



# Case Study: Street Tree Distribution

## Acknowledgements

This study was made possible through a generous grant from the Lumpkin Family Foundation. The City of Urbana Arbor Division provided much of the underlying data and capably established new street tree plantings in response to the study results.

## Introduction

The City of Urbana owns and maintains approximately 11,334 street trees in the City's right of ways. Generally, street trees in the right of way are planted between the curb and the sidewalk. Although some streets do not have a sidewalk, there is still a right of way. The City has approximately 4,034 vacant street tree sites as well. A vacant street tree site is a street tree site which is not presently planted with a tree. All vacant and planted street tree sites are geocoded in a database that includes the precise location, species, size, and eco-benefits of each street tree.

The distribution of street trees and vacant street tree sites is important as street trees provide<sup>1</sup>:

- Shade for pedestrians and bicyclists
- Shade for folks waiting for the bus
- Shade for your house to spend less on air conditioning
- Pulling carbon out of the atmosphere to make wood
- Provide wood for arts, crafts, & furnishings
- Knocking down particulate air pollution
- Slowing and soaking up stormwater
- Filtering urban noise
- Protecting pedestrians from cars
- Providing beauty
- Providing greenspace views to increase happiness
- Possible association with reduced crime rates



Figure 1: West Urbana

The City of Urbana engaged a geospatial analysis vendor to complete an analysis of vacant street tree distribution in relation to race and income demographics, and built environment factors such as surface temperature and location of bus stops.

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<sup>1</sup> <https://canopy.org/tree-info/benefits-of-trees/>, <https://www.arborday.org/trees/index-benefits.cfm>, <https://www.nature.org/en-us/what-we-do/our-priorities/build-healthy-cities/cities-stories/benefits-of-trees-forests/>

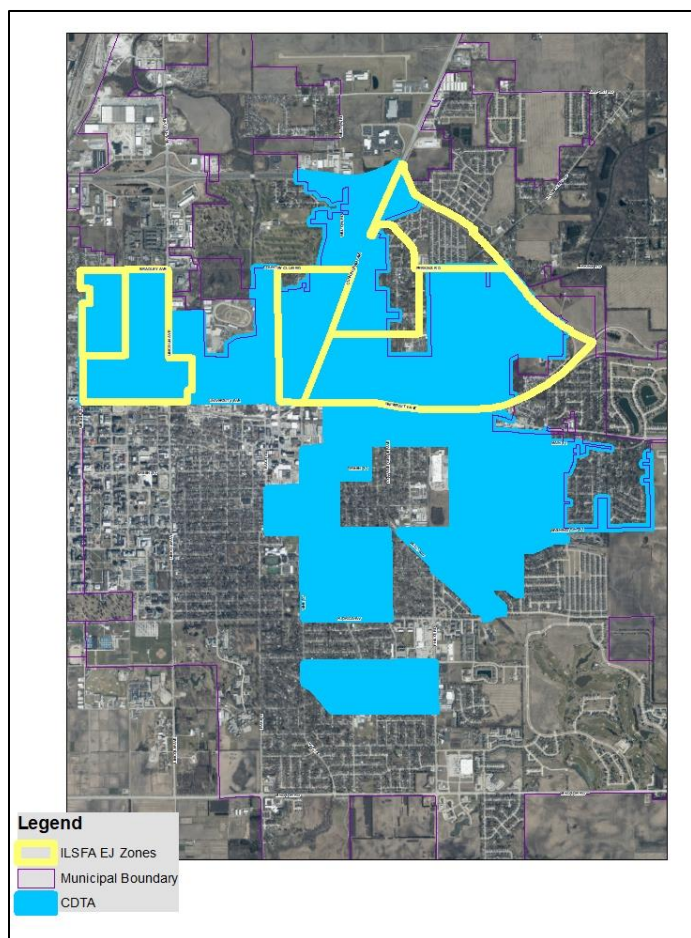


Figure 2: EJ and CDTA

## Analysis Methods

It took more time than expected to settle on a statistical method to determine the existence of any disparities in street tree distribution across the city. Census data alone misrepresents income across space due to concentrated student populations and unpopulated subdivisions in Urbana.

Eventually we determined that we needed a numerator and a denominator in order to fairly compare areas of differing geographic sizes. We selected vacant street tree sites per lane mile within a census block as our metric. We then compared those census blocks that were within an Environmental Justice (EJ) zone to those outside an EJ zone. We also compared census blocks within and outside of City of Community Development Target Areas (CDTA). The Environmental Justice (EJ) Zones were previously determined by the Illinois Solar For All program to evaluate correlations with race and income. The Community Development Target Areas (CDTA) were previously determined by the City of Urbana to evaluate correlations with income. Again, all on the basis of vacant tree sites per lane mile.

## Conclusions

Results show a correlation that is very low and not statistically significant. There are likely other ways to analyze this type of data that may produce a differing outcome. However,

- Correlation values can range from 0 – 1
- P-Value ranges from 0 – 1
- If correlation value approaches 1, the two variables are highly associated.
- If correlation value approaches 0, the two variables are not associated.
- EJ Correlation Coefficient: 0.077, p-value = 0.61
- CDTA Correlation Coefficient: 0.107, p-value = 0.47

## Phase 2

The intention at the time of application was to use the results to prioritize 50 grant funded, contracted tree plantings at \$500 each. The City received bids for contract tree planting at approximately double this rate. As such, we decided to perform the tree planting with City staff instead.

Although no correlation between EJ or CDTA and vacant tree sites has been determined, Urbana tree planting sites were nonetheless selected within Census blocks within the CDTA which had highest vacant street tree sites per lane mile (See Figure 3). Those vacant sites were then ranked on the basis of urban heat, the hottest sites being planted first (See Figure 4).

Figure 3: Vacant Street Tree Site in CDTA

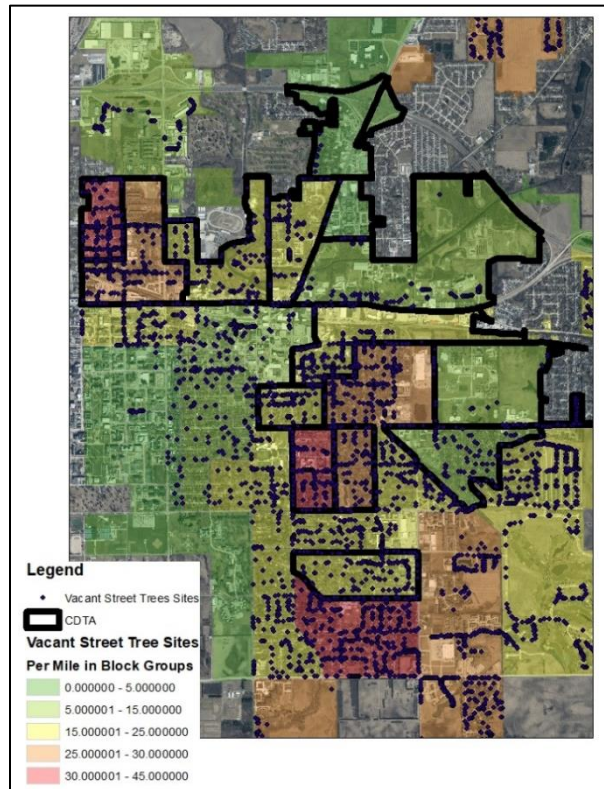
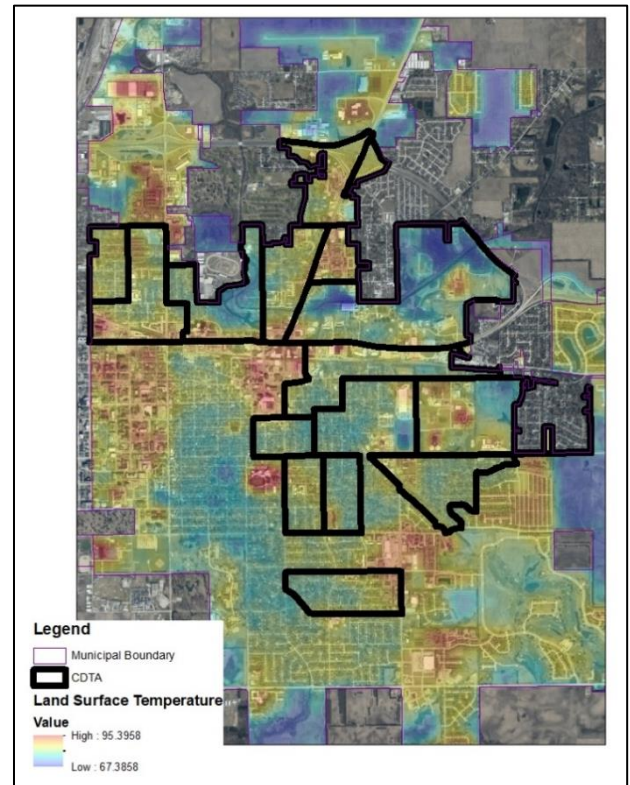


Figure 4: Land Surface Temperature in CDTA



As there were many more vacant sites than we could plant with the funds available, the vacant sites within these census blocks with the highest land surface temperatures within the CDTA were selected (See Figure 4).

Staff were able to execute the plantings at \$480.28 per tree including materials and labor, completing 54 plantings between October 12 and November 4. The total spent on tree planting was \$25,934.83. The geospatial analysis was \$12,000. These plantings reduced vacant tree sites within the two CDTA census blocks with the highest vacants per lane mile by 8.5%. The Eco-Benefits calculated by the Davey Treekeeper software include

- Yearly Eco Benefits = \$379.71
- Yearly lbs CO2 Sequestered = 710.73
- Yearly Gallons Stormwater Absorbed = 1,591.72
- Yearly lbs of air pollutants reduced = 3.76

These results were presented to a joint meeting of the Sustainability Advisory Commission and the Tree Commission. A video recording is posted at <https://urbanaillinois.us/node/9608>.



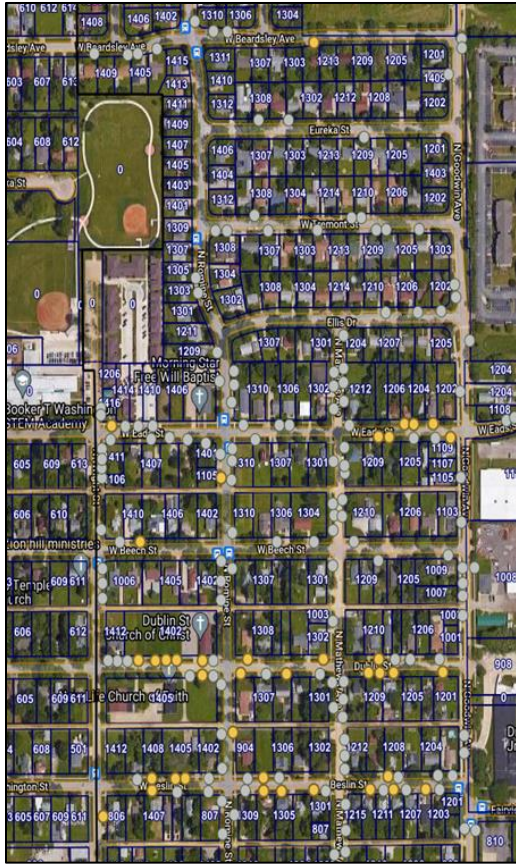


Figure 5: CDTA Census Block In Northwest Urbana

- Are Vacant Sites Planted By This Project
- Are Currently Vacant Sites

Figure 6: CDTA Census Block In Southeast Urbana

- Are Vacant Sites Planted By This Project
- Are Currently Vacant Sites

