DRAFT

REDMOND'S
TREE
CANOPY
STRATEGIC PLAN

SEPTEMBER 11, 2018

City of Redmond
WASHINGTON

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Acknowledgements

Executive Summary

"Develop a cross-departmental strategic plan to increase tree canopy across the city that will include a canopy coverage goal, proposed timeline and methods for achieving the goal."

-PR-57 Redmond Comprehensive Plan

This work began with the public engagement process of the 2017 Park, Arts, Recreation, Culture & Conservation (PARCC) Plan update, where the city learned that the community has a strong desire to retain Redmond's distinctive green character and increase the number of trees throughout the city. Tree canopy is part of the City's Environmental Investment Strategies. Tree canopy coverage refers to the amount of area in the City that is covered by tree foliage. In Redmond, approximately 38 percent of the City is covered in trees. The purpose of this plan is to develop the goals, strategies, and an implementation plan to expand tree canopy throughout the City of Redmond on public and private lands.

Currently there are 4,062 acres of tree canopy within the City of Redmond. This equates to 38.1 percent of Redmond's total area per measurements taken in 2017. Overall, tree canopy coverage is declining at a rate of 12 to 13 acres per year as vacant and underutilized parcels continue to develop or redevelop.

The proposed goal for the plan is to increase the City's canopy coverage to **40 percent over a period of 30 years**. This goal was set after consulting with the public, Parks and Trails Commission and City Council and evaluating the benefits, time to realize the benefits, costs, and resources. Implementation of the goal will be broken into phases in ten-year increments. Each phase will take a multipronged approach but will have a strategic focus. First is to focus on education to achieve no net loss. Second will focus on strategies to increase canopy on public and private lands, and the last the phase will focus on strategies to expand and maintain tree canopy to the attain 40% coverage.

Education and awareness is an important way to increase community understanding of the diverse benefits trees bring to the community. This strategy includes a breadth of tactics and topics that touch all members of the community. It is targeted and proactive in building and sustaining interest in planting and enhancing Redmond's urban forests.

The City, which maintains parks, natural areas and riparian corridors can support increased tree canopy by using these spaces to restore and increase forest cover throughout the City. These efforts bring multiple benefits from shading water for Kokanee Salmon to providing tree lined streets in our neighborhoods. These are lands the City currently manages. However, nearly half of the available lands identified as potential canopy opportunities exist on private land and the majority of that is single-family-residential sites. To reach the goals outlined in this plan a community driven model of increasing trees on public lands as well as private is essential.

The estimated cost to achieve the 40 percent tree canopy goal is approximately $80,000 per acre. Over thirty years, costs are estimated to approximately $600,000 to $1,400,000 per year in 2018 dollars. To accomplish the vision set out in the plan, a variety of existing and new funding sources will be needed including capital improvement plan budgets, general fund, tree fund, stormwater utility fund, grants, and partnerships.
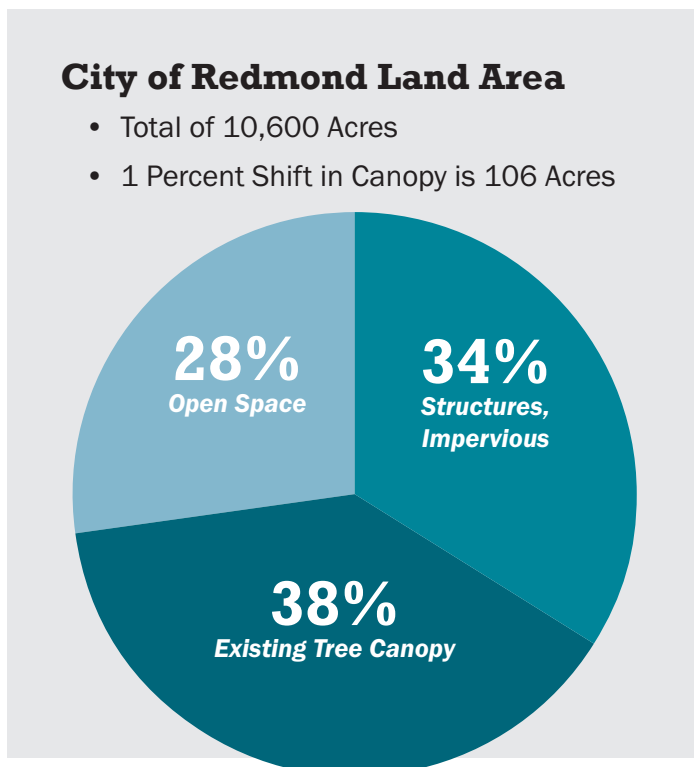
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CHAPTER 1

Introduction

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Tree canopy coverage refers to the amount of area in the City that is covered by tree foliage. In Redmond, approximately 38 percent of the City is covered in trees. The purpose of this plan is to develop the goals, strategies, and an implementation plan to expand tree canopy throughout the City of Redmond on public and private lands. This work began with the public engagement process of the 2017 Park, Arts, Recreation, Culture & Conservation (PARCC) Plan update, where the city learned that the community has a strong desire to retain Redmond's distinctive green character and increase the number of trees throughout the city. Increasing tree canopy will provide multiple environmental benefits including water, air and habitat improvements. To address the community's goals, the PARCC Plan recommended comprehensive policy PR-57 which states,

> *"Develop a cross-departmental strategic plan to increase tree canopy across the city that will include a canopy coverage goal, proposed timeline and methods for achieving the goal."*

Figure 1-1:

City of Redmond Land Area

- Total of 10,600 Acres
- 1 Percent Shift in Canopy is 106 Acres

28% *Open Space*

34% *Structures, Impervious*

38% *Existing Tree Canopy*

Currently there are 4,062 acres of tree canopy within the City of Redmond. This equates to 38.1 percent of Redmond's total area per measurements taken in 2017. Overall, tree canopy coverage is declining at a rate of 12 to 13 acres per year as vacant and underutilized parcels continue to develop or redevelop.

Redmond's character and main attraction for many community members is its trees, wooded areas, and urban forests. The benefits of trees and urban forests include reduced stormwater runoff, improved water and air quality, attractive communities, increased property values, greenhouse gas reduction, habitat for native wildlife, and improved quality of life.

Why Focus on Increasing Redmond's Tree Canopy Now?

Redmond has seen a declining tree canopy due to:

- Urbanization
- Removal of trees and replacement with different species
- Delay between removing mature trees and the replacement trees maturing and adding to the tree canopy
- Invasive species
- Limited resources for natural area management and restoration

All the factors listed above contribute to the loss of Redmond's forest canopy in parks, natural areas and on private land. Compared with the region's historic native forest composition, the current City of Redmond has a larger percentage of deciduous tree coverage than conifers, which is not typical of a normal healthy Northwest forest. Native conifer regeneration is limited, as conifers do not regenerate as quickly as deciduous trees.

> ℹ️ Public lands are properties owned by the City of Redmond or other governmental agencies within the City of Redmond. Private lands are owned by private land owners and represent a wide range of property types such as residential, commercial, industrial.

The removal of vegetation along many streams and wetlands early in Redmond's history resulted in a complete loss of native species cover. The loss of native vegetation along our waterways results in significant impacts on stream temperatures and water quality, loss of habitat, and erosion, negative influences on aquatic species, including several species of salmon.

Successes to Date

The City of Redmond is responsible for managing land that is publicly owned by the City, as well as regulating development on private properties. There are multiple conservation efforts occurring across the City that protect a significant percentage of our land mass. This happens through a variety of mechanisms including the overarching policy guidance of the City's Comprehensive Plan, functional plans prepared by different departments within the City, protective easements, and critical area policies and legislation. A brief description of the tools that guide management of natural resources on both public and private land follows.

- Redmond's Comprehensive Plan: The vision describes a beautiful and healthy natural environment, marked by well-thought out stewardship practices and environmental sustainability. Related policies are included in the following elements of the comprehensive plan:
  » Natural Environment
  » Parks, Arts, Recreation, Conservation & Culture
  » Community Character and Historic Preservation
  » Urban Centers
  » Shoreline Master Program
- The City also has several planning documents that support the goals of the functional plan, specifically related to tree canopy management and growth:
  » Watershed Management Plan (2013)
  » Stormwater Comprehensive Plan (2006)
  » Water Resources Strategic Plan (2015 to 2020) And 3-Year Action Plan (2015 to 2017)

  » Climate Action Plan
  » 20-Year Forest Management Plan (2009)
  » Parks, Arts, Recreation, Culture and Conservation Plan (2017)
- Redmond Zoning Code - RZC 21.72 Tree Protection
  » Tree protection standards
  » Tree removal and replacement regulations
  » Fee in-lieu program
  » Tree credits

Redmond Comprehensive Plan Vision:

"Redmond in 2030 has maintained a very green character. The city is framed within a beautiful natural setting, with open spaces and an abundance of trees continuing to define Redmond's physical appearance, including forested hillsides that flank the Sammamish Valley, Lake Sammamish and Bear Creek. An interconnected system of open spaces provides habitat for a variety of wildlife. Public access to shorelines has been enhanced while protecting the natural environment and property owners' rights."

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C H A P T E R   2

Goals

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Canopy Cover & Timeline

The proposed goal for the plan is to increase the City's canopy coverage to 40 percent over a period of 30 years. More than 67 percent of on-line poll respondents supported a goal of 40 percent or higher. More than 81 percent of on-line poll respondents supported the goal being achieved in the 20 to 40-year timeline. This goal was set after consulting with the public, Parks and Trails Commission and City Council and evaluating the benefits, time to realize the benefits, costs, and resources

Phasing

Implementation of the goal will be broken into phases in ten-year increments. Each phase will take a multi-pronged approach but will have a strategic focus.

- Years 1 to 10 will focus on public education, improved data collection and achieving no net loss.

- Years 11 to 20 will focus on strategies to increase canopy on public and private lands.

- Years 21 to 30 will focus on strategies to expand and maintain tree canopy to the ultimate goal set by the plan.
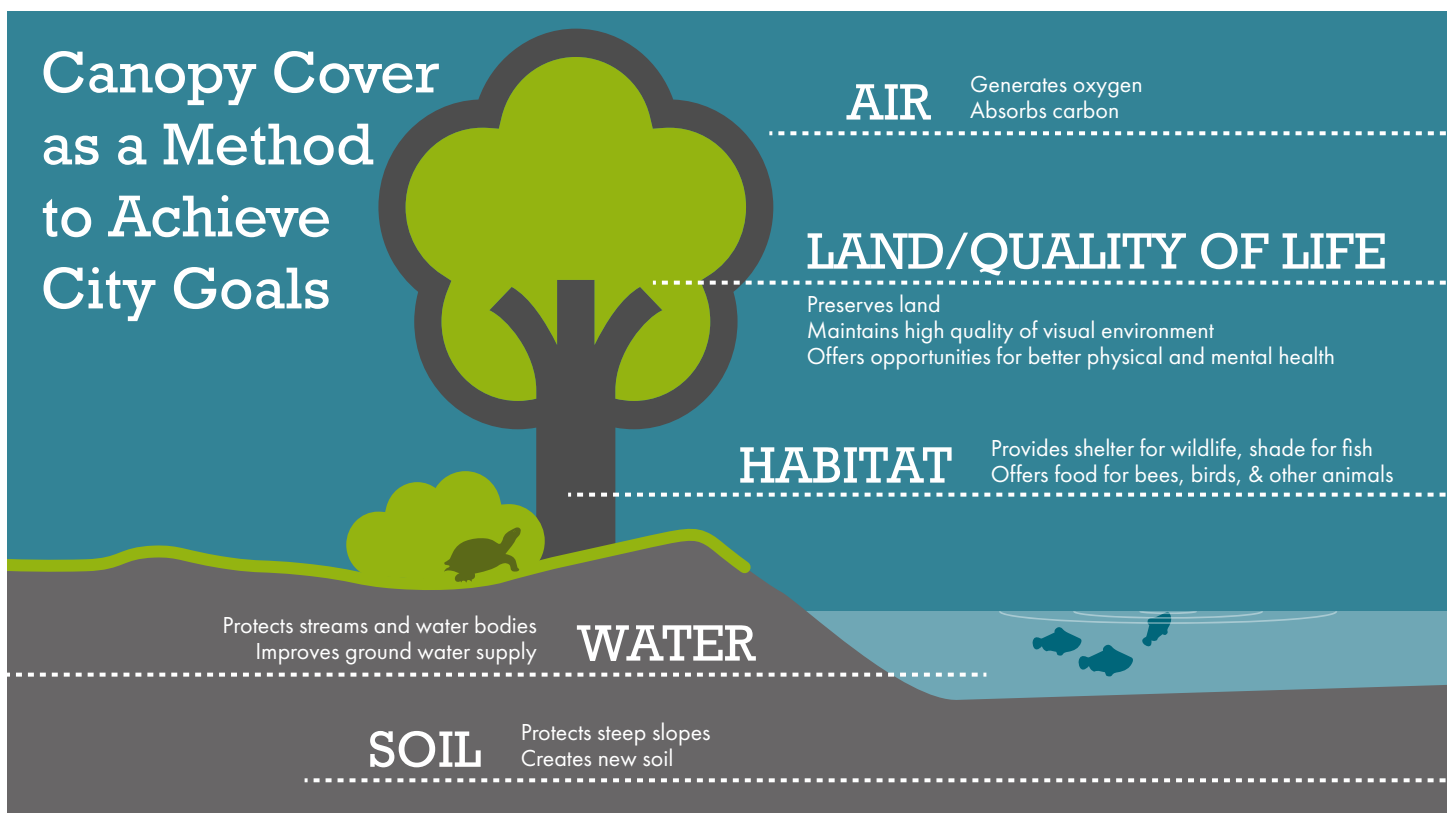
Priority Locations

Redmond has planned for growth and actively acquired open space properties over the past four decades to preserve the character of Redmond. However, many of the open space properties are at the edges of the city. The community is seeking strategies that keep and replace trees in all neighborhoods, with a specific emphasis on the neighborhoods within the city limits with the most development activity including Downtown, Overlake Village, Southeast Redmond, Bear Creek, North Redmond, and Sammamish Valley.

Stakeholders

The community supports tree planting on public and private lands. This includes encouraging education and incentives for private land owners, participating in

Exhibit 2-1: Benefits of Trees

Canopy Cover as a Method to Achieve City Goals

AIR — Generates oxygen / Absorbs carbon

LAND/QUALITY OF LIFE — Preserves land / Maintains high quality of visual environment / Offers opportunities for better physical and mental health

HABITAT — Provides shelter for wildlife, shade for fish / Offers food for bees, birds, & other animals

WATER — Protects streams and water bodies / Improves ground water supply

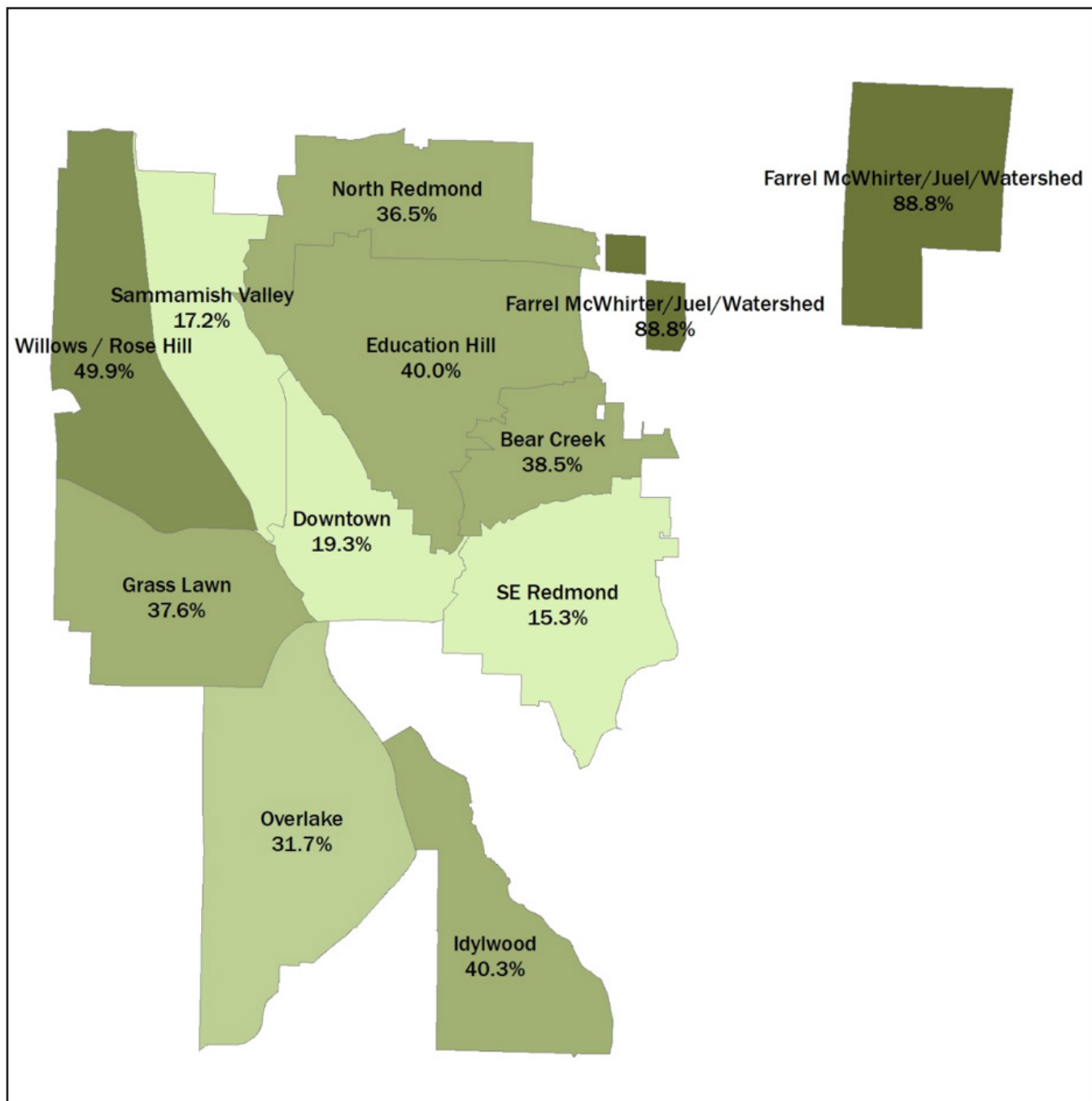**SOIL** — Protects steep slopes / Creates new soil

planting events on public and private lands, planting on their own properties, and allowing developers to mitigate for trees in private and public lands.

Enhance the Environment

Another goal of the plan is to enhance tree canopy to achieve a variety of environmental benefits, including water and air quality, aesthetics and increased property values, combating climate change and improving wildlife habitat.

Exhibit 2-2: Current Tree Canopy Cover by Neighborhood

Farrel McWhirter/Juel/Watershed
88.8%

North Redmond
36.5%

Sammamish Valley
17.2%

Willows / Rose Hill
49.9%

Farrel McWhirter/Juel/Watershed
88.8%

Education Hill
40.0%

Bear Creek
38.5%

Downtown
19.3%

Grass Lawn
37.6%

SE Redmond
15.3%

Overlake
31.7%

Idylwood
40.3%

CHAPTER 3
Community Outreach

The City conducted a robust community outreach process to evaluate the tree canopy goal, strategies and timelines. The outreach methodology started with the 2015 to 2017 PARCC Plan outreach effort, which reached nearly 1,000 people, two on-line polls specific to the Tree Canopy Strategic Plan that had 475 responses, and outreach at community events that included over 250 touches. In addition, staff provided opportunities to discuss data and strategies with OneRedmond, the Parks and Trails Commission and City Council.
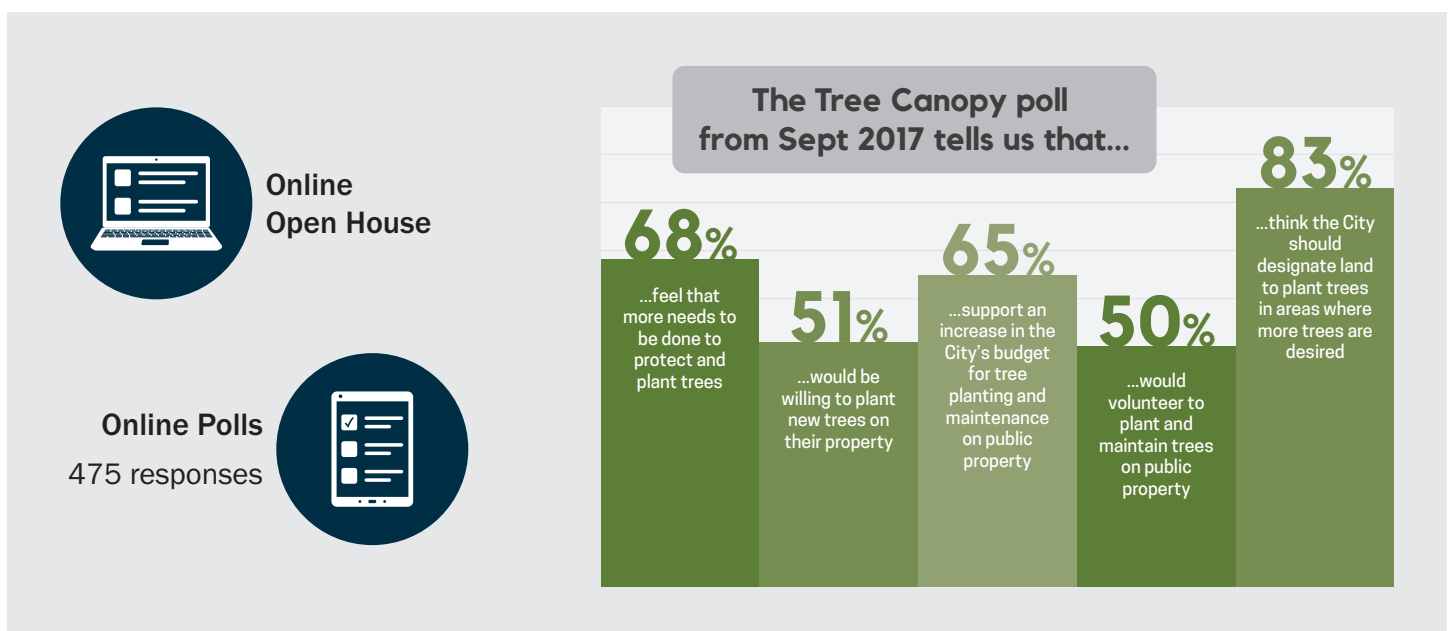
During the 2017 PARCC Plan outreach, City staff conducted several public meetings, hosted an on-line forum and comment opportunities, and the City conducted a statistically valid survey with over 800 respondents. In all the outreach efforts, a solid majority (over 60 percent of participants) said it is important to preserve more open space natural areas such as forested areas and wetlands. In the statistically valid survey, 72 percent of respondents said it is important that parks have a lot of trees.

Upon further conversation with community members about these results, staff learned that although the City has more than 1,300 acres of park land and approximately 1,000 of which are open space natural areas; the community is feeling the loss of trees with the redevelopment of Downtown, Overlake Village, and North Redmond. During the Tree Canopy Strategic Plan outreach, staff evaluated these issues further. General informational outreach was conducted at annual community events "So Bazaar" and "Redmond Lights", the City's website, and several e-newsletters and Focus articles in 2017. Two on-line polls were conducted to gather more precise feedback from the community.

Exhibit 3-1: Community Engagement Touches

Online Open House

Online Polls
475 responses

The Tree Canopy poll from Sept 2017 tells us that...

68% ...feel that more needs to be done to protect and plant trees

51% ...would be willing to plant new trees on their property

65% ...support an increase in the City's budget for tree planting and maintenance on public property

50% ...would volunteer to plant and maintain trees on public property

83% ...think the City should designate land to plant trees in areas where more trees are desired

December 2017 On-Line Poll

The December 2017 on-line open house included a short video explaining the project and data gathered to date and linked viewers to a follow up on-line poll that focused on specific goals, strategies and timeline. This poll received 243 responses.

Strategies

Respondents ranked the tree canopy enhancement strategies as follows:

1. Increase City led tree planning and restoration efforts on public properties
2. Stronger regulations to protect and ensure trees are replanted
3. Incentives for voluntarily planting trees on private property
4. City acquisition of lands to plant or preserve tree canopy
- Volunteering with community or neighborhood groups to plant trees

Respondents ranked the following education and incentive programs as follows:

1. Tree planting programs that would provide discounted trees to plant in your neighborhood or yard
2. A "Redmond Tree List" that indicates native and ornamental species appropriate for our climate
3. "Right tree in the right place" educational workshops/classes to learn how to successfully plant and maintain trees

Volunteer Priorities

1. Volunteer with existing groups to restore forested parkland
2. Plant trees on my property
3. Organize your neighborhood or HOA to plant trees

The community's tree canopy goal priorities:

- 29 percent of respondents would like the goal to be 40 percent tree

canopy cover

- 25 percent of respondents would like no net loss, maintaining 38 percent tree canopy cover
- 20 percent of respondents would like the goal to be 40 percent to 42 percent tree canopy cover
- 18 percent of respondents would like the goal to be more than 44 percent tree canopy cover
- Overall, 75 percent of respondents would like an increase in tree canopy about 67 percent were comfortable with a goal of 40 percent or higher tree canopy cover.

Preferred Time Horizon to Reach the Tree Canopy Goal

- 81 percent of respondents would like to reach the goal in 20 to 40 years

Tree Canopy Goal and Strategies

Every jurisdiction has different tree canopy goals and strategies based on their community values, topography and environmental conditions and development patterns and zoning. American Forests used to recommend a 40 percent canopy cover goal, but then adjusted the goal to be more site specific. The following exhibit shows the existing canopy cover and goals of our neighboring cities.

Based on extensive community outreach between 2015 and 2017 as well as Parks and Trails Commission and City Council feedback, the recommended tree canopy goal is 40 percent coverage in 30 years. This plan outlines the strategies the city will use to achieve those goals.
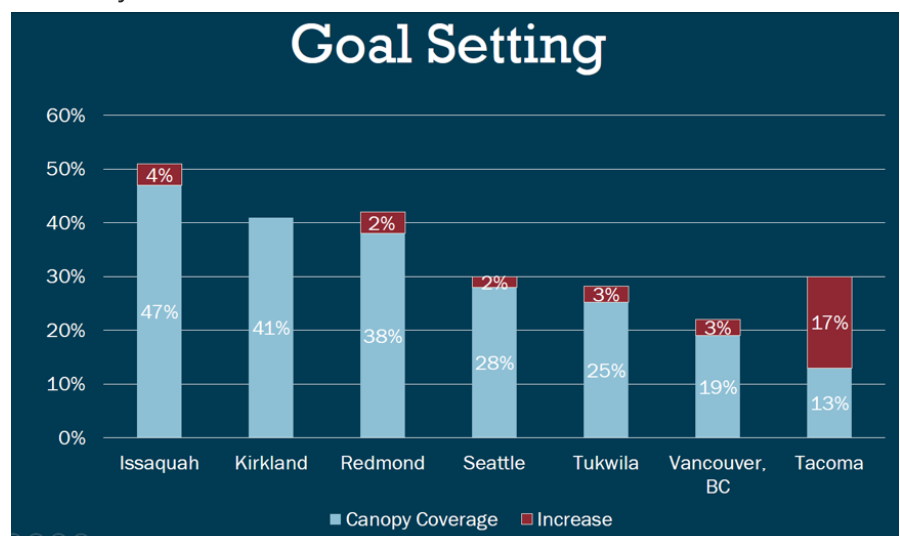
CHAPTER 4
Changing Landscape

Settled for over 10,000 years, the rich bottomland of the Sammamish Valley provided shelter and food for the Native Americans. The arrival of the European pioneers in the 1870s would lead to many changes to the landscape throughout the valley. The challenges of homesteading the land included clearing the towering trees, and the logging industry quickly arrived in the 1880s. The plentiful forests provided jobs throughout the entire region and contributed to the growth of Puget Sound. Lumber mills started operation in Redmond in approximately 1892 to meet the growing demand for shingles. The landscape of Redmond further changed with completion of the Chittenden Locks in 1916 as the Sammamish River and Lake were lowered. This project provided shipping industries fast methods of moving goods and materials, but effectively drained bogs and wetlands throughout the valley, including what is today Downtown Redmond. By the 1920s, the old growth forest had been harvested and the Redmond landscape shifted to agricultural based economy. The last lumber mill closed in late 1930 when a combination of fewer trees and less demand, because of the Depression, forced it to close.

Following decades of steady growth as a city on the outskirts of Seattle, the completion of the Evergreen Point Floating Bridge in 1963 contributed to the expansion of the suburban development patterns throughout the eastside. Redmond grew from a city of 1,426 in 1960 to 11,020 by 1970, and more than doubled again by 1980. As the demand for housing continued to grow, areas of second growth forests were being repurposed into single-family homes.

Redmond's economy quickly became redefined with the arrival and development high-tech industries. The increase of high-paying jobs, and the proximity to Seattle continued to drive the suburban expansion and continued clearing of parcels of land throughout the community for development. The recent transition from urban development to high-density mixed use in designated urban centers concentrate the demand, and will provide opportunities for tree canopy to be increased throughout the community.

CHAPTER 5
Value of Trees

Tree Canopy brings environmental and economic benefits to our community. These include Redmond's lush green hillsides, the natural beauty of Redmond, and many additional benefits. Tree canopy coverage is a metric that can quantify the amount of Redmond covered by trees and be used as a proxy to better understand many of the benefits detailed below. As Redmond continues to grow, trees and the benefits they provide will enhance the livability of all the City's neighborhoods.

Water Quality and Stream Flow

Surface water, both quality and quantity, is becoming increasingly important to carefully manage. It can be a major source of water pollution and peak flows can lead to urban flooding events. Tree canopy and restoration plantings can lessen the need for stormwater detention and improve the water quality entering Redmond's waterbodies. Runoff in urban areas often contains nitrogen, phosphorous and pet waste. Trees have been shown to filter up to 80 percent of phosphorus out of stormwater. A 50-foot strip of undisturbed forests along stream corridors has been proven to reduce nitrate concentrations by 75 percent while creating habitat and lowering stream temperature due to shading.

Air Quality

Trees affect air temperature, radiation absorption, wind speed and humidity, which can decrease pollution concentrations. Trees improve air quality by absorbing carbon dioxide, Sulphur dioxide and other pollutants with big trees removing 60 to 70 times more pollution than a small tree.[1] Mature trees absorb 120 to 240 lbs. of particulate pollution each year. [2]

Habitat

Tree canopy provides shelter and food for a variety of birds and animals. Food sources related to trees include leaves, fruits and nuts. A mix of tree species of varying ages within the canopy creates diverse habitat for a wider variety of species. Tree canopy also provides shade that reduces air and water temperatures, benefitting fish and wildlife.

Climate

Urban tree canopy offers climate benefits by reducing atmospheric carbon in two ways, sequestering it through carbon dioxide and carbon storage in the biomass of the tree. Redmond's Climate Action Plan estimates that a single tree can absorb as much as 48 pounds of carbon dioxide per year. Trees also reduce the urban heat island effect by cooling air through shade and indirectly lowering daytime and nighttime temperatures through transpiration. Mature tree canopy can reduce air temperature by 5 to 10 degrees Fahrenheit.[3]

Community Benefits

Trees are one of the most important factors in influencing the perception of a community's aesthetic value. Historically the main benefits of urban trees and forests relate to health, aesthetic and recreational benefits in industrialized cities.[4] Trees, densely planted, such as urban woodland areas, can be effective in reducing noise.[3] 80 percent of the respondents to the tree canopy poll stated that trees define community character and improve aesthetics. The natural environment is consistently one of the most important items identified by the community and the City Council has identified environmental sustainability as a top initiative.

Economic Impact

Trees provide an economic boost to commercial districts. Research show businesses located on tree-lined streets experience 20 percent higher income streams over those located in other areas. Customers will also travel further and stay longer to visit a shopping district with high-quality trees. Visitors to well-treed central business districts will spend 9 to 12 percent more for products.[5]

Neighborhood and Homeowner Benefits

Research has shown that having trees on your street can increase property values by an average of $8,870. Trees can also reduce energy consumption by 20 to 50 percent through shading buildings during the summer and blocking prevailing winds in the winter.[6]

Public Health

Trees have been shown to filter airborne pollutants and reduce conditions that cause asthma and other respiratory problems. One study showed that residents with the highest levels of greenery were three times as likely to be physically active and 40 percent less likely to be overweight or obese than residents living in the least green settings.[7] Trees also have sensory affects by creating a visually relaxing environment. The Nature Conservancy (TNC) has equated trees to a public health mandate and argues that the planting and care of trees should be funded with the same urgency as work on health care and other infrastructure.[8]

Traffic Safety

Studies have shown that reduced lane widths and street trees can reduce the severity of car crashes.[9] Trees along streets also help to break up buildings and create a sense of human scale to shopping districts and downtowns. Shading streets has also been shown to be correlated to better pavement durability and reduced maintenance.[10]

Currrent Conditions & Methodology

Determining how much of the city land area is covered by tree canopy can be accomplished by two primary methods – an on the ground field inventory or through geographic information system (GIS) analysis of aerial photographs or light detection and ranging measurements (Lidar). A ground field inventory is a process that includes physically measuring the tree canopy for each tree, determine the percentage of overlap in the tree canopy, and recording the location of each tree. The use of GIS provides an opportunity for staff to analyze two sets of data to determine the canopy based on aerial photography and (Lidar), eliminating the labor-intensive field inventory of measuring every tree in Redmond.

Aerial Photography

The use of aerial photography allows staff to easily track "green" the city is. Aerial photography is used in combination with Lidar data; since, aerial photography is significantly less expensive than Lidar it is much more economical to update the canopy coverage maps on a two-year basis. The new aerial photograph is analyzed for green vegetation and then an algorithm will highlight the difference between the new map and the existing tree canopy. Staff then manually reviews each change to ensure that the increased green vegetation is tree canopy. These updates have been conducted for 2015 and 2017. To increase the accuracy of tree canopy calculation, the aerial photography is reviewed with Lidar.

Lidar

Lidar is a surveying method that measures distance to a target by illuminating the target with pulsed laser light and measuring the reflected pulses with a sensor. Differences in laser return times and wavelengths can then be used to make digital 3-D representations of the target. Lidar is a similar process as radar, however Lidar measures distance with a laser for greater accuracy. This technology provides the ability to measure the height of objects whereas aerial photography can only capture color.

The use of these two data sets allows staff to combine the color of an image that appears to be a tree, with the height (more than ten-feet) to verify that the tree is a tree and not just a shrub.


It typically takes five or more years of growth from the time of planting before new trees reach the 10-foot height to be captured in the tree canopy coverage analysis. Additionally, the aerial photograph update method only captures relatively large-scale changes to the tree canopy. Therefore, repeating the Lidar survey (to identify trees, by measuring height) at approximately eight-year intervals would be useful to demonstrate change in canopy coverage. Due to the high cost of Lidar surveys, it is recommended that the City join with King County or other jurisdictions to share costs. A Lidar survey performed around 2021 would be ideal for updating the tree canopy coverage and setting a new baseline. The following exhibit demonstrates the differences in the data sets.

Current and Potential Conditions

When comparing the results of the aerial photography and Lidar as described in Chapter 5, the City of Redmond currently has 38.1 percent of tree canopy which is 4,062 acres of canopy out of 10,660 acres of land. The tree canopy is distributed differently throughout the community based on neighborhood characteristics such as urban or residential character. Some neighborhoods, like Downtown, currently have less than half the Citywide target of 40% due to the urban features supporting the high density-mixed use character.

The table below illustrates the current tree canopy per neighborhood compared to the potential additional tree canopy available. The potential additional tree canopy was determined by:

1. Comparing land uses that will support additional tree canopy;

2. The difficulty of planting such as buildings, roads, and sport fields; and

3. Includes incorporated areas like Watershed and Farrell McWhirter Parks, as well as unincorporated areas such as Juel Park and portions of Perrigo Park. Lake Sammamish has been removed from the total area of the City for these calculations.
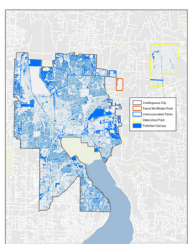

For a map of *Tree Canopy* with Neighborhood Outlines, see **Appendix A**.

For a map of *Tree Potential* with Neighborhood Outlines, see **Appendix B**.

Redmond that has lost approximately 20 acres of canopy or 8% since 2009. Sammamish Valley and Bear are both slowly increasing canopy with Bear Creek adding 13 acres of canopy or 2.5%.

Year	Acreage of Tree Canopy	Difference
2009	4197	0
2013	4129	68
2015	4095	34
2017	4062	33
Total Loss	135 Acres	17 Acres/Yr
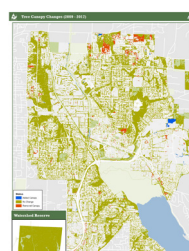
For a map of *Tree Canopy Changes* from 2009-2017, see **Appendix C**.

Rate of Loss

The loss of tree canopy occurs for many reasons including disease, safety issues and development. Understanding how much we are losing on average and why is important to consider when determining strategies, but also understanding the rate of loss will provide insight. The rate of loss was determined by the City through application of GIS comparing aerial photography between 2009, 2013, 2015, and 2017. Between 2009 and 2017, Redmond experienced a net loss of approximately 135 acres of canopy, the pace of decline occurred at a consistent rate of roughly 17 acres per year, with replanting, the net loss is approximately 12-13 acres per year. This results in a rate of loss of around 1% overall in most neighborhoods with the exception being North

CHAPTER 7

Strategies

Redmond strongly values its connection to the natural environment and the benefits urban forests bring to the community like clean water and air. A canopy coverage goal of 40 percent, which is approximately an additional 200 acres of canopy over 30 years, was established based on current conditions and input from the community. Achieving the goal by the year 2048 is realistic, achievable and able to provide a meaningful increase in the overall forest canopy.

To achieve the goal, a set of strategies were developed to maintain current canopy, educate and increase canopy through planting. The exact strategy mix will depend on site conditions, existing uses and future opportunities to protect or increase canopy. For example, most new housing growth is expected to occur in Overlake and Downtown, which will limit the overall canopy cover possible in these neighborhoods but also require that Redmond ensure green spaces and treed areas are easily accessible by those who live and work in these neighborhoods.

The strategies encompass education, planting, preservation, partnerships and regulation across the City. The strategies are outlined in detail below and the short-term, six-year implementation plan in Chapter 8 details which strategies and tactics will be developed and implemented between 2019 to 2024.

7.1 Educate

Education and awareness is an important way to increase community understanding of the diverse benefits trees bring to the community. This strategy includes a breadth of tactics and topics that touch all members of the community. It is targeted and proactive in building and sustaining interest in planting and enhancing Redmond's urban forests. The Tree Canopy goal of 40 percent is a 30-year effort so awareness and education will be an ongoing component that showcases the value of Redmond's urban forest canopy. Community input showed strong support for the goal and taking an active role in planting and stewarding the canopy vs a more regulatory approach.

The following tactics will have the potential to increase awareness.

- Calculating and sharing the value of trees for stormwater, heating/cooling, air quality, public health, economic development and climate.

- Developing a "right tree, right place" guide to tree species that are suited to Redmond's climate and that fit a variety of urban contexts in terms of size, shape and characteristics.

- Developing guidance on planting and tree care to ensure successful tree planting efforts that will grow healthy canopy. These materials could be included on the City website and included with incentive trees provided by the City.

- Coordinating a speaker series that engages the community on wide-ranging topics around urban forestry and trees in the City.

- Assessing canopy coverage numbers every two years with aerial photos and LIDAR every eight years of the current forest cover changes.

- Facilitating community planting events such as Green Redmond Day and Arbor Day activities.

Cost

Education and awareness efforts are primarily a low to moderate cost item (less than $100,000). These efforts are often accomplished with existing staff but

larger efforts may require contractor or expanded volunteer commitments.

Canopy Impact

These efforts result in minimal increases in canopy but form the basis for sustaining momentum and support for protecting and enhancing tree canopy in Redmond. Without these efforts there would be limited success in moving forward towards the goal.

7.2 Planting on Public Property

The City, which maintains parks, natural areas and riparian corridors can support increased tree canopy by using these spaces to restore and increase forest cover throughout the City. These efforts bring multiple benefits from shading water for Kokanee Salmon to providing tree lined streets in our neighborhoods. These are lands the City currently manages.

As part of this effort the City will evaluate the following initiatives to increase tree canopy.

- Continuing to restore at least two acres per year of alongside stream and river corridors. These projects include vegetation and canopy cover depending on site, but provide similar benefits to trees. Restoration projects are planted on average at 250 trees per acre.
- Increasing canopy coverage on City parklands by replacing trees that have been removed and planting in open areas according to master plans. Over 140 acres are available in City Parks to increase canopy coverage.
- Partner with the community to evaluate a memorial tree that provides increased canopy within parks and open spaces.
- Ensure a variety of tree species and ages exist across city lands to create a more diverse and resilient system

Cost

Planning level costs range from $35,000 to $135,000 dollars. Key variables include level of site preparation, need for irrigation and planting density. Initial work will target the most feasible sites which are on the lower-end of the cost spectrum, but as the project moves forward it is expected costs will rise as

site challenges need to be addressed.

Canopy Impact

High. These plantings will be overseen by staff and/or trained contractors with a species mix chosen to meet the goals of the project.

7.3 Increase Planting on Private Property

Enhance Canopy through Plantings on Private Lands

Private lands represent the largest single opportunity to increase canopy in the City of Redmond. Nearly half of the available lands identified as potential canopy opportunities exist on private land and the majority of that is single-family-residential sites. To reach the goals outlined in this plan a community driven model of increasing trees on public lands as well as private is essential. Potential programs and initiatives that will be considered to increase trees on private property through voluntary programs include the following.

- Developing a reduced-price tree program for property owners. This program could range from a free or reduced-price tree or a "tree-bate" coupon that property owners could use at local nurseries to select from a mix of trees that are suitable for our climate and the site to be planted. Trees will include educational materials on tree selection for the site, planting and maintenance.
- Targeted incentive programs to neighborhoods, especially those with lower canopy, that offer a range of opportunities from encouragement and education to incentivizing trees and planting efforts on private land
- Identify ways to expand these programs in the future based on demand and develop metrics to track success over time in increasing canopy and green infrastructure.
- Partner with school district and major employers to understand feasibility of increasing canopy on their properties and potential planting or engagement efforts to increase canopy.
- Build relationships with local nurseries to

showcase recommended trees for planting in Redmond, making it easier for homeowners to get the right tree in the right spot.

Cost

Cost estimates average $16,000 per acre at a tree density of 100 trees per acre. These estimates are based on peer cities around the region that currently have incentive programs. This is a voluntary program that could be started on a smaller scale and then adapted as demand dictates.

Canopy Impact

Moderate. Incentive programs deliver more than just canopy gains. They are an opportunity to communicate canopy benefits, help educate around the, "the right tree in the right place", and create community around the shared value of urban forestry.

7.4 Protect

Regulations can be used to protect existing canopy ensure trees are replanted to make certain that new development is balanced with the natural environment. Redmond's tree protection codes were written in the 1990's, efforts with this strategy include:

- Review of existing tree regulations and determine if they are accomplishing the intended goals and update for clarity and simplicity when appropriate.

- Improve tree removal and replacement tracking using EnerGov software to better understand short-term canopy change and track tree planting and removal citywide on an annual basis to better understand and adapt to changing conditions over time. Evaluate the need for an on-call arborist or urban forester on staff to advise on tree health and retention.

- Research opportunities for increased incentives for the retention and planting of trees during development.

Cost

Low to Moderate. Many of these efforts can be undertaken with current staffing levels and programs that are in place.

Canopy Impact

Moderate to high. Estimates show that the City is losing 10 to 15 acres of canopy cover per year over the last decade and an increased understanding of the regulations will enable the balance between development and trees.

7.5 Partner

Reaching the 40 percent goal for canopy coverage is not something the City can do on its own. Success will include City efforts, non-profits, Redmond residents and others creating sustainable partnerships. There are many potential partnerships where mutual goals can be accomplished through increasing tree canopy.

- Continue Green Redmond Partnership, which is funded by Natural Resources and Parks, has nearly 400 acres of forested parklands under active management. The partnership volunteers contributed over 3000 hours of work in 2017 that is valued at nearly $95,000 dollars. It is a way to engage the community in actions that preserve the environment.

- Update and continue implementation of the 20-year forest management plan that has been developed to restore and enhance Redmond's natural areas.
- Evaluate additional partnerships with groups like King County Conservation District, King County Million Trees, Cascade Water Alliance, Puget Sound Energy and other entities on programs and outreach activities that have potential for mutual benefit.

Cost

$4,500 per acre is the estimated cost of canopy expansion with Green Redmond Partnership. Other partnerships will depend on the efforts undertaken and volunteers engaged.

Canopy Impact:

Low to Moderate. Partnerships, such as the Green Redmond Partnership, have a low benefit in terms of new canopy generated, but are invaluable in maintain and enhancing forest health by removing invasive species and planting understory.
These programs develop community leaders and can connect urban forestry to other important issues such as water quality and salmon enhancement.

7.6 Acquire

To achieve canopy goals and distribution of canopy throughout various neighborhoods, the city may need to make strategic acquisition of forested parcels or parcels that can be re-planted and potentially used as a tree mitigation bank for public and private developments.

Cost

Acquisition of forested parcels have cost estimates from $247,000 to 280,000 per acre and non-forested parcels range from $52,000 to $183,000 dollars.

Canopy Impact

Moderate. Acquisition of forested parcels can have a significant and immediate impact on conservation of existing canopy. Potential acquisitions could be targeted to areas with lower canopy or unique

opportunity to ensure a specific forested parcel remains treed. Given that these parcels would already be calculated in the City's overall forest canopy, they would not be adding additional canopy. Non-forested parcels can increase the overall canopy coverage in Redmond. Canopy impact is moderate overall given that acquisition will likely be a small part of the overall canopy expansion due to costs.

CHAPTER 8
Implementation Plans

6-Year Tree Canopy Implementation Plan Matrix

Strategy A: Education & Awareness
Increase understanding and awareness among all community members around the value of trees for social, environmental and economic reasons. Cost estimates for strategy are low, medium, high given that there is no direct correlation to a per acre canopy cost.

Action	Timeframe	Cost Estimate*	Metric
A1. Compile a suggested tree list that identifies coniferous and deciduous tree species that fit a wide-range of conditions on public and private property for developers and community members.	2019-2020	Low	Tree list downloads
A2: Compile best practices and planting tips to ensure newly planted trees are healthy and properly maintained.	2019-2020	Low	Downloads, views or handouts
A3: Add new policies to the comprehensive plan describing the tree canopy goal, timeframe, and other key strategies.	2019	Low	Goals in comprehensive plan
A4. Develop a Tree-Tour of significant or "champion" species around the city and their ecological or historical significance	2021-2022	Low	Downloads or views
A5: Evaluate a Speaker Series on trees and forest health with a diversity variety of topics to attract a wide-ranging group of community members	2021-2022	Moderate	Attendance
A6: Develop opportunities to showcase urban forest with art and cultural programming	2021-2022	Moderate	Number of events
A7: Consider partnering with Redmond Historical Society on history of Redmond's forests.	2022-2023	Moderate	Download or attendance

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*Cost Estimate Scale:

Low: Less than $50,000. Often accomplished with existing City staff resources.

Moderate: Between $50,000 and $100,000. Has budget implications; requires dedicated staffing, contractor and/or volunteer commitment.

High: Greater than $100,000. Involves substantial project management, staffing and commitment. es owned by the City of Redmond or other governmental agencies within the City of Redmond. Private lands are owned by private land owners and represent a wide range of property types such as residential, commercial, industrial.

Strategy B: Increase City Led Planting

City led planting involves canopy enhancement projects on City-owned land, such as parks, rights-of-way and stream restoration corridors within contiguous boundaries.

Action	Timeframe	Cost Estimate	Metric
B1. Increase Canopy on city property by planting: open space areas in parks consistent with park master plans, street trees, riparian and restoration plantings.	2019-2020 (ongoing)	$35,000 to $120,000/ acre	Acres planted Trees planted
B2: Continue program to allow residents to plant trees on park property (via donation) for memorials	Ongoing	Low	Trees Planted
B3: Maintain and develop partnerships (Strategy F) to assist in city planting.	Ongoing	Moderate	Acres planted Trees Planted

Strategy C: Private Planting Incentives

Half of the opportunity to increase tree canopy coverage in the City of Redmond exists on private parcels. Meeting canopy goals will require commitment and collaboration and will not be possible without working with private property owners to assist in this effort. These opportunities will be voluntary at the discretion of the landowner.

Action	Timeframe	Cost Estimate	Metric
C1. Develop a program to provide low-cost or no-cost trees to Redmond property owners to increase canopy on private parcels	2019	$18,000/ acre	Trees planted Acres Planted Number of property owners
C2: Encourage use of Neighborhood Matching Grants to increase canopy in neighborhoods where canopy is needed.	Ongoing	Grants are up to $5,000	Trees planted Acres restored Acres planted
C3: Work with neighborhoods in ongoing efforts to increase canopy and forest health in their neighborhoods.	Ongoing	Low-Moderate	Trees planted Acres restored Acres planted

Strategy D: Regulations

Regulations can be used to understand tree removal, ensure care of urban trees and set standards for removal and replacement.

Action	Timeframe	Cost Estimate	Metric
D1: Perform comprehensive review of current regulations to determine if they are accomplishing the intended goals	2019-2020	Moderate	
D2: Improve tree removal and replacement tracking using EnerGov to better understand short-term canopy change.	2019	Low	Quarterly reports of tree removal and replacement
D3: Evaluate compliance on existing single-family tree removal permit applications and replanting to ensure required replanting of trees occurs.	2021-2022	Low	Compliance percentage
D4: Evaluate need for an on-call arborist or urban forester on staff to advise on tree health and retention.	2019-2020	Moderate	Benefit-Cost Analysis

Strategy E: City Acquisition of Lands

Acquisition of lands within contiguous city boundaries can be used to conserve existing forested parcels or could be used to acquire open space that could be used to increase canopy through mitigation planting or other mechanisms.

Action	Timeframe	Cost Estimate	Metric
E1. Evaluate acquisition of forest parcels, especially in neighborhoods or zones with less canopy, to increase urban forest cover	2023-2024	$247,000-$280,000	Acres of canopy
E2: Consider acquisition of non-forest parcels as a "tree bank" that can be planted with future canopy and can be used when off-site planting is necessary.	2023-2024	$52,000-$183,000	Acres reforested

Strategy F: Partnerships & Volunteers

Partnerships engage the community in tree planting and forest restoration. They provide an opportunity to leverage funding and broaden the coalition helping to preserve and enhance Redmond's tree canopy. Partnerships will be essential to accomplishing the goals of the tree canopy strategic plan.

Action	Timeframe	Cost Estimate	Metric
F1. Continue to progress on the 20-year Forest Management Plan developed by the Green Redmond Partnership to restore and enhance natural areas.	2019 (Ongoing)	$75,000 per year	Active volunteer forest stewards Acres under active restoration management Trees planted
F2: Update the Green Redmond 20-year Forest Management Plan	2023-2024	Low	Acres of parkland to be actively managed
F3: Develop partnerships with organizations and initiatives doing forest management, restoration work and data analysis	Ongoing	Low	Number of partnerships
F4: Provide opportunities for community groups to assist in planting and restoration through events like arbor day or other volunteer service days	Ongoing	Low	Volunteer hours
F5: Pursue grant funding to support tree canopy efforts	Ongoing	Low-Moderate	Grant funding received

Strategy G: Data Analysis

Canopy enhancement contains many variables and will need to be tracked on multiple scales (per tree, per acre and overall coverage) to ensure overall goal can be achieved.

Action	Timeframe	Cost Estimate	Metric
G1: Number of trees and acres planted	Yearly	Low-Moderate	Annually
G2: Number of street trees pruned	Ongoing	Low-Moderate	Annually
G3: Number of volunteer hours performed for restoration and stewardship activities			
G3: Acres enrolled in active management for restoration	Ongoing	Low	Annually
G4: Acquire Aerial Photography Canopy Analysis	2020	Low	Biennial
G5: Acquire updated LIDAR dataset to reset canopy baseline	2022-24	Moderate	Every 8 years
G6: Redmond's Current Canopy Coverage	Ongoing	Low	Every two years
G7: Consider I-Tree analysis to better understand species mix, age and environmental values associated with Redmond's urban forests	2021-22	Moderate	Age Species Diversity Stormwater Value Carbon sequestration
G8: Develop collector and methodology to improve tracking of trees planted on private lands	2023	Low	Number and species of trees planted

30-Year Tree Canopy Implementation Matrix

Long-Term Strategy Implementation				
Tree canopy is an ongoing effort to plant, protect and maintain the urban tree canopy in Redmond. Over time strategies will shift to take advantage of current conditions and to prioritize canopy in certain areas of the city that may need additional trees. The matrix represents potential mix of strategies that would be used to accomplish the goal.				
Strategy	**Short-Term 2018-2028**	**Mid-Term 2028-2038**	**Long-Term 2038-2048**	
Education and Awareness[1]				
Data Analysis[2]				
Increase City-Led Planting	30 to 80 acres	50 to 110 acres	40 to 100 acres	120 to 290 acres
Private Planting Incentives[3]	15 to 50 acres	35 to 75 acres	25 to 70 acres	75 to 195 acres
Regulations[4]				
City Acquisition of Lands	1	2	2	5-20
Partnerships and Volunteers	3-6	3-6	4-8	10-20
Acres[5]	50 to 125 acres	70 to 175 acres	90 to 225 acres	210 to 500** acres
Cost[6]	$4M-10 Million	$5.6M-14 Million	$7.2M-18 Million	$17-42 Million**

[1] *Education will be included as all parts of this effort, but a focus will be necessary to maintain momentum towards goal*

[2] *Data analysis does not add trees, but will be a necessary part of adaptive management of the canopy*

[3] *Based on 100 trees per acre*

[4] *Regulations are proposed to be reviewed in near-term, once updated table will reflect canopy change*

[5] *Approximately 200 net acres of new canopy to achieve 40% goal, but current rate of loss of approximately 12-13 acres per year could create overall canopy increase of 500 acres. Estimates of acreage for each strategy is based on the low-high total acreage needed to meet goal*

[6] *Cost estimates range based on ultimate number of additional acres*

CHAPTER 9
Funding

9.1 Funding Need

The estimated cost to achieve the 40 percent tree canopy goal is approximately $80,000 per acre. Over thirty years, the total costs are estimated to be between $16,000,000 to $42,000,000 or approximately $600,000 to $1,400,000 per year in 2018 dollars.

9.1 Potential Funding Sources

To accomplish the vision set out in the plan, a variety of existing and new funding sources will be needed. These sources will vary based on project type and scope. A general overview of potential funding sources is below.

Capital Improvement Plan Project Budgets

Many large-scale projects with canopy improvements will be part of the ongoing 6-year Capital Improvement Plans and funded through those efforts. An example of this would be Downtown Park, which will provide new tree canopy in downtown as part of the park development. Other examples would be a transportation project that replaces or add street trees.

General Fund

Ongoing activities such as street tree pruning, Green Redmond Partnership forest restoration program, tree planting projects, tree maintenance around traffic signals and street signs, as well as future activities such as the tree incentive program could be funded through the general fund.

Tree Fund

Current regulations require a fee to be paid when development-related tree planting requirements cannot be accommodated on-site. These funds can be used to increase canopy in other areas across the City where canopy is needed and space is available.

Stormwater Utility Funds

Utility funds help preserve and increase tree canopy through capital projects education and outreach, and partnerships to plant and maintain significant areas of tree canopy as urban forests help to mitigate stormwater runoff.

Stormwater utility services could also be used to provide information and request voluntary donation from ratepayers under RCW 35A.80.040. This could be used to raise money for future canopy expansion or maintenance via a check-box on a billing statement or other request for donation.

Grants

A variety of opportunities exist for grants with partners across the region. These vary from working with Water Resource Inventory Area (WRIA) 8 on salmon recovery funding that can be used to improve habitat. Washington Department of Nature Resources has urban forestry grant that includes but is limited to resources for developing tree ordinances, policy manuals, tree canopy analysis programs. The Nature Conservancy in Washington and City Habitats have offered grants to invest in trees and improve stormwater that ranged from $15,000 dollars to $75,000 dollars.

Partnerships

Other entities, such as King County, King Conservation District or neighboring jurisdictions provide an opportunity for partnerships around a shared goal of keeping of expanding and maintaining urban forests. Other partners may include large property owners such as corporate campus' or school sites that could potentially increase canopy for a variety of benefits. Boise, Idaho has created partnerships with their local power company to provide shade trees and calculate the impact of those additional trees on energy consumption during peak periods of use.

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CHAPTER 10

Maintenance

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Maintenance of both existing and future canopy needs to be planned for and funded to manage more than 8,000 street trees, over a thousand acres of forest parklands, and 4,000 acres of canopy in total across Redmond. These processes are already in place for public lands and now we must also work with private partners and community members to think about maintaining trees on private properties.

10.1 Maintenance on Public Property

Cost estimates to maintain an acre of city-led plantings, whether in a park, restoration area or other site are on average $900 an acre per year. These costs do have a wide-range to them depending on site, access to water and other factors. Most of the maintenance in restoration and canopy projects is in the first five years when watering and pruning have the largest effect on the survival rate during the tree establishment phase.

Certain trees, such as street trees, are managed more intensively. Issues that require maintenance include tree replacement, supplemental water, pruning, storm response and inventory. Redmond's street trees are managed on a 5-year cycle. Regular maintenance practices on trees include leaf removal, removing damaged or dead trees and pruning for both health, visibility for signs, signals and safety. Maintenance directly impacts the structure of the tree which will have a large impact on how the tree/canopy functions and the associated benefits that are derived from that canopy. Trees in forested natural areas or as part of restoration projects are usually managed less intensively. Current programs such as the Green Redmond Partnership help to remove invasive species and improve forest health with thousands of hours of volunteer labor and over 400 acres under active management.

10.2 Private Property

Maintenance of trees on private property are the responsibility of the landowner. Education around planting the right trees in the right place will help limit future issues with trees growing up under powerlines or being planted too close to fences, foundations and other infrastructure that may be damaged. All city-led efforts to increase canopy on private property will include educational materials to address these common issues. These materials will include site selection, planting and pruning practices along with watering.

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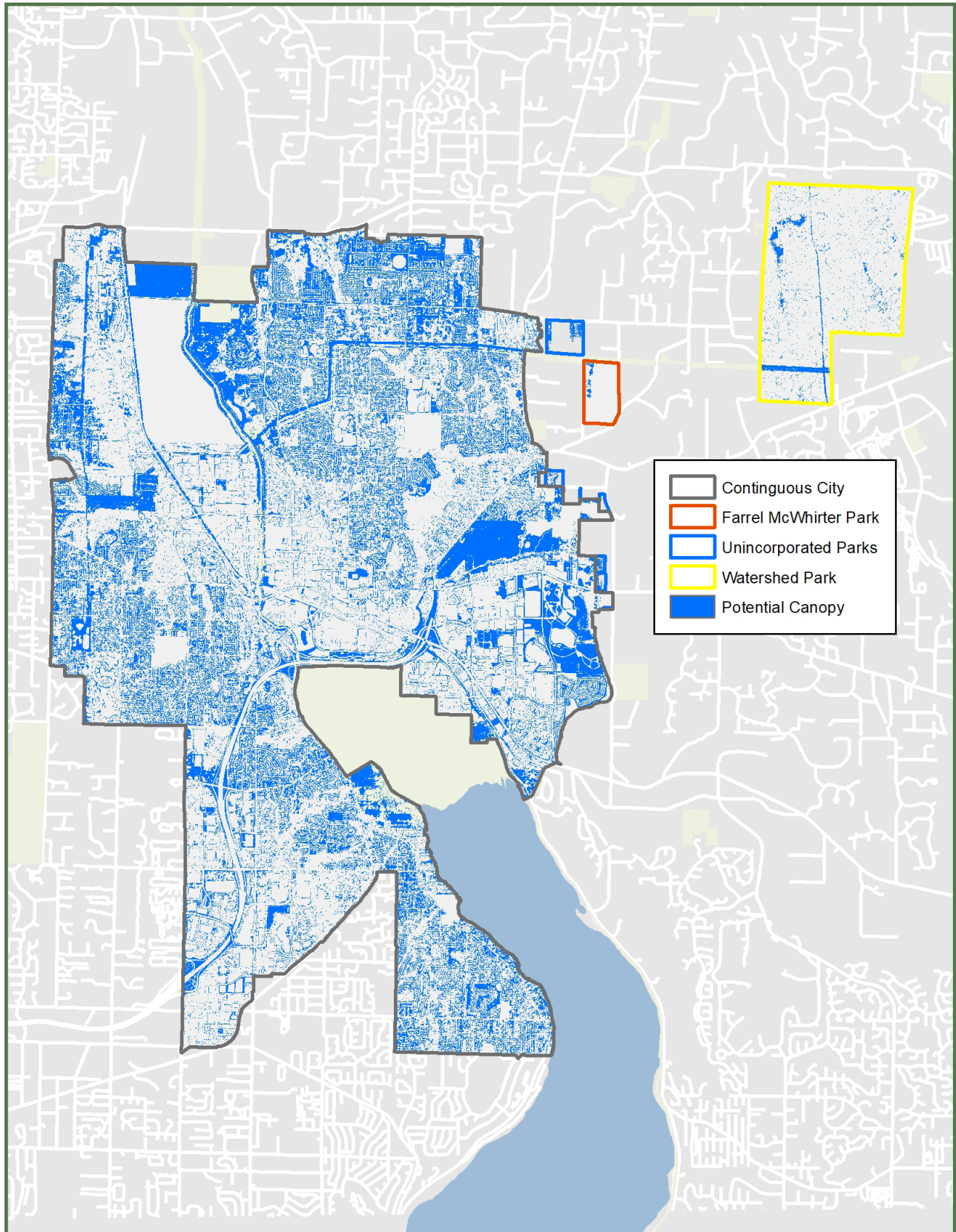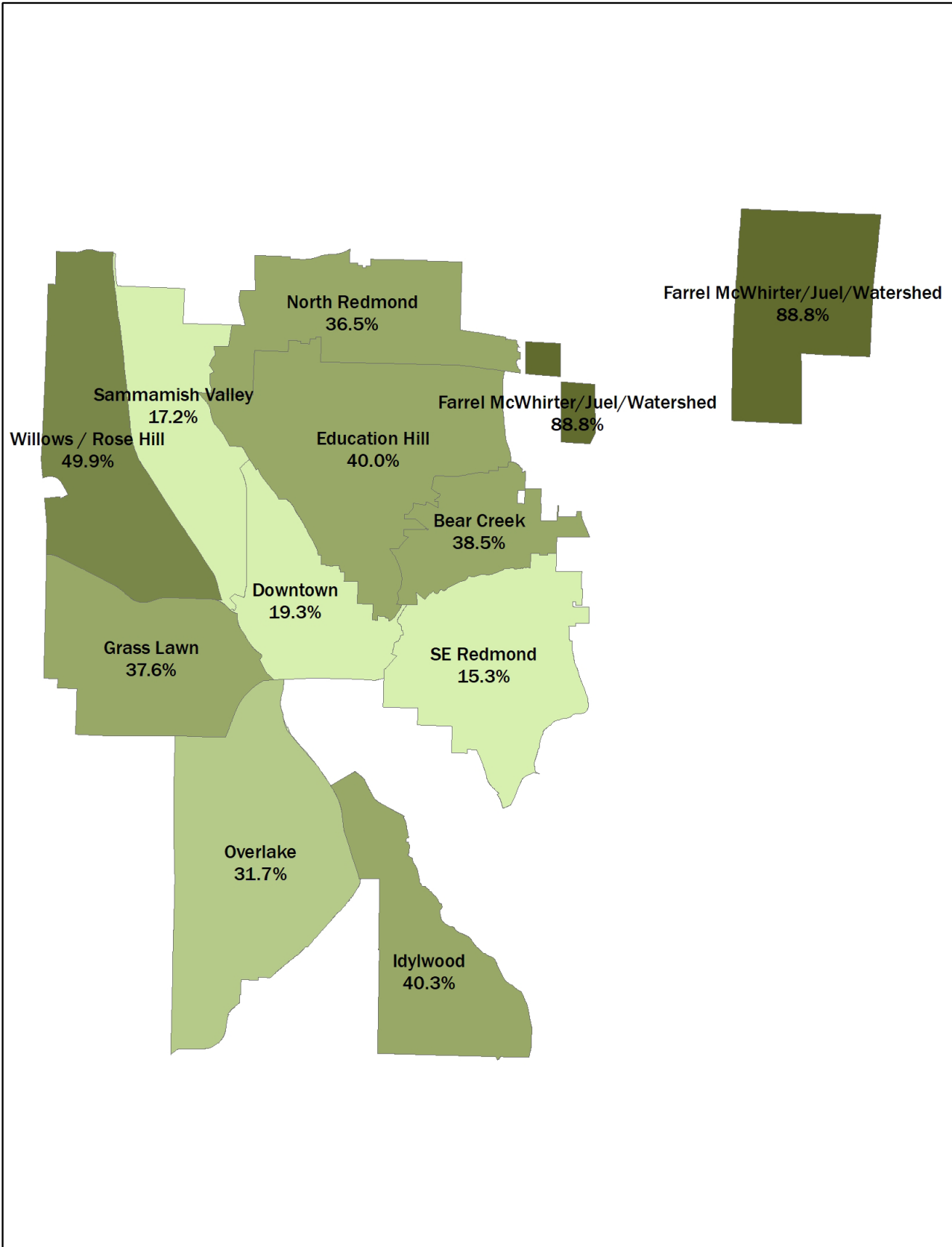
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Appendices

Appendix A: Map of Tree Canopy with Neighborhood Outlines

Appendix B: Map of Tree Potential with Neighborhood Outlines

Farrel McWhirter/Juel/Watershed
88.8%

North Redmond
36.5%

Sammamish Valley
17.2%

Willows / Rose Hill
49.9%

Education Hill
40.0%

Farrel McWhirter/Juel/Watershed
88.8%

Bear Creek
38.5%

Downtown
19.3%

Grass Lawn
37.6%

SE Redmond
15.3%

Overlake
31.7%

Idylwood
40.3%

Appendix C: Map of Tree Canopy Changes (2009-2017)

Tree Canopy Changes (2009 - 2017)

NORTH

Status
- Added Canopy
- No Change
- Removed Canopy

Watershed Reserve