# Identifying Potentially Development-Threatened Tree Canopy in Environmental Justice Priority Areas

Draft April 8, 2024

Joshua Morris, Urban Conservation Manager at Birds Connect Seattle
Email: joshm@birdsconnectsea.org

**INTRO**

Environmental Justice priority areas in Seattle are census tracts with Racial and Social Equity Index scores that fall within the two highest quintiles.

These communities tend to have lower overall tree canopy cover than whiter and wealthier neighborhoods (2016 Seattle Tree Canopy Assessment) and have experienced higher rates of tree canopy loss in recent years (2021 Seattle Tree Canopy Assessment). Given the important role trees play in community and climate resilience and the benefits they provide to mental and physical health, working with EJ communities to preserve and enhance tree canopy should be a priority for the City.

At the same time, increased demand for housing is driving land use changes and infill development. Parcels on which development occur experience significant canopy loss, 40% on average according to the 2021 Seattle Tree Canopy Cover Assessment.

The City uses Zoned Development Capacity models to identify parcels where redevelopment could occur to increase housing density. These parcels have fewer housing units that would be allowed under their current zoning class. These parcels also often support a significant number of established trees.

In some zones, development footprint may occupy 85-100% of the lot area, and tree removal in downtown and industrial zones is not regulated under the tree protection ordinance. These trees are potentially highly threatened as infill development is targeted toward these parcels.

Understanding their distribution and planning to maximize their retention during development is important if the City is to meet its canopy equity goals.

**METHODS**

**Analysis objective:** Find tree canopy in Environmental Justice Priority Areas and on private property on underdeveloped parcels in Lowrise, Midrise, Commercial, and Seattle Mixed zones, where 85-100 lot coverage allowed under the new tree protection ordinance, or on Downtown and Industrial zones which are “silent zones” not regulated by the tree protection ordinance.

**Datasets**

| Dataset | Source | Last Updated |
|---|---|---|
| Seattle_Tree_Canopy_2016_2021_RSE_Census_Tracts | https://data-seattlecitygis.opendata.arcgis.com/datasets/SeattleCityGIS::environmental-justice-priority-areas/about | Jan 26, 2024 |
| Tree_Canopy_2021_Seattle | https://data-seattlecitygis.opendata.arcgis.com/datasets/SeattleCityGIS::seattle-tree-canopy-2021/about | Jan 26, 2024 |
| Zoned Development Capacity by Development Site Current | https://data-seattlecitygis.opendata.arcgis.com/datasets/SeattleCityGIS::zoned-development-capacity-by-development-site-current/about | Jan 27, 2024 |
| Unofficial neighborhood boundaries | https://www.arcgis.com/home/item.html?id=8adffd6b8fba4a84966fa7471afd0d6c | Nov 29, 2023 |

**Defining and mapping development-threatened tree canopy procedure:**

1. Set definition query on Zoned Development Capacity Layer:
   PUB_OWN_TY = 'PRIVATE' And (REDEVSTATU = 'REDEV' Or REDEVSTATU = 'VACANT') And (CLASS = 'MR' Or CLASS = 'C' Or CLASS = 'L' Or CLASS = 'NC' Or CLASS = 'SM' Or CLASS = 'D' Or CLASS = 'I')"
   Intersect tree canopy, EJ priority areas, and zoned development capacity layers called "Development Threatened Tree Canopy 2021 in EJ Priority Areas"
2. Add new field to "Development Threatened Tree Canopy 2021 in EJ Priority Areas" called "DTTC_Acres" (double).
3. Calculate geometry of DTTC_Acres
   Property = Area (geodesic)
   Area Unit = Acres
   Coordinate system = default
4. Intersect Development Threatened Tree Canopy 2021 in EJ Priority Areas with Neighborhoods layer. Call it DTTC_Neighborhoods_Intersect
5. Add new field to "DTTC_Neighborhoods_Intersect" called "DTTC_Hood_Acres" (double).
6. Calculate geometry of DTTC_Hood_Acres
   Property = Area (geodesic)

Area Unit = Acres
Coordinate system = default

Estimating street tree canopy contribution to DTTC

1. Dissolve DTTC_Neighborhoods_Intersect on "gridcode" field (=1 for all records). Default settings (create multipart features). Output aggregates the many thousands of DTTC canopy polygons into a single, multipart feature. Call it DTTC_Dissolve
2. Create new point feature class using Create Random Points tool. Constrain the output to DTTC_Dissolve, create 500 points. Output is 500 random points distributed within the boundaries of DTTC_Dissolve. Call new feature class "Random_Point_Assessment"
3. Create new field in Random_Point_Assessment called "Street_Tree" (short, numeric).
4. Set basemap to satellite imagery.
5. Zoom to each random point to determine if the canopy it is associated with is from a tree planted in the public right of way or is rooted on private property. If street tree, assign value "1", else "0"
6. Where determination cannot be made from satellite imagery, use Google Street View.
7. Where determination is uncertain, assume street tree and assign value "1".

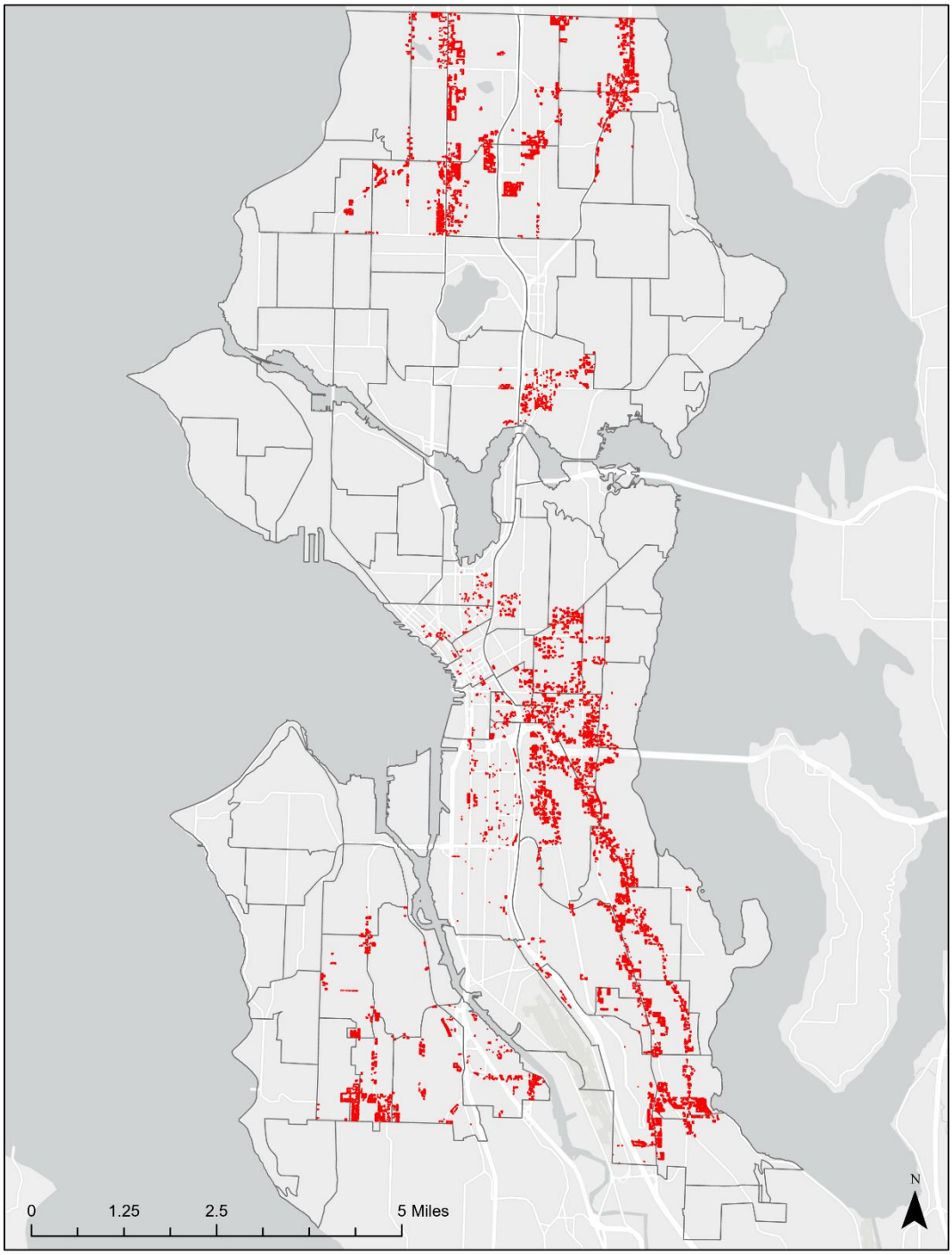
**RESULTS**

There is a total of 226.7 acres of tree canopy overhanging redevelopable parcels. Some of this tree canopy is contributed by street tree canopy spreading from the right of way over private property. Street trees are governed by different regulations than trees on private property and are not the focus of this analysis.

Of a random assessment of 500 points within tree canopy on redevelopable parcels in EJ priority areas, 33 were determined to fall within tree canopy contributed by street trees. I estimate the mean canopy contribution from street trees to be 6.6% (95% Confidence Interval 4.4% to 8.8%).

**Therefore, I estimate there are between 207 to 217 acres of development-threatened tree canopy on private property in Environmental Justice Priority Areas.**

**Map of distribution of development-threatened tree canopy in EJ Priority Areas (red) with unofficial neighborhood outlines.**


0
1.25
2.5
5 Miles
N

## Results by neighborhood

| Neighborhood | Acres of Development-threatened Tree Canopy in EJ Priority Areas | | |
|---|---|---|---|
| | Mean Estimate | Lower 95% CI Estimate | Upper 95% CI Estimate |
| North Beacon Hill | 15.60 | 15.24 | 15.97 |
| Atlantic | 13.92 | 13.59 | 14.25 |
| Columbia City | 13.86 | 13.53 | 14.18 |
| Dunlap | 13.79 | 13.46 | 14.11 |
| Haller Lake | 11.36 | 11.10 | 11.63 |
| Rainier Beach | 11.13 | 10.87 | 11.39 |
| North College Park | 9.00 | 8.79 | 9.21 |
| South Delridge | 8.80 | 8.59 | 9.01 |
| Greenwood | 7.79 | 7.60 | 7.97 |
| Brighton | 7.74 | 7.56 | 7.92 |
| Minor | 7.47 | 7.29 | 7.65 |
| South Beacon Hill | 7.42 | 7.24 | 7.59 |
| Highland Park | 7.23 | 7.06 | 7.40 |
| Olympic Hills | 6.44 | 6.28 | 6.59 |
| Mid-Beacon Hill | 6.18 | 6.03 | 6.32 |
| Maple Leaf | 5.91 | 5.77 | 6.05 |
| Pinehurst | 5.46 | 5.33 | 5.58 |
| University District | 5.41 | 5.28 | 5.54 |
| Cedar Park | 5.14 | 5.02 | 5.26 |
| Mount Baker | 4.97 | 4.85 | 5.08 |
| High Point | 4.20 | 4.10 | 4.30 |
| South Park | 3.65 | 3.56 | 3.73 |
| Industrial District | 3.06 | 2.99 | 3.13 |
| Meadowbrook | 2.88 | 2.81 | 2.94 |
| Bitter Lake | 2.69 | 2.63 | 2.75 |
| Riverview | 2.66 | 2.60 | 2.72 |
| International District | 2.40 | 2.35 | 2.46 |
| Roxhill | 2.06 | 2.01 | 2.11 |
| Crown Hill | 1.68 | 1.64 | 1.72 |
| Yesler Terrace | 1.53 | 1.49 | 1.56 |
| Victory Heights | 1.34 | 1.31 | 1.37 |
| Leschi | 1.29 | 1.26 | 1.32 |
| Stevens | 1.26 | 1.23 | 1.29 |
| Broadway | 0.94 | 0.92 | 0.96 |
| Holly Park | 0.91 | 0.89 | 0.93 |
| Mann | 0.83 | 0.81 | 0.84 |
| Broadview | 0.80 | 0.78 | 0.82 |

| | | | |
|---|---|---|---|
| Wallingford | 0.73 | 0.71 | 0.75 |
| South Lake Union | 0.56 | 0.55 | 0.57 |
| North Delridge | 0.48 | 0.47 | 0.49 |
| Belltown | 0.41 | 0.40 | 0.42 |
| Pioneer Square | 0.22 | 0.21 | 0.22 |
| Madrona | 0.18 | 0.17 | 0.18 |
| Seward Park | 0.10 | 0.10 | 0.10 |
| Central Business District | 0.08 | 0.07 | 0.08 |
| First Hill | 0.06 | 0.05 | 0.06 |
| Ravenna | 0.05 | 0.05 | 0.05 |
| Pike-Market | 0.03 | 0.03 | 0.03 |
| **TOTAL** | **211.65** | **206.66** | **216.63** |

**Results by zone class**

| **Zone Class** | **Acres of Development Threatened Canopy in EJ Priority Areas** | | |
|---|---|---|---|
| | **Mean Estimate** | **Lower 95% CI Estimate** | **Upper 95% Estimate** |
| Lowrise | 100.23 | 97.87 | 102.59 |
| Neighborhood Commercial | 47.33 | 46.21 | 48.44 |
| Commercial | 26.46 | 25.84 | 27.08 |
| Industrial | 14.04 | 13.71 | 14.37 |
| Midrise | 11.20 | 10.94 | 11.46 |
| Seattle Mixed | 8.78 | 8.58 | 8.99 |
| Downtown | 3.60 | 3.52 | 3.68 |
| **TOTAL** | 211.65 | 206.66 | 216.63 |