City of Sammamish

RIGHT-OF-WAY TREE STUDY AND RECOMMENDATIONS REPORT

2025

ACKNOWLEDGMENTS

City of Sammamish
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Executive Summary

The City of Sammamish, located within King County, has a population of over 65,000 people. Bordered to the east by the Snoqualmie Valley and to the west by Lake Sammamish, Visitors and residents enjoy extensive parks, open spaces, shorelines, and a vibrant urban forest. The City's overall 48% tree canopy cover contributes to the Sammamish community's character and provides valuable ecological, economic, and public health benefits.

The City aims to provide services that enhance and protect Sammamish's environment, quality of life, community health, safety, and welfare. The Public Works Department is responsible for maintaining the built streetscape infrastructure which provides for transportation, pedestrian access and safety, and utilities. The City's Street Tree population within its landscape maintenance zones includes over 1,500 trees, approximately 1,100 of which are maintained by the Public Works Rights-of-Way (ROW) Maintenance team, with the remaining trees maintained by adjacent private property owners, primarily homeowners' associations (HOAs). Ultimately, the City is tasked with ensuring long-term tree health to promote urban forest sustainability and climate resilience.

To effectively plan for and manage Sammamish's street tree population the City invested in an updated inventory of its ROW trees and an assessment of tree management-related sections of the 2016 Public Works Standards, the ROW Tree List, and municipal tree regulations. The results of this study and analysis were developed into this *ROW Tree Study and Recommendations Report* (Report). The primary objective of the project is to improve the management of trees within the streetscape – where the city is managing the multiple benefits and often competing demands of green and built infrastructure assets.

The 2024 street tree inventory assessed 1,525 trees located within the City's landscape maintenance zones rights-of-way. The Sammamish street tree population has a species richness of 57 species representing 30 genera and 16 plant families. Species are characterized primarily by ornamental tree varieties locally adapted to the growing conditions within Western Washington as well as trees native to the Pacific Northwest. The top five species include red maple, green ash, Norway maple, Chinese elm, and little-leaf linden. These five species combined represent four genera and a total of 53% of the tree inventory, suggesting relatively low species diversity.

The Report outlines best management practices for establishing a robust street tree canopy, covering topics such as soil volume and quality improvement, pruning standards and frequency, increasing tree species diversity, planting guidelines, and strategies for addressing infrastructure conflicts. The City will integrate recommended standards and regulatory considerations outlined in the report into the Public Works Standards and municipal code updates scheduled for 2025. The Report also serves as a guide for the Public Works Department and Department of Community Development (DCD) to inform collaborative stewardship of Sammamish's ROW tree assets and further the goals and objectives articulated in the City's *Urban Forest Management Plan*.

Table of Contents

List of Figures

List of Tables

1. Introduction

1.1 Project Purpose and Background

Urban forests include the trees and vegetation found in natural areas, formal parks, public spaces, private properties, and transportation corridors. Trees in heavily urbanized environments, especially right-of-way (ROW) street trees, help to mitigate the effects of the built environment and provide numerous environmental and public health benefits, including stormwater mitigation, shade and urban cooling, improved air quality, noise abatement, economic advantages, human health and wellness, and traffic calming. This Right-of-Way Tree Study and Recommendations Report (Report) supports the City of Sammamish's ongoing efforts to manage its urban forest resources based on sound, accurate data, and the arboriculture industry's best practices and standards. The Report aims to provide a framework for City departments engaged in ongoing street tree management as well as those tasked with the development of future regulatory and standards updates.

In addition to providing specific management and tree species selection guidance based on the updated tree data, the Report includes an assessment of the City's current policies, codes, and standards which serve as guidance for City staff and external professionals, stakeholders, and property owners engaged in street tree care and maintenance. This assessment is the basis of recommendations for:

- Revisions to the City of Sammamish 2016 Public Works Standards manual to align with current industry standards and best management practices to reduce infrastructure conflicts and improve tree establishment, overall health, and longevity.
- Updates to the Sammamish Municipal Code (SMC) to clarify the City's role in supporting the long-term health, preservation, enhancement, and sustainable management of privately maintained ROW trees.

In 2019, the City of Sammamish adopted its *Urban Forest Management Plan* (UFMP) to support stewardship and conservation of urban forest resources, emphasizing environmental sustainability and forest health. As part of the UFMP 2021-2022 implementation plan, the City completed a partial tree inventory of over 8,000 trees within City parks and ROW. Of these trees, 1,100 were identified within 18 maintenance zones and managed by the Public Works Department. Building off this initial inventory effort, the City contracted with Facet in 2024 to reassess public tree health and site conditions and to develop detailed maintenance and planting guidance for publicly maintained ROW trees.

To evaluate the City's current practices related to ROW tree management, Facet engaged in a gap analysis exercise to solicit feedback regarding issues and challenges faced in street tree management. A questionnaire was developed for City staff to complete, followed by work sessions aimed at understanding the current urban forestry program, its resources, staff roles and responsibilities, and the application of relevant policies and regulations.

1.2 Related Plans and Policies

Key City policy documents were reviewed for content related to ROW tree management and to ensure ROW tree management and regulatory recommendations meet the policy objectives, goals, and strategies identified therein. Plans reviewed for this task include the 2019 UFMP and the 2023 Climate Action Plan.

City of Sammamish Comprehensive Plan

Under the Washington State Growth Management Act (GMA), most cities are required to develop and periodically update strategies to accommodate growth that reflects the community's vision. Although the 2015 Sammamish Comprehensive Plan was undergoing its periodic review at the time this gap analysis was conducted, the goals and strategies outlined in the City's UFMP and Climate Action Plan were built off long-range Comprehensive Plan policy goals. In reviewing the draft 2024 Comprehensive Plan, significant policy goals related to street trees include:

- Maintain and enhance the City's street tree maintenance program (Land Use Goal LU 2.17).
- Provide attractive, high-quality parks, recreational areas, and streetscapes throughout the City (Land Use Goal LU 5.2).
- Utilize asset management and condition performance metrics to proactively maintain, rehabilitate, and replace the city's transportation assets (Transportation Goal T 3.1(e)).
- Encourage transportation system development that minimizes existing tree canopy removal and replaces any necessary tree removal along traffic rights of way (Transportation Goal T 4.2).
- Promote municipal actions that align with the goals of the *Urban Forest Management Plan* (Climate Change Goal CC 5.1).
- Support the City of Sammamish's Climate Action Plan and strive towards continued improvement in sustainability (Climate Change Goal CC 8).

City of Sammamish Urban Forest Management Plan (2019)

The City's UFMP aligns with the Comprehensive Plan by identifying tree canopy preservation as a critical component of environmental sustainability and the community's vision for Sammamish. The UFMP guides urban forestry stewardship grounded in an adaptive management framework with urban forest assets (A), municipal operations (M), and community collaboration/engagement (C) goals based on criteria and indicators for strategic urban forest planning and management. The tree inventory, gap analysis process, and ROW Tree Study Report recommendations meet the following UFMP goals and objectives:

- Develop an approved tree list as a separate policy document that can be updated routinely and independently from other city policy documents (Goal #UA2, Objective B).
- Assess the effectiveness of design, construction, and development standards that apply to trees and planting sites (Goal #UA3).

- Require compliance with ANSI A300 as the standard for care in all tree work (Goal #UA3, Objective A).
- Develop design standards that include optimal design standards for large-stature trees (Goal #UA3, Objective B).
- Develop requirements that landscape designs and planting plans consider existing infrastructure above and below grade (Goal #UA3, Objective C).
- Develop a standard tree inspection protocol… integrate inventory data into an accessible data management system… develop a policy and assign responsibility for keeping inventory data current Goal #UA6, Objectives A-C).
- Care for the community urban forest using the best available science (Goal #UA7).
- Set policies that any tree work complies with ANSI A300 Tree Care Standards and that tree workers comply with ANSI Z133 Safety Standards (Goal #UA7, Objectives A-B).
- Set policies that urban forestry work considers best management practices advised by the International Society of Arboriculture (Goal #UA7, Objective C).
- Review tree ordinances every 5-10 years (Goal #M6).

Sammamish Climate Action Plan (2023)

In 2023, the GMA added that Comprehensive Plans must include a new Climate Change and Resiliency Element to measure, reduce, and report on local reductions in greenhouse gas emissions and vehicle miles traveled. The development of the City's Climate Action Plan (CAP) aligns with and informs these future updates to the City's Comprehensive Plan. This project is further supported by the CAP goals, strategies, and actions that aim to mitigate local climate impacts over a 30-year horizon. Areas identified in the CAP with street tree management overlap have been identified in the Buildings and Energy (BEU), Natural Resources (NR), and Water (WR) section goals as follows:

- Cultivate a contractor network to promote the implementation of green infrastructure… (BEU Goal 3, Strategy 3).
- Identify grant and partnership opportunities to amplify City efforts to implement the *Urban Forest Management Plan* (NR Goal 1, Strategy 1).
- Encourage municipal landscape contractors to utilize native plants and drought-tolerant landscape design plans (WR Goal 1, Strategy 2).

2. Program Framework

2.1 Citywide Urban Forest Management

The Department of Community Development (DCD) led efforts to develop the City's 2019 UFMP. The UFMP Implementation Strategies Matrix documents a comprehensive list of implementation actions for each of the goals and objectives adopted in the UFMP, one of which is to develop a specific ROW strategy to retain and increase tree canopy. However, there are numerous competing priorities and challenges to preserving and enhancing street tree canopy cover, including climate impacts, utility conflicts, adverse site conditions affecting tree health, liability issues, and code compliance and enforcement effectiveness.

Based on the staff response from the Gap Analysis work session, City communications regarding tree management occur on an as-needed basis. Currently, staff meet informally regarding a specific project or an emergent issue, and there are no standing meetings scheduled for sharing tree management issues and priorities across divisions.

Departments engaged in various aspects of tree management include:

- Community Development – Development review for tree retention/protection on private property, and long-range planning.
- Public Works – ROW tree and stormwater facility management, permit review for ROW permits.
- Parks – Management of ornamentally landscaped trees and forested natural areas in public parks.

General UFMP implementation and special projects currently fall to the Natural Resource and Environmental Sustainability Coordinator. City staff engaged in tree management develop work plans for each biennium to address immediate management needs which may include hiring contracts with third-parties for on-call arborist and tree removal services. During the gap analysis, staff expressed the importance of the City Manager's office involvement in urban forestry decisions. Staff also expressed a desire to "right-size" the UFMP to ensure proper balance between strengthening and preserving tree canopy and the ability to achieve other significant policy goals, such as encouraging additional housing stock and wildfire prevention. In addition, the UFMP should reflect truly attainable staffing and budget resources. Finally, staff expressed that it would be useful for those currently involved in tree planning, management, maintenance, and enforcement to meet regularly and proactively.

2.2 Public Works Operations

The City's Public Works Department is tasked with several tree management duties, including public ROW tree maintenance and removal. This is in addition to a large body of other ROW management functions including street signs, stormwater maintenance, spill response, storm response, asphalt patching, vegetation encroachment issues, and sidewalk repairs. Under the direction of the Public Works Director and with support from City administrative staff, at the time of this study, the ROW and Stormwater maintenance team consists of one full-time Superintendent and eleven (11) full-time

employees, including one Lead Maintenance Worker who typically has responsibility for assigning tree and vegetation management work requests. The ROW team's workflow follows two pathways – reactionary and proactive.

Reactionary and Emergency ROW Tree Issues

Community members submit requests for tree care issues using the City's online work request system *See Click Fix* (SCF) through the My Sammamish webpage or mobile device app. Work requests can also be generated internally by city staff members. All requests are vetted initially by the Lead Maintenance Worker, who will investigate the issues and based on the findings, will determine its priority, jurisdictional area, and whose maintenance responsibility it is:

- If the tree is located within one of the City's ROW landscape maintenance zones and is the responsibility of the City, Public Works maintenance crew members are assigned to complete the tree maintenance task such as pruning or removing the tree or branches from within the ROW, stormwater detention ponds, etc.
- If the tree is the responsibility of an HOA, city staff will reach out to inform them of what actions they must take to remedy the issue within the ROW.
- If the responsibility rests with an individual property owner, the City will issue a fourteen-day notice for the property owner to take action/respond.

Ultimately, if the issue poses an imminent hazard to life or property, the City responds immediately to address the situation within the ROW. Depending on the circumstances, the City may reach out to the on-call arborist (i.e., a contractor shared with the Parks Department) for an arborist evaluation and report before taking any action. If the actions recommended in the arborist report are more than City crews can manage safely in-house, the City will reach out to the City's on-call tree removal contractor to evaluate and quote the work.

Proactive ROW Tree Maintenance

Work orders for tree maintenance within the city's ROW Landscape Zones (LZ) are generated by the Superintendent or Lead Maintenance Worker who will initiate a SCF request and schedule the maintenance activity (e.g., pruning, watering, etc.) to be completed in-house using city maintenance staff. At times when pruning needs involve large quantities of trees or if the crew doesn't have time, city staff will engage with the tree removal contractor to obtain a scope and fee estimate to complete the work.

The City also utilizes a ROW landscape contractor for specific tree-related work, such as keeping the ROW LZ trees sucker-free from March through October, as part of the scope of work within the contract.

Equipment

Staff engaged in the work session noted that the ROW Team is equipped with the tools and equipment needed to conduct tree maintenance and removal including climbing gear, a bucket truck and chipper. For larger tree work or for tasks that require an ISA-certified arborist, the City will engage a contractor.

Tree Asset Inventory Tracking

The City manages its current tree inventory data using an Esri-based system and updates the data on an ad hoc basis, as staff time and resources allow. The data was originally housed in TreeKeeper, a third-party tree management software developed by Davey Tree Expert Company, but the system did not meet the City's needs programmatically. Currently, there are no specific staff dedicated to providing data updates in the field, quality control, or analysis of TreeKeeper data. The City engages consultants to support data updates as the budget allows.

The City articulated the need to create a workflow for tree asset management in general where new, replaced, and/or retired tree assets would be updated regularly. The City would prefer to manage tree assets in CityWorks (a municipal asset management system connected to See-Click-Fix) and have public ROW trees tracked for inspection and maintenance. Ideally, this could include documentation such as arborist reports or notes provided by the respective City departments (e.g., Public Works, Parks). In the long term, the City seeks to manage public tree inventory data in real time to achieve the following:

- Proactively manage assets, versus respond to the highest priorities ("putting out fires").
- Manage assets with specific objectives for species diversity, age distribution, etc.
- Ensure equitable distribution of tree care services.
- Prevent catastrophic loss due to pests/disease infestation, abundance of poor condition/senescent/hazard trees, etc.
- Quantify ecosystem services such as stormwater infiltration or carbon sequestration.
- Give the public a better understanding of the urban forest, certain tree populations, or specific trees (e.g., Heritage Trees).
- Identify new tree planting areas.

In the context of this project, the audience for ROW tree data is the Public Works ROW Team to improve on-the-ground maintenance and build efficiency in operations. This data also provides important information to guide budget and policy direction by the City Council and departmental leaders.

Funding and Budget Considerations

The City of Sammamish is applying for Tree City USA community recognition through the Arbor Day Foundation. As such, the City will submit annual reports to maintain this status based on general ballpark costs and expenses. This process is coordinated by the City's Natural Resources and Environmental Sustainability Coordinator.

Staff articulated that the *Urban Forest Management Plan* was ambitious, and the City does not currently have the funding and resources to implement many of its recommended goals. Near-term goals need to be recalibrated based on current staff and resource capacity. Staff also expressed the longer-term need for capacity and budget to write grants to fund future urban forestry activities.

Policies and Regulations

The Department of Community Development (DCD) is responsible for the application and enforcement of the City's tree ordinance and the Public Works Department is responsible for reviewing and processing ROW permits. Currently, the tree permit process applies to Park trees. ROW trees are exempt only from the requirement that a permit be obtained, not from the other requirements such as replanting. Staff engaged in the work session noted that future code amendments could clarify that no permit is required for City staff maintenance, removal, or replacement of public trees and that a permit is not needed for small or minor tree pruning.

The City's Public Works Standards serve as a communication tool and guide for City staff and contractors for ROW tree design, installation, and protection. These standards are currently being updated and planned for completion in 2025-26 and will then be reviewed and updated every 2 to 4 years.

3. Tree Asset Inventory

Tree inventories are an essential component of urban streetscape management, much like other city asset inventories. They are the basis for tracking all related expenses, defining levels of service, and strategic planning. Sammamish's assets include individual and collective tree resources, street tree infrastructure (e.g., tree grates), landscape vegetation, and irrigation. Public tree inventories of this kind help to facilitate budget forecasting based on tree attributes (e.g., size, age, etc.) so that annual costs for tree care can be distributed strategically over many years (Clark 1997).

Updated data was collected in the fall of 2024, including location, species, trunk diameter size, general condition, impacts to the surrounding infrastructure, and maintenance recommendations. The associated GIS data was provided to the City to assist with future management and tracking of the trees, including geographically located tree points and attribute data. The following section describes the street tree assets managed by the City of Sammamish and summarizes tree and infrastructure attributes and conditions. Observations documented for recommended maintenance are presented and discussed in Section 4 of this report.

3.1 Data Collection Methods

International Society of Arboriculture (ISA) Certified Arborists® from Facet collected data on city-owned trees in the right-of-way using Field Maps for ArcGIS, a mobile data collection app from Esri. The attribute information was updated for previously inventoried trees and a new point was added for each new inventoried tree, using 2023 aerial photography from Esri and the City's GIS ROW boundary data for reference. GPS data is believed reliable for general planning and most regulatory purposes; however, accuracy can be variable, and locations should not be considered equivalent to a professional land survey. Data was collected within the study area described in Section 3.2 between October 3 and October 10, 2024. See Appendix A for the data attribute summary table. The trees were fully leafed out at the time of the inventory.

3.2 Study Area and Tree Locations

The study area consists of the public rights-of-way of several arterial streets in Sammamish. The tree points and study area were provided by the City in GIS prior to the inventory update. City-owned street trees include trees growing in planting strips, medians, islands, tree lawns, unmaintained areas, and tree wells integrated into sidewalks. For a detailed map of the study area and specific streets where trees were inventoried, refer to the study area map in Appendix B.

3.3 Tree Attributes

Species

The arborists determined tree species by analyzing the characteristics of each tree, such as canopy morphology and branch structure, bud shape and arrangement, bark texture, and leaves. Both botanical and common names were recorded. Specific varieties and cultivars were identified as well, when applicable.

Diameter

The diameter-at-breast height (DBH) was measured at 4.5 feet above the ground with a graduated logger's tape, except when codominant leaders bulged at 4.5 feet above the ground, in which case the diameter measurement was taken below the combined trunks. The total diameter of multi-stemmed trees was calculated by taking the square root of the sum of each diameter squared.

Condition

A Level 1 visual assessment was used to evaluate the health and condition of trees within the study area per ISA and Council of Tree and Landscape Appraisers (CTLA) standards. The condition determination was based on current conditions and considered the health, structural integrity, and form of the tree, in addition to the characteristics of each species. Each tree was rated on a six-point scale from *Excellent* to *Dead* condition, as summarized in Table 1. Locations where previously inventoried trees had been removed were documented as *Gone*. Notes were recorded regarding large wounds, structural defects, or specific pruning and maintenance recommendations.

Table 1. Tree condition ratings

Rating Category	Condition Components		
	Health	Structure	Form
Excellent 1	High vigor and nearly perfect health with little or no twig dieback, discoloration, or defoliation.	Nearly ideal and free of defects.	Nearly ideal for the species. Generally symmetric. Consistent with the intended use.
Good 2	Vigor is normal for species. No significant damage due to diseases or pests. Any twig dieback, defoliation, or discoloration is minor.	Well-developed structure. Defects are minor and can be corrected.	Minor asymmetries/ deviations from species norm. Mostly consistent with the intended use. Function and aesthetics are not compromised.
Fair 3	Reduced vigor. Damage due to insects or diseases may be significant and associated with defoliation but is not likely to be fatal. Twig dieback, defoliation, discoloration, and/or dead branches may compromise up to 50% of the crown.	A single defect of a significant nature or multiple moderate defects. Defects are not practical to correct or require multiple treatments over several years.	Major asymmetries/deviations from species norm and/or intended use. Function and/or aesthetics are compromised.
Poor 4	Unhealthy and declining in appearance. Poor vigor. Low foliage density and poor foliage color are present. Potentially fatal pest infestation. Extensive twig and/or branch dieback.	A single serious defect or multiple significant defects. Recent change in tree orientation. Observed structural problems cannot be corrected. Failure may occur at any time.	Largely asymmetric/abnormal. Detracts from intended use and/or aesthetics to a significant degree.
Very Poor 5	Poor vigor. Appears dying and in the last stages of life. Little live foliage.	Single or multiple severe defects. Failure is probable or imminent.	Visually unappealing. Provides little or no function in the landscape.
Dead 6	N/A	N/A	N/A

Status, Owner, and ID

The status of a tree was noted as either *active* if a tree was present or *removed* if the tree was no longer present. The owner of a specific tree was either documented as *Sammamish* or *private*. Each tree with a datapoint provided in the initial dataset has an assigned ID number for tracking. Any additional trees added during the inventory were not assigned an ID number and will subsequently need to have one assigned by the City.

Infrastructure Type and Noted Conflicts

The type of infrastructure surrounding the inventoried trees was documented as described below in Table 2. Along with the infrastructure type, the grow space was documented as *2-5 feet, 5-7 feet, 7-10 feet* or *Open*.

Table 2. Infrastructure type

Type	Description
Well/Pit	Tree is planted within a specific "cutout" within the right-of-way. Commonly planted within a square or rectangular soil pit, may be protected by a tree grate.
Planting Strip	Tree is planted within a larger planting area. [1]
Median	Tree is planted in an area between opposing traffic lanes.
Island	Tree is planted in a roundabout island.
Tree Lawn	Tree is planted in an open lawn area.
Unmaintained Area	Tree is planted in an unmaintained open soil area.

[1]*The size (in feet) of all planter beds was noted (for example: 4 feet by 6 feet).*

Where there were conflicts with tree parts and the adjacent infrastructure, a *yes* or *no* response was recorded for the following fields noted in Table 3 below.

Table 3. Observed infrastructure conflicts

Conflict	Description
Tree Grate Gap	The tree grate gap is less than 1.0" between the trunk and the grate.
Tree Grate Lifted	The tree grate is lifted at least 0.5" above grade.
Sidewalk Lifted	The sidewalk is lifted at least 0.5" above grade within 10' of the tree.
Root Intrusion Sidewalk	Visible root intrusion in the sidewalk.
Root Intrusion Road	Visible root intrusion in the road.
Overhead Utilities	High voltage overhead utilities are present.

Defects

Defects observed for each inventoried tree were documented. Up to three primary defects could be noted for an individual tree. Defects could be a specific tree part or the surrounding environment affecting tree health. Additional descriptions were added to the Notes section where applicable. The list of defects is as follows:

Table 4. Tree defect attributes

Defect Types	
Broken Limbs/Hangers	Poor Structure/Taper
Cavity/Decay/Nest hole	Previous Failure(s)
Crack/Seams	Pruning History
Dieback/Deadwood	Signs of Stress and/or Serious Decline
Fungal Fruiting Bodies	Stem/Root Girding
Included Bark/Weak Union(s)	Uncorrected Lean
Mechanical Damage	Water Stressed/Dehydrated

Maintenance Categories

Maintenance recommendations were provided for trees requiring pruning or other maintenance work. Maintenance tasks were divided into four main categories including *large tree routine prune, small tree routine prune, lack of water,* or *poor soil conditions*. Each tree could have up to three maintenance recommendations provided. Pruning recommendations were further separated into the following categories:

Table 5. Maintenance categories

Maintenance Recommendation	Pruning Maintenance Task
Large tree routine prune	Pruning-Clearance
Small tree routine prune	Pruning-Deadwood
Lack of water	Pruning-Structural
Poor soil conditions	Remove-Stakes
Other	Tree Removal
None	Monitor

3.4 Inventory Findings

A total of 1,525 trees were assessed within the study area. An additional 82 trees were documented as having been previously removed. Data on tree species composition, tree age, and condition are presented below, in addition to any tree-infrastructure conflicts that may affect tree condition.

Subsequent to the completion of the tree inventory update, the Pacific Northwest experienced a bomb cyclone on November 19th that caused significant damage to some trees included in this study and conditions of those trees may have been altered or necessitated removal. The Public Works department will work with the City's internal GIS team to update tree inventory data as they complete routine inspections and maintenance.

3.4.1 Species Composition

The 1,525 inventoried trees include 57 species representing 30 genera and 16 plant families. Tree species predominantly consist of non-native ornamentals (92%) with some Pacific Northwest species, such as Douglas fir (*Pseudotsuga menziesii*), mountain hemlock (*Tsuga mertensiana*), and vine maple (*Acer circinatum*). The top five species documented include red maple (*Acer rubrum*) with 300 trees, green ash (*Fraxinus pennsylvanica*) with 158 trees, Norway maple (*Acer platanoides*) with 137 trees, Chinese elm (*Ulmus parvifolia*) with 113 trees, and littleleaf linden (*Tilia cordata*) with 95 trees inventoried. Combined, these five species represent four genera and a comprise 53% of the tree inventory, suggesting relatively low species diversity.

Species diversity in the street tree population is vital to prevent catastrophic loss in the event an unexpected fatal pest or pathogen moves into the region. Conventional diversity targets follow the "10-20-30 rule" for species diversity (Plant and Kendal 2019). This means that any one species should not be reflected in more than 10% of the population, a single genus no more than 20% and an individual tree family represents no more than 30% of the inventoried tree population. The 2024 tree inventory results

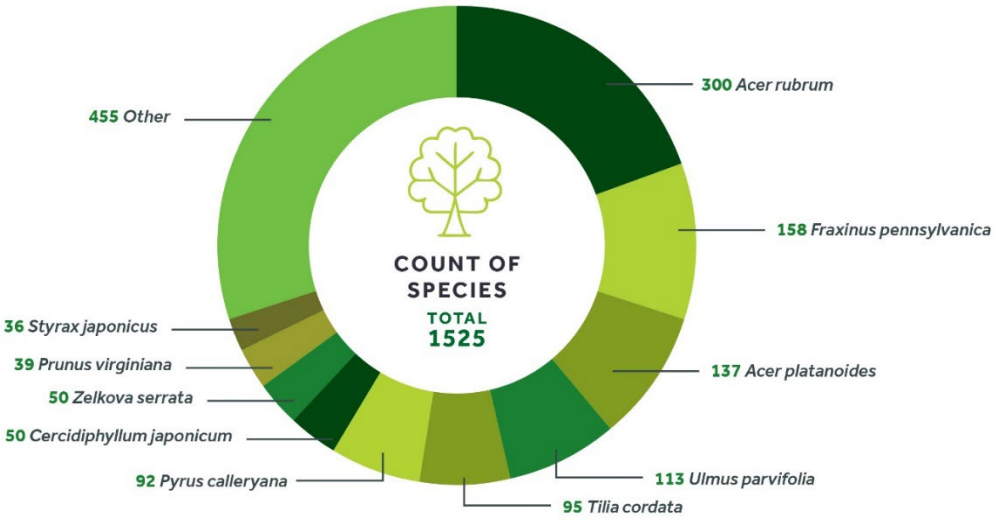


Figure 1. Tree composition

indicate that maple trees dominate the street tree family, genera, and species and are over the recommended diversity threshold for all three categories, with 34% of inventoried trees within the Sapindaceae family, 34% within *Acer* (maple) genus, and 20% red maple (*Acer rubrum*) species.

Species distribution strategies should be considered on a block-by-block or street basis. Planting corridors of a single species risks catastrophic loss from introduced pests or disease, which can be costly for municipalities. Where possible, planting a minimum of two or three tree species from different tree families in an inter-mixed fashion will ensure the tree population and canopy are more resilient to future threats.

3.4.2 Tree Diameter and Relative Age

Assessed trees range in diameter from one inch to 36 inches. The average diameter is 6.4 inches. Table 6 provides an overview of the range and average diameter of the top five tree species inventoried. Although tree species have different lifespans, growth rates, and mature size thresholds (e.g., diameter, height, crown radius), and are influenced by site-specific growing conditions, relative tree age can be extrapolated based on size classifications. Based on the tree diameter data, the inventoried trees were categorized into size/age classes as shown in Figure 2.

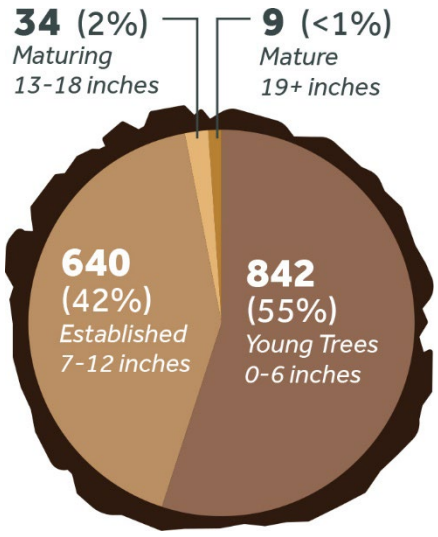


Figure 2. Tree diameter and relative age

The average size of trunk diameters of the inventoried trees is relatively small. Only the maximum trunk diameters (DBH) of the top five tree species inventoried indicate that two species, red maple and green ash, have attained the *maturing tree* relative age category, although the average size is not yet within this category (See Table 6). When comparing the average trunk diameters of the top five inventoried species, *young trees* are dominated by Green ash and Chinese elm and *established trees* are primarily characterized by Norway maple, red maple, and littleleaf linden. This suggests that in addition to limited species diversity, on average, the tree population is relatively even-aged. Even-aged public tree populations are susceptible to reaching the end of their useful life simultaneously, resulting in substantial tree removal and replacement costs within a compressed timeline.

Table 6. Diameter ranges and average for top five inventoried tree species.

Botanical Name	Common Name	Minimum DBH	Maximum DBH	Average DBH
Acer rubrum	Red maple	1 inch	18 inches	7.1 inches
Fraxinus pennsylvanica	Green ash	2 inches	13 inches	6 inches
Acer platanoides	Norway maple	2 inches	11 inches	6.2 inches
Ulmus parvifolia	Chinese elm	2 inches	6 inches	4 inches
Tilia cordata	Littleleaf linden	5 inches	12 inches	8.2 inches

3.4.3 Tree Conditions

The majority of the street trees inventoried were rated in *good* condition (1,031 trees; 68%). Trees in this category represented a wide range of species (51). Three percent were rated as *poor* (43), *critical* (2), or *dead* (13). The trees noted as *dead* trees were still present and were not categorized as *removed*. Of the 82 trees found to be *removed*, 51 were previously documented as red maples, additionally, 12 *active* red maples were noted as *dead*, indicating an 18% mortality rate of the red maples included in the inventory.

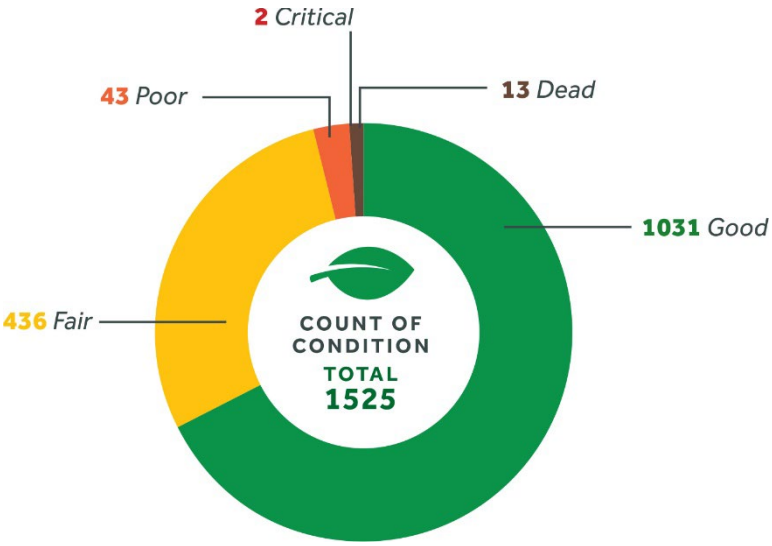


Figure 3. Tree condition summary

Trees assessed in *fair* condition—with low vigor, minor dieback, or significant structural issues— accounted for 29% of the inventory (436 trees). A *fair* condition rating was given if reduced vigor and/or defoliation was due to pests or disease as well as those displaying symptoms of drought. Of the 31 species with trees listed in *fair* condition, littleleaf linden had the highest percentage of its inventoried population (85%) noted in this category. Arborists observed that this was largely due to the presence of aphids and sooty mold. Other species with high percentages of trees in *fair* condition within the inventoried population include Callery pear (59%), *prunus* species (59%), Japanese zelkova (46%), red maple (36%), and Norway maple (36%).

Table 7. Condition ratings for top five inventoried tree species.

Botanical Name	Common Name	Condition Rating					
		Good	Fair	Poor	Critical	Dead	Total
Acer rubrum	Red maple	180	108	8	0	4	300
Fraxinus pennsylvanica	Green ash	134	24	0	0	0	158
Acer platanoides	Norway maple	85	49	3	0	0	137
Ulmus parvifolia	Chinese elm	110	2	0	0	1	113
Tilia cordata	Littleleaf linden	12	81	2	0	0	95

3.4.4 Tree Defects

The majority of inventoried trees (1,342) are free of any major defects. The defect observed most often is Poor Structure/Taper, with 203 trees presenting this issue. Many of these trees have adjacent trees encroaching into their canopy space and the adjacent trees need to be pruned to allow for appropriate growth and structure. In some cases, there is a lack of available light due to adjacent large trees shading out the city-owned trees, and pruning adjacent trees is not feasible. In other cases, past pruning has led to poor structure or taper. Figure 4 provides an overview of the defects observed during the field inventory. Up to three defects were collected per tree as applicable with additional information provided in the notes attribute field of the inventory geodatabase. Trees with defects besides the categories included were noted as "other" and comments added to the notes about the defect.

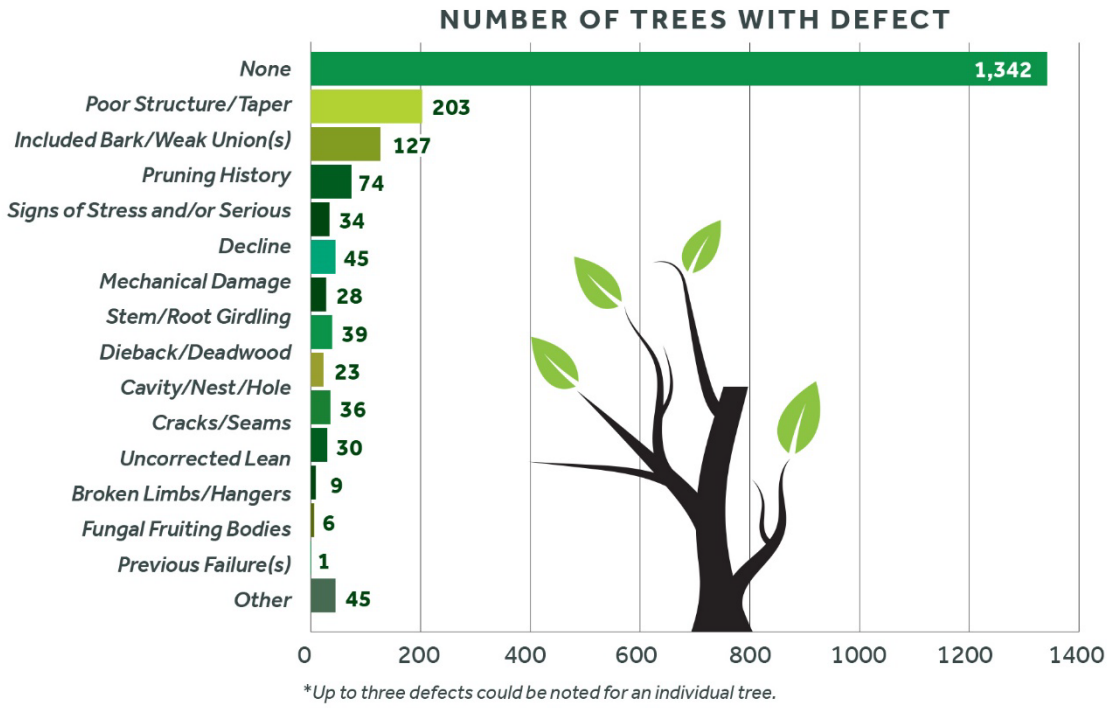


Figure 4. Tree defects summary

3.4.5 Tree-Infrastructure Conflicts

The *grow space* of assessed trees includes the following: 1,212 trees are located within a *planting strip*, 188 trees located within a m*edian*, 50 trees located in an *island*, 41 trees located in a *tree lawn,* 32 trees located in a *well/pit*, and two trees located in an *unmaintained* area. The *grow space* size was also documented as *2-5 feet, 5-7 feet, 7-10 feet,* or *open*. The most commonly noted *grow space* size is *2-5*

feet with 1,185 trees within this category, followed by 166 trees in an *open* grow space, 108 trees in *5-7 feet* of grow space, and 66 trees in *7-10 feet* of grow space.

Addressing infrastructure conflicts can lead to improved tree health, structure, and longevity. Of the 32 trees located in a *well/pit*, five were noted as having a tree grate gap less than 1 inch and 4 were noted as having tree grate uplift of more than 0.5-inches. These grates will need to be addressed to prevent girdling the trees. Sidewalk and road infrastructure impacts were also observed during the inventory. Of the trees assessed, 3% (53 trees) had an associated sidewalk uplift, 3% (47 trees) had associated sidewalk root intrusion, and road root intrusion was observed in only 7 trees (<1%).

Overhead utilities can lead to conflicts with trees where the mature canopy size is inappropriate for the space required to maintain the powerlines safely. Overhead utilities were observed near 368 trees (24%) in the inventory.

4. Maintenance Recommendations

4.1 Summary Pruning Needs for City-Managed Trees

Maintenance recommendations are provided for the 1,094 trees managed by the City of Sammamish. Up to three maintenance recommendations are provided for each assessed tree, however, for the purposes of this report, the discussion will focus on those in the primary maintenance category. Additional maintenance recommendations are available in the complete inventory geodatabase provided to the City. When creating work orders and prior to mobilizing crews, City staff should review all maintenance categories provided in the tree inventory, as some trees may have more than one recommendation provided. The majority of the trees (618) require no immediate maintenance.

Many of the assessed trees are young and recently planted, therefore structural pruning was recommended for 204 trees requiring pruning to encourage appropriate structure as they mature. See Chapter 5.2 for a summary of pruning best practices.

Maintaining vertical clearance over roadways and sidewalks is required to provide a safe line of sight and clearance for vehicles and pedestrians. Clearance pruning is recommended for 148 Active trees managed by the City. Pruning to meet right-of-way vertical clearances should be combined with other clearance objectives to minimize sight-line obstruction to transportation infrastructure (e.g., streetlights, traffic signals, signs, etc.), for streets and sidewalks. Additional notes specified where clearance pruning was needed for certain trees.

The removal of deadwood or "cleaning" can improve aesthetics and safety, as well as improve tree health and structure by removing dead, dying, diseased, weakly attached, and low-vigor branches from the crown of a tree. The pruning of deadwood is recommended for only 25 trees since many of the inventoried trees are young and do not have an accumulation of deadwood at this time.

Recommendations to monitor a tree were based on observed health or structural issues that should be tracked to anticipate the need for additional maintenance or removal of the tree should the issue progress beyond what can be mitigated. There are 55 trees recommended to monitor with notes

detailing the observation that may need to be tracked. In some cases, structural issues may warrant a more detailed Tree Risk Assessment to determine the likelihood of a tree part (branch, trunk, or root) failure and the overall risk posed by the tree.

Several trees were found to be dead or in serious decline during the inventory and therefore removal was recommended for 36 of these trees. Trees recommended for removal are likely the highest priority for maintenance to prevent the possibility of tree failure. In some cases, these trees were recently installed and may not have survived due to planting or site conditions.

A total of eight trees were recommended to have their stakes removed to allow for proper trunk growth and prevent girdling.

Table 8. Summary pruning needs for city-managed trees

Pruning Maintenance Task	Count by Task
Pruning-Clearance	148
Pruning-Deadwood	25
Pruning-Structural	204
Remove-Stakes	8
Tree Removal	36
Monitor	55

4.2 Management Tasks by Landscape Maintenance Zones

The City has identified 18 management zones within the tree inventory dataset. Zones 3, 10, 11, 12, and 14 are entirely privately maintained and no maintenance recommendations are provided for privately maintained trees. Zone 17 has no trees within this inventory. Up to three maintenance recommendations could be provided for each assessed tree, however, the summary statistics of the required maintenance by individual zones will only focus on the primary maintenance category.

Additionally, poor soil conditions were noted for locations where bare soil was exposed and trees may benefit from having soil amendments and/or mulch applied. In many cases, groundcover vegetation was present up to the trunks of trees, limiting observable soil conditions. No soil testing or analysis was included as part of the scope of this project. However, the City may want to consider testing the soils in locations where poor soil conditions were observed in order to determine what, if any, amendments may be needed to improve tree health. In most cases adding mulch to bare exposed soil will provide benefits such as added organic matter and nutrients to the soil composition, improved water retention, prevent compaction, and improve microbial activity-all of which will improve tree health. Soil sampling can be coordinated with Washington State Department of Ecology and information about sampling methods and cost can be found at Soil sampling - Washington State Department of Ecology.

Although the lack of water was an option for observed conditions in the Maintenance Task category, extensive supplemental watering by the City made this difficult to determine when evaluating trees. In most cases where poor soil conditions were noted, it may be that trees are experiencing a lack of water during the hottest months. The addition of mulch will help retain soil moisture and alleviate some of the stress from lack of water as well as reduce the frequency of supplemental watering necessary during periods of high heat and/or drought.

Landscape Maintenance Zone 1, 5, and 6

Zones 1, 5, and 6 are located along NE Inglewood Hill Rd, NE 8th St, and 233rd Ave NE. These zones combined have a total of 164 tree points, only 58 of which are Active and managed by the City. The majority (30) require structural pruning, 19 require no maintenance, four are recommended for removal, three trees require structural pruning, one is recommended to monitor, and one is recommended to have the stakes removed.

Landscape Maintenance Zone 2

Zone 2 is located along NE 16th St and has a total of 44 tree points, only 32 of which are Active and managed by the City. The majority (17) are recommended for structural pruning. A total of 14 trees require no maintenance and the remaining one is recommended to have deadwood removed.

Landscape Maintenance Zone 4

Zone 4 is located along 224th Ave NE and has a total of 228 tree points, only 104 of which are Active and managed by the City. The majority (43) require no maintenance, 21 require clearance pruning, 18 require deadwood removal, 11 require monitoring, ten require structural pruning, and one requires stakes to be removed.

Poor soil conditions were noted for eight trees in Zone 4 with bare soil observed surrounding the tree. Where poor soil conditions were observed, the addition of 2-4 inches of mulch should be applied within the root zones of the trees, keeping mulch at least 4-6 inches away from the trunk.

Landscape Maintenance Zone 7 and 9

Zone 7 and 9 are located along SE 4th St, 225th Pl SE, and 218th Ave SE. These zones combined have a total of 157 tree points, only 110 of which are Active and managed by the City. The majority (109) require no maintenance, and one tree is recommended for removal.

Landscape Maintenance Zone 8

Zone 8 is located along 228th Ave SE and has the most trees represented in the inventory with a total of 508 tree points. Of the 508 tree points, only 436 are Active and managed by the City. The majority (272) do not require any immediate maintenance. Clearance pruning was the most recommended maintenance type within this maintenance zone with a total of 83 trees needing clearance pruning. This type of pruning is often required for clearance over roads and sidewalks and specific details are provided in the notes. A total of 33 trees have been recommended for monitoring of ongoing health or structural issues with specific instructions detailed in the notes. Some trees (24) require structural

pruning to promote appropriate branching structure which will reduce the likelihood of future branch failures and promote a well-balanced canopy. Where trees were found to be dead or in serious decline, removal was recommended; and 19 of the assessed trees are recommended to be removed within Zone 8. Only five trees required the removal of visible deadwood to improve the aesthetics and/or safety of the trees.

Poor soil conditions were noted for 123 trees in Zone 8 with bare soil observed surrounding the tree. Where poor soil conditions were observed, the addition of 2-4 inches of mulch should be applied within the root zones of the trees, keeping mulch at least 4-6 inches away from the trunk.

During the field inventory, arborists observed that many Callery pears were infected with pear rust *(Gymnosporangium sabinae)*, a fungal disease with characteristic red-orange blotches on the upper leaf surface of highly susceptible pear trees. It is unsightly but can be especially damaging by resulting in complete defoliation if not treated. Short-term management strategies include timely applications of fungicide spray in alignment with the City's Integrated Pest Management Policy. Long-term strategies require culling pear trees and replanting to meet species diversity and distribution objectives.

Treatment of pear rust can be difficult, as each *Gymnosporangium sp.* has two unrelated hosts that the fungus requires to complete its life cycle. Spores produced on one host do not re-infect that host, they infect the alternate host. So, when you want to treat your pear trees to protect them, you need to treat when the alternate host (juniper or eastern redcedar) is producing infectious spores, and vice versa. Due to the difficulty in treating this fungus, consider removing and replacing Callery pears in Fair, Poor or Critical condition.

Landscape Maintenance Zone 13

Zone 13 is located along SE 30th St, 222nd Pl SE, SE 28th St, and 216th Ave SE and has a total of 151 tree points, only 144 of which are Active and managed by the City. The majority (99) require no maintenance, 18 require clearance pruning, 17 require structural pruning, five require the removal of deadwood, three tree need to be removed, and two trees need to have stakes removed.

Poor soil conditions were noted for 74 trees in Zone 13 with bare soil observed surrounding the tree. Where poor soil conditions were observed, the addition of 2-4 inches of mulch should be applied within the root zones of the trees, keeping mulch at least 4-6 inches away from the trunk.

The littleleaf linden in this maintenance zone have an abundance of aphids and sooty mold which is related to the honeydew excreted by the aphids. Sooty molds are nonpathogenic fungi that grow on plants and other surfaces fouled by insect honeydew. Sooty molds are typically harmless to plants except when they are extremely abundant and prevent enough light from reaching the leaf surface. Even where sooty mold is extensive, it is not recommended to apply fungicides. As opposed to treating the sooty mold fungus, it is preferable to control aphids, mealybugs and other insects that secrete honeydew on which sooty mold grows. In addition, selectively control ants, which tend to spread phloem-sucking insects and cause their populations to increase by protecting these pests from parasites and predators (Dreistadt, 2016).

Aphids are small soft-bodied insects that can slow plant growth and cause leaves to yellow, curl or drop early. Host-specific aphids, such as linden aphid (*Eucallipterus tiliae*) commonly overwinter as eggs on their deciduous hosts. Controls such as dormant or delayed-dormant oil sprays or a soil based systemic insecticide in late winter need only be directed at the host. Preventative cultural methods can be used to manage aphid infestations and can include conserving natural enemies by using the least-toxic insecticides such as insecticidal soap, horticultural oil or neem oil (Dreistadt, 2016). Populations of most aphids are highest on parts of the plants with high nitrogen levels, such as new growth. By minimizing fertilization, excessive pruning, and extensive watering that stimulate succulent plant growth, stimulating aphid populations can be minimized (Dreistadt 2016).

Landscape Maintenance Zone 15 and 16

Zone 15 is located along Issaquah-Pine Lake Rd SE and has a total of 104 tree points, 90 of which are Active and managed by the City. The majority (37) require no maintenance, 36 require clearance pruning, 14 require structural pruning, two trees need to be removed, and one tree needs to have stakes removed.

Poor soil conditions were noted for 54 trees in Zones 15 and 16 combined with bare soil observed surrounding the tree. Where poor soil conditions were observed, the addition of 2-4 inches of mulch should be applied within the root zones of the trees, keeping mulch at least 4-6 inches away from the trunk.

Landscape Maintenance Zone 18

Zone 18 is located along SE Issaquah-Fall City Rd and has a total of 121 tree points, all of which are Active and managed by the City. The majority (106) require structural pruning, seven trees need to be removed, four trees require no maintenance, three trees need to have stakes removed, and one requires clearance pruning.

4.3 Planting Recommendations by Landscape Maintenance Zone

Landscape Maintenance Zones 1, 5, and 6

Red maple and Norway maple are the most represented species in Maintenance Zones 1, 5, and 6 combined, therefore any new plantings should be selected from a plant family other than Sapindaceae in order to increase species diversity and resilience. Appropriate species from the Right-of-Way Street Tree List may include American hornbeam, Victoria evergreen magnolia, Vesuvius flowering plum, Japanese snowbell, Red Baron crabapple, or eastern redbud. Many other species from the street tree list may be appropriate depending on specific site conditions. The species listed above are of a family other than Sapindaceae, are smaller in stature, and are approved for under power lines and view covenants, therefore they are appropriate in a variety of locations.

Landscape Maintenance Zone 2

Red maple is the most represented species in Maintenance Zone 2, therefore any new plantings should be selected from a plant family other than Sapindaceae in order to increase species diversity and resilience. Appropriate species from the *Right-of-Way Street Tree List* may include American hornbeam, Victoria evergreen magnolia, Vesuvius flowering plum, Japanese snowbell, Red Baron crabapple, or eastern redbud. Many other species from the street tree list may be appropriate depending on specific site conditions. The species listed above are of a family other than Sapindaceae, are smaller in stature, and are approved for under power lines and view covenants, therefore they are appropriate in a variety of locations.

Landscape Maintenance Zone 4

Red maple and hawthorn are the most represented species in Maintenance Zone 4, therefore any new plantings should be selected from plant families other than Sapindaceae or Rosaceae in order to increase species diversity and resilience. Appropriate species from the Right-of-Way Street Tree List may include American hornbeam, Victoria evergreen magnolia, Tuscarora hybrid crape myrtle, Japanese snowbell, Persian parrotia, or eastern redbud. Many other species from the street tree list may be appropriate depending on specific site conditions. The species listed above are of a family other than Sapindaceae or Rosaceae, are smaller in stature, and are approved for under power lines and view covenants, therefore they are appropriate in a variety of locations.

Landscape Maintenance Zones 7 and 9

Chinese elm, green ash and sugar maple are the most represented species in Maintenance Zones 7 and 9 combined, therefore any new plantings should be selected from plant families other than Ulmaceae, Oleaceae, or Sapindaceae in order to increase species diversity and resilience. Appropriate species from the Right-of-Way Street Tree List may include American hornbeam, Victoria evergreen magnolia, Vesuvius flowering plum, Japanese snowbell, Persian parrotia, or eastern redbud. Many other species from the street tree list may be appropriate depending on specific site conditions. The species listed above are of a family other than Ulmaceae, Oleaceae, or Sapindaceae, are smaller in stature, and are approved for under power lines and view covenants, therefore they are appropriate in a variety of locations.

Landscape Maintenance Zone 8

Green ash, Callery pear, and Norway maple are the most represented species in Maintenance Zone 8, therefore any new plantings should be selected from plant families other than Oleaceae, Rosaceae or Sapindaceae, in order to increase species diversity and resilience. Appropriate species from the Right-of-Way Street Tree List may include American hornbeam, Victoria evergreen magnolia, Tuscarora hybrid crape myrtle, Japanese snowbell, Persian parrotia, or eastern redbud. Many other species from the street tree list may be appropriate depending on specific site conditions. The species listed above are of a family other than Oleaceae, Rosaceae or Sapindaceae, are smaller in stature, and are approved for under power lines and view covenants, therefore they are appropriate in a variety of locations.

Landscape Maintenance Zone 13

Littleleaf linden, common sweetgum, and green ash are the most represented species in Maintenance Zone 13, therefore any new plantings should be selected from plant families other than Sapindaceae (largest family represented in inventory), Malvaceae, Altingiaceae, and Oleaceae in order to increase species diversity and resilience. Appropriate species from the Right-of-Way Street Tree List may include American hornbeam, Victoria evergreen magnolia, Tuscarora hybrid crape myrtle, Japanese snowbell, Persian parrotia, or eastern redbud. Many other species from the street tree list may be appropriate depending on specific site conditions. The species listed above are of a family other than Sapindaceae, Malvaceae, Altingiaceae, or Oleaceae, are smaller in stature, and are approved for under power lines and view covenants, therefore they are appropriate in a variety of locations.

Landscape Maintenance Zones 15 and 16

Red maple and Norway maple are the most represented species in Maintenance Zone 15 and 16 combined, therefore any new plantings should be selected from plant families other than Sapindaceae in order to increase species diversity and resilience. Appropriate species from the Right-of-Way Street Tree List may include American hornbeam, Victoria evergreen magnolia, Vesuvius flowering plum, Japanese snowbell, Red Baron crabapple, or eastern redbud. Many other species from the street tree list may be appropriate depending on specific site conditions. The species listed above are of a family other than Sapindaceae, are smaller in stature, and are approved for under power lines and view covenants, therefore they are appropriate in more locations.

Landscape Maintenance Zone 18

Chinese elm, Katsura tree, and hedge maple are the most represented species in Maintenance Zone 18, therefore any new plantings should be selected from plant families other than Ulmaceae, Cercidiphyllaceae, or Sapindaceae, in order to increase species diversity and resilience. Appropriate species from the Right-of-Way Street Tree List may include American hornbeam, Victoria evergreen magnolia, Vesuvius flowering plum, Japanese snowbell, Red Baron crabapple, or eastern redbud. Many other species from the street tree list may be appropriate depending on specific site conditions. The species listed above are of a family other than Ulmaceae, Cercidiphyllaceae, or Sapindaceae, are smaller in stature, and are approved for under power lines and view covenants, therefore they are appropriate in a variety of locations.

5. Tree Management Standards

The guidance in this recommendations report is based on arboricultural best practices and industry standards for ROW tree planting, pruning, and removals. Recommendations are also provided on horticultural maintenance practices, tree protection during construction, and green stormwater infrastructure approaches geared toward streetscape redevelopment (versus stormwater retrofits such as detention ponds). The standards herein are organized topically and can be used to inform updates to the 2016 Public Works Standards which were assessed during the Gap Analysis. Each topical section provides a summary of the current Public Works Standards followed by recommended updates. Some recommendations may also have implications for the City's municipal code which are discussed further

in Chapter 6. A synthesis of Public Works Standards Recommendations can also be found in Chapter 6 of this report.

5.1 Planting

To achieve the City's urban forestry goals, streetscape designs, and tree planting practices must address the long-term horticultural needs of trees with considerations for climate change. Careful design decisions and improved planting practices increase right-of-way trees' odds of reaching maturity and providing associated ecosystem service benefits while reducing maintenance needs, disease/pest susceptibility, and tree-infrastructure conflicts. This chapter discusses the best management practices needed to improve street tree health and longevity including site design, species selection, soils, and general planting guidance and specifications.

The City's current guidance on the design and installation of trees within the public right-of-way streetscape is housed within Chapter 15 *Roadside Features*, Section 15.2 *Landscaping*. Overall, this section of the Public Works Standards would benefit from some reorganization with different subsection headers and allowances for alternative design scenarios that would improve soil volumes and health outcomes for ROW trees while still providing for utilities and transportation needs within the streetscape corridor.

Site Design

Street trees are valuable and dynamic green infrastructure investments with specific design criteria. When a site cannot provide adequate space, soil, drainage, and water, the ongoing costs of tree care, infrastructure impacts, and the perception of trees as short-lived landscaping elements often result. As the City considers updates to improve health outcomes for trees, it is also important to consider allowing flexibility in street design.

Section 15.2.B *Plan Design Requirements* of the 2016 Public Works Standards currently require projects to "Adjust locations of trees to accommodate utilities, pedestrians, and sight distance." This guideline could be interpreted as prioritizing other elements ahead of trees and may discourage the opportunity to have early-stage discussions about utility placement and other streetscape design elements. There may be opportunities to shift utility locations that will not add cost or complexity to utility projects yet can immensely improve conditions for trees. In addition, this guideline could potentially lead to a consistent loss of planting space, especially for large trees, leading to permanent gaps in the tree canopy.

ADEQUATE TREE SPACING

Currently, the Public Works Standards require a maximum spacing of 35 feet on-center for trees. While this is an acceptable standard, street tree spacing should ultimately be determined by the mature height, width, and shape of the tree being planted and allow enough space below and at ground level for expanding roots/root collars, which can be 2-3 times the trunk diameter (Urban 2008).

Often, clearance requirements, buildings, overhead utilities, and other infrastructure restrict larger trees' normal branching habit. Right-of-way growing spaces generally consist of small tree openings in

the sidewalk or narrow planter strips that are not large enough to accommodate mature trunk flares or buttress roots, with limited soil volumes for root growth. This often results in tree-infrastructure conflicts that pose safety issues and present a particular challenge for achieving diverse tree selection and robust canopy coverage because there are a limited number of smaller-statured tree species appropriate for small growing spaces.

Recommendations

The proposed street tree spacing should be reviewed by the City according to the spacing shown in Table 9, and should be further reviewed with the Public Works Standards update. To provide adequate space for tree crowns and roots, the following spacing targets are recommended:

Table 9. Minimum spacing for street trees

Tree Type/ Size	Spacing Between Trees (feet on center)
Large (Mature height > 45 feet)	35 – 40+
Medium (Mature height between 25 and 45 feet)	30 – 35
Small (Mature height < 25 feet)	20 – 25
Columnar (Mature height > 1.7x canopy spread)	20 – 30 (depending on variety)

Setbacks from Infrastructure

Current setback requirements are listed under Public Works Standards *15.2 c. Plant selection*. The City could consider accounting for mature tree height and canopy width compatibility with infrastructure elements based on the minimum setback recommendations provided below:

Table 10. Recommended street tree setbacks from infrastructure.

Infrastructure Element	Distance (ft)
Curb (from the face of curb)	3.5
Underground utilities	8
Underground utilities (with root barrier)	3
Power poles	15
Driveway edges	10
Streetlights or existing trees (suggest changing "existing trees" to "equal edge of mature canopy width")	20

Infrastructure Element	Distance (ft)
Curb or edge of travel lane (where no curb exists) at street intersections	30
Roadway edge where no curb is present	10
Roadway edge without a sidewalk or curb	5
Private property lines	2

GREEN INFRASTRUCTURE DESIGN STRATEGIES

Impervious surfaces and compacted soils in urban areas create challenges for both stormwater managers and urban foresters by preventing the infiltration of runoff into the ground. One way to address these problems is to design tree planting areas to increase infiltration and limit compaction by engineering to receive and process street and rooftop runoff. Green stormwater infrastructure combines stormwater management with a secondary function, such as growing trees and other vegetation to obtain multiple benefits from a shared space. Intercepting stormwater in a planting area shared with a street tree helps with the following:

- Reduces the volume of stormwater after a rain event by storing water in the planting soil, utilizing the water in the tree, and through evapotranspiration, which reduces reliance on larger municipal treatment facilities.
- Removes pollutants from street runoff, which would otherwise run directly into local waterways.

Bioretention Areas

Bioretention areas are shallow landscaped depressions designed to capture and treat stormwater runoff from adjacent impervious surfaces, such as streets and rooftops. These areas utilize a specially designed soil mix and native vegetation to filter pollutants from the stormwater as it percolates through the soil profile. Bioretention is particularly relevant in urban streetscapes where space is limited, as it can effectively reduce the volume of stormwater and improve water quality while also supporting adjacent tree health.

Photo credit: Adrian Danciu

Bioretention areas and rain gardens are often synonymous with each other; both are designed with the same purpose of holding rain until it soaks into the ground, although right-of-way bioretention areas typically involve greater engineering for larger volumes of inflow and overflow. Typical curbs and concrete edges may be eliminated on public

and private streets in favor of low-impact development stormwater management techniques such as bioretention areas and bioswales.

Design Considerations

The design and form of bioretention cells can be adapted to fit various streetscape contexts based on available horizontal and vertical space. In areas with limited space adjacent to roads and sidewalks, bioretention planters—walled cells that create deeper stormwater storage—are an appropriate solution. These structures allow for effective stormwater management while minimizing the footprint on pedestrian pathways. In contrast, where more space is available, bioretention areas can be designed with gentle slopes and planting along the sides and in the bottom of the cells, creating a more integrated and visually appealing landscape feature.

Maintenance Considerations

Regular maintenance is crucial to ensure the performance of bioretention areas. This includes inspecting and removing debris, ensuring vegetation is healthy, and monitoring soil conditions. Over time, sediment may accumulate and impede function, so periodic cleaning and rejuvenation of the soil media may be necessary.

Photo credit: PWD

Bioswales

Bioswales are linear landscape features designed to capture, convey, and treat stormwater runoff while promoting infiltration into the ground. They are an ideal application for stormwater conveyance in urban environments, especially where green infrastructure is preferred over traditional underground

piped systems. Bioswales can efficiently transport stormwater from impervious surfaces, such as roadways and parking lots, to bioretention areas or directly from building downspouts to available landscape areas.

Design Considerations

While bioswales are typically placed in areas with gentle slopes to minimize flow velocity and enhance infiltration, they can also be designed for steeper slopes. In such cases, the inclusion of check dams or other structures can slow water movement and minimize erosion potential. The design of bioswales should consider available horizontal space, as well as the surrounding landscape context, allowing for appropriate vegetation that can assist in water filtration and provide aesthetic value.

Maintenance Considerations

Regular inspections should ensure that vegetation remains healthy and that the swale is free of debris and sediment that could impede water flow. Maintenance activities may include mowing, weeding, and replacing dead or dying plants. Additionally, it's important to monitor for signs of erosion and to address any sediment buildup that may occur over time.

Underground Structural Cells

Underground structural cells, also called suspended pavement systems, such as Silva Cell (DeepRoot), StrataCell (Citygreen), or RootSpace (GreenBlue Urban), provide an innovative way to increase rooting space for trees, prevent soil compaction, and manage stormwater, while supporting the streetscape above (See the References and Resources section for links to vendor product information). The modular, pre-engineered system transfers surface loads to a compacted sub-base while allowing for a large volume of low-compacted soil in the voids of the cells for tree roots and stormwater management. The cells are ideal for use under sidewalks and plazas and can utilize nearly the entire area underground between the street and adjacent building foundations.

Structural cell systems provide various health advantages for street trees, including extended tree longevity, improved canopy cover, increased shade and cooling, enhanced amenity and biodiversity values, and reduced need for supplemental irrigation as stormwater is effectively utilized as an alternative water source for irrigation. These systems also minimize root damage to infrastructure by reducing pavement uplift. Additionally, the use of structural cells promotes increased interception of stormwater by the canopy and tree opening, leading to the reduction of pollutants entering waterways, as well as mitigating flood risk by reducing and slowing stormwater entering underground drains (Citygreen 2021).

Design Considerations

Effective design and implementation of underground structural cell systems require consideration of various factors to optimize performance. Considerations include:

Distribution of Stormwater	The distribution of stormwater into structural cell systems can occur through various means, including inlet pipes from roadways, roof drains, direct flow into tree pits, and infiltration from pervious paving. Inflow should be distributed across the soil surface area to the maximum extent feasible, utilizing distribution pipes

	installed within the system to evenly distribute water throughout the soil media. Pipe sizing and spacing should be according to the manufacturer's recommendation.
Tree Species Selection	The selection of the tree species should be based on the specific conditions and location of the growing space, aiming to maximize tree canopy potential while ensuring compatibility with the available soil volume provided within the structured cells. When structural cells serve the dual purpose of stormwater management and supporting the growth of a tree, subsurface growing conditions must be considered. Factors such as the soil media, soil moisture levels, and periodic inundation of water can impact tree health and growth. Tree species that are well-suited to these conditions should be selected.
Soil Media	The Washington State Department of Ecology has approved the use of structural cells as functionally equivalent to bioretention facilities, provided the soil media meets specific criteria outlined in the SMMWW, Volume V, BMP T7.30: Bioretention (Ecology 2019). The default bioretention soil mix specification consists of 60% mineral aggregates and 40% compost by volume, designed to provide effective filtration of stormwater to achieve runoff treatment. To ensure that the facility serves both water quality treatment and soil volume requirements, the volume of stormwater treated by the bioretention soil mix must be calculated according to the manufacturer's procedure, as approved by Ecology. To promote tree establishment, the tree root ball should be placed on compacted soil to prevent settling, while slightly compacted non-bioretention soil mix, imported topsoil, or planting soil may be utilized adjacent to tree root balls. However, this volume of soil, along with the root ball, cannot be calculated for stormwater treatment. The planting soil is typically placed surrounding the tree root ball; for bioretention applications, bioretention media is used throughout the remainder of the system (DeepRoot 2018). To allow stormwater to pond and gradually infiltrate into the soil, an air gap must be left between the soil surface and the ground surface/suspended pavement. The air gap also enhances oxygen availability for healthy soil-root conditions (Citygreen 2021).
Vendor Specifications	There are a variety of vendors that provide suspended pavement systems, each with different design standards. The References and Resources section of this management plan provides a list of links and resources to products available on the market today.

Maintenance Considerations

Note that new infrastructure can be coordinated and integrated into suspended pavement systems. Suspended pavement manufacturers provide guidance on the process for replacing trees within those systems, which involves select removal of pavement around the tree, removal of tree roots, and

replacement of soil if necessary. This should not involve replacement of the structured system in place below the pavement. For existing trees that are being replaced, in the case that a tree needs to be removed, the installation of structural pavement systems associated with a ROW improvement/street improvement/utility project or associated with adjacent development project, as a replacement of a single tree will involve more substantial investment and impact to the streetscape.

Figures 4 and 5 below show a snapshot of a project completed along Main Avenue in the downtown core of Bothell, Washington using SilvaCells suspended pavement system through DeepRoot. Street trees were planted in both continuous bioswale planters as well as in concrete planters to create a "flex zone" that calmed traffic and allowed pedestrian-friendly access within the streetscape to parking and local restaurants. This is one example of the use of structural cells to provide adequate soil volumes for trees and integrate bioswales within the streetscape. As noted above, there are several products on the market, each with its own vendor specifications.

Figure 5. Bothell downtown core Silva Cell installation – Before

Figure 6. Bothell downtown core Silva Cell installation – After

Permeable Hardscapes

Permeable hardscapes come in many different forms including permeable concrete, permeable asphalt, permeable interlocking concrete pavers, and grid pavers. Permeable hardscapes strike a balance between maximizing accessible usable areas for pedestrians and maintaining space for water and air penetration to tree root zones. They offer benefits such as supplemental water supply to street trees, improved air exchange with subsurface soils, minimized soil compaction, reduced potential uplift, and enhanced root penetration for greater stability.

Permeable Hardscapes on Pedestrian Surfaces

Concrete and grid pavers are excellent solutions for managing water runoff and promoting groundwater recharge. These permeable systems allow rainwater to seep through the spaces between the pavers or through porous materials, reducing surface runoff and preventing water pooling. This helps minimize the strain on stormwater systems and mitigates flooding risks. Additionally, they support sustainable landscaping by filtering pollutants from water as it percolates into the soil, improving water quality. Their durability and versatility make them suitable for various applications, including driveways, patios, and parking areas, combining functionality with environmental benefits.

Permeable Hardscape long-term maintenance challenges

Permeable hardscapes require regular maintenance to ensure their functionality, as debris, dirt, and organic matter can clog the pores or gaps, reducing water infiltration. Periodic sweeping and vacuuming is needed to keep the surface clear. Additionally, weeds or moss can grow in the spaces of

permeable materials, requiring removal to maintain aesthetics and performance. Proper upkeep is essential to preserving their drainage capabilities and longevity.

Species Selection

Selecting an appropriate tree species, either for new development or for replacement plantings, is a critical first step to ensure successful establishment and long-term survival, and to reduce future conflicts with infrastructure. This chapter provides guidance on species diversity and selection based on the 'right plant, right place' approach, minimizing infrastructure conflicts, and maximizing tree health outcomes.

Due to the limited space and competing infrastructure demands within the public rights-of-way (e.g., car and pedestrian access, utilities, stormwater infrastructure), species selection along with providing adequate growing space will need to be considered. For example, the use of large canopy trees within the right-of-way may only be feasible within areas adjacent to open space or within large less restrictive planting beds ten- to twelve feet wide or greater. Although native canopy tree species, such as Douglas fir, bigleaf maple, and western redcedar, provide numerous ecosystem service benefits, they are not always the best candidates for or perform best in the constrained conditions found within improved rights-of-way across Sammamish.

Currently, the City provides species selection guidance in the Public Works Standards under Section 15.2 C. Plant Selection is as follows: "…all plants shall conform to American Association of Nurserymen (AAN) grades and standards" and "Consider adaptability to climatic, geology, and topographic conditions of the site." The Public Works Standards also recommend more than two new tree species/types to provide alternating patterns of more than one species of tree.

CLIMATE CHANGE CONSIDERATIONS

Shifts in regional climate are also critical to consider for species selection. The University of Washington Climate Impacts Group predicts that Western Washington will likely see climate shifts (Mauger et al. 2015) that can increase stressors on urban trees due to these impacts:

Increase in winter precipitation	Street tree roots will receive greater volumes of water in winter. Underdrains can alleviate excessive water and tree species that are adapted to periodic flooding will be most resilient.
Warmer summers with less precipitation	Street trees will sustain prolonged or excessive heat but will receive less rainwater during the growing season. Drought-tolerant tree species, once established, will have the most resilience in warmer, drier summers.
Warmer winters with lower snowpack in the mountains	Low snowpacks mean less water is expected to be available to municipalities in the summer. Drought-tolerant tree species help to minimize supplemental summer water consumption.

Pest and disease infestation	When new pests or pathogens are introduced in regions lacking natural defenses, such as bronze birch borer, Dutch elm disease, and emerald ash borer (EAB), recently detected in Oregon. Highly fatal, EAB has resulted in the loss of millions of urban ash trees, imposing significant financial burdens on municipal forestry budgets (Hauer et al. 2016).

Climate change weather pressures noted above such as warmer, longer temperatures during the growing season and wetter winters lead to an increase in pest outbreaks due to conditions that favor shorter generation time and higher fecundity of pest species (Tubby et al, 2010).

SPECIES DIVERSITY AND DISTRIBUTION

Species diversity in the street tree population is vital to prevent significant losses due to an unexpected fatal pest or pathogen that moves into the region. The risk of ignoring species diversification can be costly for municipalities. Recommended diversity targets follow the 30-20-10 rule for species diversity (Plant and Kendal 2019). The rule specifies that any one species should be reflected in no more than 10% of the population, a single genus no more than 20%, and an individual tree family represents no more than 30% of the tree population. As outlined in Chapter 3.4 the 2024 tree inventory results indicate that maple trees dominate the street tree family, genera, and species and are over the recommended diversity threshold for all three categories with 34% of inventoried trees within the Sapindaceae family, 34% within *Acer* (maple) genus, and 20% red maple (*Acer rubrum*) species.

Recommendations

Tree diversity and distribution strategies should be considered on a block-by-block or street basis. Ideally, planting two or three tree species at a minimum from different tree families or genera in an inter-mixed fashion will ensure the tree population and canopy are the most resilient to future threats. Planting corridors of a single species, though aesthetically beautiful, risk significant loss from introduced pests or diseases, which can be costly for the City. Removing and replacing existing healthy trees can also be cost-prohibitive. Where feasible and as budget allows, species diversity can be integrated into the population over time.

Additional strategies to meet species diversity objectives include:

- Update the approved street tree species list (discussed below) as appropriate to exclude species known to be poor performers, require substantial maintenance, and must be replaced frequently.
- When selecting new tree species candidates in scenarios in which genus diversity may not be practical or desired, seek greater diversity across species (e.g., *Acer ginnala* versus *Acer rubrum*).

STREET TREE LIST EVALUATION

The City also provides guidance through its Right-of-Way Street Tree List located in Appendix F of the Public Works Standards. The current list is well organized and provides information that is important for site design considerations such as the mature tree height and canopy spread, minimum planter strip

width needed, and flower and fall foliage color. It also specifies when trees are suitable for under overhead wires or view covenants.

The Street Tree List was evaluated for this project using criteria to assess suitability under urban growing conditions, disease resistance, drought tolerance, and adaptability to the current trends in the region's changing climate. Drought tolerance specifically refers to a tree's watering needs once established versus the irrigation needs of a specific tree species when newly transplanted into a site. The establishment phase for newly planted trees is typically three years, but this will vary by species and seasonal weather patterns. Even drought-tolerant species may need supplemental water during a particularly prolonged period of drought. Drought tolerance was evaluated using the following scale:

- **High**: Adapted to withstand prolonged seasonal drought soil moisture content after the establishment phase.
- **Medium**: Adapted to withstand normal or average seasonal drought soil moisture content. May need supplemental irrigation during extended periods of drought conditions.
- **Low**: Adapted to consistently moist summer soil and cannot withstand average seasonal drought conditions. Typically requires supplemental irrigation once established.

See Appendix F for the current street tree list with drought tolerance ratings. The City may consider removing those species rated as low for drought tolerance or climate resilience. In the long term, the approved ROW Street Tree List should be reviewed and revised periodically to capture changes in commercially available nursery stock within the horticulture industry as well as changes in the best available science regarding horticultural performance and climate change adaptation.

Soils

Impervious surfaces and compacted soils are issues for both stormwater management and healthy street tree growth (EPA 2021). Streetscapes can be designed to maximize the functionality of managing stormwater and growing healthy trees by addressing soil volume, soil porosity, and soil composition. A tree's ability to establish, grow to its full genetic potential, and remain healthy is largely dependent upon soil volume. If too little soil is available, the tree will not reach full stature, regardless of the expected mature size for its species. Inadequate soil volume causes sidewalk, curb, and road surface damage from tree roots and contributes to girdling (circling) roots and root-utility conflicts. Generally, an average-sized established tree (16 inches DBH) requires approximately 1,200 cubic feet of uncompacted soil.

Currently, the City of Sammamish provides guidance on soils under Public Works Standards Chapter *15.2 D. Soil*. The City supports planting larger trees (height greater than 30 feet at maturity), which "will require deeper soil depths." However, Public Work Standards do not outline soil protection during construction, minimum quality standards, standard treatment depths, or volume requirements. The City of Sammamish planter strip detail FIG02-18 outlines that "*all plant beds to receive a uniform layer of prepared planting mix 4 inches deep and rototilled into subsoil to a depth of 8 inches*." However, elsewhere there are details with different recommendations.

Recommendations

The following outlines general recommendations for improved tree health outcomes by addressing soil volume, compaction, composition, and infrastructure strategies for increasing root volumes. The following standards can be used to inform updates to the City's Public Works Standards.

Soil Volume

Soil volume is directly correlated with tree health, size, and structural integrity. Street tree roots can damage sidewalks, streets, and other infrastructure due to inadequate soil volume. Research shows an average-sized tree at maturity with an average growth rate, such as a red maple (*Acer rubrum*), requires approximately 1,200 cubic feet of soil. Typically, street trees are planted in a 4' x 4' wide tree opening with an 18-inch depth of de-compacted soil, which equates to 24 cubic feet of soil.

The recommended minimum required soil volume per size of tree is listed in Table 7, below. For comparison, the City of Bellevue follows the EPA recommendations listed in Table 7, and the City of Seattle requires 1,200 cubic feet per 16-inch diameter tree.

Table 11. Required soil volume for mature street trees

Diameter (DBH) at Maturity	Minimum Soil Volume*
8" (small)	500 cubic feet
16" (medium)	1,000 cubic feet
24" (large)	1,500 cubic feet

**(Urban 2008, EPA 2021)*

Other methods that maximize soil volume for healthy street tree root development include:

1. Reduce street widths to expand planting strips, creating wider planting areas to accommodate larger trees' soil volumes.
2. Design larger tree wells to accommodate greater soil depths.
3. Install continuous trenches between street trees under the sidewalk, which allows water to flow between planting areas and increases rooting space.
4. Install curb bulbs (bump-outs) to provide more space for tree canopies.
5. Reduce parking lanes and/or install curving sidewalks that meander around existing trees.
6. Install suspended pavement and other systems, some of which also integrate stormwater management (as discussed further under Underground Structural Cells).
7. Locate underground utilities under the adjacent street to allow greater soil volume for street tree roots under sidewalks. When underground utilities need to be repaired or connected to future lines, the roadbed should be easier to repair than the sidewalk infrastructure despite needing to temporarily re-route vehicular traffic.

Soil Compaction

Soil compaction is a leading cause of the decline or death of mature trees in developed areas (World Forestry Center 1989); whereas healthy soils provide pore space to hold water, oxygen, and tree roots and allow on-site stormwater infiltration. Instantaneous soil compaction resulting from construction activities can result in immediate root loss, while foot traffic over time can exert pressure like that of a vehicle (Corish 1995), greatly diminishing soil quality and affecting tree health. Tilling alone has a limited effect on reducing the surface bulk density of compacted soil, while incorporating organic matter into disturbed soils has been shown to reverse the effects of soil compaction (CH2M HILL 2000).

During street tree installation, the native and/or specified planting soil mix should be amended if needed, decompacted to specified depths and widths, and topped with organic mulch, such as compost and/or wood chips. Imported soil and/or soil amendments should include compaction ratings or organic bulk density specifications. Foot traffic over tree root zones should be minimized to prevent compaction. Other measures include:

1. When working with existing native soils, topsoil should be set aside, protected from compaction, and reused if feasible.
2. Test native/existing soils to determine minimum organic matter content and bulk density (Stenn 2003).
3. Test existing soil for infiltration rates before designing bioretention features or when projects require compliance with the Stormwater Management Manual for Western Washington (SMMWW), which will determine the proper soil texture, compaction, and organic matter specifications.
4. Install suspended pavers over structural cells, which provide a walking surface for pedestrians in the streetscape, while covering a vault of uncompacted soil for tree roots. This system has the added benefit of reducing sidewalk infrastructure conflicts.
5. Maintain a two- to four-inch layer of organic mulch, such as compost or wood chips, to help reduce compaction from foot traffic, suppress weeds, and improve soil structure which increases retention, infiltration, and percolation of rainfall.
6. Avoid mulching with landscape bark, which naturally contains a waxy substance that repels water and may contain dyes or a high salt content. Gravels, decorative rock, and synthetic mulches, such as rubber, do not add organic matter to the soil, which is key to improving soil quality and tree health. Further, some rubber products on the market are made from recycled tires, which is not compatible with regional salmon recovery efforts (Tian, et al. 2020).
7. To discourage foot traffic, plant short shrubs, perennials, and/or groundcovers in the open rooting area outside of the rootball to discourage foot traffic and provide added stormwater infiltration benefits. Low barriers, such as a short fence, can be added around the perimeter of the tree opening.

Soil Composition

Soil composition is important for optimal tree health to ensure adequate drainage, availability of water and nutrients, and structural stability. The ideal soil composition for street trees is loam, sandy clay loam, or medium sandy loam soils with no more than 35% clay, 45% silt, and 80% sand by volume.

Organic material, preferably high in lignin, should be limited to 15% by volume to prevent settling and ensuing instability for the street tree (Urban 2008).

When working with existing native soils, topsoil should be set aside and protected from compaction.

1. Soil tests can determine the soil composition, and amendments can be added under the guidance of a soil scientist or other knowledgeable professional to meet the parameters listed above.
2. For trees planted in bioretention systems, imported soils should be loamy sand. However, local bioretention soil mixes consist of approximately 60% mineral aggregates and 40% organic material by volume, which is higher in organic material by volume than the 15% recommended for growing street trees. Although the higher content of organic material is beneficial for stormwater purposes, the 60/40 bioremediation mix may pose tree stability issues as the organic material decomposes. A three-way topsoil consisting of sand, loam, and organic material would be better suited to long-term tree health than the two-way bioremediation mix, while still providing bioretention benefits.
3. For trees planted as part of a stormwater management design and/or required to follow the guidance of Ecology's Stormwater Management Manual for bioretention soil (Ecology 2024), coordination with the project's civil engineer is necessary to meet stormwater guidelines while maximizing long-term tree health.
4. Avoid soil-less mixes and structural soil whenever feasible (Smiley, et al. 2006) due to poorer health outcomes for street trees compared to a soil composition higher in organic matter. Soil-less mixes decompose and lose volume rapidly, while structural soil does not provide as much rooting space for larger roots.

Retrofitting Existing Tree Pits

After the removal of a tree and grinding of the stump, tree pits can be retrofitted to enhance growing conditions. Existing soil that does not meet the composition and compaction criteria outlined in this Chapter should be removed. Excavation should be as deep as possible without impacting the structural integrity of adjacent paved areas or underground utilities. The removed soil should be replaced with new, amended soil as recommended in Section 4.3.

If feasible, tree pits should be widened by cutting and removing pavement where the adjacent use allows. The length of the tree pit can be extended parallel to roadways and sidewalks for additional soil replacement.

General Planting Guidance

Current general planting guidance is housed under Public Works Standards Chapter 19.8 Landscaping. This chapter provides installation details for right-of-way trees. The Public Works Standards include high-level soil preparation requirements and a tree installation detail. This detail includes information that is in direct conflict with the information included in the standard details elsewhere in the document, specifically the planter strip detail and amenity zone detail. These details include different recommendations for soil treatment, staking, and wrapping, preparing the hole for planting, and placement of root barrier. In general, there is an opportunity to revise the details to be more consistent

in the information they are presenting. See Figure 7 for a suggested sample detail that integrates standard arboriculture practices. Note that soil volumes are not shown to scale in the sample detail. Details can be revised to focus on the following topics: tree installation, tree placement, soil preparation. Additional recommendations are included for expanding the information in this section.

Recommendations

The following section includes recommendations adapted from the American National Standard: Tree, Shrub, and Other Woody Plant Management – Standard Practices (Planting and Transplanting (ANSI A300 Part 6 2018), and Best Management Practices (BMP) for Tree Planting (ISA 2014). This guidance is organized in the same sequence as typical tree-planting decisions and activities.

Time of Planting

When a tree is planted is an important consideration for successful establishment. In the temperate climate of the Pacific Northwest, planting during the wet cool months is optimal. Planting in the fall typically allows time for tree roots to grow and establish before the winter. Bare root planting is ideal in late winter through early spring, after which bare root stock is no longer available. Planting containerized tree stock may occur at any time, although watering needs increase when planted in the warmer, growing season.

Drainage

Most tree species do not tolerate saturated soils throughout the growing season. Percolation rates of one to two inches per hour are preferred. Typically, percolation rates of less than one inch per hour indicate a potential need for drainage improvement. If adequate drainage cannot be improved, installation of drain tiles or other systems may be necessary to keep soil in the planting area well drained. Corrugated, slotted pipes should be used for drainage. Slots must only be on the bottom half of the pipe. If the pipe has slots on top, plastic sheeting should be taped to the top to prevent soil contamination of the pipe. The drainpipe should be surrounded with coarse sand (in a trench 12 inches wide and 10 inches deep) and should not be wrapped with filter fabric. The pipe must go downhill to an appropriate drainage area.

Acceptable Plant Stock

Generally, trees with broken or dead tops, damaged trunks, signs of desiccation, and root defects have a lower chance of long-term survival and should not be used. Some minor branch damage can be corrected through pruning. In addition to the ANSI Z-60.1 Standards, more detailed information about nursery stock selection can be found in the ISA Best Management Practices: Tree Planting Handbook (ISA 2014), ANSI A300 Part 6 (2018), and Arbor Day Tree City USA Bulletins. Tree size for nursery stock is typically measured by height for conifers and in caliper diameter for deciduous trees. Caliper diameter is measured at six inches above the ground or at soil level for trees less than 4.5-inches diameter; if the diameter is 4.5-inches or greater at six inches, then caliper is measured at 12 inches above ground or soil level.

Transport, Handling, and Storage

Care should be taken during all phases of tree planting, including handling, transportation, and storage. Trees should be handled carefully to avoid trunk and major branch damage. Root balls should

be fully supported from underneath and kept intact. Trees may need to be covered during transportation or storage depending on the climate.

All transport and nursery materials should be removed, including twine, tags, burlap, containers, trunk protection, and stakes. At least the upper 1/3 of the root ball should be exposed by removing any wire basket, burlap, or bag following planting. If possible, completely remove wire baskets and burlap from the planting site. Soil should be backfilled around tree roots and/or root ball with native soil if suitable. Soil amendments such as fertilizers and conditioners require adequate soil testing prior to application.

Planting Depth and Width

Before planting the tree, pull back any twine or other material from the bottom of the trunk and locate the trunk flare (where the trunk transitions to roots), and position it at or slightly above the grade of the adjacent curb and sidewalk. The planting depth for street trees should be equal to the depth of the root ball for balled-and-burlap (B&B) trees and may be one to two inches shallower than the depth of the roots for a container-grown tree. Planting holes should be at least two times the width of the root ball, or slightly less than the width of the planting strip. The edges of the planting hole should be roughened to eliminate any glazing or compaction from digging.

If the planting site contains hardpan or other compacted soil, those layers should be decompacted through excavation or other methods and mixed with appropriate soil. The area underneath the root ball should be tamped so the tree does not settle after planting. Soil backfilled around the roots should be lightly compacted with hand tools and watered to allow soil to settle in and around the roots. For bare-root trees, backfill the planting hole with soil and water several times until the tree is sturdy in the planting site.

Fertilizer

Given proper soil composition as outlined in Section 15.2 D., fertilizer is generally unnecessary, but a balanced, slow-release fertilizer with a low salt index may be applied at planting or ideally during the first fall through winter the year after planting, following the label instructions.

Mulch Topdressing

Mulch should be applied over at least the newly planted root ball width, or at the dripline of the tree. Use coarse, untreated arborist's woodchips screened one-half to six inches in size, and free of weeds, weed seeds, and invasive plants.

- Apply a two- to four-inch depth layer of organic mulch to help reduce compaction from foot traffic, suppress weeds, and improve soil structure.
- Pull back mulch two inches from the base of the trunk.
- Avoid creating "mulch volcanoes" where tree trunks are buried under a mound of mulch.
- Woodchips produced from City tree pruning and removal activities may be used if the woodchips are disease-free. Avoid mulching with landscaping bark, which repels water, can be flammable when dry, and may contain dyes or a high salt content.

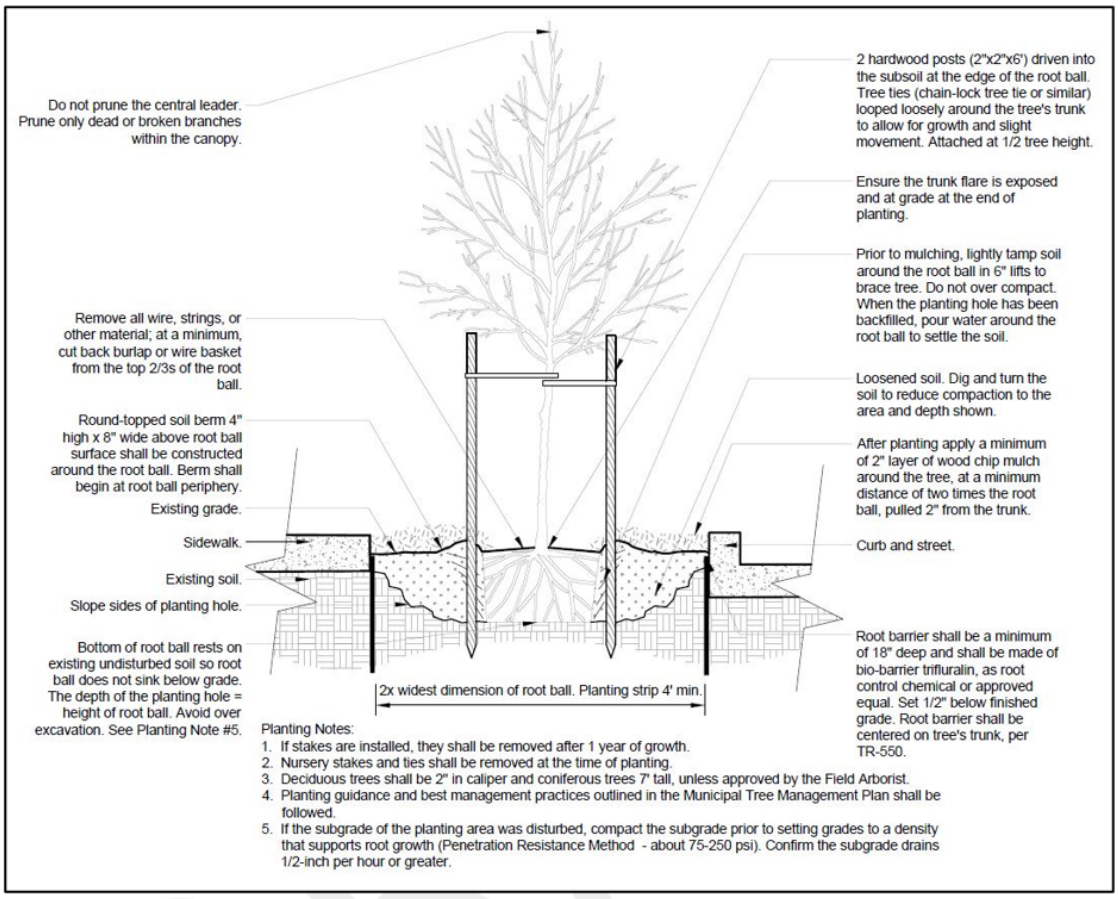


Figure 7. Sample planting detail

Tree Stakes and Ties

Tree stakes and ties should only be installed if necessary. If stakes and/or ties are used, they should be positioned in a way that allows the tree to move without damaging the bark. Stakes should remain on the trees for up to one year or until roots are firmly established. Tree ties should be installed following the current best management practices (ISA 2014) and removed as soon as the tree is established.

Site Grading

Site grading requirements are currently outlined under Chapter 19.9 Grading of the Public Works Standards. The purpose of this section is to ensure proper drainage in planting strips, prevent erosion of sediment onto sidewalks or into waterways, and reduce maintenance needs. The standards provide general grading requirements, but there are opportunities to define and use consistent terminology and definitions. The recommendations in grading and using wood chips are not consistent with details and recommendations elsewhere in the Public Works Standards related to site preparation and wood chip or mulch depths.

Recommendations

1. Establishing Positive Drainage: The planting strip should be graded with a slight slope (usually around 1-2%) to direct water away from sidewalks and roads, preventing standing water. The slope should guide water toward stormwater inlets or other designated drainage areas.

2. Avoiding Soil Erosion: Erosion control measures, such as mulching or sodding, help stabilize the soil, especially on sloped planting strips. Using ground covers or erosion control blankets can help protect soil from being washed away, especially in areas with heavy rainfall.

3. Ensuring Safe Grade Transitions: Smooth transitions between the sidewalk, curb, and planting area prevent tripping hazards for pedestrians. Abrupt changes in grade should be avoided, and the planting strip should blend naturally with surrounding areas to provide stability and accessibility.

4. Preparing the Soil: After initial grading, the soil in the planting strip should be prepared to support plant health. This may involve removing debris, tilling, and adding topsoil or amendments to improve drainage and nutrient content.

5. Managing Compaction: To avoid compacting the soil in the planting strip, grading equipment should be used sparingly. Compacted soil can restrict plant root growth, so lightly compacting the surface for stability, while leaving deeper soil layers loose, helps support healthy vegetation.

6. Creating Rain Gardens or Bioswales (where applicable): In areas where stormwater management is a priority, planting strips can be graded into shallow depressions to create rain gardens or bioswales, which help capture and filter runoff. These features may require specific grading to support water retention and plantings suited for variable moisture levels.

7. Maintaining Accessibility Standards: Grading should adhere to ADA guidelines, particularly near pedestrian access points, ramps, and driveways, ensuring that slopes remain safe and accessible. By following these grading practices, planting strips can effectively manage stormwater, support resilient plantings, and provide a safe, visually appealing environment that complements the surrounding urban landscape.

5.2 Pruning

All pruning and other tree care operations should be performed following the most current industry standards for arboriculture. Pruning standards are outlined in the American National Standard for Tree, Shrub, and Other Woody Plant Management – Standard Practices, Pruning (2023). Other valuable resources based on these standards include Best Management Practices: Tree Pruning (ISA 2019) and Arbor Day Tree City Bulletins. This section summarizes and outlines some of the best practices for pruning, specifically focused on trees located within the City right-of-way. Currently, the City does not include pruning best practices within the 2015 Public Works Standards.

Pruning goals for street trees include providing clearance and sight lines, reducing risk of failure, and maintaining good structure. Pruning for young trees should focus on developing a strong central leader and good branching structure. Well-timed and careful pruning will result in safer trees with fewer branch failures, increased resilience to pests and diseases, and a longer life expectancy.

Types of Pruning

Several types of approved pruning techniques are commonly used for mature trees. Prior to performing any work, the person(s) performing pruning and maintenance activities should be familiar with pruning best practices and ANSI Z133: American National Standard for Arboricultural Operations – Safety Requirements (2017).

The most common activities when pruning the entire crown of a tree include:

Cleaning	The removal of dead, dying, diseased, weakly attached, and low-vigor branches from the crown of a tree.
Raising	Removing the lower branches of a tree back to the trunk or lateral secondary branch to provide clearance.
Reduction	Reducing the size of a tree by pruning back to secondary branches that are large enough to assume the terminal roles (at least one-third the diameter of the cut stem).
Reducing density	Also known as thinning, it involves the removal of select branches and foliage to increase light penetration, promoting interior foliage development, or for aesthetic purposes (such as visibility to business signage or creating a uniform look throughout a planting). Routine thinning does not necessarily improve the health of a tree. Trees produce a dense crown of leaves to manufacture the sugar used as energy for growth and development. Removal of foliage through excess pruning can reduce growth and stored energy reserves, leading to tree stress.

Young Tree Pruning

The goals for pruning young street trees include developing one central leader and selecting permanent branching. Young trees are those that should be pruned during the second- or third-year following planting. Following this initial pruning, future pruning cycles should occur about every five to eight years to maintain clearance and address any structural branching issues. The following are best practices for pruning young trees:

- Retain low branches temporarily to help develop good trunk taper and prevent the trunk from getting sunscald.
- Select permanent branches to be spaced at approximately three percent of the tree's eventual mature height (for example, branches spaced every 18 inches for a tree with a mature height of 50 feet).
- Remove any dead, broken, or dying branches.
- Selectively prune or remove branches that cross or rub against the main trunk or have narrow angles of attachment with included bark against the main trunk.

- Do not prune the top of the main leader. If codominant leaders are forming, select one with the best structure and branch attachment for trunk development, and reduce the other by 30% to an appropriate lateral branch.
- Do not remove too many branches. Leaves and supporting branches are major sites of food production and storage, critical to the health and growth of the tree. Eliminating too much canopy can reduce growth and increase stress. Typically, do not remove more than 20% of live branches in any one year for young trees.

Prohibited Pruning Methods

Indiscriminate cuts are not considered acceptable types of pruning for street trees because they can affect long-term tree health. These include:

Tree topping	Removing the dominant leader branch(es) at the terminal or top, leaving only lateral branches and stubs. This practice creates large wounds that typically collect water, leaving the tree vulnerable to decay and disease. Resulting sprouts and branches are generally poorly attached, and the tree's natural form can be difficult or impossible to restore. This technique is prohibited for all trees, with the exception of creating wildlife habitat snags as an alternative to tree removal in critical areas located in unmaintained right-of-way. For street trees that have been previously topped or severely pruned for line clearance, retain if feasible due to their contributions to canopy cover, community benefits, etc. Regularly monitor previously topped trees for structural stability.
Pollarding	A form of tree topping done intentionally to encourage dense sprouts. This technique is prohibited for street trees.
Hedging	Removal of branches and foliage at the top and/or sides of the canopy at a uniform level, leaving stubs. This common practice for shrubs and small trees is appropriate in some landscaping applications but not recommended for many species as it often leads to branch decay, disease, and dieback. This technique is prohibited for street trees.

The City should consider prohibiting the following activities for street trees:

- Tree topping, pollarding, hedging, and other indiscriminate heading cuts are prohibited for street trees.
- When removing branches, pruning cuts shall not be made flush to the trunk. See pruning best practices below for determining an appropriate place for proper pruning cuts.
- No more than 25% of live branches should be removed in any one year.
- The use of climbing spurs (also known as spikes, hooks, or gaffs) is prohibited for pruning street trees. Climbing spurs may only be used when removing trees or during emergency operations.
- Wound dressings on pruning cuts or damaged tree parts should not be applied. Research has shown that wound dressings do not reduce decay, prevent insect infestation, or assist in

response growth. Wound dressings can actually prevent the tree from healing over time. Additionally, tree cavities should not be filled with any materials.

- Permanent lighting, signage, or decorative materials should not be installed nor left on a street tree year-round.

Safety

State (WSDOT) and local highway agencies regulate roadside vegetation, including whose responsibility it falls upon to maintain trees to comply with road safety standards. Safety standards for tree care operations can be found in ANSI Z133: American National Standard for Arboricultural Operations – Safety Requirements (2017). All tree service contractors performing tree care operations must follow these safety requirements along with any applicable compliance through the Washington State Department of Labor and Industries.

Pruning Requirements

Maintaining vertical clearance over roadways and sidewalks is required to maintain safe line-of-sight visibility, as described in Table 12.

Table 12. Minimum required vertical clearances.

Infrastructure	Clearance required (feet)
Sidewalk	8
Roadway	14
Bicycle Paths	10

Pruning to meet right-of-way vertical clearances should be combined with other clearance objectives to minimize sight-line obstruction to transportation infrastructure (e.g., streetlights, traffic signals, signs, etc.) as illustrated below for streets and sidewalks.

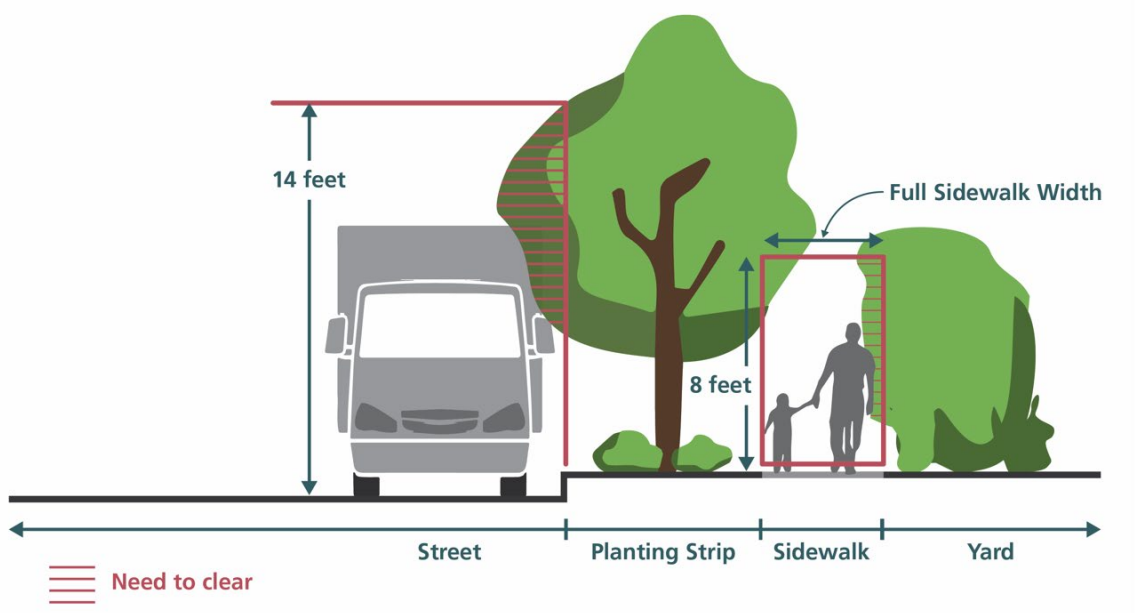


Figure 8. Street and sidewalk clearance pruning requirements

Branch reduction pruning may be acceptable to maintain clearance so long as pruning cuts are not indiscriminate heading cuts or otherwise hedged. Reduction cuts should be made back to a healthy live lateral branch or branchlet. If a reduction cut results in removal of greater than 50% of live branch growth, the branch should be removed back to the parent trunk.

Maintaining power line clearance is the responsibility of the associated utility. Neither the City nor private landowners should attempt line clearance operations.

Pruning Best Practices

DECIDING WHERE TO CUT

The location of the pruning cut is critical to a tree's growth and wound closure response. Making pruning cuts outside the branch collar (the bulge where the branch meets the trunk) is important to avoid damage to the trunk. To reduce the length of longer branches, prune back to a secondary branch or bud. Cuts made between buds or secondary branches may lead to decay, sprout production, or misdirected growth.

For larger branches (greater than two inches in diameter), a three-step cut is recommended for safety and to avoid trunk damage: 1) Make an undercut about 12 to 18 inches from the limb's point of attachment; 2) Make a second cut from the top, directly above or slightly farther out on the limb. This removes the branch leaving a short stub; 3) Remove the stub by cutting back to the branch collar, which reduces the likelihood of tearing bark down the trunk.

PRUNING TOOLS

Small branches (less than ½" diameter) may be cut with bypass-blade hand pruners. Pruning branches larger than ½" will require a pruning saw or bypass-blade lopping shears. Tools should be clean and sharp, and disinfected after use on trees with known pathogens. Powered hedging shears should not be used to prune trees.

TIMING

Most light pruning to clean the crown of weak, dead, or diseased limbs can be done any time of the year with little effect on the tree. Generally, tree growth and wound closure are maximized if pruning takes place before the spring growth flush. Avoid heavily pruning live branches just after the spring growth flush to reduce stress to the tree.

Some species are susceptible to insect infestation during spring and summer months. In this region, avoid pruning pines (*Pinus* spp.), elms (*Ulmus* spp.), birches (*Betula* spp.), and ashes (*Fraxinus* spp.) from May through October to reduce possible exposure to beetles and disease-causing agents.

CONSULTATION WITH AN ARBORIST

Pruning trees can be difficult and dangerous. Mistakes can be long-lasting and expensive. Tree care professionals affiliated with professional organizations, such as the International Society of Arboriculture (ISA) or Tree Care Industry Association (TCIA), have the training, tools, and experience to provide professional tree care. More information can be found in the Why Hire an Arborist brochure developed by the International Society of Arboriculture and located on the Trees Are Good website (https://www.treesaregood.org).

PRUNING YOUNG TREES

The goals for pruning young street trees include developing one central leader and selecting permanent branching. Young trees are those that should be pruned during the second- or third-year following planting. Following this initial pruning, future pruning cycles should occur about every five years to maintain clearance and address any structural branching issues. The following are best practices for pruning young trees:

- Retain low branches temporarily to help develop good trunk taper and prevent the trunk from getting sunscald.
- Select permanent branches to be spaced at approximately three percent of the tree's eventual mature height (for example, branches spaced every 18 inches for a tree with a mature height of 50 feet).
- Remove any dead, broken, or dying branches.
- Selectively prune or remove branches that cross or rub against the main trunk or have narrow angles of attachment with included bark against the main trunk.
- Do not prune the top of the main leader. If codominant leaders are forming, select one with the best structure and branch attachment for trunk development, and reduce the other by 30% to an appropriate lateral branch.

- Typically, do not remove more than 20% of live branches in any one year for young trees. Leaves and supporting branches are major sites of food production and storage, critical to the health and growth of the tree. Eliminating too much canopy can reduce growth and increase stress. Typically, do not remove more than 20% of live branches in any one year for young trees.

5.3 Tree Removal

Tree Removal

Trees within the public rights-of-way currently fall under the jurisdiction of the City's Public Works ROW Team. Trees are only removed if they are deemed a hazard or nuisance or if the removal is approved as part of a capital improvement, utility, or development project.

Stump Grinding and Utility Protection

Once a tree has been removed, all stumps and major roots should be removed in such a way that does not damage infrastructure, including sidewalks, curbs, and utilities. The stumps and roots of trees or shrubs should be removed to a point at least one foot below the top of the adjacent curb or proposed curb grade. Any roots that have disrupted or broken the adjacent street, curb, or sidewalk should be removed and the street, sidewalk, or curb shall be repaired. Some species prone to aggressive root sprouting should be treated by a licensed pesticide applicator to prevent future sprouting or growth.

Before any stump grinding or ground disturbing activities begin, underground utilities shall be located to ensure the safety of workers, and surrounding community members, and uninterrupted service.

5.4 Ongoing Maintenance

Without ongoing maintenance, any type of infrastructure can lose functionality and ultimately fail. Performing regular maintenance extends the useful lifespan of street trees (Hilbert, et al. 2019). The following chapter discusses best management practices needed to improve street tree health and longevity, including general irrigation, pest/disease management, and weed control practices.

Irrigation & Watering Practices

Ensuring proper irrigation and watering practices is essential for the establishment and long-term health of street trees within urban streetscapes. Trees planted in urban environments face challenges such as limited soil volume, compacted soil, limited infiltration due to surrounding hardscapes, and reflected heat and warmer temperatures. Supplemental water sources and temporary irrigation are critical and are required during the three-year establishment period of street trees.

The water requirements of street trees can vary significantly depending on factors such as:

- Tree species
- Planting conditions
- Soil volume and soil media composition
- Soil drainage characteristics

- Availability of supplemental water sources
- Climate conditions
- Inconsistent rainfall patterns
- Presence of adjacent vegetation

Periods of extreme heat, wind, or drought may necessitate adjustments to watering practices and the method and amount of water applied during the establishment period. Given climatic variations and other stressors, trees may benefit from supplemental watering after the establishment period if the tree is showing signs of stress.

Recommendations

Irrigation Methods

The type of watering system selected should be based on site conditions, partnership opportunities with adjacent developments, and anticipated short- and long-term maintenance commitment levels. Watering systems and methods of delivery feasible for the City include:

Hand Watering or Simple Mechanical System

This method involves manually watering trees using watering trucks, hoses from adjacent sources of potable water, or specialized watering bags designed to slowly release water directly to the root zone. Often, basin-watering is employed, where a three to four-inch soil berm is built to encircle the edge of the root ball to minimize runoff. The watering bag is the preferred method for irrigating street trees as it provides the greatest flexibility for managing watering needs. However, commitment and significant resources during the establishment period are required to ensure consistent watering following a predetermined schedule. This type of irrigation method can also be used during periods of prolonged drought or immediately following planting, during an initial establishment period.

Photo credit: treegator.com

Temporary Irrigation System

A temporary irrigation system can be designed and installed specifically to provide supplemental water to newly planted trees during the establishment period. These systems may include drip irrigation or root watering systems, strategically placed to ensure thorough coverage of the root zone. Temporary systems can be decommissioned after tree and plant establishment; however, they may be left in place to provide supplemental water to trees during periods of drought or stress. Temporary irrigation systems are recommended in conjunction with adjacent development projects that will be installing irrigation for the establishment of other landscape planting areas, such as ground cover and shrub beds.

Automated Irrigation System

For larger-scale projects or areas with greater visibility and investment, a permanent built-in irrigation system with an automatic controller may be used. These systems typically consist of underground pipes, drip lines, or micro-sprinklers connected to an automatic controller that regulates watering schedules based on preset parameters such as soil moisture levels, weather conditions, and time of year. Trees should be zoned separately from turf or landscaped beds so that spray heads do not target tree trunks. For drip emitters, a loop of drip tubing may be installed about two-thirds away from the trunk to the edge of the root ball. Ideally, a weather station prioritizes efficient water use, and high-efficiency spray heads or drip emitters are utilized to minimize evaporation loss and overspray. If feasible, the use of harvested rainwater and/or reclaimed greywater reduces potable water demands.

Photo credit: ProTool Reviews

Subsurface Irrigation for Underground Structural Cell Systems

Where underground structural cells are to be installed, a subsurface irrigation system may be utilized for establishment and supplemental watering. Irrigation components may include subsurface drip emitters, covering the larger soil area, or targeted root watering systems at the base of trees. Irrigation system component selection, layout, and design should be completed with the guidance of the selected manufacturer of the structural cell system.

Irrigation Frequency and Volume

New trees should be watered during the establishment period of three years (Pacific Northwest ISA 2023). Water should be applied slowly and should penetrate to the rooting depth as frequently as needed, considering the seasonal variations and availability of supplemental water sources.

With each watering, the recommended amounts are five gallons per caliper inch. The minimum standards should be as follows:

- 1-3 months in the ground: 4 times per month or as necessary
- 4-6 months in the ground: 3 times per month or as necessary
- 7-12 months in the ground: 2 times per month or as necessary

Mature, well-established trees should receive water once per month during the dry season (usually July through September) (Seattle Department of Transportation 2013).

GENERAL WATERING RECOMMENDATIONS

Frequency - Establish a consistent watering schedule. Regular, deep watering is generally preferable to infrequent, shallow watering sessions to encourage deeper root growth.

Area of Focus - Focus watering on the area beneath the drip line. Watering within the drip line ensures that water reaches the active root zone where root uptake is most efficient.

Absorption Rate - Distribute water slowly to allow for optimal soil and root absorption. Water should be slowly applied at a rate that allows soil penetration to at least a 12-inch depth and to minimize runoff.

Avoid Trunk Contact - Direct water away from the tree trunk to prevent moisture buildup and reduce the risk of bark and trunk injury and disease introduction.

Prevent Oversaturation - Standing water resulting from soil saturation suffocates developing roots and promotes root rot. Refrain from additional watering if the soil is boggy or mossy.

Adjust Seasonally - Adjust watering schedules seasonally to accommodate changes in weather patterns. Increase watering frequency during hot, dry periods and reduce watering during cooler, wetter seasons (RainBird 2023).

Weed Control

Weed types and growth rates are directly correlated to site and soil conditions. Best practices for site design, soils, and drainage are addressed in Chapter 4, Street Tree Planting Standards; however ongoing horticulture practices can proactively reduce weed management and associated costs and prevent negative environmental impacts.

Fertilizer

Chemically synthesized fertilizers encourage weed growth, negatively impact a healthy soil biome and reduce soil fertility. Ongoing fertilizer application is generally unnecessary unless tree health is compromised due to soil nutrient deficiencies. A soil or foliage nutrient test should be performed before fertilizer is applied to reduce weed germination and establishment and even so, organic alternatives used to supplement deficiencies. Although it may be impractical for trees located in high-traffic areas, where feasible, the practice of leaf mulching or topdressing has greater long-term tree health benefits without the environmental impacts as conventional fertilizer use.

Mulch

Woodchip mulch breaks down and eventually does not function as an effective weed barrier. Because mulching provides so many ancillary benefits, woodchip or other organic mulch should be applied annually to maintain a depth of two to four inches as described under General Planting Guidance in Chapter 4. Maintaining this mulch layer considerably suppresses weeds, moderates soil temperatures, adds nutrients to the soil, helps the soil retain moisture, and contributes to a healthy soil biome.

Weed Management

Proper identification and knowledge of weed lifecycles are vital in Integrated Pest Management-based weed control that focuses on removal before setting seed. Mechanical controls include physically removing weeds by hand or high heat at strategic periods in the growing season or maintaining a layer of mulch. Cultural IMP weed control includes planting groundcovers and shrubs to out-compete

weeds. Chemical IPM methods include the use of horticultural vinegar. IPM principles are further discussed in Chapter 5.5. The City's IPM policy specifies standards for addressing weed management where applicable.

Pest and Disease Management

Managing woody plant pests and diseases from an early stage is critical to the long-term health of trees. Typical problems may include leaf-chewing insects, sap-sucking insects, insects that bore into live wood, foliar diseases, trunk decay from wounds or damaged bark, and soilborne diseases (such as *Phytophthora* sp. and *Armillaria* sp.). The City's IPM policy specifies standards for addressing pest management where applicable. Abiotic factors, such as damage from vehicles, line trimmers, or vandalism, may result in trunk decay, shortening the life of the tree.

Preventive measures, such as appropriate handling and transport of trees, can reduce trunk and root decay. Thoughtful landscape design and planting practices should maximize available space for a robust root structure. Soils should remain well-drained and largely undisturbed so that the resulting healthy trees have optimal pest resistance. When necessary, use effective and environmentally sensitive Integrated Pest Management (IPM) methods when dealing with pest and disease control.

Integrated Pest Management

Integrated pest management (IPM) principles are based on levels of control, where methods include mechanical, cultural, biological and chemical controls, as discussed below, related to pests and diseases. Proper identification and knowledge of pest or pathogen lifecycles are vital IPM principles. Acceptable levels of pest damage may need to be considered.

IPM principles include prevention, monitoring, identifying the pest, establishing control thresholds and control actions, and evaluating the results. Pests and diseases must be accurately identified and diagnosed to determine appropriate treatments and documented by a trained and qualified professional. Any pesticide application must be done by, or under the supervision of, a licensed applicator through the Washington Department of Agriculture (WSDA) and in alignment with the City's Integrated Pest Management Policy. Nontoxic materials should be prioritized whenever possible.

PREVENTION

Preventing disease and pest outbreaks starts with creating and maintaining healthy soil, selecting tree species well-suited for the site, and providing ongoing maintenance such as mulching. Often, abiotic stressors reduce a tree's capacity to protect itself. For urban trees, lack of consistent water, compacted soil, and poor root growth are often tree stressors that attract pests.

MONITOR

Monitor the landscape frequently for disease and pest signs and symptoms. Early detection is crucial to keeping populations under the tolerable threshold for control, requiring a less intensive response. Be aware of unusual weather (early warm spells) that can trigger early pest emergence or subsequent populations of beneficial insects. Some monitoring methods include plant inspection, pheromone traps, sticky-colored traps, and pitfall traps.

IDENTIFY

Correctly identifying the pest and determining levels of impact informs the best management strategy. Mistakes in incorrectly identifying a pest can lead to incorrect control tactics that waste time and money and unnecessary risks to people and the environment.

CONTROL AND DAMAGE THRESHOLDS

The threshold for control involves varying degrees of tolerance for pest damage. Most levels of pest presence and some damage to the host, except in a few cases of quarantined pests, can usually be tolerated. Thresholds may trigger different management strategies, including actions other than the use of pesticides. Consider the following factors for assessing damage tolerance: the likelihood of the problem spreading to other plants, the cost to treat the problem, and the value of the tree in question.

CONTROL ACTIONS

Several different types of controls can be implemented as part of the IPM. The least toxic management practices include cultural, mechanical, and biological controls. Chemical controls should be used as a last resort.

- **Cultural** - Many cultural controls involve setting plants up for success—building healthy soil, selecting the correct tree for the planting area, watering appropriately until established to limit stress, applying mulch, and planting diverse types of trees and shrubs to encourage biodiversity.
- **Mechanical** - Mechanical controls include manually weeding, reapplying mulch to create a barrier for weeds, hand-picking to remove pests or pruning out infected tissues, and raking to remove infected tissue.
- **Biological** - Using biological controls involves utilizing natural predators (praying mantis or lady beetles), parasites/parasitoids (parasitic wasps and tachinid flies), or diseases (viruses, bacteria, or fungi that affect an insect) to reduce the pest population.
- **Chemical** - If the pest has been correctly identified and is still a problem after implementing other management strategies, chemical options may be considered a last resort. If chemical controls are the next step, apply the least toxic chemical at the lowest concentration, according to the label. Utilize chemicals from the Grow Smart Grow Safe pesticide guide (https://www.growsmartgrowsafe.org/).

EVALUATE RESULTS

The success of the controls must be constantly reevaluated. The level of success compares the current population to the established threshold. Monitor for changes in the pest population as well as the health of the tree.. Record keeping of pest issues, control measures implemented, and their successes will help inform future integrated pest management strategies.

Common and Emerging Pests and Diseases

Disease and pest outbreaks have increased in number and frequency in recent years due to the transportation of firewood, international trade, travel, and climatic changes. When pests outside of their native range are introduced into new ecosystems, natural predators or other conditions may not control their spread. Climate change (prolonged drought and elevated temperatures) adds abiotic stressors, weakening plants' ability to defend against new pest/disease pressures. The Pacific Northwest region currently faces several devastating biotic stresses, namely sooty bark disease, bronze birch borer, and emerald ash borer.

RUST

Photo credit Gail Hampshire

Seven percent of the species identified in the Sammamish ROW tree inventory consists of the pear genus, *Pyrus*. During the field inventory, arborists observed that many pears were infected with pear rust *(Gymnosporangium sabinae)*, a fungal disease with characteristic red-orange blotches on the upper leaf surface of highly susceptible pear trees. It is unsightly but can be especially damaging by resulting in complete defoliation if not treated. Its widespread impact is due to its monoculture status and common co-hosts. Short-term management strategies include timely applications of fungicide spray, remove/destroy infected material, and sanitation measures, while long-term strategies may include the removal of pear trees and replanting to meet species diversity and distribution objectives. The Washington State University Extension Services provide Integrated Pest Management (IPM) options for Pacific Coast and trellis pear rust control.

SOOTY BARK DISEASE

Photo credit Forest Health Watch

Sooty bark disease (*Cryptostroma corticale*) causes dieback primarily in maple species. To date, the fungus has been found to cause damage in sycamore maples (*Acer pseudoplatanus*), red maple (*A. rubrum*), Japanese maple (*A. palmatum*), vine maple (*A. circinatum*), and bigleaf maple (*A. macrophyllum*) in the Puget Sound region. Other confirmed hosts of the disease include Pacific dogwood (*Cornus nuttallii*) and horse chestnut (*Aesculus hippocastanum*) (PNW Pest Management Handbooks). The fungus infects the tree's vascular system and thrives during hot summers, proliferating in drought-stressed trees. No chemical management options are currently available. Proactively maintaining healthy trees allows for the best chance of survival; this includes applying

mulch, providing supplemental water during drought conditions, and disinfecting tools. The Washington State University Ornamental Plant Pathology program provides information and resources for Sooty Bark Disease control. Given that 34% of the Sammamish inventory consists of Acer species, this is something that staff should monitor.

BRONZE BIRCH BORER

Photo credit Heather Holme

Bronze birch borer (*Agrilus anxius*) is a beetle whose larvae tunnel into live wood, creating extensive galleries leading to branch or trunk girdling, ultimately cutting the rest of the branch off from resources. Bronze birch borers are attracted to trees weakened by environmental stressors, age, or other diseases and pests. European white birch (*Betula papyrifera*), silver birch (*B. pendula*), and grey birch (*B. populifolia*) are more susceptible than other birch species. River birch (*B. nigra*) appears to be resistant to bronze birch borer but may not be an appropriate street tree choice. Proactively maintaining healthy trees allows for the best chance of survival, including focusing on irrigation during drought conditions. Some chemical treatments are available and effective when applied correctly in response to the pest's life cycle. Pruning of trees exhibiting die-back should occur in the fall to limit sap bleeding, which may attract adult borers. The Washington State University Extension Services provide Integrated Pest Management (IPM) options for Bronze Birch Borer control.

EMERALD ASH BORER

Photo credit Flikr

Emerald ash borer (*Agrilus planipennis*) has been present in the United States since 2002 but only recently has been confirmed in Oregon in June 2022, and in Victoria B.C. in 2024. While it has not yet been sighted in the Puget Sound region, management strategies should assume its inevitable arrival. The emerald ash borer infects native (*Fraxinus latifolia*) and non-native ash (*Fraxinus* spp.) trees. The beetles do not discern between stressed or healthy trees, and the impact is anticipated to be significant, especially in native forests. Like other borers, its larvae create extensive galleries, causing limb and trunk dieback leading to decline and eventual tree death. While the emerald ash borer strongly prefers ash species as its host, it will also attack white fringe trees (*Chionanthus virginicus*) and olive trees (*Olea europaea*).

Management strategies include proactively removing ash trees that are in decline or in conflict with surrounding infrastructure, limiting routine maintenance of existing ash trees except when necessary

for public safety, and removing ash trees from recommended planting lists. Ash trees showing signs of damage should be removed promptly to reduce the amount of available resources for the beetle and to allow for safe removals. Infected trees become brittle and dangerous to climb. The structural integrity of ash trees declines before significant canopy damage is visible. Preventative chemical treatments are most effective in preserving ash trees when the populations are low, though they are still effective as populations grow. The most effective approach combines proactive removal with the selective preservation of certain trees. The Washington State University Extension Services provides a publication on Emerald Ash Borer identification and control (Zobrist et al 2023).

5.5 Tree Protection During Construction

Trees can be damaged quickly and irreversibly by construction activities, especially by heavy machinery and exposure to chemicals. Trees that will be preserved during construction should be protected from accidental impacts and damage. The following section summarizes the current guidance provided by the 2016 Public Works Standards and municipal code followed by recommendations and best management practices based on arboriculture industry standards for protecting trees during construction.

The 2016 Public Works Standards Section 19.2.C. references protection needed for sensitive drainage areas (19.2.C.1) as well as methods to be used during construction to preserve trees and root systems (19.2.C2) from accidental impacts and damage. Section 19.2.C.1 does not include a reference to protection standards pertaining to sensitive drainage areas nor does it provide a reference to protection methods or sequencing in the description and detail.

Currently, the terminology used to describe the area to be protected includes several terms such as *tree root zone, critical root zone, root mat area, canopy width area, and vegetation retention area*. Descriptions of tree protection and tree protection details (Figure 19.1 Tree Protection – Right-of-Way) do not consistently demonstrate the recommendations. The detail also includes references to the critical root zone, dripline, and a 'Tree, Vegetation, and Soil Protection Plan (TVSPP)' but does not provide standards for the TVSPP.

Within the City municipal code, tree Protection methods related to development projects are currently described under SMC 21.03.060.I *Tree protection standards*. The regulations include standards for the location of tree protection barriers (SMC 21.03.060.I.5.b), the materials and fencing type to be used (SMC 21.03.060.I.5.c), and signage and barriers needed for land disturbance on more remote sites (SCD 21.03.060.I.5.d).

Tree protection standards are also referenced in SMC21.07.070 *Development Standards – Landscaping and Irrigation*. The scope of this project review did not include assessment and recommendations for SMC 21.07.070, but it is worth noting that the Public Works Standards should ensure consistency of best practices for tree protection across all regulations and standards.

The municipal code does not specify standards specific to ROW trees or streetscape development nor do they reference current 2023 ANSI A300 Standards for tree protection during construction nor direct contractors to follow tree protection measures outlined in the Public Works Standards.

Tree Protection Terminology

The City should strive to provide consistent and clear definitions for all regulations and standards used to describe the public tree protection areas and plans. Terminology should be defined earlier in the PW Standards, repeated throughout the document, and consistent with definitions outlined in the City's tree ordinance. Within the tree protection plan, the tree protection area for preserved trees should be shown to scale on the site development plans, including grading and drainage plans and temporary erosion and sediment control (TESC) plans. The City could also include the procedure for making changes to the agreed-upon tree protection area and plan, keeping in mind this would differ widely between the ROW and private property.

Best Practices for Tree Protection During Construction

Protections for ROW trees during streetscape construction or private development projects adjacent to public rights-of-way should be based on ANSI A300 Tree Care Standards Part 9 (2023 or most recent update). ANSI Standards utilize the terms critical root zone (CRZ) and tree protection zone (TPZ) to describe the tree protection area.

Photo credit: sdotblog.seattle.gov

The CRZ is the area that contains tree roots critical to the health and stability of the tree. The CRZ is defined as the area surrounding a tree at a distance from the trunk, which is equal to one foot for every inch of trunk diameter measured 4.5 feet above grade. However, the CRZ varies across tree species, size, and growing conditions. A tree's tolerance to root loss and other disturbances also varies by the species, age, and health of the tree. Tree protection areas should ideally be developed with these factors in mind, by an ISA-certified arborist.

The TPZ is the area within the CRZ in which certain activities are prohibited or restricted to prevent or minimize potential injury to designated trees, especially during construction. The TPZ should encompass as much of the CRZ as possible. However, the TPZ may be adjusted in size or shape to accommodate the existing infrastructure, planned construction, and specific site conditions, as well as the tree canopy conformation and visible root orientation, species response to construction impacts, size, condition, and maturity. All construction activities, including staging and driving machinery, should be located outside of the TPZ. Verification of site conditions and long-term health of the tree by an ISA-certified arborist may be required for intrusions into the TPZ.

The Public Works Standards and details should consider the specific growing conditions present within the streetscape environment and reference ANSI standards to avoid and minimize above and below-ground tree impacts. Some general recommendations to consider include:

- In areas where existing sidewalks remain intact, tree protection should focus on the tree pit or planter strip soil and the trunk. Typical protection barriers include plywood or orange construction fences installed with clamps, PVC pipe frames, or steel fence stakes installed at the

edge of the sidewalk. Ideally, the minimum fence height should be six feet to avoid debris and garbage accumulating within the fence.

- In areas where the sidewalk is removed, tree protection fencing should be placed at the outer edges of the tree protection zone.
- Fencing should be a minimum of six-feet-high chain link or wire mesh installed with posts anchored in concrete pier block, or high-visibility plastic fencing installed with steel fence stakes at the approved tree protection zone, as shown in Figure 1 below.
- Fencing should include visible warning signs, such as "Tree Protection Area – Keep Out", spaced no further than 15 feet apart.
- Fencing and signage should be installed before the start of construction and remain in place for the duration of the project.
- For trees in open planting areas, all unpaved areas within the dripline of the tree should be enclosed with the required fencing and allow continued use of the sidewalk and keep the street open for public use.
- In some cases, lower branches may require pruning to allow clearance, or with young trees, pliable branches may be temporarily bundled into a narrow, upright shape with polypropylene or nylon twine.

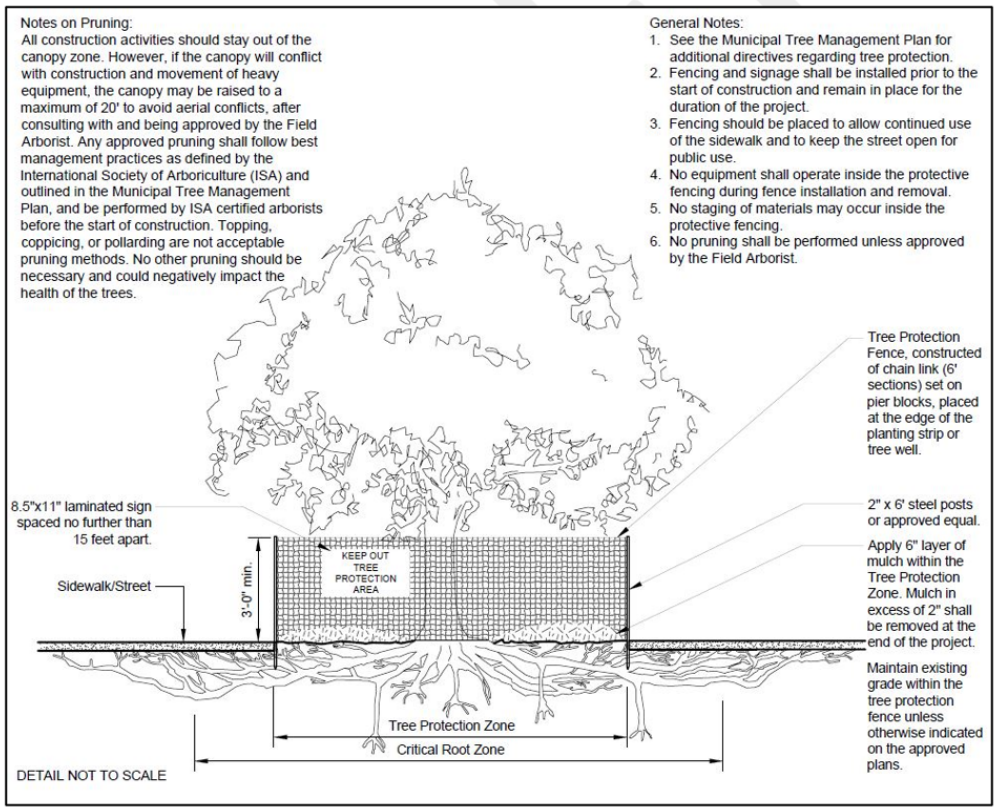


Figure 9. Sample tree protection fencing detail

6. Regulation and Standards Recommendations

Effective tree ordinances provide the framework for regulating tree management to optimize long-term health and sustainability of the urban forest. Together with Public Works Standards and data-driven tree management planning, city codes aim to support long-term health, preservation, enhancement, and sustainable management of ROW trees. The Sammamish Municipal Code (SMC) provisions related to ROW trees were evaluated in the context of the goals referenced in the policies referenced in Chapter 1.2 and the objectives of this project. Sammamish Municipal Codes related to ROW tree management are located under:

- SMC Chapter 21.03.060 Trees (private trees)
- SMC Chapter 21.08.060 Right-of-Way-Use Permits (ROW)
- SMC 21.08.080 Definitions (ROW)

Each chapter is described separately below. This review also includes a comparison of neighboring jurisdictions' ROW tree code structure, content organization, and minimum requirements.

6.1 General Municipal Code Recommendations

The general structure of Sammamish's tree codes is well-organized and concise. However, the code analysis below reveals a few areas that may be confusing to users or could become recurrent code compliance or enforcement issues, particularly regarding ROW tree management. The City may want to consider developing clear ROW tree code language for placement into one of the existing code chapters or developing a new SMC chapter dedicated to ROW management, with clearly defined criteria and requirements that highlight best practices for ROW tree management. While its guidance focuses on private property trees, *King County's 2024 Guide to Developing Effective Urban Tree Regulations on Private Property* recommends having *"dedicated tree protection regulations within the same chapter or section of the municipal code for ease of application and understanding."* The Guide provides further justification and resources for how to update tree ordinances based on feedback from 39 King County jurisdictions (King County 2024).

Creating a discrete street tree code section also supports Comprehensive Plan policies LU 2.17, T 3.1(e), and T 4.2, and *Urban Forest Management Plan* Goal #UA3, Goal #UA3 Objectives B-C, Goal #UA6 Objectives A-C, Goal #UA7 Objectives A-C, and Goal #M6.

SMC 21.03.060 Trees

CURRENT CODE OVERVIEW

Purpose SMC 21.03.060.A.

As with most introductions to a new code section, this describes the intent of the code and describes what the code seeks to accomplish. The purpose/intent section often articulates long-range policy goals and gives code users the ability to understand and interpret the code with greater insight. The Purpose of the Trees chapter includes language on "*protecting trees to the maximum extent possible in*

the design of new development proposals including, but not limited to, buildings, roadways, and utilities" (SMC 21.03.060.A.1.b).

Evaluation Required SMC 21.03.060D.
Due to the conflicting code provisions described above and below and the fact that the code section titled *Evaluation Required* precedes Exemptions in SMC 21.03.060.E, it can be assumed that any size ROW tree may be removed without any criteria or health assessment.

Exemptions SMC 21.03.060.E.
This code section describes certain tree removal activities that are exempt from obtaining City approval. While reasonable to allow the emergency removal of trees in public easements or rights-of-way, 1.b states that *"no approval is required for the removal of any significant tree in public easements and public rights-of-way,"* which seemingly contradicts the code Purpose, UFMP, and other policy documents. Further, Exemptions code language may be confusing when referencing Public Work Standard 7.4A that "*all tree removals and/or pruning within the right-of-way require a right-of-way permit*." During the gap analysis, City staff expressed that while this exemption leaves flexibility for staff to address conflicts, such as with utility lines, this section could be updated to simply state that City is exempt from ROW permits when working on trees. Additionally, there is an opportunity to improve language to clarify that other entities such as utilities and HOAs may need ROW permits for tree work in the ROW.

Removal/Retention Standards SMC 21.03.060.F-G.
Permit requirements and limits to significant tree removal on private property where no development activity is involved are described in section F, based on the presence of critical areas, land use, and lot size. Section G specifies the minimum tree retention requirements and replacement requirements related to development, also regulated by land use and critical areas provisions. Note that the retention standards outlined in Section G do not apply to ROW trees, through code language that may not be clear to most code users: "*Any trees qualifying for an exemption under SMC 21.03.060.E are not included in the limits established by this section"* (SMC 21.03.060.G.1.e and SMC 21.03.060.G.2.e).

The remaining SMC 21.03.060 Trees chapter (Variances, Tree Protection, Tree Replacement, Violations) primarily relates to trees on private property, due to the exemption reference. However, under the Tree Replacement Standards outlined in SMC 21.03.060.J.2-3, street trees may be considered to mitigate tree removals on private property. Street trees "*planted on site can receive a 50 to 100 percent credit toward the* [private property] *tree replacement requirement,* and *alternatives to on-site tree replacement are allowed through replacement planting on public land within city limits or within land owned by the City."* This provision may be missed by code users, due to its location within a code section related to private property. Note that nowhere in the Trees chapter are references to the Public Works Standards related to ROW tree management.

SPECIFIC CODE RECOMMENDATIONS

In most jurisdictions represented in the Jurisdictional Comparison table (Burien, Edmonds, Mercer Island, and Shoreline; See Appendix G), the municipal code has a specific code section related to street tree management. The City may want to consider adding a new section to SMC 21.03.060 related to

street trees, creating a separate chapter altogether, or amending the three chapters to clarify street tree removal, pruning, planting, and replacement criteria, as well as permit requirements, with references to the Public Works Standards. Other recommendations are as follows:

1. Add a statement about the preservation of street trees in the code purpose/intent that is consistent with the Comprehensive Plan and UFMP goals.
2. The City of Sammamish has already established maintenance zones for city-maintained trees versus privately maintained trees. To further UFMP Goal #UA3, along with designating who is responsible for maintenance, the City could consider adding minimum ROW tree maintenance standards to the Public Works Standards and reference from the code.
3. For privately maintained ROW trees, there should be clear criteria for ROW tree planting, retention, removal, replacement, and pruning. If the related permit requirements are not within the same code section, they should be referenced in SMC 21.08.060 Right-of-Way-Use Permits.
4. To ensure the health and longevity of the public tree assets and for public safety reasons, many jurisdictions require permits for ROW tree removal, planting, and pruning. The approval or permit process is also an efficient manner to track changes to the ROW tree inventory. Examples included in the jurisdictional code comparison conducted for this report include the City of Burien (BMC 12.38.040), Edmonds (ECC 18.85.020), and Shoreline (SMC 12.30.040).
5. Clarify who the exemptions for tree removal and retention calculations within public rights-of-way apply to (e.g., City staff, utilities).
6. Establish criteria and protocols for hazard or nuisance tree removals. For example, to verify that a ROW tree fits hazard tree criteria, the adjacent property owner's removal request or permit application may require to be accompanied by a qualified professional TRAQ form or arborist report.
7. Add the requirement that all replacement trees located in ROWs shall be from the approved street tree list.

SMC 21.08.060 Right-of-Way-Use Permits

CURRENT CODE OVERVIEW

Purpose SMC 21.08.060A.
This section lays out the intent of the code, which is to establish the rules and regulations for right-of-way uses to ensure that proposed uses are consistent with the public health, safety, and welfare of the community, and that harm or nuisance which may result from a proposed right-of-way use is prevented.

Right-of-way Use Permit Application Process and Fee SMC 21.08.060B.
This code section describes the permit submittal requirements necessary for the City to review the application and provide conditions for approval.

Right-of-way Use Permit Types SMC 21.08.060C-G.
The different types of ROW permits are outlined in this code section. Note that a Type B Right-of-way Construction Permit includes "cutting or maintaining" trees. The term "cutting" is not defined and is

confusing as to whether that means tree removal or pruning. A current city business license and a State of Washington general contractor's license are required for anyone performing this work within the ROW. Contractor responsibilities are detailed, including traffic control and work area protection, but no standards for tree operations are shown. The Type B application also has requirements for tree removal and arborist reports, but this is not codified.

The Type D Right-of-way Lease Permit (SMC 21.08.060G) is required to install landscaping for private use but is unclear if tree planting in the ROW constitutes "landscaping" or if a permit is required.

The remaining SMC 21.08.060 chapter covers permit revocation or suspension, and enforcement related to right-of-way use permits. Note that nowhere in the Right-of-Way Use Permits chapter are references to the SMC 21.03.060 Trees or specific references to Public Works Standards related to ROW tree management.

SMC 21.08.080 Definitions

The following definitions are included in SMC 21.08.080:

Development permit SMC 21.08.080.19.
Describes types of development that require a permit, including Conditional use permits.

Public facilities SMC 21.08.080.39.
Defines capital facilities owned or operated by government entities, including public streets and roads.

Right-of-way or "ROW" SMC 21.08.080.55.
Streets, avenues, ways, boulevards, drives, places, alleys, sidewalks, landscape (parking) strips, squares, triangles, easements, and other rights-of-way open to public use, including the space above or beneath the surface of the same.

SPECIFIC SMC 21.08 CODE RECOMMENDATIONS

In all jurisdictions represented in the Jurisdictional Comparison table in Appendix G, the municipal code clearly defines street trees, typically by location and size threshold for applicability of removal/retention requirements. Some municipalities broadly define street trees as any tree in the public ROW, while others that approach the management of trees located in unopened/unimproved ROW areas define them differently than formally planted street trees or landscaped ROW areas. Clear street tree definitions are the basis of a desired effect, such as properly planted trees, greater tree species diversity, reductions in unauthorized tree removals, or improvements in adjacent property owners' tree care, including the maintenance of sight-line clearances. These effects may assist with meeting the Comprehensive Plan and UFMP goals. The City should consider the following when approaching code revisions:

1. Definitions should be crafted to reduce ambiguity and adhere to industry standards and best management practices established by ISA and ANSI. The City may want to consider minor amendments to SMC 21.08 to define "nuisance" and "hazard" trees as criteria for ROW tree removal. Otherwise, any tree regardless of landmark, exceptional, condition, or other status located in the ROW is subject to removal by request.

2. Given that the average DBH (diameter-at-breast height) of trees inventoried as part of Facet's street tree assessment is 4.9 inches, the majority of which are deciduous, under the current "significant tree" definition, many ROW trees would not meet the size threshold for removal criteria. For that reason, Facet suggests that street trees are defined by their location in the ROW, not by a minimum size threshold.
3. The City may want to consider minor amendments to SMC 21.08 to clarify City/adjacent property owner roles and responsibilities and permit requirements for street tree planting, removal, maintenance, and replacement, with references to the Public Works Standards.
4. For public safety purposes, consider codifying activities related to ROW tree work that should require a permit such as stump grinding, pest management, traffic control plans, underground utility locating, inventory updates, regulatory authorities to contact, and public notice.

6.2 Public Works Standards Recommendations Summary

The Facet team assessed select chapters of the 2016 Public Works Standards to identify gaps and recommendations for standards to improve outcomes for trees within city ROWs. In addition to the recommended best practices outlined in Chapter 5, the following provides a summary overview of recommendations by chapter and section.

Chapter 15.2 Landscaping

Housed within Chapter 15 *Roadside Features*, Section 15.2 *Landscaping* serves as a guide to the design and installation of trees within the public right-of-way streetscape. Overall, this section would benefit from some reorganization with different subsection headers and allowances for alternative design scenarios that would improve soil volumes and health outcomes for ROW trees while still providing for utilities and transportation needs within the streetscape corridor.

Section 15.2.B Plan Design Requirements

Alternative designs	Allow for alternative streetscape designs so that larger amenity space could be created to host larger trees and stormwater functionality.
Minimum tree spacing	Update minimum tree spacing standards as described in Chapter 5 to allow for tree spacing based on expected mature height and trunk flare.
Structural cells	Include requirements for the use of underground structural cells

Section 15.2.C Plant Selection

The plant selection section includes information about species selection, plant size requirements at the time of installation, and planting setback requirements. Some notes pertaining to construction impact tolerances and installation details are also included. Reorganization of this information and the addition of supplemental details would improve clarity. In addition, there is an opportunity to relate the setback requirements to the table in Section 15.1 related to fixed objects.

Organization	• Consider renaming section to Plant Selection Standards and include nursery stock standards, climate resilience, and stock size. • Create a new section titled 'Setbacks and Spacing' that outlines the required clearance needed from streetscape infrastructure and utilities.
Setbacks	• Reformat the list of setbacks from infrastructure as shown in Table 10 of this report.
Species selection	• Update the approved street tree species list on a regular basis to exclude species known to be poor performers, require substantial maintenance, and must be replaced frequently. • When selecting new tree species candidates in scenarios in which genus diversity may not be practical or desired, seek greater diversity across species (e.g., *Acer ginnala* versus *Acer rubrum*).

Section 15.2.D Soil

Currently, based on the City's Street Tree List in Appendix F of the Public Works Standards, the City of supports planting larger trees where feasible (height greater than 30 feet at maturity), which "will require deeper soil depths." However, Public Work Standards do not outline soil protection during construction, minimum quality standards, standard treatment depths, or volume requirements. The City of Sammamish planter strip detail FIG02-18 outlines that "*all plant beds to receive a uniform layer of prepared planting mix 4 inches deep and rototilled into subsoil to a depth of 8 inches*." However, elsewhere there are details with different recommendations.

Soil volume	• Provide consistent soil volumes across sections of the Standards. • Update required soil volumes based on size of tree at maturity
Soil compaction	• Add requirements for soil protection during development as outlined in Chapter 5.1 of this report including protecting existing topsoil, use suspended pavers/structural cells, use of compost and wood chips, etc.
Soil composition	• Specify soil composition for street trees - no more than 35% clay, 45% silt, and 80% sand by volume. Organic material, preferably high in lignin, should be limited to 15% by volume to prevent settling and ensuing instability for the street tree

Chapter 19.1 Standards

Section 19.1 Standards references related approved plans, permit conditions, and standard references that inform the construction, workmanship, and materials. The standards referenced include:

- City of Sammamish Public Works Standard Details
- Latest edition of Standard Specifications for Road, Bridge, and Municipal Construction M 41-10, WSDOT.
- Latest version of the adopted Surface Water Design Manual, together with "City of Sammamish Surface Water Design Manual Addendum."
- Manual on Uniform Traffic Control Devices (MUTCD), Federal Highway Administration: http://mutcd.fhwa.dot.gov/

Consider adding references to new street tree standards and regulatory requirements that pertain to public and private tree retention and protection.

Section 19.2.C Vegetation

Given that Section 19.2.C is largely dedicated to tree protection during construction, the City may consider renaming to more accurately reflect the content therein.

Tree protection terminology	• Establish clear consistent terminology early in the chapter and ensure it is used across all sections of the Standards.
Tree protection standards during construction	• Protections for ROW trees during streetscape construction or private development projects adjacent to public rights-of-way should be based on ANSI A300 Tree Care Standards Part 9 (2023 or most recent update). ANSI Standards utilize the terms critical root zone (CRZ) and tree protection zone (TPZ) to describe the tree protection area. • Provide updated tree protection details that account for all potential impacts to street trees and provides additional photos and references for alternative protection designs.

Chapter 19.8 Landscaping

This chapter provides installation details for right-of-way trees. The Public Works Standards include high-level soil preparation requirements and a tree installation detail. This detail includes information that conflicts with the information included in the standard details elsewhere in the document, specifically the planter strip detail and amenity zone detail. These details include different recommendations for soil treatment, staking, and wrapping, preparing the hole for planting, and

placement of root barrier. In general, there is an opportunity to revise these details for consistency. Additional recommendations are included for expanding the information in this section.

General planting guidance	• Ensure planting standards adhere to industry best practices such as American National Standard: Tree, Shrub, and Other Woody Plant Management – Standard Practices (Planting and Transplanting (ANSI A300 Part 6 2018), and Best Management Practices (BMP) for Tree Planting (ISA 2014).
Planting detail	• Provide an update planting detail for street trees with specific requirements for tree installation, placement, and soil preparation.

Chapter 19.9 Grading

The purpose of this section is to ensure proper drainage in planting strips, prevent erosion of sediment onto sidewalks or into waterways, and reduce maintenance needs. The standards provide general grading requirements, but there are opportunities to define and use consistent terminology and definitions. The recommendations for grading and using wood chips are not consistent throughout the Public Works Standards related to site preparation and wood chip or mulch depths. See *Chapter 5.1 Site Grading* of this Report for specific recommendations.

References and Resources

American National Standards Institute (ANSI) Z133. 2017. American National Standard for Nursery Stock. Columbus, OH: AmericanHort.

American National Standards Institute (ANSI) Z60.1. 2014. American National Standard for Arboricultural Operations – Safety Requirements. Champaign, IL: International Society of Arboriculture.

CH2M HILL. (2000). Soil improvement project: Exploring the alternatives. Snohomish, WA: Snohomish County Public Works, Solid Waste Management Division.

Citygreen. (2021). Stormwater Management with Strataflow. Retrieved from Citygreen-StrataFlow-Booklet-fin-web.pdf.

City of Sammamish. (2023). Climate Action Plan. Retrieved November 2024 from: https://www.sammamish.us/our-community/environment-sustainability/climate-action-plan-home/

City of Sammamish. (2024). Comprehensive Plan. Retrieved November 2024 from: https://www.envisionsammamish2044.org/

City of Sammamish Municipal Code. Chapter 21.03.060 *Trees.* Accessed November 2024. https://online.flippingbook.com/view/635351213/166/

City of Sammamish Municipal Code. Chapter 21.08.060 *Right-of-Way Use Permits.* Accessed November 2024. https://online.flippingbook.com/view/635351213/603/

City of Sammamish. (2019). Urban Forestry Management Plan. Retrieved November 2024 from: https://www.sammamish.us/our-community/environment-sustainability/urban-forests-planning/

City of Sammamish. (2016). Public Works Standards.

Clark J.R., N.P Matheny, G. Cross, and V. Wake (1997). Model of Urban Forest Sustainability. Journal of Arboriculture 23 (1) 17-30.

Corish, K. (1995). Environmental Land Planning (ELP) series: Clearing and Grading Strategies for Urban Watersheds. Washington, D.C.: Metropolitan Washington Council of Governments. DeepRoot. (2018). Silva Cell Fact Sheet. Retrieved from www.deeproot.com/silvapdfs/resources/SC2/supporting/Silva-Cell-Stormwater-Manual.pdf.

Dreistadt, Steve H. (2016). Pests of Landscape Trees and Shrubs, An Integrated Pest Management Guide. 92, 175, 179

Environmental Protection Agency (EPA). (2021). Green Streets Handbook. EPA 841-B-18-001. Retrieved from epa.gov.

Hauer, R. and W. Peterson, (2016). Municipal Tree Care and Management in the United States: A 2014 Urban Community Forestry Census of Tree Activities. Special Publication 16-1, College of Natural Resources, University of Wisconsin, Stevens Point.

Hilbert, D., L. Roman, A. Koeser, J. Vogt, N. van Doorn. (2019). Urban Tree Mortality: A Literature Review. Arboriculture & Urban Forestry: 45(5): 167-200.

Mauger, G.S., J.H. Casola, H.A. Morgan, R.L. Strauch, B. Jones, B. Curry, T.M. Busch Isaksen, L. Whitely Binder, M.B. Krosby, and A.K. Snover. (2015). State of Knowledge: Climate Change in Puget Sound Report prepared for the Puget Sound Partnership and the National Oceanic and Atmospheric Administration. Climate Impacts Group, University of Washington.

Pacific Northwest ISA. (2023). Providing Water and Nutrients. Retrieved from https://pnwisa.org/page/providing-water-nutrients.

Plant, L. and D. Kendal. (2019). Toward Urban Forest Diversity: Resident Tolerance for Mixtures of Tree Species Within Streets. Arboriculture and Urban Forestry, 45 (2) 41-53. https://doi.org/10.48044/jauf.2019.004.

RainBird. (2023). How to Irrigate Trees. Retrieved from https://www.rainbird.com/sites/default/files/media/documents/2023-07/tree_irrigation_guide_2023.pdf.

Seattle Department of Transportation. (2013). Street Tree Manual. Retrieved from www.seattle.gov/documents/departments/sdot/about/documentlibrary/streettreemanualweb.pdf.

Smiley, E. T., Calfee, L., Fraedrich, B., and Smiley, E. J. (2006). Comparison of Structural and Noncompacted Soils for Trees Surrounded by Pavement. Arboriculture & Urban Forestry 32(4): July 2006.

Stenn, H. (2003). Guidelines and Resources for Implementing Soil Depth and Quality BMP T.5.13 in WDOE Western Washington Stormwater Manual. Snohomish, WA: Snohomish County Public Works. Revised 2005.

Tubby, T. and J. F. Webber, Pests and diseases threatening urban trees under a changing climate, Forestry: An International Journal of Forest Research, Volume 83, Issue 4, October 2010, Pages 451–459,

Urban, James. (2008). Up by Roots: Healthy Soils and Trees in the Built Environment. International Society of Arboriculture, Champaign, IL.

Washington State Department of Ecology. (Ecology). (2019). *Stormwater Management Manual for Western Washington*. Water Quality Program. Publication Number. 19-10-021.

Washington State University Extension and Puget Sound Partnership. (2012). Low Impact Development Technical Guidance Manual for Puget Sound (Publication No. PSP 2012-3).

Washington State University Cooperative Extension. Hortsense: Pacific Coast pear rust. Retrieved October 2024 from https://hortsense.cahnrs.wsu.edu/fact-sheet/pear-pacific-coast-pear-rust/.

Washington State University Cooperative Extension: Ornamental Plant Pathology Program – Sooty Bark Disease. Retrieved October 2024 from https://ppo.puyallup.wsu.edu/sbd/.

World Forestry Center and Morgan, R. (1989). A Technical Guide to Community and Urban Forestry in Washington, Oregon and California. Portland, OR: World Forestry Center.

Zobrist K.W. and R.A. Bomberger, M.N. Darr, J.R. Glass, J.M. Hulbert, and E.S. Robert. (2023). Managing Emerald Ash Borer in Washington State. Washington State University Extension, Publication FS384.

PRODUCT VENDOR INFORMATION*

*Inclusion in this list does not imply endorsement of one vendor or product over another. The following list includes links to example resources and specifications related to the recommendations outlined in this management plan.

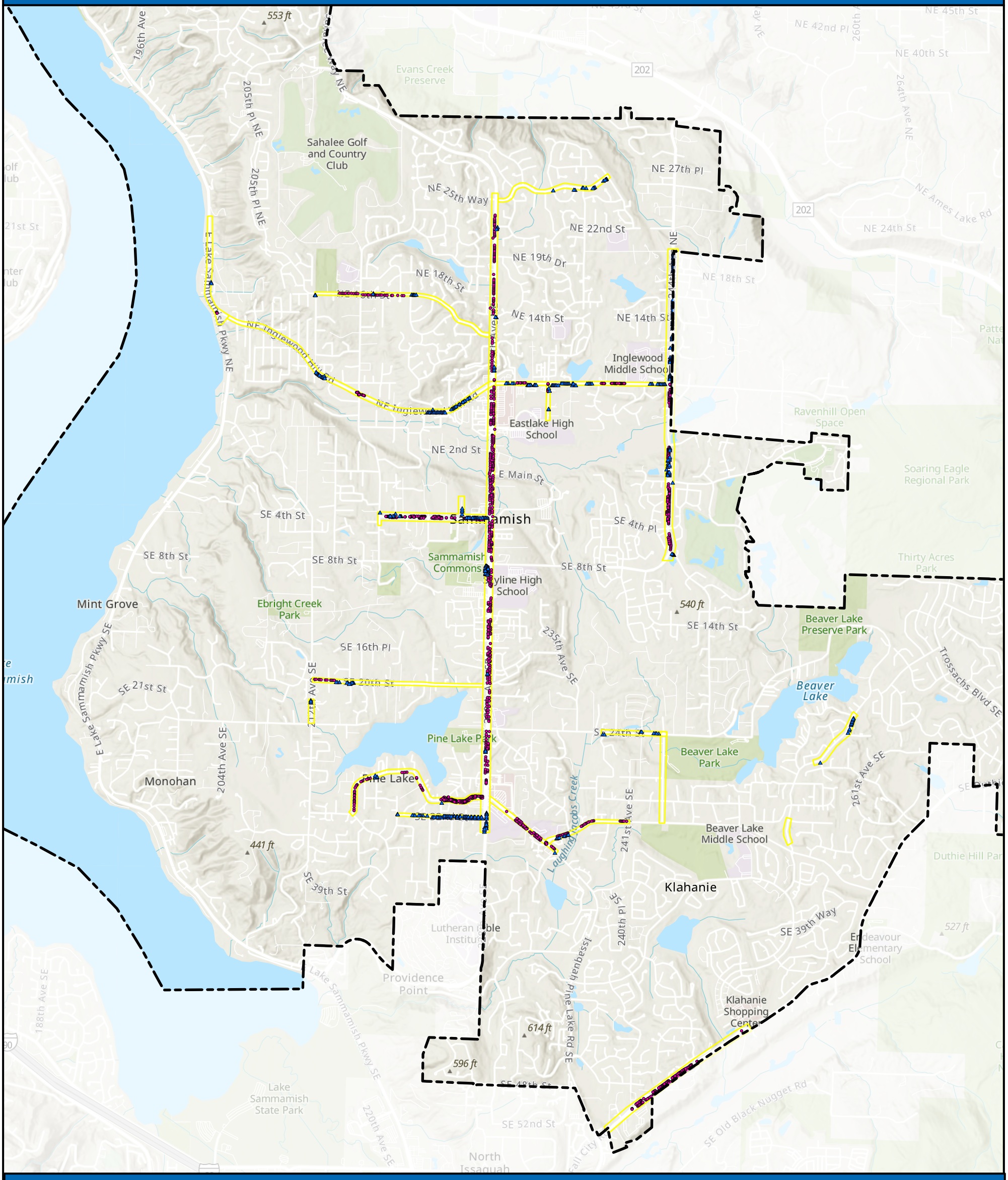
- Silva Cell Resources and Supporting Documents | DeepRoot: https://www.deeproot.com/products/silva-cell/resources/
- Citygreen Resources and Supporting Documents: https://citygreen.com/product-category/soil-vault-systems/
- ArborFlow - GreenBlue Urban: https://greenblue.com/na/products/arborflow/
- Soil Cell Pavement Support Systems Archives - GreenBlue Urban / RootSpace https://greenblue.com/na/product-category/soil-cells/ational
- Case Study: Bothell Main Street Upgrade Includes 48 new Trees in 'Flex Space' https://www.deeproot.com/case-studies/silva-cell/downtown-core-in-bothell-adds-48-trees-and-flex-space/

APPENDIX A. Inventory Data Attribute Fields

Field Name	Description	Field format; Example
Owner	Agency, HOA or other responsible for maintenance.	Text: Sammamish; Private
Status	Each data point should be located using GIS and/or GPS equipment.	Text; Active, Removed
ID	Davey Tree ID	Example: 1706
Inventory Date	Date of tree inventory.	Date; mm/dd/yyyy
Inspection Date	Date of most recent inspections.	Date; mm/dd/yyyy
Scientific Name	Fully spelled out scientific name of tree species.	Text; Picea abies
Common Name	Fully spelled out the common name of tree species.	Text; Norway spruce
DBH (Diameter at Breast Height)	The tree trunk diameter should be recorded in inches at 4.5' above grade, rounded to the nearest 1 inch. For multi-stemmed trees, record up to the 5 largest stems.	Numeric; 12
Number of Stems	If the tree is multi-stemmed, record the total number of major stems.	Numeric; 4
Condition	In general, the condition of each tree should be recorded in one of the following categories adapted from the rating system established by the International Society of Arboriculture: Excellent, Good, Fair, Poor, Critical, Dead.	Text; Good
Defect	Defects in trees or surroundings, affecting tree health. May be further described in Notes field.	Text; Stem/root girdling
Grow Space Type	Grow space/infrastructure description	Text; Planting strip
Grow Space Size	Dimension of tree well or width of planter strip, in feet.	Numeric; 5’x5’, 6’ wide
Maintenance Routine	Ongoing routine tree maintenance is needed. To include Monitor, Pruning-Clearance, Pruning-Deadwood, Pruning-Structural, Remove-Stakes, Tree Removal	Text: Pruning-clearance
Maintenance Task	One-time tree maintenance task.	Text: Removal
Overhead utilities	Existence of overhead utilities or not	Drop down: yes/no

Field Name	Description	Field format; Example
Tree Grate	Existence of grate or not	Drop down: yes/no
Tree Grate Gap	Is the gap between the trunk and grate so small that girdling is happening or will be soon?	Drop down; yes/no
Tree Grate Lifted >.5”	Is any part of the tree grate deflected by a half inch or more relative to the adjacent hardscape?	Drop down; yes/no
Sidewalk Lifted >.5”	Is any part of the sidewalk deflected by a half inch or more relative to the adjacent hardscape within 10’ of the tree	Drop down; yes/no
Root intrusion: Sidewalk/curb	Is there visible root intrusion in the sidewalk/curb	Drop down; yes/no
Root Intrusion Road	Is there visible root intrusion in the road	Drop down; yes/no
Notes	All additional information regarding the disease, insect, mechanical damage, etc. can be included in this field.	Tex; Trunk wound from vehicle damage, major sidewalk lifting.

SAMMAMISH TREE INVENTORY MAPS

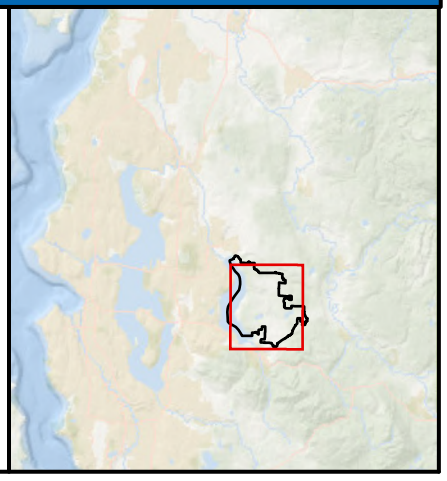


TREE INVENTORY STUDY AREA

LAYERS

- City Limits
- Private
- Sammamish
- ROWLandscapeMaintZones

0 2,000 4,000 Feet



Print Date: 12/13/2024

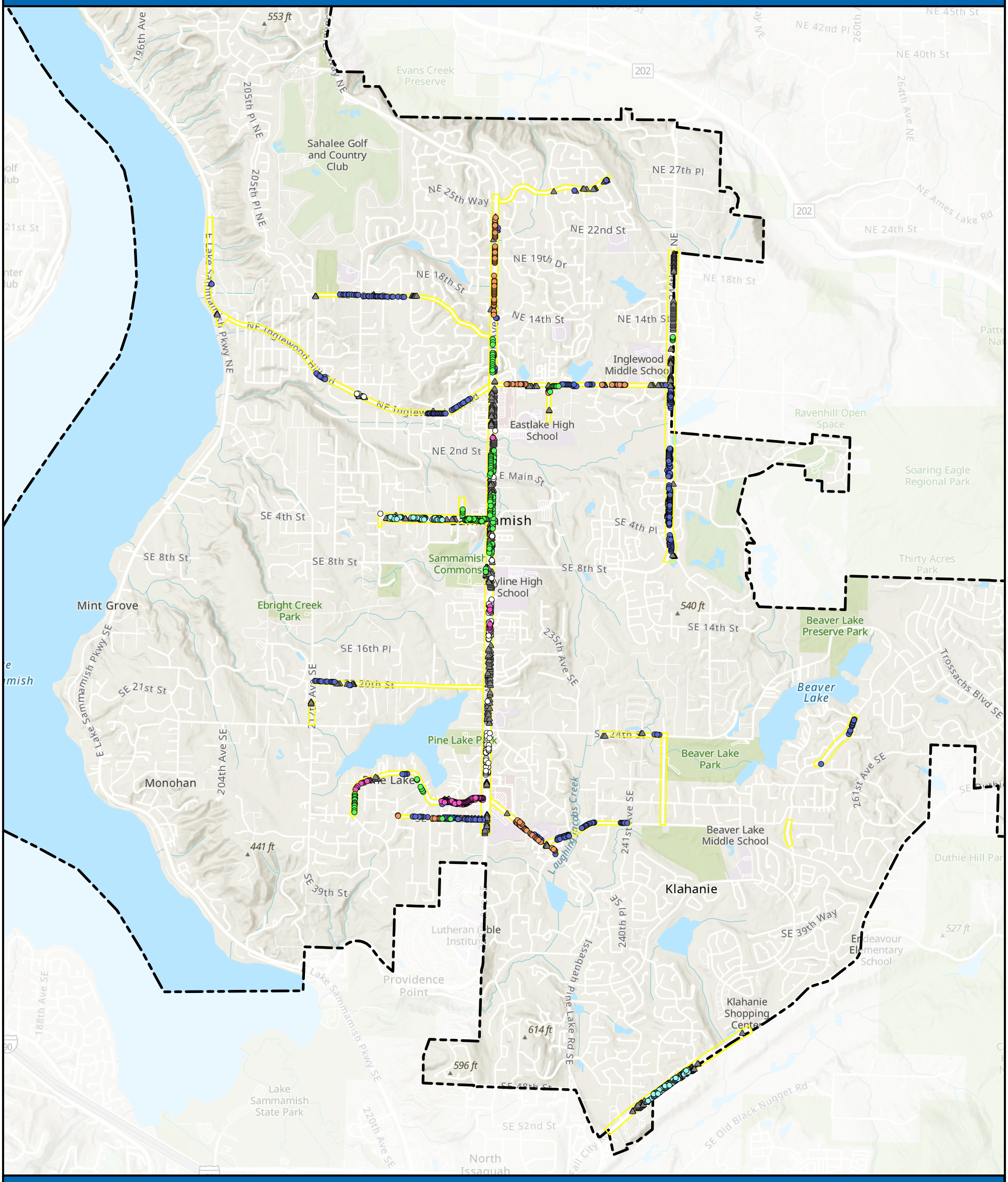
FACET

APPENDIX C. Tree Inventory Species List

Scientific Name	Common Name	Count	Percent of Total Inventory
Abies grandis	Fir, Grand	2	0.1%
Abies procera	Fir, Noble	5	0.3%
Acer campestre	Maple, Hedge	21	1.4%
Acer circinatum	Maple, Vine	9	0.6%
Acer grandidentatum	Maple, Bigtooth	12	0.8%
Acer griseum	Maple, Paperbark	1	0.1%
Acer palmatum	Maple, Japanese	12	0.8%
Acer platanoides	Maple, Norway	137	9.0%
Acer rubrum	Maple, Red	300	19.7%
Acer saccharum	Maple, Sugar	27	1.8%
Acer species	Maple	2	0.1%
Amelanchier alnifolia	Serviceberry, Western	1	0.1%
Amelanchier canadensis	Serviceberry, Shadblow	2	0.1%
Amelanchier laevis	Serviceberry, Allegheny	4	0.3%
Betula papyrifera	Birch, Paper	2	0.1%
Calocedrus decurrens	Cedar, Incense	18	1.2%
Carpinus betulus	Hornbeam, European	2	0.1%
Cercidiphyllum japonicum	Katsura Tree	50	3.3%
Cercis canadensis	Redbud, Eastern	5	0.3%
Chamaecyparis lawsoniana	Cedar, Port Orford	2	0.1%
Chamaecyparis nootkatensis	Cedar, Alaska	11	0.7%
Cornus alternifolia	Dogwood, Pagoda	6	0.4%
Cornus kousa	Dogwood, Kousa	9	0.6%
Cornus nuttallii	Dogwood, Pacific	30	2.0%
Cornus species	Dogwood	2	0.1%
Crataegus species	Hawthorn	35	2.3%
Fraxinus pennsylvanica	Ash, Green	158	10.4%
Gleditsia triacanthos	Honeylocust	29	1.9%
Gleditsia triacanthos inermis	Honeylocust, Thornless	7	0.5%
Liquidambar styraciflua	Sweetgum, Common	30	2.0%
Magnolia grandiflora	Magnolia, Southern	1	0.1%
Malus species	Crabapple	9	0.6%
Nyssa sylvatica	Tupelo, Black	10	0.7%
Picea species	Spruce	2	0.1%
Pinus nigra	Pine, Austrian	4	0.3%
Pinus resinosa	Pine, Red	1	0.1%
Pinus species	Pine	1	0.1%

Scientific Name	Common Name	Count	Percent of Total Inventory
Platanus hybrida	Planetree, London	1	0.1%
Prunus cerasifera	Plum, Flowering	25	1.6%
Prunus shrubs	Cherry, Kwanzan	3	0.2%
Prunus species	Cherry	5	0.3%
	Cherry, Kwanzan	12	0.8%
	Plum	4	0.3%
	Plum, Flowering	1	0.1%
Prunus virginiana	Chokecherry, Common	39	2.6%
Pseudotsuga menziesii	Fir, Douglas	14	0.9%
Pyrus calleryana	Pear, Callery	92	6.0%
Pyrus species	Pear	15	1.0%
Quercus alba	Oak, White	3	0.2%
Quercus coccinea	Oak, Scarlet	1	0.1%
Quercus ellipsoidalis	Oak, Northern Pin	1	0.1%
Quercus palustris	Oak, Pin	3	0.2%
Quercus rubra	Oak, Northern Red	34	2.2%
Styrax japonicus	Snowbell, Japanese	36	2.4%
Thuja plicata	Cedar, Western Red	7	0.5%
Tilia cordata	Linden, Littleleaf	95	6.2%
Tsuga heterophylla	Hemlock, Western	1	0.1%
Tsuga mertensiana	Hemlock, Mountain	11	0.7%
Ulmus parvifolia	Elm, Chinese	113	7.4%
Zelkova serrata	Zelkova, Japanese	50	3.3%
Grand Total		**1525**	**100.0%**

SAMMAMISH TREE INVENTORY MAPS

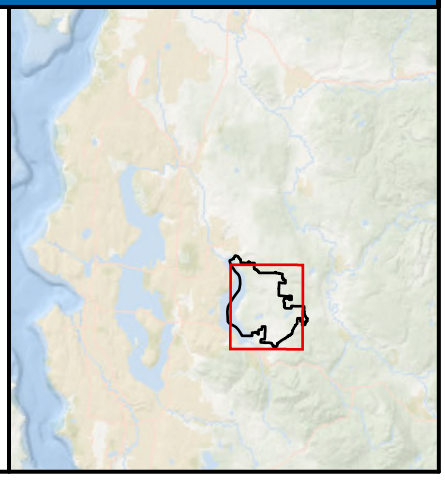


SPECIES COMPOSITION

LAYERS

- City Limits
- ROWLandscapeMaintZones
- Maple, Red (352)
- Ash, Green (160)
- Maple, Norway (137)
- Elm, Chinese (113)
- Linden, Littleleaf (96)
- Pear, Callery (94)
- All Other Trees (655)

0 2,000 4,000 Feet



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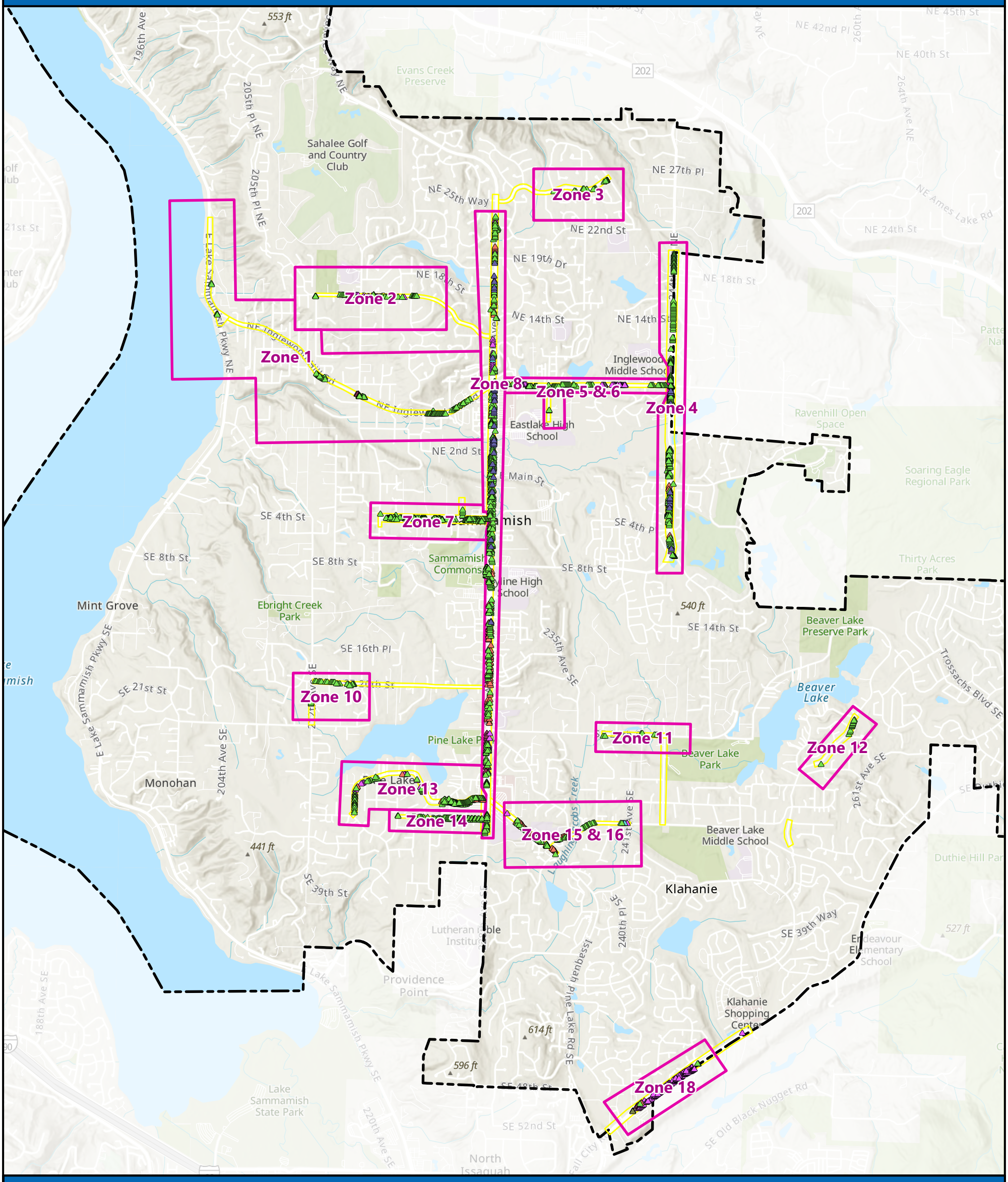
SAMMAMISH TREE INVENTORY MAPS

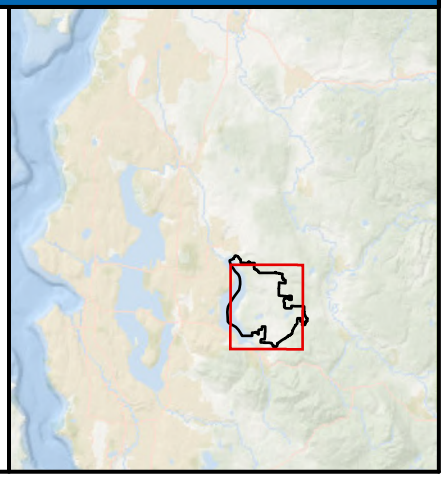


MAINTENANCE ROUTINE OVERVIEW

LAYERS

- City Limits
- ROW Landscape Maintained Zones
- Maintenance Zones

0 2,000 4,000 Feet



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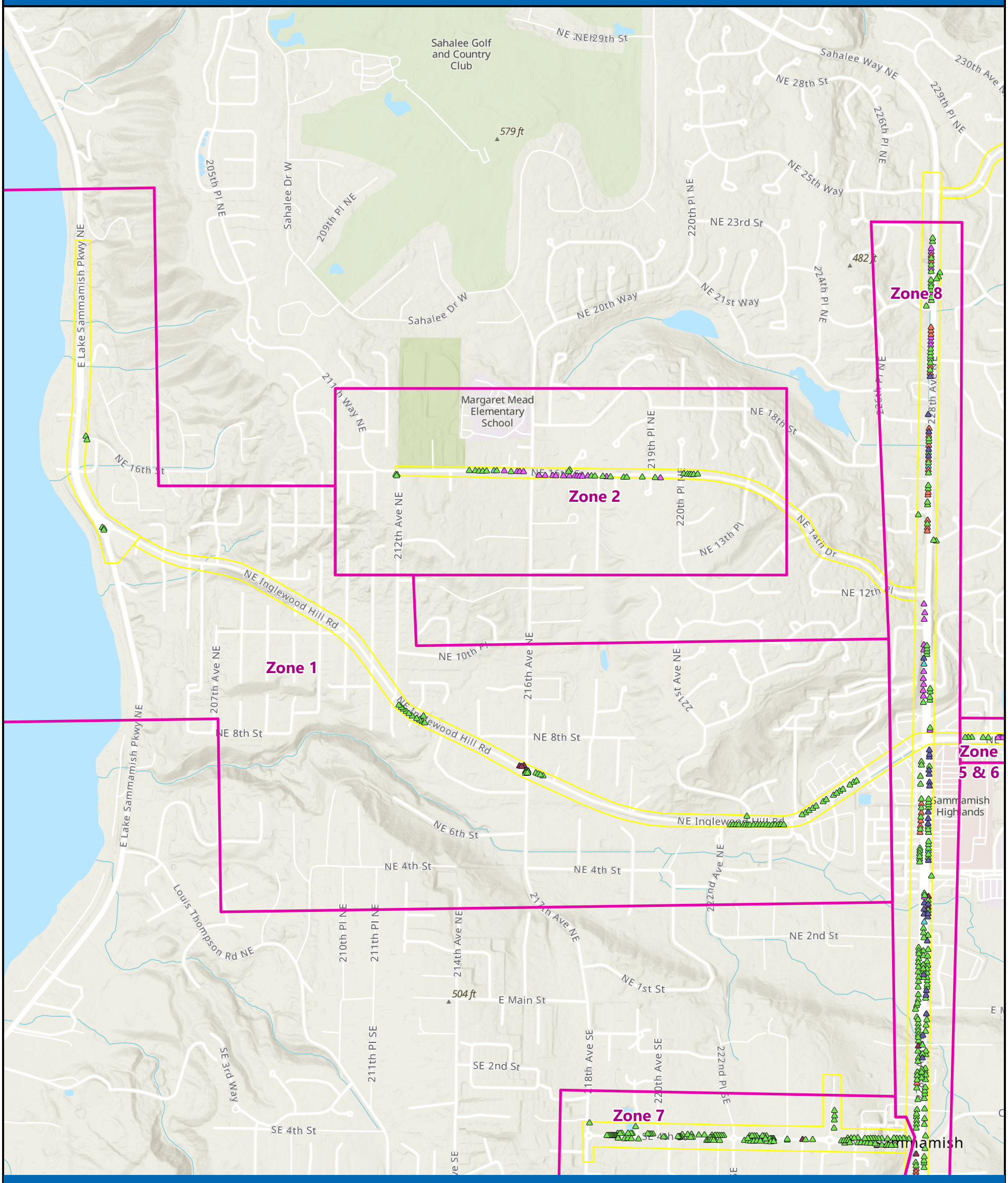
SAMMAMISH TREE INVENTORY MAPS

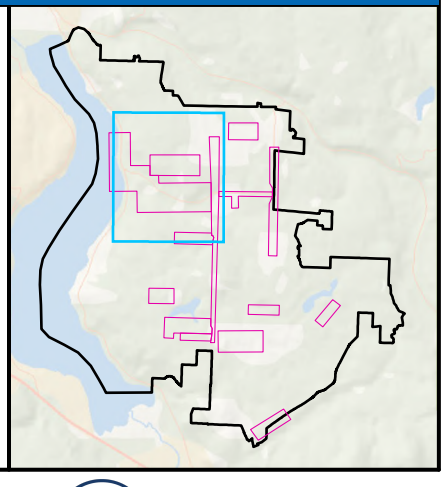


MAINTENANCE ROUTINE - ZONE 1, 2, & 8

LAYERS

- City Limits
- ROW Landscape Maintained Zones
- Maintenance Zones
- Monitor
- Pruning-Clearance
- Pruning-Deadwood
- Pruning-Structural
- Remove-Stakes
- Tree Removal
- None
- Other

0 810 1,620 Feet



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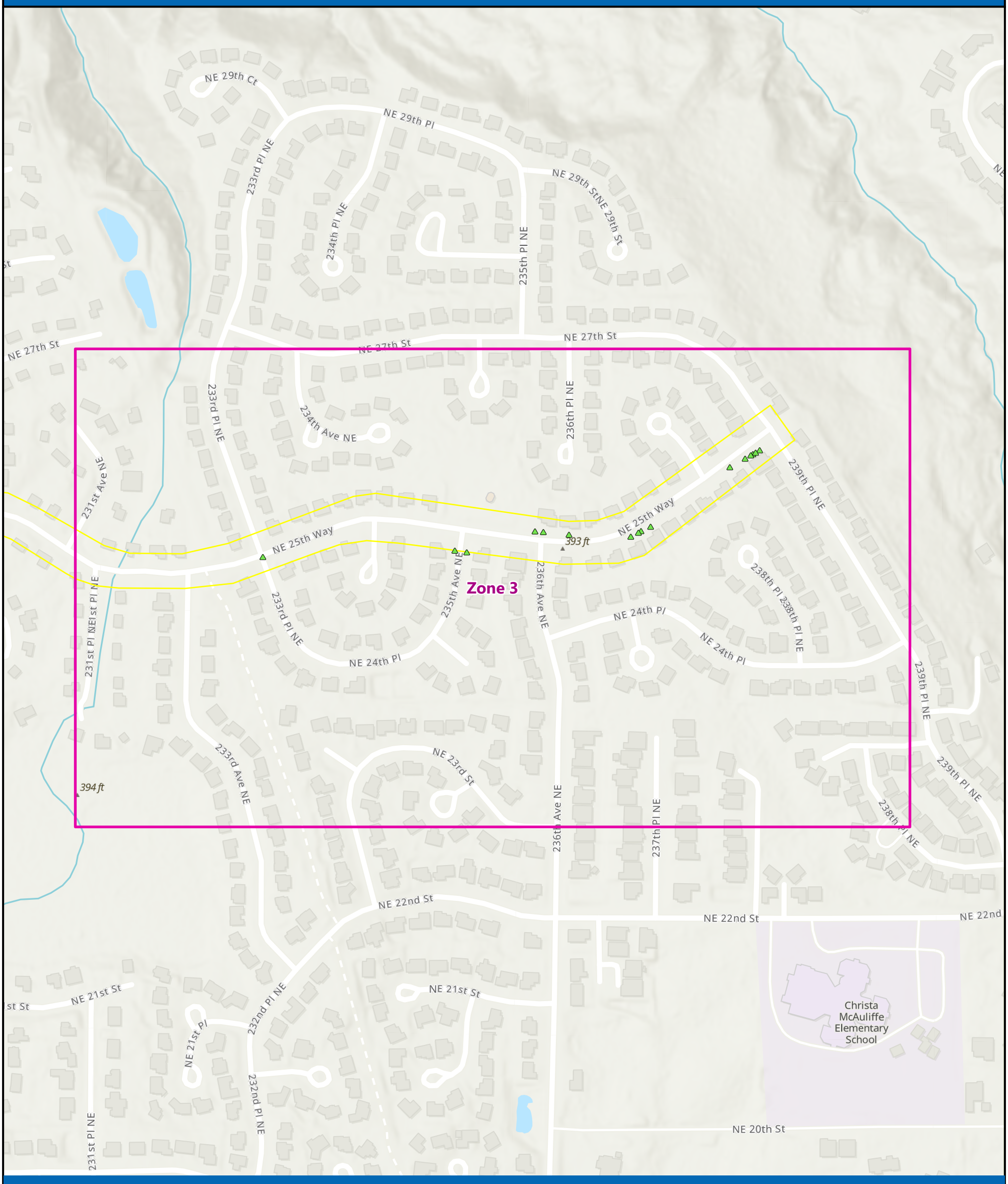
SAMMAMISH TREE INVENTORY MAPS

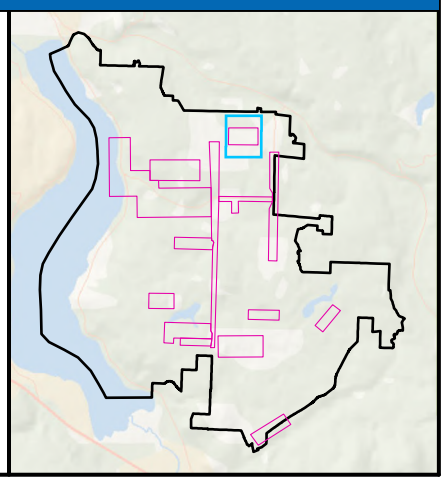


MAINTENANCE ROUTINE - ZONE 3

LAYERS

- City Limits
- ROW Landscape Maintained Zones
- Maintenance Zones
- Monitor
- Pruning-Clearance
- Pruning-Deadwood
- Pruning-Structural
- Remove-Stakes
- Tree Removal
- None
- Other

0 260 520 Feet



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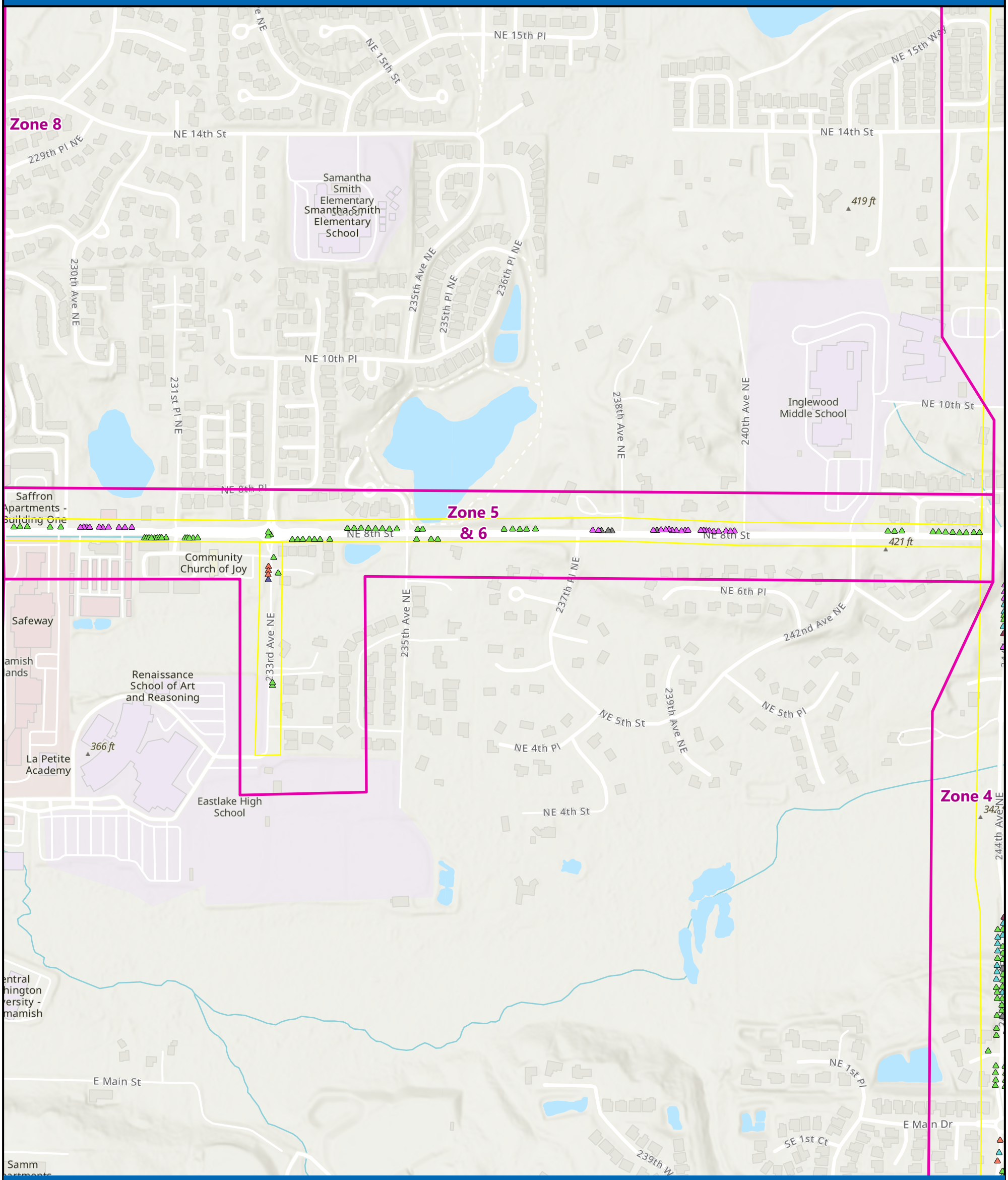
SAMMAMISH TREE INVENTORY MAPS

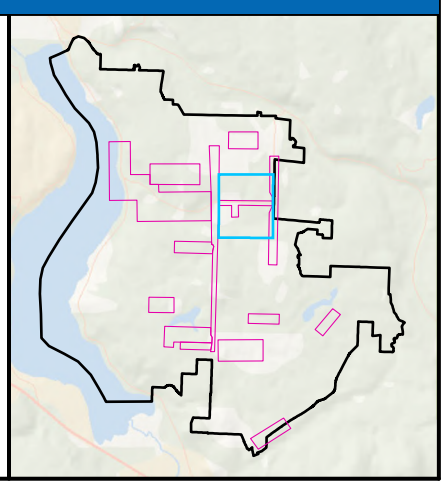


MAINTENANCE ROUTINE - ZONE 5 & 6

LAYERS

- City Limits
- ROW Landscape Maintained Zones
- Maintenance Zones
- Monitor
- Pruning-Clearance
- Pruning-Deadwood
- Pruning-Structural
- Remove-Stakes
- Tree Removal
- None
- Other

0 400 800 Feet



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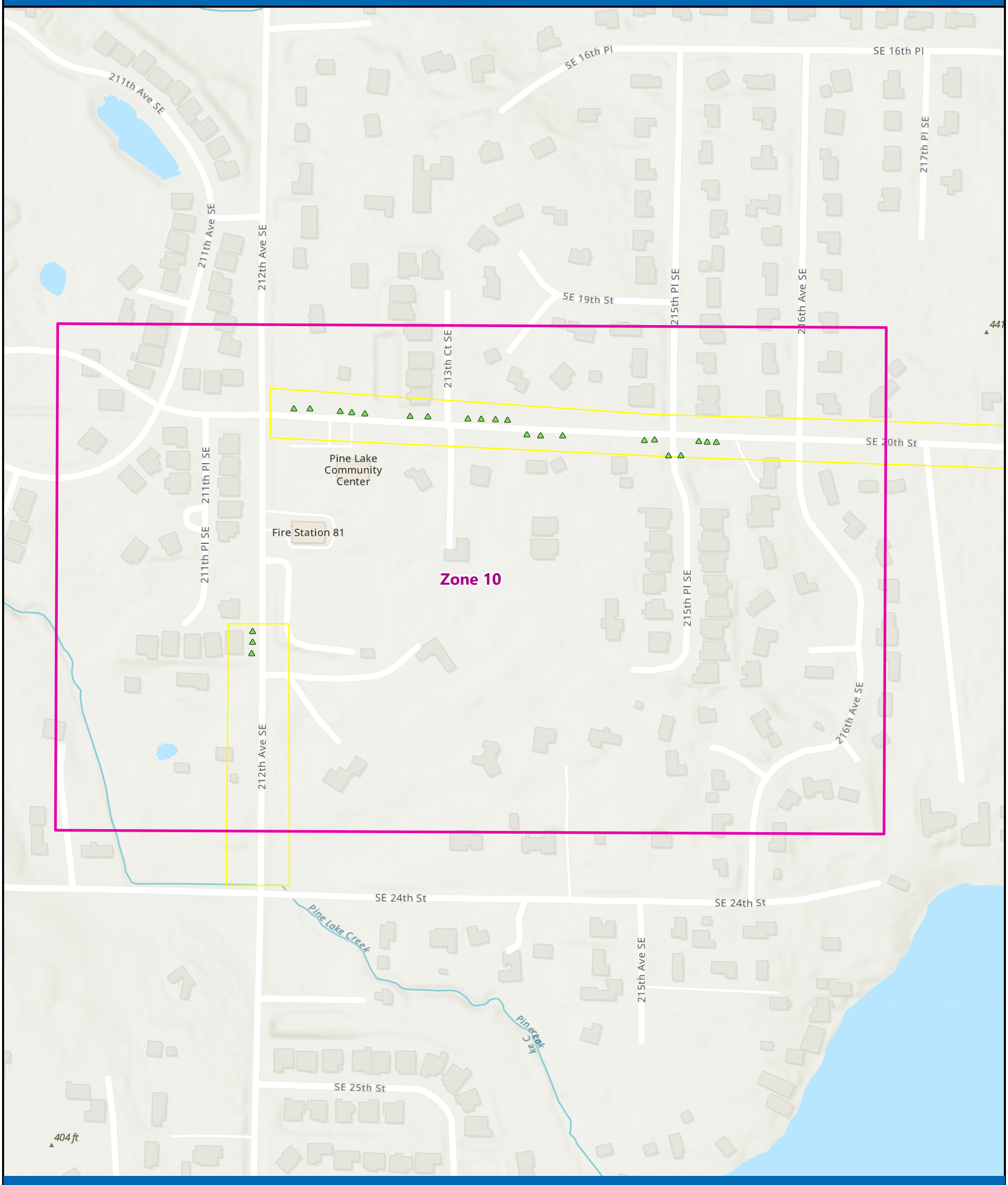
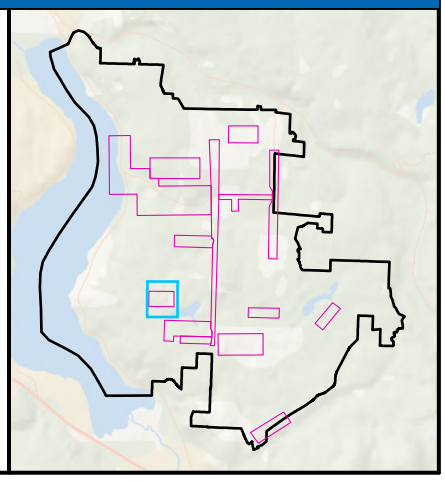


MAINTENANCE ROUTINE - ZONE 10

LAYERS

- City Limits
- ROW Landscape Maintained Zones
- Maintenance Zones
- Monitor
- Pruning-Clearance
- Pruning-Deadwood
- Pruning-Structural
- Remove-Stakes
- Tree Removal
- None
- Other

0 220 440 Feet



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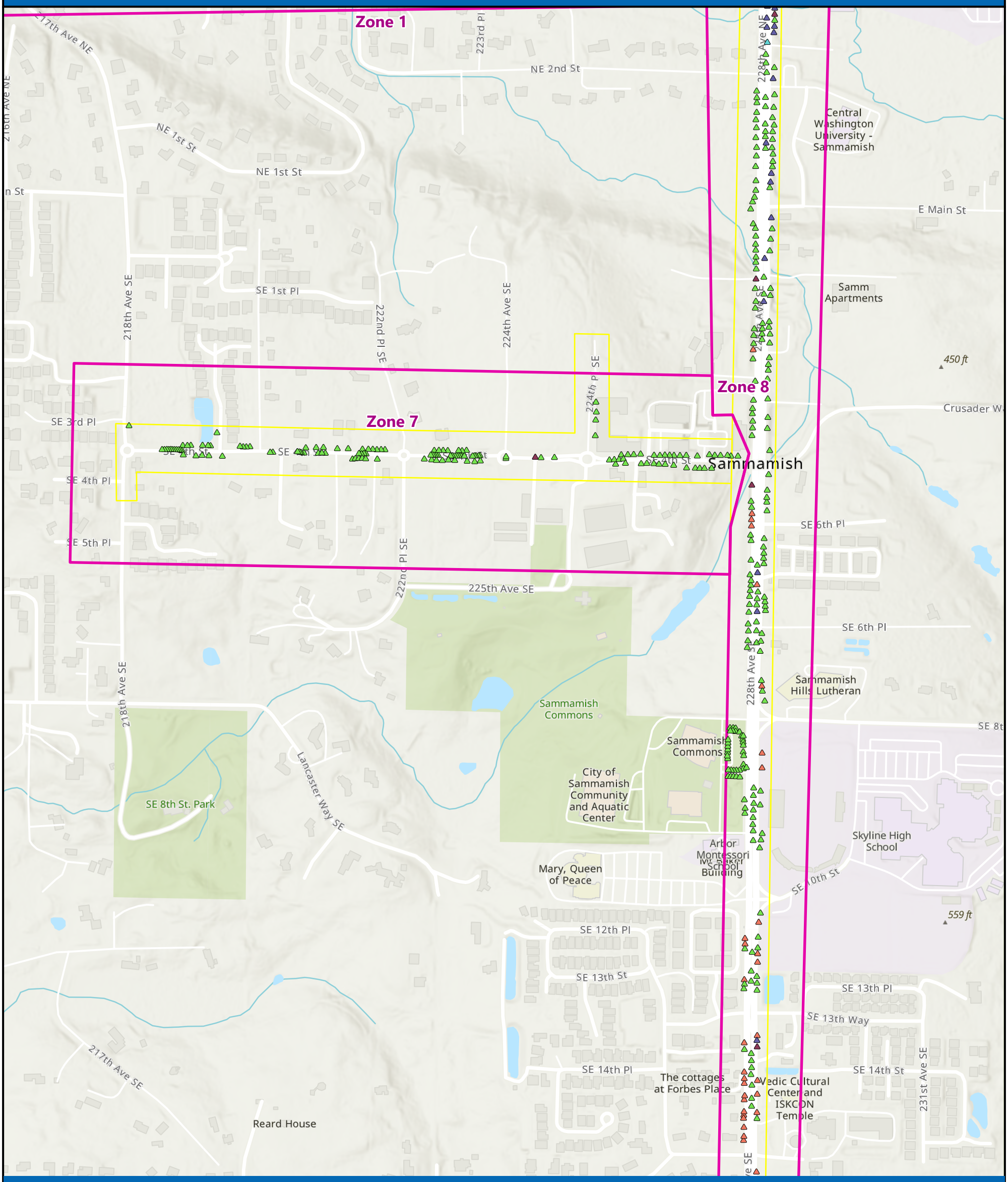
SAMMAMISH TREE INVENTORY MAPS

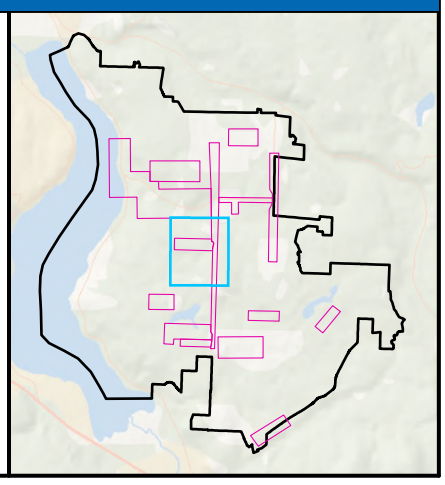


MAINTENANCE ROUTINE - ZONE 7 & 10

LAYERS

- City Limits
- ROW Landscape Maintained Zones
- Maintenance Zones
- Monitor
- Pruning-Clearance
- Pruning-Deadwood
- Pruning-Structural
- Remove-Stakes
- Tree Removal
- None
- Other

0 425 850 Feet



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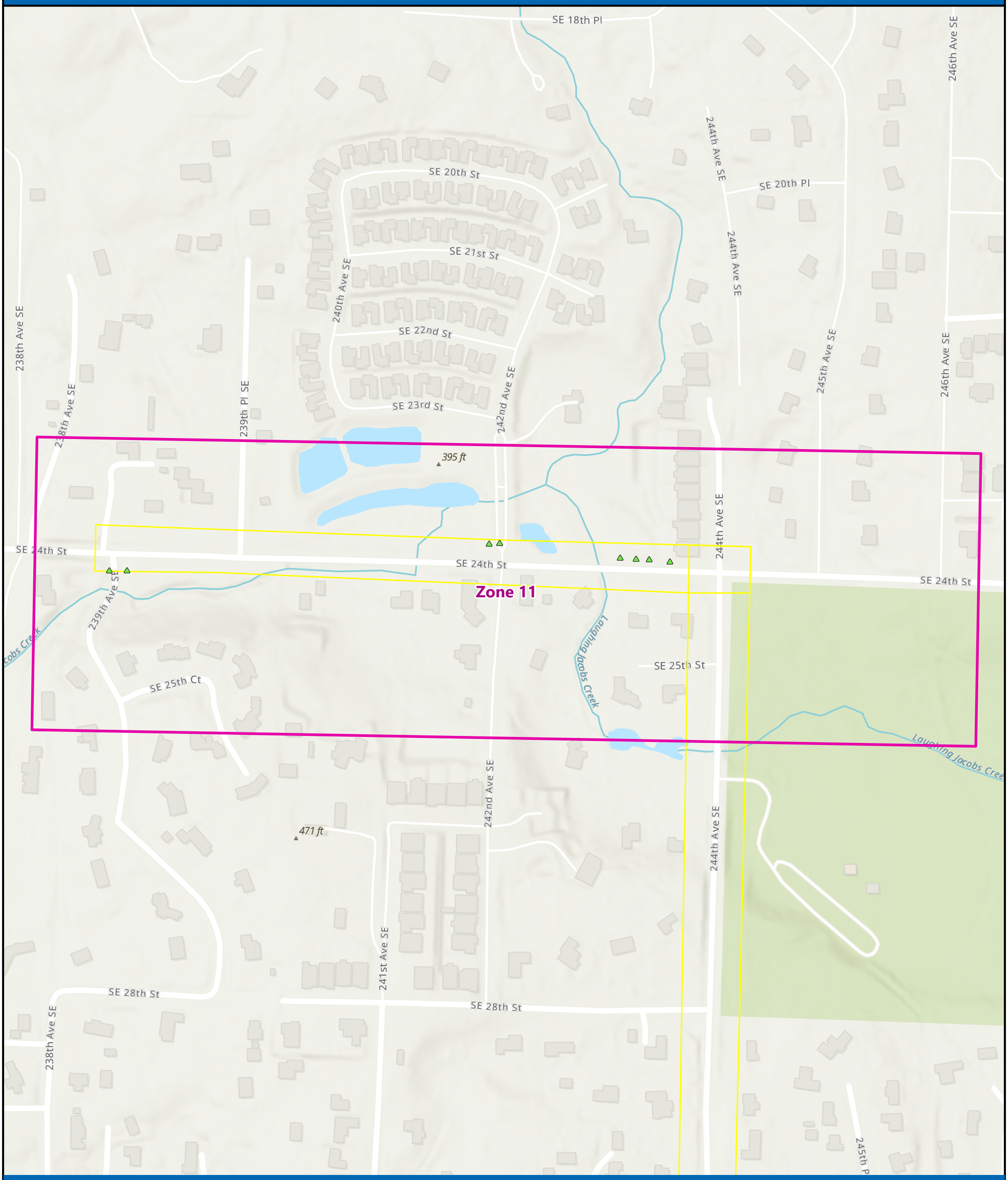
SAMMAMISH TREE INVENTORY MAPS

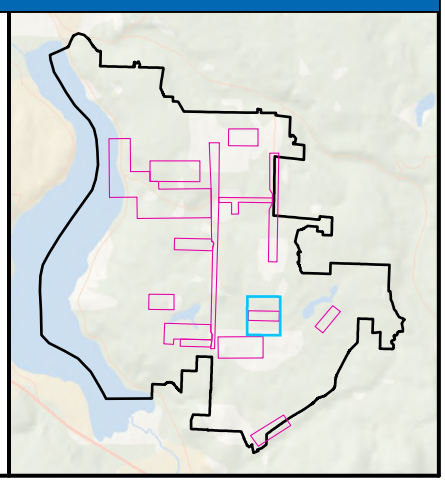


MAINTENANCE ROUTINE - ZONE 11

LAYERS

- City Limits
- ROW Landscape Maintained Zones
- Maintenance Zones
- Monitor
- Pruning-Clearance
- Pruning-Deadwood
- Pruning-Structural
- Remove-Stakes
- Tree Removal
- None
- Other

0 240 480 Feet



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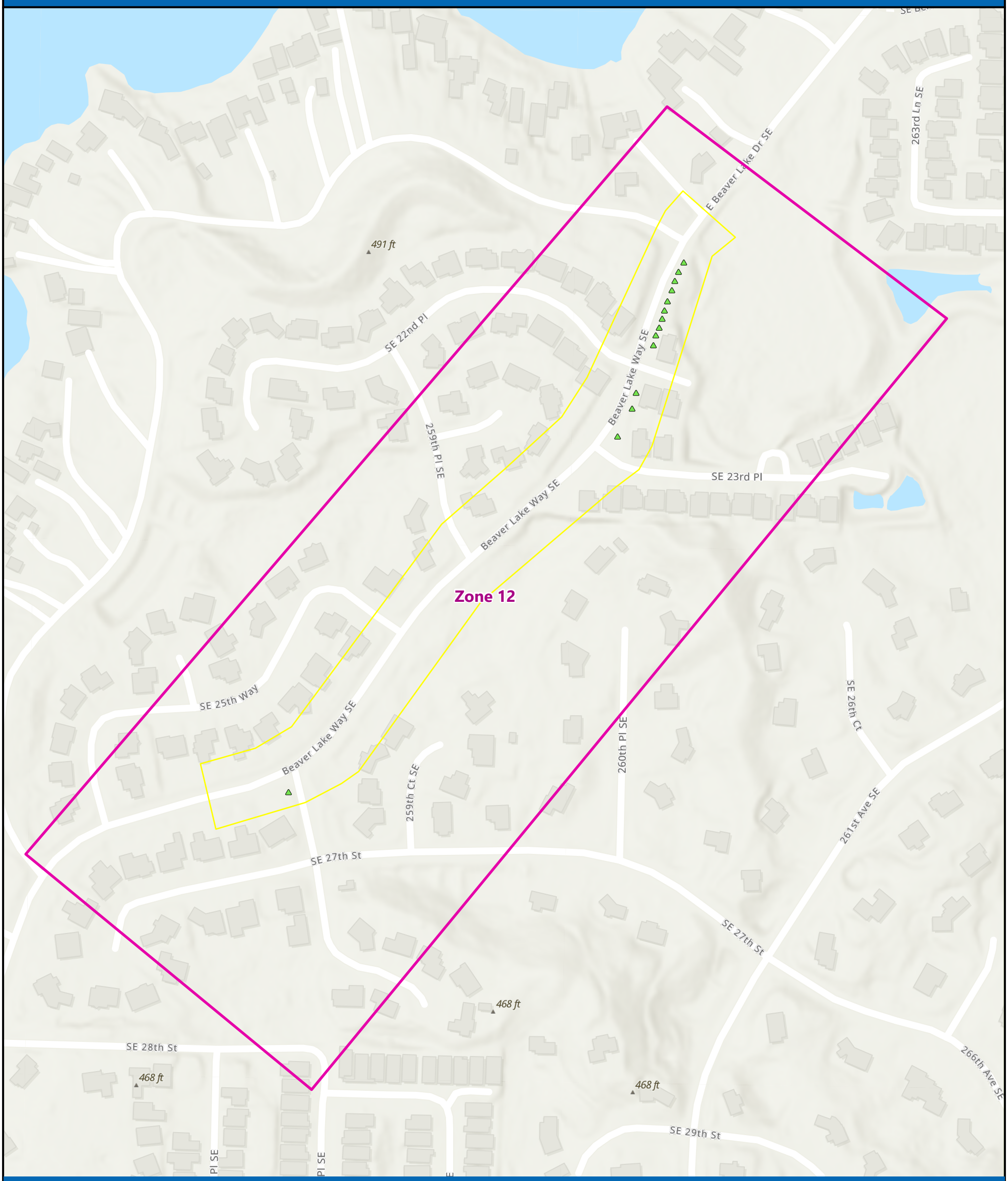
SAMMAMISH TREE INVENTORY MAPS

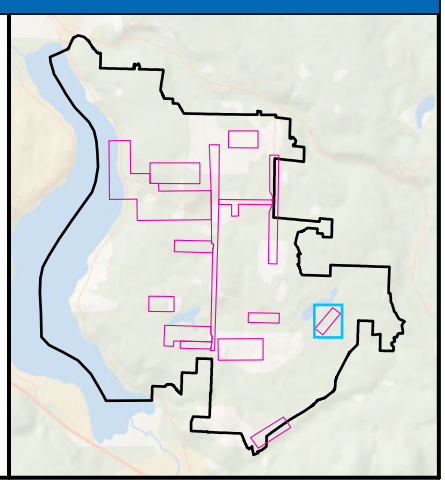


MAINTENANCE ROUTINE - ZONE 12

LAYERS

- City Limits
- ROW Landscape Maintained Zones
- Maintenance Zones
- Monitor
- Pruning-Clearance
- Pruning-Deadwood
- Pruning-Structural
- Remove-Stakes
- Tree Removal
- None
- Other

0 200 400 Feet



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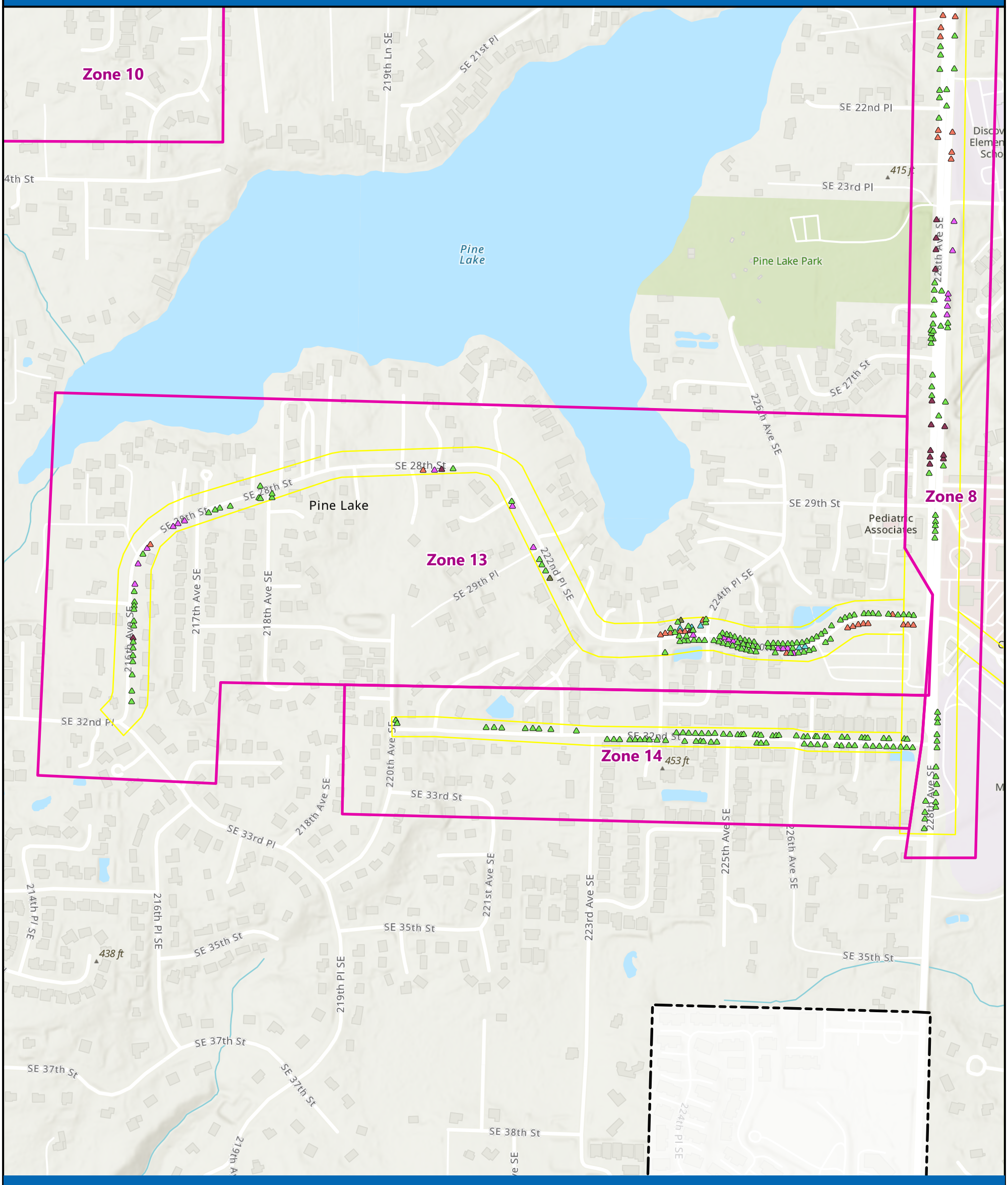
SAMMAMISH TREE INVENTORY MAPS



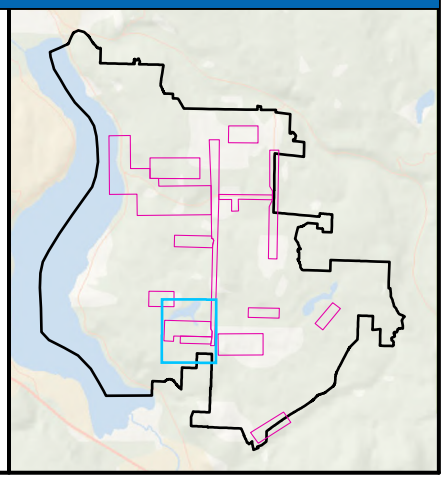
MAINTENANCE ROUTINE - ZONE 13, 14, & 8

PAGE- 8

LAYERS

- City Limits
- ROW Landscape Maintained Zones
- Maintenance Zones
- Monitor
- Pruning-Clearance
- Pruning-Deadwood
- Pruning-Structural
- Remove-Stakes
- Tree Removal
- None
- Other

0 390 780 Feet



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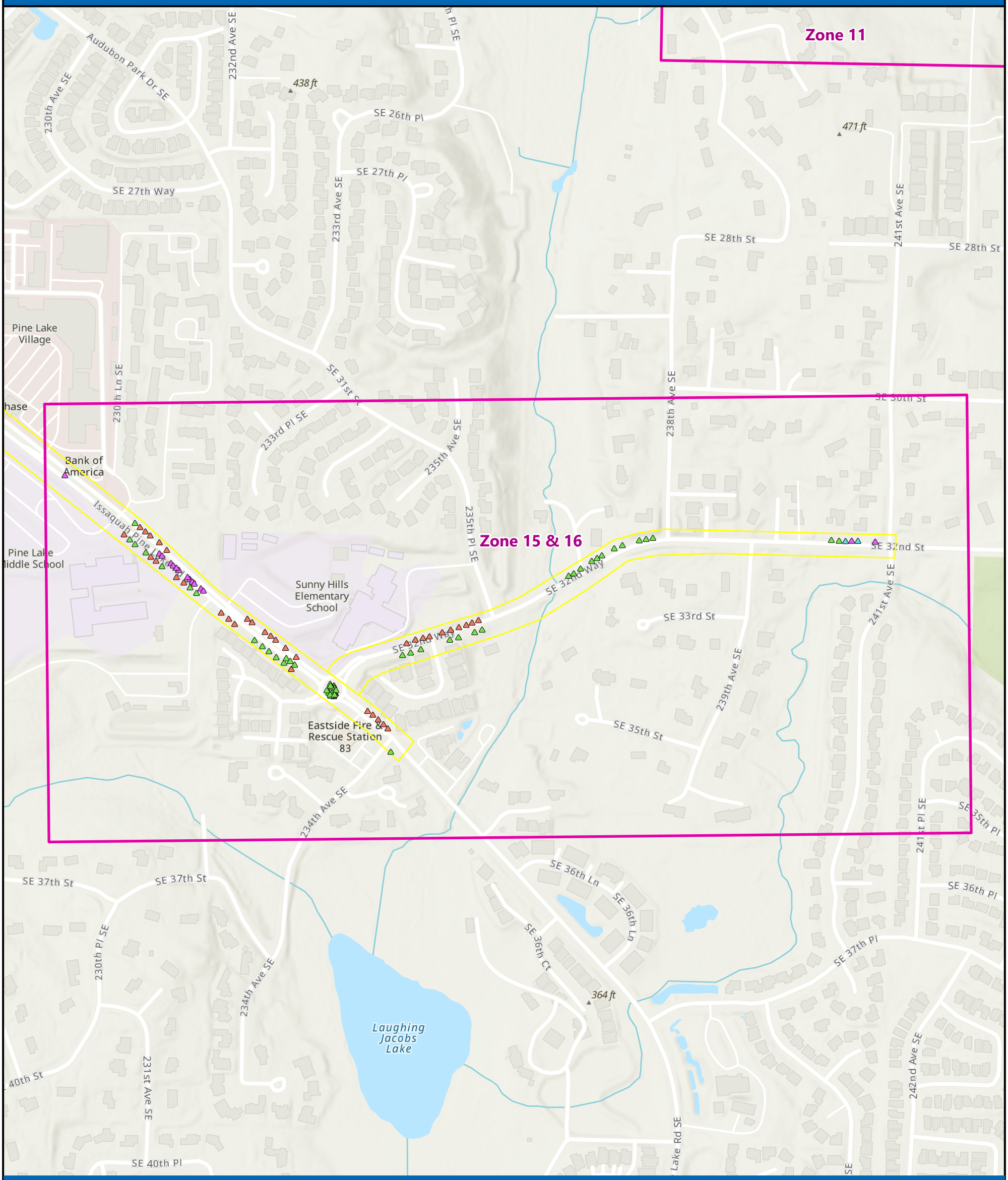
SAMMAMISH TREE INVENTORY MAPS

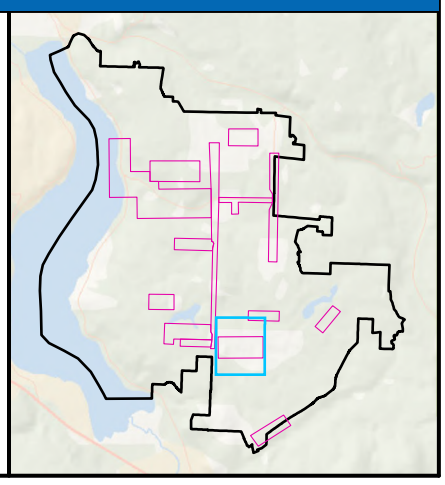


MAINTENANCE ROUTINE - ZONE 15 & 16

LAYERS

- City Limits
- ROW Landscape Maintained Zones
- Maintenance Zones
- Monitor
- Pruning-Clearance
- Pruning-Deadwood
- Pruning-Structural
- Remove-Stakes
- Tree Removal
- None
- Other

0 350 700 Feet



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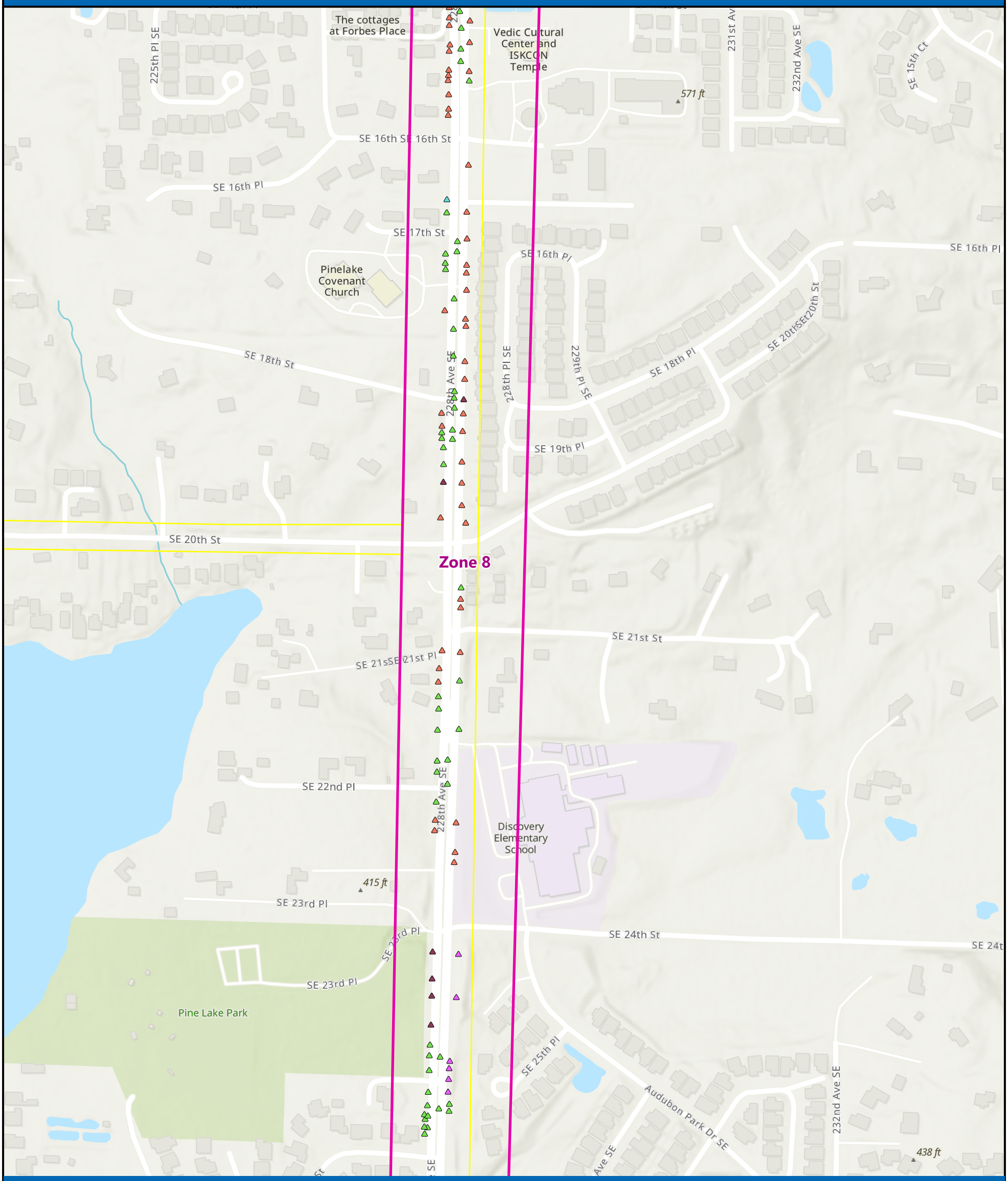
SAMMAMISH TREE INVENTORY MAPS

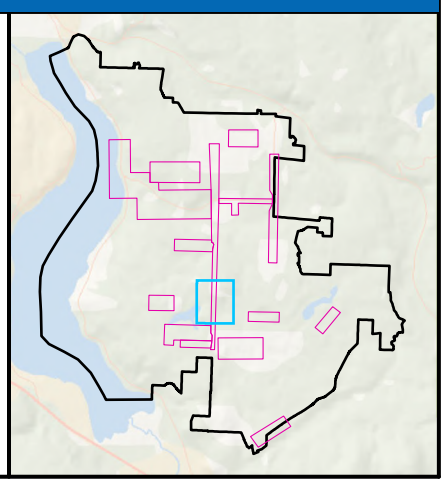


MAINTENANCE ROUTINE - ZONE 8 LOWER

LAYERS

- City Limits
- ROW Landscape Maintained Zones
- Maintenance Zones
- Monitor
- Pruning-Clearance
- Pruning-Deadwood
- Pruning-Structural
- Remove-Stakes
- Tree Removal
- None
- Other

0 270 540 Feet



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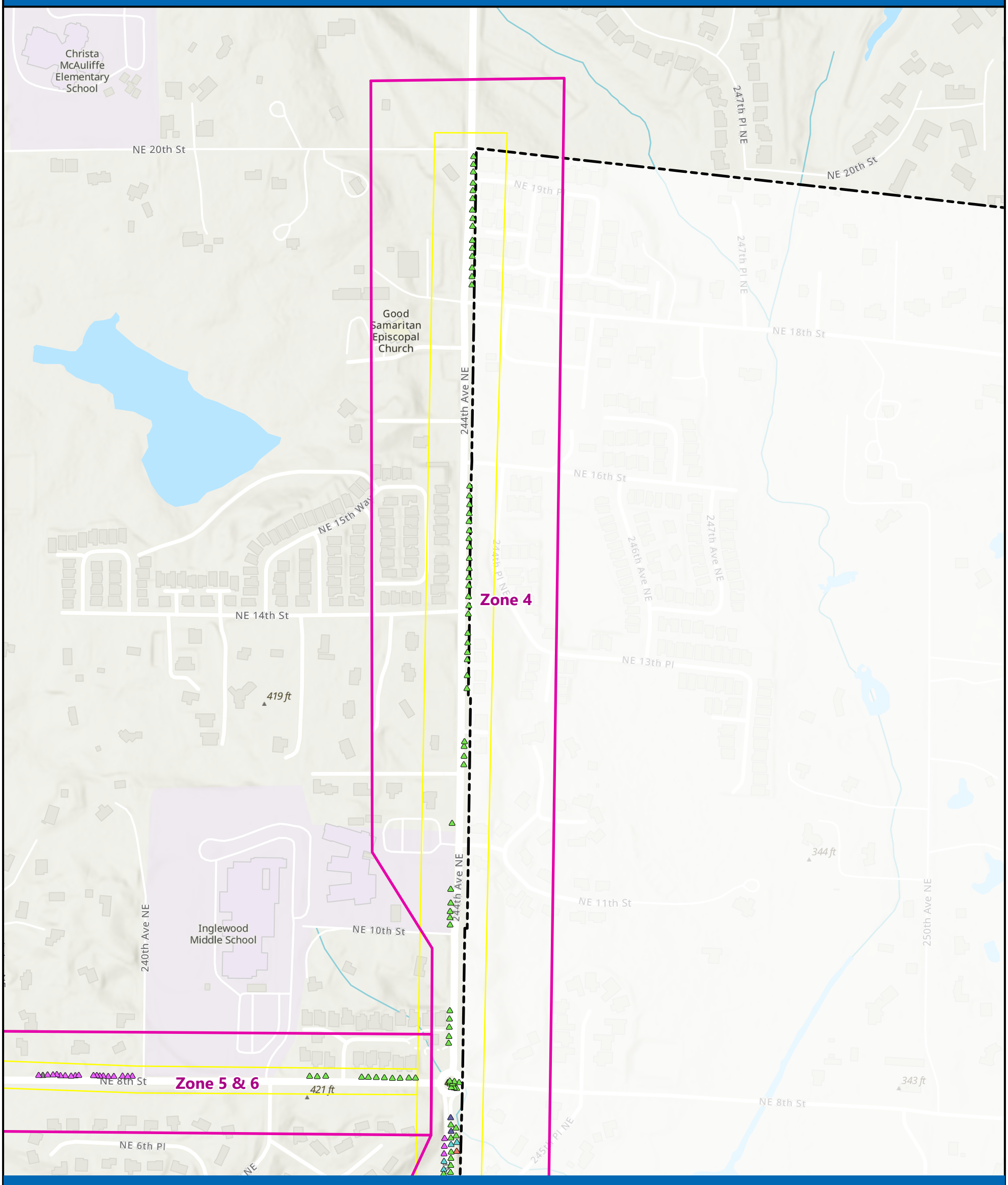
SAMMAMISH TREE INVENTORY MAPS

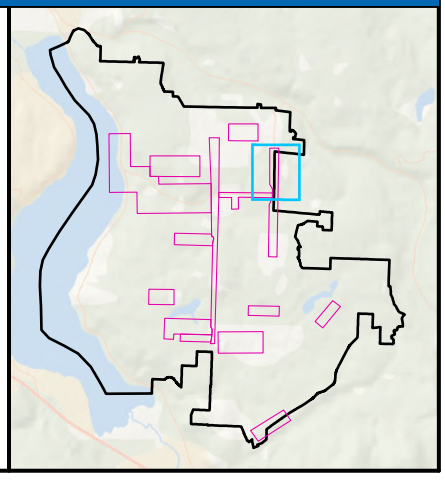


MAINTENANCE ROUTINE - ZONE 4A

LAYERS

- City Limits
- ROW Landscape Maintained Zones
- Maintenance Zones
- Monitor
- Pruning-Clearance
- Pruning-Deadwood
- Pruning-Structural
- Remove-Stakes
- Tree Removal
- None
- Other

0 340 680 Feet



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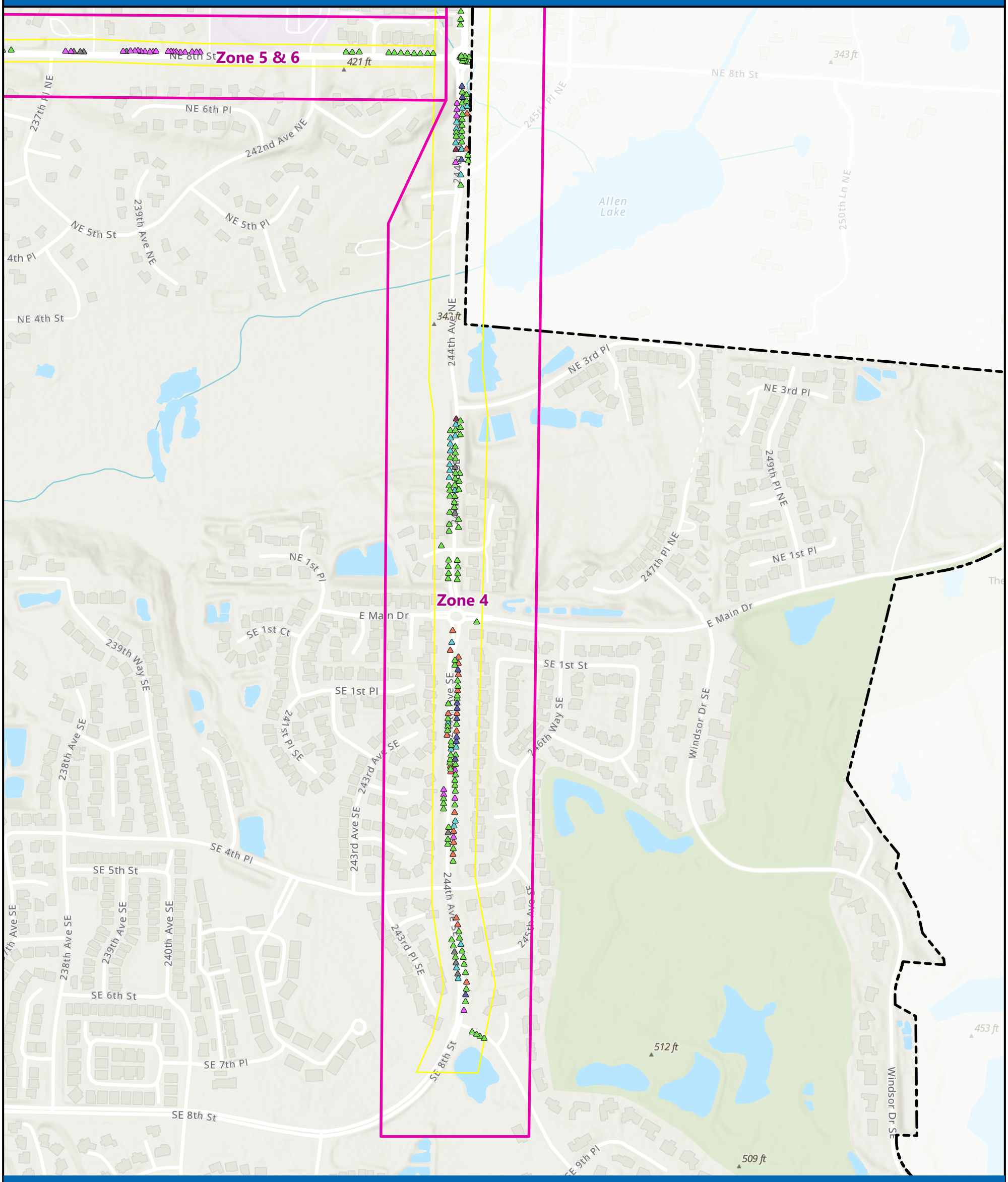
SAMMAMISH TREE INVENTORY MAPS

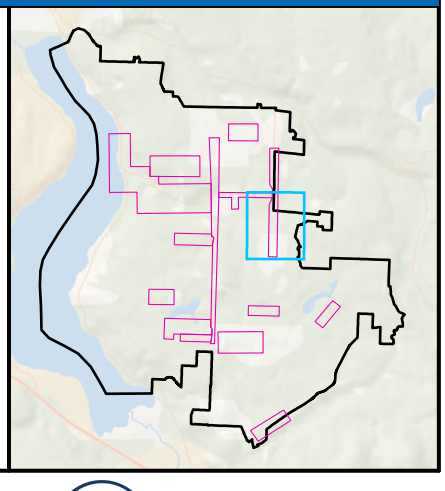


MAINTENANCE ROUTINE - ZONE 4B

LAYERS

- City Limits
- ROW Landscape Maintained Zones
- Maintenance Zones
- Monitor
- Pruning-Clearance
- Pruning-Deadwood
- Pruning-Structural
- Remove-Stakes
- Tree Removal
- None
- Other

0 420 840 Feet



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Notes:

* "Drought Tolerance" is in reference to established trees. Newly planted trees still need sufficient water after transplanting.

Dought tolerance ratings are listed as Hight (H), Medium (M), and Low (L) where trees scoring Low would require continued watering through drier summer conditions.

** Drought Tolerance per Puget Sound Region: Tree Species Vulnerability Assessment plant adaptability class.

Selections should be aesthetically compatible with existing trees planted on adjacent portions of the street.

While species on this list were selected due to their current availability, please note all trees might not be readily available.

The trees listed here have been pre approved; however, other species may be considered for approval by the Field Arborist.

- The mature size of the selected tree should be suitable for the width of the planting area and the available space above the ground for the tree's canopy.

Scientific & Common Name	Form or Size	Mature Height (ft)	Spread (ft)	Under Wires/ View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Drought Tolerance*	Climate adaptability class**	Comments
Abies grandis / Grand Fir	Conical	100	30	No	10	N/A	N/A	L-M	M	Use only in large planter strips 10'+, Use only where lower branch growth will not interfere with site distance. Native evergreen, conical. Moderately drought tolerant once established. The most drought tolerant of PNW firs.
Acer buegerianum / Trident Maple	Small	25	25	Yes	4	N/A	Orange	M	M	Somewhat shrub-like – must train to a single stem – interesting bark. Slow growing tree good for small spaces. Fall and winter interest with rich orange and red fall colors and peeling bark. Grows best in full sun to part shade in well-drained soil, but tolerates clay and sand. Drought tolerant once established but grows better with occasional water during dry periods.
Acer campestre / Hedge Maple	Medium/ Large	40	30	No	5	N/A	Yellow	H	No data available	Contrary to its name, this is not a small tree – nice overall shape and structure. Generally tolerant of urban conditions, including compaction. Adaptable to soil type. Tolerates drought once established. Prefers full sun to part shade.

Scientific & Common Name	Form or Size	Mature Height (ft)	Spread (ft)	Under Wires/ View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Drought Tolerance*	Climate adaptability class**	Comments
Acer campestre 'Evelyn' / Queen Elizabeth Hedge Maple	Medium/ Large	40	30	No	5	N/A	Yellow	H	No data available	More upright branching than the species. Generally tolerant of urban conditions. Adaptable to soil type. Tolerates some drought once established. Prefers full sun to part shade.
Acer freemanii 'Autumn Blaze' / Autumn Blaze Maple	Medium/ Large	50	40	No	6	N/A	Red	M	N/A	Cross between red and silver maple – fast growing with good fall color. Grows best in full sun to part shade in well-draining soils. Tolerates some drought once established. Fast growing with little insect or disease issues.
Acer ginnala 'Flame' / Flame Amur Maple	Small	25	20	Yes	4	White	Red	M	No data available	Clusters of small cream colored flowers in spring – very fragrant. Nice fall color. Informal branch structure. Some drought tolerance.
Acer grandidentatum 'Schmidt' / Rocky Mt. Glow Maple	Medium	25	20	Yes	5	N/A	Red	H	No data available	Intense red fall color - Limited availability in nursery trade. Drought and cold tolerant once established. Low maintenance. Performs best in full sun to part shade.
Acer griseum / Paperbark Maple	Small	25	20	Yes	4	N/A	Red	M	L	Peeling cinnamon colored bark for seasonal interest. Adapatable to a variety of soils but prefers well-draining moist soils. Tolerates compacted urban soils. Avoid planting areas that may collect standing water. Low maintenance. Interesting cinnamon-colored peeling bark.
Acer miyabei 'Morton' / State Street Maple	Medium/ Large	40	30	No	8	N/A	Yellow	H	No data available	Similar to, but faster growing and larger than Hedge maple. Performs best in full sun to part shade and well-draining soil. Tolerates drought once established.

Scientific & Common Name	Form or Size	Mature Height (ft)	Spread (ft)	Under Wires/ View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Drought Tolerance*	Climate adaptability class**	Comments
Acer nigrum 'Green Column' / Green Column Black Sugar Maple	Large Columnar	50	10	No	6	N/A	Orange	M	No cultivar specific data available	Good close to buildings. More adapted to hot, dry conditions than sugar maples. Tolerates some dought.
Acer palmatum / Japanese Maple	Small	20	25	Yes	4	N/A	Yellow	L	M	Many varieties available – select larger varieties for street planting. Sensitive to frost and not drought tolerant.
Acer platanoides 'Globosa' / 'Globe Norway Maple'	Small	15	18	Yes	5	N/A	Yellow	M	N/A	Dense and round crown.
Acer pseudoplatanus 'Atropurpureum' / Spaethii Maple	Medium/ Large	40	30	No	8	N/A	Brown	M	M	Leaves green on top purple underneath. Requires a moderate amount of water.
Acer saccharum 'Bonfire' / Bonfire Sugar Maple	Large	50	40	No	8	N/A	Orange	M	N/A	Fastest growing sugar maple.
Acer saccharum 'Commemoration' / Commemoration Sugar Maple	Large	50	35	No	8	N/A	Orange	M	N/A	Resistant to leaf tatter.
Acer saccharum 'Green Mountain' / Green Mountain Sugar Maple	Large	45	35	No	8	N/A	Orange	M	N/A	Reliable fall color. Tolerant of heat and drought.
Acer saccharum 'Legacy' / Legacy Sugar Maple	Large	50	35	No	6	N/A	Orange	M	N/A	Limited use - where sugar maple is desired in limited planting strip area. Resistant to leaf tatter and burning during the droughty summer months.
Acer tataricum / Taterian Maple	Small	25	20	Yes	5	N/A	Orange	M-H	M	Oval to rounded shape, often low branched. Tolerates some drought once established.
Acer triflorum / Three-Flower Maple	Small	25	20	Yes	4	N/A	Orange	M	M	Multi seasonal interest with tan, exfoliating bark and red, orange/red fall color. Performs best in sun to part shade and acid, moist well-drained soil. Tolerant of transplanting. Intolerant of alkaline soils, soil compaction, and overly wet soil.

Scientific & Common Name	Form or Size	Mature Height (ft)	Spread (ft)	Under Wires/ View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Drought Tolerance*	Climate adaptability class**	Comments
Acer truncatum x A. platanoides / 'Keithsform Norwegian Sunset Maple	Medium	35	25	No	6	N/A	Red	M	N/A	Reliable fall color - nice reddish orange. Performs best in sun to part shade, more heat and drought tolerant than Norway maples.
Acer truncatum x A. platanoides 'Warrensred' / Pacific Sunset Maple	Medium	30	25	Yes	6	N/A	Red	M	N/A	Limited use under higher wires. Performs best in sun to part shade, more heat and drought tolerant than Norway maples. Limited availability.
Aesculus flava / Yellow Buckeye	Large	60	40	No	8	Light Yellow	Yellow	M	M	Least susceptible to leaf blotch – large fruit – fall color is varied, but quite beautiful. Prefers full sun and moist, rich, deep, and slightly acidic soils. Tolerates brief flooding and urban conditions. The foliage can scorch in dry conditions.
Aesculus x carnea 'Briottii' / Red Horsechestnut	Medium/ Large	30	35	No	6	Red	Brown	L-M	N/A	Resists heat and drought better than other horsechestnuts. Leaf scorch may occur in droughty conditions or on sites exposed to wind.
Amelanchier grandiflora 'Princess Diana' / Princess Diana Serviceberry	Small	20	15	Yes	4	White	Orange	M	No data available	Good for narrower planting strips. Performs best in sun to part shade in moist, well-drained soils but tolerates a range of soil types.
Amelanchier laevis 'Snowcloud' / Snowcloud Serviceberry	Small	28	20	Yes	4	White	Red	M	No data available	Edible fruit. Tolerant of a range of soils, but performs best in moist, well-drained sites. Plant in full sun to part shade. Needs occasional water during periods of drought. Tolerant of air pollution.
Amelanchier x grandiflora 'Autumn Brilliance' / Autumn Brilliance Serviceberry	Small	20	15	Yes	4	White	Orange	M	No data available	Good for narrower planting strips – reliable bloom and fall color. Performs best in sun to part shade in moist, well-drained soils but tolerates a range of soil types.

Scientific & Common Name	Form or Size	Mature Height (ft)	Spread (ft)	Under Wires/ View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Drought Tolerance*	Climate adaptability class**	Comments
Betula albosinenesis var septentrionalis / Chinese Red Birch	Medium	40	35	No	6	N/A	Yellow	H	N/A	White and pink peeling bark. Drought tolerant once established.
Carpinus betulus 'Fastigiata' / Pyramidal European Hornbeam	Medium Columnar	35	20	No	6	N/A	Yellow	M	N/A	Broadens when older. Prefers full sun. Tolerant of drought and urban pollution once established.
Carpinus caroliniana / American Hornbeam	Medium	25	20	Yes	6	N/A	Orange	M	H	Outstanding fall color (variable – yellow, orange, red) – nice little tree. Prefers full sun to part shade. Tolerates a wide range of soil moisture conditions.
Carpinus japonica / Japanese Hornbeam	Small	30	25	Yes	6	N/A	Yellow	H	No data available	Wide spreading, slow growing – fall color is not outstanding. Requires only occasional watering during drought once established. Tolerates many soil types.
Cercidiphyllum japonicum / Katsura Tree	Large	40	40	No	6	N/A	Orange	L	L	Needs lots of water when young – can produce large surface roots. Prefers rich, moist, well-drained soils. Tolerates full sun, but has little tolerance for drought particularly when young. Protect from strong winds.
Cercis canadensis / Eastern Redbud	Small	25	30	Yes	4	Pink	Yellow	L-M	M	Deep pink flowers on bare twigs in spring. Prefers full sun to part shade. Tolerates a wide range of soil moisture conditions except permanently wet soil. Adapatable to acidic or alkaline soils.
Cercis siliquastrum / Judas Tree	Small	25	30	Yes	4	Pink	Yellow	L-M	No data available	Deep pink flowers on bare twigs in spring – drought resistant. Requires consistent soil moisture.
Chamaecyparis nootkatensis 'Pendula' / 'Weeping Alaska Cedar'	Medium	30	10	No	8	N/A	N/a	M	N/A	Narrow, conical, light green foliage. Moderately drought tolerant.

Scientific & Common Name	Form or Size	Mature Height (ft)	Spread (ft)	Under Wires/ View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Drought Tolerance*	Climate adaptability class**	Comments
Cladrastis kentukea / Yellowwood	Medium	40	40	No	6	White	Yellow	M-H	No data available	White flowers in spring, resembling wisteria flower – blooms profusely only every 2 to 4 years – yellow/gold fall color. Water occasionaly during dry weather. Drought tolerant once established.
Cornus alternifolia / Pagoda Dogwood	Small	25	25	Yes	4	White	Red	L	No data available	Small white flowers in flat clusters – fall color is varied. Needs ample watering.
Cornus controversa 'June Snow' / June Snow Giant Dogwood	Medium	40	30	No	6	White	Red	L	No data available	Frothy, 6-inch clusters of white flowers in June. Requires regular watering in well drained soil, clay, or sandy soil.
Cornus 'Eddie's White Wonder' / Eddie's White Wonder Dogwood	Medium	30	20	Yes	4	White	Red	M	No data available	A hybrid of C. florida and C. nuttalii. Resistant to dogwood anthracnose. Requires occasional watering during hot weather.
Cornus kousa 'Chinensis' / Kousa Dogwood	Small	20	20	Yes	4	White	Red	L	N/A	Does not do well on harsh, dry sites. Limit large plantings. Resistant to dogwood anthracnose. Requires regular watering during drought.
Cotinus obovatus / American Smoke Tree	Small	25	25	Yes	4	Pink	Red	L	M	Showy pinkish panicles of flowers in the spring – reddish purple leaves on some varieties. Requires occasional watering during drought.
Crataegus crus-galli 'Inermis' / Thornless Cockspur Hawthorne	Medium	25	30	Yes	4	White	Orange	M	N/A	Red persistent fruit. Performs best in full sun and well-drained soil, but tolerates a wide range of soil conditions with good drainage. Tolerates some drought.
Crataegus laevigata 'Crimson Cloud' / Crimson Cloud Hawthorn	Small	25	18	Yes	5	Red	N/A	M	N/A	Wavy branches. Performs best in full sun. Tolerates a wide range of soil conditions. Drought tolerant. Outstanding tree for urban planting.

Scientific & Common Name	Form or Size	Mature Height (ft)	Spread (ft)	Under Wires/ View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Drought Tolerance*	Climate adaptability class**	Comments
Crataegus x lavalii / Lavalle Hawthorne	Medium	25	20	Yes	4	White	Orange	M-H	No data available	Thorns on younger trees. Performs best in full sun. Adapatable to a wide range of conditions for light and soil conditions.
Davidia involucrata / Dove Tree	Medium	40	30	No	6	White	N/A	M	No data available	Large, unique flowers in May. Water occasionaly during dry weather.
Eucommia ulmoides / Hardy Rubber Tree	Medium	50	40	No	8	N/A	N/A	M-H	H	Dark green, very shiny leaves – insignificant fall color. Drought tolerant.
Fagus sylvatica / Green Beech	Large	90	40	No	8	N/A	Orange	M	M	Silvery-grey bark. Prefers full sun to light shade and moist but well drained soil.
Fagus sylvatica 'Dawyck Purple' / Dawyck Purple Beech	Medium Columnar	45	15	No	6	N/A	Brown	L	N/A	Purple foliage. Requires regular to occasional watering.
Fagus sylvatica 'Asplenifolia' / Fernleaf Beech	Large	70	40	No	8	N/A	Orange	M	N/A	Beautiful cut leaf. Some drought tolerance once established.
Fagus sylvatica 'Rohanii' / Purple Oak Leaf Beech	Medium	50	30	No	8	N/A	N/A	M	N/A	Attractive purple leaves with wavy margins. Occasional water needed during prolonged dry periods.
Fraxinus excelsior 'Aureafolia' / Golden Desert Ash	Small	20	18	Yes	5	N/A	Yellow	L	N/A	Small rounded tree, bright golden stems and twigs.
Fraxinus excelsior 'Globosa' / 'Globe Ash'	Small	20	20	Yes	5	N/A	Yellow	L	N/A	Dense and cylindrical crown.

Scientific & Common Name	Form or Size	Mature Height (ft)	Spread (ft)	Under Wires/ View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Drought Tolerance*	Climate adaptability class**	Comments
Fraxinus latifolia / Oregon Ash	Large	50	30	No	6	N/A	Yellow	M	M	The only ash native to the PNW. Prefers wet areas. Survives standing water in winter months and does not need to be watered during the summer once established. Prefers cool, humid summers and mild winters. Dry conditions will cause stunting of growth, loss of leaves and allow for diseases to take hold.
Gingko biloba 'Princeton Sentry' / Princeton Sentry Ginkgo	Medium	40	15	No	6	N/A	Orange	H	N/A	Narrowly pyramidal form, seedless male clone. Performs best in full sun. Highly tolerant of the urban environment. Upright, more narrow, branching habit.
Gymnocladus dioicus 'Espresso' / Espresso Kentucky Coffee	Large	50	35	No	8	N/A	Yellow	M	N/A	Very coarse branches - extremely large bi- pinnately compound leaves. Seedless cultivar. Tolerant of urban conditions, heat, drought, cold, and alkaline soils. Plant in full sun. Prefers deep, rich, moist soil.
Halesia carolina / 'Wedding Bell Silverbell'	Small	20	15	Yes	5	White	Yellow	L	No data available	White, bell shaped flowers. Suffers during drought, will need irrigation.
Halesia Carolina / Carolina Silverbell	Medium	40	35	No	5	White	Yellow	L	No data available	Bell shaped flowers. Suffers during drought.
Halesia monticola / Mountain Silverbell	Medium	45	25	No	4	White	Yellow	L	No data available	Attractive small white flower. Needs ample water.
Halesia tetraptera / Carolina Silverbell	Medium	35	30	No	4	White	Yellow	L	No data available	Attractive bark for seasonal interest. Suffers during drought.

Scientific & Common Name	Form or Size	Mature Height (ft)	Spread (ft)	Under Wires/ View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Drought Tolerance*	Climate adaptability class**	Comments
Koelreuteria paniculata / Goldenrain Tree	Medium	30	30	Yes	4	Yellow	Yellow	H	H	Midsummer blooming – slow growing. Prone to weak branch attachments. Lantern-shaped seed pods. Drought tolerant. Tolerant of urban conditions.
Lagerstroemia 'tuscarora' / Tuscarora Hybrid Crape Myrtle	Small	20	20	Yes	4	Pink	Red	M	No data available	Light cinnamon brown bark lends year round interest – drought resistant – likes a warm site. Resistant to powdery mildew.
Liriodendron tulipifera / Tulip Tree	Large	60	30	No	8	N/A	Yellow	M	L	Fast-growing tree – can get very large in open conditions. Drought tolerant once established
Liriodendron tulipifera 'Fastigiatum' / Columnar Tulip Tree	Medium Columnar	60	20	No	6	White	Yellow	M	N/A	Good next to buildings – can have problems with tight branch angles. Drought tolerant once established.
Maackia amurensis / Amur Maackia	Small Columnar	30	20	Yes	4	White	N/A	M	H	Interesting exfoliating bark – flowering in June or July - varies in intensity from year to year. Several cultivars available. Does not tolerate moisture extremes. Prefers full sun to part shade.
Magnolia denudata / Yulan Magnolia	Medium	40	40	No	4	White	N/A	L-M	N/A	6" inch fragrant white flowers in spring. Water regularly in summer for best flowering and healthiest growth. Well established plants can tolerate occasional watering during dry weather.
Magnolia 'Elizabeth' / Elizabeth Magnolia	Small	30	20	Yes	4	Yellow	N/A	L-M	N/A	Yellowish to cream colored flower in spring. Water regularly for best flower growth, though well established plants can tolerate occasional watering during drought.

Scientific & Common Name	Form or Size	Mature Height (ft)	Spread (ft)	Under Wires/ View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Drought Tolerance*	Climate adaptability class**	Comments
Magnolia 'Galaxy' / Galaxy Magnolia	Small	25	25	Yes	4	Pink	Yellow	L-M	N/A	Showy pink flowers. Water regularly for best flower growth, though well established plants can tolerate occasional watering during drought.
Magnolia grandiflora 'Victoria'/ Victoria Evergreen Magnolia	Medium	25	20	Yes	4	White	N/A	L-M	N/A	Evergreen magnolia – can be damaged in years with wet, heavy snow. Limit large plantings. Most suitable for protected locations close to buildings. Water regularly in summer for best flowering and healthiest growth. Well established plants can tolerate occasional watering during dry weather.
Magnolia kobus 'Wada's Memory' / Wada's Memory Magnolia'	Medium	30	20	Yes	4	White	Yellow	L-M	N/A	Does not flower well when young. Water regularly in summer for best flowering and healthiest growth. Well established plants can tolerate occasional watering during dry weather.
Magnolia x loebneri / Loebner Magnolia	Small	20	20	Yes	4	White	Yellow	L-M	N/A	Flower is 'star' shaped rather than tulip like – white to pinkish white in March or April. Water regularly for best flower growth, though well established plants can tolerate occasional watering during drought.
Malus 'Adirondack' / Adirondack Crabapple	Small Columnar	20	10	Yes	4	White	Yellow	H	N/A	Very resistant to apple scab – one of the narrowest crabapples. Strongly upright vase-shape. Drought tolerant once established. Tolerant of a range of soil types but prefers slightly acidic, moist well-drained soil in full sun. persistent reddish ¼" fruit.

Scientific & Common Name	Form or Size	Mature Height (ft)	Spread (ft)	Under Wires/ View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Drought Tolerance*	Climate adaptability class**	Comments
Malus 'Golden Raindrops' / Golden Raindrops Crabapple	Small	20	20	Yes	4	White	Yellow	M	N/A	Disease resistant – persistent yellow fruit in fall and winter. Tolerant of a range of soil types but prefers slightly acidic, moist well-drained soil in full sun. Does not tolerate standing water in the winter.
Malus 'Jarmin' / Marilee Crabapple'	Small	24	10	Yes	5		Yellow	L	N/A	Narrow, upright form, good disease resistance. Should not be allowed to dry out. Tolerant or urban conditions.
Malus 'Red Barron' / Red Barron Crabapple	Small Columnar	20	10	Yes	4	Pink	Yellow	H	N/A	Deep pink blossom and persistent red berries for seasonal interest. Tolerant of a range of soil types but prefers slightly acidic, moist well-drained soil in full sun. Drought tolerant once established.
Malus 'Royal raindrops' / 'Royal Raindrops Crabapple'	Small	20	15	Yes	4	Red	Orange-Red	M	N/A	Disease resistant, good fall colors. Established trees have some drought resistance.
Malus 'Tschonoskii' / Tschonoskii Crabapple	Medium Columnar	30	15	Yes	4	White	Red	M-H	N/A	Sparse green fruit, pyramidal. Good resistance to apple scab, rust, and powdery mildew. Poor resistance to fireblight. Narrow in form. New growth is silvery. Rare 1/2" green apples. Tolerant of a range of soil types but prefers slightly acidic, moist well-drained soil in full sun.
Malus 'Donald Wyman' / Donald Wyman Crabapple	Small	25	25	Yes	4	White	Yellow	M	N/A	Large white blossom – nice green foliage in summer. Tolerant of a range of soil types but prefers slightly acidic, moist well-drained soil in full sun.
Malus 'Lancelot' ('Lanzam') / Lancelot Crabapple	Small	15	15	Yes	4	White	Yellow	M	N/A	Red flower buds, blooming white – red persistent fruit. Tolerates dry sites.

Scientific & Common Name	Form or Size	Mature Height (ft)	Spread (ft)	Under Wires/ View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Drought Tolerance*	Climate adaptability class**	Comments
Metasequoia glyptostroboides / Dawn Redwood	Large	70	25	No	6	N/A	Red	H	M	Fast growing deciduous conifer. Prefers moist to well-drained soil, will tolerate poor compacted soils, sand and clay. Drought tolerant once established, and can handle standing water.
Nothofagus antarctica / Antarctic Beech	Medium/ Large	50	30	No	6	N/A	Brown	M-H	No data available	Rugged twisted branching and petite foliage – difficult to find in the nursery trade. Tolerates drought and wind once established.
Nyssa sylvatica / Tupelo	Large Columnar	50	25	No	6	N/A	Red	M	H	Handsome chunky bark. Select male varieties. Tolerant of drought, heat, soil moisture extremes, and salt. Not tolerant of alkaline conditions.
Ostrya virginiana / Ironwood	Medium	40	25	No	4	N/A	Yellow	H	H	Hop like fruit – slow growing. Prefers light shade. Tolerates drought and heavy clay soil. Does not tolerate salt.
Oxydendron arboreum / Sourwood	Medium Columnar	35	15	No	4	White	Red	M	H	Consistent and brilliant fall color. No serious disease or insect problems. Requires occasional watering during dry weather once established.
Parrotia persica / Persian Parrotia	Small	30	25	Yes	4	Red	Orange	M-H	H	Blooms before it leafs out – drought tolerant - Varied fall color - reds, oranges and yellows.Adaptable to a variety of moisture and soil conditions. Ideally, select stock with a single, central trunk. Limit placement of multi-stemmed stock to areas where sight lines are not an issue between cars and pedestrians (ie away from intersections and other pedestrian crossings).
Phellodendron amurense 'Macho' / Macho Cork Tree	Medium	40	40	No	6	N/A	Yellow	H	No data available	This variety is fruitless – fall color can be varied. High drought tolerance. Air-pollution tolerant.

Scientific & Common Name	Form or Size	Mature Height (ft)	Spread (ft)	Under Wires/ View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Drought Tolerance*	Climate adaptability class**	Comments
Pinus flexillis 'Vanderwolf's Pyramid' / Vanderwolf's Pyramid Pine	Medium	40	20	No	8	N/A	N/A	H	No data available	Pyramidal shape, blue green foliage. Very adaptable.
Pinus nigra / Austrian Pine	Large	55	30	No	8	N/A	N/A	M	M	Cold hardy, adaptable
Pinus ponderosa / 'Ponderosa Pine'	Pyramidal	80	30	No	15	N/A	N/A	H	L	Use only in large planter strips 10'+, Use only where lower branch growth will not interfere with site distance. Native evergreen, adaptable to west-side. Drought tolerant. Wind and fire-resistant.
Pinus strobus 'Fastigiata' 'Fastigiate White Pine'	Medium	30	10	No	8	N/A	N/a	L	N/A	Narrow, upright form, blue-green foliage. Susceptible to many insects and diseases.
Prunus 'Frankthrees' / Mt. St. Helens Plum	Small	20	20	Yes	4	Pink	N/A	M	No data available	Burgundy colored leaves – tree best used as an accent rather than in mass plantings. Performs well in extreme climates.
Prunus 'Newport' / Newport Plum	Small	20	20	Yes	4	Pink	N/A	M	N/A	Burgundy colored leaves – tree best used as an accent rather than in mass plantings. One of the more hardy flowering plum trees.
Prunus 'Snowgoose' / Snow Goose Cherry	Small	20	20	Yes	4	White	Red	M	N/A	This selection sports abundant white flowers and healthy green, disease-resistant foliage.
Prunus cerasifera 'Cripoizam' 'Crimson Pointe Plum'	Medium	25	10	Yes	5	White	Red	M	N/A	Pink buds open to white flowers that contrast nicely with the emerging purple foliage.
Prunus cerasifera 'Krauter Vesuvius' / Vesuvius Flowering Plum	Medium	30	20	Yes	4	Pink	N/A	M	N/A	Burgundy colored leaves – tree best used as an accent rather than in mass plantings.
Prunus cerasifera 'Thundercloud' / Thundercloud Plum	Medium	30	20	Yes	5	Pink	N/A	L	N/A	Can produce significant fruit. Susceptible to many insects and diseases.

Scientific & Common Name	Form or Size	Mature Height (ft)	Spread (ft)	Under Wires/ View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Drought Tolerance*	Climate adaptability class**	Comments
Prunus sargentii 'JFS-KW58' / 'Pink Flair Cherry'	Small	25	15	Yes	5	Pink	Orange-Red	M	N/A	Upright narrow case shape. Drought tolerant once established.
Prunus serrulata 'Amanogawa' / Amanogawa Flowering Cherry	Small Columnar	20	10	Yes	4	White	Orange	M	N/A	Pinkish flower bud, changing to white flower.
Prunus serrulata 'Royal Burgundy' / 'Royal Burgundy Cherry	Small	20	15	Yes	5	Pink	Purple	M	N/A	Vase shaped crown
Prunus viginiana 'Canada Red' / 'Canada red Chokecherry'	Small	25	20	Yes	5	White	Orange-Red-Purple	M	N/A	Foliage turns fron green in spring to dark purple as weather warms and a deeper red in autumn. Prefers regular watering but will tolerate mild, periodic dry spells.
Prunus x yedoensis 'Akebono' / Akebono Flowering Cherry	Small	25	25	Yes	4	Pink	Red	L-M	No data available	Has masses of large, semi-double, pink flowers – most widely planted cherry in Pacific Northwest. Performs best in full sun with moist, well-drained soils. More drought tolerant once established. Prefers acidic soils and can adapt to a variety of soil types.
Pyrus calleryana 'Cambridge' / Cambridge Pear	Medium Columnar	40	15	No	4	White	Red-Purple	M	N/A	Invasive species. Narrow tree with better branch angles and form than the species – brittle limbs may be a problem with ice or wet snow. Limit large plantings.
Pyrus calleryana 'Jaczam' / 'Jack Pear'	Small	16	10	Yes	5	White	Yellow	L	N/A	Tight, upright form.

Scientific & Common Name	Form or Size	Mature Height (ft)	Spread (ft)	Under Wires/ View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Drought Tolerance*	Climate adaptability class**	Comments
Quercus 'Crimschmidt' / Crimson Spire Oak	Large Columnar	45	15	No	6	N/A	Orange	M	N/A	Hard to find in the nursery trade. Columnar form. Produces acorns. Tolerant of drought and urban conditions. Performs best in full sun. Fast growing. Some structure pruning when young may be necessary to encourage appropriate branch spacing. Trees retain their fall leaves through the winter.
Quercus bicolor / Swamp White Oak	Large	50	45	No	8	N/A	Brown	M	H	Interesting shaggy peeling bark.
Quercus coccinea / Scarlet Oak	Large	50	40	No	8	N/A	Red	H	M	Best oak for fall color. Produces acorns. Large spreading canopy. Performs best in full sun and well-draining soil. Once established, water occassionally during dry periods.
Quercus frainetto / Italian Oak	Large Columnar	50	30	No	6	N/A	Brown	H	No data available	Drought resistant – beautiful green, glossy leaves in summer. Produces acorns. Drought resistant. Beautiful green, glossy leaves in summer.
Quercus Ilex / Holly Oak	Medium	40	30	No	6	N/A	N/A	H	No data available	Evergreen oak - Underside of leaf is silvery-white. Often has a prominent umbrella form. Produces acorns. Dense canopy.
Quercus imbricaria / Shingle Oak	Large	60	50	No	8	N/A	Brown	M-H	H	Nice summer foliage - leaves can persist throughout the winter. Produces acorns. Leaves can persist throughout the winter. Tolerant of urban conditions.
Quercus muhlenbergii / Chestnut Oak	Large	60	50	No	8	N/A	Brown	M-H	No data available	Coarsely toothed leaf. Relatively good drought tolerance.

Scientific & Common Name	Form or Size	Mature Height (ft)	Spread (ft)	Under Wires/ View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Drought Tolerance*	Climate adaptability class**	Comments
Quercus robur / English Oak	Large	50	40	No	8	N/A	Brown	M	M	Large, sturdy tree. Acorns do not need dormant cold period to germinate, so can be invasive. Happy in different soil types and urban conditions.
Quercus robur 'fastigiata' / Skyrocket Oak	Large Columnar	40	15	No	6	N/A	Brown	M	N/A	Columnar variety of oak. Produces acorns. Tolerant of salt, drought, and urban conditions. Performs best in full sun. Some structure pruning when young may be necessary to encourage appropriate branch spacing. Trees retain their fall leaves through the winter.
Quercus rubra / Red Oak	Large	60	45	No	8	N/A	Red	M	M	Fast growing oak – large tree that needs space.
Quercus velutina / Black Oak	Large	70	50	No	8	N/A	Orange	M-H	No data available	More drought tolerant than red oak. It is drought and poor soils tolerant.
Rhamnus purshiana / Cascara	Medium	30	20	Yes	4	N/A	Orange	L	No data available	Native tree – fall color depends on exposure – purplish fruit feeds many native birds. Best in moist, well-drained soils.
Sorbus alnifolia / Korean Mountain Ash	Small	40	25	No	6	White	Orange	M-H	M	Simple leaves and beautiful pink/red fruit. Requires only occasional watering during drought once established.
Sorbus Americana 'Dwarfcrown' / Red Cascade Mountain Ash	Small	18	8	Yes	5	White	Orange	L-M	No data available	Small, red berries in clusters. Tolerant of urban conditions and small root volume.
Sorbus americana 'Dwarfcrown' / Red Cascade Mountain Ash	Small Columnar	20	10	Yes	4	White	Orange	L-M	No data available	Nice winter form - Red berries persistent in clusters. Bright red fruit in clusters. Tolerant of urban conditions and small root volume.
Sorbus x hybridia / Oak-leaf Mountain Ash	Medium	40	30	No	5	N/A	Red	M	No data available	Resistant to dutch elm disease, vase shaped form.

Scientific & Common Name	Form or Size	Mature Height (ft)	Spread (ft)	Under Wires/ View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Drought Tolerance*	Climate adaptability class**	Comments
Sorbus x hybridia / Oakleaf Royal Mt. Ash	Medium	30	20	Yes	4	White	Orange	L-M	No data available	It has leaves which are similar to English oak, and interesting bark for seasonal features.
Stewartia monodelpha / Orange Bark Stewartia	Small	30	20	Yes	4	White	Orange	L-M	No data available	Extraordinary cinnamon colored bark – avoid hot, dry sites. Extraordinary cinnamon colored bark. Requires occasional watering during dry months. Limit pruning to clearance requirements. Prefers rich, well-draining soil. Prefers light shade but will tolerate full sun.
Stewartia psuedocamellia / Japanese Stewartia	Small	30	20	Yes	6	White	Orange	L	L	Patchwork bark, white flower in spring. Prefers light shade. Requires regular watering during dry months. Limit pruning to clearance requirements. Prefers rich, well-draining soil. Prefers light shade but will tolerate full sun.
Styrax japonica / Japanese Snowbell	Medium	25	25	Yes	4	White	Yellow	L	M	Reliable and easy to grow, it has plentiful, green ½" inch seeds. Flowers similar to lily in the valley. Plant in full sun to partial shade. Performs best in a moist, acidic, well-drained organic soil. Produces small white fruits. Requires regular to occasional watering during dry months. Several cultivars available: Emerald Pagoda, Snow Charm®, Pink Chimes.
Styrax obassia / Fragrant Styrax	Small	25	20	Yes	4	White	Yellow	L-M	No data available	Smooth gray bark and fragrant white flowers. Plant in full sun to part shade. Performs best with well-drained sandy soil. Requires regular to occasional watering during dry months.

Scientific & Common Name	Form or Size	Mature Height (ft)	Spread (ft)	Under Wires/ View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Drought Tolerance*	Climate adaptability class**	Comments
Taxodium distichum / Bald Cypress	Large	65	35	No	8	N/A	Orange	M	H	A deciduous conifer, broadly spreading when mature – columnar when young. adaptable to different soil types and does well on wet sites including in standing water.
Thuja plicata / Western Red Cedar	Pyramidal	100	40	No	15	N/A	N/A	H	H	Use only in large planter strips 10'+, Use only where lower branch growth will not interfere with site distance. Native evergreen, large maturing species. Drought tolerant when established, though occasional watering of a dry site during summer will boost growth.
Tilia americana 'Redmond' / Redmond Linden	Medium/ Large	60	35	No	8	N/A	Yellow	M	N/A	Pyramidal, needs extra water when young. Tolerates some drought.
Tilia cordata 'Chancoler' / Chancelor Linden	Medium	35	20	No	6	N/A	Yellow	M	N/A	Pyramidal when young. Fragrant flowers that attract bees.
Tilia cordata 'De Groot' / De Groot Littleleaf Linden	Medium	40	20	Yes	5	N/A	Yellow	M	N/A	One of the smaller stature littleleaf lindens. Good tolerance of urban conditions.
Tilia cordata 'Greenspire' / Greenspire Linden	Medium/ Large	40	30	No	6	N/A	Yellow	L-M	N/A	Symmetrical, pyramidal form – sometimes has structural issues due to tight branch attachements. Tolerates urban pollution.
Tsuga heterophylla / Western Hemlock	Pyramidal	100	30	No	15	N/A	N/A	L	L	Use only in large planter strips 10'+, Use only where lower branch growth will not interfere with site distance. Native evergreen, large maturing species. Shallow root system and introlerant to drought.
Ulmus 'Frontier' / Frontier Elm	Large	50	35	No	6	N/A	Red	M	No data available	Resistant to Dutch elm disease. Tolerates occasional drought.

Scientific & Common Name	Form or Size	Mature Height (ft)	Spread (ft)	Under Wires/ View Covenants	Min Strip Width (ft)	Flower Color	Fall Color	Drought Tolerance*	Climate adaptability class**	Comments
Ulmus 'Homestead' / Homestead Elm	Large	60	35	No	6	N/A	Yellow	M	No data available	Complex hybrid - close in form to American elm - Resistant to Dutch elm disease. Reasonably drought tolerant once established.
Ulmus parvifolia 'Emer II' / Allee Elm	Medium/Large	60	40	No	8	N/A	Orange	M	N/A	Exfoliating bark and nice fall color – Resistant to Dutch Elm Disease, elm leaf beetle, leaf scorch, dieback and cold winters. Tough and durable.
Ulmus parvifolia 'Emer I' / Athena Classic Elm	Medium	30	35	No	4	N/A	Orange	M-H	N/A	High resistance to Dutch Elm Disease. Drought resistant. Cinnamon colored exfoliating bark for seasonal interest.
Zelkova serrata 'Greenvase' / Green Vase Zelkova	Large	45	40	No	6	N/A	Red-Purple	H	H	Attractive exfoliating bark provides Winter appeal. Dark green leaves turn orange-red and purple in Fall. Upright form. Prefers full sun and moderate water. Tolerant of drought and wind once established. Relatively slow growing.
Zelkova serrata 'Village Green' / Village Green Zelkova	Large	40	40	No	6	N/A	Red-Purple	H	N/A	Green Vase, Mussichino and Halka are improved forms. Vase-shaped, rounded form. Prefers full sun and moderate water. Tolerant of drought and wind once established. Relatively slow growing.

References

https://plants.ces.ncsu.edu/find_a_plant/
https://landscapeplants.oregonstate.edu/species
chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://woodyplants.cals.cornell.edu/plant/print/103
https://www.seattle.gov/trees/trees-for-neighborhoods/past-plantings/espresso-kentucky-coffee-tree
https://www.seattle.gov/trees/trees-for-neighborhoods/past-plantings
https://selectree.calpoly.edu/
https://extension.usu.edu/botanicalcenter/gardens-venues/arboretum-trees
https://nysufc.org/underutilized-urban-trees-crimson-spire-oak/2022/12/03/
Rutledge, A.; Brandt, L.A. 2023. Puget Sound Region: Tree Species Vulnerability Assessment. White Paper.

APPENDIX G. Jurisdictional Comparison Summary

Code Topic	Sammamish	Burien	Edmonds	Mercer Island	Lake Forest Park	Shoreline
	(Effective January 1, 2022; Revised June 29, 2022)	*(Updated October 2022)*	*(Last amended 2010, currently undergoing an update)*	*(Updated 2017)*	*(Updated 2017)*	*(Updated 2022)*
Specific Code Sections that Regulate or Reference Street Trees	• *SMC 21.03.060 Trees* • *SMC 21.08.060 Right-of-Way Use permit*	• *BMC 12.38 Street Trees and Trees on City Property* • *BMC 19.26 Tree Retention* • *BMC 19.25 (Landscaping)* • *BMC 19.17 Miscellaneous Use, Development, and Performance Standards* • *Climate Action Plan (2021)* • *Comprehensive Plan (last updated 2021)*	• *EMC 18.85 Street trees* • *EMC 20.13 Landscaping* • *EMC 23.10 Tree Related Regulations* • *Edmonds Street Tree Plan*	*MICC 19.10.100 Trees on Public Property* *MICC 19.10 - Trees*	• *LFPMC 16.14 Tree Canopy Preservation and Enhancement* • *LFPMC 16.06 State Environmental Act Implementation* • *LFPMC 12.40 Complete Streets* • No specific street tree ordinance.	• *SMC 12.30 Public Tree Management* • *SMC 20.50 General Development Standards* • *Engineering Development Manual* **Figure 1.**
Recommended Street Tree List	Street Tree List (Appendix F): 2016_public_works_standards.pdf	No approved Street Tree List.	Street Tree List is provided on p. 128 of the Edmonds Street Tree Plan. Other species suggestions are based on location.	No approved Street Tree List. The City is currently developing a preferred street tree species list.	No approved Street Tree List.	Street Tree List (Appendix G): Right-of-Way Street Tree List - 2024 Engineering Development Manual
Street Tree Replacement Standards	• ROW trees are exempt from the removal and replacement provisions in SMC 21.03.060. • For consideration of conifers within the ROW, ample root growth area, no impact to pedestrian and vehicular sight distances. A licensed arborist must make recommendations. Appropriate vertical clearances shall be maintained.	• New trees planted in ROW shall be selected from recommended species list, approved by City. (BMC 12.38) • For detached SF short plats, plant 1 ROW tree every 50' on neighborhood collectors and 40' along arterial street frontages. • Trees shall be located within the ROW, if permitted. • Mature/healthy native trees retained within ROW or within 20' of ROW line may substitute for required street trees at a 1:1 ratio. • Work along Des Moines Memorial Dr. may require planting of elm trees *(BMC 19.25.060.2).*	• When necessary to remove a tree, the City shall replant tree(s) or replace them. • Replacements shall meet the standards specified in the street tree plan for size, species, and placement. • The permittee shall bear the costs of removal and replacement. *(EMC 18.85)*	• Tree replacement standards per MICC 19.10.070: - 1 replacement tree for removal of a tree less than 10 inches diameter - 2 replacement trees for removed tree between 10 and 24 inches - 3 replacement trees for removed tree between 24 and 36 inches - 6 replacement trees for removed tree more than 36 inches and any exceptional tree	• For RM, BN, TC, CC zones and uses, at least one tree shall be required for every 250 square feet of landscape area (*LFPMC 18.62.041).*	• All existing public trees 6" DBH or greater allowed to be removed shall be replaced with an approved variety of tree in area of removal according to the replacement formula in SMC 20.50.360: One existing significant tree 8" DBH for conifers or 12" DBH for all others equals one new tree. • If director determines there is no suitable space for replacement trees in vicinity of removal, director may allow applicant replant at approved public site or pay fees in lieu. • All street trees must be selected from the City-

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		• Developments within Station Area Overlay abutting sidewalks are exempt from landscaping standards, except street trees required at 1 tree per 30' of linear street frontage *(BMC 19.16.025).*				approved street tree list. *(SMC 20.50.480)*
Permit requirements	• A Type B ROW construction permit is required to remove and replace a tree located within the City ROW. • The following items must be submitted along with the permit application: - Narrative describing tree to be removed and reason - Site plan - Tree installation detail - Arborist report - Traffic control plan if occupation of ROW is necessary.	• A tree permit will not be issued to a private individual for the pruning or removal of trees or other vegetation on city property identified on the city maintenance responsibility list, including streets, parks and open spaces. • Issuance of a tree permit is based on the City arborist determining that the removal or requested action or treatment is necessary. • Planting plan required. (BMC 12.38)	• Permit required from the director of public works for planting, removing, pruning, or otherwise changing a tree on a street, ROW, parking, planting strip, or other public place. • Proposal must conform to the Edmonds Street Tree Plan. (EMC 18.85)	• ROW Tree Pruning application and ROW Use permit application required. • Permit reviewed by city arborist. • For pruning requests not related to a possible hazard to public/private health or safety, can submit a petition showing at least 60% of the property owners located within 300' of the proposed tree are in favor of the trimming. The petition must describe location of tree and extent of proposed pruning. • When request is associated with a hazardous, diseased, or dying/dead tree, an arborist's memo may be required by ROW Arborist. • A Site Plan is required if removing a tree to provide driveway to new homes. • A Utility/Road/Sidewalk Plan is required for construction of public improvements in the ROW.	• Minor permit, major tree permit, or utility forest management permit required. (LFPMC 16.14)	• ROW Use permit required and issued by the director of Public Works. • Public tree removal is prohibited on ROWs that have not been opened with public improvements. • No trees listed in the Engineering Development manual as approved tree varieties for planting in the ROW shall be removed unless deemed a hazard by a certified arborist. • In commercial zones, tree removal is exempt unless within a critical area or buffer, or if the existing trees were included as required landscaping within the previous three years. (SMC 12.30.040).

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Protection and Management of Public Trees	• Not explicitly defined for street trees. • Tree protection: minimum 4' ht. barriers and signage *(SMC 21.03.060.I).*	• The City manager, or his/her designee, shall oversee the planting, care, and removal of trees on City property. • The City of Burien has a City Maintenance Responsibility list for street trees and other vegetation on ROW and City property. List is codified *(BMC 12.38.080).*	• Not explicitly defined in Chapter 18.85. • Tree protection: minimum 3' ht. fence, prohibits soil excavation or compaction within fence *(EMC 23.10.070).*	• Not explicitly defined for street trees. • Permit plans and construction activities shall comply with then-existing BMPs published by ISA. • Tree protection plan shall be prepared by a qualified arborist, reviewed by city arborist. • All new trees and tree protection measures shall be shown on development plans.	Not explicitly defined for street trees.	Not explicitly defined for street trees.
Maintenance Requirements	• All required replacement trees shall be maintained through the life of the project. • Best management practices for maintaining the health of the tree include: - No topping, no excess pruning unless needed to protect life/ property; - Prune visible deadwood. - Apply fertilizer to enhance vigor of stressed trees; - Amend/aerate soil for protected trees and planting areas; - Apply mulch over drip line areas. - Ensure water availability during, immediately after construction.	• City shall maintain all trees/other vegetation on the City maintenance list established in chapter. • No person shall prune or remove trees or other vegetation on the city property identified on the City maintenance list. • Property owners adjacent to an improved/unimproved ROW not listed on the City maintenance list shall maintain street trees and other vegetation located within maintenance area. (BMC 12.38) • Public utilities shall maintain any vegetation that interferes with utilities, may prune trees. *(BMC 12.38)*	• Not explicitly defined in Chapter 18.85. • Except where otherwise defined by the City, the adjacent property owner is responsible for ROW tree planting and maintenance. • Street Tree Maintenance is outlined in the Edmonds Street Tree Plan and includes maintenance standards for water, fertilizer application, pruning, treating disease, avoiding damage, and reducing plant competition.	• Applicant shall maintain all replacement trees in a healthy condition for 5 years. • The applicant shall be obligated to replant any replacement tree that dies, becomes diseased, or is removed during the 5-year time period.	• Not explicitly defined for street trees. • All protected trees and required replacement trees shall be maintained in a healthy condition. • Pruning and maintenance of protected trees shall be consistent with the ANSI A300 standards and ISA best management practices for proper pruning. *(LFPMC 16.14)*	All planted trees and replacement trees shall be maintained in good health and condition by an applicant, or their successor in interest, in accordance with the issued right-of-way use permit or other authorizing permit. *(SMC 12.30.040)*

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Code Enforcement, Penalties & Mitigation for Violations	• Any person who violates the provisions or fails to comply with requirements shall be guilty of a gross misdemeanor, subject to the penalties set forth in SMC 1.10.010. • Maximum fine of $5,000 per occurrence and imprisonment not to exceed one year. *(SMC 21.03.060.K)*	• Violation or failure to comply with Ch 12.38 is subject to enforcement set forth in BMC Chapter 1.15. (*BMC 12.38)* • Violations constitute a misdemeanor, unless otherwise designated as a gross misdemeanor. • Violations are punishable by jail imprisonment for a maximum term no more than 90 days or by fines no more than $1,000 or both. • Gross misdemeanor punishable by fine no more than $5,000 or by imprisonment no more than 12 months or both. *(BMC 1.15)*	• Public Works enforces this chapter. • If a tree is planted contrary to provisions, the director of public works may remove the tree. A second violation is a misdemeanor. *(EMC 18.85)*	• Penalty for violations shall be a fine equal/up to 3x value of the damaged/cut tree/removed vegetation, plus cost of remediation. Trees and other vegetation to be appraised per the Council of Landscape and Tree Appraisers. • Unauthorized tree removal remediation shall include - Remove remaining plant parts/debris - Prepare replanting plan - Pay costs for City review, approve, administer, etc. - Install required trees. - Maintain required trees for 5 years.	• Violations are addressed by the administrator. • Liability for violations shall be the joint and responsibility of the landowner and any person performing the activity. *(LFPMC 16.14)*	• It is the responsibility of the parks, fleet, and facilities manager to manage and oversee the planting, care maintenance, and removal of all trees on public ROW and city-owned property. • No penalties or violations identified. *(SMC 12.30)* **Figure 2.**
Nuisance, e.g., Damage Caused by Trees as Criteria for Removal	N/A	• City maintains trees planted by the City, may remove any tree located on/near City property that presents unsafe condition, disrupts utilities or public improvements, or has major disease/insect infestation. (*BMC 12.38)*	• Not addressed in Street Tree Chapter 18.85. • Nuisance trees may be removed with supporting documentation of damage and any tree work attempting to rectify the nuisance. *(EMC 23.10)*	• Not addressed in tree chapter. • Nuisance trees are regulated under MICC 8.24, but tree removal is not explicitly discussed.	N/A	N/A