Michael Marchak – PPD 631, Fall 2024 – Final Project

Visualization of the City of Los Angeles Tree Canopy Coverage:
An Environmental Justice Consideration and Where to Start

In the era of climate change, weather events are increasing both in frequency and intensity. Cities are particularly vulnerable to extreme heatwaves, effecting human health and energy consumption. Known as the Urban Heat Island (UHI) effect, urban areas experience higher temperatures when compared to rural areas. This difference is attributed to the built environment of cities with reduced green spaces, compact design, and impervious surfaces.

Several strategies exist to mitigate UHI. One such method utilizes land use changes such as the provision of Green Infrastructure (GI), or urban greening, to aid in lowering outdoor air temperature. GI simply is the network of natural, semi-natural, and artificial green spaces in an urban environment (Marando, Salvatori, Sebastiani, Fusaro, & Manes, 2019). This project visualizes the tree canopy coverage of the City of Los Angeles (LA) to evaluate LA's capacity in adapting to extreme heat conditions. Due to the spatial limitations of cities, tree canopy coverage was chosen as a proxy for open space in the measurement of GI provision. Expansive open space is hard to come by in a city; therefore, tree canopy cover was chosen. Additionally, this project compares tree canopy coverage against socio-demographic indicators such as a race/ethnicity and income, incorporating a lens of Environmental Justice (EJ). Finally, a potential solution, or starting place, is offered utilizing City owned property.

To visualize tree canopy coverage in the City of Los Angeles, *Figure 1. City of Los Angeles, Tree Canopy Coverage* uses the "2016 Tree Canopy Cover Calculations" dataset provided by Neighborhood Data for Social Change. The dataset assigns a percent value to each tract within LA, ranging from roughly 1% of tract area covered by trees to the highest of around 76%: the darker the green, the higher the vegetative coverage. While the data might arguably be deemed vintage, it is assumed in the eight years since that no appreciable tree planting/greening work has been done to significantly alter a given tract's coverage percentage.

Figure 2. City of Los Angeles, Share of White Population depicts the racial and ethnic landscape of LA. Using ESRI's *Enrich* tool in ArcGIS Pro, sociodemographic data was pulled in from the U.S. Census. Instead of mapping each racial and ethnic group – which would get visually unrulily – percent white provides an indication as to the remaining share of minority racial and ethnic population within each tract. A tract 51% or more indicates a majority white population tract, while 50% or less indicates a majority non-white population tract. Like the color gradient for *Figure 1*; the darker the purple that is the tract, the higher the percent of white population residing in it.

Adding an economic lens, *Figure 3. City of Los Angeles, Income Distribution* maps the 2024 median household income across LA. Again, ESRI's *Enrich* tool in ArcGIS Pro pulled in sociodemographic data from the U.S. Census. The blue shade gets darker as income increases within each tract. The tracts void of color can be attributed to public lands, which no population resides upon (i.e. LAX, Griffith Park Observatory, UCLA etc.).

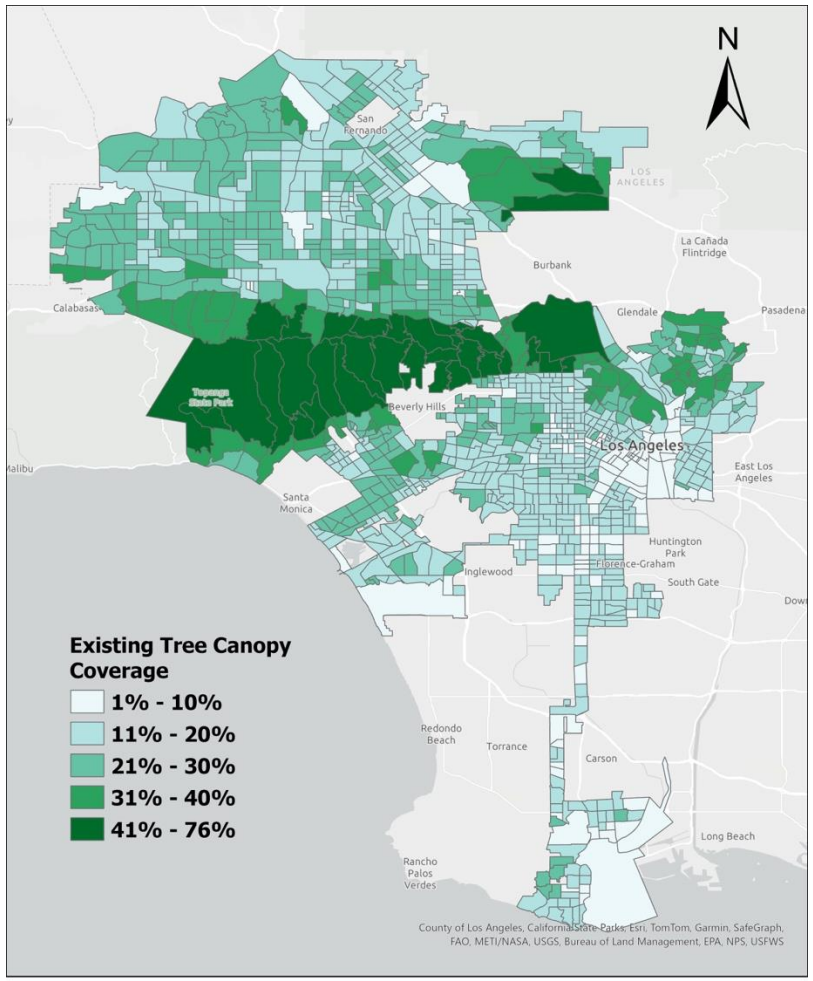

Figure 1. City of Los Angeles, Tree Canopy Coverage

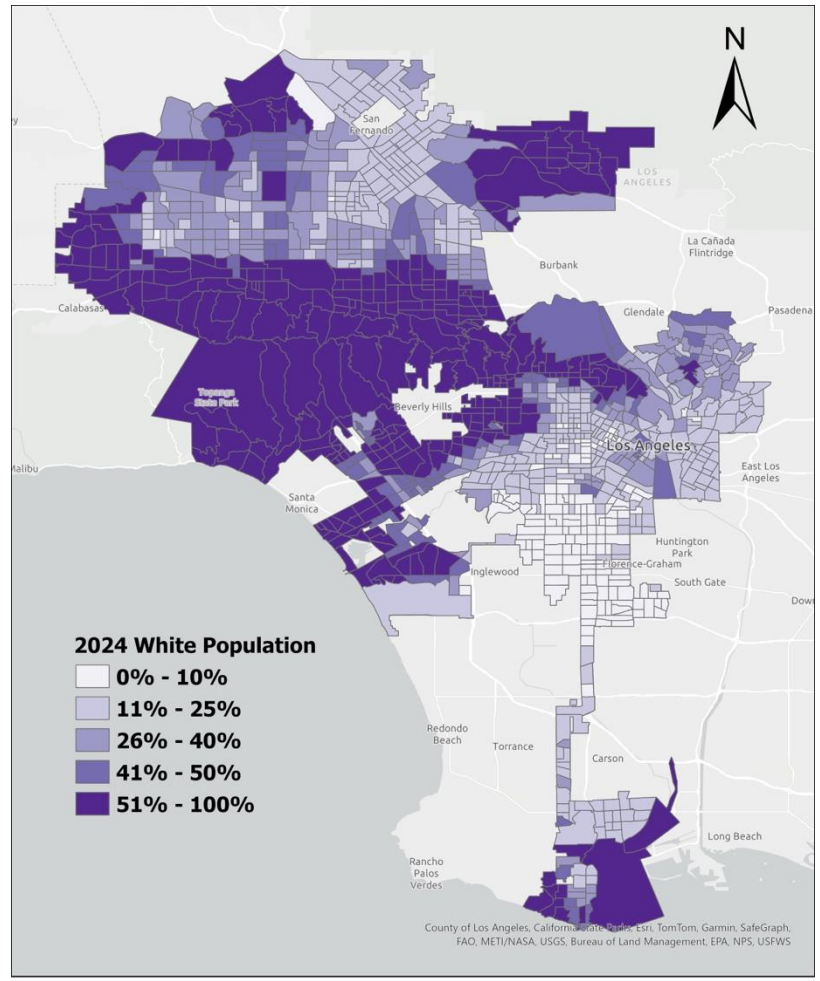

Figure 2. City of Los Angeles, Share of White Population

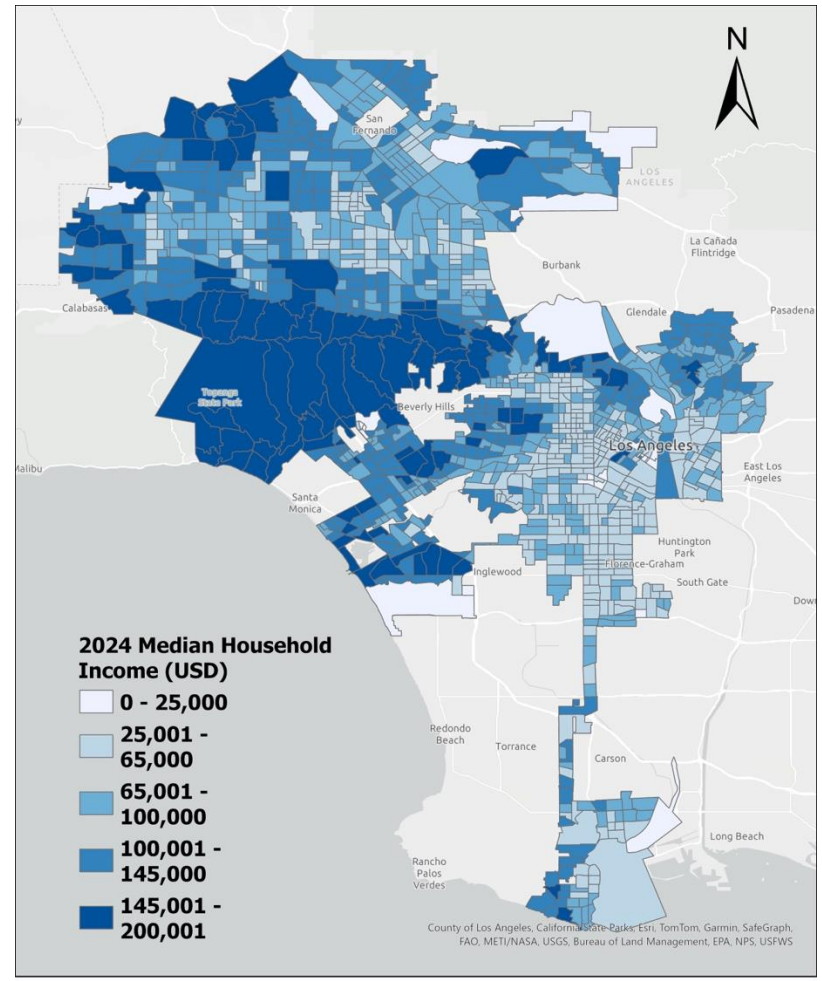

Figure 3. City of Los Angeles, Income Distribution

Orienting figures 1 through 3 side-by-side – as they are above – makes the similarities in comparison vivid. Generally, the tracts with the highest tree canopy coverage also have the highest white population share *and* the highest median household income. If the figures used the same color gradient, they'd be nearly identical visualizations. What should LA do about this?

Environmental Justice argues that minority and low-income groups bear the majority of the burden of environmental degradation. So, if LA has limited funds for remediation, tracts exemplifying the burden EJ describes might be a good place to start. According to Tree People – a well-known non-profit dedicated to urban forestry – the City of Los Angeles as a whole has an average existing tree canopy coverage of 21.72%[1]. For the 2018-2022 year, the City's median household income is $76,244.00.[2]

Therefore, a good place to start greening would be in the tracts that are below these numbers above and that are also less than 51% white. *Figure 4. Intersection of Canopy, Race, and Income* highlights the City of Los Angeles tracts that satisfy these three criteria simultaneously. The darker red depicts the tracts that are below LA's coverage average, median household income, *and* 50% or more non-white. The pink are tracts that do not meet this intersection criteria. Great, now where should LA start?

The easiest place for a city to begin intervention would be on properties that it owns. Using a dataset pulled from the City of Los Angeles GeoHub, *Figure 5. Potential Properties to Increase Vegetation* plots the city owned parking and vacant lands specifically in the intersection tracts. *Figure 5* maps parking lots simple because it is known that LA is trying to move away from auto-dependency; therefore, these parking lots could potentially be or become obsolete. If they aren't used for parking, then they could be used for park creation. Furthermore, there are quite a few vacant properties along the "shoestring" section of Los Angeles; so much so that the City could perhaps make a tree canopy tunnel!

The comparison between tree canopy coverage and select sociodemographic indictors (percent white and income) is stark. The more vegetated areas are also the wealthiest and whitest. The colors don't lie. While it's a bit of a "chicken or the egg" discussions; a prominent EJ researcher, Laura Pulido, argues that "whites have secured relatively cleaner environments by moving away from older industrial cores via suburbanization" (Pulido, 2000). Pulido further maintains that "the historical processes of suburbanization and decentralization are instances of white privilege" (Pulido, 2000). So, in many ways the highest tree density areas are white because of the trees. White populations historically have had the financial means to more easily access these areas.

In the era of funding scarcity, we luckily can determine where to start intervention: the tracts where below average tree coverage, below city median income, and highest minority populations intersect. That greatly narrows down from the vastness that is the City of Los Angeles. While urban greening is a dynamic process – occurring over time – starting with city owned property represents static intervention, places to start immediately.

There are several limitations of the project that could improve through further research. First, the city owned properties list used for *Figure 5* doesn't make clear why

[1] https://treepeople.org/los-angeles-county-tree-canopy-map-viewer/

[2] https://www.census.gov/quickfacts/fact/table/losangelescitycalifornia/RHI325223

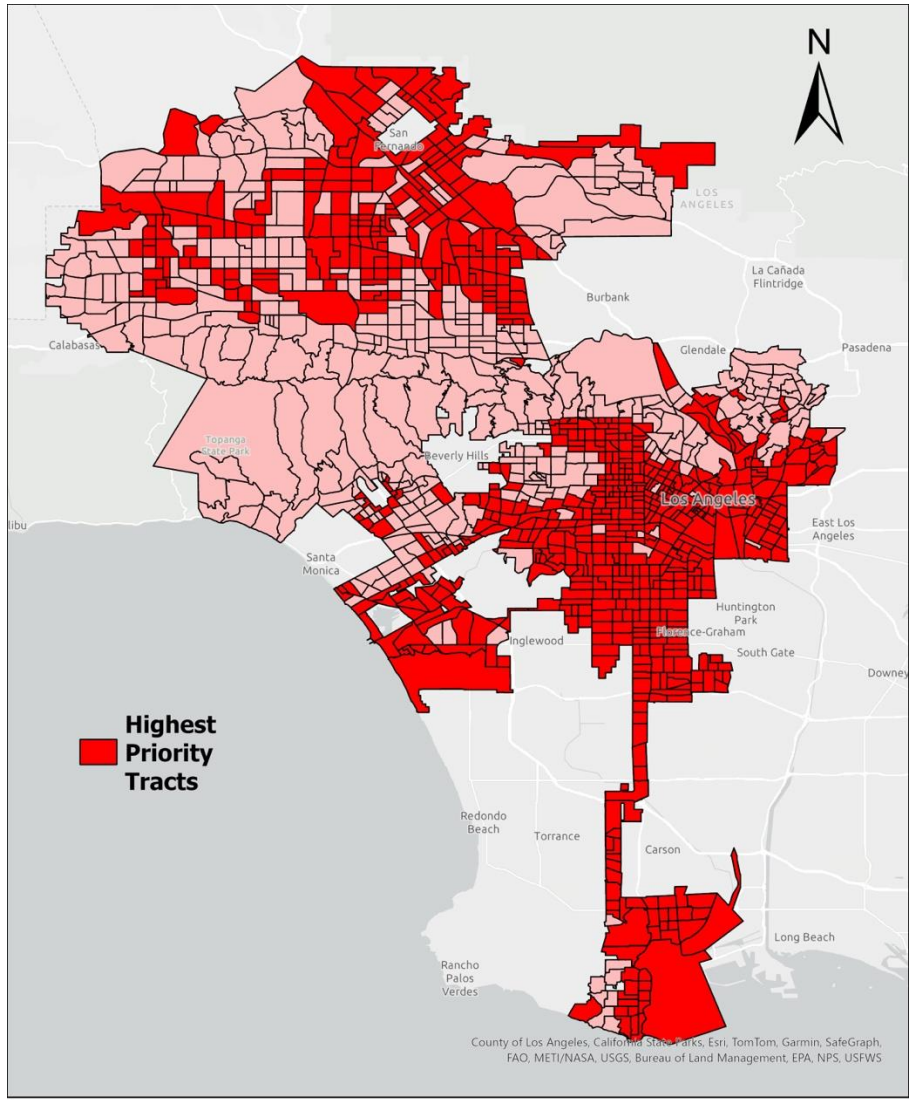

Figure 4. Intersection of Canopy, Race, and Income

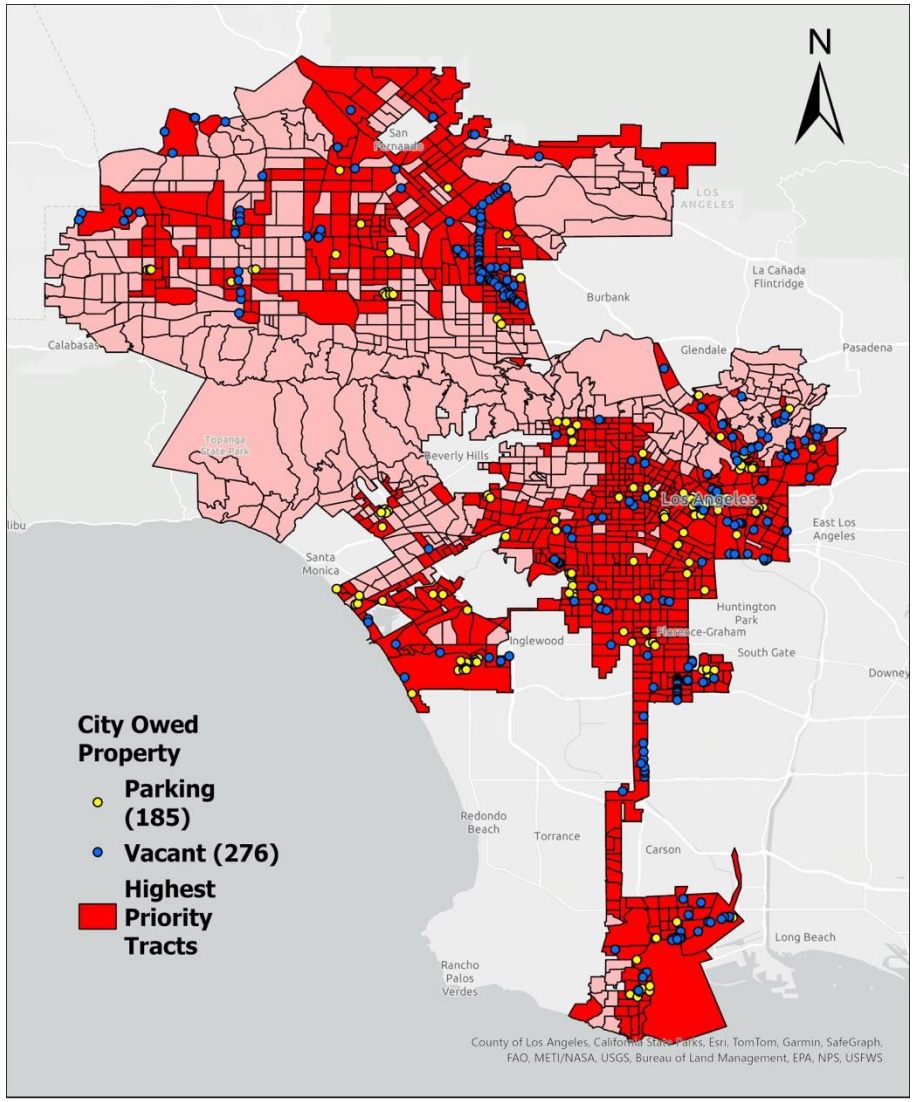

Figure 5. Potential Properties to Increase Vegetation

certain properties are vacant. It is possible these sites could be in holding for a specific purpose, leaving them unavailable for GI interventions. Second, this project does not evaluate the potential for areas to increase tree canopy coverage. Meaning, areas of low tree density may have physical limitations inhibiting the ability to increase coverage, such as concentrated building arrangements leaving little space for sidewalk trees or unsuitable topography where trees are unable to take root. Therefore, further development of this project would incorporate a percent potential for tracts to increase their tree canopy coverage.