CITY OF RAINIER

STREET TREE PLAN

Prepared for

The City of Rainier

and the

Thurston Regional Planning Council

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City of Rainier

STREET TREE PLAN

Introduction

The City of Rainier's "physical and aesthetic character" will be enhanced with a long-term plan providing street tree 'themes' and space for trees. This street tree plan, coupled with creative landscape plantings and preservation of native trees in new developments, parks, critical areas, open spaces, and residential lots will insure that the environmental health, economic, and aesthetic benefits of trees to a community grow with time

Trees are one of the most useful design elements on individual projects, but must be planned on a community wide basis so that diverse elements of the entire city are linked. This linkage cannot possibly be achieved if urban forestry planning proceeds on a project by project basis. Space for trees must be created to achieve the long-term benefits that trees provide for the entire community.

Cities have embraced a combination of tree protection and tree planting to ensure that the hard concrete lines of development are softened by tree lined boulevards, curved and planted walkways, shady parks, and natural areas. These planted and protected areas are enhanced by the natural instincts of humans to plant trees around their dwellings.

As we continue to press on the edges of our native forests with our increasingly dense urban and suburban structure, the need to design for trees, implement sound tree protection practices, and create long-term planting plans becomes more and more critical.

By working to make our cities more comfortable and pleasant we instill pride in our citizens. Proud citizens will get more involved and work even harder to preserve, protect, and enhance our cities. This is the key to a livable city of the future.

Goals of the Street Tree Planning Process

The following are the goals of the necessary street tree planning process:

1. **Modify street standards to provide space for trees.**
2. **Modify street tree design and planting guidelines to provide for long-term development and health of the trees.**
3. **Update the tree selection list to provide durable, long-term street trees.**
4. Require street trees to be planted on all public and private streets, and in all new industrial, commercial, and residential development.
5. Provide the budget necessary to maintain street trees.
6. Aggressively solicit funding to bring existing major and minor arterials up to this long-term plan.

Only items 1-3 are addressed in this report.

Methodology for Developing the Plan

The evaluation of Rainier's street tree conditions was undertaken through the following activities:

- Collection of maps, shapefiles, and aerial photos.
- Conducted an inventory and evaluation of the condition and locations of the street trees and open planting spaces on selected arterials and collectors as directed by Thurston County Regional Planning.
- Determine the appropriate tree species for use in the rights-of-ways for comprehensive street tree planning and develop street tree themes for use on the arterials and collectors.

Observations

The first step in management of any resource is an inventory to determine the extent, condition, and needs of (in this case) the street tree community.

Since all life is rooted in the soil, geologic and soil survey information was examined to determine the physical characteristics of the soils in Rainier. The information pertinent to management of trees includes: general fertility levels, drainage, depth to root restrictions, organic matter contents, plant available water capacity, and windthrow potential. The suitability for wildlife, construction and engineering properties was also examined. This information was then considered when recommendations were made with regard to tree protection areas, tree species selection, and planting designs.

An inventory of the existing street trees on the rights-of-ways along the city arterials and collectors was done, as per Thurston Regional Planning Council.

Soils and Site Information

The topography of the study area was flat to gently sloping. The soils are predominantly formed in glacial drift deposited by the most recent of several continent-sized glacial ice sheets. The soils generally consist of compact basal till covered by a thin, discontinuous layer of ablation till.

Over 95% of the study area is on the Spanaway gravelly sandy loam soil type. This is a very deep, somewhat excessively drained soil found on terraces. It formed in glacial outwash and volcanic ash. Permeability is moderately rapid in the subsoil and very rapid in the substratum. The available water capacity for plants is low and the effective rooting depth for trees is greater than 60". Windthrow hazard is slight under normal conditions. Irrigation is necessary to establish new trees and shrubs. This is an intermediate to low productivity site for Douglas-fir and other native tree species.

Figure 1. Soil Types: 110, 111 = Spanaway gravelly sandy loam

Due to the gravelly, infertile, and droughty nature of the Spanaway soil type, amendment with a silt loam, or silty clay loam topsoil is required to establish new street trees in Rainier.

The Street Tree Inventory - Designated Arterials and Collectors

The aerial photo in Figure 2 illustrates the locations of existing street trees and open planting spots in the study area. The street trees included planted street trees, trees planted by neighbors in the street tree zone, and native trees in the street tree zone. The street tree zone is simply the area along the edge of the street rights-of-way.

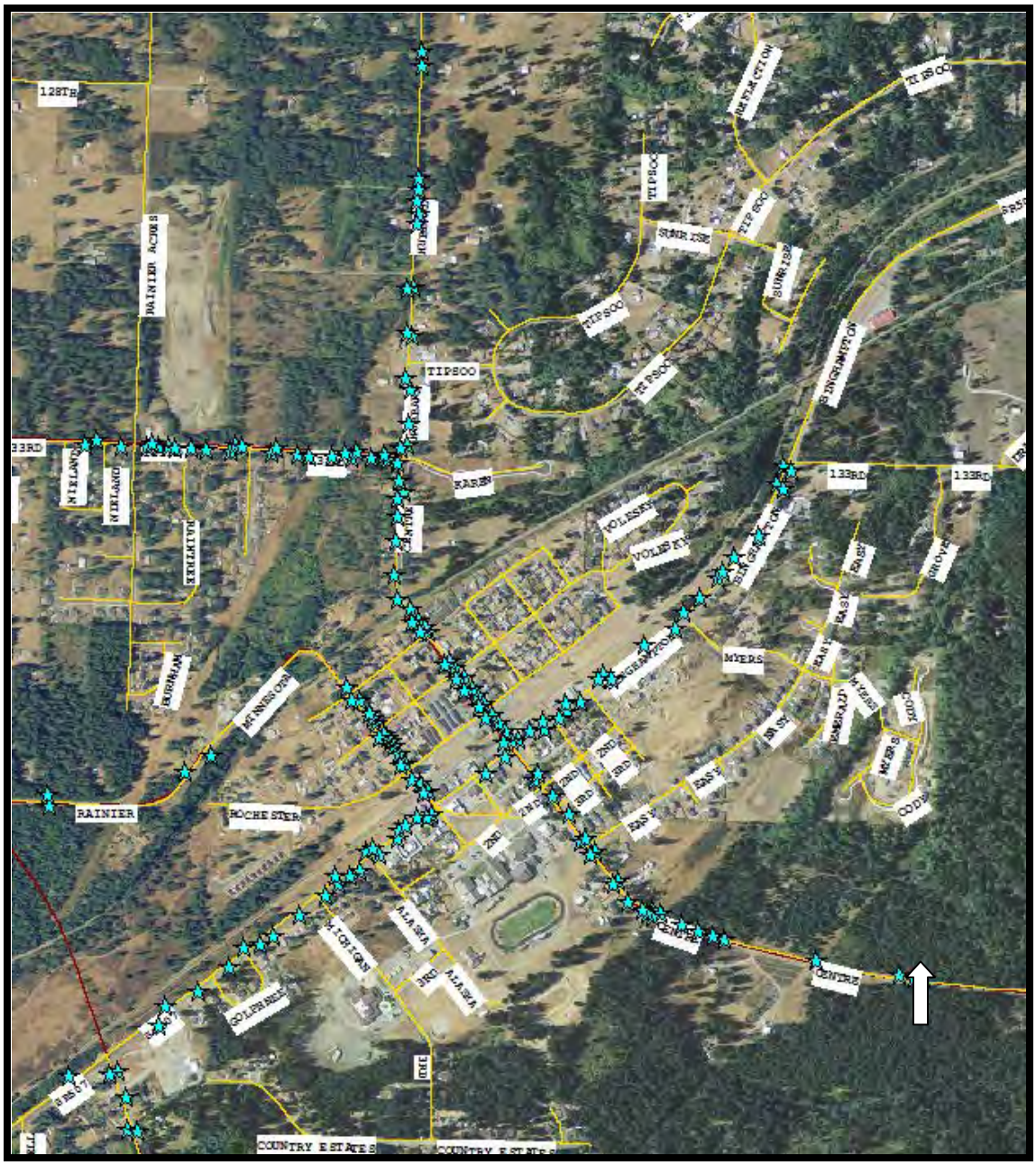


Figure 2. Street tree survey. Each star is an existing street tree or open planting spot. Shows extent of study area. Enlarged maps are provided in Appendix II.

The study area included the following arterials and collectors:

- SR507/Binghampton Drive
- Vail Cut-Off Road
- Minnesota St.
- Rainier Road SE
- Algyer Road SE
- Center St. South
- Center St. North
- Hubbard St. SE
- 133rd Ave. SE

A 100% inventory of existing trees and open planting spots was conducted. Information on tree species, size, condition, and the planting site was collected.

We found 9 species of Trees on the rights-of-way. They included a mix of planted trees and native trees in the street tree zone. Hawthorne and Callery pear were the predominant street tree species, with all other species being planting by adjacent landowners, or native trees. The planted street trees ranged from 2 to 9 inches diameter (measured at 4.5 ft. above the ground line). The other street trees or native trees ranged from 5-38 inches DBH.

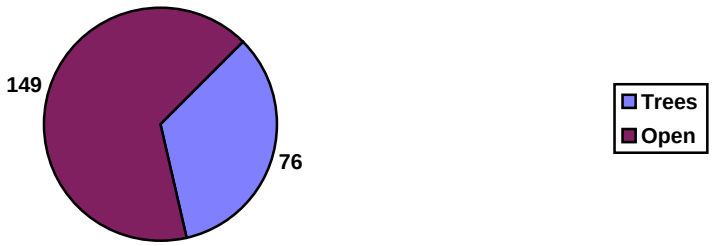
The hawthorne street trees were mostly in Poor condition and the Callery pears were mostly rated in Good condition. Overall, 45% of the street trees were rated in Good condition, 20% in Fair condition, and 35% in Poor condition. Most of the trees in Poor condition exhibited poor vigor and dieback.

Table 1. Summary of existing trees, tree conditions, and open planting spots on the arterials and collectors in the study area.

Species	DBH Range (in)	Tree Condition			
		Good	Fair	Poor	Total
Hawthorne	2-9		4	13	**17**
Callery pear	2-3	24	1		**25**
Douglas-fir	5-38	9	6	4	**19**
Lodgepole pine	7-20			8	**8**
OR White oak	6-12		2		**2**
Bigleaf maple	4-17		1	1	**2**
Apple	8		1		**1**
Cherry	12	1			**1**
Willow	4			1	**1**
Total Trees		**34**	**15**	**27**	**76**
% Composition		**(45%)**	**(20%)**	**(35%)**	
Open Planting Spots					149
Trees/Spots Under Powerlines					105

We surveyed a total of 76 existing street trees and 149 open planting spots. Over 66% of the street tree zone is not stocked with street trees, but potentially could be planted. Some planting spots will require design changes to the rights-of-way to accommodate the trees. This means that space will need to be created for trees in planter strips, grates cut into sidewalks, bump-outs created on street edges, or space behind sidewalks must be improved for trees.

Figure 3. # Trees vs. Open Planting Spots



Diversity is key in any urban forest. This helps insure that entire urban canopies are not wiped out by common maladies, such as what the Dutch elm disease did to many elms across the U.S., the chestnut blight on American chestnut, and ash decline on several species of ash. Emerald ash borer is likely the next invasive species for our area that will cause major damage.

As a rule of thumb, no more than 10-15% of the urban tree population should be of the same species. Some tree species such as red maples, green ash, London plane, and sweetgum tend to be over planted in the Pacific Northwest urban areas and should be limited or not used.

Selection of cultivars resistant to known insect or disease problems help to insure that mortality will be limited if outbreaks occur. Ice and snow storms, wind storms, or extended droughts also may impact some tree species differently. Diversity is the key to minimizing damage from abiotic and biotic influences.

There is adequate space in many locations on Rainier streets for larger scale street trees. Many of the best and longest lived street trees are the larger tree varieties. Many of the small flowering tree species are plagued by leaf diseases, twig blights, cankers, and other problems and are short-lived. Hawthorne is one of these species that is often heavily impacted by disease. Even some resistant cultivars will still have problems.

It is recommended that the existing species selection for street trees be modified to improve the quality of the Rainier street trees.

City Street Tree Maintenance and Recommendations

The 42 street trees (hawthorns and Callery pears) maintained by the City of Rainier are generally described as being young and in Poor to Good condition. Staff has raised crowns on the young trees to provide sidewalk and street clearances performed some corrective pruning. The quality of this work is good when evaluated against the current standard for proper pruning[i]. The use of stone as a mulch in the planter strip on Minnesota St. is attractive and low maintenance, but is not effective mulch for the trees. Stone adds to soil temperatures during the summer, and does not prevent moisture loss from the soils.

Photo A. View of existing Callery pears in rock mulch.

Normally, in cities with more and larger trees, all work is prioritized based on the urgency of the work. In our evaluation, we recommend removal of and replacement of 23 of the hawthorns due to poor health. The following is the recommended prioritization for future street trees.

- Priority 1 Tree Removal: Trees designated for removal have structural defects that cannot be cost-effectively or practically treated. The majority of the trees in this category have a large number of dead branches which present a safety hazard. Removal of these branches would leave a severely deformed tree, the live crown would be reduced to the point that mortality was sure, or that the tree is already in irreversible decline. Removal of trees before they are dead and in severe decline helps to prevent property damage or injury, and the tree removal is safer and theoretically less costly for a tree service to remove.

- Priority 2 Tree Removal: Trees on public property that are recommended for priority removal should be removed after priority one removals are completed. These trees may be in irreversible decline, but still be structurally sound.

- Priority 1 Large Tree Pruning: Trees are recommended for priority one pruning if there is a need to remove hazardous deadwood, hangers, cracked or broken branches. If conditions cannot be determined from the ground, then a lift truck or climber may need to be employed to do a closer inspection of the above ground parts.

- Priority 2 Small Tree Pruning: These trees require routine corrective pruning to establish scaffold branches and to raise crown for sidewalk or street clearances. Corrective pruning should be minimal after planting, and should remove crossing, damaged, and extra branches. Pruning for street clearances and sidewalk clearances depends on the length of the crown and growth rate of the tree.

- Priority 3 Monitor: Tree has structural defect that cannot be repaired, or is showing minor symptoms of decline. Tree should be monitored in spring after leaf-out and fall before leaf drop and a prescription for care developed.

- Planting Spot: This category indicates a vacant planting spot or a stump where a previous street tree had died.

The causes for tree decline and mortality in a city are many and varied. Planting shock or lack of irrigation are the most common causes of mortality for newly planted trees. The gravelly soils in Rainier present a harsh environment for trees even when amended.

The next most common cause of mortality is man-caused injury. Weed eater damage, lawnmowers, bicycles tied to trees, trees vandalized, root disturbance, or run over by cars are the most common reasons newly planted trees failed. Insect or disease problems usually are a problem in later years, unless a tree was infected with disease or infested with insects in the nursery.

It is important to remove and replace dying trees quickly to eliminate inoculum from disease or insect infestations, to maintain aesthetic quality, and to get a new tree established and growing to maintain some uniformity of the planting.

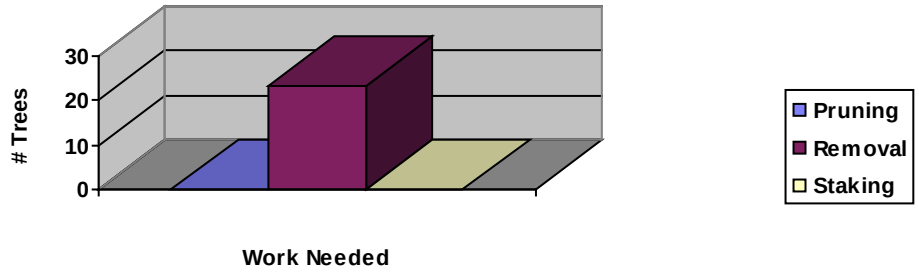
Maintenance needs by priority is described below. Work should be accomplished by priority. This may require specialized tree contractor to deal with some of the larger hazard trees. Most of the small tree work can be accomplished with city staff.

All small street trees should be inspected on a 3-year cycle. This helps to assure that pruning is accomplished on a timely basis, that damage, decline, mortality, or other problems are addressed quickly. Decline and other insect or disease problems can be identified and control methods implemented before the tree is a total loss.

Individuals that maintain weeds near the bases of trees, mow curb-lawn zones, and that do tree maintenance should be trained to recognize tree problems before they result in mortality.

All pruning should conform to the ANSI A300, Standard Practices for Trees, shrubs and Other Woody Plant Maintenance (2011). This is the recognized standard for all tree care. All pruning should be completed by an International Society of Arboriculture Certified Arborist®, or be supervised by one. It is recommended that at least one staff member of the parks maintenance staff become certified.

Figure 4. Maintenance Needs



Condition of the Street Trees

A condition rating was assigned to each tree to help assess the health of the street trees. The ratings are adapted from the *Plant Appraisal Guide* (2000), published by the International Society of Arboriculture. The condition of the foliage (if present), twigs, scaffold branches, stem, and roots is assessed, along with any hardware (stakes, cable and bracing) present in the tree. After the tree is evaluated it is rated as: Excellent, good, fair, poor, or dead.

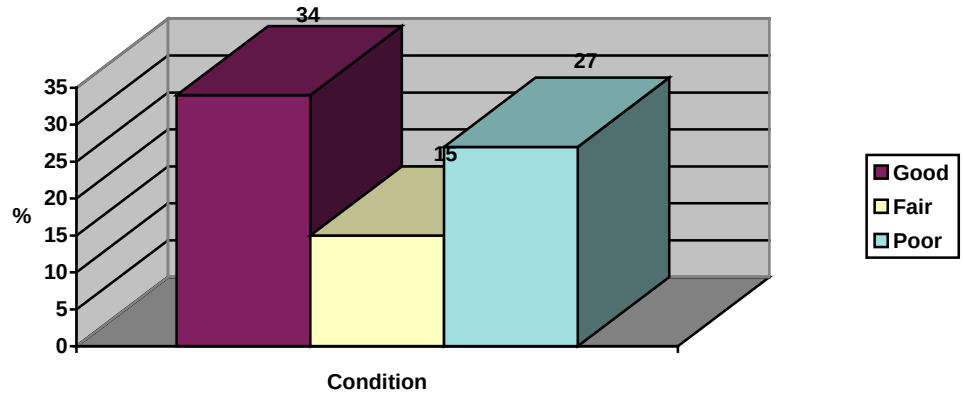
Photo B. View of existing hawthorn street trees under powerlines. Quality is poor.

Trees that are rated as dead or poor are usually recommended for immediate removal and replacement. Large trees rated as very poor usually are in irreversible decline due to root disturbance or some other factor. Small trees rated as very poor usually did not establish, or have been severely damaged since planting. Quick replacement of these trees simply gains a year of establishment and growth.

Trees rated as fair and good may need minor cultural care and are expected to be long-term trees. Trees rated as excellent are expected to be long-term trees and require no care at this time.

Approximately 65% of Rainier's trees were rated as Fair to Good. The following graph provides a summary of the condition of the city trees.

Figure 5. Condition Classes



Based on this data, removal and replacement of low vigor trees is recommended, since pruning will not improve tree health.

Priority Pruning

Pruning of any safety hazards should be completed first, followed by the routine maintenance pruning. The routine maintenance pruning should be completed in the dormant season between October 1st and February 15th.

All pruning should confirm to the ANSI A300 (2001) *Standard Practices for Trees, Shrubs and Other Woody Plant Maintenance.* This is the standard for proper tree care. All pruning should be done by an International Society of Arboriculture Certified Arborist.

When contracting with a professional tree service, it should be specified in the contract that they observe the safety guidelines for tree care operations: ANSI Z133.1 - 2001 -- *Pruning, Trimming, Repairing, Maintaining, and Removing Trees, and Cutting Brush -- Safety Requirements*.

Clearance Requirements

The types of situations where trees can interfere with visibility include: signs, sidewalks, buildings, street lights, stop lights, or sight distances for pedestrians and motorists. In all cases trees can be pruned to provide adequate clearances.

Trees and other vegetation should be *monitored annually* to identify these types of safety hazards. The annual inspection of all rights-of-way is recommended for about June 1 when the first flush of deciduous tree growth begins to slow. Trees and other vegetation that are close to these signs will begin to obscure site distances and visibility. A second inspection is also recommended for early September, after vegetation growth is complete, but before leaf drop.

The tree that requires clearance pruning should be inspected and pruned for clearance immediately. This should include native vegetation encroaching onto the streets and sidewalks as well as planted street trees.

Sidewalk overhead clearances should be a minimum of 8', but 10' is recommended. Pruning on smaller trees may need to be done over a 3-4 year period to achieve these clearances and avoid stress on the trees. Trees with thorns are especially a hazard. Generally, trees with thorns should not be planted as street trees. Where pruning for sidewalk clearance dramatically changes the look or shape of the tree, notification of the tree owner is recommended. As an option, they could be notified to prune their own trees to provide clearance with a time-frame before the City completes the work.

Street clearances must be maintained to prevent damage to vehicles and to the trees, and to maintain sight distances. A height of at least 15 feet needs to be maintained to the first branches. Any branches hanging lower will be torn off by trucks.

Trained city staff will recognize these clearance problems and correct them during routine maintenance. As a rule of thumb, branches should be pruned before they reach a diameter of 2" at the branch bark collar. This minimizes the wound size and allows a tree to quickly callus over the wound, protecting tree health.

Where branches of private trees encroach into the city rights-of-way, the city can only prune to the rights-of-way edge. In some cases this will leave stubs or unsightly branches that will die back. To maintain tree health and appearance it is recommended that all pruning cuts be made to the nearest lateral branch. Where pruning beyond the rights-of-way edge should occur to protect tree health, then landowner permission is recommended.

Overhead Utilities

The presence of overhead utility wires was noted for 105 (nearly 50%) of the existing trees trees and open planting spots. Many of the trees had been crown reduced for the overhead powerlines. Tall growing tree species under powerlines will require repeated

pruning to maintain reliability and safety for the public. Only trees with a mature height of 20' or less should be planted under utility lines to avoid costly pruning and deformation of the appearance of trees.

Photo C. View of existing street trees under powerlines. Quality is poor.

When these crown reduced trees are replaced due to mortality or other problems in the future, 'Utility Friendly' trees should be planted in those planting spots. A list of 'Utility Friendly' trees is provided in the section on street tree selections.

Curb Lawn Zone Widths

It is recommended that the designs for all new city streets include a curb lawn zone (the area between the sidewalk and the street) with a minimum width of 5 feet. Six to 8 feet is the more optimal width.

Photo D. View of narrow curblawn zone, with overhead powerlines. Only space for trees is private property behind sidewalk.

In many cases, especially where large, canopy forming trees are desired, planting the street trees behind the sidewalk is the best location. This moves trees away from the street edge, reducing car damage, pruning for clearances, and will reduce sidewalk damage. Overhead utilities are less of a problem with these planting locations. Private easements for street trees can be obtained.

Maintaining the Safety of the Street Trees

Annual evaluation of larger trees on and adjacent to rights-of-ways is necessary to identify developing hazard trees and to identify clearance pruning needs. This can normally be done with a windshield survey.

Removals

The small street trees recommended for removal are less of a hazard, but should be scheduled for replacement due to poor health and aesthetics.

The average lifespan of an urban street tree varies from 7 to 18 years. Mortality will be ongoing, and replacement should be completed during the next planting season.

Trees that require removal can be removed by city crews or on a lump-sum bid contract with private tree services. It is recommended that all large tree work and other difficult removals be handled by skilled contract tree professionals. Small tree pruning can effectively be handled by city staff.

When crews begin to remove hazard trees, public notices should be posted to avoid concerns by citizens. Much anxiety and public concern can be avoided if citizens understand that only hazard trees are being removed.

Sidewalk Damage

The majority of the street trees in Rainier are smaller trees, so sidewalk heaving is not yet a major problem. However, there will need to be some annual repair activity anytime trees grow near sidewalks or curbs.

Potential problems with new plantings can be minimized by use of root barriers along curbs and sidewalks to deflect or direct roots deeper. This will defer and with proper tree selection, can eliminate heaving problems.

Where roots of large native trees or ornamental trees adjacent to sidewalks begin to cause heaving, care must be used to avoid severe damage to the tree. Cutting of large lateral anchor roots can cause stability problems, may cause decay, and will reduce the lifespan of the tree.

Minor heaving can be temporarily repaired with an asphalt bridge between the lifted section of concrete, or the lifted edge can be ground flush. As the deflection of the section continues to rise, replacement of the section will be required. A decision to cut the root or bridge the root must be made at this time. If at all possible it is recommended that root cutting be avoided. Curving the sidewalk, leaving a cutout for the root, or raising the grade of the sidewalk to go over the top of the root is recommended. These

decisions must be made on a case by case basis. Trees in poor condition, or that would be made hazardous by the activity should be considered for removal.

Open Planting Spots

The following specifications are to be used to identify an open planting spot:

- A minimum of 4' is needed for a plantable area.
- The minimum distance to the adjacent planted trees is 25'.
- All planting spots are at least 25' away from intersections.
- All planting sites are at least 10' away from fire hydrants, driveway, utility poles and street lights.
- All planting sites are at least 10' away from any visible or identifiable underground electrical vaults.
- Planting spots with overhead (electrical conductors) or side restrictions for growing space are identified.
- Planting behind the sidewalk is preferable to narrow (4') planting spots in many cases. This may require private easements to establish medium to large street trees.

Knowing the numbers of open spots, coupled with a street tree plan with recommended species easily allows preparation of grant proposals for additional tree planting funds. Having good, demonstrable data on the urban forest will improve success in acquiring grants. These projects are also excellent to get citizen involvement.

Photo E. View of a well-designed planter strip, however tree wells are not adequate – turf is too close to tree's rootball.

The Street Tree Planning Process

The process of street tree planning encompasses all aspects of street design, soils and tree biology, planting, maintenance, and ordinances that affect street trees.

Planting Design Patterns (Themes)

There are four general designs for planting trees in the community. The type of design depends upon space available, both above and below ground, presence of other native tree stands, the character of the area, and effect desired.

1. **Formal Design:** This approach is strongly advocated to provide spatial definition to street corridors, and continuity between different types of areas within the city. This type of planting scheme works well in grid type street designs and long, linear corridors that lack space for groupings of trees. Trees are normally planted in rows. Species diversity is usually limited, but not so limited that monocultures are created.
2. **Informal Design:** This approach utilizes clustering, planting a variety of species, with irregular spacing intervals by design, or because of space limitations. This design is more often applicable in suburban areas or newly developing areas where space can be created on and off of rights-of-ways for tree plantings. It can however, be used in virtually every zone of the city achieving more species diversity. Informal plantings are most common in parks, and along park corridors.
3. **Combined Design:** In some cases, informal plantings can be used to break-up the more formal rows of trees, where space is provided. This is especially useful in commercial and industrial areas to help break up the moonscape of asphalt and buildings. Plant size, shape, color, seasonal flowering, fall coloration and growth rates are the most critical factors to consider when combining planting designs.
4. **Wildlife Design:** This concept utilizes clusters, layers of vegetation, and a variety of species of trees and shrubs to attract songbirds and small mammals. This design is best utilized near critical areas or other open spaces, and in parks. Safety and security must be considered when creating these types of dense plantings. Most trees with higher value for wildlife trees are not suitable for the street environment due to size, form, or fruit production.

Mature Tree Size

Street tree plantings are limited by space. Large trees require wide planter strips or areas for the tree roots to explore to avoid damage to curbs, sidewalks, and underground utilities. Powerlines, adjacent buildings, overhanging awnings, and vehicle clearances are the most common above ground restrictions to growing space. Planting a tree with space to achieve its mature size will greatly increase the aesthetics and useful life of the street tree, while dramatically reducing the maintenance costs.

Longevity of the Species

Communities must fight the urge to plant fast growing tree species such as soft maples, poplar, and birch. Generally the fast growing tree species have shorter life-spans, are more easily damaged by storms, and cause more damage to curbs and sidewalks. This results in higher maintenance costs, requires replacement of trees years sooner, and upsets the visual and spatial continuity of the planting. Species such as Norway and sugar maple, linden, northern red and other oaks, and ash species tend to be more durable long-term trees.

Tree Character

The color of summer and fall foliage, presence of flowers, shape of the crown, color of bark, type of foliage and habit of branches (weeping, upright) give trees their color, texture, and form. These characteristics, along with size, longevity and growing space should be considered when selecting trees for all projects.

These tree characteristics should complement building architecture, define streets and sidewalks, accent adjacent landscaping, and add diversity along Rainier streets.

Trees are defined as having form that is:

1. Columnar
2. Round- full crowned, or spreading (upright, oval, globose)
3. Pyramidal (conical)
4. Vase shaped
5. Weeping
6. Irregular
7. Multi-stemmed
8. Fountain

Multi-stemmed trees are less desirable for street trees due to line-of-sight obstruction and sidewalk clearances. In most cases, tall growing trees are best since it is easy to raise crowns for ground and vehicle clearances. Signs for adjacent businesses can be exposed by crown raising. Ground signs work well with trees.

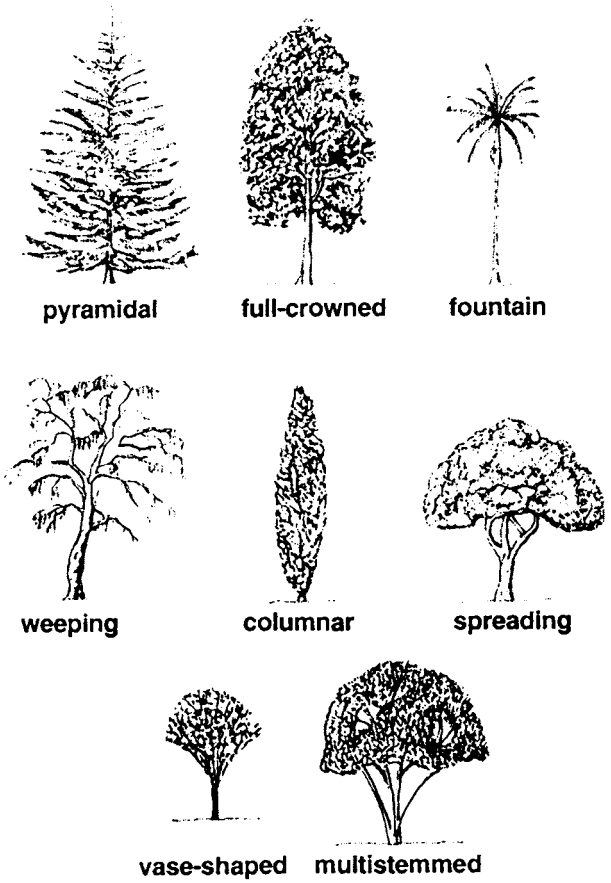


Figure 6. Illustration of Tree Shapes.

The form is critical in selecting trees to fit the growing space, and providing amenities such as screening of incompatible land uses or unsightly buildings, protecting views of vistas or signs, or lining streets in formal designs.

The summer color of a tree generally includes hues of green or shades of red or maroon. Reddish color summer foliage is used to break up the monotony of a formal, linear street tree planting, or accenting an informal design. Long rows of reddish foliage are considered more monotonous than facades created by tall, green canopies.

Fall color is more often considered when selecting seasonal color. Contrasting yellow fall coloration with occasional red or orange colored trees (or vice versa) catches the eye and stirs the 'ooh and aah' emotion common to the finale of a fireworks display.

The texture of a tree is not just apparent between conifers and deciduous trees. It varies greatly between deciduous tree species with simple leaves of differing shapes such as oaks and maples, to compound, bi- and tri-pinnately compound leaves on ashes, locusts, and mimosa. Subtle color differences accentuate the differences between leaf shapes.

Conifers also vary greatly in texture. Needle color, length, density, shape, and presence of cones create startling contrasts between tree species. Consider the differences between western red cedar, western hemlock, Douglas-fir, noble fir, and western white pine. All are strikingly different and can create attractive clusters in informal, combined, or wildlife plantings. When combined with deciduous accent trees, year-round beauty is created.

Hardiness to the Pacific Northwest

The temperate climate of Rainier (hardiness zones 7-8-USDA Hardiness Zone Map) allows many tree species to thrive, though some insect and disease populations also are well suited to the climate. Most of our common and most valued street tree species are native to the Midwestern and eastern United States.

Genetic selection is constantly improving the trees available from nurseries, as is the knowledge of growing them. Some cultivars of Pacific Rim species further improve the disease resistance of small trees available for use on Rainier streets.

Diversity of Street Trees

It is very important to avoid over planting a single species. We learned from Dutch elm disease and Chestnut blight to populate our cities with a diversity of tree species. Threats from ash decline, an actinomycete that threatens red maple, sudden oak death, oak wilt, gypsy moths, and other maladies will require that urban foresters be vigilant.

Tree Selection

The following selection of trees in Table 2 is suitable for planting as street and landscape trees within the city of Rainier. This list includes large, medium, and small size trees for planting in all types of growing spaces. Species of flowering trees are selected based upon their colors and resistance to insect and disease problems, and low amounts of plant debris.

Species include red, orange, maroon, and yellow fall coloration. There is however, a great variation as to the timing and interval of fall leaf drop. For example, green ash cultivars turn yellow and drop their leaves within a week, while cultivars of white ash will have maroon leaf color, and may persist for 2-3 weeks. Unfortunately, leaf drop is not something that can be controlled if diversity is desired in street tree populations.

Trees that hold and drop leaves all winter long (such as pin oak and sweetgum) are to be avoided. Severe damage has occurred to sweetgums from early snowfalls and ice storms. Most sweetgum varieties will hold their leaves until the end of December (occasional exceptions). While their fall coloration is exceptional, planting more than a few accent trees should be avoided until cultivars with earlier leaf drop are available.

The following is a general list of tree species that should be considered Rainier's Street Tree List. All commercial, industrial, and residential projects should utilize this list. Selections should be in concert with the continuity provided by existing trees planted on adjacent portions of the street. Where existing street trees are of an undesirable, unhealthy, or inappropriate species, consideration should be given to re-treeing the entire area.

In short, trees can be chosen on a project basis, but must fit the overall plan for what has already been planted, or will be planted as part of the overall comprehensive street tree plan. More specific street tree themes will be provided for all major and minor arterials, and collectors in Table 3.

Table 2. General list of trees for Rainier

COMMON NAME	BOTANICAL NAME	CULTIVAR	MATURE HEIGHT	CROWN SPREAD	SPACING	FALL COLOR
Large >50' Tall					40-50'	
Autumn Purple Ash	*Fraxinus americana*	Autumn Purple	50'	35'		Maroon
Sugar Maple	*Acer saccharum*	Commemora-tion	60'	35'		Yellow
Greenspire Linden	*Tilia cordata 'Greenspire'*					Yellow
Northern Red Oak	*Quercus rubra*					Red, burgundy
Scarlet Oak	*Quercus coccinea*		60'	40'		Red, orange
Medium-Narrow Crowns 40-50' Tall					25-35'	
Bowhall Red Maple	*Acer rubrum*	Bowhall	40'	15'		Orange
Parkway Maple	*Acer platanoides*	Columnar-broad	40'	25'		Orange
Medium – Wider Crowns 40-50' Tall					35-40'	
Norwegian Sunset Maple	*Acer truncatum x A. platanoides*	Keithsform	45'	35'		Burgundy, red, orange
Summit Ash	*Fraxinus pennsylvanica*	Summit	45'	25'		Yellow
Patmore Ash	*Fraxinus pennsylvanica*	Patmore	45'	35'		Yellow
October Glory Red Maple	*Acer rubra*	October Glory	45'	35'		Orange
Honeylocust	*Gleditsia triacanthos*	Shademaster	45'	35'		Yellow
Red Horsechestnut	*Aesculus x carnea*	Briotti	30'	35'		Yellow
Autumn Gold Ginkgo	*Ginkgo biloba*	Autumn Gold				Yellow
Small Trees <35' Tall					25-40'	
Pacific Sunset Maple	*Acer truncatum x A. platanoides*	Warrenred	30'	25'		Red, burgundy, orange
Black Tupelo Gum	*Nyssa sylvatica*		35'	20'		Orange, red
Crimson Sentry Maple	*Acer platanoides*	Crimson Sentry	25'	15'	30-40'	Purple
Snowgoose Cherry	*Prunus spp.*	Snowgoose	20'	20'		Reddish
Spire Cherry	*Prunus x hillieri*	Spire	30'	10'		Reddish

COMMON NAME	BOTANICAL NAME	CULTIVAR	MATURE HEIGHT	CROWN SPREAD	SPACING	FALL COLOR
Flowering Crabapple	*Malus spp.*	Snowdrift, Red Baron, Prairiefire	20’	20’		Reddish
Japanese Snowbell	*Styrax japonicus*		25’	25’		Yellow
Rustica Rubra Saucer Magnolia	*Magnolia soulangiana*	*Rustica Rubra*	30’	15’		Burgundy
Rocky Mt. Maple	*Acer grandidentatum*	Schmidt	25’	15’		Red, orange
Galaxy Magnolia	*Magnolia spp.*	Galaxy	30’	15’		Yellow
Golden Desert Ash	*Fraxinus oxycarpa*	Aureafolia	20’	18’		Yellow
Chinese Kousa Dogwood	*Cornus kousa*	Chinensis	20’	20’		
Serviceberry	*Amelanchior x grandiflora*	Autumn Brilliance	20’	15’		Red, maroon
Flowering Plum	*Prunus cerasifera*	Thunder-cloud	20’	20’		Purple
Paperbark Maple	*Acer griseum*		25’	20’		Red
Tatarian Maple	*Acer tatarian*		25’	20’		Yellow, orange
Trident Maple	*Acer buergeranum*		20’	20’		Red, orange
Flame Maple	*Acer ginnala*	Flame	20’	20’		Orange, red, deep red
David’s Maple	*Acer davidii*		30’	25’		Yellow
Sargent Cherry	*Prunus sargentii*		30’	30’		Reddish
Small Trees – Narrow <35’ Tall					25-30’	
Redmond Linden	*Tilia americana*	Redmond	35’	25’		Yellow
Pyramidal European Hornbeam	*Carpinus betulus*	Fastigiate	35’	25’		Yellow
Hedge Maple	*Acer campestre*	Evelyn	35’	30’		Yellow
Callery Pear	*Pyrus calleryana*	Redspire or Cleveland Select	35’	25’		Red, maroon
Red Cascade Mt. Ash	*Sorbus americana*	Dwarfcrown	18’	8’		
Japanese Tree Lilac	*Syringa meyeri*	Palibin	7’	5’		

**Other species or cultivars may be appropriate but must be approved by the City of Rainier.*

If conifers are used in informal plantings, then the following species are appropriate for use in Rainier:

Western red cedar (*Thuja plicata*)
Douglas-fir (*Pseudotsuga menziesii*)
Giant sequoia (*Sequoia gigantea*)
Alaska Yellow Cedar (*Chamaecyparis nootkatensis* and ‘Pendula’)
Austrian pine (*Pinus nigra*)
Deodar Cedar (*Cedrus deodara*)
Shore Pine (*Pinus contorta* var. contorta)
Western white pine (*Pinus monticola*-blister rust resistant cultivars)

All trees planted as street trees and other landscape trees in Rainier should meet the standards defined as the American Standard for Nursery Stock (ANSI Z60-1-2004). This standard specifies height, caliper, and rootball diameter standards for nursery stock. It also provides standards for container stock and shrubs.

In addition to specifying that stock meet the ANSI standard, the stock should have 1) strong central leaders for all but small, spreading trees, 2) show evidence of cultural pruning by the nursery, including corrective pruning and crown raising, 3) be free of damage from nursery lifting and shipping to site, 4) be free of insects, diseases, and other pests, and 5) the rootball should be intact, not broken from rough handling.

The trees should not be picked up from the nursery until time to plant the trees. Most project sites are not set up to protect trees from freezing temperatures, drying, vandalism, theft, and other maladies. If they are brought in early, all balled and burlap material should have rootballs covered with sawdust or clean woodchips, and irrigation must provided daily in absence of rains (except during the dormant season). During the dormant season the woodchips or sawdust must just be kept moist. Container stock must be irrigated daily during the growing season. The trees must be monitored closely. Holdover time should be minimal (less than 1 week if possible).

Trees must be handled carefully when they arrive from the nursery to avoid stem and branch damage, and to avoid breaking the rootball. Plan the operation to minimize handling of the trees. If the rootball is broken, then consider that the tree is now a bare root tree, and the potential for survival and rapid establishment has been greatly reduced. Do not accept broken root balls from the nursery.

If trees are included as part of a contract, provide detailed specifications to prevent planting of inferior or damaged trees. Do not be afraid to reject trees due to poor quality. A detailed tree specification for use on projects is provided in Appendix III.

To help insure that proper size of high quality trees of the desired species are procured for street projects, it is recommended that the City of Rainier procure their own trees and bid only the installation of the trees on projects. For large future projects, it is recommended that a reputable nursery be contracted to provide the species, quality, and numbers of trees needed for the project. Tree quality will be greatly improved and the street tree design plan will continue to move in the planned direction.

Street Tree Themes

The following street tree themes are recommended to provide tree-lined corridors, canopies over the streets, and linkages between differing zones in the city. Detailed descriptions are provided for what were determined to be the highest need, and highest profile areas. The remainder of the arterials and collectors are described in Table 3.

SR507/Binghampton Drive

This stretch of highway includes the downtown core plus more open rural residential land uses on either end of town.

There is little existing tree planting space within the downtown core. The sidewalks abut the building frontages and are narrow. There is no space for trees in grated planter pits. The only potential to establish new trees in the downtown core is to create 'bump-outs' along the sidewalk/street edge, at the expense of parking. These types of bump-outs are common in cities today, and have a calming effect on traffic.

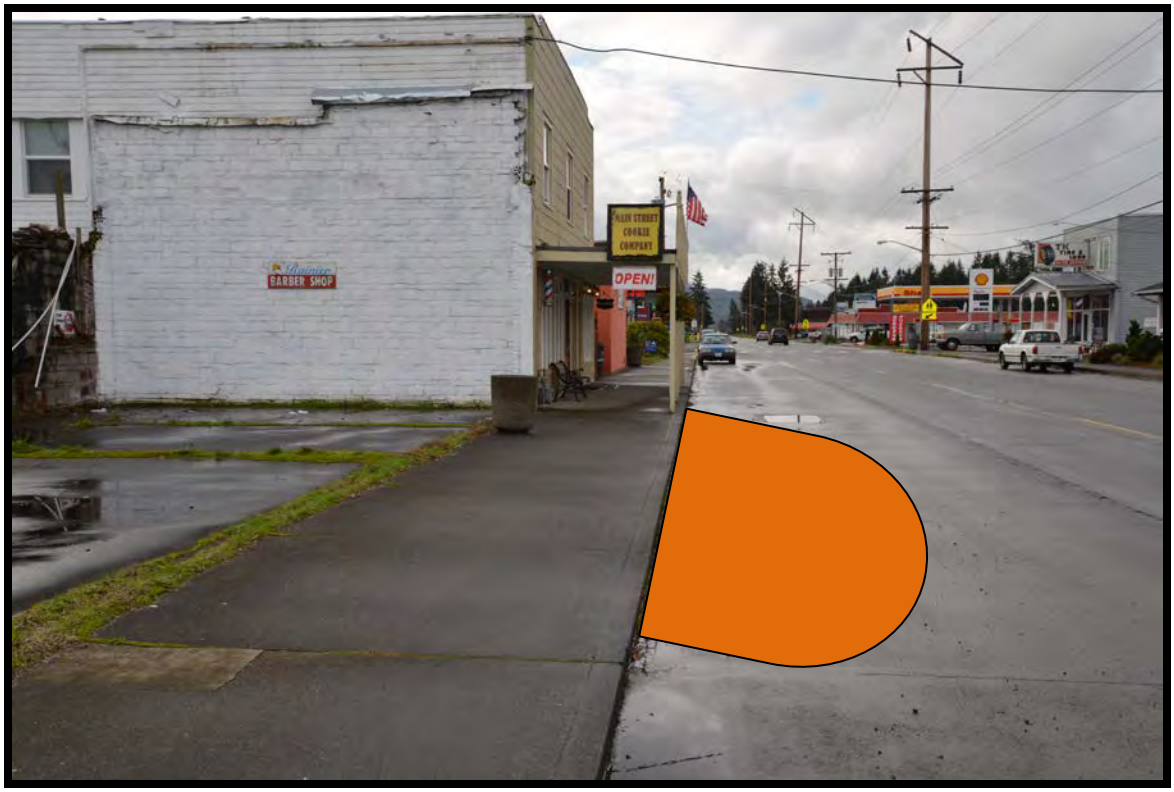


Photo E. View of downtown core from south to north on west side. No space for trees unless created. Illustrates potential bump-out traffic calming structure with space for a tree.

Photo F. View of an actual bump out constructed on busy street.

The street profile for almost the entire corridor is a 2 lane highway with sidewalks abutting the curbs. There is space for trees on the parking strip abutting the highway, but no space in the sidewalk or behind the sidewalk.

It is recommended that canopy forming trees be planted on 35 to 50 ft. centers in bump-outs along both sides of the highway in the downtown core. Where store awnings or building frontages prevent the planting of a tree with a wide canopy, then trees with narrower or columnar crowns could be used. It is important to minimize mixing tree species to provide linkage and continuity between the north and south ends of town.

The design should establish trees on a wide spacing, incorporating 3-4 different canopy forming and flowering tree species along the way. There are additional obstacles to a uniform design, including distribution and transmission power lines along portions of the route.

Where there is space behind the sidewalk outside the downtown core, then trees can be planted on private property.

Summary: Planting design – Formal

Primary street tree species – Scarlet oak

Secondary street tree species – Autumn purple ash

Secondary columnar tree species – Parkway maple

Accent tree species – Snowgoose cherry

Utility Trees – Kousa dogwood, 'Snowdrift' flowering crabapple

This planting scheme, coupled with replacement of some poor quality trees and creation of additional planting spots will change this Binghampton Drive/SR507 into a tree lined corridor. The green canopy of foliage and splendid fall coloration will warm the appearance of the street and traffic will slow. Businesses and residents will find this will be a friendly and comfortable street to shop, walk, bike and jog along, most unlike the stark conditions today. The linkage between the north and south ends of town complete.

Photo G. View looking south on SR507/Binghampton drive. Space for street trees can be created at back edge of rights-of-way, behind any future sidewalk location and out from under the powerlines.

The following table provides a summary of the proposed street tree themes for all major and minor arterials and collectors in Rainier.

Table 3. 'Street Tree Themes' for all major and minor arterials and collectors.

STREET	SEGMENT		PRIMARY TREE	SECONDARY TREE	ACCENT TREE	UTILITY TREE
	FROM	TO				
Binghamton Drive	133rd St. SE	Vail Cut-Off Rd.	Scarlet oak	Autumn Purple Ash	Snowgoose cherry	Snowdrift crabapple
Minnesota St.	Binghamton Drive	RR Trestle	Callery Pear - existing	Redmond Linden	Kousa Dogwood	Trident Maple
Minnesota St.	RR Trestle	End	Native tree cover – no street trees needed If Trees are Needed: Black Tupelo Gum	Pacific Sunset Maple	Paperbark maple	Autumn Brilliance Serviceberry
Centre St. North	Binghamton Drive	Hubbard St. SE	Commeration Sugar Maple	Norwegian Sunset Maple	Rustica Rubra Saucer Magnolia	Galaxy Magnolia
Hubbard St. SE	Centre St. North	End	October Glory Red Maple	Shademaster Honeylocust	Galaxy Magnolia	Trident Maple
133rd St. SE	Hubbard St. SE	Nieland	Norwegian Sunset Maple	Shademaster Honeylocust	Prairiefire crabapple	Desert Ash
Center St. South	Binghampton Dr.	City Limits	Patmore Ash	Norwegian Sunset Maple	Snowdrift crabapple	Pacific Sunset Maple
Vail Cut-Off Road	Binghampton Dr.	145th Ln. SE	Shademaster Honeylocust	Patmore Ash	Flowering Plum	Pacific Sunset Maple

Street Profiles for Trees

The ideal street profile to create a tree-lined street with canopy forming trees would include 8’ planter strips plus a 12-18’ wide medians. Future designs of major and minor arterials should consider this type of design where rights-of-ways permit. This design provides adequate space above and below ground for trees, minimizing damage to curbs and sidewalks. The feel and look of driving, bike riding, jogging, and walking on these types of streets in 30 years will please residents of Rainier. To achieve this effect, we must plan for it and plant it today.

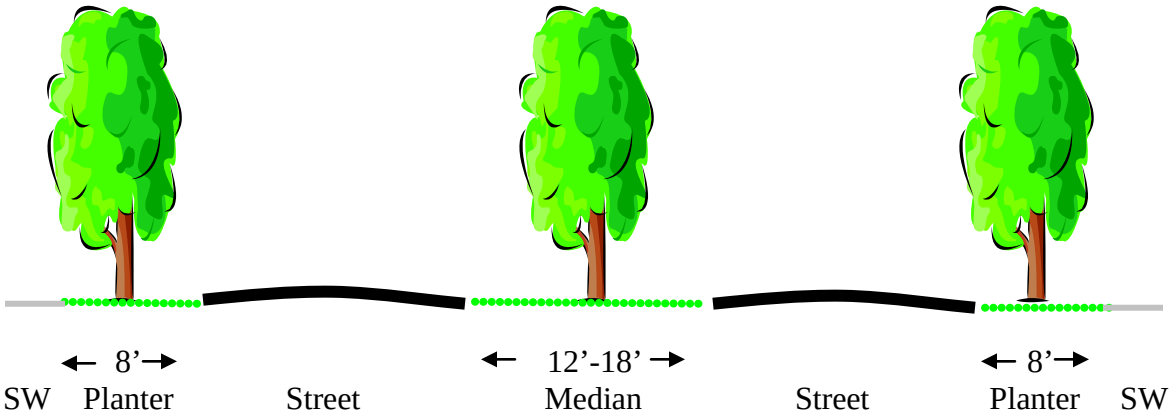


Figure 7. Ideal street design for development of maximum canopy, while providing separation between streets and sidewalks.

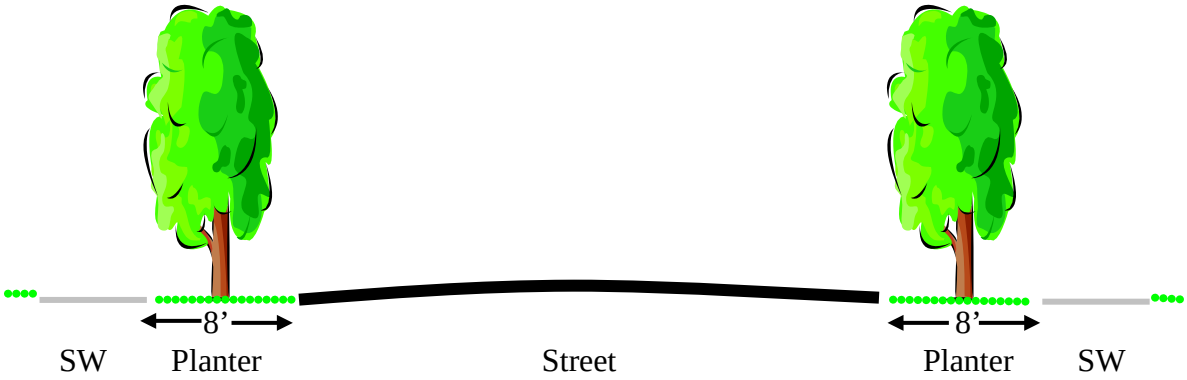


Figure 8. When space does not allow development of a full median, providing 8’ planter strips will allow development of large, canopy forming trees. Planter strips should not be less than 6’ wide. These narrow widths will only allow planting of small to medium sized trees that will not produce the canopy effect.

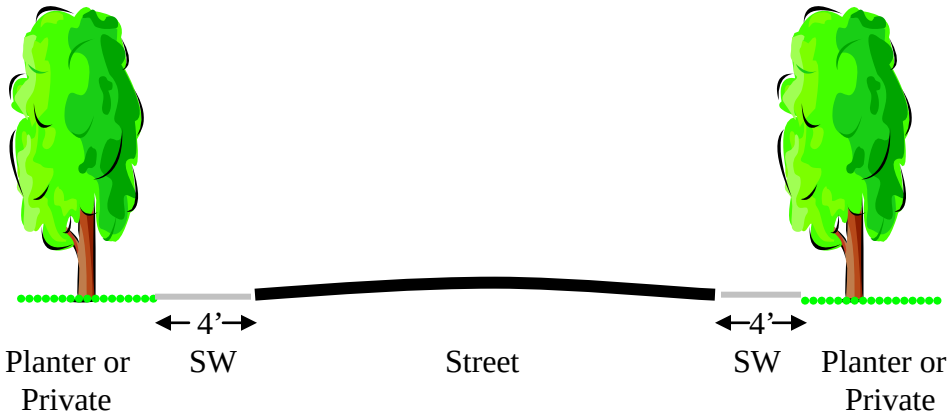


Figure 9. This is a commonly occurring street design in Rainier. Street trees, when they occur, are located on private property, or occasionally in planter strips.

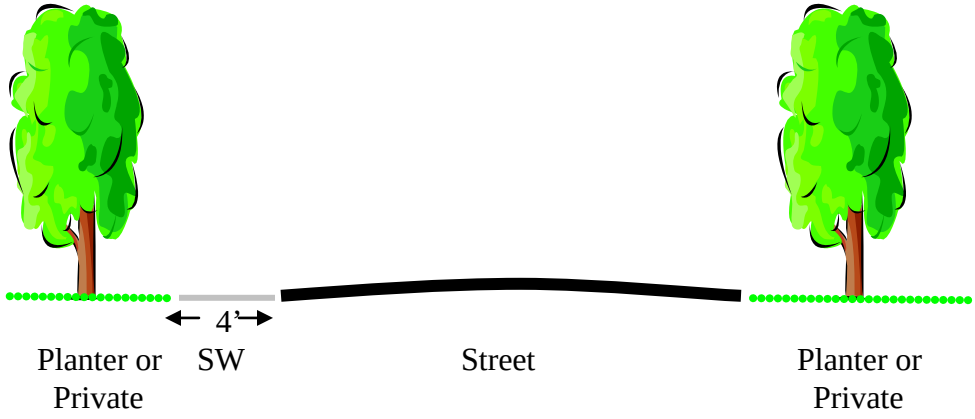


Figure 10. This is a commonly occurring street design in older neighborhoods in Rainier. In some cases no sidewalks occur. Most street trees are privately planted, without uniformity of design or occurrence.

Planting Space Recommendations

When designing sidewalks for street tree plantings, an 8' wide planter strip is recommended to accommodate large, canopy forming trees. Narrower strips increase the potential for heaving of the sidewalks and curbs. Five feet should be considered to be an absolute minimum for a planter strip, and then tree size must be adjusted for the decreased rooting space. Placing trees between the vehicle and the pedestrian provides a feeling of safety for sidewalk users, though trees are more susceptible to vehicle damage in this location.

For trees, the most desirable location is behind the sidewalk where the tree can exploit the larger soil volumes of yards and open space. Development of a canopy over the street will take longer, and will be less effective. However, trees in this location will have greater longevity and cause less hardscape damage.

Often driveways, water meters, signs, and other obstructions limit strict, uniform spacing for street trees. Compromises must then be made to achieve the visual and spatial effects provided by rows of street trees. Street tree spacing will be determined primarily by the mature size of the tree being planted. However, the purpose of the tree also is a factor.

If one is trying to screen objectionable views or less attractive structures, then tighter street tree spacing may be desirable. In an area where attractive architecture, signage, or views are to be preserved, then widen the tree spacing. Do not over plant. This will simply increase initial establishment costs, as well as future maintenance costs. Always consider the desired future visual and spatial effects – linkage, beauty, and shade.

The following are the recommended targets for street tree spacing, understanding that **variations may occur** due to obstacles or the desired effect.

Tree Type/Size	Spacing Between Trees
Large Street Trees	40’-50’
Medium Street Trees	35’-40’
Columnar Trees	25’-35’
Small Trees	25’-35’

Informal planting designs utilizing conifers in cluster plantings should be 12’-15’ on center, depending on the use of accent trees in the cluster. Each conifer must have two sides of its crown free to grow. These types of clusters of tall growing trees must be planted at least 25’ from overhead utilities, and 15’ from awnings, buildings, and signage. Screen plantings should be designed on a project by project basis and the plant spacing designed for the species used and the effect desired. Species other than listed in Table 1 may be used when dense screens are desired.

Compromises to this ideal design while still achieving some of the feel, would be 6’ planter strips with a median. Any design that places the sidewalk against the curb with the trees behind the sidewalk will sacrifice the separation of pedestrians from traffic that the planter strip provides. Though planting trees behind the sidewalk where unlimited root zone occurs is good for the tree, the same feeling of security and visual beauty is not achieved.

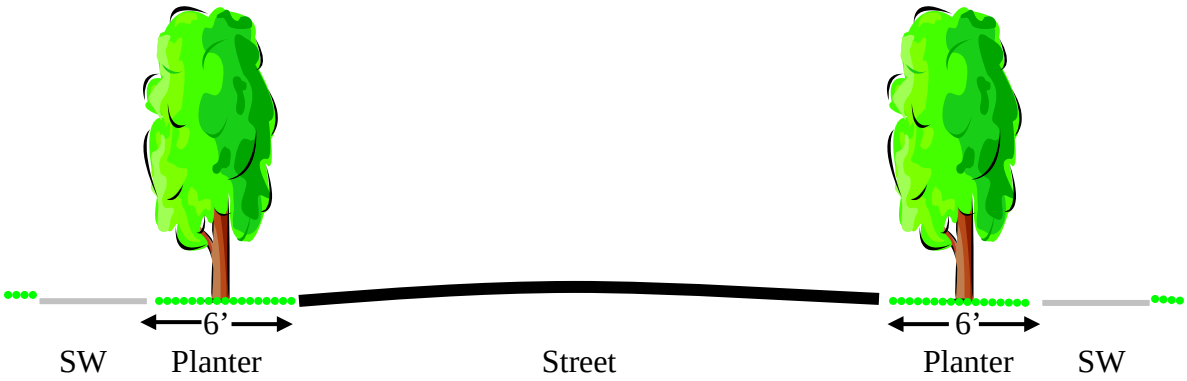


Figure 11. If space does not allow for 8’ wide planter strips, then 6’ can still be planted with medium to large street trees, however potential for root damage is higher.

Street Tree Planting and Maintenance

Ideally, the responsibility and budget for the planting and maintenance of street trees should be with the Parks Maintenance division of the Public Works Department.

The selection and design of street tree plantings should be completed by a landscape architect or urban forester, and be reviewed by the Planning Department and the Parks Maintenance Division to insure that it furthers goals outlined in the street tree plan, is compatible with the existing site conditions and the overall goals of the city.

Budget

As the street tree numbers grow, the maintenance, and thus the maintenance budget must grow. A minimum of $45-49 per tree per year is required to provide adequate care for a street tree population. As the street tree population matures, these numbers will increase. The budget should be increased annually based on the new plantings, and with a modifier for inflation.

Stock Quality

All trees should meet the American National Standard for Nursery Stock (ANSI A60.1-2004), have a strong, central leader and show evidence of cultural care in the nursery. The trees should not be damaged, and should be free of insect, insect eggs, disease, and other problems. The root balls should well-wrapped with burlap and unbroken. Trees with broken root balls, damage, poor form, or other problems should be rejected. A detailed contractual specification is included in Appendix III for street projects.

It is strongly recommended that the City of Rainier remove the street tree procurement from the overall street project contract, and only contract for planting. The city should contract for trees in advance with a reputable nursery to insure that the numbers, species,

size, and quality of trees are available when a project is constructed. This will eliminate substitution, accepting less than high quality trees, and holding stock on site for extended periods of time (1 week is the target).

Preparing the Planting Hole

The planting hole within the planter strip or behind the sidewalk often contains structural soils used in the preparation of the sub grade for the street and sidewalks. If the planter strip will be planted with grass, the entire planter strip should be backfilled with topsoil that has a silt loam or loamy sand texture. The organic matter content should be 4-6%. It should be free from contaminants.

The area where the tree is to be planted should be excavated to the proper depth so the root ball sits on native soil, and the top of the root ball will be 1" above the final soil grade. The planting hole should be at least 3 times the diameter of the rootball of the street tree. The edges of the planting hole should be shaved off to eliminate the glazed or compacted hole edge.

If a hardpan or other compacted layer occurs that will cause perching of water in the planting hole, this layer should be fractured by over excavating the hole and backfilling the native material. The area under the rootball should be firmed to prevent settling of the tree. In cases where drainage cannot be improved by over excavating, installation of drain tile may be necessary to drain the planting hole and the surrounding root zone.

Orientation of the Tree

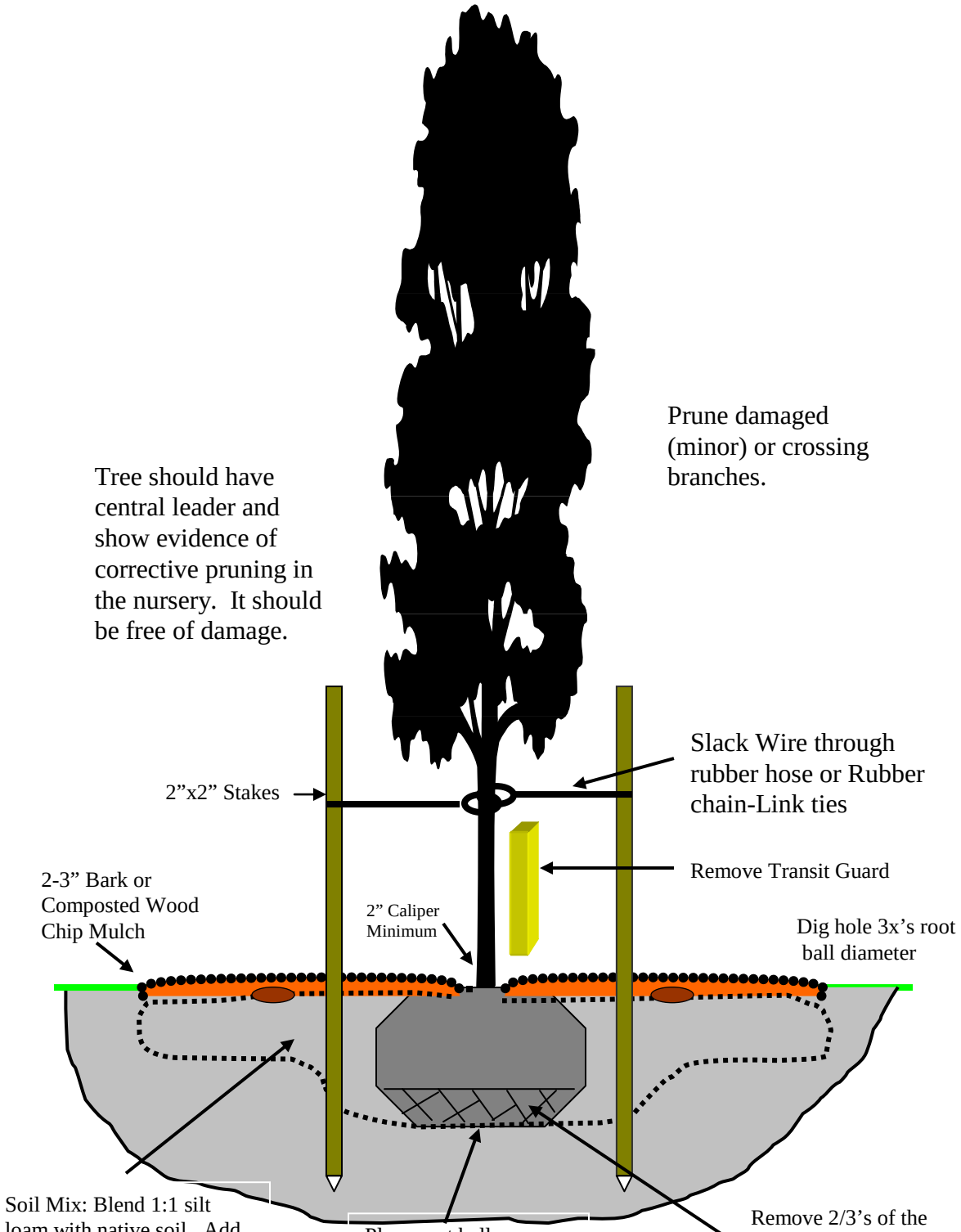
Plant the tree in the same orientation as it grew in the nursery. Most trees will be marked at the base to indicate the north side of the tree. This will reduce the potential for sunburn of the bark.

Tree Grates

Every effort should be made to avoid planting trees in tree grates within a sidewalk. Planting behind the sidewalk and within planter strips will provide a microclimate much more conducive to tree growth and survival. Planting trees at the back of a sidewalk edge with half-grates is a better alternative than full grates within a sidewalk.

If the only planting location is within the sidewalk and tree grates must be used, then the minimum size grate should be 5' x 5'. If smaller grates must be used, then small street tree cultivars must be selected for these limited spaces. Preparation of the planting soils and space is similar to planting in planter strips.

FIGURE 12. STREET TREE PLANTING DETAIL



Burlap and Wire Basket

Remove twine ties from the root collar of the tree and fold the burlap down into the hole exposing at least 2/3's of the root ball. If desired, cut out the extra burlap. If the tree has a wire basket, leave it on until the tree is in the ground and stabilized. Prior to completing backfill, cut out the upper 2/3's of the wire basket and remove from the hole.

Complete backfilling with the topsoil mix. In areas with gravely soils, blend the topsoil with native soils. In areas of Rainier with sandy loams, utilize the native material or imported topsoil's with additional silt and organic matter. If native sandy loams are used, then incorporate organic matter as described on the planting diagram.

Fertilization

Trees should be fertilized with a granular formulation of 20-10-10 at a rate of 6 pounds per 1000 square feet of surface area. This amounts to approximately 2 ounces per tree. Do not incorporate the fertilizer into the planting hole or fill soils. Salt burn of the new roots may occur. Do not apply any other root stimulants. Good weed control must accompany fertilization treatments.

Watering

All trees should be thoroughly water in to eliminate air pockets and settle the soil around the rootball. Create a small 4" high berm with soil to create a well for holding water from irrigation. This berm should be located 12" outside of the rootball.

The rule of thumb for water is to apply 2" of water per week, or follow the rates listed below:

Tree Caliper	Gallons per Week
1"	5
2"	10
3"	13
4"	18
5"	23

Monitor soil moisture contents in the root ball and the surrounding soil to determine the actual watering frequency and amounts.

Mulching

All trees should be mulched for a distance of at least 2 times the rootball diameter with 2-3" of bark mulch or composted wood chips.

Staking

All deciduous trees 1.5" to 2.5" caliper and conifers taller than 5' should be staked with two stakes. Trees should be staked with 2" x 2" or round wooden stakes that are 6' long. The stake must be tall enough to provide support to the tree. The stakes should be driven firmly into the ground outside of the root ball. They should be placed straight up and down, and be equidistant from the tree. Trees should be oriented to support the tree against the prevailing winds.

The stake ties should be rubber chain-link, installed snug but not stretched. The tree needs to be able to move slightly to develop normal stem diameter and taper. Avoid wire and hose ties.

The stakes and ties should be inspected several times in the first year. Vandalism and accidental damage occurs frequently. Once the tree becomes established, usually one year, remove the stakes and ties. Ties left on trees long-term will often girdle the tree. Trees larger than 2.5" caliper will require 3 stakes. Trees larger than 4" caliper should be guyed with three cables and buried earth anchors.

Trunk Wraps

Trunk wraps are used to prevent sunburn on new trees. This is usually not a problem, however if trunk wraps are used, they should be made of paper and left on the tree for 1 year.

Transit guards should not be left on the tree as trunk wraps. They are designed to protect the stem of the tree during transport only. Molds, insects, and other fungi may be attracted to the moist, shady confines of the transit guard.

Root Collar Protectors

Plastic sleeves should be installed on all newly planted trees to protect the root collars from lawn mowers and weed eaters. These protectors should be left on the trees until trees are 6" caliper, or the protector becomes snug.

Grass and weeds should not be allowed to grow in the tree well, removing the temptation to mow or weedeat near the stems. Root collar damage from weed eaters is a major cause of tree mortality, and/or reduced vigor.

Pruning

Newly planted trees that were well cultured in the nursery should need only minor pruning to remove crossing branches, or branches damaged during transport and planting. Pruning in successive years to provide sidewalk and street clearance, improve the branch structure of the tree, and maintain central leaders should conform to the American

National Standard ANSI A300 (2001), *Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices* (Pruning).

This small tree pruning is critical to provide a strong tree and branch structure for the future, minimizing storm damage, and the need for additional pruning. Pruning should be completed by an arborist certified by the International Society of Arboriculture, or supervised by a certified arborist. No more than 20% of the live branches should be pruned in any one year.

Inspections

The newly planted trees should be inspected several times in the first year to adjust stakes and note other cultural concerns. Prior to release of the 1 year bond or end of the 1 year guarantee for trees planted as part of a street project, the trees should be inspected by a certified arborist. Trees that were unhealthy or poorly handled often 'hang on' for some time after planting. Specialized expertise is needed to identify the trees that are in decline, but still alive. This inspection must take place when trees are foliated.

Timing of Tree Planting

Tree planting should not occur between May and October. Trees planted during this time will be stressed and survival and establishment will be reduced. The following is a general window for planting the different types of trees.

Stock Type	Timing of Planting
Balled and Burlap	October 15th through May 1st
Containerized	October 15th through May 1st
Bare-Root Stock	February 15th through April 15th

Fall planting of B&B and containerized stock is preferred, since tree roots will grow for part of the winter. This will improve establishment and early growth.

Maintenance Recordkeeping

As trees are planted in the city of Rainier, maintenance records need to be updated on the street tree inventory system. This will help with tracking of stake removal, weed control, pruning needs, and hazard assessment. This system is up and running and simply needs to be maintained and refined as needed.

Street Tree Management Units. – The only soils based separation in Rainier street tree populations are soils that are 1) excessively drained gravels, 2) sandy soils, and 3) poorly drained soils.

Geographically, it is recommended that the management units be based on the Rainier planning areas.

Figure 13. Calendar for tree planting and maintenance activity.

ACTIVITY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Tree Planting:												
Balled & Burlap and Containerized	←	—	—	→						←	—	→
Bare-Root Stock		←	—	→								
Fertilization: Surface Applied			↔		↔					↔		
Watering					←	—	—	—	→			
Weed Control			←	—	—	—	—	—	—	→		
Integrated Pest Management – Scouting		←	—	—	—	—	—	—	—	—	→	
Pruning:												
Spring Flowering Trees					↔							
Summer Flowering Trees	←	—	→							←	—	→
All Other Shade Trees and Conifers	←	—	→							←	—	→
Storm Damage Assessment-As Needed	←	—	—	—	—	—	—	—	—	—	—	→

Trees and Planting Specifications

The following summarizes the tree and planting specifications:

All trees and shrubs should conform to the American Standard for Nursery Stock ANSI Z60.1-2004 for size, root ball diameter, and quality, and be planted according to industry standards, including mulching. All street trees should have a well-defined central stem and show evidence of corrective cultural pruning in the nursery.

Tree planting should occur in the spring between March 1 and June 1, or preferably in the fall between October 1 and December 1. Irrigation should be provided to the trees and shrubs at least weekly during the summer, in the absence of adequate rainfall.

Summary

We found 42 planted, city maintained street trees and 149 open planter spaces within the study area. Of the 149 open planter spots, 105 had overhead powerlines. Portions of these arterials and collectors were stocked with native trees adjacent to the street, so there was no space for street trees.

Street tree maintenance for the 42 trees is good, but the use of more suitable mulch than the drain rock is necessary to support good tree growth. Species selections for planting, and matching species to site need to be modified. We need to diversify the species mix and increase the tree numbers on Rainier's streets.

The best opportunity to make the greatest change/improvement in Rainier is to create space and plant trees along Binghampton Drive/SR507 through the downtown core. Currently there are not suitable planting space or soils conditions to plant trees. Significant improvements will need to be made to create bump-outs and prepare the soils and site conditions to support tree growth. Tree grates are **not** recommended for street trees.

In the downtown area, the presence of well designed street tree plantings will slow traffic, cause people to stop, linger, patronize the business and generally be a much more attractive area than provided by the hard lines of the concrete and wood structures lining SR507 today.

On other city streets, planting street trees in the yards or private property behind the sidewalks will provide the best opportunity for trees that will thrive. Neighborhoods with tree lined streets and shady sidewalks also slow traffic, improve property values, and help to encourage a more walkable, friendly community.

Where native forest encroaches on the street and there is little to no space for street trees, then do not plant street trees.

Many cities are living with the infrastructure that was built 50 years or more ago. Space was not provided for trees, and the street tree situation today is poor. We have to create space in street design for trees, otherwise in 40 years our great grandchildren will be having the same conversation about street trees that we are having today.

Appendix I

Tree/Planting Spot Inventory

(Tree numbers in the list are shown on the maps in Appendix II)

(7 pages attached)

Tree #	SPECIES	DBH(in)	CONDITION	PROBLEM	WORKNEEDED	WRKPRIORTY	COMMENTS
1			Other	None	Other	Other	open space, overhead powerlines, 300 ft
2			Other	Other	Other	Other	open space, overhead powerlines, 400 ft
3			Other	Other	Other	Routine	open space, overhead powerlines,400 ft
4	Hawthorne	4	Poor	Major Dieback	Remove tree	Routine	overhead powerlines
5	Hawthorne	4	Poor	Major Dieback	Remove tree	Routine	overhead powerlines
6	Hawthorne	2	Fair	None	Other	Other	overhead powerlines
7			Other	Other	Other	Routine	open space, overhead powerlines, 500 ft
8			Other	Other	Other	Routine	open space, overhead powerlines,50 ft
9			Other	Other	Other	Routine	open space, overhead powerlines, 80 ft
10			Other	Other	Other	Routine	open space, 100 ft
11			Other	Other	Other	Routine	open space, drainage ditch, 50 ft
12	Fir - Douglas	12	Good	None		Routine	
13			Other	Other	Other	Routine	open space, overhead light, 70 ft
14			Other	Other	Other	Routine	open space, 200 ft
15			Other	Other	Other	Routine	open space, 150 ft
16			Other	Other	Other	Routine	open space, 200 ft
17			Other	Other	Other	Routine	open space, 200 ft
18			Other	Other	Other	Routine	open space, 200 ft
19	Hawthorne	2	Fair	None	Other	Routine	overhead powerlines
20	Hawthorne	2	Fair	None	Other	Routine	overhead powerlines
21	Fir - Douglas	38	Fair	Minor Dieback	Prune	Routine	crown clean
22			Other	Other	Other	Routine	open space, 40 ft
23			Other	Other	Other	Routine	open space, 30 ft
24			Other	Other	Other	Routine	open space, 150 ft
25			Other	Other	Other	Routine	open space, 50 ft x 4 ft
26			Other	Other	Other	Routine	open space, 30 ft x 4 ft
27			Other	Other	Other	Routine	open space, 40 ft
28	Hawthorne	9	Poor	Thinning Crown	Remove tree	Routine	replace tree
29	Hawthorne	8	Poor	Minor Dieback	Remove tree	Routine	topped, overhead powerlines, planter box
30			Other	Other	Other	Routine	open space, 20 ft
31			Other	Other	Other	Routine	open space, 100 ft
32	Hawthorne	5	Poor	Major Dieback	Remove tree	Routine	replace tree
33	Fir - Douglas	20	Fair	None		Routine	
34	Hawthorne	6	Fair	None		Routine	topped
35			Other	Other	Other	Routine	open space, drainage ditch, 20 ft
36			Other	Other	Other	Routine	open space, 250 ft
37			Other	Other	Other	Routine	open space, 70 ft
38			Other	Other	Other	Routine	open space, 70 ft
39			Other	Other	Other	Routine	open space, 150 ft
40			Other	Other	Other	Routine	open space, 200 ft
41			Other	Other	Other	Routine	open space, hill side, 500 ft
42			Other	Other	Other	Routine	open space, overhead powerlines, 750 ft

Tree #	SPECIES	DBH(in)	CONDITION	PROBLEM	WORKNEEDED	WRKPRIORTY	COMMENTS
43			Other	Other	Other	Routine	open space, overhead powerlines, hill side, 700 ft
44			Other	Other	Other	Routine	open space, overhead powerlines, 700 ft
45			Other	Other	Other	Routine	open space, overhead powerlines, 700 ft
46	Hawthorne	3	Poor	Major Dieback	Remove tree	Routine	overhead powerlines, topped
47	Hawthorne	3	Poor	Major Dieback	Remove tree	Routine	overhead powerlines, topped
48	Hawthorne	3	Poor	Major Dieback	Remove tree	Routine	overhead powerlines, topped
49	Hawthorne	3	Poor	Minor Dieback	Remove tree	Routine	overhead powerlines, topped
50	Hawthorne	4	Poor	Major Dieback	Remove tree	Routine	overhead powerlines, topped
51	Hawthorne	4	Poor	Major Dieback	Remove tree	Routine	overhead powerlines, topped
52	Hawthorne	3	Poor	Major Dieback	Remove tree	Routine	overhead powerlines, topped
53			Other	Other	Other	Routine	open space, planter, overhead powerlines, 30 ft x 7 ft
54			Other	Other	Other	Routine	open space, planter, overhead powerlines, 10 ft x 4 ft
55			Other	Other	Other	Routine	open space, overhead powerlines, 40 ft
56			Other	Other	Other	Routine	open space, overhead powerlines, between rd and sidewalk, 50 ft x 4 ft
57			Other	Other	Other	Routine	open space, 30 ft
58			Other	Other	Other	Routine	open space, 150 ft
59			Other	Other	Other	Routine	open space, poor drainage, 60 ft
60	Apple	8	Fair	None		Routine	
61			Other	Other	Other	Routine	open space, overhead powerlines, dense brush, not suitable for planting, 300 ft
62	Fir - Douglas	26	Poor	Thinning Crown		Routine	
63	Maple - Bigleaf	17	Fair	Tight_V Crotches		Routine	
64	Oak - OR White	6	Fair	None		Routine	
65	Oak - OR White	12	Fair	None		Routine	
66			Other	Other	Other	Routine	open space, hill side, drainage ditch, 100 ft
67			Other	Other	Other	Routine	open space, 100 ft
68			Other	Previous Failure	Other	Routine	open space, 1200 ft
69	Fir - Douglas	7	Fair	None		Routine	
70	Fir - Douglas	14	Good	None		Routine	
71			Other	Other	Other	Routine	open space, shaded by trees, 100 ft
72	Fir - Douglas	5	Poor	None		Routine	suppressed
73	Fir - Douglas	13	Good	None		Routine	
74	Fir - Douglas	13	Good	None		Routine	
75			Other	Other	Other	Routine	open space, overhead powerlines, 1500 ft
76			Other	Other	Other	Routine	open space, overhead powerlines, hill side, 75 ft
77			Other	Other	Other	Routine	open space, overhead powerlines, 200 ft
78	Fir - Douglas	18	Poor	Major Dieback	Remove tree	Routine	overhead powerlines, topped
79	Pine - Lodgepole	7	Dead	Other	Remove tree	Routine	overhead powerlines, dead
80	Pine - Lodgepole	11	Poor	Major Dieback	Remove tree	Routine	overhead powerlines, topped

Tree #	SPECIES	DBH(in)	CONDITION	PROBLEM	WORKNEEDED	WRKPRIORTY	COMMENTS
81	Pine - Lodgepole	17	Poor	Other	Remove tree	Routine	overhead powerlines, topped
82	Willow - other	4	Poor	None	Remove tree	Routine	sprouting in fence, overhead powerlines
83	Pine - Lodgepole	14	Poor	Other	Remove tree	Routine	overhead powerlines, topped
84	Pine - Lodgepole	20	Poor	Other	Remove tree	Routine	overhead powerlines, topped
85	Pine - Lodgepole	19	Poor	Other		Routine	overhead powerlines, topped
86	Pine - Lodgepole	20	Poor	Other	Remove tree	Routine	overhead powerlines, topped
87			Other	Other	Other	Routine	open space, overhead powerlines, 110ft
88			Other	Other	Other	Routine	open space, overhead powerlines, 50 ft
89	Maple - Bigleaf	4	Poor	Other	Remove tree	Routine	sprouting in fence, overhead powerlines
90			Other	Previous Failure	Other	Routine	open space, overhead powerlines, 300 ft
91			Other	Other	Other	Routine	open space, overhead powerlines, planter strip, 100 ft x 3 ft
92			Other	Other	Other	Routine	open space, 75 ft
93			Other	Other	Other	Routine	open space, 75 ft
94			Other	Other	Other	Routine	open space, 100 ft
95			Other	Other	Other	Routine	open space, 25 ft
96			Other	Other	Other	Routine	open space, overhead powerlines, 60 ft
97			Other	Other	Other	Routine	open space, 60 ft
98			Other	Other	Other	Routine	open space, overhead powerlines, 60 ft
99			Other	Other	Other	Routine	open space, 60 ft
100			Other	Other	Other	Routine	open space, overhead powerlines, 150 ft
101			Other	Other	Other	Routine	open space, 150 ft
102			Other	Other	Other	Routine	open space, overhead powerlines, 200 ft
103			Other	Other	Other	Routine	open space, 200 ft
104			Other	Other	Other	Routine	open space, overhead powerlines, 250 ft
105			Other	Other	Other	Routine	open space, brush and trees off row, 250 ft
106	Fir - Douglas	23	Fair	None	Prune	Routine	prune for clearance
107	Fir - Douglas	16	Good	None		Routine	
108	Fir - Douglas	17	Good	None		Routine	
109	Fir - Douglas	15	Good	None		Routine	
110	Fir - Douglas	13	Good	None		Routine	
111			Other	Other	Other	Routine	open space, 800 ft
112			Other	Other	Other	Routine	open space, 800 ft
113			Other	Other	Other	Routine	open space, 800 ft
114			Other	Other	Other	Routine	open space, 800 ft
115	Fir - Douglas	34	Poor	Tight_V Crotches	Remove tree	Routine	potential for failure
116			Other	Other	Other	Routine	open space, planter, 20 ft x 6 ft
117			Other	Other	Other	Routine	open space, planter, 20 ft x 10 ft
118			Other	Other	Other	Routine	open space, 30 ft
119			Other	Other	Other	Routine	open space, 30 ft
120			Other	Other	Other	Routine	open space, 30 ft x 4 ft
121			Other	Other	Other	Routine	open space, 30 ft x 4 ft

Tree #	SPECIES	DBH(in)	CONDITION	PROBLEM	WORKNEEDED	WRKPRIORTY	COMMENTS
122			Other	Other	Other	Routine	open space, 15 ft x 4 ft
123			Other	Other	Other	Routine	open space, 50 ft
124			Other	Other	Other	Routine	open space, 30 ft x 5 ft
125			Other	Other	Other	Routine	open space, planter, 40 ft x 4 ft
126			Other	Other	Other	Routine	open space, 30 ft
127			Other	Other	Other	Routine	open space, 12 ft x 6 ft
128			Other	Other	Other	Routine	open space, 40 ft x 4 ft
129			Other	Other	Other	Routine	open space, 30 ft
130			Other	Other	Prune	Routine	open space, 200 ft
131			Other	Other	Prune	Routine	open space, overhead powerlines, 10 ft x 10 ft
132			Other	Other	Other	Routine	open space, overhead powerlines, 150 ft
133			Other	Other	Other	Routine	open space, overhead powerlines, hill side, 30 ft
134			Other	Other	Other	Routine	open space, overhead powerlines, hill side, 100 ft x 6 ft
135			Other	Other	Other	Routine	open space, overhead powerlines, black berry brush,120 ft
136			Other	Other	Other	Routine	open space, overhead powerlines, 75 ft
137			Other	Other	Other	Routine	open space, next to powerlines, 75 ft
138			Other	Previous Failure	Other	Routine	open space, overhead powerlines, 50 ft
139			Other	Other	Other	Routine	open space, overhead powerlines, 30 ft x 12 ft
140			Other	Other	Other	Routine	open space, overhead powerlines, 100 ft x 5 ft
141			Other	Other	Other	Routine	open space, overhead powerlines, 10 ft
142			Other	Other	Other	Routine	open space, overhead powerlines, 30 ft x 4 ft
143	Cherry - Other	12	Good	None		Routine	
144			Other	Other	Other	Routine	open space, overhead powerlines, planter, 30 x 8 ft
145	Hawthorne	3	Poor	Major Dieback	Remove tree	Routine	overhead powerlines
146			Other	Other	Other	Routine	open space,overhead powerlines, 40 ft x 5 ft
147			Other	Other	Other	Routine	open space, overhead powerlines, drainage ditch, 175 ft
148			Other	Other	Other	Routine	open space, overhead powerlines, 80 ft
149			Other	Other	Other	Routine	open space, overhead powerlines, drainage ditch, 40 ft
150			Other	Other	Other	Routine	open space, overhead powerlines, drainage ditch, 40 ft
151			Other	Other	Other	Routine	open space, overhead powerlines, drainage ditch, 20 ft
152			Other	Other	Other	Routine	open space, overhead powerlines, drainage ditch, 20 ft
153			Other	Other	Other	Routine	open space, overhead powerlines, drainage ditch, 20 ft

Tree #	SPECIES	DBH(in)	CONDITION	PROBLEM	WORKNEEDED	WRKPRIORTY	COMMENTS
154			Other	Other	Other	Routine	open space, overhead powerlines, drainage ditch, 60 ft
155			Other	Other	Other	Routine	open space, overhead powerlines, drainage ditch, 150 ft
156			Other	Other	Other	Routine	open space, overhead powerlines, drainage ditch, 100 ft
157			Other	Other	Other	Routine	open space, overhead powerlines, 70 ft
158			Other	Other	Other	Routine	open space, overhead powerlines, 30 ft
159			Other	Other	Other	Routine	open space, overhead powerlines, hill side, dense brush, 90 ft
160			Other	Other	Other	Routine	open space, overhead powerlines, hill side, dense brush, 150 ft
161			Other	Other	Other	Routine	open space, overhead powerlines, 50 ft
162			Other	Other	Other	Routine	open space, overhead powerlines, 80 ft
163			Other	Other	Other	Routine	open space, between rd and sidewalk, drainage ditch, 110 ft x 5 ft
164			Other	Other	Other	Routine	open space, 110 ft x 3 ft
165			Other	Other	Other	Routine	open space, hill side, 70 ft x 3 ft
166			Other	Other	Other	Routine	open space, between rd and sidewalk,drainage ditch, 500 ft x 5 ft
167	Fir - Douglas	11	Fair	None		Routine	
168			Other	Other	Other	Routine	open space, 100 ft
169			Other	Other	Other	Routine	open space, 40 ft
170			Other	Other	Other	Routine	open space, drainage ditch, 80 ft
171			Other	Other	Other	Routine	open space, drainage ditch, 70 ft x 6 ft
172			Other	Other	Other	Routine	open space, drainage ditch, 200 ft
173			Other	Other	Other	Routine	open space, drainage ditch, brush and trees growing off row, 900 ft
174			Other	Other	Other	Routine	open space, drainage ditch, trees growing off row, 900 ft
175			Other	Other	Other	Routine	open space, brush and trees growing off row, 600 ft
176			Other	Other	Other	Routine	open space, 250 ft
177			Other	Other	Other	Routine	open space, planter, 8 ft x 4 ft
178			Other	Other	Other	Routine	open space, planter, 15 ft x 6 ft
179			Other	Other	Other	Routine	open space, planter, 20 ft x 5 ft
180	Pear - Callery	3	Good	None	Other	Routine	remove stakes
181	Pear - Callery	3	Good	None	Other	Routine	remove stakes
182			Other	Other	Other	Routine	open space, planter, missing callery pear, 10 ft x 6 ft
183	Pear - Callery	3	Good	None	Other	Routine	remove stakes
184	Pear - Callery	2	Good	None	Other	Routine	remove stakes

Tree #	SPECIES	DBH(in)	CONDITION	PROBLEM	WORKNEEDED	WRKPRIORTY	COMMENTS
185	Pear - Callery	3	Good	None	Other	Routine	remove stakes
186	Pear - Callery	2	Fair	None	Other	Routine	remove stakes
187	Pear - Callery	3	Good	None	Other	Routine	remove stakes
188	Pear - Callery	3	Good	None	Other	Routine	remove stakes
189	Pear - Callery	3	Good	None	Other	Routine	remove stakes
190	Pear - Callery	3	Good	None	Other	Routine	remove stakes
191	Pear - Callery	3	Good	None	Other	Routine	remove stakes
192	Pear - Callery	3	Good	None	Other	Routine	remove stakes
193			Other	Other	Other	Routine	open space, planter, 70 ft x 6 ft
194			Other	Other	Other	Routine	open space, planter, 55 ft x 6 ft
195			Other	Other	Other	Routine	open space, planter, overhead powerlines, 35 ft x 6 ft
196			Other	Other	Other	Routine	open space, planter, overhead powerlines, 15 ft x 6 ft
197			Other	Other	Other	Routine	open space, planter, overhead powerlines, 45 ft x 6 ft
198			Other	Other	Other	Routine	open space, planter, overhead powerlines, 5 ft x 5 ft
199			Other	Other	Other	Routine	open space, planter, overhead powerlines, 10 ft x 6 ft
200	Pear - Callery	2	Good	None	Other	Routine	remove stakes, overhead powerlines
201	Pear - Callery	2	Good	None	Prune	Routine	crown clean, remove stakes, overhead powerlines
202	Pear - Callery	3	Good	None	Other	Routine	remove stakes, overhead powerlines
203	Pear - Callery	2	Good	None	Other	Routine	remove stakes, overhead powerlines
204	Pear - Callery	3	Good	None	Other	Routine	remove stakes, overhead powerlines
205	Pear - Callery	3	Good	None	Other	Routine	remove stakes, overhead powerlines
206	Pear - Callery	3	Good	None	Other	Routine	remove stakes, overhead powerlines
207	Pear - Callery	3	Good	None	Other	Routine	remove stakes, overhead powerlines
208	Pear - Callery	3	Good	None	Other	Routine	remove stakes, overhead powerlines
209	Pear - Callery	3	Good	None	Other	Routine	remove stakes, overhead powerlines
210	Pear - Callery	3	Good	None	Other	Routine	remove stakes, overhead powerlines
211	Pear - Callery	3	Good	None	Other	Routine	remove stakes, overhead powerlines
212	Pear - Callery	3	Good	None	Other	Routine	remove stakes, overhead powerlines
213			Other	Other	Other	Routine	open space, planter, overhead powerlines, missing callery pears, 30 ft x 6 ft
214			Other	Other	Other	Routine	open space, overhead powerlines, 20 ft
215			Other	Other	Other	Routine	open space, overhead powerlines, 40 ft
216			Other	Other	Other	Routine	open space, 20 ft
217			Other	Other	Other	Routine	open space, overhead powerlines, 80 ft
218			Other	Other	Other	Routine	open space, 30 ft x 6 ft

Tree #	SPECIES	DBH(in)	CONDITION	PROBLEM	WORKNEEDED	WRKPRIORTY	COMMENTS
219			Other	Other	Other	Routine	open space, dense brush, not suitable for planting, 300 ft
220	Fir - Douglas	19	Fair	None		Routine	
221			Other	Other	Other	Routine	open space, 200 ft
222			Other	Other	Other	Routine	open space, overhead powerlines, 200 ft
223			Other	Other	Other	Routine	open space, between rd and sidewalk, drainage ditch, 200 ft x 5 ft

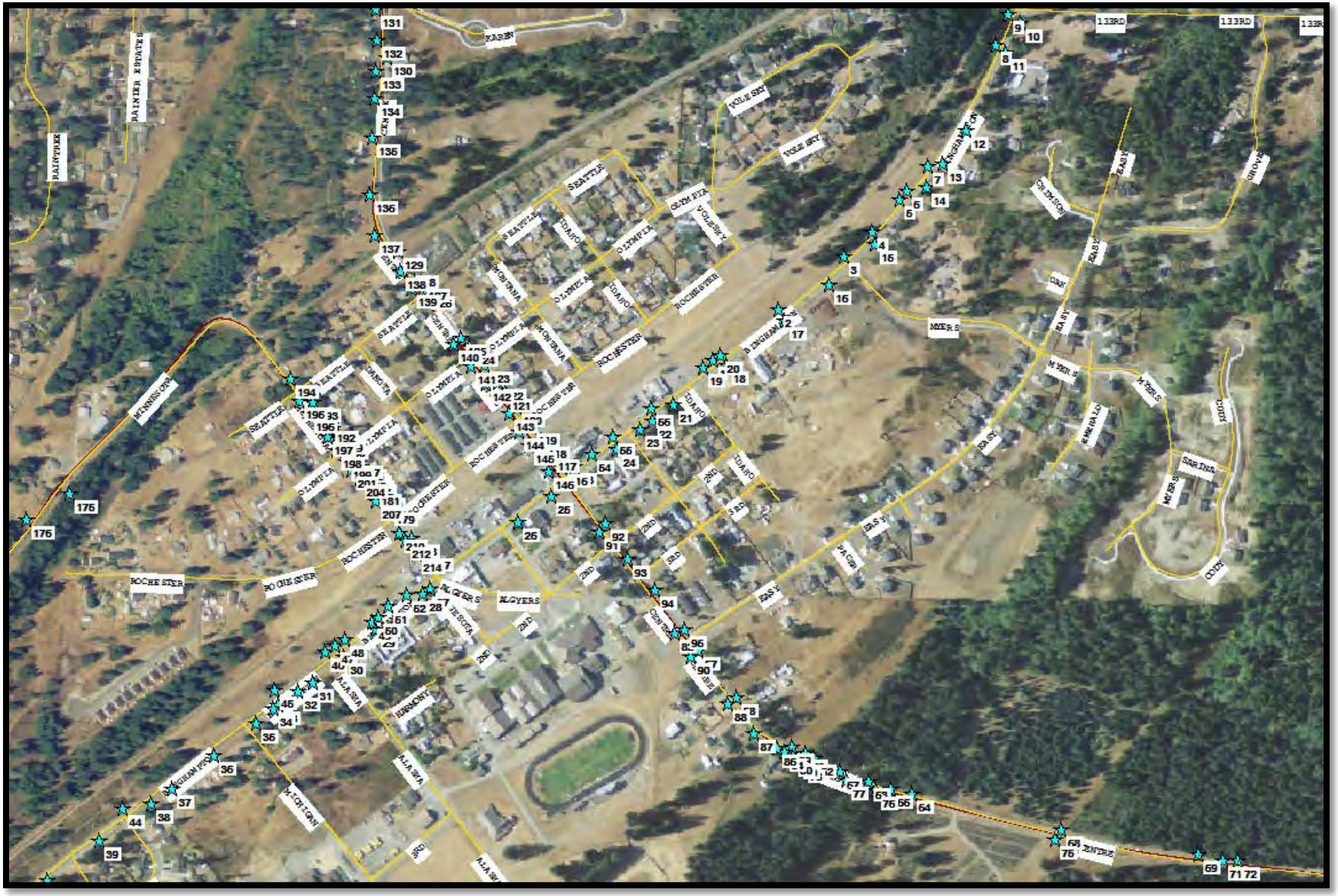
Appendix II

Tree/Planting Spot Locations Mapped
(3 pages attached)

North End of Rainier

A

Central Rainier



South Rainier

Appendix III

Tree Planting Specifications
For
Rainier Street Tree Planting Projects

I. Description of Work

These specifications include standards necessary for and incidental to execution and completion of planting street trees.

A. Specifications for the planting hole design, tree planting, mulching and watering are included.

B. Protection of existing features. During construction, protect all existing trees, shrubs, and other specified vegetation, site features and improvements, structures, and utilities specified herein and/or on submitted drawings. Removal or destruction of existing plantings is prohibited unless specifically authorized by the owner.

II. Applicable Specifications and Standards

A. *Principles and Practice of Planting Trees and Shrubs*. 1997. International Society of Arboriculture, P.O. Box GG, Savoy, IL 61874

B. *American Standard for Nursery Stock.* 1996. American Association of Nurserymen, Inc. 1250 I Street NC Suite 500, Washington, D.C. 20005

C. *Standardized Plant Names*. 1942. American Joint Committee on Horticulture Nomenclature, Horace McFarland Company, Harrisburg, Pennsylvania. (Second edition).

III. Planting Season

A. Planting shall be done within the following dates:

Balled and Burlaped (B&B) trees and shrubs: October 15 to May 1st
Containerized trees and other: October 1st to May 1st.
Bare rooted trees and shrubs: February 15th to April 15th.

B. Variance: If special conditions exist that warrant a variance in the above planting dates, a written request shall be submitted to the project owner stating the special conditions and the proposed variance. Permission for the variance will be given if warranted in the opinion of project owner.

IV. Planting Locations

A. The landscape contractor (hereafter referred to as Contractor) shall plant at locations to be determined and marked by the owner or other person representing the owner (hereafter referred to as the Owner's Representative).

B. Locations for individual trees will be supplied by the Owner's Representative. In some cases, the location may be inferred from reference to some identifiable field object or from some line that can be constructed in the field.

C. No tree that grows over 25 feet at maturity shall be planted under electrical utility wires.

D. No tree or shrub shall be planted within 10 feet of fire hydrants, driveways, streetlights, or intersections, or as specified by local ordinance.

V. Underground Utility Location

A. The Contractor shall contact the local utility companies for verification of the location of all underground utility lines in the area of the work. The Contractor shall be responsible for all damage resulting from neglect or failure to comply with the requirement.

B. Trees shall not be planted closer than 10 feet from water service connections, sewer laterals, or gas lines, unless so directed by the Owner's Representative. The Contractor shall be responsible for moving trees if planted closer than the specified distance.

VI. Materials

A. Topsoil provided shall be declared by the Contractor to be free from subsoil, roots, stones over 1 inch (2.5 cm) in diameter, herbicides, contaminates, and other extraneous materials. The Contractor shall dispose of materials removed. Topsoil shall be silt loam or loamy sand with 4 to 6 percent organic mater (by weight). Topsoil shall not be used in a frozen or muddy condition. The Contractor shall remove all surplus materials.

B. Plants shall be true to species and variety specified and nursery-grown in accordance with good horticultural practices under climatic conditions similar to those in the locality of the project for at least 2 years. They shall have been freshly dug (during the most recent favorable harvest season).

Unless specifically noted, all plants shall be of specimen quality, exceptionally heavy, symmetrical, so trained to be favored in development and appearance as to be unquestionably and outstandingly superior in form, compactness, and

symmetry. They shall be sound, healthy, vigorous, well-branched and densely foliated when in leaf; free of disease and insects, eggs, or larvae' and shall have healthy well-developed root systems. They shall be free from physical damage or other conditions that would prevent vigorous growth.

Trees with multiple leaders, unless specified, will be rejected. Trees with a damaged or crooked leaders, bark abrasions, sunscald, disfiguring knots, insect damage, or cuts of limbs over ¾ in (2 cm) in diameter that are not completely closed will be rejected.

Plants shall conform to the measurements specified, except that plants larger than those specified may be used if approved by the Owner's Representative. Use of larger plants shall not increase the contract price. If larger plants are approved, the root ball shall be increased in proportion to the size of the plant.

Caliper measurements shall be taken on the trunk 6 inches (15 cm) above the natural ground line for trees up to and including 4 inches (10 cm) in caliper, and 12 inches (30 cm) above the natural ground line for trees over 4 inches (10 cm) in caliper. Height and spread dimensions specified refer to the main body of the plant and not from branch tip to branch tip. Plants shall be measured when branches are in their normal position. If a range of size is given, no plant shall be less than the minimum size, and no less than 50 percent of the plants shall be as large as the maximum size specified. Measurements specified are minimum size acceptable after pruning, where pruning is required. Plants that meet measurements but do not possess a standard relationship between height and spread, according to the American Standards for Nursery Stock, shall be rejected.

Substitutions of plant materials will not be permitted unless authorized in writing by the Owner's Representative. If proof is submitted in writing that a plant specified is not obtainable, consideration will be given to the nearest available size or similar variety with a corresponding adjustment of the contract price.

C. The plant list at the end of this section is for the Contractor's information only, and no guarantee is expressed or implied that quantities therein are correct or that the list is complete. The Contractor shall satisfy himself that all plant materials shown on the drawings are included in his bid.

D. All plants shall be labeled by plant name and size. Labels shall be attached securely to all plants, bundles, and containers of plant materials when delivered. Plant labels shall be durable and legible, with information given in weather-resistant ink or embossed process lettering.

E. Certificates of Plant Inspections: Certificates of inspection shall accompany invoices for each shipment of plants as may be required by law for transportation. Certificates are to be filed with the Owner's Representative prior to acceptance of

the material. Passing inspection by federal or state governments at place of growth does not preclude rejection of plants at the work site.

VII. Selection and Tagging

A. Plants shall be subject to inspection for conformity to specification requirements and approval by the Owner's Representative at their place of growth and upon delivery. Such approval shall not impair the right of inspection and rejection during progress of the work. Inspection outside the state of Washington and Oregon shall be made at the expense of the Contractor. A Contractor's representative shall be present at all inspections.

B. A written request for the inspection of plant material at their place of growth shall be submitted to the Owner's Representative at least 10 calendar days prior to digging. This request shall state the place of growth and the quantity of plants to be inspected. The Owner's Representative may refuse inspection at this time if, in his/her judgment, sufficient quantities of plants are not available for inspection.

C. All plants shall be selected and tagged by the owner at their place of growth. For distant materials, photographs may be submitted for pre-inspection review.

VIII. Digging and Handling Plant Materials

A. Trees designated B&B shall be properly dug with firm natural balls of soil retaining as many fibrous roots as possible in sizes and shapes as specified in the most recent edition of the *American Standard for Nursery Stock*. Balls shall be firmly wrapped with nonsynthetic, rottable burlap and secured with nails and heavy nonsynthetic, rottable twine. Root collar will be apparent at surface of ball. No trees with loose, broken, or manufactured balls will be planted, **except with special written approval before planting.**

B. Plants grown in containers shall be of appropriate size for the container as specified in the most recent edition of the *American Standard for Nursery Stock,* and be free of circling roots on the exterior and interior of the root ball.

C. All other types of nursery stock shall also conform to the *American Standard for Nursery Stock.*

IX. Transportation and Storage of Plant Material

A. Fresh dug material is given preference over plant material held in storage. Plant material held in storage will be rejected if excessive growth or dieback of branches has occurred in storage.

B. Branches shall be tied with rope or twine only, and in such a manner that no damage will occur to the bark or branches.

C. During transportation of plant material, the Contractor shall exercise care to prevent injury and drying out of the trees. Should the roots be dried out, large branches broken, balls of earth broken or loosened, or areas of bark torn, the Owner's Representative may reject the injured tree(s) and order them replaced at no additional cost to the owner.

D. Plants must be protected at all times from sun or drying winds. Those that cannot be planted immediately on delivery shall be kept in the shade, well protected with soil covered with wet wood chips or other acceptable material, and kept well watered. Plants shall not remain unplanted any longer than 3 days after delivery. Plants shall not be bound with wire or rope at any time so as to damage the bark or break branches. Plants shall be lifted and handled with suitable support of the soil ball to avoid damaging it.

X. Mechanized Tree Spade Requirements

Trees may be moved and planted with an approved mechanical tree spade. The tree spade shall move trees limited to the maximum size allowed for the similar B&B root ball diameter according to the *American Standard for Nursery Stock*, or the manufacturer's maximum size recommendation for the tree spade being used, whichever is smaller. The machine shall be approved by the Owner's Representative prior to use. Trees shall be *planted* at the designated locations in the manner shown in the plans and in accordance with applicable sections of the specifications.

XI. Excavation of Planted Areas

A. Locations for plants and outlines of areas to be planted are to be staked out at the site. Approval of the Owner's Representative is required before excavation begins. A minimum of 30 percent total planting must be staked out before inspection.

B. Shrub beds are to be excavated to a depth of 1 foot (30 cm) unless otherwise indicated. Ground cover beds are to be excavated to at depth of 6 inches (15 cm), unless otherwise indicated. Tree pits shall be excavated three times wider than the diameter of the ball, unless otherwise specified by the Owner's Representative, and only as deep as the root ball to be placed in the hole. If initially dug too deep, the soil added to bring it up to the correct level should be thoroughly tamped. The sides of all plant holes shall be sloped and the bottoms horizontal. On slopes, the depth of the excavation shall be measured at the center of the hole. Poor quality subgrade soils shall be separated from the topsoil, removed from the area, and not

used as backfill or otherwise spread around in the landscape area. Pits shall not be left uncovered or unprotected overnight.

C. Detrimental soil conditions: The Owner's Representative is to be notified, in writing, of soil conditions that the Contractor considers detrimental to the growth of plant material. These conditions are to be described as well as suggestions for correcting them. Proper water drainage must be assured.

D. Obstructions: If rock, underground construction work, tree roots, or obstructions are encountered in the excavation of plant pits, alternate locations may be selected by the Owner's Representative. Where locations cannot be changes as determined by the Owner's Representative, and where digging is permitted, submit cost required to remove the obstruction to the depth of not less than 6 inches (15 cm) below the required hole depth. Proceed with work after approval of the Owner's Representative.

XII. Planting Operations

A. Plants shall be set at the same relationship to finish grade as they were to the ground from which they were dug. Plants must be set plumb and braced in position until prepared topsoil has been places around the ball and roots. Plants shall be set so that they will be the same depth 1 year later. The trunk of the tree is not to be used as a lever in positioning or moving the tree in the planting hole.

B. Ropes, strings, and wrapping from the top half of the root ball are to be removed after the plant has been set. All waterproof or water repellant wrappings shall be removed from the ball. Remove at least the top half of the wire basket before backfilling.

C. The roots of bare root trees shall be pruned at the time of planting to remove damage or undesirable roots (those likely to become a detriment to future growth of the root system). Bare root trees shall have the roots spread to approximate the natural position of the roots and shall be centered in the planting pit. The planting soil backfill shall be worked firmly into and around the roots, with care taken to fill in completely with no air pockets.

D. When specified by the Owner's Representative, amend the backfill soil by adding 4-6 percent (by weight, 20-35 percent by volume, depending on materials) composted organic matter.

E. Basins are to be formed around tree and shrub root ball with a raised ring of soil as indicated on drawing.

F. Planting areas are to be finish graded to conform to grades on drawing after full settlement has occurred.

G. Plants are to be thoroughly watered immediately after planting.

H. Any excess soil, debris, or trimmings shall be removed from the planting site immediately upon completion of each planting operation.

XIII. Guying, Staking, Wrapping, Pruning and Mulching

A. Stake all deciduous trees over 1.5 inch caliper and all conifer trees over 5 feet tall.

B. Staking and guying shall be completed immediately after planting. Trees up to 2.5 inches caliper are to be staked with two stakes and separate flexible ties as shown on drawings. For larger trees, use 3 guy wires and ground anchors. Ground anchors are to be driven at approximately a 45-degree angle to ground plane and distributed at 120 degree intervals around the trunk. Guying cables, turnbuckles, and hose are to be attached securely until the tree is well supported.

C. Guying and staking materials: Ground anchors shall be arrowhead shaped earth anchors of malleable iron castings, aluminum castings, or stamped steel. Staking wire shall be pliable 12-gauge galvanized, twisted two strands. Guying cable shall be 5 strand, 3/16 in (5 mm) diameter steel cable. Vertical supporting stakes shall be sound hardwood or pine. They shall be a minimum of 2 x 2 in. (5 x 8 cm) in diameter, 6-8 feet (2.4 m) long, and pointed at one end. Rubber chain-link ties are to be used to secure the tree to the stakes.

D. Plants are to be pruned at the time of planting and according to best horticulture practices. Pruning of all trees will include the removal of injured branches, double leaders, watersprouts, suckers, and interfering limbs. Healthy lower branches and small twigs close to the center should not be removed, except as necessary to clear sidewalks or streets. All pruning cuts shall be clean and smooth, with the bark intact and uninjured at the edges. In no case shall more than 25% of the branching structure be removed, **leaving the normal shape of the plant in tact.**

E. All trees, shrubs, and other planting beds will be mulched with a mixture of composted wood chips or bark previously approved by the owner. The composted mulch will be free of materials injurious to plant growth, branches, leaves, roots, and other extraneous matter. The mulch will be 2 to 3 inches deep on trees and shrubs. The depth of mulch on the planting beds will be 2-3 inches. Mulch must not be placed within 3 inches (8 cm) of the trunks of trees or shrubs.

F. Antitranspirant, if required, shall be an emulsion that provides a protective film over plant surfaces and is nontoxic to all plants used. It shall be delivered in containers of the manufacturer and mixed according to the manufacturer's directions.

XIV. Maintenance of Trees, Shrubs and Vines

A. Maintenance shall begin immediately after each plant is planted and continue until the Owner's Representative has confirmed its acceptance.

B. Maintenance shall consist of pruning, watering, cultivating, weeding, mulching, tightening and repairing guy and stakes, resetting plants to proper grades and to an upright position, restoration of the planting saucer, and furnishing and applying such sprays or other materials as are necessary to keep planting free of insects and diseases and in vigorous condition.

C. Planting areas and plants shall be protected at all times against trespassing and damage of all kinds for the duration of the maintenance period. If a plant becomes damaged or injured, it shall be treated or replaced as directed by the Owner's Representative at no additional cost.

D. Watering: Contractor shall irrigate, as required, to maintain vigorous and healthy tree growth. Over-watering or flooding shall not be allowed. Contractor shall use existing irrigation facilities and furnish any additional material, equipment, or water to ensure adequate irrigation. During periods of restricted water usage, all governmental regulations (permanent and temporary) shall be followed. Should modifications of existing irrigation systems and/or schedules facilitate adherence to these regulations, the Contractor shall notify the owner of the suggested modifications. The Contractor may have to transport water from other sources when irrigation systems are unavailable.

XV. Acceptance

A. The Owner's Representative shall inspect all work for acceptance upon written request of the Contractor. The request shall be received at least 10 calendar days before the anticipated date of inspection.

B. Acceptance of plant material by the Owner's Representative shall be for general conformance to specified size, character, and quality and shall not relieve the Contractor of responsibility for full conformance to the contract documents, including correct species.

C. Upon completion and reinspection of all repairs or renewals necessary in the judgment of the Owner's Representative, the Owner's Representative shall certify in writing that the work has been accepted.

XVI. Acceptance in Part

A. Work may be accepted in parts when the Owner's Representative and Contractor deem that practice to be in their mutual interest. Approval must be

given in writing by the Owner's Representative to the Contractor verifying that the work is to be completed in parts. Acceptance of work in parts shall not waive any other provisions of this contract.

XVII. Guarantee Period and Replacements

A. The guarantee period for trees and shrubs shall begin at the date of acceptance.

B. The Contractor shall guarantee all plant material to be in a healthy and flourishing condition for a period of 1 year from the date of acceptance.

C. When work is accepted in parts, the guarantee periods extend from each of the partial acceptances to the terminal date of the guarantee of the last acceptance. Thus, all guarantee periods terminate at one time.

D. The Contractor shall replace, without cost, as soon as weather conditions permit, and within a specified planting period, all plants determined by the Owner's Representative to be dead or in an unacceptable condition during and at the end of the guarantee period. To be considered acceptable, plants shall be free of dead or dying branches and branch tips and shall bear foliage of normal density, size, and color. Replacements shall closely match adjacent specimen of the same species. Replacements shall be subject to all requirements stated in the specifications.

E. The guarantee of all replacement plants shall extend for an additional period of 1 year from the date of their acceptance after replacement. In the event that a replacement plant is not acceptable during or at the end of the said extended guarantee period, the Owner's Representative may elect subsequent replacement or credit for that item.

F. The Contractor shall make periodic inspections, at no extra cost, during the guarantee period to determine what changes, if any, should be made in the maintenance program. If changes are recommended, they shall be submitted in writing to the Owner's Representative.

XVIII. Final Inspection and Final Acceptance

A. At the end of the guarantee period and upon written request of the Contractor, the Owner's Representative will inspect all guaranteed work for final acceptance. The request shall be received at least 10 calendar days before the anticipated date for final inspection. Upon completion and reinspection of all repairs or renewals necessary in the judgment of the Owner's Representative at that time, the Owner's Representative shall certify, in writing, that the project has received final acceptance.

XIX. Planting Diagram - STREET TREE PLANTING DETAIL