



THE HEAT IS ON

With temperatures rising and quality parks too few and far between, communities of color face a dangerous disparity

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Introduction

The summer of 2020 is predicted to be the hottest ever recorded. Meanwhile, as the number of COVID-19 cases continues to surge nationwide, city officials are closing public beaches and pools and limiting the capacity of cooling centers. This is putting even more pressure on public parks, which were already in high demand as one of the few places where Americans can escape the confines of home.

Parks—especially those that are densely wooded and deep green—can counter urban temperatures exacerbated by heat-trapping buildings, pavement, and concrete. Given the increased importance of parks during this public health emergency, The Trust for Public Land analyzed park data from across the country to determine who does and doesn't have access to this vital public resource. We found:

- Communities with nearby parks can be dramatically cooler than those in so-called “park deserts.” Our analysis of 14,000 cities and towns shows that nationwide, **areas within a 10-minute walk of a park are as much as 6 degrees cooler than areas beyond that range.**
- And yet, not everyone has equal access to the kinds of parks that lower temperatures and allow for safe social distancing. Our data reveals that across the United States, **parks serving primarily nonwhite populations are half the size of parks that serve majority white populations and nearly five times more crowded.**
- In addition **parks serving majority low-income households are, on average, four times smaller and nearly four times more crowded than parks that serve majority high-income households.**



ISTOCK USER ANDRESGARCIA

The heat is on

Summer is here, and with it, extreme heat, which is the number one weather-related killer in the United States. This year, that risk is amplified by the coronavirus, which is complicating and in some cases even scuttling cities' plans to help residents stay cool. Many cities are closing pools, beaches, and spray parks in order to limit the spread of the virus, while others are scaling back the capacity of indoor cooling centers or closing them all together.

In the face of these pandemic-enhanced challenges, there's one piece of public infrastructure that is proving itself more vital and necessary than any other time in our history: parks. As the virus rages on, our nation's park systems are serving as a lifeline. They are where we go for exercise and to safely socialize, to blow off steam, barbecue, or give the kids a place to run and play. More recently, they've served as venues for protests against racism and police brutality that have stretched from coast to coast.



Explore neighborhood-by-neighborhood data on heat and parks in your community: visit tpl.org/parkscore

And now, parks are helping people cope with summer heat. Studies show that large parks – especially those with dense trees and vegetation – can be as much as 17 degrees cooler than the surrounding cityscape. That is due to the “urban heat island effect,” a well-documented phenomenon in which densely packed buildings, concrete, and pavement trap heat, leading to increased temperatures in areas with the least amount of green space and vegetation. For the first time, The Trust for Public Land has assembled the highest-resolution heat data available for the entire United States, revealing a stark difference in temperature between neighborhoods that have parks nearby and those that do not. Specifically, our researchers studied satellite heat maps for 14,000 cities and towns and found that areas within

a 10-minute walk of a park can be as much as 6 degrees cooler than neighborhoods outside that range.

More troublingly, the data indicates that not everyone has equal access to the cooling benefits of parkland. One hundred million people, or more than one in three Americans, do not have a park within a 10-minute walk of home. And a closer look reveals that nationwide, parks that serve majority nonwhite populations are, on average, half as large – 45 acres compared to 87 acres – and nearly five times as crowded as parks that serve majority-white populations.

Nationwide, parks that serve majority nonwhite populations are, on average, half as large—45 acres compared to 87 acres—and nearly five times as crowded as parks that serve majority-white populations.

With temperatures rising from coast to coast, that disparity means that Black, Indigenous, Latinx, Asian, Pacific Islander, and multiracial populations, as well as those with lower incomes, are at heightened risk.

A recent study by researchers at Portland State University and the Science Museum of Virginia [found a strong correlation](#)¹ between exposure to deadly heat and the historically racist housing policies known as “red-lining,” in which banks withheld home mortgages from Black families. The researchers examined 108 cities in the United States and found that red-lined communities were the hottest neighborhoods in 94 percent of the cities. The study cited a lack of greenspace and tree canopy as the chief reasons for the disproportionate heat exposure.

“As cities struggle with extreme heat this summer, parks are one of the best ways for residents to find relief,” said Diane Regas, president and CEO of The Trust for Public Land, a national organization that has built thousands of parks and protected millions of acres of land. “We all need and deserve parks – and all of the benefits they provide – all of the time. But during this period of compounded public health emergencies, unequal access to quality parks can be downright dangerous.”

The perils of extreme heat

Over the last 30 years, extreme heat, on average, has been the deadliest form of weather – including floods, extreme cold, tornadoes, hurricanes, and other events – according to the National Weather Service. Climate change is making the problem increasingly more severe, with [19 of the hottest 20 years on record](#)² occurring in the past two decades. The Union of Concerned Scientists predicts that, absent efforts to cut the greenhouse gas emissions responsible for climate change, the [number of Americans](#)³ experiencing 30 or more days with a heat index above 105 degrees in an average year will balloon from 900,000 people today to more than 90 million by mid-century.

Extreme heat causes a range of health problems. According to the Centers for Disease Control and Prevention, heat exhaustion – characterized by heavy sweating, dizziness, a weak pulse, nausea and vomiting, muscle cramps, and headache – can easily escalate to the more dangerous condition known as heat stroke, a health emergency leading to symptoms that include confusion, elevated body temperature, and loss of consciousness.

Each year, more than 65,000 people visit an emergency room for heat-related illness and more than 600 people die, according to federal statistics. But new research indicates that the number of deaths may, in fact, be significantly higher than previously thought. [A study](#)⁴ published this spring in the journal *Environmental Epidemiology* looked at deaths during a recent decade in 297 counties in the United States, representing about three-fifths of the population. Researchers from Boston University's School of Public Health and the University of British Columbia estimated that heat contributed to the deaths of 5,600 people each year, on average, from 1997 to 2006.

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Experts on heat-related illness, like Gregory A. Wellenius, a professor of environmental health at Boston University and senior author of the study, fear that the pandemic will only cause more Americans to suffer from heat this year,

especially those who lack air-conditioning. In addition to shuttering beaches and public pools and limiting access to cooling centers, the pandemic has forced the closure of the air-conditioned spaces that many people rely on when the weather warms, including office buildings, stores, movie theaters, and museums.

Indeed, research shows that the expense of air-conditioning is a growing burden for low-income people worldwide, with climate change expected to worsen the problem. [A recent study](#)⁵ of energy use in eight nations, including Australia, Spain, and Japan, found that people spent 35 to 42 percent more on electricity when they adopted air-conditioning, plunging some into what researchers called “energy poverty.” Those who can’t afford the increased cost simply do without.

As with many diseases and conditions, including COVID-19, nonwhite populations are disproportionately affected by heat-related illnesses. In California, for instance, emergency-room visits for heat-related illnesses jumped 35 percent from 2005 to 2015, but the [increases were steeper](#)⁶ for certain groups. Hospital visits increased an average of 67 percent for Black Californians and 63 percent for Latinos; among White Californians, however, they rose only 27 percent. Urban heat islands and lack of access to air-conditioning are frequently cited as factors.

“This summer is projected to be one of the hottest summers on record,” said Wellenius. “In addition, you have high levels of unemployment, commercial buildings are closed, and community resources are stretched thin. So there is a confluence of factors making people more vulnerable to extreme heat.”



CHRISTOPHER T. MARTIN

Many cities are closing pools, beaches and spray parks in order to limit the spread of COVID-19.

Parks: nature's cooling centers

From Syracuse, New York to Southern California, city officials are having to balance preventing the spread of coronavirus with the need to protect residents from extreme heat. And in many locations, the virus is winning. During a hot spell in mid-June, officials in Syracuse decided not to open its cooling centers or spray parks on a 90-degree day, out of concern for upping the rate of transmission. And health officials in Los Angeles County, which was struggling with the state's biggest COVID-19 caseload in late June, decided to close all beaches over the Fourth of July weekend.

The Centers for Disease Control and Prevention recently issued guidelines on how best to operate cooling centers this summer, given social-distancing requirements, and presented alternatives. The federal agency, for example, urged cities to develop programs that help people pay their utility bills, since air-conditioning can be costly to run. And the agency suggested a temporary ban on utility shut-offs during heat waves, so residents behind on their bills do not have to go without air-conditioning.

As part of a multi-faceted plan to combat heat-related illness, New York City, which closed most of its public pools due to COVID-19, announced a \$55 million program to provide 74,000 air conditioners to low-income residents who are at least 60 years old. About a third of the AC units will go to residents in public housing developments.

JOE MARTINEZ



Communities with nearby parks can be dramatically cooler than those in so-called "park deserts."

That announcement followed an [open letter in April](#) by New York City Comptroller Scott M. Stringer, calling on the city to prevent heat-related deaths. Stringer noted that more than 80 percent of the heat stroke deaths in recent years involved victims who were exposed to heat in homes without air-conditioning.

For cities that decide to operate cooling centers, the C.D.C. offered a [range of recommendations](#): reducing capacity to allow for greater distancing, temperature screenings upon arrival, separate rooms for those who are symptomatic, and even emergency alternatives like parked air-conditioned buses.

Public health experts point out, however, that the coronavirus is much less likely to be transmitted outdoors. In Japan, for instance, health officials found that the chance of catching the coronavirus is almost 20 times higher indoors than out. Among the reasons, scientists say, are wind and sun, which dissipate and destroy the virus, respectively.

Surili Patel, director of the American Public Health Association's Center for Climate, Health and Equity, worries about the ability of governments to protect citizens from the dangers of summer heat. "Having enough cooling centers is certainly a concern, especially as those that exist will have to operate under diminished capacity," she said, adding that cities should partner with community and faith leaders to increase potential sites.

At the same time, she encouraged Americans to take advantage of parks, the "natural cooling centers" in their communities. "Greenery and trees bring down the overall temperature of an area, and at night they serve to cool the neighborhood rather than trap the heat," she said. "Parks will offer some reprieve for those who don't have air-conditioning."

A growing body of research recognizes the power of trees and plants to cool the air, not only inside parks, but beyond their borders as well. A few mechanisms are at work here: from the simple effect of tree shade to the complex process known as evapotranspiration. According to the Environmental Protection Agency, surfaces in shade can be up to [45 degrees cooler](#)⁷ than those in sun. (Tree canopy also lessens indoor temperature, especially when shade covers parts of rooftops and windows.) Evapotranspiration, meanwhile – the phenomenon by which trees pull moisture from the soil and release

it through leaves – cools air directly: [anywhere from 2 to 9 degrees](#), depending on tree density, according to the E.P.A.

A [2016 report by The Trust for Public Land](#)⁸ explored the ability of trees and other “green infrastructure” to cut urban heat and emissions. As the report showed, the cooling effects of parks extend into the surrounding neighborhoods; one study detected reduced temperatures up to a half mile away. Moreover, parks combining lawn and trees are more effective at lowering air temperature than those comprised of grass only.

In the summer of 2018, a [landmark citizen-science project](#)⁹ funded by the National Oceanic and Atmospheric Administration demonstrated the striking cooling properties of trees and vegetation. Temperature readings on a few of the hottest days that August, in both Washington and Baltimore, revealed differences of up to 17 degrees between parkland and neighborhoods dominated by buildings and pavement.

Brendan Shane, climate director at The Trust for Public Land, pointed out that the coolest temperature readings in Washington came from Rock Creek Park and the National Arboretum.

“It comes down to the size of the park and how deep-green the park is,” he said. “In D.C., the parks were heavily forested, deep-green oases that can really magnify that cooling impact. The tiny neighborhood park or pocket park, by contrast, will have some benefits, but they are going to be a lot less significant than those larger, high-quality parks.”

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Scientists believe that street trees alone can prevent deaths. [A new study](#)¹⁰ in Philadelphia, led by a social scientist with the U.S. Forest Service and published in the journal *Lancet Planetary Health*, looked at the potential impact of the city’s plan to increase its tree canopy to 30 percent by 2025. Researchers estimated that the additional canopy could prevent up to 400 premature deaths a year in the city. Among other things, they cited the ability of trees and greenspace to reduce heat and air pollution, as well as boost physical activity and social connection.



ANDY ISAACSON

The cooling effects of parks can extend into the surrounding neighborhoods, reducing temperatures up to a half mile away.

Patrick L. Kinney, the Beverly A. Brown professor of urban health and sustainability at Boston University School of Public Health, believes that the term “urban heat island” over-simplifies the geography behind the plants-pavement dichotomy.

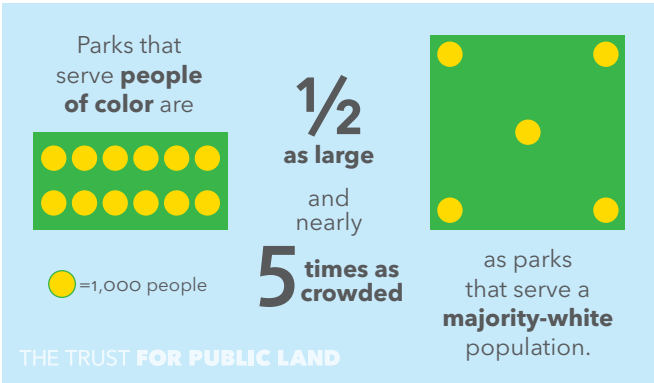
“The evidence has shown in the past ten years that it’s not just that cities are hot and the country is cooler,” he points out. “Within the city, there is a lot of variation in temperature from place to place. So it’s not an island, but more of an archipelago. The higher the density of vegetation, the bigger the cool spot within the city.”

City residents might have a renewed appreciation for verdant parks this summer, Kinney said. “Buildings absorb a lot of heat and that heat builds up over time,” he observed. “Even at night, when temperatures usually go down during a heatwave, that doesn’t happen indoors because a building has retained so much heat over the course of the summer.”

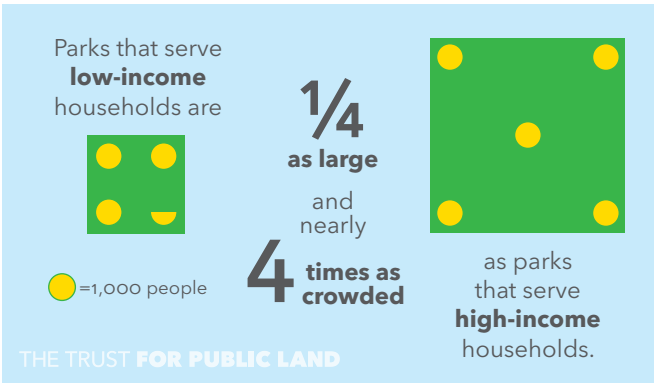
“So if you don’t have cooling centers and you don’t have air-conditioning, you should get to a tree-filled area and I’m sure it will be better than being inside, especially on the top floor of an apartment building,” he added. “I think the parks have a lot of potential benefit, especially this summer.”

In search of cooling shade, a growing disparity

But of course not everyone has easy access to a park, and if they do, that park might not be very large or very green. The Trust for Public Land analyzed data from 14,000 cities, towns, and census-designated places across the United States, finding that Black, Indigenous, Latinx, Asian, Pacific Islander, and multiracial populations – when they do have parks within a 10 minute walk – are likely to find small, crowded spaces, not the kind of parks that allow for easy social distancing or ample cooling shade.



In addition to the startling discovery that parks that serve a majority nonwhite population are, on average, half as large – 45 acres compared to 87 acres – and nearly five times as crowded as parks that serve a majority-white population, our analysis also found that parks serving primarily low-income households are, on average, four times smaller – 25 acres versus 101 acres – than parks that serve a majority of high-income households.



Data showing that low-income and nonwhite populations lack access to spacious, sylvan parks comes as no surprise to outdoor activists, especially those who advocate for marginalized communities. Jose Gonzalez, founder of Latino

Outdoors, said that the history of park development is tied up with the history of white supremacy.

“We need to look at how parklands came to be,” he said. “That’s very true in terms of our national parks system and state parks. But even looking at cities, it’s how they were designed, who they were designed for, and what the historical reasoning was for that. It’s not surprising, when you look at parks and even tree cover, how that aligns with other metrics of socio-economic status.”

The Trust for Public Land’s [2020 ParkScore® Index](#), which ranks park systems in the one hundred most populous cities, shows, with the exception of New Orleans, a paucity of land devoted to greenspace among the half dozen cities with majority Black populations.

In Detroit, for instance, where 78 percent of residents are Black, the city devotes 6 percent of its land to park space, compared to the national median of 15 percent. In Memphis, Tennessee, just 5 percent of land area is comprised of parks, while in Baton Rouge, Louisiana, only 3 percent of the city is dedicated to parkland.

PARKLAND AS PERCENT OF CITY AREA IN MAJORITY BLACK CITIES ON THE PARKSCORE® INDEX	
THE TRUST FOR PUBLIC LAND	
National median	15%
Baton Rouge	3%
Memphis	5%
Detroit	6%
Atlanta	6%
Baltimore	10%
New Orleans	26%

Experts on race and discrimination assert that Black, Indigenous, Latinx, Asian, Pacific Islander, and multiracial populations don’t always feel comfortable in parks, especially those that serve a majority-white population.

In May, on the same day that George Floyd died in Minneapolis with a police officer's knee on his neck, a White woman called the police on a Black bird watcher in Central Park after he asked her to leash her dog. The bird watcher, Christian Cooper, who happens to sit on the board of New York City Audubon Society, made a video recording that went viral. In it, the woman frantically claims during a 911 call that Cooper was physically threatening her, even as he moves farther and farther away.

For Carolyn Finney, author of *Black Faces, White Spaces: Reimagining the Relationship of African Americans to the Great Outdoors*, the episode illustrated the uneasy feeling that many Black people, including herself, can have in parks.

"For Black people," she wrote in an opinion piece in *The Guardian* in early June, "navigating both city streets and hiking trails can be charged; at worst, they are fraught terrains where we are at the mercy of someone else's interpretation of our presence. Too often, by default, Black people are perceived as threats to White people's physical safety. And as a consequence, it is our physical safety that is compromised..."

Finney, a scholar-in-residence at Middlebury College and a former member of the National Park System Advisory Board, said cities needed to redouble their efforts to include nonwhite communities as stakeholders in the process of creating and programming parks. She notes that this country's Jim Crow laws applied to not just restaurants and movie theaters, but to parks and beaches too.

"This is why a lot of us emphasize the issue of representation," she said. "If you want to represent Latinx people, for example, then bring in someone who is Latinx. You're dealing with systemic racism that has been in place for many decades. It's not that people of color don't care about their parks. Sometimes, it's that no one has ever asked them what they think. Cities need to make space for their voices."

While park agencies may not have tremendous leeway in creating large new parks in highly developed cities, there are other ways to connect city dwellers to parkland, park advocates say.

Gonzalez says building new urban parks is important. But so is introducing residents to parks that, while farther

afield, may be closer than many realize. He points to the Roving Ranger, a "park-mobile" operated by the Golden Gate National Parks Conservancy in San Francisco. The vehicle visits neighborhoods and community events to help educate residents about their nearby parks, as well as provide information on how to visit them using public transportation.

"It's a way to bring the park to the people, almost like an ice cream truck," Gonzalez says. "The park truck shares what is accessible and what the time-distance is, as well as the programming. In other words, 'here's what is available within a half hour; here's what is available within one hour or two hours.'"

For those lucky enough to live by a park, the cooling capacity of nature is readily apparent. Lory Pollina, a musician and artist in Buffalo, New York, where the coronavirus kept cooling centers closed during an unusually hot day in June, lives a block from Delaware Park. It is one of several Buffalo parks designed 150 years ago by Frederick Law Olmsted. Because Pollina's apartment does not have air conditioning, he seeks refuge from the summer heat during his early-morning strolls around the park's oblong Hoyt Lake.

"There are trees around the lake and there's usually a breeze," said Pollina, a volunteer with the Buffalo Olmsted Parks Conservancy. "I like to walk in the morning because it's cooler. Nature is very healing when the city is hot."



Outdoor activists who advocate for marginalized communities say that the history of park development is tied up with the history of white supremacy.

Methodology

The Trust for Public Land prepared data for town and city boundaries by converting United States Census Bureau-based borders into an open-standard format representing geographical features. Using the Descartes Labs platform, we then accessed NASA's Landsat 8 thermal band data for 14,000 towns, cities, and census-designated places, focusing on the period of June 1 to September 30, 2019. Satellite data measure the temperature at the surface, rather than ambient temperatures, which are typically taken about six feet above the ground. While ambient temperature is a more accurate measure of how people experience heat, we used satellite data because it is more widely available and can reveal heat island information for all 14,000 towns and cities nationwide.

After performing a quality check on a statistically significant sample of the Landsat data, we detected errors along the edges of scenes, or digital images, in a very small percentage of the output datasets – about 1.5 percent. Typically two adjacent scenes for the same period would appear as one continuous image. When the edge of a scene is visible, that means there is enough of a difference in temperature between two images. For cities such as these where we could not find two 2019 scenes that were close enough in temperature to not show the scene boundaries, we used summer 2018 data in combination with the 2019 data to eliminate the scene boundary errors. Because the output data consists of billions of pixels, it is likely that a very small percentage of errors still exists in the output data.

The Trust for Public Land wrote software that converts thermal data into a heat value, expressed in degrees Fahrenheit, for every 30-meter by 30-meter geographic area, or pixel. The heat values were used to calculate the mean temperature value for a given municipality. The difference between the mean temperature value for an entire town or city and the heat value of a single pixel was then calculated. This difference is known as the heat anomaly.

To compare park size and crowding by race and income, we examined parks that serve residents in all 14,000 cities, towns, and census-designated places in the United States. We omitted parks that were greater than 70,000 acres, such as large conservation areas and National Forests. This ended up excluding 99 park areas out of a total of more than 123,000. To calculate average park size according to race and income, we looked at the population that lives within a 10-minute walk of each park. Population was derived from 2019 Forecast Census Block Groups provided by ESRI. Rather than using buffers, we used park service areas that were generated from a walkable street network derived from ESRI's StreetMap Premium. These parks and service areas were previously collected and created for our ParkServe® platform.

We focused our analysis to look at parks that serve a subset of race and income categories (majority low-income, majority White, majority-nonwhite, etc.) and calculated average park size for each subset. We used this same process to set up our analysis to calculate crowding. We calculated crowding by normalizing park size to one acre and calculating the proportion of people served by one park acre.

Citations

1. Jeremy S. Hoffman et al., "The Effects of Historical Housing Policies on Resident Exposures to Intra-Urban Heat: A Study of 108 U.S. Urban Areas," *Climate* 8, no. 1 (January 2020), <https://www.mdpi.com/2225-1154/8/1/12>.
2. Brady Dennis, Andrew Freedman, and John Muyskens, "2019 Capped World's Hottest Decade in Recorded History," *Washington Post* (January 15, 2020), <https://www.washingtonpost.com/climate-environment/2020/01/15/2010s-hottest-decade-world/?arc404=true>.
3. Kristina Dahl et al., "Killer Heat in the United States: Climate Choices and the Future of Dangerously Hot Days," *Union of Concerned Scientists report* (July 2, 2019), <https://www.ucsusa.org/resources/killer-heat-united-states-0>.
4. Kate R. Weinberger et al., "Estimating the Number of Excess Deaths Attributable to Heat in 297 United States Counties," *Environmental Epidemiology* 4, no. 3 (June 2020), https://journals.lww.com/enviroepidem/fulltext/2020/06000/estimating_the_number_of_excess_deaths.1.aspx.
5. Teresa Randazzo, Enrica De Cian, and Malcolm N. Mistry, "Air Conditioning and Electricity Expenditure: The Role of Climate in Temperate Countries," *Economic Modelling* 90 (August 2020): 273-287, <https://www.sciencedirect.com/science/article/pii/S0264999319308168?via%3Dihub#!>.
6. Manas Mishra, "Heat-Related Illness Affects Ethnic Groups Disproportionately," *Physician's Weekly* (February 26, 2019), <https://www.physiciansweekly.com/heat-related-illness-affects-ethnic/>.
7. U.S. Environmental Protection Agency, "Using Trees and Vegetation to Reduce Heat Islands," <https://www.epa.gov/heatislands/using-trees-and-vegetation-reduce-heat-islands>.
8. Urban Climate Lab, Georgia Institute of Technology, for The Trust for Public Land, The Benefits of Green Infrastructure for Heat Mitigation and Emissions Reductions in Cities (June 2016), <https://www.tpl.org/benefits-green-infrastructure-heat-mitigation-and-emissions-reductions-cities>.
9. National Oceanic and Atmospheric Administration, "Hot Days in the City? It's All About Location" (October 15, 2018), <https://www.noaa.gov/news/hot-days-in-city-it-s-all-about-location>.
10. Michelle C. Kondo et al., "Health Impact Assessment of Philadelphia's 2025 Tree Canopy Cover Goals," *Lancet Planetary Health* 4, no. 4 (April 2020), [https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(20\)30058-9/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(20)30058-9/fulltext).



The Trust for Public Land creates parks and protects land for people, ensuring healthy, livable communities for generations to come.

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