Greening the Concrete Jungle:
Exploring the Intersection of Green Infrastructure, Sustainability,
and Socioeconomics in Urban Los Angeles

By

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Abstract

We are researching how the heat island effect impacts different communities within Los Angeles by comparing the temperatures of concrete within shaded and unshaded regions in contrast to air temperatures within neighborhood parks of differing incomes. The goal is to investigate how temperature differences are linked to the economic and social disparities within Los Angeles low-income neighborhoods through the access of green infrastructure. We concluded that the lack of vegetation raised the overall temperature of low-income neighborhood parks pavement by 10-30 degrees more than the average air temperature than high income parks. Our research brings awareness to equal opportunity to green infrastructure and why simple projects like parks can make a significant difference to the overall health and wellbeing of individuals and the environment.

Introduction

Why is it that asthma is more common in low-income neighborhoods and communities of color than in wealthy white neighborhoods? New findings suggest heat as a leading cause. Heat can cause more concentrated pollution, increased greenhouse gases, impaired water quality, and more heat-related hospitalizations. With climate change in full affect, raising temperature to all-time highs, NPR found that, "In more than 70% of counties, neighborhoods with more people of color and lower income people 'experience significantly more extreme surface urban heat than their wealthier, whiter counterparts' (Shivaram, 2021).

The primary catalyst of temperature disparities within neighborhoods is the heat island effect. The heat island effect is when heat energy emulates from cars, people, and buildings which creates excessive heat. The ways to combat this phenomenon are having vegetation to provide surface coverings like parks and green roofs, as well as cool and reflective pavements. We see that urban, high-density, low-income neighborhoods which lack green infrastructure endure hotter than average days than wealthy neighborhoods. Our research focuses on examining how the presence of parks within neighborhoods can lower the overall temperature but more importantly mitigate overall climate change effects on people and the planet.

Methods

For our project, we conducted an observational study of four different parks in Los Angeles County. The four parks we assessed were Hope and Peace Park, Normandie Recreation Center, Hopkins Wilderness Park, and Vista Hermosa Natural Park. For each of the four observational sites, we recorded the GPS coordinates, temperature, and time of observations. We utilized the weather apps associated with meteorological data on our iPhones to collect the air temperature in degrees Fahrenheit for our sites. In order to minimize time discrepancy amongst observations, all parks were assessed within a 30-minute time frame on the same day, July 13, 2024. Each observer utilized infrared temperature guns to measure the temperature of concrete and the main surfaces of each park. We organized our data into tables indicating shaded and unshaded parks (Table 1 & Table 2).

To contextualize our park temperature assessments, we utilized CalEnviroScreen to conduct a demographics analysis of the community each park resides in. CalEnviroScreen is a mapping tool that helps to identify communities that are most affected by pollution. A high percentile means that the area experiences higher pollution than the low percentile areas (Office of Environmental Health Hazard Assessment). We recorded the census tract of each location, assessed the race and ethnicity profile for the location, and noted any other significant findings, including the socioeconomic factors and the CalEnviroScreen 4.0 overall percentile (Table 3).

Results

Table 1. Little-to-No Shade Parks | Los Angeles County

Temperature (°F)	Location	GPS coordinates	Time
Unshaded: 113.4 Air temperature: 83	Hope and Peace Park	34.053161010549594, -118.27662535604819	1313
Unshaded: 108.3 Air temperature: 83	Normandie Recreation Center	34.0448211917276, -118.29981113256193	1329

Table 2. High Shade Parks | Los Angeles County

Temperature (°F)	Location	GPS coordinates	Time
Shaded: 64.4 Unshaded: 97.5 Air temperature: 72	Hopkins Wilderness Park	33.82971247148984, -118.37414774955995	1338
Shaded: 66.9 Unshaded: 100.5 Air temperature: 83	Vista Hermosa Natural Park	34.0620420473421, -118.25692881906812	1330

Table 3. CalEnviroScreen 4.0 Data

| CalEnviroScreen 4.0 - Overall Percentile	Location/Census Tract #	Socioeconomic Factors (Percentile)	Race/Ethnicity Profile (Percentile)
92	Hope and Peace Park (#6037209402)	Poverty: 99 Unemployment: 78	Hispanic: 89.05% White: 7.01% Asian American: 3.38%
79	Normandie Recreation Center (#6037221220)	Poverty: 88 Unemployment: 59	Hispanic: 88.30% White: 3.29% Asian American: 8.03%
20	Hopkins Wilderness Park (#6037621301)	Poverty: 12 Unemployment: 39	Hispanic: 10.74% White: 65.98% Asian American: 14.03% African American: 3.27%
72	Vista Hermosa Natural Park (#6037208000)	Poverty: 45 Unemployment: 51	Hispanic: 43.95% White: 32.83% Asian American: 16.99%

Hope and Peace Park

Normandie Recreation Center
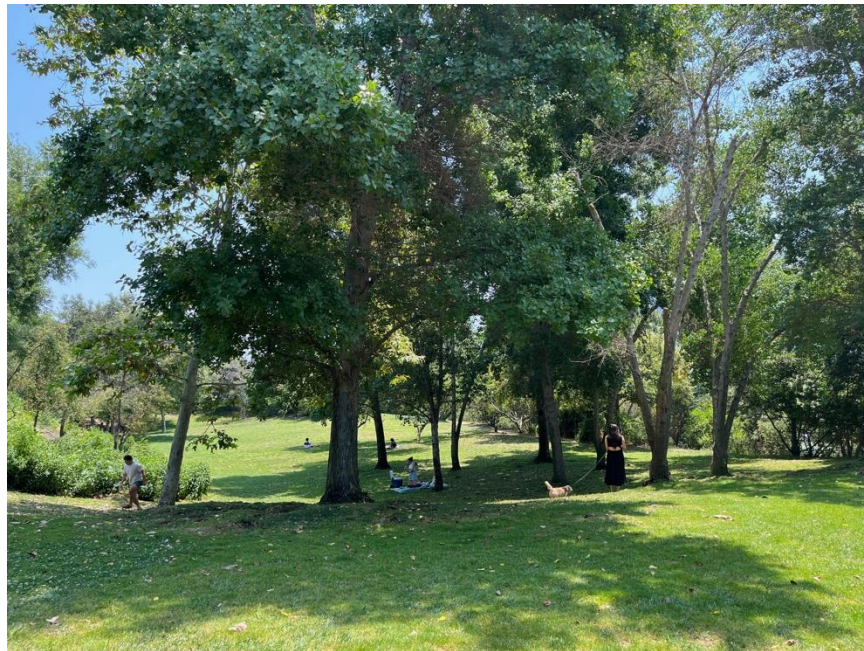
Vista Hermosa Natural Park

Hopkins Wilderness Park

Reflection

In Table 1, the Little-to-No Shade parks, Hope and Peace and Normandie Recreation Center showed higher unshaded ground surface temperatures 10-30 degrees warmer than the areas recorded air temperature. The highest recorded temperature was assessed at Hope and Peace Park with an unshaded temperature of 113.4 degrees Fahrenheit. This indicates that these parks are susceptible to the urban heat island effect. While reviewing Table 3, the CalEnviroScreen 4.0 data for these two parks, it also shows higher poverty and unemployment rates within the socioeconomic assessment and a lack of diversity, with a predominantly Hispanic population. Both of the parks were rated with a CalEnviroScreen 4.0 Overall score of above 90. The high end of the percentile.

Whereas, in Table 2 it shows that the High Shade Parks like Hopkins Wilderness Park and Vista Hermosa Natural Park had significantly lower ground surface temperatures. The highest recorded temperature was evaluated at Vista Hermosa Natural Park where the unshaded region displayed as 100.5 but saw a decrease in temperature to 66.9 in the shaded region. While reviewing the CalEnviroScreen 4.0 data for our High Shade parks, it indicates a lower poverty population and lower unemployment percentile. These locations also showed a more diverse population where the White population was dominant. The CalEnviroScreen Overall score for the High Shade parks also showed a lower percentile trend.

The results indicate a correlation between location, socioeconomics, race, and the exposure to harmful high temperatures, diagnosing a huge issue in environmental inequality within the Los Angeles landscape. We see clear evidence of minority groups being largely affected by the Urban Heat Island effect within their outdoor gathering spaces, so we can also assume these issues are present within the neighborhoods where these groups live. By assessing healthier green infrastructures, we can observe the benefits of vegetation and tree coverage as a mitigation factor. A temperature reduction of 15 to 30 degrees can enhance the well-being of vulnerable communities by reducing heat-related illnesses.

Also, further benefits can follow, the increase in the number of trees and green spaces in these areas can improve air quality by decreasing air pollution, managing storm runoff that can prevent flooding, and offer habitats for surrounding wildlife. It is important that sustainable green solutions are accessible and equal within the city landscape so that we can create healthier, more livable environments for all.

Bibliography

Aram, F., Higueras García, E., Solgi, E., & Mansournia, S. (2019). Urban green space cooling effect in cities. Heliyon, 5(4), e01339. https://doi.org/10.1016/j.heliyon.2019.e01339

Higgins, L. (n.d.). *Voices of L.A. nature: An interview with Tafarai Bayne*. Natural History Museum. https://nhm.org/stories/voices-la-nature-interview-tafarai-bayne

Oehha.ca.gov. (2023, February 6). https://oehha.ca.gov/climate-change/general-info/human-health-impacts-climate-change

Office of Environmental Health Hazard Assessment . "About CalEnviroScreen." *Oehha.ca.gov*, 2022, oehha.ca.gov/calenviroscreen/about-calenviroscreen.

Shivaram, D. (2021). Extreme heat is worse for low-income, nonwhite Americans, a new study shows. Retrieved from https://www.npr.org/2021/07/14/1015983700/extreme-heat-is-getting-worse-for-low-income-non-white-americans-a-new-study-sho

Shreevastava, A., Raymond, C., & Hulley, G. C. (2023, June 15). *Contrasting intraurban signatures of humid and dry heatwaves over Southern California*. AMETSOC. https://journals.ametsoc.org/configurable/content/journals$002fapme$002f62$002f6$002fJAMC-D-22-0149.1.xml?t%3Aac=journals%24002fapme%24002f62%24002f6%24002fJAMC-D-22-0149.1.xml

Understanding the Urban Heat Island Index | CalEPA. (2012). Ca.gov. https://calepa.ca.gov/climate/urban-heat-island-index-for-california/understanding-the-urban-heat-island-index/

US EPA, OAR. "Heat Island Resources." (2014, June 17) Epa.gov, www.epa.gov/heatislands/heat-island-resources.

Yin, Y., He, L., Wennberg, P. O., & Frankenberg, C. (2023, April 28). *Unequal exposure to heatwaves in Los Angeles: Impact of uneven green spaces*. Science advances. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10146884/

Zhou, W., Yu, W., Zhang, Z., Cao, W., & Wu, T. (2023). How can urban green spaces be planned to mitigate urban heat island effect under different climatic backgrounds? A threshold-based perspective. *The Science of the total environment*, *890*, 164422. https://doi.org/10.1016/j.scitotenv.2023.164422