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Advancing Shade Equity for Unincorporated South Los Angeles Communities

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STUDENT CAPSTONE REPORT

Advancing Shade Equity for Unincorporated South Los Angeles Communities

A comprehensive project submitted in partial satisfaction of the requirements for the degree Master of Urban & Regional Planning

Brittney Lu • 2023
Client: Office of Supervisor Holly J. Mitchell, District 2
Faculty Advisor: Anastasia Loukaitou-Sideris

UCLA Lewis Center for Regional Policy Studies

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Los Angeles

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by

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Client: Office of Supervisor Holly J. Mitchell, District 2
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Disclaimer: This report was prepared in partial fulfillment of the requirements for the Master in Urban and Regional Planning degree in the Department of Urban Planning at the University of California, Los Angeles. It was prepared at the direction of the Department and of the Office of Supervisor Holly J. Mitchell, District 2 as a planning client. The views expressed herein are those of the author and not necessarily those of the Department, the UCLA Luskin School of Public Affairs, UCLA as a whole, or the client.

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Executive Summary

The cooling and environmental benefits of an urban tree canopy are well-documented, but its full and balanced integration into urban infrastructure, and specifically so for climate vulnerable communities, has not always been achieved. This capstone project, "Advancing Shade Equity for Unincorporated South Los Angeles Communities," is prepared for the Office of Supervisor Holly J. Mitchell, and seeks to better understand and respond to challenges of urban tree canopy implementation and management.

The Office of Supervisor Holly J. Mitchell serves LA County's Second District, which includes South Los Angeles (South LA) and specifically those living in unincorporated communities. South LA covers a wide geography and is home to diverse and culturally-rich neighborhoods, but has been disproportionately impacted by racist housing policies and lending practices, historic and ongoing disinvestment, and overexposure to environmental hazards (de Guzman et al, 2022). An unincorporated status adds another layer of burden, as typically, these communities lack formal governance, increasing vulnerability to lack of services and political representation (Gomez-Vidal & Gomez, 2021). Supervisor Mitchell's intentional focus on unincorporated communities in South LA aims to bridge the sociopolitical, environmental, and health gaps that these communities experience compared to other municipalities in the LA region. This project contributes to one of many strategies within the Supervisor's Office, with a focus on understanding the availability of and access to shade through the urban tree canopy.

The guiding research questions are: (1) What existing programs and design standards in other major urban United States (US) cities increase, maintain, and preserve urban tree canopy for climate vulnerable communities? (2) How can urban forest strategies also balance existing infrastructure needs? and (3) What best practices could be applied to unincorporated South LA for increased shade equity?

This project drew upon recent and relevant literature, scanned existing data on LA's urban forestry practices, and studied eleven different U.S. cities' tree and/or built environment policies and programs to summarize key lessons learned and develop preliminary recommendations about urban forestry for the unincorporated communities of South LA. Research focused on understanding shade equity and urban forestry through the lenses of distributional and procedural justice, as well as community capacity building, while recommendations for "the right tree for the right place" were framed using the socio-ecological model[1] to comprehensively target multiple levels of intervention.

[1] The Socio-Ecological Model (SEM) is a public health framework that uses the following levels of intervention: individual, interpersonal, community (including institutions), and societal. This allows for change to occur at multiple, interacting levels, creating more comprehensive solutions. In this report, the SEM is used to analyze urban forestry recommendations from the individual to structural level *(Centers for Disease Control, 2022. "Socio-Ecological Model." https://www.cdc.gov/violenceprevention/about/social-ecologicalmodel.html)*

Key Terms and Definitions

Climate Resilient Communities - "communities that are able to integrate the concept of resilience (the ability to bounce back from disruptions) in a proactive and continuous manner…[to address] three types of risks: routine hazards, design hazards, and extreme events" (U.S. Climate Resilience Toolkit, 2019)

Climate Vulnerable Communities - "the degree to which natural, built, and human systems are at risk of exposure to climate change impacts; vulnerable communities experience heightened risk and increased sensitivity to climate change and have less capacity and fewer resources to cope with, adapt to, or recover from climate impacts; these disproportionate effects are caused by physical, social, political, and/or economic [forces]" (California Governor's Office of Planning and Research, 2018)

Shade Equity - the (re)distribution of urban greenery and environmental amenities to increase shade access and corresponding benefits to the most vulnerable, historically-disinvested communities (Riley & Gardiner, 2020)

Urban Tree Canopy - "the layer of branches, stems, and leaves of trees that cover the ground when viewed from above" (TreePeople, 2016)

Urban Heat Island Effect - "the occurrence when cities replace natural land cover with dense concentrations of pavement, buildings, and other surfaces that absorb and retain heat which increases energy costs, air pollution levels, and heat-related illness and mortality" (Environmental Protection Agency, 2023)

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Background: Existing Conditions and Relevant Literature

Demographics, Existing Environments, and Heat

Across the U.S., racist housing policies, discriminatory lending practices, concentrated local political power, and hazardous facility siting have historically and presently interacted to create uneven urban environments where some communities are positioned to be more vulnerable to climate change and poorer health outcomes, and are systematically removed from urban and ecological amenities (Schell et.al, 2020). In many U.S. cities, including Los Angeles (LA), it is predominantly lower-income, Black and Latino/a/e frontline communities that are disproportionately burdened (de Guzman et al, 2022). Geographically in LA County, many of these communities are concentrated within South LA, some of which are also unincorporated from the surrounding region.

Unincorporated communities are those without representation from their own local governing body, which as a result, are often politically isolated (Gomez-Vidal & Gomez, 2021). This can put many unincorporated communities at a disadvantage related to resource allocation and access (Ibid). Unincorporated status then adds another layer of harm on lower-income residents of color, who already face greater environmental and health disparities attributable to racist urban land use policies, insufficient municipal services, inadequate infrastructure, and less political representation compared to their counterparts living in incorporated municipalities (Ibid).

Spatially, South LA encompasses a number of communities and neighborhoods, portions of which may or may not be incorporated, and each with its unique assets, strengths, and needs. The Supervisor's Office looks specifically at the unincorporated communities in and adjacent to the greater South LA area – Florence-Firestone, Willowbrook, Westmont, West Athens, East Rancho Dominguez Hills, West Rancho Dominguez Hills, Lennox, and West Carson – where public services and political representation are primarily received through the LA County and Board of Supervisors. These communities were highlighted because they represent a subset of South LA unincorporated communities, where a majority of residents identify as Black/African-American or Latino/a/e (LA Almanac, 2020), and the median household income approximating $46,840 falls comparatively lower than the LA County median household income of $71,358 (LA Times, n.d. & US Census Bureau, 2021).

Table 1. Demographic Information for Target District 2 Communities

Community[1]	Population	Race & Ethnicity[2]	Median Household Income[3]	Occupancy Status	Language(s) Spoken[4]
East Rancho Dominguez Hills	14,462	Black/African American: 12.0% Hispanic: 85.0% White: 1.0%	$62,886.00	Owner-occupied: 54.0% Renter-occupied: 46.0%	English only: 17.0% Spanish: 82.0%
Florence-Firestone	60,154	Black/African American: 12.8% Hispanic: 86.1% White: 0.8%	$42,873.72	Owner-occupied: 37.6% Renter-occupied: 62.4%	*Not available*
Lennox	21,514	Black/African American: 3.0% Hispanic: 90.0% White: 2.0%	$49,694.00	Owner-occupied: 28.0% Renter-occupied: 72.0%	English only: 9.0% Spanish: 86.0%
West Athens	9,621	Black/African American: 47.0% Hispanic: 48.0% White: 1.0%	$68,750.00	Owner-occupied: 62.0% Renter-occupied: 38.0%	English only: 53.0% Spanish: 41.0%
West Carson	22,024	Black/African American: 35.0% Hispanic: 36.0% White: 14.0% *Asian: 35.0%*	$84,914.00	Owner-occupied: 73.0% Renter-occupied: 27.0%	English only: 43.0% Spanish: 28.0% Asian/Islander: 26.0%
Westmont	35,913	Black/African American: 36.0% Hispanic: 60.0% White: 1.0%	$44,670.00	Owner-occupied: 29.0% Renter-occupied: 71.0%	English only: 46.0% Spanish: 53.0%
West Rancho Dominguez Hills	22,007	Black/African American: 43.0% Hispanic: 50.0% White: 2.0%	$70,391.00	Owner-occupied: 72.0% Renter-occupied: 28.0%	English only: 56.0% Spanish: 43.0%
Willowbrook	24,006	Black/African American: 16.0% Hispanic: 82.0% White: 1.0%	$45,700.00	Owner-occupied: 41.0% Renter-occupied: 59.0%	English only: 21.0% Spanish: 78.0%
Los Angeles County[5]	9,829,544	Black/African American: 7.0% Hispanic: 49.0% White: 25.0%	$77,456.00	Owner-occupied: 46.0% Renter-occupied: 54.0%	English only: 44.0% Spanish: 38.0% Asian/Islander: 11.0%

1. U.S. Census Bureau. (2021). *ACS 5-year Estimates* and LA Times. *Mapping LA:* East Rancho Dominguez Hills, Florence-Firestone, Lennox, West Athens, West Carson, Westmont, West Rancho Dominguez Hills, Willowbrook.
2. Categories: White, Black, Native, Asian, Islander, Other, Two+, and Hispanic. This table only non-zero and >1%
3. Inflation was calculated using the Bureau of Labor Statistics CPI Inflation Calculator to correspond with 2021 values.
4. Represents language spoken at home among adults aged 18+
5. LA County data included as a comparative reference. U.S. Census Bureau. (2021). *ACS 5-year Estimates.* (link)

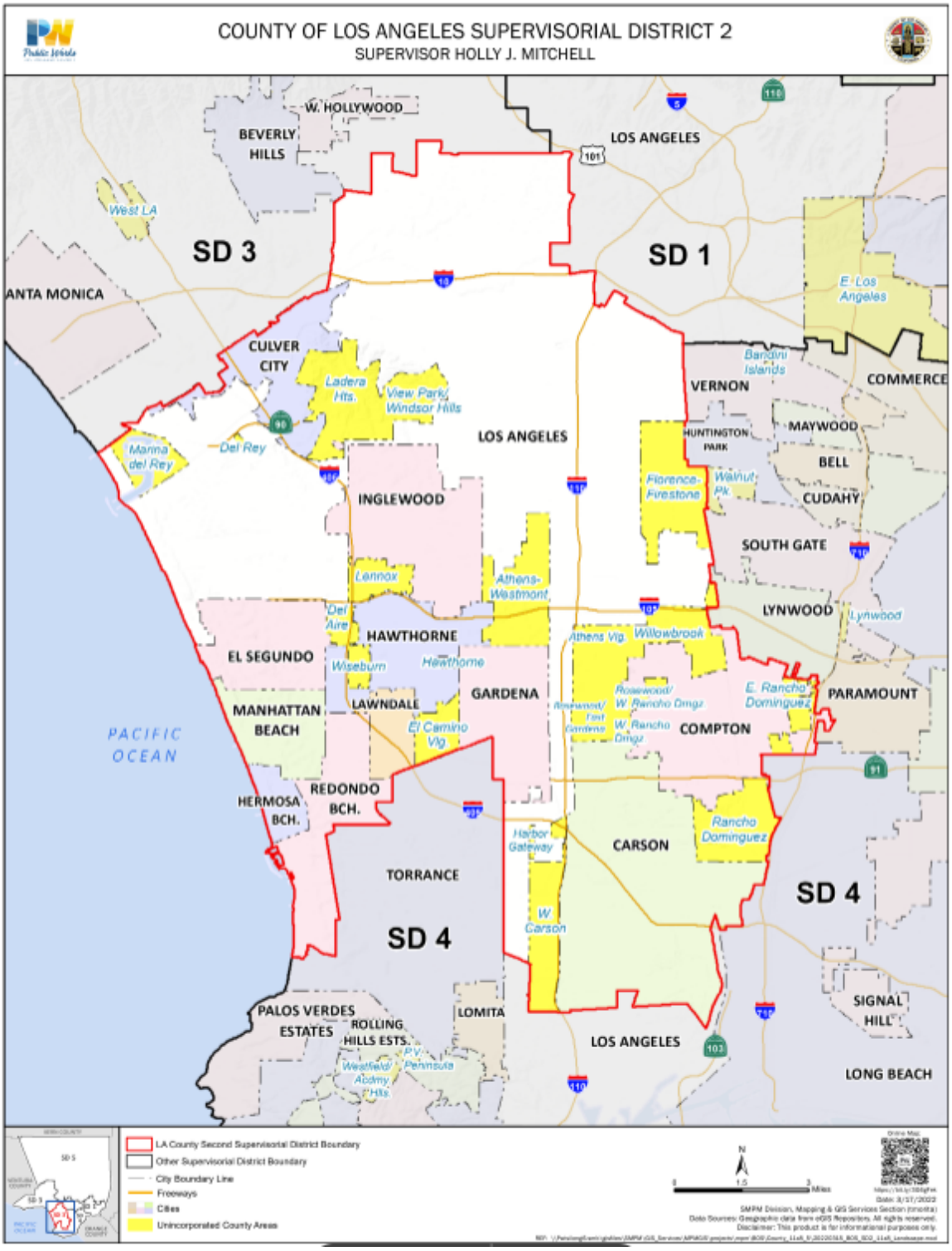
These communities also bear a disproportionate share of environmental and climate hazards. All are located in close proximity to, directly alongside, or bisected by major roadways and freeways, including the 1, 91, 105, 110, 405, and 710 freeways. High levels of emissions from car traffic disperse and concentrate air pollutants like particulate matter, ozone, nitrogen oxide, and carbon monoxide into surrounding areas where there is greater incidence and prevalence of respiratory and cardiovascular illness; in LA, it is predominantly Black/African-American and Latino/a/e residents in South LA who are disproportionately exposed (Gabbe, 2018). Spatial data also reveal that unincorporated South LA has significantly less species diversity, conserved habitats, proximity to water drainage systems, and more groundwater hazards, waste facilities, drinking water contaminants, and access to green space (LA County Parks and Recreation Needs Assessment Plus, 2022). The lack of environmental amenities coupled with an unevenly higher distribution of hazards indicates these spaces are more cumulatively impacted compared to other parts of LA, but have been given less resources to mitigate and adapt to these burdens.

There are various mechanisms influencing exposure to climate hazards, and this report will specifically look at the relationship between heat, shade, and urban tree canopies.

As climate change increases the number of extreme heat events, lower-income communities of color are more vulnerable to hotter temperatures due to lack of shade amenities, air-conditioning, and tree availability (Aguilera, 2021). This pattern remains true for unincorporated South LA. For example, the surface temperature for the targeted communities of this project approximates 102 degrees Fahrenheit (F) across its hottest days, which is hotter than other wealthier neighborhoods of LA County – such as Beverly Hills (96F), Culver City (98F), Pasadena (96F), San Marino (95F), or Santa Monica (97F) – during their hottest days (American Forests, 2018). Across the LA region, heat is an increasingly present climate and health threat affecting all municipalities in the LA region, but it is the lower-income communities of color in LA that experience more heat-exposure due to poorer infrastructure (de Guzman, 2022), urban heat island effect, and lack of cooling services (Bedsworth et. al, 2018).

Simultaneously, urban tree canopy coverage protects "less than 10% of neighborhoods" in unincorporated South LA compared to the LA County average of 18%, with even higher percentages in wealthier parts of the City and County (Tree People, 2020). Though LA is a city predisposed to heat, and increasingly experiencing climate change, this heat is not dispersed evenly across neighborhoods, and neither are the urban trees that can protect against heat. However, these types of outcomes are not by accident. The next section will help establish context to the problems associated with uneven distribution of climate burdens and amenities, health and environmental benefits, and limitations as they relate to the urban tree canopy.

Figure 1. LA County Supervisorial District 2 Boundaries and Base Map



Literature Review: Past Practices, Benefits, and Trade-Offs

Urban tree canopy and its benefits are unequally distributed (Locke et. al, 2021) along racial and socioeconomic lines (Jiang & Yang, 2022), where Black/African-American, Latino/a/e, lower-income communities are disproportionately burdened with more climate challenges and less infrastructure, including trees (Danford et. al, 2014).

Defining the Problem - Urban Tree Canopy Coverage and Shade Disparities

The 2019 LA County Sustainability Plan describes urban tree canopy as including young and mature urban trees on private and public property that help increase shade, biodiversity, soil health, and ecosystem preservation (Our County: LA County Sustainability Plan, 2019). Historically racist land use policies are one contributing factor to the unevenness in urban tree canopy coverage. In a 2021 analysis of 37 US cities, including LA, researchers found a correlation between redlining and less tree coverage (Locke et. al, 2021). Redlining, or the codification of neighborhood value based on race, ethnicity, immigration, and socioeconomic status, demarcated areas with more lower-income, non-white residents as hazardous, segregating and protecting white-owned property and values (Ibid). Redlining was formalized by the Home Owners' Loan Corporation in the 1930s, and continued to racialize homeownership and residential properties for years, until the Fair Housing Act of 1968 deemed racial discrimination as it relates to housing an illegal practice (Ibid). Though redlining as a formal practice has since been prohibited, its effects can still be felt today (Ibid). This study found that neighborhoods with more US-born, white residents had nearly double the present-day urban tree canopy coverage (43%) compared to redlined neighborhoods given a lower grade, representing non-US born, lower-income, non-white residents (23%) (Ibid). Urban tree canopies are a result of historically racist land use decision-making, accumulating into the disparities observed today.

Additionally, the process of zoning creates differential lived experiences for residents within the same city (Maantay, 2001). Zoning is a planning practice leveraged to categorize land use and site proximity to environmental hazards or amenities; within the same city, one residential area may be zoned away from industrial uses whereas another residential area a few miles away may be zoned closer to industrial uses, which can lead to differential day-to-day experiences and long-term health outcomes for residents within the same region (Ibid). Redlining, zoning, hazardous facility siting, housing stock, freeway placement, and municipal decision-making are a few examples of land use practices that create environments where whiter, wealthier residents have better housing, financial stability, and urban greenery than lower-income, non-white residents who live in warmer, climate vulnerable neighborhoods, increasing the risk of heat-related illness (Locke et. al, 2021, Maantay, 2001 & Harlan, 2006). Segregated environments also rely on "power and income differentials influencing the level of public investment in green infrastructure, [as] members of higher socioeconomic groups are better able to attract public investment in local greening initiatives that include tree planting" (Nyelele & Kroll, 2020). Racist housing practices resulting in segregated neighborhoods with disparate concentrations of wealth, along with the preservation of

racialized municipal power over time has created an imbalance of short and long-term investment in urban trees, canopy coverage, and overall climate resilience.

Understanding the Benefits - Public Health and Climate Resilience

Distributed equitably, the urban tree canopy can help alleviate burdens faced by communities disproportionately exposed to hotter environments. Advancing shade equity or (re)distributing urban greenery and other environmental amenities to increase shade access and corresponding benefits is one way to prevent heat-related illness and increase climate resilience for the most vulnerable communities (Riley & Gardiner, 2020). Shade trees help reduce the urban heat island effect by providing natural atmospheric and pavement cooling, especially on extreme heat days (McNamara et. al, 2022). In a 2019 study of 97 US cities, researchers estimated that of 1,300 heat-related deaths per year, increased urban tree canopy coverage could help prevent 245-346 of those deaths, with "an annual economic value of avoided mortality, morbidity, and electric consumption [attributable to air conditioning use] worth $5.3 to $12.1 billion" (McDonald et. al, 2020).

A 2020 literature review also revealed broader health benefits; of the 201 urban tree studies reviewed, 41% of the studies highlighted how urban greenery can protect against health hazards like air pollutants, 31% of the studies indicated an association between urban greenery and enhanced health outcomes like decreased stress, and 28% of the studies revealed how urban greenery can promote wellness at the individual and communal level, such as public parks that facilitate relational connection (Wolf et. al, 2020). Urban tree canopy coverage was also linked to wellbeing during the COVID-19 pandemic, particularly among those with greater access to trees (Duempelmann, 2020). From a climate resilience perspective, case studies in Baton Rouge, Chicago, Houston, Sacramento, and Salt Lake City contribute to the understanding that urban tree canopies can help with capturing and sequestering carbon and reducing emissions related to energy and electricity use (Konopacki & Akbari, 2002).

Identifying the Potential Trade-Offs - Community Exhaustion and Tree Disservices

Another factor to consider when designing and implementing urban tree canopy policies and programs is community engagement. While meaningful outreach and partnership are necessary when implementing any type of project, it is just as critical to avoid top-down decision making, community exhaustion, or short-term commitments that could facilitate more harm. In a series of 20 interviews with community leaders from a designated "low-canopy neighborhood" in North Philadelphia, researchers learned about both the desires and concerns surrounding urban trees, ranging from limited time and resources to support tree canopy efforts to anxieties over potential gentrification caused by urban greening (Riedman et. al, 2022). A few interviewees explicitly expressed that planting initiatives would often require multiple rounds of participation and uncompensated support, creating a "general concern of asking too much of often overworked community volunteers" who may already be stretched with other jobs, familial needs, etc. (Ibid). In the Newton Creek neighborhood of Brooklyn, residents sought strategies that abide by a "just green enough" mentality to "achieve

environmental remediation with environmental gentrification;" this is because environment-based improvements also have the potential to displace existing residents as new amenities may increase property values (Curran & Hamilton, 2012). As more regional policies seek to advance climate or tree policies, it will be crucial to ensure communities are not just a procedural checkmark, but that authentic, community-led stewardship and agency are emphasized and structurally supported throughout the long-term (Grant et. al, 2022).

Urban trees may also pose challenges throughout the planting, establishment, growing, maintenance, and preservation phases. "Tree disservices" must also be considered, such as over-burdened irrigation systems, susceptibility to pests and diseases, roots that interfere with sewage systems or result in upended sidewalk pavement, or ill-placed trees blocking viewpoints for drivers and pedestrians, which could lead to collisions (Roman, 2021). Urban trees also have a large initial cost, with short-term fees associated with planting and an intensive first three-year watering policy, and long-term fees associated with trimming and maintenance (Conversation with Lukas Bradley from LA County Department of Public Works, 2022).

Additionally, in a 2022 review of tree initiatives across 46 global cities, researchers found that while most energy is dedicated to new planting, true benefits come through maintaining tree diversity, equity, survival, and canopy area; "the focus should be on increasing benefits, not necessarily the number of trees planted," indicating that large front-end investments to increase urban tree counts should be coupled with sustained long-term support associated with establishing a network of trees that create the urban canopy (Sousa-Silva et. al, 2022). Finally, urban tree canopies can also be influenced by private, public, and nonprofit actors, each with its own agenda and priorities which can lead to multiple types of programming and mechanisms of regulation (Guo et. al, 2018). Ensuring that urban tree benefits are extended equitably, do not interfere with other infrastructure needs, and are maintained sustainably through coordinated efforts requires "right tree in the right place"-based policies that meet the varying ecological, community, and municipal needs and desires of different places and players.

LA County: Sustainability and Urban Forestry Goals and Barriers

Across the LA region, there is ongoing and upcoming work being done at the city and county levels to advance climate resilience, including the development of urban forestry management plans (UFMP).[2] In 2017, TreePeople released the report, "Public Trees for Public Good: An Assessment of Urban Forestry Management and Practices in Los Angeles County," finding that some of the biggest gaps for the LA regional tree canopy were related to lack of publicly available and accessible tree inventory data, inadequate funding, and an overall need for greater organizational capacity that can holistically maintain the urban tree canopy (TreePeople, 2017). In this report's assessment of 26 jurisdictions across LA, those that had higher-income communities and greater population density were more likely to have more robust tree canopy programs and budgets (Ibid). It was also found that each jurisdiction was likely to adopt different strategies to urban forestry, likely creating a piecemeal approach to a regional canopy (Ibid). Additionally, maintenance was found to be primarily responsive to minimizing risk associated with liability (e.g. injuries caused by disruptive roots) (Ibid). Focusing on liability and risk as the vision for an urban tree canopy might undermine the overall goal of establishing robust green infrastructure and regional shade resources.

To better understand the status of work on urban forestry happening at LA County now, a series of informal conversations with representatives from the Office of Sustainability, Board of Public Works, and Department of Public Health were conducted to gain a baseline understanding of regional urban tree canopy-related efforts.

These departments represent a subset of the Healthy Design Workgroup focusing on interdepartmental tree coordination, which also includes the departments of Regional Planning, Parks and Recreation, Internal Services, Agricultural Commissioner Weights and Measures, and the Fire Department (County of LA Public Health, 2020). Notably, the development of an UFMP with an emphasis on unincorporated communities is underway, funded by a grant through CalFire and with the goal of creating a regional plan for trees based upon the different built environments, needs, and governance across LA County (Conversation with LA County Department of Public Health, 2022 and PLACE Urban Forest Work, 2020). This grant, coupled by a motion under the Board of Supervisors in 2019, also helped facilitate the creation of the OurCounty sustainability plan under the County Office of Sustainability (Motion by Supervisors Sheila Kuehl and Hilda L. Solis, 2019). OurCounty represents a vision for a greener, more sustainable, and environmentally just LA County, and includes action steps to create the UFMP (Action

[2] An urban forestry management plan (UFMP) is a type of strategic plan and document outlining what the regional tree canopy goals are, what resources and staffing are needed to coordinate and maintain the regional tree canopy goals, and specific actions needed to implement the plan. A UFMP is typically developed after a robust tree inventory and community engagement is conducted (American Public Works Association. "Urban Forestry Best Management Practices for Public Works Managers, Urban Forest Management Plan"). In LA County, the UFMP will seek to "prioritize resilient, climate-appropriate trees, understory vegetation, native biodiversity, conserve mature trees, and properly manage resources" in its goals and strategies (Los Angeles County Department of Public Health. "Policies for Livable, Active Communities and Environments (PLACE) Urban Forest Work.")

43), along with other shade-related goals, such as bus stop shade structures (LA County Sustainability Office, 2019). Since this adoption in 2019, there has been a status report released each year to document and track progress on the plan as a whole, with the creation of the UFMP as a priority item (Chief Executive Office, 2022 & Conversation with LA County Office of Sustainability, 2023).

At the time of this report, the UFMP is in its early stages, with a consulting agency conducting initial analysis to understand and categorize the following: (1) existing tree-related policies and programs across LA County, (2) a tree inventory to document all County-managed trees, and (3) a urban tree canopy coverage dataset to spatially assess where canopy coverage is most or least accessible (Conversations with LA County Office of Sustainability, 2022). Community engagement strategies are also being developed between LA City and County, with an emphasis on environmental justice and equity (Conversations with LA County Office of Sustainability, 2022). Multiple county departments have also been informally coordinating and collaborating in preparation of creating an UFMP that would intersect with sustainability goals, pedestrian planning, active transportation, sidewalk design and infrastructure maintenance (Conversations with LA County Office of Sustainability and Office of Supervisor Holly J. Mitchell, District 2, 2022). A few concerns and opportunities, such as identifying funding sources or navigating spatial limitations, have also been identified, with the intention of incorporating responsive recommendations in the UFMP (Conversations with LA County Office of Sustainability, 2022).

Official proposals and recommendations have yet to be identified, and will likely come following the release of public data on tree inventory and community engagement processes. Meanwhile, in a brief search of LA County Board motions proposed from January 2020 through May 2023, 90 of the 3,973 motions focused on the environment or environmental justice (County of LA, 2023). Using a key term search for "tree" and "tree canopy," only 9 motions were found, 3 of which were led by Supervisor Mitchell (Ibid). These motions focused on protecting those "most vulnerable to extreme heat…exacerbated by a lack of investment in urban trees," "planting and maintaining street trees," and implementing shade equity through tree planting at specific parks (Ibid & Mitchell, 2023). It is anticipated that following the release of LA County's UFMP, additional Board motions may be proposed specifically to advance urban forestry. Additionally, LA County Metropolitan Transportation Authority (Metro) has concurrently brought forth their own tree and shade policy that would "protect the urban tree canopy throughout its construction program…including a sustainable tree replacement strategy when tree removal is deemed unavoidable to build Metro projects" (Sotero, 2022).

Across LA County's landscape, there are 170,000 active tree planting sites (costing approximately $30 million per year), and 30,000 appropriate vacant sites available (Conversation with LA County Department of Public Works, 2022 and LA County Public Works Parkway Trees, 2023). To build upon this, the UFMP will be a critical tool in developing effective strategies to plant and maintain the urban tree canopy.

Tree Removals and Replacements

Two hypothesized drivers of tree removals include invasive species and sidewalk quality (Conversations with LA County Department of Public Works and Office of Sustainability, 2022). Often, tree cuttings are necessary to address sick trees impacted by non-native bugs, or to remove obstacles that can create safety concerns on sidewalks related to street furniture, underground and overhead infrastructure, and pavement quality (LA County Department of Parks and Recreation, 2011). One possible recommendation being considered is an Early Detection Emergency Rapid Response to identify where invasive species are impacting tree health, coupled with tree replanting led by arborists whose expertise can determine what appropriate tree would be most suitable for the space it is given and the surrounding biodiversity (Conversations with LACounty Office of Sustainability, 2022). Another possibility for replacement is the adoption of a 1:1 to 2:1 ratio, such that for every tree removed, two trees would be planted (Conversations with LA County Office of Sustainability, 2022).

Funding Sources and Consistency

A majority of funding for LA County trees comes from a gas-tax (constituting nearly 90%) and road maintenance fees (Conversations with LA County Department of Public Works, 2022). There is usually some funding for planting, establishment, and maintenance, but this may come from different sources, and is not always consistent over time (Anguelovski & Carmen, 2011 and Pincetl, 2003). Short-term grants for upfront financial support are not ideal (Conversations with LA Department of Public Works, 2022). Planting itself can cost upwards to $500 per tree, and an intensive three-year establishment period can cost upwards to $2000, with ongoing maintenance costs accrued after (Conversations with LA County Department of Public Works, 2022 and Smith et. al, 2019). During the establishment period, watering and maintenance are critical, as this initial survival period determines longevity (Ibid). Without robust irrigation and infrastructure, or consistent funding, individual actors may be in charge of watering, and in many cases, residents may be the ones taking on maintenance costs (Conversations with LA County Department of Public Works, 2022).

Governance and Coordinated Enforcement

Given the size and diversity of LA County, a comprehensive approach meeting a myriad of needs is bound to be challenging. Policies would require shared visioning and collaboration across departments to ensure uniform enforcement (Dudek, 2018). And in LA County, trees fall under both public and private property; in fact, most of the urban canopy is on private property, and community members may not always prioritize or have the means to support urban trees in the same way (Conversations with LA County Department of Public Works and Department of Public Health, 2022). There are two mechanisms to plant parkway trees: an opt-in option where interested residents are identified to receive, plant, and maintain a tree, or an opt-out option where residents within a certain community receives notice with an explicit request for rejections if the individual chooses not to have a tree (Conversations with LA County Department of Public Works and Department of Public Health, 2022). The opt-in option is preferred for

establishing public-private partnerships, but the response rate is low (around 10-20%) (Conversations with LA County Department of Public Works, 2022). On the other hand, the opt-out option is preferred when there is guaranteed maintenance support from the private actor, as public agencies may not always have consistent funding for long-term maintenance (Conversations with LA County Department of Public Works, 2022). Unincorporated LA County residents can also request from Public Works a free parkway tree, but residents will be required to water the tree, monitor for concerns, and report problems back to the County (LA County Public Works Parkway Trees, 2023).

Each of the LA County department representatives spoke about the need to see the urban tree canopy as a long-term component of our shared ecosystem and urban infrastructure, rather than just as a one-off benefit. While there are very real barriers surrounding tree removals, funding, and governance that have impacts on the overall urban tree canopy and shade accessibility, there are also strategies LA County could adopt to equitably advance the fullest benefits associated with an established urban tree canopy.

Methods: Data Collection and Initial Analysis

The information researched for this report was generated from a scan of peer-reviewed journal articles, gray literature, and program reports. Information for building contextual knowledge of unincorporated South LA communities and LA County tree policies was generated from a review of existing community needs assessments and profiles of the targeted communities – Florence Firestone, Willowbrook, Westmont and West Athens, East Rancho Dominguez Hills, West Rancho Dominguez Hills, Lennox, and West Carson – as well as through informal conversations with the project client (Laura Muraida, representing the Office of Supervisor Holly Mitchell for District 2), representatives from various LA County public agencies, and staff from UCLA's Institute of the Environment and Sustainability.

The spatial data was compiled from a series of existing sources and datasets, including the 2016 Tree People LA County Tree Canopy Map, the 2018 Tree Equity Scores Mapping Tool, the 2019 Tree People Shade Coverage Assessment Tool, and LA County Board of Public Works Parkway Trees Map and dataset. Initial data cleaning and basic summary statistical analysis focused primarily on the targeted unincorporated communities of South LA, with a secondary emphasis on LA City and County broadly, as well as comparatively wealthier and greener neighborhoods across the LA region.

The case-study review initially included 10 US cities with robust tree programming, policies, and designs identified during the scan of existing literature, including Austin TX, Boston MA, Chicago IL, Denver CO, Los Angeles City CA, New York City NY, Philadelphia PA, Portland OR, Seattle WA, and Washington DC. A first-pass search was conducted for existing programs, regional policies, UFMPs, partners, etc. with information sorted into various categories, including problem definitions, community engagement, funding sources, regulation and governance, health benefits, climate benefits, barriers to planting, barriers to maintenance, identified solutions, and recommendations for South LA. A second pass included San Francisco CA as another case-study, as well as a narrowed focus on sidewalk design practices across all identified comparison cities.

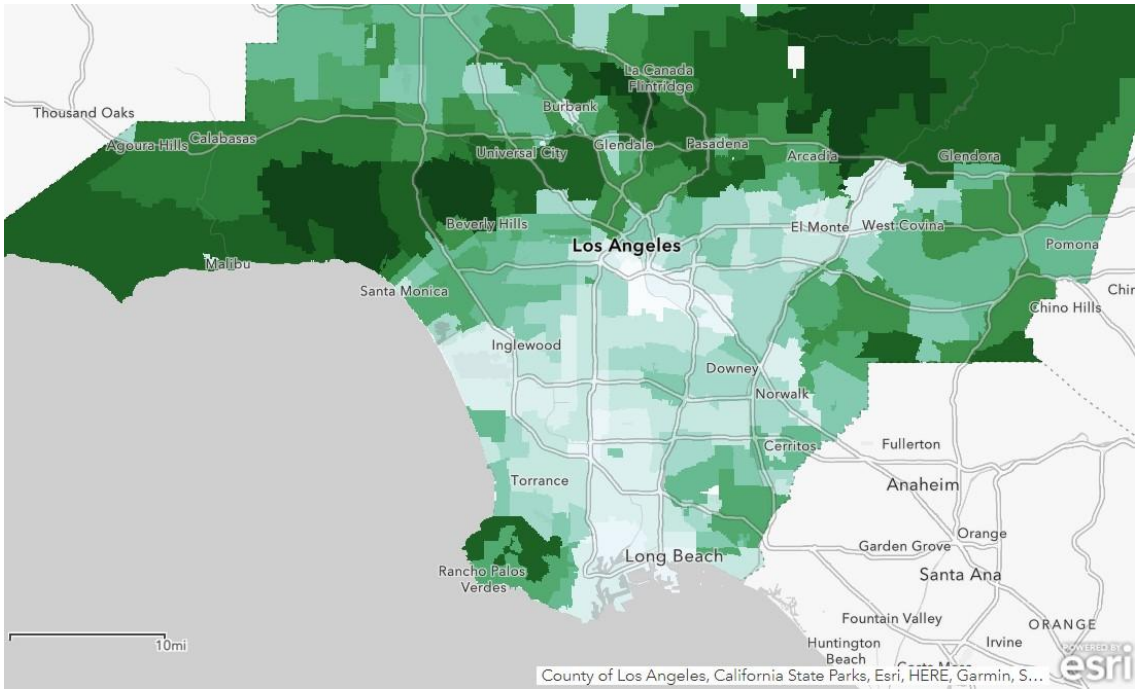
Using the methods described above, preliminary recommendations for the Office of Supervisor Holly Mitchell for District 2 were drafted using the Socio-Ecological Model (SEM). The SEM is a common public health framework generally used to identify multiple levels of intervention, including the individual, interpersonal, institutional, community, and societal and/or structural levels. This framework was used specifically upon review of the study "A socio-ecological approach to align tree stewardship programs with public health benefits in marginalized neighborhoods in Los Angeles, CA" (de Guzman et. al, 2022). Using the SEM as a guiding framework allows for recommendations to be crafted based on specific target audiences and needs at different scales of intervention for a more holistic approach. Preliminary recommendations provided per SEM level outline both best practices and opportunities to close potential equity gaps based on the findings.

Findings and Key Takeaways

Existing Urban Tree Canopy Data

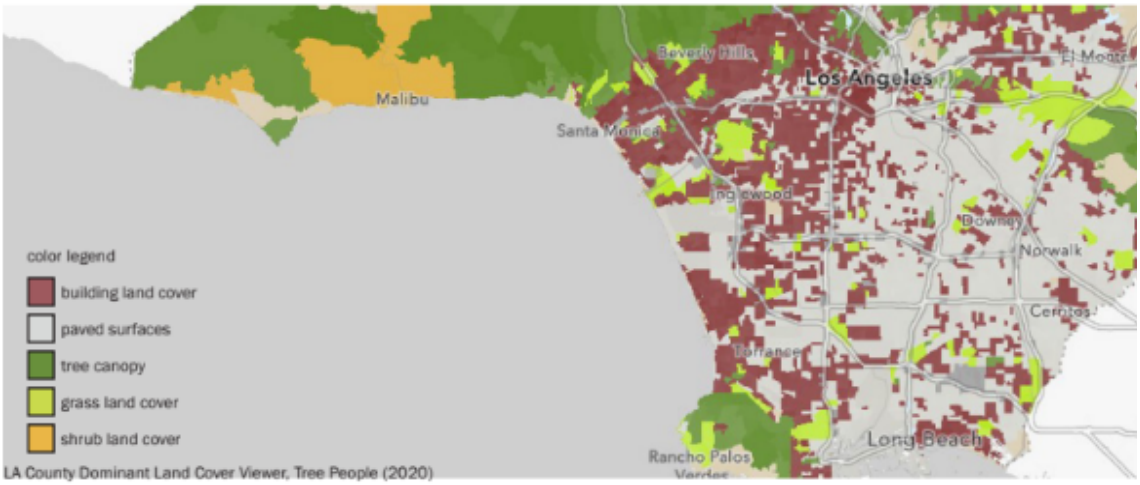
This section will summarize existing conditions of the urban tree canopy across unincorporated South LA. Mapping data was acquired from the TreePeople LA County Advanced Tree Canopy Map Viewer, with targeted communities' data and analysis generated using the LA County Department of Public Works Parkway Trees Dataset.

Figure 2. LA County Tree Canopy Map Viewer (TreePeople, 2020)



The map above depicts how aerial tree canopy coverage (and thus shade) varies by zip code, with greater coverage indicated by darker greens and typically concentrated in wealthier areas, and less shade coverage indicated by lighter greens and typically concentrated across lower-income communities of color (TreePeople, 2020).

Figure 3. LA County Dominant Land Cover Map Viewer, TreePeople (2020)



The dominant land type also varies across neighborhoods. Compared to the map above, this map reveals that there is an observed visual correlation that where there is less tree coverage, there are also more paved surfaces. This reveals that the same spaces with less canopy coverage also have more heat-absorbing surfaces. Though LA is regionally predisposed to heat, there are communities less protected against hotter temperatures (TreePeople, 2020).

Across LA County, tree canopy coverage and tree plantings are unevenly distributed, creating pockets of the region that have more access to tree resources than others (Ibid). Simultaneously, in the areas where there are less trees, there is also increased exposure to paved surfaces, contributing to excess heat (Ibid). For unincorporated South LA communities, these maps indicate the coupling of over-exposure to impervious, paved surfaces and under-canopied tree coverage, increasing the risk associated with extreme heat events, the overall prevalence of hotter temperatures, and the lack of climate-mitigating, adaptive, and resilient infrastructure.

Table 2. Existing Canopy Coverage Across Target District 2 Communities

Existing Tree Canopy Coverage and Comparisons against LA County Average (2016)[1]			
Unincorporated South LA[2]	Associated Zip Code[3]	Existing Tree Canopy[4]	% Compared to LA County Average[5]
East Rancho Dominguez	90221	12.50%	5.5% points lower
Florence-Firestone	90001	10.94%	7.06% points lower
	90002	11.34%	6.66% points lower
Lennox	90304	13.26%	4.74% points lower
West Athens-Westmont	90044	11.94%	6.06% points lower
	90047	11.94%	6.06% points lower
West Carson	90502	12.35%	5.65% points lower
	90710	15.10%	2.9% points lower
West Rancho Dominguez	90220	11.66%	6.34% points lower
	90248	12.01%	5.99% points lower
Willowbrook	90059	11.41%	6.59% points lower
	90061	10.53%	7.47% points lower
	90222	11.67%	6.33% points lower

1. Data was generated and calculated from the Los Angeles County Tree Canopy Basic Viewer
2. Target communities as identified by the Supervisor of Holly J. Mitchell's Office.
3. Zip codes determined through an initial internet search per unincorporated target community.
4. Existing tree canopy data represents the percent of land occupied by tree canopy coverage. Each zip code was searched for in the basic viewer map, and percentages are reported here.
5. The LA County average is reported at 18% in 2016. This is the most recent available data, with updated data published and accessible through the upcoming Urban Forestry Management Plan. Absolute percentage points difference was calculated using the LA County Average (18%) - Zip Code Reported Percentage.

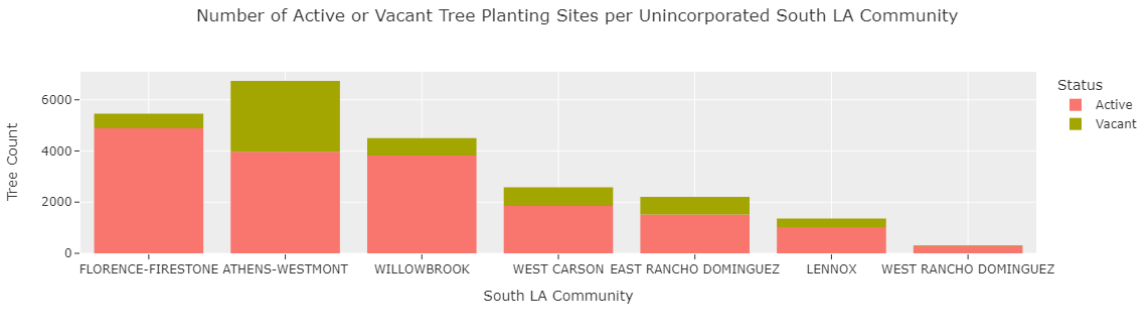
The table above outlines the variances in existing tree canopy across the targeted communities, and how they compare against the LA County average of 18% urban tree canopy coverage. Across each of these communities, there is an observed decreased canopy coverage compared to the County at large.

Table 3. Existing Tree Counts Across Target District 2 Communities

Total Number of Parkway Tree[1] Planting Sites per Unincorporated South Los Angeles Community[2]					
Community Name	Total Planting Sites[3]	Active Sites[4]	% Active among Total	Vacant Sites[5]	% Vacant among Total
West Athens - Westmont	6,738 (29.1%)	3,967	58.9%	2,771	41.1%
Florence - Firestone	5,457 (23.5%)	4,882	89.5%	575	10.5%
Willowbrook	4,503 (19.4%)	3,827	85.0%	676	15.0%
West Carson	2,584 (11.2%)	1,850	71.6%	734	28.4%
East Rancho Dominguez	2,210 (9.5%)	1,517	68.6%	693	31.4%
Lennox	1,362 (5.9%)	1,028	75.5%	334	24.5%
West Rancho Dominguez	314 (1.2%)	290	92.4%	24	7.6%
Total Counts	23,168 (100.0%)	17,361 (74.9%)	–	5,807 (25.1%)	–

1. "A parkway tree is typically planted by Public Works or a developer…within the County's right of way. LA County maintains over 170,000 parkway trees in unincorporated areas along more than 3,200 miles of roadways." (LA County Department of Public Works)
2. The unincorporated South LA communities are those identified as target SD2 communities.
3. Total planting sites are areas that have or are available for the planting of a parkway tree (LA County Department of Public Works)
4. Active planting sites ("active tree assets") include existing parkway trees in unincorporated LA County (LACounty Department of Public Works). The percentage represents the number of active sites divided by the total number of planting sites per community.
5. Vacant planting sites ("appropriate vacant sites") are spaces for potential parkway trees, assuming minimum spacing requirements are met. (LA County Department of Public Works). The percentage represents the number of vacant sites divided by the total number of planting sites per community.

Figure 4. Active vs. Vacant Tree Wells Across Target District 2 Communities



The data in the previous graphs takes a closer look at canopy disparities, and where there are active or vacant tree plantings in the communities that are the focus of this capstone project. Regarding canopy coverage, we can see that across unincorporated South LA and adjacent communities, canopy coverage ranges from 4 to 7 percentage points lower than the LA County average (TreePeople, 2020). Quantitatively, the aerial coverage across LA is not distributed evenly, and on average, unincorporated South LA has more exposure to sun and less shade coverage from green infrastructure.

Regarding tree counts, active sites include those where a tree plant is currently present, and vacant sites include those where a tree well is not currently filled, but the conditions are appropriate for future planting. West Athens-Westmont has the most planting sites, but a majority of those sites are attributable to vacant wells. Comparatively, Florence-Firestone has the most active tree plants across these communities. In total, there are 23,168 overall sites, with 17,361 representing active wells (74.9%) and 5,807 representing vacant wells (25.1%). This data is the most recent and comprehensive look at public parkway trees only, and does not include coverage from trees located on private property or open parkland (LA County Public Works Parkway Trees, 2023). In conversations with County representatives, a more robust dataset is set to be publicly accessible in 2024, which will include aerial coverage and tree count data for all tree sources (private, public, and park) and will be used to inform County goals.

Table 4. Top 10 Most Common Tree Species Across Target District 2 Communities

Tree Species Name	Count	Size	Description
Crape Myrtle (including hybrids)	1,776	15-25' tall, 6-15' spread	"It needs plenty of moisture when young, but after established, it will tolerate drought and grow well in limited soil spaces." (Arbor Day Foundation)
Southern Magnolia	1,070	60-80' tall, 40' spread	"Full sun and partial shade are best…it grows well in acidic, loamy, moist, sandy, well-drained clay soils. It can withstand some flooding and has moderate drought tolerance." (Arbor Day Foundation)
Australian Willow	979	25-30' tall	"They do well in full sun with little to moderate water and well-drained soils. Some pruning is required to keep its shape." (University of California Agriculture and Natural Resources)
Fern Pine	966	35-45' tall, 25-35' spread	"As an evergreen, it is a great candidate for spaces that could benefit from year-round cooling; it tolerates partial shade and poor soil quality well. Moderate water needs." (Sacramento Tree Foundation)
Brisbane Box	932	50' tall, 10-30' spread	"Drought resistant once established; smog tolerant, and may be a larger tree in warmer areas. Moderate root damage potential with no known health hazards." (Cal Poly)
Jacaranda	841	30-50' tall, 30' spread	"This tree grows best in fully sunny locations, [but] the trunk is susceptible to sunscald. It is tolerant of many different soils but cold-sensitive. It is advisable to prune older trees. Low water use." (University of Arizona)
Weeping Fig	815	40-50' tall, 25-30'	"Heavy pruning decreases the longevity of

		spread	this plant. Watch for scale, aphids, mealybugs, thrips, and spider mites; frost sensitive." (North Carolina State University)
Indian Laurel Fig	740	35' tall, 35-40' spread	"Medium water use. Loam or sand soil texture is best, with slightly acidic to very alkaline soil pH. Moderate root damage potential and not powerline friendly." (Cal Poly)
Mexican Fan Palm	645	n/a	"Has become invasive in riparian, orchards, and landscaped areas. Known to create monospecific stands and dead fronds can create a fire hazard." (California Invasive Plant Council)
Chinese Elm	567	40-50' tall, 35-45' spread	"Works well as a street tree due to its ability to grow in adverse conditions and relative freedom from the diseases affecting many other elm species. Adapts to many soil conditions; some flood tolerance and drought resistance." (Arbor Day Foundation)

From Top Left to Bottom Right: Crape Myrtle, Southern Magnolia, Australian Willow, Fern Pine, Brisbane Box, Jacaranda, Weeping Fig, Indian Laurel Fig, Mexican Fan Palm, Chinese Elm (all photos are sourced from Google Images)

The table above describes the top ten most common tree species contributing to the existing urban tree canopy. The number one most common species for South LA is the Crape Myrtle, which has only a moderate canopy coverage (6-15 feet spread), but is the most drought and soil tolerant.

In 2021, TreePeople published a report titled, "Planting Resilience: Identifying Climate-Resilient Tree Species and Increasing Their Presence in Los Angeles' Urban

Forest," which offers guidance on what types of tree species would be a best fit to a surrounding community's local environment, given particular climate and biological stressors as well as the trees' capacity to contribute towards cooling-based strategies (TreePeople, 2021). The report describes trees that have a greater leaf area index ("broad, flat leaves"), a shorter height, darker leaf color, and a more simple leaf shape to have the highest cooling potential (Ibid). Furthermore, a list of 28 trees were identified as being drought and pest resistant, while requiring less water (Figure 5, Ibid). Of the top 10 most common tree species planted in unincorporated South LA, only one appears to overlap with TreePeople recommendations. This may be due to variances in hyper-local environments, but further analysis on whether the recommended species can be established in unincorporated South LA may be worthwhile.

Figure 5. List of 28 Climate-Resilient Tree Species for the LA Region (Tree People, 2021)

Comparative Case Studies

This section summarizes findings, barriers, and opportunities from the studied cities.

Austin, Texas

The City of Austin, Texas established a Urban Forest Plan: A Master Plan for Public Property in 2013, specifically designed to shape Austin's "public urban forest" covering trees and urban canopies across public right-of-ways, "where the City of Austin can exert the most direct influence" (City of Austin, 2013, page ix). The creation of this UFMP was responsive to community feedback and visioning, and under the guidance of a seven-member Urban Forestry Board representing various City departments, each with specific responsibilities and oversight related to the public urban forest (City of Austin, 2013, Figure 2.13 on page 55).

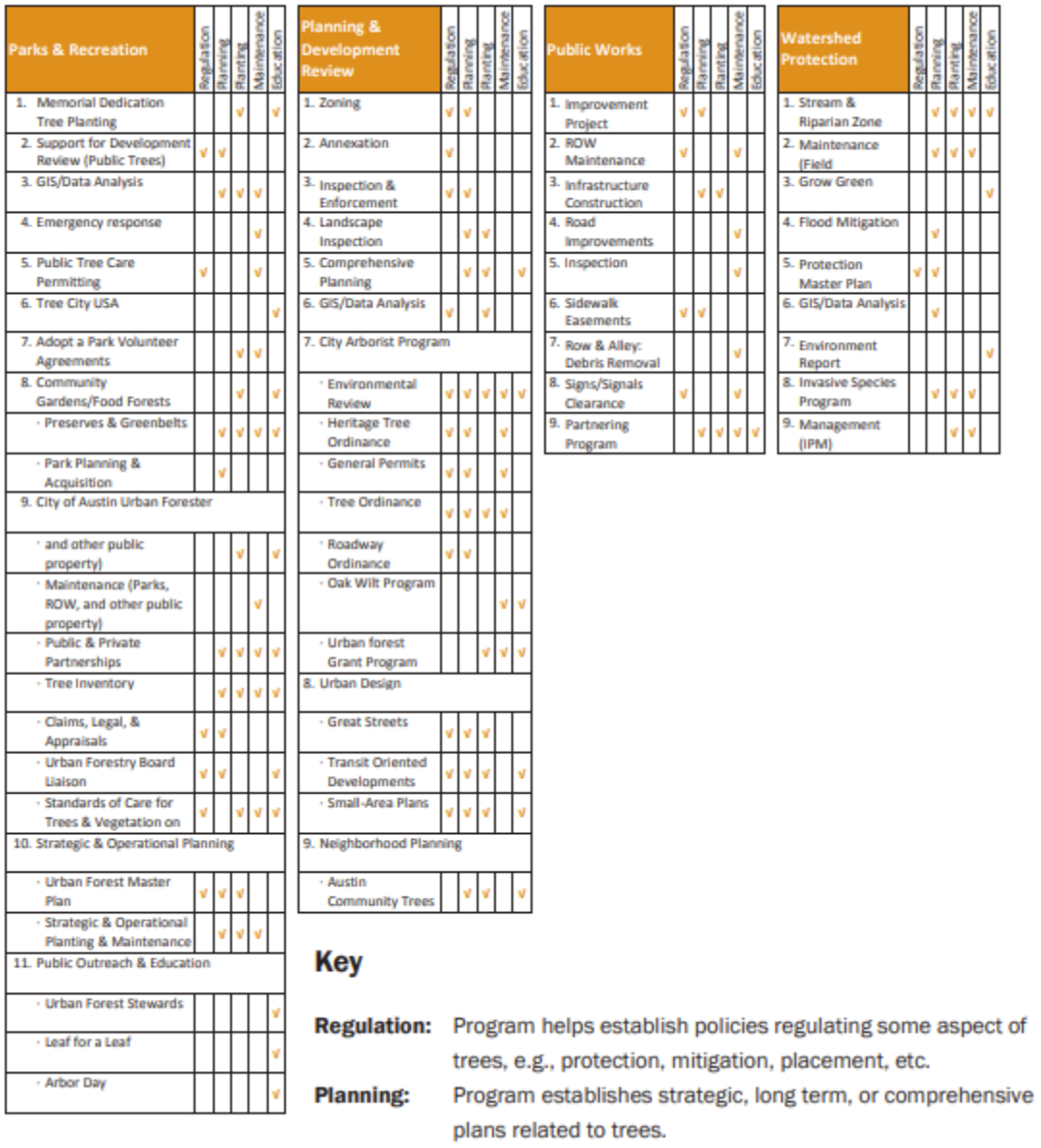
Various goals and strategies include annual evaluation of the urban tree canopy, hiring an urban forester to oversee and coordinate canopy goals, identifying specific roles for different public agencies as they relate to urban forestry management (City of Austin, 2013, Figure 2.13 on page 55, screenshot below), and alignment with nation-wide goals and practices associated with maintenance and funding (City of Austin, 2013, page 66). Categories of urban forestry management practices cover urban tree canopy preservation, sustainability, planting, maintenance, governance, design guidelines, and community engagement (City of Austin, 2013, pages 72-73). Heavy emphasis is placed on long-term maintenance mechanisms that would support the greatest canopy coverage and shade related benefits.

A few policy-based takeaways LA County could integrate in its own UFMP include community input for visioning and goal-setting, interdepartmental collaboration and coordination for execution of the UFMP, and emphasis on long-term maintenance structures that allow for the fullest-benefits of an urban forest. Centering community needs and desires could help alleviate community-engagement related exhaustion, and ensure there is a community-led focus at the forefront of policy implementation. Being specific about strategies geared for public trees in county-owned lands and institutionalizing roles, budgets, etc. by various public agency departments could help streamline the relationship between public parkway trees and public agency responsibility, while clarifying tasks and assigning accountability.

On private properties, Austin identified new development and construction as a facilitator of tree removal and increased impervious surface cover (Lentz, 2021). As a response, Austin, among other municipalities across Texas, began implementing Tree Preservation Ordinances which would protect private trees and prevent tree loss; however, development exemptions may still provide loopholes that pose another barrier to tree preservation (Lavy & Hagelman, 2019). For instance, preservation may only protect certain tree species, be limited to specific tree sizes, or bureaucratic processes may cause delays that "permit removals exceeding denied requests [for tree preservation]" (Ibid). Researchers looking at Tree Preservation Ordinances across Texas

ultimately recommend to utilize these ordinances, but to create and implement them with fewer exemptions that can create gaps in tree protection policies.

Figure 6. Tree-Related Responsibilities by City of Austin Departments (Urban Forest Plan: A Master Plan for Public Property, 2013. Pages 53-54)



Parks & Recreation	Regulation	Planning	Planting	Maintenance	Education
1. Memorial Dedication Tree Planting			√		√
2. Support for Development Review (Public Trees)	√	√			
3. GIS/Data Analysis		√	√	√	
4. Emergency response				√	
5. Public Tree Care Permitting	√			√	
6. Tree City USA					√
7. Adopt a Park Volunteer Agreements			√	√	
8. Community Gardens/Food Forests			√		√
· Preserves & Greenbelts		√	√	√	√
· Park Planning & Acquisition		√			
9. City of Austin Urban Forester					
· and other public property)			√		√
· Maintenance (Parks, ROW, and other public property)				√	
· Public & Private Partnerships		√	√	√	√
· Tree Inventory		√	√	√	√
· Claims, Legal, & Appraisals	√	√			
· Urban Forestry Board Liaison	√	√			√
· Standards of Care for Trees & Vegetation on	√		√	√	√
10. Strategic & Operational Planning					
· Urban Forest Master Plan	√	√	√		
· Strategic & Operational Planting & Maintenance		√	√	√	
11. Public Outreach & Education					
· Urban Forest Stewards					√
· Leaf for a Leaf					√
· Arbor Day					√

Planning & Development Review	Regulation	Planning	Planting	Maintenance	Education
1. Zoning	√	√			
2. Annexation	√				
3. Inspection & Enforcement	√	√			
4. Landscape Inspection		√	√		
5. Comprehensive Planning		√	√		√
6. GIS/Data Analysis	√		√		
7. City Arborist Program					
· Environmental Review	√	√	√	√	√
· Heritage Tree Ordinance	√	√		√	
· General Permits	√	√		√	
· Tree Ordinance	√	√	√	√	
· Roadway Ordinance	√	√			
· Oak Wilt Program				√	√
· Urban forest Grant Program			√	√	√
8. Urban Design					
· Great Streets	√	√	√		
· Transit Oriented Developments	√	√	√		√
· Small-Area Plans	√	√	√		√
9. Neighborhood Planning					
· Austin Community Trees		√	√		√

Public Works	Regulation	Planning	Planting	Maintenance	Education
1. Improvement Project	√	√			
2. ROW Maintenance	√			√	
3. Infrastructure Construction		√	√		
4. Road Improvements				√	
5. Inspection				√	
6. Sidewalk Easements	√	√			
7. Row & Alley: Debris Removal				√	
8. Signs/Signals Clearance	√			√	
9. Partnering Program		√	√	√	√

Watershed Protection	Regulation	Planning	Planting	Maintenance	Education
1. Stream & Riparian Zone		√	√	√	√
2. Maintenance (Field		√	√	√	
3. Grow Green					√
4. Flood Mitigation		√			
5. Protection Master Plan	√	√			
6. GIS/Data Analysis		√			
7. Environment Report					√
8. Invasive Species Program		√	√	√	
9. Management (IPM)			√	√	

Key

Regulation: Program helps establish policies regulating some aspect of trees, e.g., protection, mitigation, placement, etc.

Planning: Program establishes strategic, long term, or comprehensive plans related to trees.

Boston, Massachusetts

The City of Boston, Massachusetts established their latest Urban Forest Plan in 2022 (City of Boston, 2022). This UFMP centered equity, sustainability, and environmental justice to simultaneously increase coverage for historically-harmed, under-canopied neighborhoods and maintain existing coverage to promote a contiguous, regional

urban canopy (City of Boston, 2022). In terms of governance and funding, the 2023 city budget incorporated "11 additional staff positions for the Tree Division," dedicated funding for pilot programs that allow for residential tree plantings, and allocated "$2.5 million from the American Recovery Protection Act…to employ additional [maintenance] tree crews in the field" (City of Boston, 2022, page 12). This is especially significant given previous Boston initiatives found that planting alone is insufficient in establishing a robust urban tree canopy, and resources and staffing specifically targeting maintenance are also needed to ensure tree survival beyond the early planting years and protection against future tree mortality (Smith et. al, 2019).

The City also collaborated with a community nonprofit to create PowerCorpsBOS, a "workforce development program for youth aged 18 to 30 years old [to] help provide pathways for more diverse candidates to enter the urban forestry field," helping ensure that the urban forest would be supported through representative, generational care (City of Boston, 2022, page 13). Similar to Austin, Boston's UFMP highlighted the importance of preservation, outlining actions such as proactive maintenance over on-demand maintenance, formal establishment specifications for newly planted trees, emergency plans related to storms or pests, data management systems that can support routine tracking and evaluation, and creating municipal codes and ordinances that support shade tree preservation (City of Boston, 2022, pages 60-78). For new plantings, Boston also incorporated design-based strategies that emphasize prioritization of tree planting along right-of-way areas, and include recommendations for corridors, medians, and sidewalks that acknowledge parking and existing co-infrastructure needs (City of Boston, 2022, pages 100-121, diagrams below).

Figure 7. Look for opportunities for trees in road network changes and traffic calming efforts (City of Boston Urban Forest Plan, 2022. Pages 101 - 102)

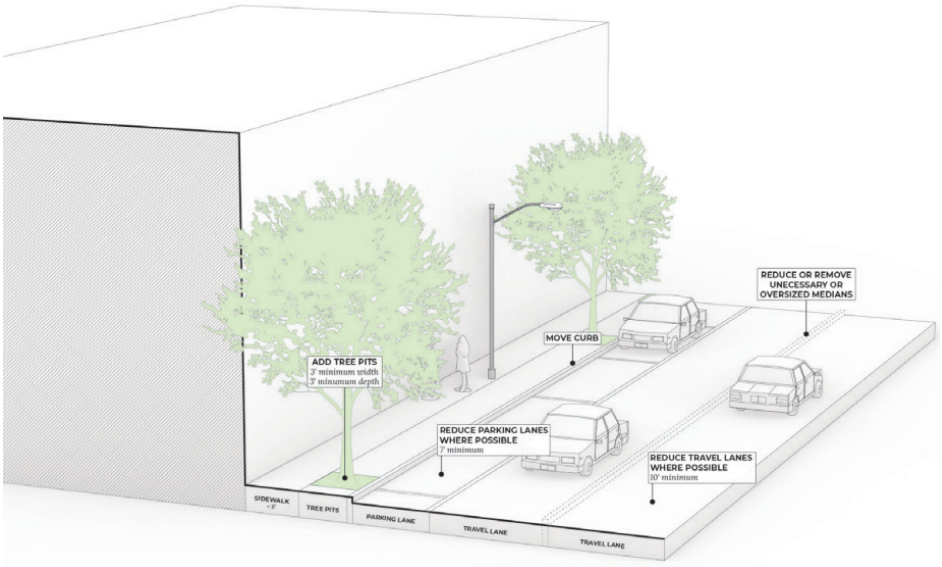


Figure 8. Identify streets with areas that can be transformed into bump-outs or other planting sites (City of Boston Urban Forest Plan, 2022. Pages 103 - 104)

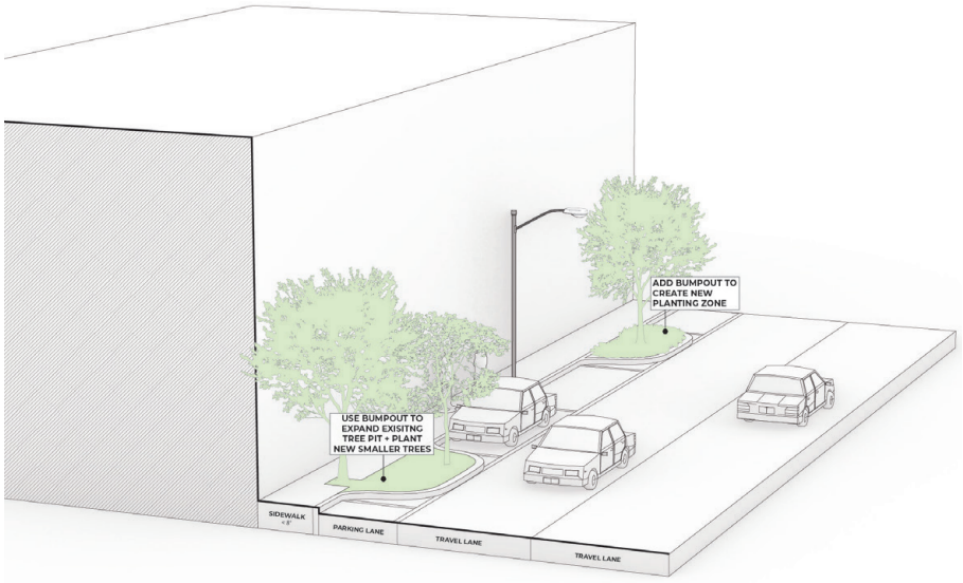
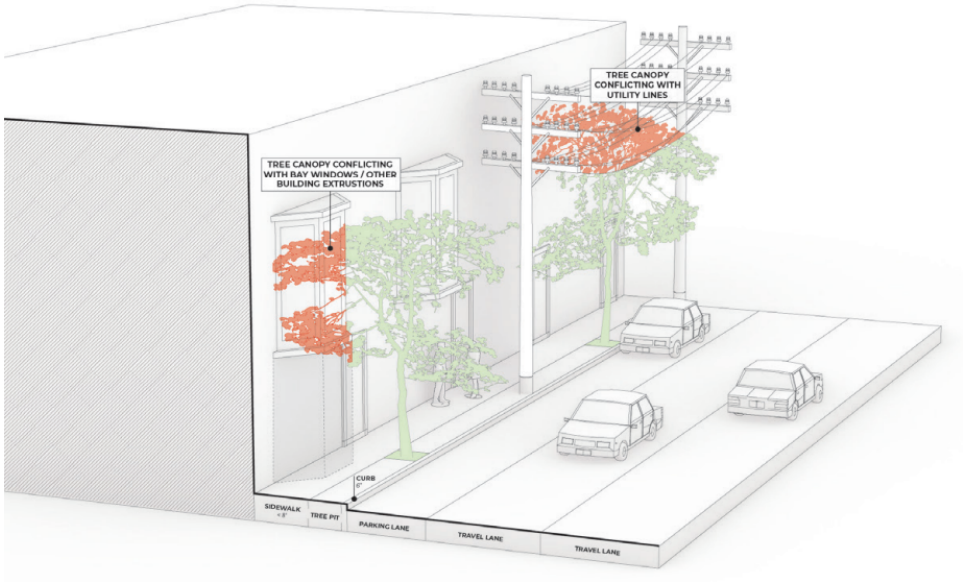


Figure 9. Minimize above-grade conflict (City of Boston Urban Forest Plan, 2022. Pages 109 - 110)



Boston's UFMP provides a robust, multi-pronged approach to their urban forest. A few takeaways that LA County could incorporate include using equity-first framing throughout vision setting, meaningful goal co-creation with community members (and specifically those living in the most under-canopied neighborhoods), funding a more robust and diverse urban forestry workforce and workforce development pipeline, and leveraging design guidelines that include street trees as part of the urban ecosystem and infrastructure, without infringing upon the spatial needs of the existing

infrastructure. Boston's UFMP design standards are also supplemented by their Transportation Department Street Tree Guidelines, wherein parkway street trees are planned to be part of the sidewalk and right-of-way, given substantial root space with soils engineered to adjust to rooting needs, strategically distanced to provide continuous, aerial coverage, with an intention to include a variety of tree species that promote biodiversity and accommodate microclimates (Boston Transportation Department, 2013, pages 1-15, diagrams below).

Figure 10. Root Environment for Street Trees (Boston Department of Transportation Street Trees, 2013. Page 8)

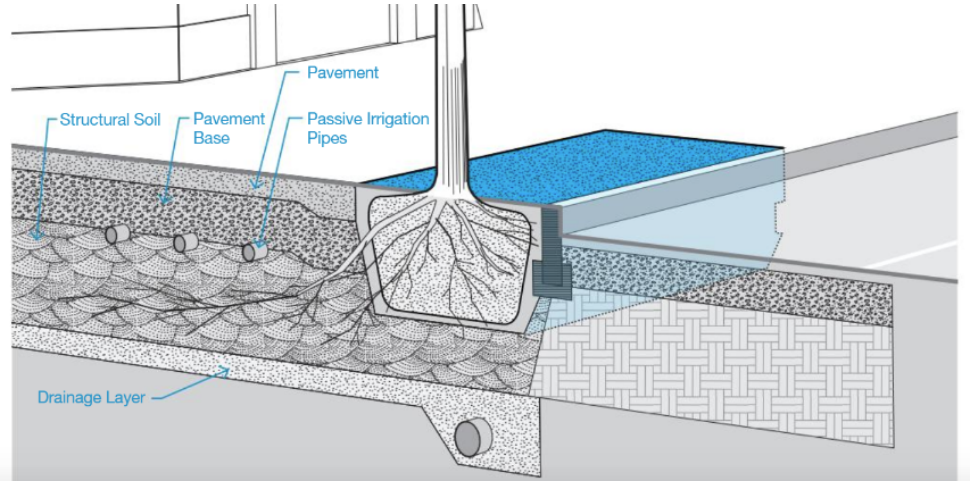
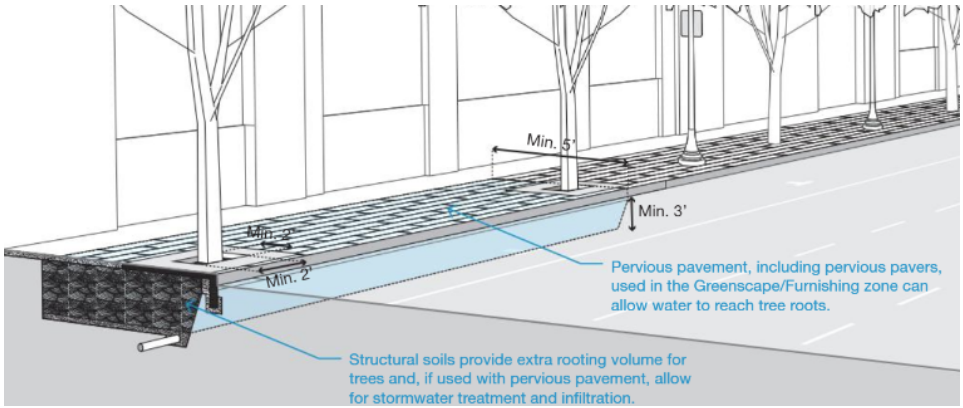


Figure 11. Tree Trenches and Soils (Boston Department of Transportation Street Trees, 2013. Pages 10 -11)



Chicago, Illinois

The City of Chicago, Illinois was one of the first to establish a legal, municipal code to protect and preserve their public trees. The Chicago Landscape Ordinances of 1991 (City of Chicago, 2023) and the 1999 amendment (Institute for Local Self-Reliance,

2023) helped establish more than 112,000 new trees since 2007 by incorporating standards for shade tree plantings in new construction and development as well as sidewalks and streetscapes (City of Chicago, 2009). Since then, the urban tree canopy in Chicago has also been integrated into the Chicago Department of Transportation's Sustainable Urban Infrastructure Policies and Guidelines, Volume 1, building in opportunities for shade and green infrastructure into the existing urban form (Chicago Department of Transportation, 2013). Similar to Boston's design guidelines, Chicago also looks at using permeable ground materials that can help store and filter water for tree roots and bump outs that can increase the surface area for planting space.

Chicago is one example of leveraging landscape ordinances and municipal codes to promote its urban tree canopy by creating conditions for new tree plants in private and public developments. While new project development and building requirements include tree plantings, there may also be potential for increasing protection and preservation of existing large shade trees during times of construction and development in the upcoming UFMP. Simultaneously, the Chicago Region Trees Initiative created a template to show what types of policies can be implemented based on the property type (e.g. private v. public), and a similar assessment tool could be applied for properties across LA (Chicago Region Trees Initiative, 2023).

One major challenge Chicago faces in maintaining an urban tree canopy is the loss of trees attributable to invasive pests, tree diseases, intense storms, and ongoing development (Natural Awakenings Chicago, 2021). To create more tailored strategies that address multiple hazards to the urban tree canopy, a heavy emphasis on urban forestry data that tracks patterns in elements like specific threats, biodiverse ecosystems, and the counts of new plants, replacements, and removals, is being advanced to increase capacity for monitoring, evaluating, and planning for the urban tree canopy (Scott et al, 2020).

Denver, Colorado

The City of Denver, Colorado is currently pursuing an Urban Forest Strategic Plan under the shared guidance of its Department of Parks and Recreation and Office of the City Forester, and is in the early stages of collecting community feedback through an online survey (City and County of Denver, 2023). Simultaneously, the Downtown Denver Partnership has also adopted an Urban Forest Initiative, which is a city-funded project to establish urban tree infrastructure in its downtown core (Downtown Denver Partnership, 2019). This initiative has identified commercial properties that have the capacity to expand the downtown urban tree canopy by retrofitting and adapting existing vacant space that can be used for planting (Downtown Denver Partnership, 2019). Simultaneously, the Downtown Business Improvement District has become the lead coordinator for maintenance services through a Tree Health Program that provides ongoing tree care for commercial property owners within the Business Improvement District (Downtown Denver Partnership, 2019). Together, these strategies emphasize the ability of dense commercial districts to advance the urban tree canopy.

Something Denver has to keep in mind with the implementation of these plans and strategies is its previous experience with the Emerald Ash Borer – a type of beetle originally native to Asia that has caused a variety of destruction to ash trees in the US and is an ongoing invasive pest to its urban forestry plans (Alexander et. al, 2019 and United States Department of Agriculture, n.d.). Over the decades that Denver has been dealing with this challenge, researchers have found that interagency collaboration is key to quantify, assess, and manage the invasive species (Alexander et. al, 2019). The "transfer of technical information, shared observations, cross-boundary stewardship, and peer relationship development" was found to be successful in creating comprehensive databases and interdisciplinary workgroups with diverse expertise that helped increase community awareness and understanding of the issue, while creating more resilient environments that can leverage biodiversity and tree species-selection to combat the effects of the Emerald Ash Borer (Ibid).

Based on this information, one takeaway from Denver that could be adopted by LA County, is in identifying commercial corridors within each jurisdiction, including unincorporated communities, where commercial property owners can be incentivized to contribute towards a continuous canopy in the urban core, where there will likely be higher pedestrian density and use. Allocating funds to support business owners in planting and maintaining parkway trees could be used as one strategy to advance shade access in high-traffic areas. Another takeaway could be found in institutionalizing and funding for interdisciplinary work groups and goals that can tackle invasive species from a community, ecological, biological, and planning points of view.

New York City, New York

In New York City, New York, a number of organizations collaborated to create the Urban Forest Agenda: Toward a Healthy, Resilient, Equitable, and Just New York City in 2021 as a way to outline concrete recommendations that would grow and maintain the urban tree canopy and enhance resiliency among the most heat- and climate-vulnerable neighborhoods (NYC Urban Forest Task Force, 2021). New York City holistically defines the urban forest to encompass not only trees, but surrounding "biodiversity, soil, roots, understory, [community] stewards, policy, funding, and investment," creating a comprehensive understanding of the urban forest to include a multitude of diverse ecologies and actors (Ibid, page 19). This definition was then further tailored by community district and borough, so that all urban forestry goals would "reflect local geography, need for vegetative cover, development styles, community needs, and the degree to which large trees can be planted and survive," allowing for hyperlocal applications of urban forestry goals that match neighborhood values (Ibid, page 48).

Similar to Boston, New York City also established initiatives supporting urban forestry related job opportunities and training, and couples this with stewardship programs that allow for meaningful community engagement and leadership in growing and maintaining the urban tree canopy (NYC Urban Forest Task Force, 2021). To utilize the whole life cycle of a tree, New York City also created recommendations related to wood waste programs that could help "develop a wood reuse policy and establish necessary infrastructure to transform waste into a sustainable local resource" (Ibid, page 75).

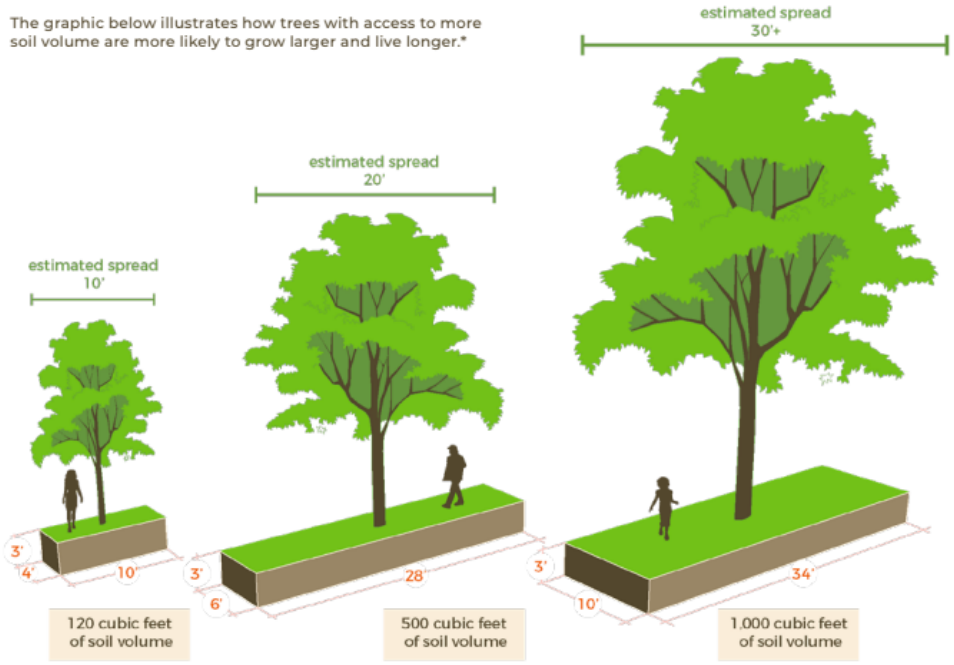
While New York City's UFMP goals are ambitious, equity-focused, forward-thinking, and could be informative during the crafting of LA County's UFMP, quantitative data from New York also reveals that goals related to new tree plantings have not been met under their recent mayoral term, and that plantings have since decreased, while maintenance has fallen behind due to lack of staffing and resources or major storms that have damaged existing trees (Offenhartz, 2023). While the Urban Forest Agenda itself provides a model for how LA County could define, expand, and scale its urban forest and workforce, the recent data is also a reminder that without robust and sustained funding, political willpower, dedicated, well-trained, and well-compensated staff, as well as emergency measures in place, idealized goals may not be fully realized.

Philadelphia, Pennsylvania

In 2023, the City of Philadelphia, Pennsylvania released the Philly Tree Plan: Growing Our Urban Forest to acknowledge the shrinking and inequitable distribution of its urban forest (City of Philadelphia, 2023). This ten-year plan centers environmental justice, community leadership, and long-term sustainability, and aims to expand the urban forest to mitigate against extreme heat, climate change, and air pollution while promoting health and wellbeing, specifically for the most climate-vulnerable and historically-redlined communities (Ibid). This plan is also directly responsive to a robust community outreach and engagement initiative, incorporating feedback from more than 9,000 residents into its vision, goals, strategies, and recommendations (Ibid, page 10). One desire that received specific attention was that "maintenance [was needed] before planting to restore trust" from the community; where forestry efforts often stop at planting, ongoing watering, pruning, and maintenance resources are needed to ensure long-term benefits are fully realized (Brown, 2023). The Philly Tree Plan also mapped neighborhoods by highest-need priority areas according to "health risk, heat vulnerability, and rate of poverty," to spatially recognize where greatest investment needs to take place (City of Philadelphia, 2023, page 19).

In terms of design guidelines, the Philly Tree Plan also takes into consideration existing utility systems and infrastructure needs, recommending the hiring of a specific Utility Tree Coordinator – a staff member to help mediate and balance needs relating to infrastructure and tree growth; some outlined responsibilities include addressing pruning needs and monitoring root systems that could negatively impact underground systems. Another recommendation calls for the burying of some power lines that could create space for taller trees to be planted, ultimately creating larger aerial coverage and more shade (City of Philadelphia, 2023, page 22). Another recommendation is to ensure adequate soil volume at the onset of planting to accommodate healthy growth and proactively address potential spatial conflicts (Ibid, page 35, including diagram below). Throughout the plan, there is ongoing emphasis for diverse and long-term funding mechanisms, sufficient staffing, protective policies that uphold tree preservation, redistribution of tree planting efforts to support under-canopied neighborhoods, and reducing maintenance-related burdens for residents.

Figure 12. Develop Tree Planting Design Standards (City of Philadelphia Tree Plan, 2023. Page 35)



While this plan's implementation is in its early stages, its process could be informative for LA County. Guaranteeing that highest-needs areas are prioritized for funding and staffing and focusing on community voices with an emphasis on residents from the highest-needs areas can be one way to promote procedural justice in advancing shade equity. For Philadelphia, this was reflected through "32 community meetings and a survey that garnered more than 7,000 responses in eight languages" (Schmidt, 2023).

Portland, Oregon

The City of Portland, Oregon first established a UFMP in 2004, with subsequent UFMP Action Plan reporting beginning in 2007 (Portland Parks and Recreation, 2018). Then in 2018, a report titled Growing a More Equitable Urban Forest: Portland's Citywide Tree Planting Strategy was published (Portland Parks and Recreation, 2018), followed by the 2021 Urban Forest Action Plan Implementation Update (Portland Parks and Recreation, 2022) and Tree Canopy Protocol and Monitoring (Portland Parks and Recreation, 2022) reports, both published in 2022. Together, these documents evaluate the ongoing efforts surrounding Portland's urban tree canopy, which like LA County, is inequitably distributed, particularly along lines of income.

In the 2018 report, Portland officials identified priority planting areas that had both lower-income residents and under-canopied spaces, and sought to better engage with the community through culture-specific focus groups (Portland Parks and Recreation,

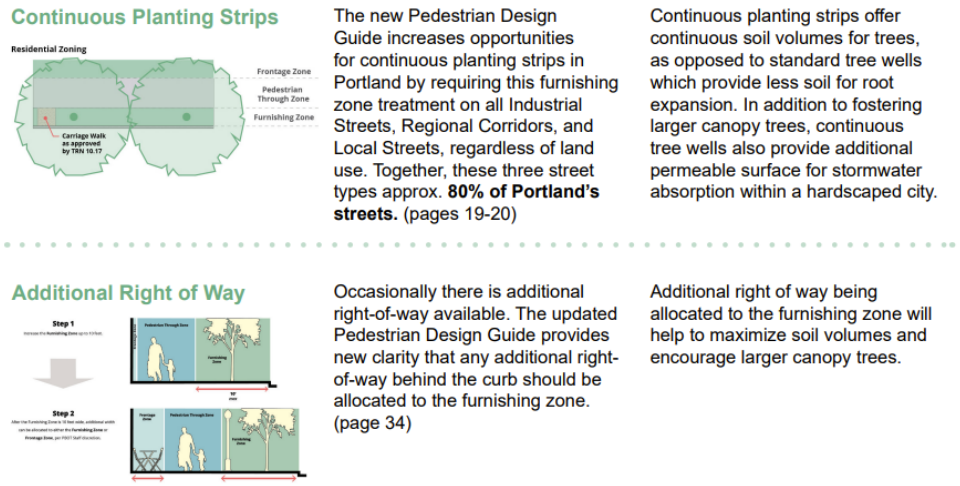
2018). Key findings included differentiating desires based on community identified needs, distinguishing needs and messaging for renters versus property owners (as there are differing maintenance tasks and financial burdens for urban trees based on renting or owning), and providing opportunities for greater involvement without having to take on undue burdens of maintenance, especially for lower-income residents of color (Ibid).

Additionally, an online public tool was created to show where in Portland canopy, heat, air pollution, and vulnerability are distributed, and mapping and clarifying inequities and opportunities (Portland State University, 2017) . City-sponsored planting and funding programs have specific goals surrounding the highest-needs areas by lowering or eliminating associated costs to residents in priority areas, partnering with schools to increase canopy coverage, and contracting with community-based organizations to support long-term tree care and forestry workforce development, among other strategies (Portland Parks and Recreation, 2018 & Portland Parks and Recreation, 2022).

The 2021 Implementation Update shows that 125 new park trees were planted between 2020-21 as replacements for removed trees, and that 6,000 new trees were planted across natural land areas (Portland Parks and Recreation, 2022). An additional 1,188 street trees and 986 yard trees were planted as well (Ibid). Portland also began offering a Treebate credit program, which "offers an incentive in the form of a utility bill credit for stormwater fee ratepayers in Portland who plant trees on their residential private property" (City of Portland, 2023). Free trees are continuously offered for low-income, under-canopied neighborhoods, with 1,222 trees distributed in 2020-21 (Portland Parks and Recreation, 2022 & City of Portland, 2023). A Youth Conservation Crew was also established to support forestry experience and workforce development among younger Portland participants (Portland Parks and Recreation, 2018 & Portland Parks and Recreation, 2022). While there were great advances in planting new trees, the 2022 Tree Canopy Monitoring Report reveals there were still tree canopy losses across all land use types with the most occurring along residentially-zoned lands, though none of the canopy losses across all zoning types were considered to be statistically significant (Portland Parks and Recreation, 2022). Upcoming reports will evaluate whether this is a sustained trend, and identify underlying causes for canopy loss.

With regard to street tree design, the Portland Pedestrian Design Guide recommends planting in curb zones that impact parking over pedestrian-based use to maintain sidewalk width, increasing standard tree well dimensions to increase soil volume as a way to avoid concrete buckling, and creating planting strips that allow for contiguous canopy (City of Portland, 2022, see diagrams below).

Figure 13. City of Portland Pedestrian Design Guide and Street Trees, 2022



From Portland's experience, LA County could also look into similar planting efforts that reduce the burdens and costs, specifically for residents who may have higher needs but potentially lesser financial capacity for maintenance. Introducing a rebate or crediting method that incentivizes and subsidizes the cost of maintenance could help ease associated financial burdens, and shift the burden of watering, pruning, etc. from residents to public agencies and organizational partners. Simultaneously, planting efforts should directly address removal and replacement to prevent canopy loss.

San Francisco, California

In 2014, the City of San Francisco, California established the Urban Forest Plan for their street tree network, with additional recommendations for open park spaces and private properties (San Francisco Planning Department, 2014). This plan was informed by a series of community engagement events and was in partnership with a consultant who analyzed what a 100% City-maintained tree canopy would cost as a way to completely shift responsibility from the resident to the City (Ibid). Additional policies that support an urban tree canopy in San Francisco include an urban forestry ordinance, a streets plan that offers guidelines for streetscape siting, planning codes for planting, maintenance, and removal, and a dispute resolution ordinance for private property conflicts, among others (Ibid, page 72-75).

Since this first plan was adopted and started implementation, Proposition E was passed by 79% of voters in 2016 to "shift maintenance responsibility of street trees and root-damaged sidewalks from property owners to the City, [and] provide funding for trees on public schoolyards" (San Francisco Planning Department, 2016). The consultant report on street tree financing also found that "a comprehensive municipal program would provide net benefits to residents…and the added benefit of growing the urban forest by 50% over 20 years, while the status quo is expected to result in a continuing decline" (AECOM, 2013, page 3). The report also recommended planting 2,900 new trees on top of replacing removed trees, financing from state grants and capital

improvement funds, and utilizing a parcel tax based on frontage size to resource maintenance, as example strategies to increase the urban tree canopy (AECOM, 2013).

With regard to design recommendations, the San Francisco Better Streets, Better Trees guidelines highlight continuous strips rather than individual basins for planting, moving infrastructure furniture when possible and if not possible, planting a tree a few feet away, ensuring a contiguous canopy by reducing the space between trees whenever possible, while accommodating for sightlines, lighting, and utilities, utilizing permeable surface materials to increase access to water and oxygen, and reducing the use of "tree grates and other structural basins" that can impact both mobility needs and tree growth (SF Better STreets, 2015). The San Francisco Ordinance 165-169 also recommends tree planting standards for parking-designated areas (SF Public Works, 2020). Additionally, because of San Francisco's unique microclimates, design guidelines need to consider specific species that can best acclimate and thrive in certain temperatures, humidities, and climate conditions at a hyper-local level (Martin et. al, 2016).

Seattle, Washington

In 2020, the City of Seattle, Washington began updating their UFMP since its first plan was created in 2007 (City of Seattle, 2020). This UFMP emphasizes high-priority areas that are lower-income and racially and culturally diverse to directly respond to cumulative environmental injustices as well as racist land use and housing policies (Ibid). The draft UFMP interacts with the City's comprehensive plan, race and social justice initiative, equity and environment initiative, among other plans and strategies as a way to holistically advance equity for those historically and presently most impacted (Ibid).

This draft UFMP also highlights existing programs that advance the urban tree canopy, such as Trees for Seattle which "engages residents in urban forest stewardship," and has since "planted 1,000 trees each year on private properties," the Green Seattle Partnership program that addresses "invasive shrubs and groundcovers that smother existing trees and prevent replacement trees from growing," and the Heritage Tree Program that advances tree preservation (City of Seattle, 2020, pages 18, 23-24).

Though these policies and programs are in the works, a 2021 Canopy Cover Study found that the city "lost 255 acres of tree canopy," representing a "1.7% relative decline and 0.5% absolute decrease" from total canopy coverage at 28.6% in 2016 to 28.1% in 2021 (City of Seattle, 2021, page 8). Most of the tree loss was associated with park space and residential areas, either due to development or other reasons (City of Seattle, 2021). Subsequent recommendations call for increased funding for maintenance, planting in public right-of-ways, using new engineered and design-based solutions for managing spatial needs, and ensuring that new housing and building development practices coincide with increased tree regulation that preserve and accommodate trees (i.e. "require mitigation when trees do need to be removed and establish a payment option for when tree replacement cannot be done on site") (City of Seattle, 2021, pages 39-42). Together the recommendations provided in the 2020 UFMP draft and 2021 canopy coverage study aim to address issues of planting distribution, canopy preservation, and remediation of canopy loss.

In terms of design, the Seattle Street Trees Design Standards vary and adjust tree species siting according to right-of-way width and utility location, corridor needs, community desires, and compatibility with existing infrastructure (Seattle Rights-of-Way Improvements Manual, 2017). Transportation and mobility needs are also accommodated for using soil volume (i.e. "1,200 cubic feet of soil volume per tree planted"), at-grade, below-grade, and above-grade clearances (i.e. "5 feet standard clearance for service connections''), and tree pits that can maintain sidewalk width for pedestrian safety (Ibid). Seattle also discourages the use of tree grates, which can impact accessibility-based needs, advocates for planting strips that provide continuous shade and buffers pedestrians on the sidewalk from street traffic, and permeable surfaces that allow for water and oxygen access (Ibid). Seattle has a series of robust programs, policy recommendations, and design guidelines that promote a long-term canopy; however, their statistics on tree loss are a reminder that any implemented practices need to also consider underlying causes of removal and loss which can vary by place and community, while proactively addressing protection and preservation.

Washington D.C.

Washington D.C. (DC) has a series of programs and policies in place to support its urban tree canopy. In 2013, a Urban Tree Canopy Plan was drafted to support the overarching goal of increasing canopy coverage "from 35 to 40% by 2032," while considering existing and potential programs and governing structures at the district and federal level (Government of the District of Columbia, 2013, page 4). This report also indicates that despite the perception that trees and pavement are incompatible, "trees have been shown to extend the life of roadways …[by keeping the] asphalt cooler, reducing the frequency with which streets need to be resurfaced" (Ibid, page 10). In terms of design, DC's plan also recommends increasing soil volume space and reducing impervious surfaces (e.g. concrete cutouts) that can conflict with tree roots and stormwater runoff, while leveraging medians for continuous canopy coverage (Ibid, pages 16-17). DC also has a rebate program, called Casey Trees Tree Rebate Program which "offers homeowners up to $100 for each tree they purchase and plant" (Ibid, page 17). If applying this to LA County, it will be important to ensure that not only the homeowners but renters can access this subsidy to support maintenance efforts.

The plan also outlines two existing tree-related regulations, the Tree and Slope Overlay Zoning Code and the Urban Forest Preservation Act (Government of the District of Columbia, 2013). Where the overlay "restricts the number and size of trees that can be removed on any given property," the preservation act "does not restrict tree removal, but requires payment of a fee when a healthy tree greater than 55 inches in circumference is removed" (Ibid, page 22). However, like other cities, DC has also found that since 2013, there has been a small net loss of tree coverage of 1%, likely attributed to vacant spaces, parks, and residential areas while right-of-way trees have seen "sustained growth" (DDOT Urban Forestry, 2022). Understanding the mechanisms that drive loss based on land use would be significant in addressing how to best replace, plant, and maintain trees in the long-term.

Los Angeles City, California

In 2018, the City issued Developing an Urban Forest Management Plan for the City of Los Angeles (Dudek, 2018). This UFMP process is similarly responsive to the California Department of Forestry and Fire Protection funding, and is in the beginning stages of identifying the needs of the urban tree canopy to inform upcoming recommendations (Ibid). This document identified that nearly 90% of LA City's urban forest is attributed to private property (Ibid, page 10), right-of-ways and medians are spatial opportunities for public tree plantings (Ibid, page 11). Despite the multiple benefits of the urban tree canopy, there is little indication that it is valued as represented in LA City's budget, staffing, shared knowledge, and research tools (Ibid, page 15).

Recommendations include calling on City officials to prioritize the urban tree canopy in its policies and budgets, hiring staff dedicated to urban forestry, increasing funding for maintenance, developing a tree inventory and corresponding software to maintain the database, and continuing to build ongoing relationships with highest-priority communities (Dudek, 2018). Additionally, the roadmap highlights the relationship between street trees and sidewalks, with quantitative data estimating that "7,000 to 10,000 trees will need to be removed throughout the sidewalk repair program," but that the true extent of concrete removals is to be determined until an Environmental Impact Report is complete (Ibid, page 46).

The LA Urban Forest Equity Collective (UFEC) also released two significant recent reports: the LA Urban Forest Equity Assessment Report (CAPA Strategies, 2021) and the LA Urban Forest Equity Streets Guidebook (CAPA Strategies, 2021), both published in 2021. The Equity Assessment Report highlights the unequal distribution of tree planting and canopy coverage as a consequence of historic redlining, power and decision making imbalance (CAPA Strategies, 2021). Through a series of interviews with residents, it found that key needs included long-term funding for a sustainable canopy and not just for planting new trees, coordination among the multiple municipal bodies that operate across LA (including LA County and unincorporated areas), balancing what is realistically feasible and scalable across the LA region broadly, and "reclaiming the public right-of-way as an issue of equity…in supporting the expansion of tree canopy," especially for historically disinvested neighborhoods (Ibid, page 37).

The Streets Guidebook provides a tiered system to spatially assess tree planting feasibility. In the figure below, three tiers correspond to the level of ease or difficulty in planting and maintaining urban trees (CAPA Strategies, 2021, page 8) with a series of case studies outlining how these might be applied across South LA (Ibid, page 17), the San Fernando Valley (page 28), and South and Southeast LA (Ibid, page 37). LA County could consider this same model in analyzing spaces across unincorporated areas to best apply the "right tree, right place" approach. LA City's recommendations should be considered by LA County, and it could even be recommended that both interact to create a robust urban tree canopy system across the LA region.

Figure 14. Tiered System (LA Urban Forest Equity Streets Guidebook, 2021. Page 8)

Tier 1 - Available

No site modification is needed. Tree canopy goals can be achieved by planting vacant existing vacant locations.

Tier 2 - Moderate

Minimal site modifications needed. Tree canopy goals can be achieved with additional financial resources and possible site modifications within current City and County standards.

Tier 3 - Hard

Drastic site modifications needed. Significant tree canopy increase cannot be achieved with exisiting infrastructure and policy modifications are needed to reach canopy equity and public health targets.

Table 5. Comparative Cities Case Studies' Most Common Urban Forestry Practices

Category	Description	Examples
Design	Assessing, utilizing, and expanding upon the built environment to integrate the urban tree canopy as part of the city's infrastructure.	• Increasing soil volume and tree well planting space for root growth • Burying utility lines to prevent overhead conflict with power lines • Optimizing planting in under-utilized parking spaces with bulb outs • Maintaining ADA-accessibility by avoiding impervious tree grates
Programs	Partnering and collaborating with community members and organizations to build capacity, increase co-stewardship, and manage the urban tree canopy.	• Developing youth internships and pipelines to diversify and prepare the upcoming arborist workforce • Partnering with local nonprofits to host community planting days, tree walks, etc. • Understanding resident needs and desires to create responsive informational materials
Policy	Establishing funds, ordinances, and codes that help sustain and scale the urban tree canopy at a regional level.	• Leveraging preservation ordinances to protect larger shade trees against removal during development and construction • Institutionalizing annual budgets for tree inventory data, staffing, watering, etc. • Coordinating across public agency departments to holistically manage the urban tree canopy

Preliminary Recommendations for Unincorporated South LA Communities

Based on a review of the existing literature, initial data analysis, and scan of comparative cities' practices and policies, the following preliminary recommendations were drafted. Each recommendation falls along a specific level of intervention from the Socio-Ecological Model (SEM); individual, interpersonal, institutional, community, societal and/or structural (de Guzman et. al, 2022). The intention is to establish an interacting, contextual, multi-scalar set of recommendations that can be applied to the South LA communities served by Supervisor Holly Mitchell in District 2.

Interventions and Recommendations at the Individual Level

Recommendations at this level will aim to address individual behaviors, knowledge, and feelings of self-efficacy related to understanding the urban tree canopy, its benefits, and how to personally contribute to shared goals involving shade equity.

- Understand what Communities Want - Conduct outreach and build relationships with community members and key stakeholders to understand main priorities and tailor strategies
- Increase Awareness and Interest - Share educational materials with households, schools, etc. senior centers, etc.
- Maintain Access to Free Trees - Retain the DPW Parkway Trees program for residents to use
- Provide Financial Support - Offer subsidy programs and incentives that support tree planting, establishment, and maintenance

Interventions and Recommendations at the Interpersonal Level

Recommendations at this level will aim to address social cohesion, relationship building, capacity building, and acknowledgement of power dynamics related to establishing mutual partnerships that help the urban tree canopy grow.

- Develop Workforce Pipelines - Increase community stewardship of trees by providing workforce development for youth and residents interested in urban forestry, and ensure that work opportunities are fairly compensated
- Identify Local Partners - Build partnerships with local schools, community-based organizations, community centers, churches, etc. to co-create and co-maintain the urban tree canopy. One resource that may be useful to identify potential partners is the ReLeaf Network in California, which acts as "a statewide forum for exchange, education, and mutual support for community-based organizations that share the common goals of planting and protecting trees, fostering environmental stewardship, and promoting volunteer involvement" (California ReLeaf, 2023). Public agencies at LA County may be able to find organizational partners already doing forestry related work in the South LA area by referencing this network.

Interventions and Recommendations at the Institutional Level

Recommendations at this level will aim to address municipal funding structures, governance processes, and shared visioning related to coordinating efforts across public agencies to help maintain the urban tree canopy.

- Establish Accountability and Collaboration - Create roles for multiple departments as well as a community committee that can support cross-departmental and community-based efforts
- Institutionalize Funding - Establish a robust budget per fiscal year that can finance tree planting, establishment, maintenance, and preservation, as well as a forestry workforce
- Evaluate and Monitor - Increase priority for tree inventory data collection, management, and evaluation for the urban tree canopy, offering opportunities for public use and input
- Create Preservation Ordinances - Formalize policies and incentives that protect trees against removal, specifically during times of development and construction

Interventions and Recommendations at the Community Level

Recommendations at this level will aim to address the physical built environment, infrastructure, and local planning decisions related to cultivating public and private spaces that support the urban tree canopy as part of the urban ecosystem and infrastructure.

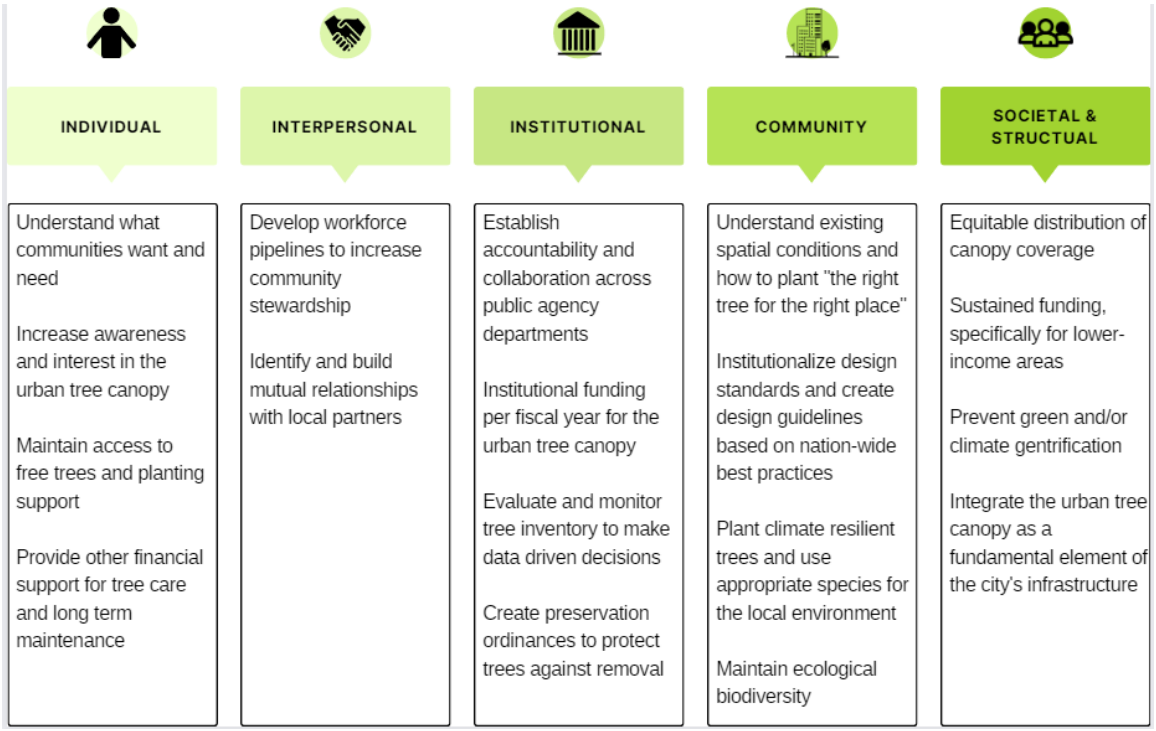
- Understand Existing Spatial Conditions - Leverage the LA City Urban Forest Equity Collective tiered-model for spatial assessment per unincorporated community's built environment
- Institutionalize Design Standards - This may include continuous planting strips, guaranteed minimum requirements for soil volume to avoid compacted root zones and sidewalk buckling, and guaranteed minimum spacing requirements to avoid underground infrastructure damage (Toole Design, n.d.).
- Create Design Guidelines - This may include increased soil volume to accommodate root growth, permeable surfaces without tree grates to maintain mobility and ADA-accessibility, bulb outs for planting where there are fewer conflicts with street parking and cleaning needs, and burying utility lines to avoid above-grade conflicts (Toole Design, n.d.).
- Plant Climate Resilient Tree Species - To build upon the "right tree in the right place" framing, it will be important to choose the correct type of tree species for the Los Angeles urban forest based on its surrounding local environment and spatial requirements, while ensuring that the species itself is drought tolerant and climate resilient to ensure long-term sustainability (TreePeople, 2021).
- Maintain Ecological Biodiversity - This may include planting beneath the trees' understory, avoiding resource-intensive species, and establishing plans for emergency preparedness

Interventions and Recommendations at the Societal and/or Structural Level

Recommendations at this level will aim to address regional policies, urban forestry management, broad climate goals and acknowledgement of historically racist land use practices, related to repairing past harms that created disparities in urban tree canopy coverage and creating equitable, forward-thinking policies that build local and regional resilience.

- (Re)distribute Canopy Coverage - Prioritize planting efforts and funding in under-canopied areas
- Sustain Funding - Allocate long-term funding that supports maintenance and preservation for areas with residents who have lower incomes or are renters.
- Prevent Green Gentrification - Enforce anti-gentrification and anti-displacement measures that protect existing residents when green infrastructure is put in place
- Integrate the Urban Tree Canopy - Pursue holistic built environment practices that maintain healthy, safe, and whole communities that recognize the urban tree canopy as a critical part of the urban ecosystem

Table 6. Preliminary Recommendations using the Socio-Ecological Model



INDIVIDUAL	INTERPERSONAL	INSTITUTIONAL	COMMUNITY	SOCIETAL & STRUCTUAL
Understand what communities want and need Increase awareness and interest in the urban tree canopy Maintain access to free trees and planting support Provide other financial support for tree care and long term maintenance	Develop workforce pipelines to increase community stewardship Identify and build mutual relationships with local partners	Establish accountability and collaboration across public agency departments Institutional funding per fiscal year for the urban tree canopy Evaluate and monitor tree inventory to make data driven decisions Create preservation ordinances to protect trees against removal	Understand existing spatial conditions and how to plant "the right tree for the right place" Institutionalize design standards and create design guidelines based on nation-wide best practices Plant climate resilient trees and use appropriate species for the local environment Maintain ecological biodiversity	Equitable distribution of canopy coverage Sustained funding, specifically for lower-income areas Prevent green and/or climate gentrification Integrate the urban tree canopy as a fundamental element of the city's infrastructure

Limitations and Considerations

At the time of this report, LA City and County were both undergoing their process of planning for and creating the Urban Forestry Management Plan, tentatively set for release in 2024. At the County level, available tree count data was restricted to public parkway trees only, and available canopy data was generalized based on existing and combined City and County regional data. More recent and tailored data (e.g. specific rates of planting, removal, replacement, etc. of both public and private trees as well as aerial canopy for Supervisor District 2) is being compiled, but has yet to be released to the public. Upon publication of this data being gathered by consultants, more accurate data may be available for more targeted decision-making.

This report is also limited by time and capacity restraints preventing robust community engagement. Though this report is built upon a review of existing needs and asset assessments as well as relevant planning documents, coupled with informal conversations to better understand the context of unincorporated communities, time limitations prevented more formal community outreach and engagement to take place. Both the City and the County have contracts for upcoming community engagement efforts, but their timelines fell outside the scope of this project. Any preliminary recommendation presented from this report should be first consulted with and approved by community members.

Conclusion

The urban tree canopy is one of many strategies that can be leveraged in advancing shade equity and mitigating against the urban heat island effect, especially for the most climate-vulnerable communities. In a review of the existing literature, policies, and practices, it is evident that urban canopies can provide a diverse array of benefits, but it will be critical to balance strategies and decisions in the context of expressed community needs and desires, existing infrastructure and spatial capacity, and hyperlocal climates and ecologies. Institutionalizing funds for establishment, maintenance, preservation, and workforce development will also be necessary to ensure that there are structures in place to support the short and long term needs of an urban forest. And finally, framing the urban forest through the lens of distributional and procedural equity, environmental justice, and as an integral component of the urban ecosystem will help ground data-driven decisions moving forward.

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