

**LA Urban Forest Equity Collective – Phase II  
GIS Canopy Projection Analysis: Tier 1 Interventions  
Tree Placement Model Methodology Notes  
2022 - 2023**

[Tree Spacing Guidelines](#)

<b>Tree Spacing Guidelines - Parkways</b>	
<b>Available Datasets</b>	<b>Distance (feet)</b>
Catch Basins (Storm Drain Inlets)	6
Driveways	8
Transit Shelters	10
Fire Hydrants	10
Street Lights	20
Electrical Power Poles (not all of L.A.)	20
Alleys	20
Intersections (Curb Line Intersect)	45
Railroad Tracks + Metro Rail	100
Street Trees	10

**Datasets**

Refer to the [GIS Datasets](#) sheet for the latest datasets and sources

**Projection Used:** NAD 1983 StatePlane California V FIPS 0405 (US Feet)

Cleaning Up Data

1. Driveways & Alleys

The driveways layers also contain alley entrances but they have different spacing guidelines so we need to isolate the features that are driveways only.

- Select by Location
  - Driveways intersect AlleySidewalk (Invert Spatial Relationship)

## 2. Subdividing Parkway Polygons

The parkway polygons need to be subdivided into 25 sq ft polygons so that the model will identify segments of the parkway polygons that are available for planting.

- Input Features: Parkway
- Subdivision Method: Equal Areas
- Target Area: 25 Square Feet
- Subdivision Type: Stacked blocks

## 3. Optional Merges

I merged the SCE Electrical Power Poles (3 layers) and Metro Rail (5 layers) to keep the model shorter. Since we only need their locations and none of the information.

- SCE Electrical Power Poles:  $4,244 + 3,101 + 263 = 7,608$
- Metro Rail:  $144 + 17 + 64 + 39 + 216 = 480$

## 4. Snapping Vacant Sites

Davey had located some vacant sites that were outside the parkway polygons. This would affect the accuracy of the ModelBuilder because the vacant sites would not get picked up during the intersection when they should.

- ArcGIS Pro: Snap Tool
  - Input Features: Vacant\_Sites
  - Snap Environment:
    - Features: Subdivided\_Parkways
    - Type: Edge
    - Distance: 10 feet
  - Check: Enable Undo

## Methodology

Can also refer back to [OG Tier 1 Analysis Report](#) & [Tier 1 GIS Methodology](#) for more details

### *Identifying Available Parkways and Plotting Tree Points (Models 1 and 2)*

1. Project all layers to *NAD 1983 StatePlane California V FIPS 0405 (US Feet)*
2. Select Layer by Location (for all of the parameters)
3. Copying feature and creating a layer for it
4. Calculate MBG
5. Adding & Calculating a Field (done manually)
  - a. This step allows us to calculate how many trees can fit inside the dissolved selected parkways
  - b. Open the attribute table for the Minimum Bounding Geometry layer created in the previous step
  - c. Add a field by clicking on the Add button near the top of the table

- i. Field Name: Num\_Trees
- ii. Data Type: Float
- d. After the field is created, right click on the Num\_Trees column and select Calculate Field
- e. Under Expression, type in the following code:
  - i. Under the equal sign:  
*Rec(!Num\_trees!,!MBG\_Length!)*
  - ii. Under the code block:  
*def Rec(Num\_trees, MBG\_Length):*  
*if MBG\_Length <35:*  
*return 1*  
*elif MBG\_Length >=35:*  
*return int((MBG\_Length-35)/25)+1*  
*else:*  
*return 99*

6. Setting up Model 2 with the output from Model 1 (with added Num\_Trees field)

*Parkway Size and Tree Size Breakdown (Model 3)*

<b>Parkway Width</b>	<b>Tree Size</b>	<b>Canopy Spread (ft)</b>	<b># of Points</b>
< 3 ft, 3 - 4 ft	Small	15	195,029 (Null) 21,067 (Small)
5 - 6 ft	Medium	30	38,138
7 - 10 ft, > 10 ft	Large	50	37,945

- I think that the points that do not have a parkway size should be kept at a SMALL tree canopy spread as a conservative approach such as when we did the analysis in 2021
- These sizes were also determined when I did Rachel M's request during CCAC summer term for StreetsLA Cool Neighborhoods projection
- Rachel M has confirmed the sizes for Canopy Spread by parkway size
  - We are also including Overhead Electrical Wired with the following breakdown:

<b>Overhead Wires Criteria</b>	<b>Tree Size</b>	<b>Canopy Spread (ft)</b>
Yes - Conflicting	Small	15
Yes - Not Conflicting	Small	15
No	Depends on Parkway Width	15 (S), 30 (M), 50 (L)

1. Add parkway width + other info to parkway layer
  - Spatial join between original parkway layer and street trees layer
  - Remove any info regarding the tree points
  - Attributes to keep: OH utilities, parkway width (space size d), council, neighborhood, maintenance zone,
2. Add parkway info to the Model 2 outputs (polygon & point)
  - Spatial join between the model 2 points and the parkway SJ layer
3. Add parkway info to the Model 1 output (polygon & polygon)
  - Spatial join between the parkway SJ layer and model 1 output (selected parkways)
4. Build the Model
  - Select By Attribute
    - Null, Small, Medium, Large, and Overhead Wires will have its own layer but we need to select and isolate them first
    - Selection Formula:
      - Where Parkway Size is null
      - Where Parkway Size includes the values < 3 ft, 3 - 4 ft **AND** OH Utility is No
      - Where Parkway Size includes the values 5 - 6 ft **AND** OH Utility is No
      - Where Parkway Size includes the values 7 - 10 ft, > 10 ft **AND** OH Utility is No
      - Where OH Utility includes the values Yes - Conflicting, Yes - Not Conflicting
  - Copy Features
    - Each size selection will have its own layer
    - Names:
      - Null\_Tree\_Points
      - Small\_Tree\_Points
      - Medium\_Tree\_Points
      - Large\_Tree\_Points
      - OH\_Wires\_Tree\_Points
  - Buffer
    - Buffer sizes:
      - Null: 15 ft
      - Small: 15 ft
      - Medium: 30 ft
      - Large: 50 ft
      - Overhead Wires: 15 ft
    - Buffer Layer Names:
      - Null\_Trees\_15ft\_Buffer
      - Small\_Trees\_15ft\_Buffer
      - Medium\_Trees\_30ft\_Buffer
      - Large\_Trees\_50ft\_Buffer
      - OH\_Wires\_Trees\_15ft\_Buffer

- Add Field
  - We are adding a Short Integer field to each layer
  - Field Name: Canopy\_Size
  - Field Alias: Canopy Size
- Calculate Field
  - We will calculate the newly added field to add canopy size to it
  - Field for calculation: Canopy\_Size
  - Expression: 15, 30, 50 (depending on size)
- Merge
  - Not really necessary for now, but it will combine all the buffered points (canopy sizes) into one layer

5. Cleaning Up

- Spatial Join
  - SJ the Trees\_with\_Sizes layer with the 2022 CD layer
- Export Features
  - Clean up and export the spatial joined layer

Fields to Keep		
Field Name	Alias	Type
OHUtility	Overhead Utility	Text
GrowSpace		
Neighbor	Neighborhood Council	Text
Zone	Zone	
MtDistrict	Maintenance District	
Parkway_Width	Parkway Width	
SectID	Section ID	
MaintRegn	Maintenance Region	
Canopy_Size	Canopy Size	Short
Canopy_Area	Canopy Area (sq ft)	Double
CD	Council District	Short

6. Calculate the Canopy Area for each tree point/buffer

- Add a double field
  - Field Name: Area / Alias: Area (sq ft)
- Calculate Field
  - Calculate the Area field for area in square feet

## 7. Separate by Council District

### Accuracy Check

#### Parkways

1. Snap the Vacant Sites to OG Parkways
  - a. 10 ft
  - b. Edge
2. Make a copy of Snapped Vacant Layers (171,526 points)
3. Select Layer by Location
  - a. Remove Vacant Sites that are not near/on OG parkways
    - i. Snapped Vacant Sites are within a distance of 10 ft from OG Parkways
    - ii. Check “invert spatial relationship”
    - iii. Delete selection (~31,000 points)
    - iv. Save edits
  - b. Accuracy Check
    - i. Snapped Vacant Sites are within a distance of 10 ft from Subdiv Parkways (Model 1 Output)
    - ii. 118,624 selected points / 139,629 total points = 84.95% ~85%
    - iii. This means 85% of the Davey Vacant Points were picked up by the Model 1 Selected Parkways Layer

#### Private Property

- Only done in random neighborhood in Central Alameda and Sylmar
1. Create Feature
    - a. Use Create Feature to draw a polygon in a random neighborhood in each NC for QC Boundary
  2. Clip
    - a.
  3. Add LARIAC 2017 layer as basemap
    - [https://utility.arcgis.com/usrvcs/servers/2a21a26708cf4fdaa3b2ee6d859afcc4/se rvices/LARIAC5/LARIAC5\\_WebMercator/ImageServer](https://utility.arcgis.com/usrvcs/servers/2a21a26708cf4fdaa3b2ee6d859afcc4/se rvices/LARIAC5/LARIAC5_WebMercator/ImageServer)
  4. Using the LARIAC Data, select trees that are placed in areas that cannot be planted:
    - a. On concrete/asphalt (driveways, backyards)
    - b. On parkways/parks (did not get removed during the initial erase)
    - c. Overlapping trees - choose the one that makes more sense
      - i. Covers more of the grass/soils
      - ii. Space-size appropriate
    - d. Incomplete clipped trees
  5. Accuracy Check
    - a. Central Alameda
      - i. Boundary Area: 1,745,676.73 sq ft (double check)
      - ii. Initial Tree Count: 310
      - iii. Final Tree Count (after deletion): 62
      - iv. Calculation:  $(62/310) * 100\% = 20\%$

- v. Absolute Error (measured - actual):  $310 - 62 = 248$
- vi. Relative Error (absolute error / actual value):  $248 / 310 = 0.8$
- b. Sylmar
  - i. Boundary Area: 1,853,104.56 sq ft (double check)
  - ii. Initial Tree Count: 181
  - iii. Final Tree Count (after deletion): 116
  - iv. Calculation:  $(116 / 181) * 100\% = 64.08\% \sim 64\%$
  - v. Absolute Error (measured - actual):  $181 - 116 = 65$
  - vi. Relative Error (absolute error / actual value):  $65 / 181 = 0.359 \sim 0.36$

### Tree Canopy Calculation Results

Use this sheet to look at calculations regarding Tier 1

- [Tier 1 Calculations 2022](#)

# Private Property Analysis

## Spacing Guidelines

Tree Spacing Guidelines - Private Property	
Infrastructure	Distance (feet)
Existing Tree Canopy & Buildings	10
Grass & Soils	10
	10

## Datasets

- LA City Land Cover Raster (from LASAN)
- Neighborhood Councils
- [Countywide Parks and Open Space](#)
- Parkways - same layer as parkway analysis

## Methodology

1. Reclassify
2. Raster to Vector
3. Create No\_NC Layer - works by itself

## Model

### TCB - Tree Canopy & Buildings

1. Clip
2. Buffer

### GS - Grass & Soils

1. Clip
2. Erase

## Notes

### Priority before starting the Private Property Analysis

- Tree Spacing Guidelines for Private Property
  - Old "Guidelines"

When doing the model using NC boundaries, it stops at:

- CANOGA\_PARK
- COMMUNITY\_AND\_NEIGHBORS\_FOR\_NINTH\_DISTRICT\_UNITY\_\_CANNDU



- DOWNTOWN\_LOS\_ANGELES
- EMPOWERMENT\_CONGRESS\_SOUTHEAST\_AREA\_NDC
- EMPOWERMENT\_CONGRESS\_SOUTHWEST\_AREA\_NDC
- GRANADA\_HILLS\_NORTH\_NC
- HARBOR\_GATEWAY\_SOUTH\_NC
- HISTORIC\_CULTURAL\_NC
- HOLLYWOOD\_UNITED\_NC
- LA\_32\_NC
- MAR\_VISTA
- SUN\_VALLEY\_AREA\_NC
- TARZANA\_NC
- VENICE\_NC
- WEST\_LOS\_ANGELES\_NC
- WESTSIDE\_NC
- Total # of NCs that did not work: 16
  - Combined it with the No\_NC layer - also did not work

#### Ideas to do tree canopy points

- Tessellation on individual CDs or individual NCs? (Sylmar and Central Alameda)
  - Creating 25 sq ft tessellation for the city took too long and makes the software laggy
- Clip the tessellation
  - After running the model clip it to available spaces only
- Feature to point
  - Puts centroid point within the clipped tessellation

#### Create random points

- Use the shape area field to determine how many points can be plotted within a polygon
- Distance: 25 feet away from each other?

#### Split by Attributes - separates the neighborhood councils to individual NC layers (99 layers total)

- Need to account for missing parts of LA - use an erase on the city boundary?
  - Should they be one attribute even though they are in different CDs?
  - Add to NC gdb for iteration in model

<https://lahubcom.maps.arcgis.com/home/item.html?id=2a21a26708cf4fdaa3b2ee6d859afcc4>

Erase

Erase Parks & Open Spaces

Erase Parkways

Add Field

Short field - Canopy Size

Select by Attribute for tree sizes

Small: where area sq ft is  $\geq 16$  AND area sq ft  $< 36$

Medium: where area sq ft is  $\geq 36$  AND area sq ft  $< 100$

Large: where area sq ft is  $\geq 100$

Calculate Field

Canopy Size = 15 where area sq ft is  $\geq 16$  AND area sq ft  $< 36$

Canopy Size = 30 where area sq ft is  $\geq 36$  AND area sq ft  $< 100$

Canopy Size = 50 where area sq ft is  $\geq 100$

Select by Attribute

Where canopy size is not null

Export Features

Feature to Point

Select by Attribute & Export

Where canopy size = 15 -> export as S layer

Where canopy size = 30 -> export as M layer

Where canopy size = 50 -> export as L layer

Buffer

Buffer each tree size layer

Merge

Merge each buffered tree size layer

Tier 2 - do not include in Phase 2 report!!!

After talking to Audrey, from BSS, she gave some tips on how they determined tree well spacing

- Tree well size can be 4x4 or 4x6
- Minimum width of the sidewalk is 8-9 ft, but 9 ft is preferred
- Must consider where the building property line is