USC Urban Trees Initiative

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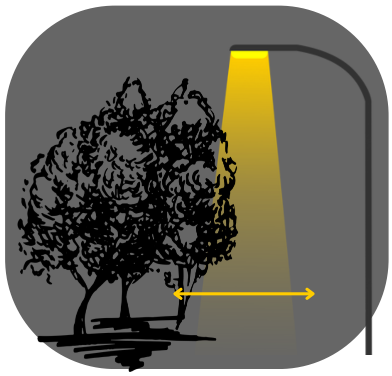
Research Brief: How Street Tree Spacing Guidelines Can Improve Los Angeles Tree Canopy

The Challenge

Trees play a crucial role in making urban life healthier and more sustainable. Shade trees help cool down neighborhoods, reduce air pollution, and manage stormwater, providing essential relief in bustling urban areas. However, space constraints mean that trees often lose out to infrastructure and utilities. Regulations on how close trees can be planted to other infrastructure along streets further limit the opportunities for greening our public spaces (see Aryal et al., 2021; Braverman, 2008; Macdonald et al., 2006). These challenges are particularly tough on low-income neighborhoods, where space is modest and tree coverage is most needed.



The Research

The USC Urban Trees Initiative (USC Trees) partnered with the City of Los Angeles Office of Forest Management to review L.A.'s tree planting guidelines. Led by Laura Messier from USC's Spatial Sciences Institute, the team compared L.A.'s rules for tree spacing in relation to other infrastructure with 17 other cities, including eight in California. They also modeled how changing these guidelines could affect tree distribution in different neighborhoods, highlighting the differences between high- and low-income areas, with a case study in two L.A. neighborhoods.

The Key Findings & Recommendations

Updating L.A. City's street tree spacing guidelines would reduce barriers to planting trees and increase canopy in areas where shade is needed most. Bigger changes, such as adopting wider parkways and curb bulb-outs, are necessary for addressing canopy and shade deficiency. Even small changes, like adjusting the spacing around intersections, utility poles, and driveways, could increase opportunities for planting trees.

A. **L.A.'s street tree spacing guidelines are stricter than those in many other cities, yet there's no clear evidence that these rules lead to better safety, liability, or tree health outcomes.** In fact, a large number of existing street trees — 39 to 47% in the case study neighborhoods — do not currently adhere to the guidelines, suggesting that more flexible standards might not increase risks. Table 1 compares L.A. with California peer cities and Table 2 compares L.A. with U.S. peer cities.

B. **Risk aversion is a major obstacle to revising guidelines.** It is not always clear who is responsible for decisions around standards and, by extension, determining risk tolerance.

C. **Tree spacing guidelines could be adjusted without needing to change municipal codes,** but changing guidelines does require collaboration across city departments. Codes or standards related to each guideline and the department responsible are provided in Table 3.

Element	% Increase
Intersections	7.6
Utility Poles	5.5
Gas lines	2.6
Street Lights	2.2
Driveways	1.4
Alleys, Fire Hydrants, Sewer lines	< 1

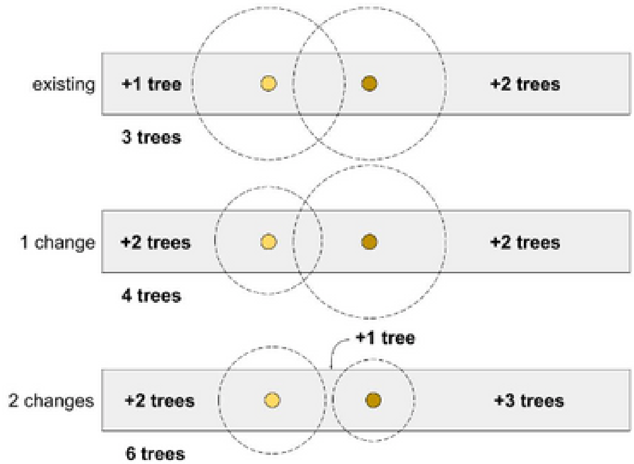


Figure 1: Percent increase in number of trees as a result of each guideline change (20.3% increase total). Multiple guideline changes add to the amount of space that could be made available for trees (25.8% increase when all changes are made).

D. **Changes in only four guidelines could significantly improve the amount of space for trees: intersections, utility poles, street lights, and driveways.** Our case study tested reductions in buffers at intersections from 50 to 15 feet, utility poles from 20 to 5 feet, street lights from 20 to 15 feet, and driveway buffers from 8 to 5 feet in residential areas. Reductions to the extent possible in these and other guidelines can be particularly impactful when made collectively (see Figure 1).

E. **Guidelines that consider additional nuance, as found in other cities, could create additional space for trees.** For example, requirements could vary by tree size, whether located at the approach to or departure from an intersection or alley, or in a residential or commercial area, and could vary by street type (i.e., arterial vs. local) and traffic speed.

F. **Wider parkways are crucial for improving shade equity, providing the space necessary for larger shade trees.** Our research showed that low-income neighborhoods often have less space for large trees compared to high-income neighborhoods. Additionally, wider parkways could help prevent accessibility issues, such as sidewalk damage from tree roots.

G. **Curb bulb-outs at intersections could be a particularly impactful solution.** Curb bulb-outs can address multiple needs simultaneously — space for large trees, traffic calming and pedestrian safety at crossings, and space for street furniture at bus stops (see Figure 2). Los Angeles Municipal Code 62.200 permits high-branching trees within intersection visibility triangles. More frequent pruning at intersection trees could make planting at intersections feasible without changing existing codes.

H. **Like building codes, more comprehensive guidelines for tree spacing could provide consistent application and clear standards for addressing various infrastructure elements.** Currently, each city only covers a few infrastructure elements in its guidelines.

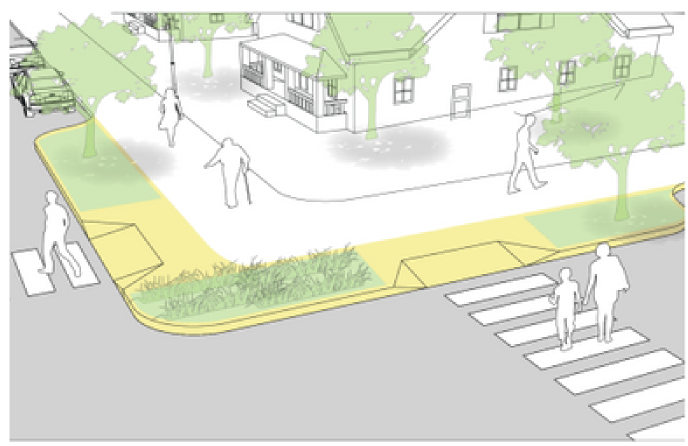


Figure 2: Example curb bulb-outs at intersections from the National Association of City Transportation Officials (NACTO).

I. **Some cities use standard plans or diagrams to clarify their street tree spacing requirements, such as where the distance must be measured at an intersection, alley, or driveway.** The City of Fremont in California incorporates all street tree requirements in a single standard plan, while in Chicago, Illinois, individual diagrams are provided accompanying each spacing guideline (see Figure 3).

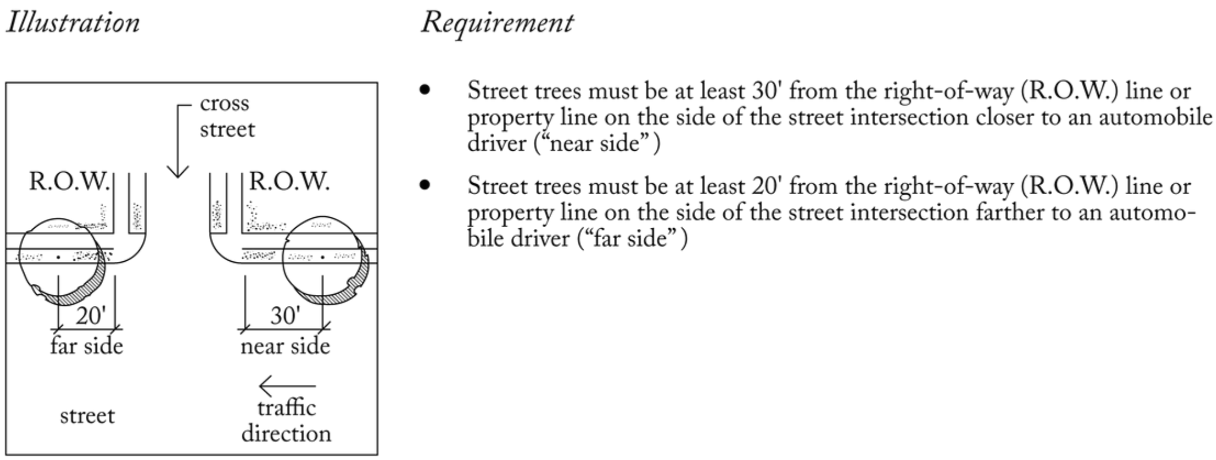


Figure 3: Example Chicago diagram which clarifies street tree spacing requirement at intersections, indicating from where setback distance should be measured and differences for approach vs. departure side of intersection.

J. **The City of L.A. could consider implementing an urban living lab, similar to Copenhagen Solutions Lab in Denmark, where new approaches could be piloted.** Residential neighborhoods that volunteered for Slow Streets during COVID-19 may be open to participation. Upcoming right-of-way projects for the 2028 Olympic Games also offer implementation opportunities. An urban living lab should collect data before and after project implementation. Collected data should include air quality, noise, temperature, pedestrian, cyclist, and automobile counts, traffic speed, and automobile accidents. Qualitative data such as user surveys, data related to stormwater runoff, and maintenance needs/costs could also be considered.

K. **Access to geospatial data from utility companies could facilitate using GIS to identify locations for tree planting and coordination with pedestrian and equity priority areas.** These data are not currently available or available only at a high cost in Los Angeles.

The Output

USC Trees is publishing this research in *Urban Forestry and Urban Greening* and *Landscape and Urban Planning* and collaborating with the City of L.A. to provide a framework for updating spacing guidelines. The emphasis is on guidelines for commonly encountered items in public parkways. The team is also conducting further research to project potential tree canopy changes from new guidelines to prioritize challenges related to shade equity.

For more information, please visit our website [publicexchange.usc.edu/urban-trees-initiative] and/or contact Laura Messier at lmessier@usc.edu.

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References

Aryal, B., Steenberg, J., Duinker, P. (2021). The effects of residential street tree spacing and crown interactions on crown dimensions and canopy cover. Arboriculture and Urban Forestry, 47(5), https://doi.org/10.48044/jauf.2021.017

Braverman, I. (2008). Governing certain things: The regulation of street trees in four North American cities. Tulane Environmental Law Journal, 22(1), 35-60.
https://journals.tulane.edu/elj/article/view/2217

Macdonald, E., Harper, A., Williams, J., Hayter, J. A. (2006). Street trees and intersection safety. IURD Working Paper Series. https://escholarship.org/uc/item/9t6465vq

Messier, L., MacDonald, B., Wilson, J.P. (2025). Equity impacts of street tree spacing guidelines: A case study in two Los Angeles neighborhoods. *Landscape and Urban Planning, 259*, 105345.
https://doi.org/10.1016/j.landurbplan.2025.105345_

Messier, L., Margulies, E., Wilson, J.P. (2025). Elevating street trees to infrastructure status: A comparison of street tree spacing guidelines in Los Angeles with U.S. peer cities. *Urban Forestry & Urban Greening, 103*, 128584.
https://doi.org/10.1016/j.ufug.2024.128584_

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Disclaimer

Any opinions, findings, and conclusions expressed herein are those of the authors and do not necessarily reflect the views of the University of Southern California, the City of Los Angeles, or the National Science Foundation.

Brief Research Methodology

We compared street tree spacing guidelines among 17 U.S. cities based on documents available on municipal websites. California cities with the least restrictive standards were selected based on previous work by Macdonald et al. (2006) and updated to current standards. Cities in other states were selected if in the top 30 with respect to population, with a demonstrated commitment to urban forestry as indicated by the “Tree City USA” designation from the Arbor Day Foundation for at least 25 years.

We reviewed codes and standards applicable to L.A. and conducted four semi-structured interviews in Fall 2023 with representatives from the Board of Public Works Office of Forest Management, the Department of City Planning Urban Design Studio, the Bureau of Street Services Urban Forestry Division, and the Bureau of Engineering Sidewalk Division for insight on implementation, drivers of existing guidelines, and barriers to change (Messier, Margulies and Wilson, 2025).

From this information, we developed an alternate policy scenario, aligning with the least restrictive requirement in at least one city in California for each infrastructure element (i.e., spacing required from a fire hydrant, a streetlight, etc.).

We selected two L.A. neighborhoods to compare the outcomes of the existing and proposed guidelines in a high- and low-income setting (Messier, MacDonald and Wilson, 2025). We modeled existing and proposed future street tree spacing guidelines using ArcGIS Pro software.

Table 1 - Comparing guidelines across 8 California cities with the minimum spacing required for each element summarized in the "California Minimum" column

		Distance of Tree (feet)								
		Anaheim	**Fremont**	**Fresno**	**Oakland**	**Pleasanton**	**San Francisco**	**San Jose**	**Los Angeles**	**California Minimum**
Tree Spacing										
Tree spacing (by size of tree)	Small		35	20	15-20	45	15-20		**25**	**15**
	Medium				20-25		20-25			**20**
	Large				25-35		35		**40**	**25**
Intersections										
Signalized	Approach to Intersection	40	15	30	20		25	40	**50**	**15**
	Departure from Intersection	25					5			**5**
Unsignalized	Approach to Intersection	25					25		**45**	**15**
	Departure from Intersection	10					5			**5**
Stop sign	Approach to Intersection	25		30			20	20		**20**
	Departure from Intersection	10								**10**
	Alley Entrance			15					**20**	**15**
Driveway Apron	Residential	10	8	10	5	10		5	**8**	**5**
	Commercial				10			10		**8**
	Railroad tracks								**100**	**100**
Utilities and Fire Safety										
Electrical										
	Utility Pole			15	5		5		**20**	**5**
Street Light (by tree size)	Small	15	15	20	20		9	20	**20**	**9**
	Medium						15			**15**
	Large						21			**15**
	Pedestrian Light								**15**	**15**
Water, Sewer and Stormwater										
	Water Meter or Vault				5			5	**6**	**5**
Water line	Main		5	3	10					**3**
	Other line									
Sewer line	Main	10	8	8	10			10		**8**
	Other line				5					**5**
	Catch Basin	5							**6**	**5**
Fire, Gas and Other Utilities										
	Fire Hydrant	5	5	10	5		5	5	**10**	**5**
	Gas Meter				5				**8**	**5**
	Gas line		8	3	10					**3**
	Underground utilities or utility box			5				5		**5**
Accessibility, Signage and Other										
	Transit Shelter						6		**10**	**6**
	Clear path of travel								**5**	**5**
	Parking meter				3		3			**3**
Roadway sign	Critical Safety	10		5			20	20		**20**
	General						5			**5**
	Parking						3			**3**
Distance from curb	Standard	3	8				0-3			**3**
	Restricted parking zone						8			**8**

Table 2 - Comparing Guidelines Across 10 U.S. Cities with the minimum spacing required for each element in California cities summarized in the "California Minimum" column and the minimum in U.S. cities in the "U.S. Minimum" column

		Distance of Tree (feet)											
		New York	Chicago	Philadelphia	Charlotte	Seattle	Nashville	Portland	Phoenix	Fort Worth	Los Angeles	California Minimum	U.S. Minimum
Tree Spacing													
Tree spacing (by size of tree)	Small			15	30						**25**	**15**	**15**
	Medium		20-25			20		25		25		**20**	**20**
	Large			30	40						**40**	**25**	**20**
Intersections													
Signalized	Approach to Intersection		30	30							**50**	**15**	**15**
	Departure from Intersection		20									**5**	**5**
Unsignalized	Approach to Intersection	40	30	15		30	25	25		40		**15**	**15**
	Departure from Intersection		20								**45**	**5**	**5**
Stop sign	Approach to Intersection	30		30				20				**20**	**20**
	Departure from Intersection			15								**10**	**10**
Alley Entrance	Approach		20					5		15	**20**	**15**	**5**
	Departure		10										
Driveway Apron	Residential	7	10	10		7.5				10	**8**	**5**	**5**
	Commercial											**8**	**7**
	Railroad tracks		50								**100**	**100**	**50**
Utilities and Fire Safety													
Electrical													
	Utility Pole	25		15	30	10		5			**20**	**5**	**5**
Street Light (by tree size)	Small	2						15				**9**	**9**
	Medium	0	12	15	30	20	10	25		10	**20**	**15**	**10**
	Large	30										**15**	
	Pedestrian Light			15	15						**15**	**15**	**15**
Water, Sewer and Stormwater													
Water Meter or Vault	Small to medium planting area	2				5		5	3		**6**	**5**	**2**
	Large planting area							10					
Water line	Main	6		5		5		5	6-10			**3**	**3**
	Other line	2		1.5									**1.5**
Sewer line	Main			5		5			6-10			**8**	**5**
	Other line			1.5								**5**	**1.5**
	Catch Basin		5	5			10	5		10	**6**	**5**	**5**
Fire, Gas and Other Utilities													
	Fire Hydrant	5	5	15	5		10	10	6		**10**	**5**	**5**
	Gas Meter	2*				5			3		**8**	**5**	**3**
Gas line	Main	2*		5		5		5**				**3**	**3**
	Other line			1.5									**1.5**
Underground utilities or utility box	Small tree				15	5	10	5		5		**5**	**5**
	Large tree									10			
Accessibility, Signage and Other													
	Transit Shelter	5						5			**10**	**6**	**5**
	Clear path of travel	4-6		3-5					5		**5**	**5**	**3**
	Parking meter	5										**3**	**3**
Roadway sign	Critical Safety							20/5***				**20**	**20/5*** **
	General	6		5				10/5***				**5**	**5**
	Parking											**3**	**3**
Distance from curb	Standard		2	1.5-3		3				1.5-2		**3**	**1.5**
	Restricted parking zone	Do not plant										**8**	**8**

** From edge of tree bed; disregarded for U.S. Minimum*

*** 3 feet for small planting sites*

**** Clearance at front of sign / back of sign*

Table 3 - City of Los Angeles existing codes and guidelines impacting street trees and responsible department

	L.A.	Min. Req.	Code or Standard	Code	Guideline	Dept.
	feet	feet				
Water meter / vaults	6	–	None found.			Urban Forestry
Catch basins	6	–	None found.			
Gas meters	8	4	Natural Gas Service Guidebook, SoCal Gas (2023). Figure 17 - not specific to trees; requires flat level working space in front of gas meter.		•	
Driveway aprons	8	–	Standard Plan S-440-4 Driveways, Department of Public Works (2014) Driveway standard dimensions and relationship to utility poles and fire hydrants; does not include trees.		•	
		–	Manual of Policies and Procedures, Section 321, Los Angeles Department of Transportation (2024) Not specific to trees; driveway design depends on many contextual factors (street width, travel speed and volume, sight distance, driveway traffic volume, etc.)		•	
Transit shelters	10	Multiple	Public Right-of-Way Accessibility Guidelines, R309, R404, US Access Board (2023) Boarding and alighting areas need 8 feet (perpendicular to curb) x 5 feet (parallel to curb) clear area. Clear space of 30 x 48 inches must be provided within transit shelter. Transit shelters must be connected to boarding and alighting areas by a route that is at least 4 feet wide; where route is less than 5 feet wide, passing spaces of 5 ft x 5 ft must be provided every 200 feet maximum.	•		Bureau of Street Services
		–	City of Los Angeles Supplemental Street Design Guide, Bureau of Engineering Department of Transportation (2020) Figure 4-3 - 8 feet (perpendicular to curb) x 5 feet (parallel to curb) at front door and rear door (if used for boarding); additionally calls for clear zone 4 feet (perpendicular to curb) x 12 feet (parallel to curb) centered on rear boarding door.		•	
Fire hydrants	10	3	2019 California Fire Code, Title 24, Part 9, Sec. 507.5.5 3-foot clear space around circumference of fire hydrants is required.	•		Urban Forestry
Pedestrian lights	15	–	Design Standards and Guidelines, Bureau of Street Lighting (2007). Provides recommended lighting levels for roadways; does not address trees.		•	Bureau of Street Lighting
Street lights	20	–				
Electrical power poles	20	10 (for some poles)	California Code of Regulations, Title 14, Div. 1.5, Ch. 7, Art. 4, Sec. 1254 Firebreak clearance of 10 feet from the outer circumference of a pole or tower on which a switch, fuse, transformer, or lightning arrester is attached and around each dead end or corner pole.	•		Urban Forestry
Alley entrances	20	–	Standard Plan S-420-2 Alley Intersections, Department of Public Works (2013) Alley intersection standard dimensions; does not include trees.		•	
		–	Design Criteria for Special Street Components and Projects, Bureau of Engineering (1970) E615 - Curb return radius for an alley intersecting a street is 5 feet but should be increased up to 10 feet in areas zoned for industry, commerce, multiple residences, or at narrow streets.		•	
Approach to a traffic control device in the direction of travel	50	–	Design Criteria for Special Street Components and Projects, Bureau of Engineering (1970) E659 - Provide same sight distance as at unsignalized intersections.		•	
Unsignalized intersections	45	–	Los Angeles Municipal Code, Ch VI, Article 2, Sec. 62.200 Intersections without traffic control signals or stop signs must have clear visibility triangle extending 45 feet from intersection, except trees trimmed to the trunk to a line at least 8 feet above the level of the intersection and saplings or plant species of open growth habits and not planted in the form of a hedge.	•		
		–	Design Criteria for Special Street Components and Projects, Bureau of Engineering (1970) E659 - Provides instructions for calculating clear sight triangle based on minimum stopping distances for cars traveling at various speeds.		•	
Railroad tracks	100	–	Pedestrian-Rail Crossings In California, California Public Utilities Commission (2008), Figure 1 Recommends clear sight distance and sight triangle for pedestrians at rail crossings, with recommendations depending on train speed; does not address visibility for cars		•	
Tree spacing	25-40	–	None found.			