
- 4) Killer Heat in the United States: Climate Choices and the Future of Dangerously Hot Days (Union of Concerned Scientists, July 2019)
  - https://www.ucsusa.org/sites/default/files/attach/2019/07/killer-heat-analysis-full-report.pdf
- 5) Climate Change and Extreme Heat: What You Can Do to Prepare (EPA & CDC, October 2016)
  - https://www.cdc.gov/climateandhealth/pubs/extreme-heat-guidebook.pdf

#### **SCIENTIFIC PAPERS**

- 1) Magnitude of Urban Heat Islands Largely Explained by Climate and Population (Nature, September 2019)
   https://www.nature.com/articles/s41586-019-1512-9
- The Burden of Heat-Related Mortality Attributable to Recent Human-Induced Climate Change (Nature Climate
  - Change, May 2021)
  - https://www.nature.com/articles/s41558-021-01058-x
- 3) Learning is Inhibited by Heat Exposure, Both Internationally and Within the United States (Nature Human Behaviour, October 2020)
  - https://www.nature.com/articles/s41562-020-00959-9
- 4) Urban Street Tree Biodiversity and Antidepressant Prescriptions (Scientific Reports, December 2020)
   <u>https://www.nature.com/articles/s41598-020-79924-5</u>
- 5) Climate Change Adaptation to Extreme Heat: A Global Systematic Review of Implemented Action (Oxford Open Climate Change, June 2021)
  - https://academic.oup.com/oocc/article/1/1/kgab005/6290719



# For any questions regarding this document, please contact Alyssa Hernandez (*alyherna@fiu.edu*) with the email subject "Shading Dade: Heat Resource Guide".

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Citizens joining for the May 2021 sensor deployment event under the deep shade of Legion Park in the City of Miami



FIU Sea Level Solutions Center FIU Journalism + Media College of Communication,



UNIVERSITY OF MIAMI ROSENSTIEL SCHOOL of MARINE & ATMOSPHERIC SCIENCE

