

# Policy and Design Guidelines for Trees in a Growing Seattle

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A thesis  
submitted in partial fulfillment of the  
requirements for the degree of

Master of Urban Planning

University of Washington  
2016

Committee:  
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Program Authorized to Offer Degree:  
Urban Design & Planning

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**Abstract**

# Policy and Design Guidelines for Trees in a Growing Seattle

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Trees are important for a healthy urban environment and must be promoted through design and policy guidelines in Seattle. Seattle is a city that is growing and aiming to increase density by reducing sprawl and accommodating growth in designated urban centers. However, the associated development can also come with a reduction of green space and the removal of existing trees. This thesis shows the benefits of urban trees, discusses highlights from many of Seattle's goals and plans that pertain to trees and density, and discusses lessons to be learned from other comparable United States cities' forestry plans. The goal of this thesis is to propose steps forward that would promote retention of trees and stress their importance in urban areas. Surveys of professionals from the City, nonprofit organizations, and academia informed the final suggestions. A four-pronged approach of analyzing funding strategies and program support, advocacy and education, collaboration, and design and enforcement standards guides future policy recommendations for keeping trees in Seattle while it continues to grow.

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## **Acknowledgments**

Thank you to Manish Chalana and Christine Bae for your support not only through the thesis process, but also throughout my career at the University of Washington.

## **Dedication**

This thesis is dedicated to my parents, my roommates, my thesis support group, and my friends without whom none of my achievements are possible.

# Policy and Design Guidelines for Trees in a Growing Seattle

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## I. INTRODUCTION

A man sits in a tree in Downtown Seattle overnight and it makes national news.<sup>12</sup> Over a hundred trees get cut down by a group of private individuals in park land on a slope in West Seattle and legal battles with possible felony charges ensue.<sup>3</sup> Questions about how the new housing initiative proposing increasing affordability and density in Seattle (HALA – Housing Affordability and Livability Agenda) fits with the preservation of trees and green spaces cause uproar at a local community meeting and make the news.<sup>4</sup> Trees in Seattle have become a controversial issue. Everyone seems to have a position on where trees belong and where they do not. In the past few years, plans for parks in Seattle have included fewer trees and more hardscaping in their plans, making some tree-lovers upset.<sup>5</sup> With trees in the forefront of much of the local news, the logical question is what does this mean for the future of the “Emerald City” and the trees that make it green? How do we citizens and policy makers make sure Seattle keeps the natural environment the city is famous for even with population growth within the city limits?

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<sup>1</sup> (Victor 2016)

<sup>2</sup> (Hauser 2016)

<sup>3</sup> (King 2016), (Knauf 2016), (Record 2016), (Beekman 2016), (Keeley 2016)

<sup>4</sup> (Trumm 2016), (Scigliano 2015)

<sup>5</sup> (Hinshaw 2016), (Lange 2011)

## Background

There are social and ecological implications for the population growth, densification, and urbanization of cities like Seattle. The City of Seattle comprises 83.94 square miles<sup>6</sup> and is one of the fastest growing cities in the country.<sup>7</sup> This thesis shows that trees are integral to urban environments and acknowledges the perceived conflict between trees and development. This thesis reviews many of the City of Seattle's goals around urban forestry and development and reviews, critiques, and suggests ways to better promote the urban forest with increased density. It also includes case studies and information from informed professionals to provide guidance for Seattle policy makers, community members, and developers. The Puget Sound Regional Council (PSRC) projects that population will grow to 4.9 million by 2040 (from 3.8 million in 2014) within the Central Puget Sound Region.<sup>8</sup> Seattle will receive a good portion of this growth. Planners, developers, and policy makers will have to figure out how to make room for growth to happen in an equitable, healthy, and vibrant manner for generations to come.

Making sure that the urban forest is maintained and increased can help mitigate some of the traditional problems that cities face. The most prominent professional association, American Planning Association (APA), does not always emphasize the benefits of urban forestry. However, in 2009 the APA acknowledged that there are many benefits that could be accrued by joining the disciplines of planning and forestry. They argued that, "because urban forestry is an emerging discipline, its relationship to planning is still evolving."<sup>9</sup> Staying within the discipline of urban planning to look at the benefits of trees is very limited, instead urban

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<sup>6</sup> (United States Census 2016)

<sup>7</sup> (Balk, U.S. Census: Seattle now fourth for growth among 50 biggest U.S. Cities 2016)

<sup>8</sup> (Puget Sound Regional Council 2016)

<sup>9</sup> (APA, 2009)

forestry should also be looked at through the disciplines of ecology, biology, human health, economics, sociology, and more. There have been many studies that have shown how trees and green areas within cities are important tools for creating healthier and more equitable cities.<sup>10</sup> Urban trees are an important factor in contributing to environmental justice initiatives. The economic benefits to trees is discussed in on page 32.

Mayor Ed Murray has been working on an affordable housing initiative – HALA (Housing Affordability and Livability Agenda) – in order to create options for equitable accommodations within the City of Seattle. This initiative must include landscaping and the presence of trees.<sup>11</sup> Many of the benefits that trees provide help to combat many of the problems common in cities. A study in Chicago showed that maintained trees and grass made residents feel safer in inner-city neighborhoods.<sup>12</sup> The importance and benefits of trees in cities cannot be undervalued especially as cities like Seattle grow denser.

## Research Questions

This thesis evaluates Seattle’s urban forestry plans and goals for comprehensiveness and how they can be improved through additional design and policy guidelines. Through this process I am answering the following questions: How comprehensive are Seattle’s urban forestry plans and goals? What is not being addressed in the plans? Do other city programs in

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<sup>10</sup> (Schwartz, et al. 2015)

<sup>11</sup> Mayor Murray has also recently released an “Equity and Environment Initiative” that includes goal areas of 1) healthy environments for all, 2) jobs, local economies and youth pathways 3) equity in city environmental programs 4) environmental narrative and community leadership. More information can be found online: <http://www.seattle.gov/environment/about-ose/equity-and-environment>

<sup>12</sup> (Kuo, Bacaicoa and Sullivan, Transforming Inner-City Landscapes: Trees, Sense of Safety, and Preference 2016)

the United States offer best practices that are translatable to the City of Seattle's Urban Forestry program? Can increasing building and population density in Seattle happen while also increasing tree canopy cover?

## Methodology

This thesis will first state why trees are of particular importance and are a benefit to urban environments. It will then discuss several of Seattle's plans that deal with urban forestry and highlight sections that offer solutions for how to manage trees around buildings. It will discuss what sections of the plans are strong and assess gaps. I will compare a few other cities' urban forestry plans in the United States. The city selection is based on location and climate, reputation of the forestry plan, and population increases similar to Seattle.

This thesis includes a simple survey that was sent out to professionals who work within Seattle on trees. Those surveyed include people who work in government as well as those who are part of nongovernmental partnerships or nonprofits and are in academia focusing on trees. The survey included 10 questions and was sent by email with a link to a Google Forms survey. For the most part, those surveyed were people I have previously met or worked with. In analyzing the surveys, I looked for repeating themes and also compared answers to other city case studies to see if innovative aspects of case studies corresponded to respondent's answers. By drawing conclusions based on survey responses, city case studies, and Seattle plan overlap, I have proposed steps forward for creating policy and design guidelines for trees in the City of

Seattle at different scales: City wide, neighborhood, and site specific for residential and mixed-use zones.<sup>13</sup>

## Audience and Results

City residents and policy makers in City of Seattle might find this work informative. It is intended for academic purposes, but hopefully will inspire others to discuss the topic in a productive and informed manner. The design and policy guidelines are intended to create a streamlined approach to promoting trees at multiple levels. The results focus on a four-point strategy with suggestions for funding and support, advocacy and education, collaboration, and design and enforcement. There is a strong underlying environmental justice implication to who has trees near where they live and who does not.<sup>14</sup> Comprehensive guidelines for trees in an environment of increasing urban density hopefully can be useful throughout Seattle because they span different economic, social, and racial demographics. As one person at the Urban Forest Symposium on May 17, 2016 stated, “Trees are the most important privately owned utility.”<sup>15</sup>

## Summary

Trees are integral for creating a healthy and livable urban environment. This thesis attempts to answer questions pertaining to Seattle’s population growth and built form explosion that are pertinent to maintaining Seattle’s goals as an environmentally conscious city

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<sup>13</sup> These zones were targeted based on a forthcoming explanation from Figure 3 and Existing Seattle Plans.

<sup>14</sup> (Wolch, Byrne and Newell 2014)

<sup>15</sup> Quote from a participant at the Urban Forest Symposium held at the Center for Urban Horticulture at the University of Washington on May 17, 2016.

moving forward. By looking at existing design and policy structures, asking knowledgeable professionals, and learning from other urban forestry plans – this thesis attempts to create a path forward for promoting and incorporating trees into a growing city.

## II. LITERATURE REVIEW: BENEFITS OF TREES

### Introduction: Why trees are important in urban environments

Historically there have been different reasons to green a city. One reason is aesthetics. European cities like Paris and London created sculptures out of greenery in the form of topiaries, pollarded trees, and allées of tree-lined streets adding whimsy and acting as living design structures in the built environment. They demonstrated the city's (or historically the king or queen's) attention to detail and design in their surroundings. Another reason for planting trees was that they were, and still are, an expression of social power. People who had the authority, owned the land, had the financial security and power to plant trees demonstrated their wealth.<sup>16</sup> Tree-lined streets in European cities showed the government's power and control to be able to shape the built and natural environment. These two historical reasons for adding trees to an urban environment still exist, but are less influential in the United States because of the country's history without a central ruling monarch. Today there is more of an emphasis on measurable, qualitative good and researched studies on the value of trees.

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<sup>16</sup> (Lawrence 2006)

When the importance of trees is discussed, the most obvious benefits are often environmental. Trees produce oxygen and store carbon, they are habitat for wildlife, filter out pollutants, and they regulate temperatures and stormwater runoff, but trees have other values that are just as important. They create livable communities and are integral to both physical and psychological human health. They are used successfully in design strategies to increase aesthetic value, and make street safer. Mature trees increase home values and save residents money on utilities when strategically planted around their homes. Urban food forests are becoming a popular way to increase food security and promote community. Trees add value to a city and are integral to a healthy and thriving urban experience.

### **Definition of Trees, Urban Forestry, and Density**

For the purposes of this thesis, **trees** are described as a “woody perennial plant having a single usually elongate main stem generally with few or no branches on its lower part.”<sup>17</sup> This definition precludes bushes, shrubs, grasses, and other landscape plants that are often grouped with trees. There are many benefits to these other types of vegetation, but the forthcoming suggestions will not address any flora outside of the above definition of trees.

The **urban forest** encompasses not only trees within parks, but also street trees and yard trees in residential areas. There is more to a natural forest than trees and sometimes the term “urban forest” includes shrubs, lawns, pervious soils, and other vegetation types, but throughout this thesis, the term “urban forest” will refer to the trees in the city without a focus

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<sup>17</sup> From the Merriam-Webster dictionary

on the understory. Green infrastructure<sup>18</sup> is also important in an urban environment, but this thesis uses Ira Nadel and Cornelia Hahn Oberlander’s definition of the term “urban forestry” as, “a new concept in the late 1970s which referred specifically to the ‘management of trees in urban areas based on ecological and biological premises.’”<sup>19</sup> See Figure 1 for a conceptual model of the definition of urban forest.

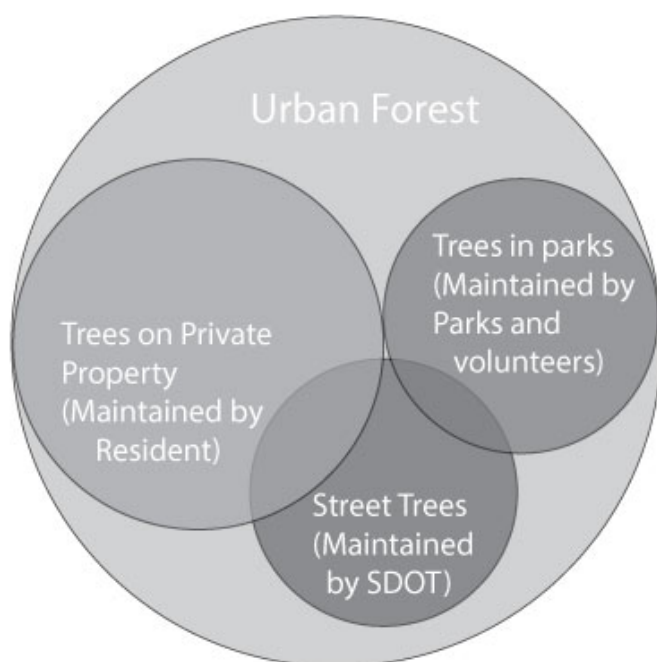


Figure 1: Conceptual model explaining urban forests and urban trees inspired by S. Roy framework<sup>20</sup>

Figure 1 shows the overlap of trees within the City of Seattle. Most trees within the City of Seattle lie in categories of: Trees on private property, trees in parks, or trees along streets. Residents can plant trees in their own yards or along streets. If they plant a tree along the

<sup>18</sup> Green infrastructure refers to using vegetation to aid in offsetting ecological implications of urbanization.

<sup>19</sup> (Silvera Seamans 2013)

<sup>20</sup> (Roy, Byrne and Pickering 2012)

street in a planting strip<sup>21</sup> then the resident and all future residents of the adjacent property are responsible for taking care of the tree. Street trees are usually planted by the Seattle Department of Transportation (SDOT) along arterial roads or along streets in neighborhoods that they deem appropriate for large-scale plantings. The street trees planted by SDOT are maintained by SDOT. The Parks and Recreation department in the city maintain trees planted in parks and are often assisted by volunteers.

Densification of cities is thought of as a “sustainable” way to provide growth. Increasing **density** creates more housing units in urban centers in order to provide increased affordability, better access to transit, and a better proximity to jobs and services. Washington State’s Growth Management Act (GMA) attempts to consolidate growth in particular urban areas in order to prevent sprawl. Seattle’s urban village neighborhood strategy works at the city scale to create neighborhood pockets of growth and allocating taller buildings with more units to areas that can handle more people.<sup>22</sup> These areas have access to transit and commercial centers or have plans for further development with possible upzoning.<sup>23</sup> The population density of Seattle is approximately 8,000 people per square mile with projections in 20 years of rising to 9,400 people per square mile.<sup>24</sup> For comparison in the Cascadia area, Portland’s

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<sup>21</sup> A planting strip is land in the public right-of-way that is between the road and the sidewalk. The size of the planting strip differs greatly along different streets.

<sup>22</sup> (Murray 2016)

<sup>23</sup> The term “upzoning” refers to designating a certain area to have more density than it previously had.

<sup>24</sup> (Bolster 2016)

population density is around 4,375 people per square mile<sup>25</sup> and Vancouver's population density is 13,590 people per square mile.<sup>26</sup>

**Canopy cover** is an often-used measurement used to determine the health and extent of an urban forest. A larger canopy means a broader leafed covering which can indicate healthier or more mature trees. It can also suggest the size of root system for the tree and the amount stormwater the tree can absorb both through its roots, leaves, and bark. In Seattle canopy cover was last measured in 2007 using QuickBird satellite data that collects infrared imagery. The imagery was then evaluated using a geographic information system (GIS) to find the percent land coverage. Although canopy cover is not a perfect measurement, it is a useful one in order to see where trees are and are not present and to gain an understanding of the tree maturity or the number of trees in a given area. See Figure 3 for 2007 canopy cover average percentages by neighborhood. Note the wide discrepancy between neighborhoods and how the presence of parks in a neighborhood greatly adds to the canopy cover average. There are environmental justice implications for uneven canopy cover that will be briefly discussed later in this thesis. The most recent measurement of canopy cover by the City was taken in 2007. Efforts have been made since 2007 to update the canopy cover data, but have encountered barriers with hiring contractors. The Mayor's Office of Sustainability and Environment (OSE) have a goal for producing a 2016 assessment.

The City has a goal to increase canopy cover from the 23% measured in 2007 to 30% by the year 2030. Other cities like San Francisco (13.7% measured in 2012), Los Angeles (21% measured in 2006), Chicago (17% measured in 2012), New York City (24% measured in 2012),

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<sup>25</sup> (American FactFinder 2010)

<sup>26</sup> (Canadian Census 2011)

Portland Oregon (30% measured in 2012), and Austin (30.8% measured in 2014) when last measured mostly had smaller canopy covers than Seattle with three exceptions: Portland, Austin and New York. <sup>27</sup> This comparison is not of much significance because of the different areas of each city. For example, New York City is a much smaller city than Los Angeles, but has a higher percentage canopy cover because of the presence of parks like Central Park. Los Angeles has far more trees because the city is larger in area, but also has much more sprawl and areas that may not support a large canopy tree species. Since 2007 28,463 trees have been planted through City of Seattle programs with a net increase of 19,949 trees. <sup>28</sup> This number however does not account for the number of trees planted or removed from private property by residents who did not use City of Seattle programs.

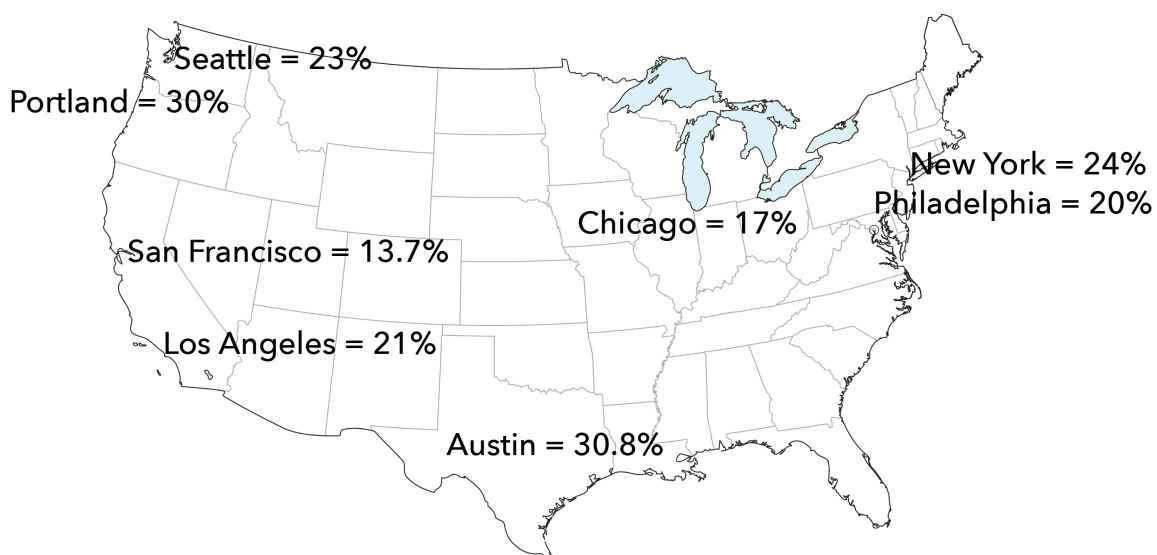


Figure 2: Last measured canopy cover in major US cities. (Source: Author)

<sup>27</sup> (Swae, Short and Flanagan 2016)

<sup>28</sup> (Seattle reLeaf 2016) Over 8,000 trees have also been removed by Parks and Recreation, Department of Transportation, Seattle City Light, and Seattle Center

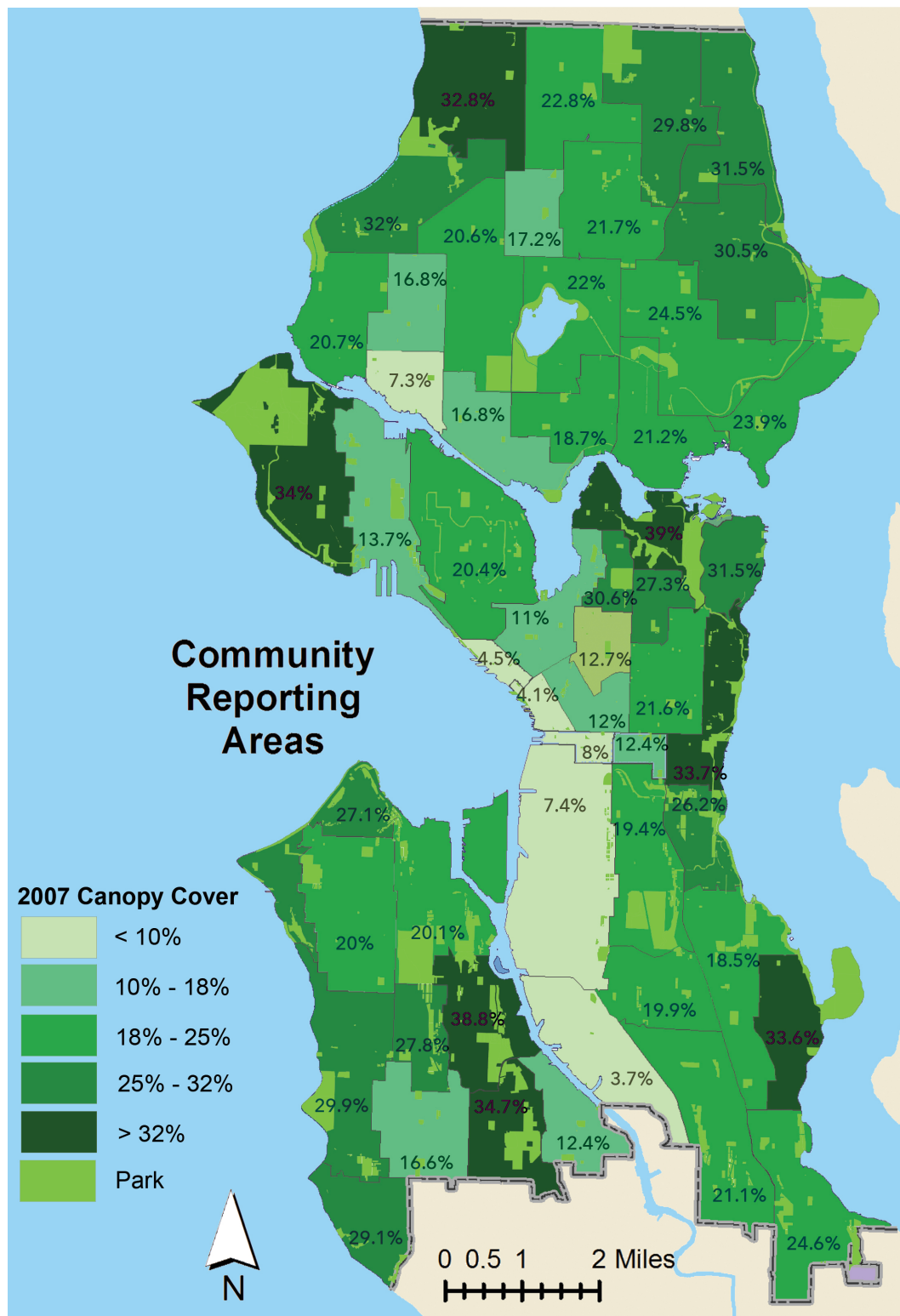


Figure 3: Canopy cover by Community Reporting Area. Data from Seattle reLeaf 2007. (Source: Author)

## Contested tree issues within the City of Seattle

Trees have become a political wedge topic in the City of Seattle. A specific tree on a resident's property can cause strife. The City's goal of increasing the number of urban trees can sometimes conflict with a resident's goal for their own property. There are sometimes issues with infrastructure, like sidewalks and above ground electrical lines or underground sewer lines, when the wrong type of trees is planted in a space where the tree does not fit.

Seattle is known for its views of the Olympic Mountains to the west and views of the Cascade Mountains to the east and surrounding bodies of water. The hilly cityscape creates many opportunities for sweeping vistas. In the past few years topping trees has become more of an issue as the housing market has exploded in Seattle and views of water or mountains increasing property values. By topping trees, homeowners are reducing the health and stability of a tree and creating brittle branches that can more easily be downed in a storm. Similarly, tree removal and trimming around power lines<sup>29</sup> by Seattle City Light and other government entities has been a political issue for tree lovers who see tree removal as a problem related to urban development and a symptom of change in their neighborhoods.

Who owns what tree can be difficult to deduce. Neighborly conflicts arise about property line and management of branches, fruit, roots, leaves, or views. Who is responsible for the regular maintenance of the tree – including proper pruning, watering, and care – depends upon who planted the tree. Whoever plants the tree is responsible for the tree. There are departments within the City government who plant street trees include the SDOT and Seattle City Light (SCL). The city arborists will only step in to manage privately owned street trees in

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<sup>29</sup> It is a federal law to trim back branches from around power lines by ten feet to keep trees from catching on fire.

emergency situations or on a case-by-case basis. Residents are required to acquire a permit from SDOT for pruning branches that are greater than a two-inch diameter on a street tree. The confusion around tree ownership and maintenance often have residents reluctant to invest the time in effort into planting, taking care of their trees, or realizing the benefits of trees.

Roots of trees that have been planted in the wrong place can heave sidewalks creating issues for universal accessibility and leave adjacent property owners fearful of liability from people tripping and falling on pavement in front of their house. This continues to be an issue in the city. By encouraging residents to plant particular trees and discouraging other trees to be planted as street trees, the city is trying to prevent future conflicts between sidewalks and trees. Preventative measures are important and should be further highlighted in city documents. Recently, the city has gone through great lengths to save a row of mature bigleaf maple trees that have caused upheaval of the sidewalk along 8<sup>th</sup> Ave S in the South Park neighborhood of Seattle.<sup>30 31</sup> The most recent plan changes the right-of-way to create a pedestrian lane with a buffer in the current vehicle parking lane and making traffic and parking lanes narrower in order to save the trees and redirect pedestrian traffic. See the appendix for the street section of the forthcoming changes in the right-of-way.

Seattle is known for its beautiful natural environment. Before the city came into being, the land was covered with old growth Douglas fir and other native trees. Because one of the main early industries in Seattle was logging, little is left from these old growth forests. Some people mourn the loss of the original native conifers but urban environments with compacted

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<sup>30</sup> (Allen 2016)

<sup>31</sup> The City no longer allows the planting of bigleaf Maple trees (*Acer macrophyllum*) in planting strips because of their shallow root system and large size.

soil and fill have changed the biology and structure of the soil that does not support many types of large native trees. If we planted only native trees our city would have a completely different urban form because of the amount of space needed for trees to create a healthy maturity, or we would hardly have any trees. Many of the trees in the city are species that have been introduced and are non-native.<sup>32</sup> This thesis will not go into depth on the exact species to plant in Seattle, but this information is available through city and non-profit resources like SDOT's master tree list, and Seattle Tilth.<sup>33</sup>

## Urban Tree Benefits: Introduction

Urban trees are essential for a variety of reasons. They provide many benefits that offset some of the problems created by built human hardscape that defines urban environments. Although this thesis focuses on trees in Seattle, some of these studies cited were done internationally. No matter what city is being studied, these studies are somewhat applicable. Urban trees are particularly important in cities because they make a difference in the environment, improve human health and quality of life, make cities more attractive and safer, and lead to economic benefits. Cities in the United States are home to 62.7% of the U.S. population meaning that to create a livable human environment that people can enjoy on a daily basis, trees must also be included in cities.<sup>34</sup>

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<sup>32</sup> As a note: "non-native" is not the same as "invasive." "Invasive" means that the trees aggressively spread, keep other plants from growing, and/or can change or poison the soil structure.

<sup>33</sup> (City of Seattle 2011)

<sup>34</sup> Numbers from census.gov news release from 2015.

## Environmental Benefits of Urban Trees

Urban trees are important for mitigation of environmental problems and sustainability. Climate change is altering many of our weather patterns and creating an immediate crisis and need to cease the most detrimental human habits and create solutions towards resource conservation and attention to natural systems. Promoting trees in cities is a small but necessary piece of the puzzle to create a healthy city.

Trees **filter out pollutants** by removing dust and pollution particulates. Some trees are especially pollutant resistant and remove a range of different pollutants and airborne particulates. A study in Leicester in the United Kingdom showed that, “trees have a regionally beneficial impact on road traffic emissions by increasing turbulence and reducing ambient concentrations of road traffic emissions by 7% at pedestrian height on average.”<sup>35 36</sup> By acting as natural filters, trees make air quality better and more breathable.<sup>37</sup>

Greening cities and providing canopy cover over blacktop **lessens the effect of urban warming**.<sup>38</sup> In cities and places with more hardscape, the pavement and structures attract and retain heat – making cities warmer than rural or forested areas referred to as “heat island effect.” Including trees in cities provides canopy cover to absorb some of the sun’s energy before it hits the pavement and the built environment becoming heat energy. Trees are an easy and relatively low cost way to create shade and help reduce temperatures in cities.

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<sup>35</sup> This study is especially important because it negates some of the studies that suggested that trees trapped pollution in street canyons by obstructing wind flow.

<sup>36</sup> (Jeanjean, et al. 2015)

<sup>37</sup> (Rao, et al. 2014)

<sup>38</sup> (Kurn, et al. 1994)

Trees provide a natural source of **stormwater management** and improve **water quality** before reaching bodies of water. This is an environmental asset as well as an economic benefit. In Seattle, trees filter out urban pollutants like runoff from roadways and lawns from entering streams, lakes, and the sound protecting our life on land as well as in the water. Stormwater runoff from impervious surfaces often produces more water than our sewers can handle.<sup>39</sup> Trees help to soak up and retain some of the water through evapotranspiration and through their root systems, mitigating the amount of flooding. “The nonprofit American Forests postulates that increasing tree canopy cover in U.S. cities to 40% would add \$100 billion to the \$400 billion in storm water retention benefits that urban trees currently provide nationwide.”<sup>40</sup> In Seattle, the Forest Service and University of Washington researchers did a study in 2012 and reported that the city’s urban forest supplied billions of dollars worth of free stormwater retention per year instead of the city needing to build costly infrastructure to handle the stormwater and implications of stormwater runoff.<sup>41</sup>

Trees are important for the role they play as a ground cover by helping to **stabilize slopes**. Researchers in Pittsburgh, PA had a unique opportunity to study the effects of trees and landslides because of an infestation of Emerald ash borers that caused a loss of many trees on slopes within the city.<sup>42</sup> They found that large canopy species, such as the ash, contribute to urban slope stability. The 75% loss of ash resulted in “roughly 800 new potential landslide initiation locations.”<sup>43</sup> Trees retain water that can cause landslides and root systems can act as

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<sup>39</sup> (Condon and Moriarity 2002)

<sup>40</sup> (Young 2011)

<sup>41</sup> (Mayor and Mapes 2014)

<sup>42</sup> (Pfeil-McCullough, et al. 2015)

<sup>43</sup> Ibid.

webbing to keep soils from slipping and causing damage in urban areas. They also reduce pavement maintenance when planted in the right place. A 2005 study in Modesto, California showed that tree shade was partially responsible for reduced pavement deterioration.<sup>44</sup>

Diversity of species is important for creating a healthy ecosystem. Trees act as **habitat for animals**. They are home to birds, insects, and mammals and create a network of shelter for urban animals. The original Pollinator Pathway is located in Seattle. It is a mile long corridor that runs from 12<sup>th</sup> to 29<sup>th</sup> Avenue on Columbia Street and is planted with pollinator friendly gardens and trees.<sup>45</sup> This project is particularly beneficial because a continuous pathway is important for creating urban areas that can host animals and insects.

By **storing carbon**, trees are an important key in the ecosystem and a way to combat climate change. Other research has been done about how the increase of carbon in the atmosphere has contributed to climate change and the best ways to try to mitigate it, but urban trees storing carbon is an integral way to mitigate climate change within cities.

“Researches approximate that urban trees in the U.S. store 700 million tons of carbon as a long-term sink and annually sequester 23 million tons of carbon valued at \$14.3 billion and \$460 million respectively, depending upon climate, extent of canopy cover, forest age, and species.”<sup>46</sup>

Trees can also **provide fruit** for human consumption and many trees have **medicinal value**. Some trees are used in Eastern medicine and are growing increasingly popular in Western medicine as well. Gingko, Echinacea, and other trees have shown to have medicinal

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<sup>44</sup> (McPherson and Muchnick 2005)

<sup>45</sup> (The Pollinator Pathway 2016)

<sup>46</sup> (Nowak & Crane 2002)

values, and many drug companies are experimenting with trees for their medicinal values. Access to these trees in an urban environment hold potential for future exploration of health security and equality. Fruit trees help provide food security and add to a healthier diet. City Fruit in Seattle is a non-profit corporation whose stated mission in harvesting fruit “promotes the cultivation of urban fruit in order to nourish people, build community, and protect the climate.”<sup>47</sup> Non-profits like City Fruit help to reap some of the rewards that trees provide in an urban environment. They gather unused fruit, educate other on how to harvest and preserve their own fruit, and also promote the sharing of extra fruit. The Beacon Food Forest is sponsored by the Seattle Department of Neighborhoods and is a permaculture project with an edible arboretum.<sup>48</sup> Projects like these highlight some of the benefits that trees can provide to humans and their importance as part of an urban ecosystem.

Trees are an integral part of the urban environment for creating a more sustainable future. Trees moderate the heat island effect, reduce stormwater runoff, improve water quality in streams and lakes, improve air quality by filtering out pollutants, stabilizing slopes and reducing land slides, reduce pavement maintenance, provide habitat for animals, provide food, sequester carbon, and mitigate against climate change. Because of all these benefits, trees are an efficient and relatively inexpensive way to contribute to urban quality of life and sustainability.

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<sup>47</sup> (City Fruit 2016)

<sup>48</sup> (Beacon Food Forest 2016)

## Human Health Benefits of Urban Trees

Studies have shown that trees are good for physical and psychological health. Trees create an overall calming effect, reduce stress, and improve moods. Trees have been shown to help physical wellbeing by creating more walkable environments and speeding up recovery times in hospitals. Trees are important in creating a livable and healthy environment for humans.

Studies have shown that trees are important for psychological health. They reduce stress and fatigue and have a calming effect.<sup>49</sup> A study in London showed that people who lived near trees in the city were on fewer anxiety medications even when controlled for socio-economic status, income, age, and other confounders.<sup>50</sup> Good will between neighbors was also measured in Baltimore, Maryland in conjunction with tree cover. They found that trees are a useful intervention for enhancing “the social ties among neighbors.”<sup>51</sup> This may be because people walked outside more and had friendly interactions with their neighbors or that the presence of trees improved moods of residents in general.

Attention Deficit Hyperactivity Disorder (ADHD) has been studied in conjunction with trees. Studies based on Attention Restoration Theory show that children function better after activities in green settings.<sup>52</sup> One study showed that even views of trees from outside of school

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<sup>49</sup> (Roe, et al. 2013)

<sup>50</sup> (Taylor, et al. 2015)

<sup>51</sup> (Holtan, Dieterlen and Sullivan 2015)

<sup>52</sup> (Faber Taylor, Kuo and Sullivan 2001)

windows improved school performance and concentration.<sup>53</sup> One study showed that children who commuted to school through tree-lined areas had reduced symptoms of ADHD.<sup>54</sup>

The researcher David J. Nowak conducted many studies of the specific benefits of trees. He did a study with colleagues in Syracuse, NY on the fine particulate air pollution that trees remove from the air in ten cities. He found that the particulate matter removed annually by trees, was between 4.7 tons in Syracuse to 64.5 tons in Atlanta. Annual values for the particulate removal varied from \$1.1 million in Syracuse to \$60.1 million in New York City.<sup>55</sup> This particulate matter is associated with pulmonary inflammation, altered cardiac functions, lung cancer, and other air quality related diseases. Nowak found that the monetary value of trees was higher in urban areas for providing positive health effects than in rural areas.<sup>56</sup> The Women's Health Initiative did a study when the Emerald ash borer infected areas in Michigan. The data showed that the loss of trees due to the pest correlated with increased cardiovascular disease.<sup>57</sup>

There have been a few studies of how views from windows have made a difference in hospitals. The initial study was done in 1984 by Roger Ulrich, which showed that patients with hospital beds that had a room that overlooked a stand of deciduous trees sped up recovery times from patients recovering from gallbladder surgery.<sup>58</sup> Other studies have replicated

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<sup>53</sup> (Faber Taylor, Kuo and Sullivan, Views of Nature and Self-Discipline: Evidence from Inner City Children 2002)

<sup>54</sup> Taylor et al. 1988, Taylor et al. 2001

<sup>55</sup> (Nowak, et al. 2013)

<sup>56</sup> (Nowak, Hirabayashi, et al., Tree and forest effects on air quality and human health in the United States 2014)

<sup>57</sup> (Donovan, et al. 2015)

<sup>58</sup> (Austin 2002), (Dwyer et al. 1992) and (Hutchinson 2015)

Ulrich's findings.<sup>59</sup> One found that patients whose hospital windows provided views of trees and landscaping experienced an accelerated recuperation time (8.5% faster) and had a lower consumption of painkilling drugs than those whose windows faced walls.<sup>60</sup> These findings have important implications both for human health and for decreasing costs for places like hospitals or other institutions.

Studies in Portland, Oregon, Munich, Germany, Southern California, Vancouver, Canada, and in Spain, all found a positive association between a larger tree canopy and higher birth weight of babies depending on tree canopy around the mother's home.<sup>61</sup> Peter James, a research associate at Harvard, suggested that any increase in vegetation including street trees "seems to decrease mortality rates"<sup>62</sup> for the entire population.

A team of researchers in the United States, Canada, and Australia found that ten additional trees per block corresponded with a one percent increase residents' perception of health. The researcher stated, "To get an equivalent increase with money, you'd have to give each household in that neighborhood ten thousand dollars – or make people seven years younger."<sup>63</sup> In that study they found that the independent effect of trees on health (controlling for income, age, and education) was the strongest for public street trees.<sup>64</sup> All trees make a difference, but trees in the right-of-way that are shared by all made the biggest difference in their large study in Toronto.

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<sup>59</sup> (Hartig, Mang and Evans 1991)

<sup>60</sup> (Urban Releaf 2012)

<sup>61</sup> (Wolf, et al. 2015)

<sup>62</sup> (Bakalar 2016)

<sup>63</sup> (Kardan, et al. 2015)

<sup>64</sup> (Mooney 2015)

Trees also increase walkability in neighborhoods and lead to an increase in physical activity. By designing streetscapes that are tree-lined, cities create human scale pedestrian-friendly environments and encourage active forms of recreational and utilitarian transportation.<sup>65</sup> Trees encourage healthy behaviors and support outdoor recreation. More green spaces including trees create social areas with increased opportunities for physical activities. Multiple studies have shown the correspondence of green spaces and healthy lifestyles.<sup>66</sup>

### **Design and Safety Benefits of Urban Trees**

Trees are important as design and safety elements along streets and in residential neighborhoods. They are an attractive way to create a safer environment for drivers, pedestrians, and residents. Trees slow drivers down and also reduce stress levels in drivers. People are more likely to walk in tree-lined environments and create a more welcoming environment for pedestrians and increase feelings of safety. Trees also increase safety and reduce crime in neighborhoods.

Drivers go slower down tree-lined streets than in treeless straightaways. Trees create a visual corridor that makes drivers more cautious and attentive.<sup>67</sup> Trees also provide a visual stimulus that makes driving more interesting and keeps the driver more engaged with their surrounding environment.<sup>68</sup> The presence of trees makes people calmer and has been shown to

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<sup>65</sup> (Wolf, City Trees, Nature, and Physical Activity: A Research Review 2008)

<sup>66</sup> (van den Berg, et al. 2015)

<sup>67</sup> (Rosenblatt Naderi, Kweon and Maghelal 2008)

<sup>68</sup> (Wolf, Roadside Urban Trees: Balancing Safety and Community Values 2006)

reduce feelings of road rage when driving down streets.<sup>69</sup> Calmer drivers make for safer drivers and fewer car accidents.

Trees also act as safety buffers for pedestrians on sidewalks. Street trees between the sidewalk and the road create a visual and physical screen that makes walking feel safer. People are more willing to walk in neighborhoods that have trees, making the sidewalk feel safer overall because of the presence of others.

Trees have their own innate aesthetic worth. Some trees flower, turn colors in the fall, attract wildlife, produce fruit, or have other interesting characteristics adding value to the landscape. They add privacy around residential homes and can sometimes be a good alternative to fences. Trees can also be used to enhance architecture or accentuate and frame views.

There are lower levels of crime in urban environments in areas with better landscaping and trees. There are stronger relationships among neighbors and fewer reports of domestic abuse and less crime.<sup>70 71</sup> Frances E. Kuo studied inner-city public housing residents in Chicago who were randomly assigned buildings with varying levels of surrounding trees and grass. She found that residents who lived in barren buildings, “reported more aggression and violence than did their counterparts in greener buildings.”<sup>72</sup> In another study Kuo found that buildings with surrounding vegetation had 48 percent fewer property crimes and 56 percent fewer

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<sup>69</sup> (Dixon and Wolf 2007)

<sup>70</sup> (Weinstein, et al. 2015)

<sup>71</sup> (Urban Releaf 2012)

<sup>72</sup> (Kuo and Sullivan 2001)

violent crimes than apartments barren of vegetation in Illinois.<sup>73</sup> Similar studies in Portland, Oregon,<sup>74</sup> New Haven, Connecticut,<sup>75</sup> Philadelphia, Pennsylvania,<sup>76</sup> and the Baltimore Maryland<sup>77</sup> area also found that trees in the public right-of-way are associated with lower crime rates.

## Economic Benefits of Urban Trees

There are economic benefits to having trees within urban areas in residential, commercial, and industrial areas. A report from Stockholm evaluated the monetary benefits of trees by looking at their “urban ecosystem services” and through local pollution removal, carbon sequestration and storage, regulating water flows, climate regulation/cooling effects and aesthetics, recreation and other amenities.<sup>78</sup> They concluded that the trees and greenery in urban areas save cities and utilities a lot of money. They use monetary valuation in the studies to show values in these three different categories.<sup>79</sup>

A researcher at the University of Washington, Kathleen L. Wolf, has done many studies that tie trees with economic benefits for storeowners. Some of her studies have shown that people spend more money in areas with trees. Shoppers are willing to spend more time in commercial areas with trees.<sup>80</sup> Commercial tenants are also willing to pay more in rent for spaces with ample landscaping.<sup>81</sup>

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<sup>73</sup> (Kuo and Sullivan, Environment and crime in the inner city: Does vegetation reduce crime? 2001)

<sup>74</sup> (Donovan and Prestemon, The Effect of Trees on Crime in Portland, Oregon 2010)

<sup>75</sup> (Gilstad-Hayden, et al. 2015)

<sup>76</sup> (Wolfe and Mennis 2012)

<sup>77</sup> (Troy, Grove and O'Neil-Dunne 2012)

<sup>78</sup> (Elmqvist, et al. 2015)

<sup>79</sup> See appendix for attached tables

<sup>80</sup> (Wolf, Business District Streetscapes, Trees, and Consumer Response 2005)

<sup>81</sup> (Wolf, More in Store: Research on City Trees and Retail 2009)

Trees boost property values between 3.5% and 10%.<sup>82</sup> In a study of Portland, Oregon published in 2010, scientist Geoffrey H. Donovan found that on average, street trees add \$8,870 to home sale prices and reduce the time-on-market of houses in Portland by 1.7 days.<sup>83</sup> There is an increase in desirability of an area if there are mature trees rather than no trees. Urban greenness was also studied in Philadelphia, Pennsylvania indicating that there is a relationship between greenness and socio-economic conditions.<sup>84</sup> There are questions about what comes first – the trees or the people with higher incomes, but there is a strong correlation between the two.

Trees are a substitute for other forms of expensive mitigation of environmental problems discussed earlier. They reduce the need to create infrastructure to control stormwater, they clean the air, and offset emissions.<sup>85</sup> There are particular trees that work well for noise buffering from adjoining properties or roadways. Planting trees along a roadway can reduce sound 20 decibels.<sup>86</sup> Some trees act as windbreaks and can protect residential homes from wind or protect soil from erosive winds.<sup>87</sup>

Planting trees strategically around buildings saves on utility costs. Mature trees shade houses in the summer and reduce temperatures and need for air conditioning. In the winter, trees help to protect buildings from cold winds and can reduce heating costs for homeowners.

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<sup>82</sup> (Anderson 1988)

<sup>83</sup> (Donovan and Butry, *Trees in the city: Valuing street trees in Portland, Oregon* 2010)

<sup>84</sup> (Pearsall and Christman 2012)

<sup>85</sup> (McPherson, et al. 2005)

<sup>86</sup> (Nadel and Oberlander 1977)

<sup>87</sup> (USDA National Agroforestry Center 2012)

There have been a few initiatives, like i-Tree<sup>88</sup> and OpenTreeMap, which have designated monetary values for trees.<sup>89</sup> In 2010 these programs helped to produce estimates that trees saved an estimated 850 lives and prevented about 670,000 cases of severe respiratory problems and absorbed \$4.7 billion worth of pollution filtration in cities alone.<sup>90</sup>

### Summary of Benefits

Clearly, trees are a major benefit to the City of Seattle. They improve the environment, human health and wellbeing, increase safety, and save the city money. Trees are an important tool for creating a more just and livable city. Continuing to prioritize incorporating trees into Seattle as neighborhoods accommodate an increase in population should be a priority.

## III. EXISTING SEATTLE PLANS FOR TREES

Trees are integral to Seattle's identity. Its nickname of "The Emerald City" was established in 1982 inspired by the native evergreen forests in the region. It pays homage to Seattle's history as a logging town as well as to the natural beauty that is still valued in the city. The first Seattle plan that dealt with trees was the Comprehensive System of Parks and Parkways report in 1908 by the Olmsted Brothers Landscape Architecture firm. It included planting plans and greenbelts of trees. In 1967 Operation Green Triangle was created to beautify street triangles and also included the Urban Tree Replacement Program from Seattle City Light, the Millennium Woods Legacy Project from Parks and Recreation, and the Fall Tree

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<sup>88</sup> For more information see <https://www.itreetools.org>

<sup>89</sup> For more information see <https://www.opentreemap.org>

<sup>90</sup> (Schiller 2014)

Fund by the Department of Neighborhoods. (See appendix for timeline of Seattle’s urban forestry history).

I found three main implementation tools to draw from for assessing urban forestry programs within the city. The three plans I picked are highlighted on the interdepartmental City of Seattle urban forestry website – Seattle reLeaf.<sup>91</sup> The website calls out a few important manuals including the Street Tree Manual from SDOT, Tree Protection Regulations from the Seattle Municipal Code, and the Urban Forest Stewardship Plan. These plans also point to other plans. References to them are included and taken into account for the forthcoming suggestions for promoting trees within Seattle.

Many of Seattle’s plans discuss trees and greening the city. Seattle has recently released the Comprehensive Plan update with a goal for adoption by City Council by the middle of 2016. The Comprehensive Plan states in the introduction, “Seattle is a growing city. We use this Comprehensive Plan to manage growth in a way that benefits all of the city’s residents and preserves the surrounding natural environment.”<sup>92</sup> The implementation tools are based on the Seattle Comprehensive Plan that has citywide and neighborhood goals and policies. With the changes in the Comprehensive Plan, there is potential for some of the implementation tools to change and improve with a focus on trees. In this plan recommended by Mayor Murray, the city acknowledges that there are potential conflicts between green spaces and development: “Even as the city becomes increasingly urban, Seattle is dedicated to protecting and restoring

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<sup>91</sup> <http://www.seattle.gov/trees/> Seattle reLeaf is a program housed in Seattle Public Utilities and is a resource for residents for questions and programs surrounding trees in the city.

<sup>92</sup> (Murray 2016)

the green spaces and water that makes our city special.”<sup>93</sup>

Density and development has changed the canopy cover in Seattle. To demonstrate the change, Seattle reLeaf developed a presentation in 2011 using the latest city canopy cover data from 2007. It showed the change in canopy cover in areas that were redeveloped between the 2002 and 2007 measurements. The amount of development and construction in Seattle has only increased since these numbers were measured.

## Redeveloped Parcels Only

(average canopy cover change on parcels that underwent redevelopment between 2003 and 2007)

Zoning Category	Average 2002/3 Canopy Cover	Average 2007 Canopy Cover	Total Change in Canopy (Acres)
Commercial/Mixed Use	6.5%	4.3%	-4.91
Developed Park or Boulevard	10.9%	10.8%	-0.02
Downtown	4.4%	1.7%	-0.81
Major Institutions	21.9%	21.3%	-1.03
Manufacturing/Industrial	3.3%	3.4%	0.18
Multi-Family	17.6%	5.4%	-9.15
Parks Natural Area	93.1%	77.8%	-0.07
Single Family	30.0%	17.9%	-19.47
<b>TOTAL</b>	<b>13.1%</b>	<b>9.4%</b>	<b>-35.28</b>

Figure 4: Numbers from Seattle reLeaf presentation March 2011

The numbers in Figure 4 show that there is much room for improvement in how we replace and incorporate trees into all redevelopment plans. They show that we should pay special attention to Commercial/Mixed use, Multi-Family, and Single Family zones. The average

<sup>93</sup> (Murray 2016)

canopy cover percentage in these different zones all decreased, except for an increase of 1% in Manufacturing/Industrial areas. The total number of acres lost in the different zones is in the far right hand column. Commercial/Mixed Use zones lost 4.91 acres of canopy during development, Multi-family zones lost 9.15 acres of canopy during development, and Single Family zones lost 19.47 acres of canopy during development. Canopy cover loss from these three zones accounted for over 95% of the total canopy cover loss between 2002 and 2007 on redeveloped parcels. These three zones are the focus for the design and policy guidelines in this thesis.

There are two basic ways to promote more trees within the city especially while more built density is happening in Seattle. One way is to plant trees, and the other is to keep healthy trees from being removed. There are many planting initiatives in the city. They are not well advertised, but they are present. Seattle City Light (SCL) and Seattle Department of Transportation (SDOT) both plant trees along residential streets. The Seattle reLeaf Trees for Neighborhoods program gives out up to four trees per resident per year to plant along the street or in their yard. There are non-profits like DIRT (Duwamish Infrastructure Restoration Training) Corps that also give away free trees. Programs like these help to increase the urban tree canopy. Tree planting in Seattle is still about choice on private property. Other cities require trees to be planted on properties that are being redeveloped or are having a certain amount of remodeling done.

The regulations surrounding tree removal are different for various departments. SDOT protects all trees they planted along roads (in the public right-of-way) as long as they are healthy and not a danger to people. When city departments remove trees, their goal is to

replace a tree with two healthy trees. The Department of Construction and Inspections<sup>94</sup> has a few regulations regarding private property surrounding exceptional<sup>95</sup> trees, but does not have requirements for all other trees on private property or for replacing removed trees.

## Format for Evaluation of Plans and Guidelines

Through this thesis, Seattle's existing plans, case studies from other cities' plans, and survey results will be evaluated within the following categories. **Funding and support** evaluates how the plan addresses financial support of the urban forestry program. **Advocacy and education** evaluates how trees are promoted and how the program does public outreach. **Collaboration** addresses whether the urban forestry programs work with others including other city departments or nonprofits. **Design and enforcement** refers to the design guidelines, (existing or proposed) and methods of enforcement for keeping trees in the city. The recommendations for the City of Seattle will also be laid out with these same four subcategories.

## Tree Protection regulations in Seattle

The Seattle Municipal Code chapter 25.11 is Tree Protection Regulations.<sup>96</sup> It includes restrictions on tree removal (25.11.040), provisions for exceptional tree determination (25.11.050), tree protection for development (25.11.060-080), tree replacement and site

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<sup>94</sup> Formerly the Department of Planning and Development (DPD) which has split into two departments, the Department of Construction and Inspections and the Department of Planning and Community Development.

<sup>95</sup> Exceptional trees are designated as heritage trees by the City of Seattle or they are rare or exceptional by size, species, condition, cultural/historic importance, age, and/or contribution as part of a grove of trees (Director's Rule 16-2008)

<sup>96</sup> See [https://www2.municode.com/library/wa/seattle/codes/municipal\\_code](https://www2.municode.com/library/wa/seattle/codes/municipal_code) for updates to the SMC

restoration (25.11.090), and enforcement and penalties (25.11.100). Chapter 25.09 of the Seattle Municipal Code is about regulations for environmentally critical areas with 25.09.320 referring specifically to trees and vegetation. Chapter 15.43 pertains to tree and vegetation management in public places. It refers to tree preservation and protection, permits needed for pruning, planting, or removal of trees in the right-of-way, and the maintenance of trees.

The current tree protection code for private land is for regulating “exceptional” trees. The other regulation around keeping trees is if the developer is building in an environmentally critical area (SMC 25.09.320) or if the developer is asked to retain landscaping or use the Green Factor – which can include planting trees. The Green Factor is a score-based requirement for new development to include items like more landscaping, adding trees, green roofs, permeable paving, and public access.<sup>97</sup> The score is established by zoning and square footage of the parcel.<sup>98</sup>

## Street Tree Manual

The purpose of the Street Tree Manual is, “to clarify the intent and scope of the Street Tree Ordinance updated in the spring of 2013 after more than 50 years.”<sup>99</sup> This manual is friendlier and more accessible than the Seattle Municipal Code and guides residents, developers, and city workers through trees in the right-of-way. The chapters are short and include guides for permitting, planting, pruning, and removing street trees. Because the manual was produced by the Seattle Department of Transportation, (SDOT) it does not deal

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<sup>97</sup> From the Green Factor Score Sheet. Can be found at <http://www.seattle.gov/dpd/codesrules/changestocode/greenfactor/documents/default.htm>

<sup>98</sup> For information on early assessment of the Seattle Green Factor see (Stenning 2008)

<sup>99</sup> (The Seattle Department of Transportation 2014)

with yard trees, only street trees in the right-of-way. The manual also includes appendices with forms, recommendations, and suggestions.

## The Urban Forest Stewardship Plan

The Urban Forest Stewardship Plan from 2013 assesses Seattle’s urban forest and describes the existing programs and policies. It defines a path forward with goals, priorities, strategies, and funding options and also leaves room for improvement intending updates and calling it a “living document.” The vision statement is:

“Seattle’s urban forest is a thriving and sustainable mix of tree and understory species and ages that creates a contiguous and healthy ecosystem that is valued and cared for by the City and all of its residents as an essential environmental, economic, and shared community asset that reinforces Seattle’s identity and legacy as a forested livable city.”<sup>100</sup>

The document is an accessible policy document that educates as well as laying out goals, strategies, and priorities. However, it is not clear for whom the document was created. There are evocative photos that make it friendly for public consumption, but I cannot imagine a typical citizen sitting down and reading this document.

In 2002, Seattle began a partnership with Forterra, then known as the Cascade Land Conservancy (CLC) on an initiative that became the Green Seattle Partnership (GSP).<sup>101</sup> Cascade Land Conservancy worked with the Seattle Parks and Recreation department, Seattle Public Utilities, and the Mayor’s Office on the Environment. The GSP focuses on trees in parks and open spaces in the city – land that, for the most part, does not have the same conflicts with development.

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<sup>100</sup> (Urban Forestry Commission 2013)

<sup>101</sup> (Noonan 2007)

## Other Related Plans and City Documents

Other plans and guidelines within the City of Seattle also mention trees and include: The Pedestrian Master Plan, City Design guidelines, the Complete Street Assessment, Seattle City Light's Right Tree book, the SDOT Transportation Levy to Move Seattle, The Tree and Sidewalks Operations Plan, and the Stormwater Management Manual. These plans have information that was taken into account for my forthcoming suggestions.

The Pedestrian Master Plan identifies ways to make Seattle more safe, equitable, vibrant, and healthy and defines actions to make the city the most walkable city in the nation. The plan addresses paving conflicts with street trees and provides solutions with suggested sizes for tree pits. City Design guidelines provide suggestions for how to provide shade, provide habitat for animals, how to use trees for natural drainage systems on site, and the importance of trees in residential areas or as buffers for privacy.

The Complete Street Assessment includes trees as an important part in creating a "complete street." Complete Streets aim to have multiple modes of transportation, and be attractive and safe places to walk. Examples of Complete Streets in Seattle include 15<sup>th</sup> Ave NE, Columbian Way, and NE 125<sup>th</sup> Street.<sup>102</sup>

Seattle City Light's Right Tree book shows planting options and education for how to plant the right tree for the amount of space and light available. This book is meant for residents and focuses on how trees can interfere with overhead electrical wires. The book also includes a list of trees with some details of the features of the trees.

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<sup>102</sup> (Department of Transportation 2016)

The SDOT Transportation Levy to Move Seattle prioritizes funding programs for transportation maintenance and improvements with a commercial parking tax. The levy provides funding for tree pruning and planting with suggestions for how to allocate funds. SDOT and SvR Design Company in Seattle and created the Trees and Sidewalks Operations Plan to clarify SDOTs work in street maintenance and urban forestry in partnership with residents, businesses, and property owners. It provides guidance on installation, repair, and maintenance of sidewalks and street trees in the right-of-way. The Stormwater Management manual makes suggestions and puts forward best practices for planting trees to help mitigate stormwater. It also includes a small section about how to protect trees from construction equipment, grade change, and excavation and links to tree protection and preservation requirements.

## Assessing the documents

### Funding and Support

Financial support for urban forestry in the city comes from a mix of nonprofit and City of Seattle resources. The City documents show that funding consistently comes from the Seattle General Fund, Seattle Public Utilities, and Seattle City Light. The SDOT also has funding for planting and maintaining street trees. The Parks and Recreation Department manages trees within the designated parks land. Levies like “Move Seattle” as well as the 2000 Pro Parks Levy and Bridging the Gap (2006) have provided additional funding for urban forestry. A few of these plans make suggestions for partnering with the Seattle business community in order to increase funding and stewardship of the trees. All programs within the City could use additional resources in terms of funding and staff time. For example, some of the trees that are

taken care of by SDOT are years behind their routine maintenance. Seattle could also take cues from other major cities for creative funding options, which will be addressed in the case study section.

## Advocacy and Education

Much of the load for advocacy and education for urban trees is lead by Seattle reLeaf. Since the program is located with Seattle Public Utilities (SPU), its focus on urban trees comes from the utilities and stormwater perspective. This is partially because of the substantial amount of money the City saves on stormwater runoff and water filtration. The team is very small for the amount of work it does: two staff members, an intern, and support from other departments. Advocacy and education within Seattle also comes from non-profits and NGOs like PlantAmnesty, Forterra, and City Fruit.

## Collaboration

Seattle reLeaf also works with Parks, SDOT, SCL, and other City organizations in order to increase community involvement in the stewardship of trees. They recognize that the City can only do so much in taking care of and promoting trees, so they aim to provide resources for residents to plant and care for their own trees. Seattle reLeaf is the main outreach branch for the City and is meant to be a resource for residents.

The Department of Neighborhoods has a program called the, “Neighborhood Matching Fund’s Tree Fund” where groups of five or more households on residential streets with planting strips and sidewalks can request 10-40 trees. These residents are then responsible for planning

and maintenance. This program works with the SDOT to make sure the planting project is reasonable.

The Urban Forest Commission (UFC) is an interdepartmental team that created and maintains the Urban Forest Stewardship Plan (UFSP) and works to advise the Mayor and City Council about the establishment of policies and regulations around trees and vegetation. The UFC has ten members. The mayor appoints five, four are appointed by City Council, and appointed commissioners elect one member. Positions are designated in the following way in order to be multi-disciplinary with one position for a: wildlife biologist; urban ecologist; representative of a local, state, or federal natural resource agency; hydrologist; arborist; landscape architect; representative of a non-profit or NGO; representative of the development community; economist; and a young adult. They serve without compensation and have staggered three-year terms.

## **Design and Enforcement**

The SDOT puts signs on trees for a couple of reasons. Signs near development provide education on the monetary value of a tree. Others are a warning that the tree will be removed in the right-of-way. These signs give the public a chance for comment by calling a phone number and also educate people on the value of trees. We do not have a comprehensive tree ordinance for private property – this is a major obstacle to tree protection that influences the health and livability of Seattle as density increases.



Figure 5: Protect Tree notice from SDOT showing the tree valued at \$2,100 and what protection of the tree means. (image from SDOT Flickr via Flickr Creative Commons)



Figure 6: Public notice for tree removal and replacement and graffiti “no” on 24<sup>th</sup> Ave NW<sup>103</sup>

<sup>103</sup> (Seattle Department of Transportation 2011)

## IV. CITY CASE STUDIES

### Introduction

We can look at other cities, to glean ideas from what their urban forestry programs have accomplished and the tools they use to achieve success. Seattle can use these ideas in its plans for promoting trees despite the densification of the city. Most of the major cities in the United States have urban forestry plans because trees need constant maintenance and stewardship. A few cities have plans and municipal codes of particular interest because of their relevance to the case of Seattle. The three plans that I will discuss are those of Portland Oregon, Austin Texas, and Philadelphia Pennsylvania. Seattle is often compared to Portland because of proximity, and similarity of climate, and culture. Austin is a progressive city and like Seattle it has experienced an increase in population over the past ten years. Philadelphia has a creative plan that has innovative funding strategies and non-profit stewardship. After reviewing the plans and municipal codes of numerous cities, I chose these three based on literature and survey input that cited them as having particularly good urban forestry practices.

### Portland, OR

The last Portland Urban Forest Management Plan is from 2004. Since 2004 there was a 2007 Urban Forest Action Plan that proposed action items based on the Management Plan. On the Portland urban forest website, they have Urban Forest Action Plan Implementation updates from 2009 through 2014.<sup>104</sup> They have a fairly active urban forestry program and Seattle and Portland are in the Cascadia region with a similar climate. Highlights of Portland's program as

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<sup>104</sup> (City of Portland 2016)

they apply to funding and support, advocacy and education, collaboration, and design and enforcement follow.

## Funding and Support

The aspects of funding and support that Seattle could find useful include how Portland collects fees and designates funds. Portland has an Urban Forestry Fund, a Tree Planting and Preservation Fund, and accepts charitable contributions. They are outlined in Portland's Charter, Code, and Policies in Chapter 11.<sup>105</sup> Money for the Tree Planting and Preservation Fund comes from four different sources as stated in Chapter 11.15, Funds and Contributions:

1. Payment made in lieu of tree replacement as part of a tree permit issued as stated in Chapter 11.40;
2. Payment made in lieu of preservation or planting where site or street characteristics or construction requirements make it infeasible to meet the requirements of chapter 11.50;
3. Payment of restoration fees for enforcement actions for Private Trees; and
4. Voluntary contributions. The funds shall be used within the watershed of the contributor's choosing.<sup>106</sup>

Funding for the Urban Forestry Fund comes from two different sources as stated in Chapter 11.15.020:

1. Payment of restoration fees, civil penalties, or civil remedies resulting from City or Street Tree enforcement actions; and
2. Voluntary contributions<sup>107</sup>

The City Forester administers both funds in dedicated separate accounts independent of the general fund. This additional funding provides some flexibility in spending for their urban forestry department.

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<sup>105</sup> (City of Portland 2015)

<sup>106</sup> (City of Portland 2015)

<sup>107</sup> (City of Portland 2015)

## Advocacy and Education

In 2014 Portland Parks and Recreation Urban Forestry developed educational workshops for staff and developers to learn about tree planting requirements during development. Also discussed was how to select the right tree species for a site and provided information about species diversity. Attendees at the workshops included contractors, permit applicants, property owners, neighborhood representatives, and urban forestry volunteers.<sup>108</sup> They targeted an important audience in order to disseminate their message effectively. Seattle could also develop targeted workshops such as these.

## Collaboration

Portland has an Urban Forestry Commission (UFC), a volunteer group of eleven members serving four-year terms that advises the City Forester, the Director of Parks, and the City Commissioner who oversees Portland Parks & Recreation (PP&R). They have a robust non-profit partnership with Friends of Trees and the Bureau of Environmental Services. Seattle has similar collaboration strategies, but their partnerships with nonprofits are potentially even more robust than Seattle's partnerships.

## Design and Enforcement

The Portland Municipal Code Chapter 11 on trees went into effect on January 1, 2015.<sup>109</sup> Chapter 11.50 is specifically about Trees in Development Situations. It includes tree preservation standards, on-site tree density standards with requirements for different

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<sup>108</sup> (Bohannon 2014)

<sup>109</sup> (City of Portland 2015) Find code online at <https://www.portlandoregon.gov/citycode/?c=66002>

development types, and street tree planting standards that go along with development.

Portland's code requires that applicants preserve and protect at least 1/3 of the trees 12 inches and larger in diameter located on the development site (PMC 11.50.040). New development, exterior alternations, and additions have a required tree area and density for development type.<sup>110</sup>

Portland's tree code requires a permit to remove a tree on private property. The city provides assistance on how to remove dangerous trees, but requires that a new tree be replanted to replace the removed tree. Seattle has a goal of replacing two trees for every one tree removed on City property or removed by City entities. This strategy is not mandated, nor is it required on private property.

## Austin, TX

Austin's Urban Forest Plan<sup>111</sup> ranks "Development" as number one top threat to the urban forest. Austin City Council adopted "Austin's Urban Forest Plan: A Master Plan for Public Property" on March 6<sup>th</sup>, 2014. The plan is supported by other documents like the Environmental Criteria Manual that provides requirements for trees in natural preservation areas designated by Austin's Land Development Code. There are other Urban Forest Initiatives that include an Invasive Species Management Plan and a Community Wildfire Protection Plan. There are also programs specific for park trees, greenbelts and preserves, residential trees, and street trees. Austin is a city that has seen a lot of change and development in the past ten years and is regularly ranked by the US Census, Forbes, and USA Today as among the fastest growing

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<sup>110</sup> More information can be found at <https://www.portlandoregon.gov/citycode/article/514739>

<sup>111</sup> (Urban Forestry Board 2014)

cities in the United States. Highlights for Austin’s program as they apply to funding and support, advocacy and education, collaboration, and design and enforcement follow.

### Funding and Support

Austin’s planting program is partially funded through Austin Energy. Austin also has a Planting the Future Fund (PFTF) that was established in 1991.<sup>112</sup> The fund was meant to aid in meeting an ambitious community goal of planting one million trees by 2000. The fund also provides materials, promotes education, and facilitates preservation of existing trees. PFTF revenues come from contributions that utility customers make by checking a box on their bill specifying a donation amount adding to their utility payment. Mitigation fees are added to the fund when trees on Parks and Recreation properties are destroyed. The PFTF revenues also come from citizens and businesses who contribute to the fund.

### Advocacy and Education

Austin’s program NeighborWoods, is a collaboration between Austin’s Parks and Recreation Department and the nonprofit TreeFolks. NeighborWoods distributes trees, and also does outreach. The program educates neighborhood groups about the value of street trees and what benefits trees add to their property and the community. Austin’s Urban Forestry department has a website which includes Tree Resources and a section on Development and Tree Protection.<sup>113</sup>

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<sup>112</sup> (City of Austin n.d.)

<sup>113</sup> (City of Austin n.d.)

## Collaboration

The City's Urban Forestry department works with Austin Water Utility, Watershed Protection Department, Public Works Department, Austin Energy, and the Office of Sustainability.<sup>114</sup> Austin has a few different planting groups. Some tree plantings are public and are administered by Parks and Recreation and the Urban Forestry Department.<sup>115</sup> The city also works with TreeFolks through the program NeighborWoods which delivers street trees on residential property for free. Austin's partnership with NeighborWoods allows tree planting to span across private and public entities with the benefits of each.

The city's program Great Streets works with private developers to create streetscapes that go beyond the minimum requirements. The city offers financial assistance to offset the costs of streetscape work and requires that when new asphalt is put down, one percent of the project's costs must be dedicated to incorporating and caring for trees.<sup>116</sup>

## Design and Enforcement

The City Council adopted one of the most progressive tree ordinances in the country in 1983. Their Land Development Code addresses preserving trees and requirements for tree removal. Austin's Land Development Code contains a subchapter on tree and natural area protection (Chapter 25-8 B).<sup>117</sup> There are very specific requirements for tree removal in the city that can only be given exceptions by the Planning and Review department.

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<sup>114</sup> (Werts, et al. 2012)

<sup>115</sup> Parks and Recreation department and the Urban Forestry Program plants between 500-1,000 trees annually

<sup>116</sup> (Werts, et al. 2012)

<sup>117</sup> (The City of Austin 2016) Find code online at

The code includes requirements that a site plan includes a certain number of trees depending on the yard size. A landscape yard that is less than 10,000 square feet must have at least one tree for each 1,000 square feet. A landscape yard that is 10,000 or more square feet must contain at least ten trees plus at least one additional tree for each 2,500 square feet over 10,000 square feet. A landscape yard that is over 110,000 or more square feet must contain at least 50 trees plus at least one additional tree for each 5,000 square feet over 110,000. Landscaped areas that are at least eight feet wide must include a newly planted tree (Chapter 25-2-1005).

The code also requires the inclusion of trees in parking lots of varying sizes, (Chapter 25-2-1007). Parking lots must have end islands landscaped with trees and a tree must be located within 25 feet of each parking space adjacent to a median. A particular density of trees is required in single-family residential areas (Chapter 25-2-1032). Austin’s definition of allowable tree “removal” requires that the tree be expected to die because of uprooting, severing the main trunk, damaging the root system, or excessive pruning.<sup>118</sup>

Austin’s Heritage Tree Ordinance was passed in 2010 and protects public trees as well as trees on private property of particular species.<sup>119</sup> Austin’s development application regulations (Chapter 25-8-604) require that the site plan demonstrates that trees eight inches or larger in diameter must be retained. If development is unable to continue without removing a tree that is eight inches in diameter or larger, then the planting of replacement trees is required. A person cannot remove a protected tree (a tree whose diameter is more than 19 inches) without

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<sup>118</sup> (City of Austin n.d.)

<sup>119</sup> Species include Texas ash, Bald cypress, American elm, Cedar elm, Texas madrone, Bigtooth maple, all Oaks, Pecan, Arizona walnut, or Eastern black walnut that are 24 inches or more that are 4.5 feet above natural grade.

a permit from the Planning and Review Department. Chapter 610S.4 is about Construction Methods including how to protect trees during construction, how to prune for development, and how to pave around trees by including a tree grate. All newly planted street trees need to have a minimum of a five-inch caliper (measured 12 inches above the root ball) at installation. The standard street tree spacing is 22 feet and shade trees shall not exceed 30 feet spacing and utility compatible trees shall not exceed 24 feet. The specific codes are progressive and are measures that Seattle could enact in order to make sure trees are included within new construction.

## Philadelphia, PA

Philadelphia, Pennsylvania is one of the oldest cities in the countries. The city has ongoing housing and environmental justice issues, but are using creative engagement and funding solutions to encourage trees in the city. Philadelphia's urban forestry program is in the Parks & Recreation department. The Parkland Forest Management Framework was last updated April 2013 and addresses trees primarily in parks.<sup>120</sup> The City has had a lot of success with public/private partnerships that help provide education and funding. Highlights of Philadelphia's program as they apply to funding and support, advocacy and education, collaboration, and design and enforcement follow.

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<sup>120</sup> (Philadelphia Parks & Recreation 2013)

## Funding and Support

Urban Forestry programs in Philadelphia are mostly funded through grants and rely on Fairmount Park’s experience with grant writing and creative funding strategies.<sup>121</sup> The City receives funding for tree purchase and removal from the general fund, but is lacking in funding for maintenance and cannot use capital funds to plant on private property. Philadelphia has worked with banks like Wells Fargo and TD Bank to give away trees with TreePhilly for residents to plant in their yards.

## Advocacy and Education

TreePhilly also works with community partners like Keep Philadelphia Beautiful and a group of realtors who inform new homeowners about their yard tree giveaway programs.<sup>122</sup> Another program that TreePhilly runs is TreeKeepers, which is a work development program that supports ex-offenders by providing them training and education and job opportunities.

The Mayor’s plan through the Office of Sustainability is called “Greenworks Philadelphia.” It educates people about how trees make a difference for energy, environment, equity, economy, and engagement. The two focuses of Philadelphia’s urban forestry program are planting trees and community engagement and education.

## Collaboration

Philadelphia Parks & Recreation program started as a collaboration between the Fairmount Park System and the Department of Recreation. The initiative TreePhilly is a program from Parks and Recreation but also has nonprofit partnerships like Fairmount Park

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<sup>121</sup> (Werts, et al. 2012)

<sup>122</sup> (Philadelphia Parks & Recreation n.d.)

Conservancy and corporate partners like TD Bank. The City also have a program to do outreach through community development corporations and civic associations.<sup>123</sup>

## Design and Enforcement

Philadelphia has a Heritage Tree program for preserving special trees. The zoning code chapter 14-705 states that all healthy trees that are lost due to development activities that are 2.5 inches DBH (diameter at breast height) or larger must be replaced and indicated on the site plan. The total caliper of all of the replacement trees must be more than the total caliper of all trees removed from the lot and each tree must be larger than 2.5 inches DBH at planting. The municipal code also gives credits to developers who preserve existing trees.

## V. SURVEY SYNOPSIS

In order to get a sense from the people in Seattle who currently work with trees about how this work was going, I sent out a brief ten-question survey. I wanted to find out how these people felt about density, who they thought were helping to meet their goals, if density and development was a barrier to their goals, and how various entities worked together. See appendix for the survey in full. I asked questions related to funding and support, advocacy and education, collaboration, and design and enforcement. The survey was open for over a week and sent using email through Google Forms embedded in the email. There are many opinions on how trees and density interact, which entities do the most work, and how urban forestry can be improved in Seattle. This section will explore some of the findings and contributed to final recommendations.

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<sup>123</sup> (Philadelphia Parks & Recreation n.d.)

## Sample Population

I sent the survey to fourteen people whom I have had either had contact with before, or who I know do extensive work on the topic of Seattle's trees. I received ten survey responses. Six of the respondents worked at the City of Seattle, one identified as an academic, and three stated that they worked for a non-profit or nongovernmental entity (NGO). None of the respondents identified as "developer or real estate adjacent" or filled in an "other" category.

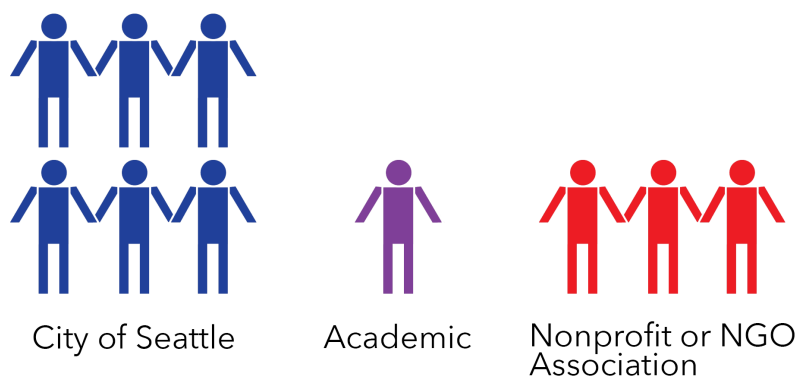


Figure 7: Survey responses for, "How would you describe your position?" (Source: Author)

Two academics and two developers/real estate adjacent people asked did not submit the survey.

## Bias

This survey is biased because of whom I asked and who responded related to my position as an intern with the City of Seattle in the reLeaf office. I work the most with city officials and non-profits and so my original sample size for these populations was larger. These people know me well and see me regularly so they may have felt more pressure to complete the surveys. The answer to one question in particular reflects this bias, I asked where they

personally would go for information about trees before doing any tree work in the city and three of them responded that they would go to reLeaf's website.

## Results

Respondents were allowed to skip questions they felt uncomfortable answering. Most of the questions were long answers to which I got varying degrees of details in their responses. Some of the results from the survey are detailed in the appendix. The first respondent responded April 29<sup>th</sup> and the last participant responded May 6<sup>th</sup> 2016.

All of the respondents surveyed either said that density was a barrier to increasing tree canopy cover in Seattle or that it was a challenge. When asked if there were examples where trees and new development worked well together within the city limits, three responded that there were no substantial instances of new development and trees working well together within the city.

Two city of Seattle employees thought that the city did the bulk of the effort in meeting urban forestry goals. One person in non-profits thought the city did the bulk of the effort in meeting goals. One person answered the residents and the public did the bulk of the effort in contributing to meet goals. Most of the respondents had valuable input and used positive language when answering questions and had a lot of recommendations on how to improve conditions both to make their jobs more effective and also how to implement other policy around trees including what other entities could contribute to a better urban forest in Seattle.

Everyone who answered the survey thought that Seattle could do better and as one participant said, "Seattle has an opportunity to be at the forefront of urban forestry in the country! We need to be bolder! We need to be more creative!"

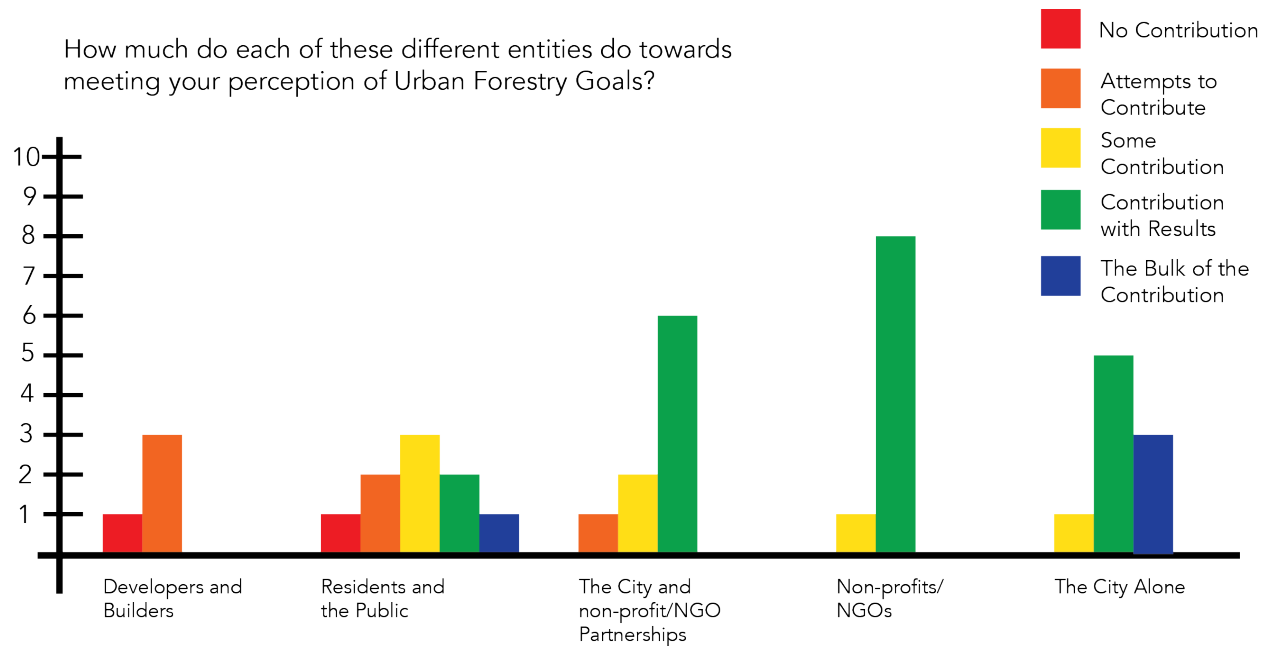


Figure 8: Chart showing perception of who contributes to meeting urban forestry goals (Source: Author)

The above figure shows a fairly wide spread of ideas for who contributes the most to contributing to urban forestry goals. No one answered that Developers and Builders actually achieve urban forestry goals. Most people agreed that some combination of the City of Seattle along with non-profits or NGOs or one of these entities on their own contributed the most to meeting the respondent’s perceptions of urban forestry goals.

### Funding and Support

The question I asked that specifically relates to funding was, “What funding structures are most appropriate for urban forestry and why?” All of the respondents who answered suggested that monetary support should be spread through a diverse mix of public and private funding. One respondent suggested that not only would diverse support be helpful for raising enough money, but it would also make sure that, “every NGO, residents, and City department

should have some skin in the game.” A couple different respondents mentioned the importance of trees and green infrastructure implications for utility savings.

Specific funding suggestions include creating a tree fund like Portland, Oregon’s fund which uses permit funds and fines for non-compliance to be used for urban forestry land acquisition and education. Two people also mentioned that an impermeable tax could be used to raise funds as well.<sup>124</sup> Another tax that was suggested was a frontage fee that would directly correlate with the right-of-way.

## Advocacy and Education

I asked two questions that had to do with advocacy and education. The first question was, “Where would you personally go for information about trees before doing any tree work in the City of Seattle?” The second was, “Which other cities do you look to for good urban forestry practices and why?” From these questions I got a few very direct responses.

Respondents responded differently on the question depending on their place of work of where they would go for information. Their responses included King County IMAP parcel viewer to see who owns the property, City of Seattle colleagues and departments, Washington Department of Natural Resources’ Urban Forestry Program, US Forest Service, International Society of Arboriculture, the City Arborist, SDOT for permitting information, PlantAmnesty, and local nurseries. One respondent said, “SDCI will of course confuse you with regulations but

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<sup>124</sup> Impermeable taxes – although not popular – have been successful in other cities in the country. The amount of development and growth happening in Seattle could be mitigated by the small tax on creating impervious surfaces like parking lots or building footprints within the city.

approve or forgive just about any reductions the urban canopy you propose.” Three respondents said they would go to [www.seattle.gov/trees](http://www.seattle.gov/trees).

Suggestions for cities to look at for good urban forestry practices included Los Angeles, Portland, Austin, Savannah, Grand Rapids, Philadelphia, Kirkland, Milwaukee, Indianapolis, Surrey British Columbia, Vancouver, and Tacoma.

## Collaboration

My hope for the surveys was to gain an understanding of how of collaboration among organizations works in practice rather than reading about how it is supposed to work. Therefore, most of my questions were about this. I asked people to describe their position, and then asked whether they ever collaborated with other entities on the topic of urban forestry and asked them to select from a list. Then I asked, “How could collaboration be more productive between the entities you’ve selected and the entity you identify with?” Following that question, I asked, “What are the goals of your organization and how are they different or similar to other goals within the City of Seattle?” and then “How much do each of these different entities do to contribute to meeting these goals?” with a Likert scale which ranged from “No contribution” to “The bulk of the contribution.” See the appendix for the survey in its entirety.

Responses included a suggestion for more organized joint applicants for grants, contracts, and foundation money at the state and federal level to bring more money to Seattle in urban forestry and more local money to NGOs. One person said:

There are areas of Seattle’s forests that are falling between the cracks because no one wants to take ownership. There could be improved collaboration about the best management practices and latest research that could improve the efforts of all

practitioners or (sic) urban forestry. We need to get the latest information in the hands of the people doing the work to improve the health of Seattle's Urban Forests.

This respondent echoed the frustrations that many others mentioned. Others also mentioned how bureaucracy in the city and top down politics – rather than using knowledge from the “boots on the ground” – left gaps in the care for the urban forest.

All respondents who answered the question about their organization's goals for urban forestry and how they are similar or different to other goals within the city answered similarly. All of the respondents seemed united about the goals of creating a sustainable, resilient, and engaged culture of caring for trees, communities, and the services that the trees provide environmentally, economically, safety and aesthetic benefits. An academic stated that their goal was, “creating knowledge and understanding of urban systems’. Which is rather different from the City...” overall there were overlaps and phrases used like, “engage public” and “promote ecosystem” and “increase tree canopy cover” showing that the people surveyed all more or less agreed on broad goals for trees in the city.

## Design and Enforcement

Two questions related to density and enforcement. The first question was “Do you see increasing residential and retail density in the City of Seattle as a barrier to increasing tree canopy cover? Please explain.” And the second was, “Are there examples you can think of where trees and new development have worked well together within the City of Seattle?” Most people answered that density is a barrier to increasing tree canopy cover, and three people stated that it depends on the situation. The consensus was that with increased density,

there is less room for big trees that provide the most tree canopy and have the most benefits.

One person stated that it is important to remember that tree canopy is not static or uniform:

“...the distribution of canopy cover in the city is already not uniform, and increases in some areas may balance out decreases in others, when it comes to total canopy. The city still has a large number of immature street trees and green belts on the verge (in a decade or two) of changing dominant species.”

One person mentioned that even if a tree is maintained during construction, the health of the tree might have been jeopardized by construction.

Respondents noted a few examples of where trees and development have worked well together. One was the preservation of trees in historic areas, like Pioneer Square and the Seattle Center. Other projects mentioned were Fremont Brewing near the Canal Substation in West Woodland. They removed unhealthy trees after buying the property and replaced the trees with “young trees of a more appropriate species” and a rain garden. Two respondents mentioned the Green Factor program for adding trees where trees did not previously exist and for providing requirements for tree retention.

One respondent suggested a private property tree removal ordinance, view ordinances, proper planning for trees including siting of underground/overhead utilities and planting strip width to create spaces that can be planted in. They also suggested using flexible sidewalk materials and/or the ability to reroute sidewalks around mature trees. These recommendations suggest an overhaul of how urban forestry is handled in the city and prioritize trees as a utility.

## VI. RECOMMENDATIONS

Although there are potential conflicts between more buildings with footprints (like apartment complexes and attached condominiums and townhouses) larger than traditionally sized single-family homes and the presence of trees on a property, there are still many places within the city where trees could be added. A 2007 canopy cover study shows there's potential to plant 1 million more trees in the city.<sup>125</sup> As referenced earlier, from 2007-2016, various city departments have planted 28,463 trees in total. In Seattle, 65% of the land is zoned for single-family residential. This means that much of increasing the tree canopy will have to be done in single-family residential zones. Creating standards for single family housing units and the density of trees would provide a lot of benefits to the residents. In denser multi-family zones or commercial corridors, providing options and restrictions for including trees in the design for new development can be mandated through an ordinance and enforced through taxes and fines and encouraged through an increase in building height or leniency in other restrictions.

I recommend a multi-faceted approach that uses different tactics at varying scales. Education and awareness of the value of trees is important at all scales: site specific, neighborhood, and citywide. However, I suggest different focuses depending on the target audience.

A tree ordinance has been suggested by the Urban Forestry Commission a number of times, but has been rejected by council because of the fear of lack of funding and lack of political support surrounding regulations on private property. Trees are a privately owned

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<sup>125</sup> (Parlin 2009)

public amenity – as demonstrated in Chapter II: Benefits of Urban Trees. The public right-of-way is only 27% of the land in Seattle, so the majority of the attention for our need for trees is on private property with specific regulations for commercial/mixed use, multifamily, and single-family zones.<sup>126</sup>

## Site Specific Recommendations

The City cannot currently force people to plant trees on their own private property, and residents can also oppose the planting of trees on the planting strip in front of their residence. The opt-out attitude is a fair approach to take, but their decisions also affect the community at large. The option to pay into an urban forestry fund instead of planting a tree could be a way to help offset the cost and also could encourage people to plant trees.

## Funding and Support

At a certain level, the city does a lot to provide support and funding. They have programs for free trees in residential areas as well as free tree replacements. They also make an effort to replace every tree that is removed with two other trees either on the site or somewhere else within the city. Residents can get the support to plant on their own property, but the City planting programs sometimes have limited species options. Good services that could be provided with more funding and support for specific sites include tree planting help, or stump grinding to remove old trees. Fees for not including trees on developing sites could be helpful in creating more assistance for those who need help with care and maintenance of their trees.

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<sup>126</sup> Percentage quoted by Shane E. DeWald, Senior Landscape Architect for the Seattle Department of Transportation

## Advocacy and Education

At a site-specific level, it's about the individual tree and how it interacts with the built environment. Seattle's list of appropriate street trees provides helpful guidelines. There should be similar suggestions for yard trees with different urban issues listed such as soil compaction, bad drainage, steep slope, known pests or diseases. Site plan suggestions could also be an accessible graphic way to show how trees could fit in a yard.

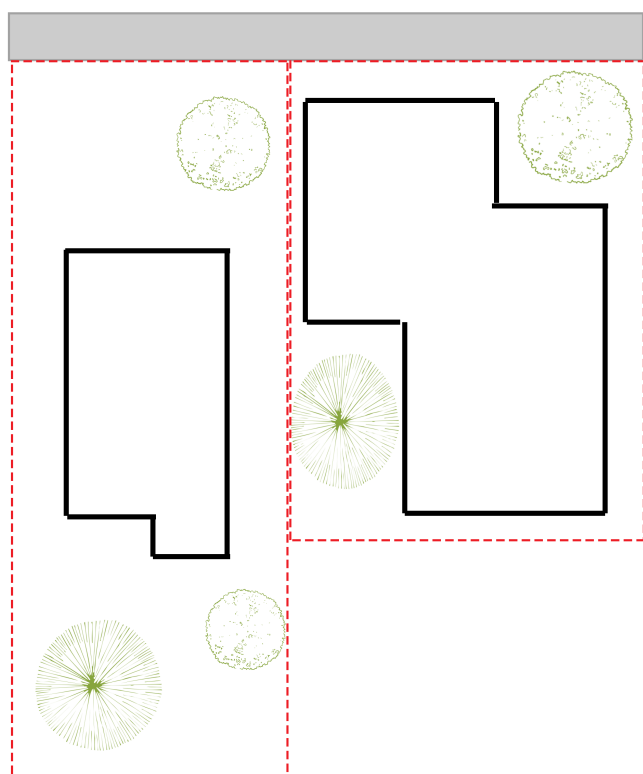


Figure 9: Leaving planting space for trees when redeveloping and using them for an architectural asset (Source: Author)

Some education has been done at a site-specific scale with signs on trees indicating their particular value around construction zones (see Figure 5). They include a number to call and have a small amount of information, but additional site-specific information could be useful including the benefits that trees have. Creating opportunities for the public to know the

benefits that trees have can help to create a culture of stewardship and knowledge of the values that trees have.

The City could provide classes and create a certification for developers and builders to show that they are tree and landscape friendly. It could certify that they are aware of existing ordinances and work to uphold them. Although all developers and builders may be required to protect trees during development, it does not always happen in the correct fashion.<sup>127</sup> The certification should include credit hours through classes and a reward in the form of certification with a stamp of approval should remind the builder that they are bound to more than erecting walls in a timely fashion at budget.

Another way to promote and educate about trees would be to introduce a campaign similar to the one in Philadelphia whose urban forestry department partners with real estate firms to include information about how to get free trees and other green infrastructure for new homebuyers. Working with real estate agents to could give the city a way for new homeowners to learn about tree planting options and also could be an opportunity to provide instruction on how to promote growing and taking care of the urban forest in their own yards and neighborhoods through existing programs.

## Collaboration

Although efforts have been made to increase collaboration between departments to target specific sites, the importance of this cannot be overstated. The sidewalk solution in South Park is a good example of a particular site with tree related issues that needed to be

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<sup>127</sup> Examples of this include placing the fence inside the canopy drip line, compacting the soil around the tree, interfering with the health and stability of the tree during development.

addressed (See section on contested tree issues or the appendix for more information). By moving the pedestrian walk area into the street, the residents in South Park can keep their mature trees and the benefits that come with them and also have a safe way to walk without walking in the street. Collaboration between residents can also result in organized tree planting efforts in a neighborhood. Neighbors have worked with the Departments of Neighborhoods program to request and receiving trees from SDOT or SCL over multiple properties.

## Design and Enforcement

A new ordinance that would mandate tree planting or preservation when property changes hands or when redevelopment happens seems reasonable to me. Many other cities have taken this approach – Portland Oregon, Charlotte North Carolina, and Falls Church Virginia. By highlighting the values that the right tree would have to the homeowner’s or developer’s property, policies like mandated tree density, tree removal and replacement, or paying into a tree protection fund could help make requirements more politically feasible.

Planting and taking care of street trees is important at the site level and should also be enforced at the City level. It is the role of both residents and city departments to plant street trees and keep them healthy. Both Seattle City Light (SCL) and Seattle Department of Transportation (SDOT) do large scale planting projects along the right-of-way and will also replace trees that need to be taken down because of interferences with utilities or health of the tree. There are other creative solutions that can be incorporated by both agencies – especially SDOT. In conjunction with Seattle Public Utilities (SPU), SDOT can create paving options that leave room for trees. Besides what is being done in South Park (see appendix for street

sections) along 8<sup>th</sup> Ave S and relocating the pedestrian walkway into the current roadway, the city can increase soil volume – and thus larger trees – by utilizing current technology that creates soil cells for tree roots to grow unimpeded by utilities and pavement.

Increased soil volumes in planting strips means that trees can grow larger and healthier.

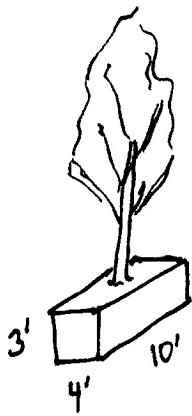


Figure 10: A soil volume of 120 cubic feet will result in about a 10 foot diameter canopy (Source: Author)

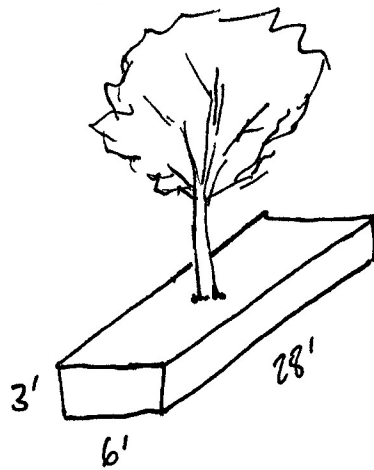


Figure 11: A soil volume of 500 cubic feet will result in a canopy diameter of over 20 feet (Source: Author)

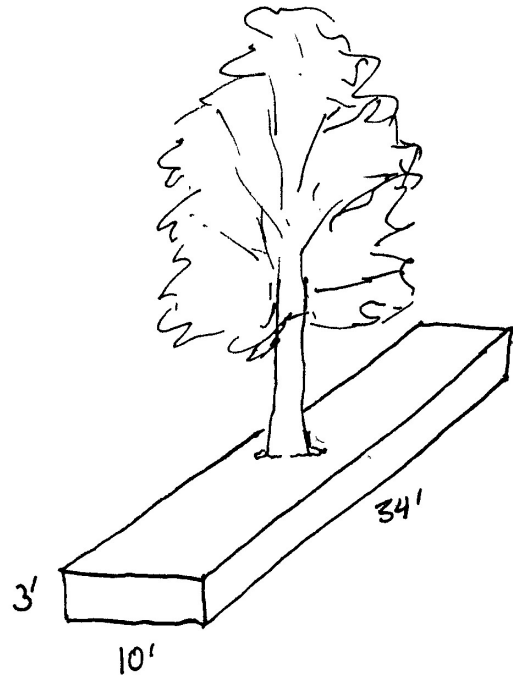


Figure 12: High soil volumes results in larger tree canopies that can reach full maturation (Source: Author)

A larger planting strip along the side of the road with more soil volume is a way to promote larger tree growth. Other technology like structural soil and soil cells can support the sidewalk and keep the soil from being compacted by pedestrians and vehicles. Structural soil is a mixture of crushed stone gravel, loam, and a hydrogel stabilizing agent.<sup>128</sup> The soil cells are plastic lattice structures that are placed below grade and then filled with soil and covered with

<sup>128</sup> (Bassuk, et al. 1998)

pavement. The soil cells provide support for the sidewalk and prevent the soil from being condensed injuring roots or stunting root growth.

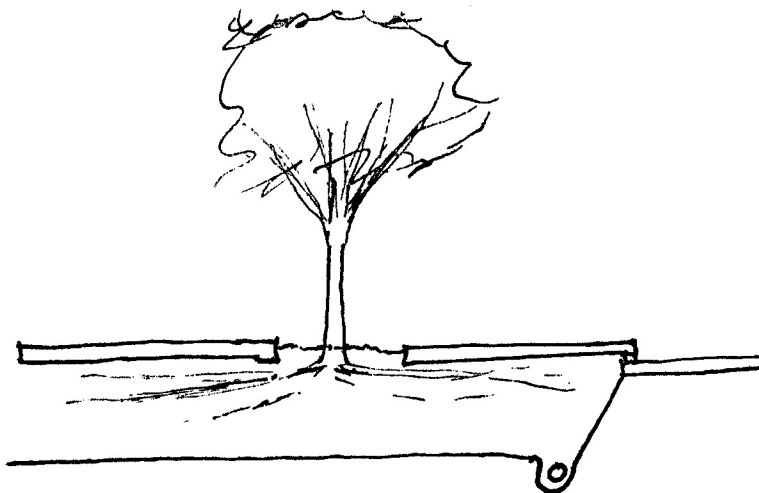


Figure 13: Structural soil includes more structurally sound materials that do not compact as easily when paved over. (Source: Author)

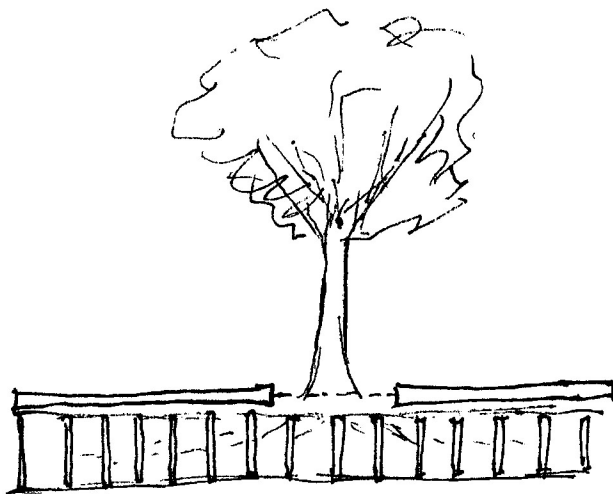


Figure 14: Soil cells can help support the sidewalk and keep the soil from being compacted by vehicles and pedestrians. (Source: Author)

## Neighborhood Recommendations

Trees can be encouraged at the neighborhood level in a few different ways. Design guidelines for neighborhoods could do more to highlight trees, neighborhood groups could be involved in tree stewardship projects and tree planting projects, and more events and education can happen around the benefits of trees and the City programs.

## Funding and Support

Funds and support from the Department of Neighborhoods can be used for neighbors to join together to get trees, but there should also be a similar program for neighborhoods that need tree maintenance. Neighborhood groups could also ask local businesses to invest in the community and help sponsor planting trees or helping with tree care.

## Advocacy and Education

Neighborhoods have a lot of power in Seattle. They are the community that most residents identify with and have built-in school districts, activity groups, blogs, community gathering spaces, and shared parks and right-of-way. Reaching out to residents on the neighborhood level is an effective way to provide education about how to effectively redevelop their property while still retaining trees, or plant additional trees on their property. This could be done through more community outreach during neighborhood festivals or pushing events and opportunities through neighborhood blogs.

## Collaboration

Retaining trees in the city while growth happens is more than planting more trees in the ground. Trees also require continued support and upkeep. Engaging existing groups to water, mulch, and plant trees is an activity that is intergenerational and gets people outside and engaged with their neighbors. It also creates a stewardship ethic around trees and encourages the peer-to-peer spread of knowledge. The City leads a few community planting events, but they could make more of an effort in reaching out to already formed community groups before planting or doing other tree care in the neighborhood. Going to existing groups and teaching classes on how to plant the right tree in the right spot, benefits of trees, or how to take care of a tree, would do a lot to target specific populations.

## Design and Enforcement

Design guidelines encourage trees, but do not detail how useful they can be in overall design concepts and other benefits they can provide. The use of trees as screening will become even more useful as houses get closer together. The amount of aesthetic beauty that trees add is an important design element and should be included in more detail for further design standards.

## City-wide Recommendations

The City can make the largest difference in implementing wide sweeping policy changes and coordinated education and advocacy. Seattle is known for its progressive politics, and environmental sensitivity. There are opportunities to implement stronger policies in order to reap the benefits that trees provide.

## Funding and Support

At the city level, there should be a funding structure that expands upon Green Seattle Partnership, which is currently the largest urban forest restoration project in the country.<sup>129</sup> By harnessing the power of a non-profit partnering with a City entity, more can be done – not just in parkland and open space – but also in residential neighborhoods. By using non-profits, the city can better utilize the skill that already exists while entities divide tasks that are easier for each entity to achieve.

## Advocacy and Education

A public awareness campaign of what kinds of green infrastructure can be included with new development and what the city offers in the form of incentives and free advice and trees would go a long way both in public relations, and in creating a greener city. This is helpful both for new residents just learning about the city and the City of Seattle’s programs, and also for current residents who are not aware of the services that are currently offered.

The City should work more with public education institutions like community colleges and the University of Washington, which have great ecological programs, to better provide opportunities for education to the public. The role of the City government should be to provide services and enforce regulations, and the role of educational systems should be to aid in creating a more educated city. The City could work with the colleges and universities on education and awareness campaigns and possibly providing seminars or additional planting and care workshops.

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<sup>129</sup> (Green Seattle Partnership 2016)

## Collaboration

Urban forestry can be supported through nonprofits, and city departments, but Seattle should also consider partnerships with corporations. The number of large-scale technology firms and other large economic drivers are bringing more workers to Seattle. By harnessing the people power, the influx of money, and corporate philanthropy standards, urban forestry can take advantage of the growth in the city. Days of service similar to MLK day of service or particular events that companies put on like Comcast's Bridge to Beach tree stewardship event in 2016 can do a lot not only in that one day, but also for office workers to learn more about the trees that are in the city.

## Design and Enforcement

Development can also be used towards the urban forest by creating a taxing structure that benefits trees. Creating an impervious surface tax, which would tax square footage of new impervious surfaces<sup>130</sup> could help to provide some of the money needed for supporting staff and providing new programming around urban forestry. It has been a controversial tax in Maryland, but has been important in helping to fund and mitigate the protection and care of the Chesapeake Bay.<sup>131</sup>

Developers should also be rewarded for protecting currently standing trees or for planting more trees. Allowing more height could be an incentive for protecting existing mature trees. If developers also understand the cultural and monetary benefits of keeping mature trees, they may feel more apt to keeping trees during development and redevelopment.

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<sup>130</sup> Impervious surfaces would include roofs, sidewalks, and parking lots outside of the right-of-way.

<sup>131</sup> (Chesapeake Bay Foundation 2016)

Adapting software like i-Tree that gives monetary value to trees, could be used for more than the fine associated with its removal, but also for showing how the tree adds to the local economics.

Creating a city-wide tree ordinance for trees on private property during development is the key to keeping pace with the number of trees being taken down and not replaced on private land. Besides encouraging builders, doing public campaigns of good case studies, and providing incentives, there should also be a requirement for including the privately owned public utility of trees in new development. A tree ordinance with associated guidelines and fines may be politically hard to pull off – it has been for the past eight years – but with the current talk of affordable housing and what it means for creating density and the preponderance of trees in the Seattle news, this is a perfect time to be discussing the need for a tree ordinance.

By creating incentives, marketing the value of trees, expanding partnerships, and creating more regulations, Seattle as a whole can become more aware of what a critical time this is for supporting trees in the city and the tree canopy can be enlarged.

## LESSONS LEARNED AND LIMITATIONS

There are many site-specific suggestions and theories on Smart Growth, infill development, and different ways to increase density within a city. There are multiple theories on urban greening that can be contradictory with other “good practices” of stormwater remediation, walkability, and neighborhood centers. Some are for rooftop gardens and trees, while others in the profession fear that rooftop shrubs could be a replacement for old growth

trees on ground level. It is important to have these discussions and through this research, I have found that there are no real “best practices” in balancing density and trees. It is a problem that is coming to a head in the City of Seattle. Creating regulations on private property for new development and large remodeling projects that encourage keeping existing trees and planting and caring for new trees through both fines and incentives is one way to keep the city green and has been proven to work in other cities throughout the country. Another important way to promote trees is educating people on the benefits of trees through public outreach. The importance of trees in an urban landscape cannot be understated.

Politics and public comment are great drivers of action in the City of Seattle. Much of the political action taken is because of critical emergencies (for example, homelessness, housing affordability, the overdue earthquake). I would argue that the need for trees and the benefits gained from trees is just as notable as many of the city’s other crises. Trees require planning for the future and will impact the shape of our city moving forward. Their presence or loss in a neighborhood will create even larger disparities among income groups and are part of a larger environmental justice issue. It is important for the lawmakers to remember that nothing gets done overnight and good plans are roadmaps for the future. Creating strong tree policies is an investment for the future with long-term benefits will outweigh the short-term political ramifications.

These policies should include increased funding for tree services from development taxes, fines, and fees, the creation of a tree ordinance for development and redevelopment on private property, and increased education and support on the values and programs surrounding trees. The effort to sustain Seattle as a city that is just and environmentally conscious needs to

be approached at different levels and supported by large-scale entities that include government, nonprofits, residents, developers, and corporations.

## NEXT STEPS

The location of trees in the city has implications for environmental justice. There is both racial and economic inequality often made clear by neighborhood boundaries. Poor neighborhoods have fewer trees. Since we have seen from earlier in this thesis that trees are integral for creating a healthy, safe, productive, and enjoyable place to live, one can see that planting and taking care of more trees in traditionally poorer neighborhoods would help to increase quality of life. Researching the social and environmental justice implications of where trees are in the city is an important next step and should be followed by aggressive tree programs in neighborhoods that do not currently benefit from the presence of trees.

## APPENDIX

### Survey Questions

If you have trouble viewing or submitting this form, you can [fill it out in Google Forms](#).

#### Seattle's trees

The purpose of this survey is to get a feeling for how different entities that have a stake in urban forestry in Seattle work together in practice.

This survey is completely anonymous. Your answers will not be linked to any identifying information and will be taken into account for academic purposes only. If you feel uncomfortable answering any question, feel free to skip it.

Thank you so much for participating in this survey!

**How would you describe your position (select all that apply)?**

- City of Seattle employee
- Academic
- Non-profit or NGO association
- Developer/Real Estate adjacent
- Other:

#### Collaboration:

**Do you ever collaborate with other entities on the topic of urban forestry? If so, please select which ones:**

- Other City departments
- Other academics
- Other non-profits/NGOs
- Other developers
- Other:

**How could collaboration be more productive between the entities you've selected and the entity you identify with?**

What are the goals of your organization and how are they different or similar to other goals within the City of Seattle?

How much do each of these different entities do to contribute to meeting these goals?

	No contribution	Attempts to contribute	Some contribution	Contribution with results achieved	The bulk of the contribution
The City alone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Non-profits/NGOs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The City and non-profit/NGO partnerships	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Residents and the public	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Developers and builders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### Density and Development:

Do you see increasing residential and retail density in the City of Seattle as a barrier to increasing tree canopy cover? Please explain.

Are there examples you can think of where trees and new development have worked well together within the City of Seattle?

**Other:**

Where would you personally go for information about trees before doing any tree work in the City of Seattle?

Which other cities do you look to for good urban forestry practices and why?

What funding structures are most appropriate for urban forestry and why?

What else do you think is relevant to trees and collaboration and/or density?

Thank you for participating in this survey!

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Canopy Cover

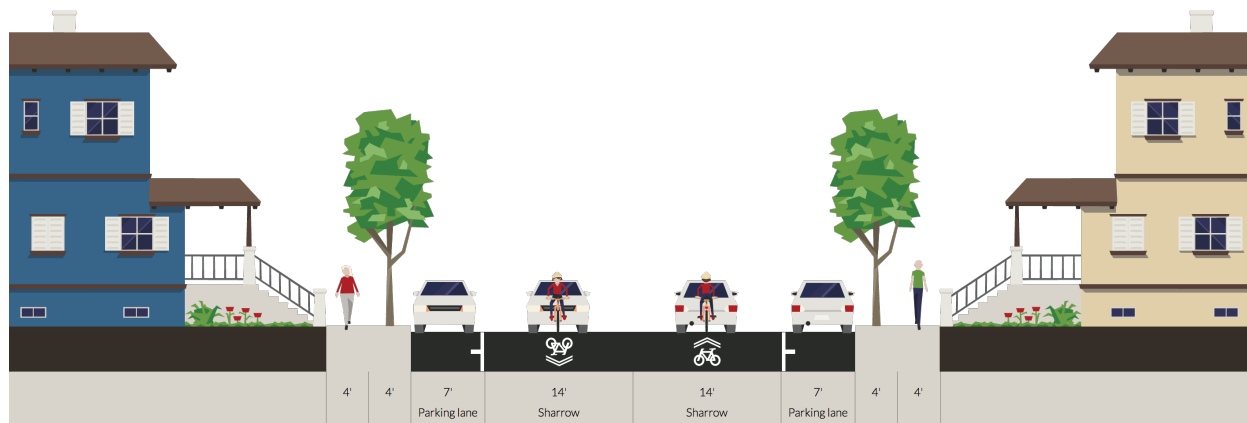
Land Use Category	2002 Canopy Cover	2007 Canopy Cover	Goal Canopy Cover
Commercial/ Mixed Use	8.4%	9.7%	15%
Developed Park or Boulevard	25.9%	25.5%	25%
Downtown	4.2%	4.7%	12%
Major Institution	18.4%	19.4%	20%
Manufacturing/ Industrial	3.8%	4.3%	10%
Multi-Family	16.6%	17.1%	20%
Parks Natural Area	82.5%	80.4%	80%
Single Family	25.2%	25.7%	31%
<b>Total</b>	<b>22.5%</b>	<b>22.9%</b>	<b>30%</b>

Potential Planting Sites				
Zoning Category	Area (Acre)	Tree Cover 2002 (Acre)	Tree Cover 2007 (Acre)	Potential Planting Sites
Commercial/Mixed Use	4522.25	381.40	437.47	28,967
Developed Park or Boulevard	2578.17	667.39	656.42	70,266
Downtown	815.25	34.29	38.55	1,104
Major Institutions	1101.09	202.59	213.95	18,384
Manufacturing/Industrial	6190.75	235.67	267.47	27,209
Multi-Family	5645.47	935.72	963.51	92,965
Parks Natural Area	2355.48	1943.06	1894.40	25,194
Single Family	29918.02	7543.61	7700.63	817,411
<b>Total</b>	<b>53126.48</b>	<b>11943.72</b>	<b>12172.40</b>	<b>1,081,500</b>

From Seattle reLeaf 2011 PowerPoint presentation

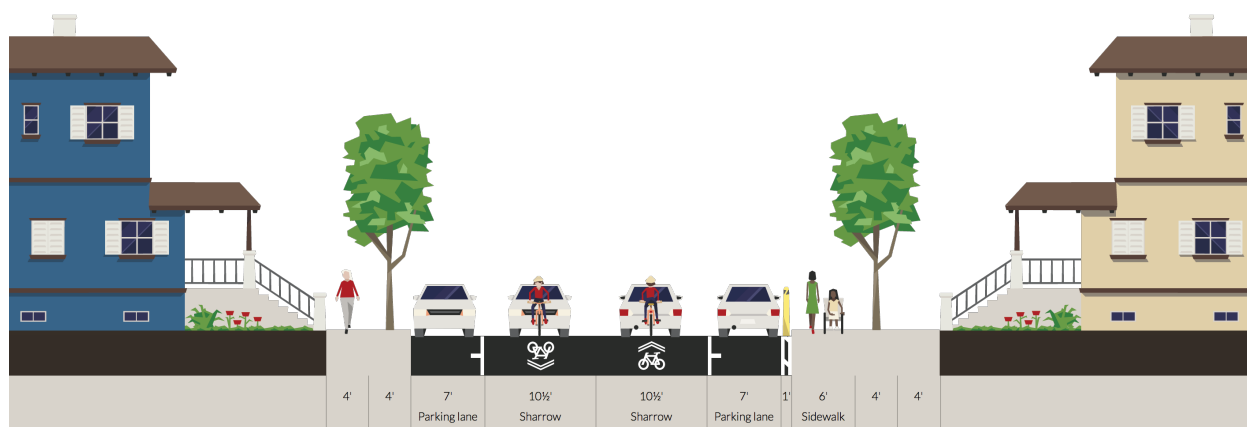
8<sup>th</sup> Ave S street section proposed in South Park

**8th Ave S**



Existing street section for 8<sup>th</sup> Ave S. (Streetmix.net)

**8th Ave S**



Future street section for 8<sup>th</sup> Ave S. (Streetmix.net) Find more information at:  
<http://www.seattle.gov/transportation/8thavesouthpark.htm>

## Monetary Benefits of Trees in urban areas

**Quantification of urban ecosystem services in biophysical units. Amounts presented are averages per hectare of land area with tree cover (amounts given in parentheses are in units per hectare with high tree cover). For details, see ESM.**

City or state	Pollution removal (kg/ha/y)	C sequestration (tons/ha/y)	C storage (tons/ha/y)	Stormwater reduction (m <sup>3</sup> /ha/y)	Energy savings (kWh/ha/y)	Reference
Beijing	132	–	–	–	1400	Jim and Chen [37]
Casper, WY	6.2 (69.9)	0.20 (2.2)	6.2 (69.7)	–	72 (808)	Nowak <i>et al.</i> [65]
Chicago, IL	13.5 (74.9)	0.38 (2.1)	10.9 (60.3)	–	317 (1760)	Nowak <i>et al.</i> [66]
Guangzhou	42.4	4.0	25.0	–	14.1	Jim and Chen [37]
Hangzhou	–	–	–	167	–	Jim and Chen [37]
Indiana (urban areas)	13.6 (67.6)	0.59 (2.9)	17.7 (88.0)	–	377 (1875)	Nowak <i>et al.</i> [67]
Kansas (urban areas)	14.6 (104.6)	0.40 (2.8)	10.4 (74.2)	–	253 (1809)	Nowak <i>et al.</i> [68]
Lanzhou	4.1	–	–	–	22.7	Jim and Chen [37]
Los Angeles, CA	14.7 (71.4)	0.36 (1.8)	9.4 (45.9)	–	653 (3168)	Nowak <i>et al.</i> [69]
Minneapolis, MN	18.3 (53.8)	0.53 (1.6)	15 (44.1)	–	1111 (3258)	Nowak <i>et al.</i> [70]
Modesto, CA	210	18.4	–	390	16.8	McPherson <i>et al.</i> [71], McPherson and Simpson [72]
Morgantown, WV	23.4 (59.0)	1.2 (3.1)	34.6 (87.4)	–	1085 (2741)	Nowak <i>et al.</i> [73]
Nebraska (urban areas)	32.0 (213.6)	0.40 (2.7)	10 (66.7)	–	455 (3036)	Nowak <i>et al.</i> [68]
New York, NY	19.0 (91.0)	0.48 (2.3)	15.3 (73.3)	–	1014 (4851)	Nowak <i>et al.</i> [74]
North Dakota (urban areas)	1.3 (48.3)	0.08 (2.8)	2.1 (77.8)	–	129 (4768)	Nowak <i>et al.</i> [68]
Philadelphia, PA	15.3 (73.5)	0.43 (2.1)	14.1 (67.7)	–	836 (4020)	Nowak <i>et al.</i> [75]
Sacramento, CA	9.3	2.02	66.3	1000	9800	McPherson [76], Scott <i>et al.</i> [77], Xiao <i>et al.</i> [78], Simpson [79]
San Francisco, CA	10.7 (66.7)	0.39 (2.4)	14.7 (91.8)	–	–	Nowak <i>et al.</i> [80]
Scranton, PA	15.6 (70.9)	0.88 (4.0)	20.3 (92.4)	–	361 (1639)	Nowak <i>et al.</i> [81]
South Dakota (urban areas)	10.3 (60.8)	0.22 (1.3)	5.3 (31.4)	–	237 (1393)	Nowak <i>et al.</i> [68]
Syracuse, NY	15.2 (56.6)	0.77 (2.9)	23.1 (85.9)	–	372 (1383)	Nowak <i>et al.</i> [82*]
Tennessee (urban areas)	39.1 (103.6)	1.28 (3.4)	24.4 (64.7)	–	1843 (4888)	Nowak <i>et al.</i> [83]
Toronto, Canada	29.9 (112.4)	0.73 (2.8)	17.4 (65.3)	–	646 (2430)	Nowak <i>et al.</i> [84]
Washington, DC	23.8 (68.0)	0.92 (2.6)	29.8 (85.2)	–	1766 (5045)	Nowak <i>et al.</i> [85]
Wisconsin (urban areas)	17.6 (65.8)	1.0 (3.7)	15.3 (57.3)	–	409 (1530)	Buckelew Cumming <i>et al.</i> [86]

–: not available.

**Average value in US\$/ha/y (2013) of selected services provided by green spaces in urban areas**

Service	Average value (US\$/ha/y)	Range
1. Pollution and air quality regulation	647 (n = 9)	60–2106
2. Carbon sequestration (annual flow)	395 (n = 5)	58–702
Carbon storage (stock value)	3125 (n = 3)	1917–5178
3. Storm water reduction	922 (n = 6)	615–2540
4. Energy savings/temperature regulation	1412 (n = 4)	34–1908
5. Recreation and other amenity services	6325 (n = 2)	2133–10 517
6. Positive health effects	18 870 (n = 1)	N/A
Total (excl. health effects and carbon storage)	9701 US\$/ha/year	3212–17 772

\* See ESM for details.

Tables from (Elmqvist, et al. 2015)

## History of Trees in Seattle

<b>1879</b>	Last tree along Seattle’s waterfront cut down for development
<b>1884</b>	Denny Park dedicated as Seattle’s first park
<b>1903</b>	Improvement of parking strips and street medians begins Olmsted Brothers Landscape Architecture firm hired to develop a plan for a city-wide park and boulevard system
<b>1908</b>	The Olmsted Plan released titled “A Comprehensive System of Parks and Parkways”
<b>1959</b>	Planting of street trees along Third, Fourth, and Fifth Avenues for the 1962 World’s Fair begins
<b>1967</b>	Operation Green Triangle approved by bond measure which includes beautifying street triangles, Seattle City Light’s Urban Tree Replacement Program, Parks’ the Millennium Woods Legacy Project, and the Department of Neighborhoods Fall Tree Fund
<b>1982</b>	Seattle adopts nickname “The Emerald City”
<b>1989</b>	\$41 million Open Space Bond Measure passes
<b>1994</b>	Funds from the Cumulative Reserve Fund allocated for forested parklands restoration Seattle’s first Heritage Tree recognized by City Council
<b>1998</b>	Parks and Recreation acquires almost 600 acres of open space to be maintained in a natural state in perpetuity
<b>1999/2000</b>	26,000 new trees planted throughout the city as part of Millennium Woods Legacy Project
<b>2001</b>	Dutch Elm disease discovered in Seattle and City government provides emergency funding to control the spread of the disease
<b>2004</b>	The Green Seattle Partnership formed as a collaboration between the City and non-profit Forterra (Cascade Land Conservancy) to restore 2,500 acres of forested parklands by 2025
<b>2007</b>	The Urban Forest Management Plan created with the goal to increase canopy cover in Seattle to 30% by 2037
<b>2009</b>	The Urban Forestry Commission is created to advise City Council and the Mayor on policies and regulations governing Seattle’s urban forest

Table adapted from 2013 Urban Forest Stewardship Plan<sup>132</sup>

<sup>132</sup> (Urban Forestry Commission 2013)

## Resources

Seattle Department of Transportation – Approved Street Tree List

[http://www.seattle.gov/trees/docs/2011-Street\\_Tree\\_List.pdf](http://www.seattle.gov/trees/docs/2011-Street_Tree_List.pdf)

Seattle’s Green Factor – Scoresheet, Tree List, and Director’s Rule

<http://www.seattle.gov/dpd/codesrules/changestocode/greenfactor/documents/default.htm>

Seattle Design Guidelines:

[http://www.seattle.gov/dpd/cs/groups/pan/@pan/documents/web\\_informational/p2083771.pdf](http://www.seattle.gov/dpd/cs/groups/pan/@pan/documents/web_informational/p2083771.pdf)

Seattle Land Use Statistics:

<http://www.seattle.gov/dPd/cityplanning/populationdemographics/aboutseattle/landuse/default.htm>

List of Common Seattle Trees:

[http://www.seattle.gov/dpd/cs/groups/pan/@pan/documents/web\\_informational/dpds021218.pdf](http://www.seattle.gov/dpd/cs/groups/pan/@pan/documents/web_informational/dpds021218.pdf)

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