**Environmental Justice Tree Canopy Technical Report**

To: Lou Stubeki
From: [redacted]

Dear Mr. Stubeki,

Thank you for requesting this important report on tree canopy cover and environmental justice in Seattle! I have attached the report below. Our team found that areas with higher populations of people of color and more people living below the poverty line, especially in South Seattle, tend to have lower canopy cover. We recommend that the City of Seattle urban forestry team invest money and effort into planting trees in these areas, and speak to community environmental leaders in these areas to determine how best to implement these suggestions.

We also request that this information be distributed to all members of the urban forestry team, and that action be taken as soon as possible. Please let me know if you have any questions, concerns, or thoughts about our research and proposal. Thank you again for your investment in this project, and I hope to hear from you soon.

Sincerely,
[redacted]

**Environmental Justice: Tree Canopy Cover in Seattle**

## Abstract

This report examines the correlation between low canopy cover and socioeconomic status based on the 2016 Seattle Tree Canopy Assessment and the Trees for Seattle Map Series. It conducts a high-level analysis of the factors that contribute to lower canopy cover in economically and socially disadvantaged neighborhoods, and analyze which of these locations have the lowest canopy cover. The synthesis of this data informs recommendations for actions that the city can take to begin to alleviate this deeply-rooted problem.

## Background

Environmental justice refers to the fair treatment of all people regardless of race or income in relation to environmental laws and policies. Although Seattle has taken steps to protect the environment, there are still higher levels of pollution in lower-income neighborhoods and communities of color, which often cause health issues (Seattle Equity Agenda). The purpose of this report is to address the disparities caused by unequal canopy cover in these areas.

Canopy cover is the percentage of land that is covered in trees, as seen from above. Seattle's most recent canopy cover study, conducted in 2016, found that 28% of Seattle is covered with trees. The city aims to reach 30% canopy cover by 2037, as laid out in the Urban Forest Stewardship Plan. Higher canopy cover in a neighborhood can help to reduce pollution and increase quality of life for residents. Benefits of street trees include stress reduction, soaking up rainwater, and cleaning the air ("Trees for Seattle: Tree Benefit"). Areas with low canopy cover miss out on these benefits.

In order to analyze different locations in Seattle, we can analyze different census tracts, which are small subdivisions of a county that average around 4,000 inhabitants ("Census Tracts"). Seattle is divided into 131 census tracts, as delineated by the Census Bureau. Alternately, we can look at Urban Forestry Management Units, which are larger stretches of land containing multiple census tracts. Trees for Seattle divides Seattle into 27 Urban Forestry Management Units, giving a broader look at the canopy cover in these communities.

## Methods

The 2016 Seattle Tree Canopy Assessment pulls environmental justice data from the 2015 Equity and Environmental Initiative (EEI) launched by Seattle Mayor Ed Murray. The EEI sought to analyze the correlation between tree canopy and environmental equity in Seattle. Environmental equity factors considered in this analysis include people of color, people within

200% of the poverty level in each census tract. Canopy cover mapping in the 2016 Seattle Tree Canopy Assessment is based on estimates by the USDA Forest Service's tree canopy metrics tool. Tree canopy percentage was calculated by mapping land cover, and then dividing the amount of tree canopy by the amount of land in each census tract. In order to analyze the social factors of each census tract, the study examines the percentage of people of color, and percentage of people within 200% of the poverty level.

On the Trees for Seattle Map Series website, the map was developed by examining the right-of-way (ROW) canopy data to determine the density of tree coverage in each census tract. ROW canopy refers to street trees, which are regulated by the Seattle Department of Transportation. These street trees make up 22% of Seattle's land area, and thus have a major impact on the city's overall canopy cover. The Map Series website data was generated by comparing ROW canopy cover with the Racial and Social Equity Index of each census tract in order to determine the difference in canopy cover based on social, environmental, and health factors. The Racial and Social Equity Index is calculated based on race/ethnicity, socioeconomics, and health factors, which are used to rank communities from in five levels from least to most disadvantaged. These estimates are based on the 2011-2015 American Community Survey from the U.S. Census Bureau and the Center for Disease Control and Prevention.

**Data Analysis**

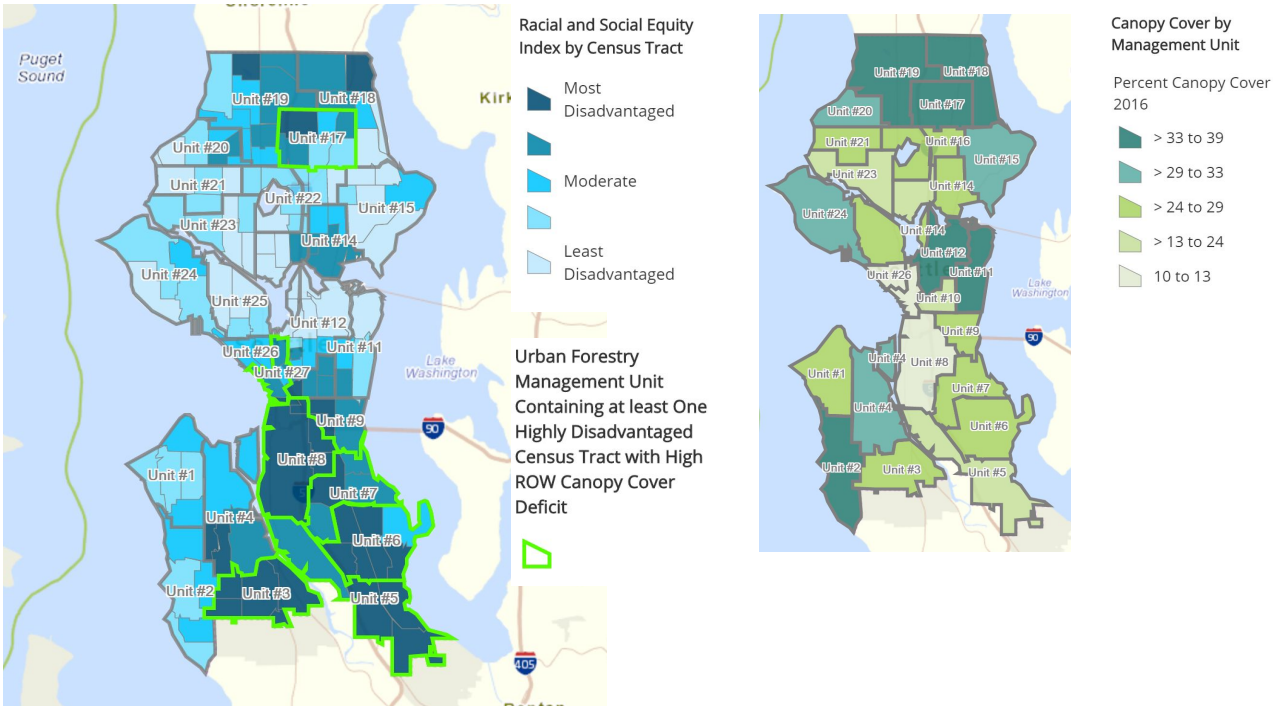



Figure 1: Social Analysis of Urban Forestry Management Units (http://seattlecitygis.maps.arcgis.com/)

Trees for Seattle compares socioeconomic factors and canopy cover by mapping the overlap between urban forestry management units with high ROW canopy deficit and those with highly disadvantaged census tracts, as shown in Figure 1 above. On the left map, areas shown in darker blue are more disadvantaged. Urban forestry management units highlighted with a green border contain at least **one highly disadvantaged census tract with high ROW canopy cover deficit**. Highly disadvantaged census tracts are those which are ranked most and second-most highly disadvantaged according to the Racial and Social Equity Index. A high ROW canopy cover deficit is defined as a deficit of at least 8% less than the overall goal of 27% ROW canopy cover. The highlighted urban forestry management units include Units #3, 5, 6, 7, 8, 17, and 27. These areas are mostly concentrated in south Seattle. For comparison, the smaller green map to the right shows the canopy cover in each urban forestry management unit, with darker green areas representing urban forestry management units with higher percent of canopy cover. Figure 2 below additionally compares the canopy cover in Seattle's management units.

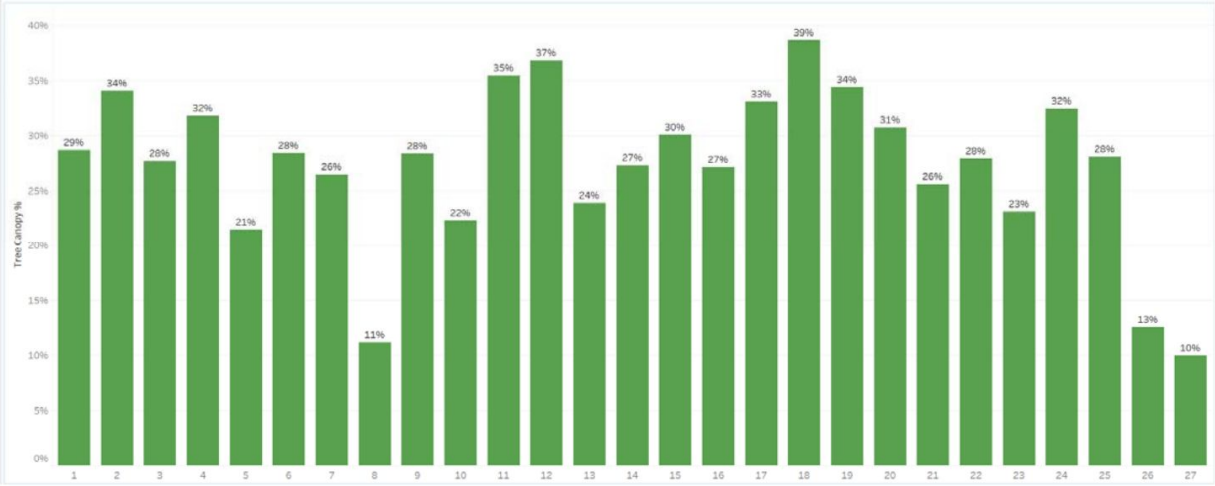



Figure 2: Percentage of Canopy Cover in Urban Forestry Management Units (https://www.seattle.gov/trees/management/canopy-cover)

Canopy cover in these management units ranges from 10% in Unit #27 to 39% in Unit #18. The three management units with the lowest canopy cover are Units #8, 26, and 27.

Although there are some clear disparities shown in the canopy cover for different urban forestry management units, it is also important for us to look closer at specific census tracts which have low-income, diverse populations and low canopy cover. We can look at the 2016 Seattle Tree Canopy Assessment's analysis of the relationship between tree canopy and environmental justice to better understand this information.

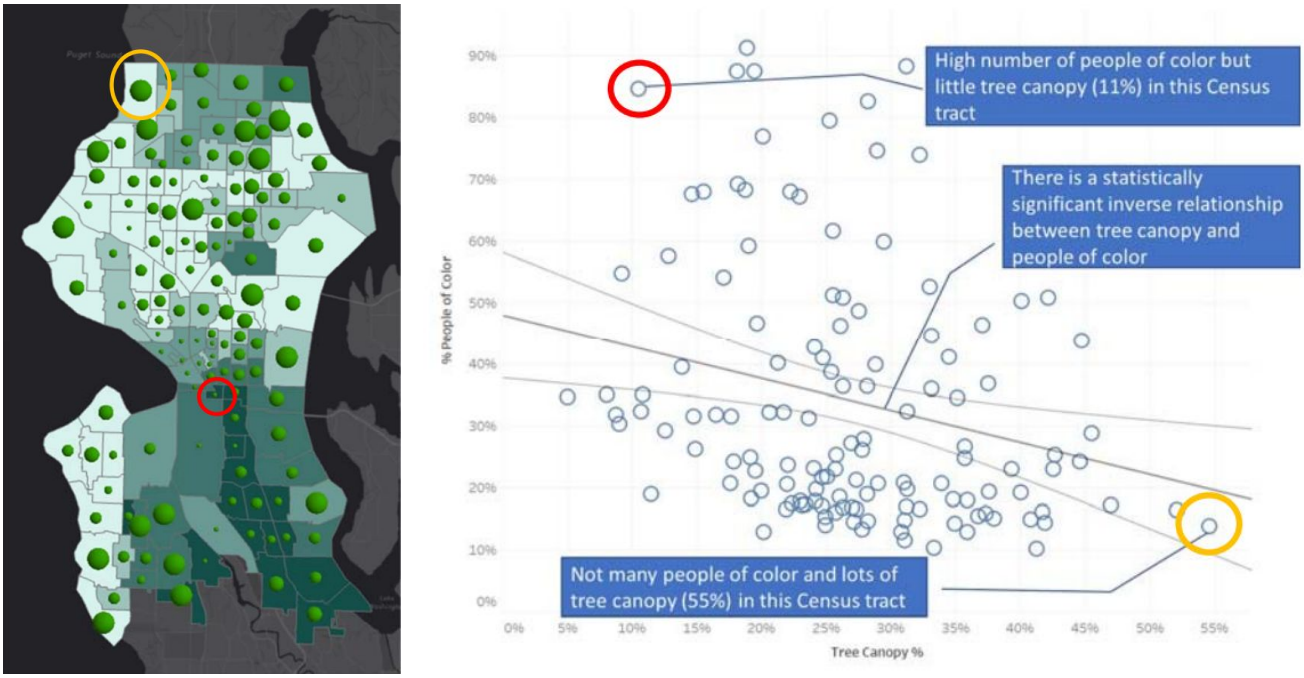



Figure 3: Percent Tree Canopy vs. Percent People of Color in Seattle Census Tracts (https://www.seattle.gov/trees/management/canopy-cover)

The images shown above examine the correlation between the percentage of the population which consists of people of color and amount of canopy cover. The map on the left shows all the census tracts in Seattle. The green spheres on the left image represent canopy cover, with larger circles representing higher canopy cover. Census tracts colored with a darker green have higher populations of people of color. The scatterplot on the right plots each census tract according to percent canopy cover and percent people of color. The yellow circles highlight Census Tract #5, the Broadview neighborhood, which contains roughly 55% tree canopy and has a relatively low (less than 20%) population of people of color. The red circles highlight Census Tract #91, located downtown within Urban Forestry Management Unit #8. Census Tract #91 contains a population of almost 90% people of color, and has a low canopy cover of slightly more than 10%.

**Findings**

The Trees for Seattle map data strongly suggests that areas that are more racially and socially disadvantaged also have the lowest canopy cover. Urban Forestry Management Units #3, 5, 6, 7, 8, 17, and 27 all contain one or more census tracts which are classified as most or second most disadvantaged and have a high ROW canopy cover deficit.Further analysis of this data also demonstrates this disparity.

The 2016 Seattle Tree Canopy Assessment found that overall, there is a statistically significant inverse relationship between the percentage of people of color and percent tree canopy cover - in other words, places with more people of color generally have less trees. As suggested by the negative trend line in the scatterplot in Figure 1, the more people of color in a neighborhood, the less trees tend to be present. Census tracts with the highest tree canopy have the lowest percentage of people of color (eg. Census Tract #91), and census tracts with the lowest tree canopy have the highest percentage of people of color (eg. Census Tract 5). The study also found a statistically significant inverse relationship between percentage of people within 200% of the poverty level and percent tree canopy cover, showing that there are fewer trees in areas that are more financially disadvantaged.

Although there is an inverse relationship between these social factors and canopy cover, it is important to note that there are exceptions - some locations with many people of color and people below 200% of the poverty level still have high canopy cover. It is also important to note that correlation does not indicate causation; we cannot gather from this data whether there is a causal relationship between socioeconomic factors and tree canopy cover. However, there are still steps we can take to begin to guide the city towards a more equitable distribution of trees.

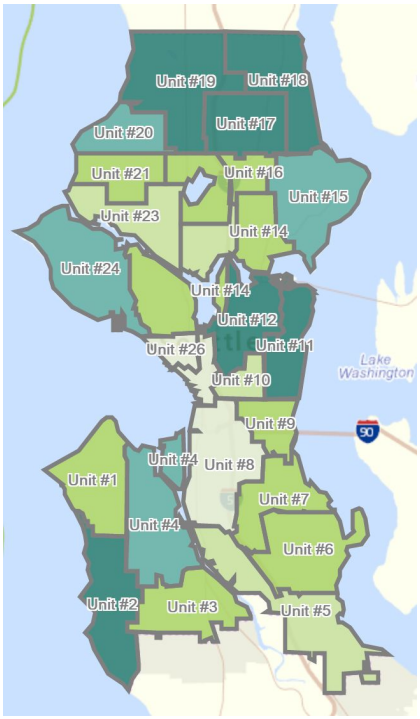
**Recommendations**

Based on the findings, the Seattle Department of Transportation should consider investing more funding into the planting and maintenance of street trees in census tracts that are most disadvantaged and have the lowest tree canopy cover.

In order of priority, the city should invest its funds in planting and maintaining trees in:

1. Census Tract 111 (Unit 6): 13.44% deficit
2. Census Tract 91 (Unit 8): 12.40% deficit
3. Census Tract 81 (Unit 27): 10.9% deficit

In addition to investing in funding, the city should also speak with community leaders in these neighborhoods, particularly those representing communities of color, in order to determine how to implement these suggestions in a way that will truly benefit these communities. Although planting more trees in these areas will not fix all of these problems, it is a step towards building a healthier environment for these communities to live in.



**Works Cited**

Seattle Tree Canopy Assessment by Jarlath O'Neil-Dunn, University of Vermont, 2016
https://www.seattle.gov/trees/management/canopy-cover

Trees for Seattle Story Map: Urban Tree Canopy, Environmental Justice, Tree Benefit
http://seattlecitygis.maps.arcgis.com/apps/MapSeries/index.html

Equity & Environment Agenda, City of Seattle
https://www.seattle.gov/environment/equity-and-environment/environmental-justice-committee