
CITY OF LACEY

URBAN FOREST MANAGEMENT PLAN



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JULY 25, 2013



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Executive Summary

Background:

The City of Lacey has been regulating the protection of trees and vegetation since the mid-1970's. Policy development regarding the City's role in protecting trees, vegetation and landscape were first reviewed and adopted a few years later with the adoption of the 1985 "City of Lacey Urban Beautification Project" which was co-sponsored by the United States Department of Agriculture and Washington State Department of Natural Resources. That plan was fairly specific about recommendations for "street" corridors, parks and public space furnishings and City maintenance recommendations. It did not consider landscape concepts or tree and vegetation preservation or protection for residential and commercial development on private properties. Official City guidelines regarding tree and vegetation protection was not formulated or developed by public policy other than adoption of regulations.

The next iteration of policy development occurred with the development and adoption of the Environmental Protection and Resource Conservation Plan developed under the Growth Management Act in 1992. This Plan was prepared as an element of the Growth Management Act (GMA) Comprehensive Land Use Plan for the City of Lacey and its urban growth area which was later adopted in 1994. Trees and vegetation were a specific focus of the environmental element's Urban Forest Resources section and policies

discussed the value of preserving some of the natural characteristics of the area and emphasized the importance the urban landscape with the increased intensity of urban style development. In 2002 - 2004 the City of Lacey adopted a major update of the 1994 plan, but did not change anything in the environmental element's Urban Forest Resources section that would affect the preservation and protection of trees and vegetation. The Environmental Element and implementing habitat and wetland protection ordinances did however update and strengthen the policies that address “urban” habitats.

Following the adoption of the updated land use plans, implementation regulations were approved by the City of Lacey that continued and re-enforced earlier strategies put in motion to promote the urban style development projected in the Comprehensive Land Use Plan. Most of the implementation was not changed dramatically from what was required prior to the GMA plans update. However, beginning in 2000, the first influx of development using the new urban development provisions started to be reviewed and in 2003 and 2004 a much accelerated rate of private property development came on line as the inventory of lots from pre-GMA development was almost totally absorbed. Much of the private property being proposed for development was in areas with second growth forest species on site and appeared heavily forested.

Since the intensity of urban development was causing nearly all the trees to be removed from development sites, the Lacey City Council started receiving more complaints from Citizens about removal of trees. Council in general shared those concerns. In 2001, the Council decided we needed to update our tree and vegetation protection and preservation regulations. In order to facilitate the update or create new standards it was determined that we should have strong policies to support any updates of the regulations. It was also determined that policies should be consistent with the vision Council had for balancing intense urban development and what the City should look like regarding the forested character the City currently possesses. With the assistance of the City of Lacey urban forester to look at the technical realities of the forested nature of the City, this plan defines Lacey’s vision of urban forest and directs how we will maintain the look and feel of the Pacific Northwest Woodland character of the area.

In early February of 2005, the Council began the process of updating the forestry section of the environmental element and started a series of work-sessions including the Planning Commission. The work-sessions were designed to outline and refine the Council's vision for the city urban forestry program through development of an entirely new Urban Forestry Plan. The Urban Forestry Plan was adopted by the Lacey City Council on July 27, 2006.

In keeping with the goals of the Urban Forestry Plan to be updated every five years, the Urban Forestry Plan was updated in 2013 with a revision to technical data as well as addressing design and administration issues associated with implementation of the plan since 2006 including:

- Adding regulations for administering Class IV Forest Practices Applications
- Establishing a fee-in-lieu program for tree tracts in certain locations

- Clarification of regulations contained in LMC 14.32 pertaining to tree replacement on individual lots
- Clarification of definitions contained in LMC 14.32
- Improve inspection procedures for trees in the right-of-way

The 2013 update was preceded by a total inventory of all street trees on city arterials and collectors as well as all city-maintained street trees. The data from that inventory has also been included as an update to the plan.

Methodology for Evaluating Lacey's Urban Forest:

The first step in management of any resource is an inventory to determine the extent, condition, and needs of, in this case, the urban forest. Since all life is rooted in the soil, geologic and soil survey information was examined to determine the physical characteristics of the soils in Lacey. 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.

The evaluation of Lacey's urban forest was undertaken through the following activities:

- Collection of maps, aerial photos, Landsat images, the transportation plan, and materials relating to the City of Lacey and its urban growth area.
- Interview of City Council members regarding their perceptions about the Lacey urban forest.
- Discussion of Lacey's urban forestry and landscape ordinances with staff in Community Development, Public Works, and Parks Maintenance.
- Obtain current contract language from Public works for tree planting contracts.
- Street tree inventory and location data.
- Inventory all private trees that function as street trees on the major and minor arterials, and collectors. Determine species, size and condition of trees.
- Evaluate the condition of the City maintained street trees.
- Conduct an inventory and evaluation of the general forest canopy conditions in the City of Lacey and its urban growth area. The inventory utilized aerial photos with ground truthing of a sample of stands (city property).
- Review of the past and current street tree profiles and how well trees fit and grow in these growing conditions.
- An assessment of the city was made to determine appropriate tree species for use in the rights-of-ways for comprehensive street tree planning.
- Continue hazard tree evaluation in all Lacey Parks.
- General review of other tree conditions that exist in the City of Lacey.

- Review of ordinances that relate to tree protection and planting.

Urban Forester's Technical Review and Recommendations:

Using the methodology discussed above over the last several years, the City Urban Forester has completed a technical review of the woodland character and current wooded areas of the City of Lacey and the City's history of the being forested. At the time of incorporation, 1966, the area of the City and its urban growth area was a combination of open prairie and forest lands. Urban Forests are cyclical and our Urban Forester's findings appear to reinforce those characteristics. The following is his summary:

This study found that in 2006, 43% of Lacey and its urban growth area is covered with 1) native forests, 2) trees retained in parks, critical areas, and developed residential, commercial, and 3) residential areas, and ornamental trees planted along streets, parks, and developed areas. The remaining 57% of the land area is developed, logged and not replanted, pastures, lawn, or other areas without trees.

Tree cover in 1966, before Lacey was incorporated was only slightly higher, with 48% of the city and the urban growth area covered by trees. The remainder (52%) was cutover forest land, pastures, lawns, and development.

What appears to be a very small forested cover loss is due to significant tree retention in our older developments, replanting of streets, landscaping of parking lots, and continued retention in new developments. However, as areas such as the Hawks Prairie industrial area (Meridian Campus) continues to develop, the canopy loss will likely accelerate.

An inventory of the arterials and collectors completed in 2012, found 3,208 (an increase of 363 trees since an inventory completed in 2001) privately maintained street trees in addition to the 2,973 (an increase of 1,699 since 2001) street trees that the Parks Maintenance staff already maintains. These are in addition to all of the trees in the city parks that staff cares for.

The study found few open planting spaces within the city maintained street tree areas, indicating that staff is doing an excellent job of replacing mortality or damaged trees. The quality of maintenance of the street trees is very good, though some additional corrective pruning is needed in certain areas.

The quality of maintenance is quite variable for the private street trees. Most have received little corrective pruning to remove storm damage and extra branches. In the worst cases, required landscape trees that also serve as street trees are being severely topped or removed for perceived view improvement of business signage.

Based on the City Forester's evaluation of the urban forest in Lacey, the ordinances, visits with staff and citizens, and maintenance procedures - the following priority is recommended to improve protection and management of the Lacey urban forest:

- Continue annual maintenance activity on the existing street trees for sign clearance, corrective pruning, and clearance pruning, and complete annual hazard tree evaluations.
- Budget adequate annual funding to complete basic maintenance tasks for city street trees and some replanting.
- Continue to review all commercial and industrial projects with one or more trees. This is important in cases when, as an example, only a few Oregon white oaks occur on the site. Tree retention may have an even higher impact in areas nearly devoid of trees. Also, continue to require a minimum percentage area for tree tracts in all types of developments as well as establishing a fee-in-lieu of tree tract program in certain instances. Language regarding tree removal on private property needs to be clarified.
- Implement education programs to prevent improper pruning of required landscape trees and implement procedures for better inspection of required landscaping in the right-of-way.
- Continue to require that all trees and shrubs planted on projects within the City of Lacey meet the current ANSI Z60.1 American Standard for Nursery Stock.
- Consider appointing a tree advisory board.
- Create a ‘Lacey Friend of Trees’ award to be given to citizens, developers, or companies that have taken special care to protect, plant, or maintain significant trees or stands of trees in Lacey.
- Conduct a ‘Big Trees in Lacey’ contest to find and recognize large or specimen trees in the city.
- All new street tree plantings should be taken from the prescribed species list and matched to the growing space of the planting site. All landscape tree plantings in required landscaping on projects should be taken from the general tree list for Lacey. Other trees can be incorporated in the design upon approval of the site plan review committee.
- Solicit grant funding, corporate donations, and other funds to expand tree planting and maintenance.
- Revise the urban forest management plan every 5 years.

Goals:

The goal of managing city trees is to improve canopy cover and the aesthetic and physical benefits of trees to a community, while protecting the infrastructure from tree damage. This can have positive environmental and economic benefits to the community. In short, the urban trees should be compatible and functional, while minimizing maintenance costs. This management plan provides a detailed Goal and Policy section and technical appendixes that will assess the current urban tree conditions and make recommendations for preservation, protection, restoration, species selection, design, planting, and citizen involvement.



Streetscape in Lacey, WA

City of Lacey

URBAN FOREST MANAGEMENT PLAN

Introduction

Today, more than ever, we are a population of city dwellers. Over 75% of our citizens live within 50 miles of our shorelines in increasingly large and dense cities. Implementation of the Growth Management Act has pressed on our remaining undeveloped green spaces within growth areas, and shrunk lot sizes to the point that tree planting, not individual tree protection, is often the order of business. Areas outside the adopted urban growth areas are seeing less pressure to convert from resource and agricultural lands. While this may preserve more net “green” spaces in the long run, other islands of green such as parks, wetlands and undeveloped green spaces within the urban growth areas are becoming more precious.

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.

Urban trees provide both visual and emotional solace in our world of stressful jobs, family commitments, smart phones, and tablet computers.

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.

A significant element of maintaining a livable city is to instill pride in its character. 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.

The City of Lacey has recognized the need to protect and manage its valuable urban forest. This Urban Forest Management Plan is one of many steps the City of Lacey has undertaken to improve the benefits that its urban forest provides to the community.

Recognized Benefits of the Urban Forest:

The urban forest provides numerous environmental, psychological and economic benefits. It is critical in providing a healthy environment for people, fish and wildlife. It affects our health and sense of well being. It provides economic benefits by reducing the need for power, and water treatment. Most benefits can be measured, some cannot, and all are significant.

Environmental Benefits:

Water Quality - Clean water is vital to the health of our environment. In every area of the city, the urban forest helps to provide clean water. The urban forest intercepts rain, reducing runoff before it can occur. It absorbs and stores water which reduces the impacts of stormwater pulses, especially in developed areas, along streets and highways and in parking lots. It helps remove pollution from water and reduces excess sedimentation. Riparian vegetation shades and cools the water surface and the air in riparian areas, providing better habitat for fish and wildlife.

Erosion Control - The hard surfaces common to urban areas are impervious to water infiltration, thereby increasing stormwater runoff volume and flow. The rapidly moving water erodes soil, increases siltation in urban waterways and creates water pollution problems. Trees and other plants play a role in stabilizing soils and preventing erosion. The roots slow runoff by holding soil in place and absorbing water. Leaves diminish the impact of raindrops on bare land and mitigate stormwater volume (McPherson et al 2002).

Energy Efficiency and Temperature Control - The role of vegetation in temperature control in the Pacific Northwest is becoming more important with rising energy costs and conservation concerns. Well placed vegetation can significantly reduce energy needs and increase energy efficiency by reducing heat loss in winter and increasing cooling in summer.

In winter, evergreen vegetation can reduce wind velocity that pulls heat out of buildings and provide an insulating effect by trapping air close to buildings. Deciduous vegetation around buildings allows for solar gain in winter months, reducing heating costs. In summer, well placed trees can intercept up to 90% of the solar energy, reducing the need for air conditioning (The National Arbor Day Foundation).

Trees reduce the temperatures of heat islands that form in urban centers by shading pavement and structures. Considering this cooling effect, the larger the size of trees and the bigger the size of the green spaces, the greater the effect of the trees on climate.

Plants can be used to manipulate air movement by strategically placing them to block undesirable prevailing winds and to provide effective barriers. Walls of vegetation can be used to direct air to sites where cooling is wanted.

Improved Air Quality - Many plants of the urban forest can reduce the effects of air pollution by removing pollution, both particulates and gases, from the air. This occurs because plants reduce winds, causing particulates to settle out of the atmosphere onto plants and the ground where precipitation washes the particulates into the soil. Certain gases such as nitrogen oxides, carbon monoxide, chlorine and fluorine halogens, ammonia, and ozone are removed by absorption and stored in leaves and needles of some woody vegetation. Trees also sequester and reduce atmospheric carbon dioxide (National Arbor Day Foundation) (McPherson et al. 2002). Trees improve air quality as they release oxygen through photosynthesis and they reduce ozone levels by reducing urban temperatures.

Sound Control - The leaves, twigs and branches on vegetation absorb sound energy, as do grasses and other low growing plants, especially sounds in the higher frequencies which are the most bothersome to people. Plants dissipate sound energy by refraction that occurs when sound passes through vegetation barriers and bends around plant structures. Barriers of trees and vegetation in conjunction with walls and landforms can reduce traffic and highway noise (McPherson et al. 2002). Such barriers can be used as part of a noise mitigation strategy for new development.

Vegetation also masks unwanted sound by providing sounds of nature, rustling leaves and singing birds, to cover unwanted noise. People can focus on those natural sounds that are more pleasing than the noise of the city.

Fish and Wildlife Habitat - The urban forest provides habitat for many species of birds, mammals, fish, insects and amphibians that enrich urban life and offer opportunities for

study. The larger the area, the greater the possibility for diversity of habitat and wildlife. While forested natural areas with native understory offer more biological diversity than other parts of the urban forest, all provide some habitat. Squirrels and chipmunks live in and around trees; numerous species of birds abound in vegetation; bats dwell in secret places; and fish inhabit the creeks, streams, and rivers. Wetlands, riparian areas, connected natural areas, and urban landscapes provide important biodiversity.

Psychological Benefits:

Mental and Emotional Benefits - People generally feel that the urban forest increases the enjoyment of everyday life and provides a meaningful connection with the natural environment. Research now provides the scientific basis to support those feelings. Urban forests have a clear role to play in reducing stress-related impacts on health such as lowering blood pressure.

Studies show that exposure to nature and urban forest reduces stress and provides significant restorative benefits. Various studies using slides of different subjects show that natural scenes and urban nature settings hold the viewer's attention more effectively than urban scenes without nature. Even slides of unspectacular natural scenes produce more positive emotional states than urban scenes without trees (Hull and Ulrich, 1991).

Significance and Symbolism - Trees have deep significance to people, especially in the urban setting that may offer little of the natural world. Trees and forests provide beauty and serenity that we can experience in the sensory realm. The constantly changing sights, sounds and smells of plants fascinate and delight us.

Trees may have symbolic meaning. Many cultures associate trees with strength and wisdom, and we often remember loved ones with memorial tree plantings (Dwyer 1994). Planting trees shows a commitment to the future and a desire to improve places where we live.

Aesthetics - Positive emotional states are also associated with being in or looking at things that are pleasing. Trees and vegetation provide much of the color, variety, texture, shape and sound that are pleasing in all seasons of the year. Visual preference surveys have shown that small parks and open spaces are uniformly desirable in all settings of a city. Such surveys show that people prefer scenes that have well maintained trees and vegetation. Research substantiates what people have known intuitively, that trees and natural areas bring pleasure and provide benefits beyond their economic values (Dwyer 1994).

Economic Benefits:

A healthy urban forest can improve water quality, prevent erosion, reduce heating and cooling costs, convert carbon dioxide into oxygen and has positive effects on our health and wellbeing.

Trees generally provide benefits in their immediate location and to the surrounding community. From the individual property owner who has a more comfortable environment and increased resale value, to community members who have better water and air quality, to the fish and wildlife who have better habitat - all benefit from healthy trees and vegetation.

Increased Resale Values - Studies show that landscaping with trees is associated with an increase in the value of residential properties. Generally larger trees have greater effect on the resale values than smaller trees. Properties with trees show better and sell faster. Increased property values increase a community's tax base (McPherson et al. 2002).

Stormwater Benefits - In addition to increased resale value, trees and vegetation mitigate stormwater runoff from new construction, reducing or eliminating the need for more costly systems.

Economic Stimulus - Trees make the city more attractive to both residents and businesses. The National Arbor Day Foundation explains that "trees can be a stimulus to economic development, attracting new businesses and tourism. Commercial retail areas are more attractive to shoppers, apartments rent more quickly, tenants stay longer, and space in a wooded setting is more valuable to sell or rent." (Coolcommunities.org).

In a study conducted by the University of Washington, consumers indicated they would be willing to pay 12% more for goods purchased in a well landscaped district. The study also indicated 15% higher interaction between consumers and merchants, and tree-lined sidewalks were rated 80% higher for amenities and comfort (Wolf, 1999).

Recreational Value - Lacey's urban forest includes wonderful recreation areas such as Wanscher's Community Park and Wonderwood Park. While it is important to provide ample open space for active recreation, it is equally important to provide places for passive recreation. Lacey's urban forest includes many areas where wetlands and associated wooded buffers have been preserved. These areas provide places to observe wildlife, commune with nature and escape the pressures of daily life.

Traffic Management - Trees function as "traffic calming" devices effectively slowing speeding drivers while also adding to the aesthetics of the urban landscape. Vertical elements, including trees, reduce the "optical width" of the narrow street, thereby discouraging speeding (Project for Public Spaces "Traffic Calming" <http://www.pps.org>). Trees and other plants may be used to direct not only vehicular traffic, but pedestrian traffic as well (Grey and Deneke 1992).

Challenges:

Since the 2006 adoption of the Urban Forest Management Plan, there have been several issues, challenges, and experiences with the implementation of the plan that are important to examine.

The first item is the challenge with application of tree tract standards in cases of infill or redevelopment where tracts previously did not exist. In Lacey's core area, specifically the Woodland District and Central Business District 5, many of the properties developed in the 1960's and 70's and predated even the earliest landscaping requirements, let alone, tree tract requirements. As properties redevelop under current policy, they would be required to set aside a 5% tree tract. If no trees exist, then they would be required to replant this area with trees to meet a certain coverage requirement in 15 years. This standard also runs somewhat contrary to Lacey's goals of establishing the core area as the urban center. Very few urban centers (if any) have set aside 5% tree tracts on all developable parcels. It may be prudent for the City to require a fee-in-lieu that may be used to either further urban forestry goals in other areas of the City or be used even in the same Planning Area to provide additional tree canopy to balance the City's urban forestry goals with its goals to urbanize. The priority areas for installation of any additional trees should be public (City-owned) properties.

Second, there have been challenges with maintenance responsibilities for street trees between the City and adjacent property owners. The City's policy has been to maintain street trees on City arterials, commercial areas, and City transportation projects and adjacent property owners or owners associations maintain the remainder. However, this has not been evenly applied across the board and there is a large amount of confusion between adjacent property owners and the City as to who has the maintenance responsibilities. The street tree inventory completed in 2012 will address some of the issues as it will provide a map of all City-maintained trees in Lacey and will therefore provide better information delivery to the public. The City currently lacks an ordinance related to street tree maintenance and may benefit from developing one in the future. Such an ordinance would provide additional clarity and consistency when it comes to maintenance responsibilities.

Another benefit of having a street tree ordinance would be to clarify notice and abatement procedures for trees on private property that may impact city right-of-way. This ordinance would help the City better define procedures where a tree on private property is hazardous or potentially hazardous that may fall and damage city property (right-of-way) or other situations where liability could be a concern.

Finally, there are financial challenges related to residential homeowners and homeowners associations in Lacey's neighborhoods when it comes time to replace trees. The need to replace trees can be for various reasons including being hit by a car, hazard tree, etc, but many need to be replaced due to damage or replacement due to an inappropriate species being initially installed. Many Lacey neighborhoods were developed using a street tree that, due to aggressive root structures or being a species susceptible to damage, needs to be replaced. However, many of our homeowners and homeowner's associations do not

have the financial means to be able to replace the trees. The City should consider establishing a grant program or other means, including potential fee-in-lieu funds, to be able to assist our neighborhoods in these efforts.

Conclusion:

Washingtonians have chosen to protect farm and forest land by limiting expansion of urban growth boundaries under the Growth Management Act. While this results in more efficient use of urban land for development, it reduces the space available in the city for trees and vegetation. As cities become denser, there is a greater need to maintain, protect, and manage our urban forest.

While many people think of street trees when they think of the urban forest it is much more than that. The urban forest is a complex system of trees and smaller plants, wildlife, associated organisms, soil, water, and air in and around our city. It is the trees along the streets, the landscaping around our homes and institutions, the vegetation in commercial and industrial areas, the multilayered forests in our natural areas and the plants and landscaping in our parks.

The urban forest provides water and air quality benefits, improves the local climate by providing cooling and shading and improves the ecological health of the urban environment. Managing the urban forest for these benefits is sometimes difficult. Housing, commerce, transportation, public safety, and recreation must be accommodated. Successful urban forest management accommodates these uses, provides environmental benefits and improves the quality of life for our residents.

Our urban forest is managed by the city for many reasons, healthy watersheds, prime wildlife habitat, excellent outdoor recreation and exceptional trees. A healthy urban forest is essential to our quality of life and increasingly important to the city's efforts to improve the quality of the environment of our city. A healthy urban forest is an asset that increases in value over time, one that provides service as well as beauty to Lacey residents.

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Creative use of trees – Lacey, WA



Development pressure on the forest – Lacey, WA

Goals and Policies Of the Urban Forest Management Plan

1. GOAL - Achieve and maintain a vibrant, healthy and diverse urban forest in Lacey and Lacey's urban growth area consisting of both native and non-native landscape components.

Policies:

A. Base decisions for preservation of trees and re-vegetation on privately owned lands upon the requirements of individual development sites considering criteria necessary for maintaining healthy, safe tree stands. Ensure trees planned for preservation or replanting can be integrated with expected uses given the zoning classification and anticipated urban development characteristics.

B. Base landscaping plans and landscaping decisions, concerning species selection, upon requirements of individual development sites, desired function, and anticipated urban development characteristics.

C. Create and maintain a street tree program that takes advantage of indigenous trees, provides a coordinated and deliberative approach on selection of preferred deciduous street tree species, and provides diversity of species, interest, and aesthetic quality

D. Develop landscaping themes as part of the city design review program promoting the desired wooded look and feel for specific traffic corridors and selected areas. In designated areas, where the width is sufficient to accommodate mature conifers, design landscape plans which include coniferous evergreens and native under-story vegetation in planter strips, medians and traffic islands.

2. GOAL - Preserve and maintain native forest components in areas conducive to the lifecycle of native plants such as critical areas (wetland and habitat areas and buffers), conservation parks, large tracts of open space and other areas that can be naturalized while maintaining compatibility with the anticipated land use of the surrounding area.

Policies:

A. Utilize the Open Space Institutional (OSI) zone for preserving and maintaining natural indigenous vegetation and habitat.

B. Preserve natural vegetation in all designated privately owned wetland and habitat sensitive lands and buffers.

C. Emphasize the preservation and use of natural vegetation on lands zoned OSI where the urban use is expected to be institutional.

D. Preserve natural vegetation or use indigenous, or landscaping resembling indigenous, vegetation in all large buffer areas preserved or created for the separation of one land use category from another. Provided the existing vegetation is sufficient to accommodate the desired function of separation of uses and mitigation of identified impacts.

E. Create and maintain programs that identify potential conservation areas and strategy to protect them through public acquisition.

3. GOAL - Preserve natural forest components recognizing and considering the nature of the urban zoning classifications and limitations particular zones and uses have on the preservation of indigenous trees.

Policies:

A. Replant and maintain non-native landscape components in areas of urban density and intensity where the natural life cycle of existing vegetation conflict with the built environment envisioned by the Comprehensive Land Use Plan.

B. When replanting is required give priority to the use of vegetative species that resemble native species in areas of the built environment not conducive to the native plant life cycle.

C. When making decisions for tree preservation or re-vegetation consider land use zoning designations and urban land use characteristics and expectations for development.

D. Develop specific urban forestry landscape expectations and standards for each land use zone. Standards should consider urban requirements and limitations pertaining to urban forestry.

E. Small lot areas should have reduced emphasis on preserving indigenous vegetation because of physical development constraints and more intensive density. These areas should be planned for intensive re-vegetation with an appropriate combination of indigenous and non-native tree species.

F. Large lot areas can have more emphasis on preserving indigenous trees as lot sizes permit. However, efforts for preservation, particularly evergreen trees, should also recognize individual preference for residential landscaping options and the benefits of replacement of indigenous evergreens with deciduous tree species sensitive to residential home limitations and functions. Deciduous trees may be preferred given advantages for solar access, climate control and gardening.

G. Commercial areas anticipating intense development and little opportunity for saving trees because of significant grading, utility provisions, parking lot areas and access should emphasize preserving select tree stands with dedicated tree tracts and significant re-planting of preferred tree species throughout the site.

H. Trees in parking lots should emphasize deciduous trees that are preferred in parking areas given advantages of solar access and climate control. Pedestrian areas, particularly walkways required in design criteria for pedestrian access across parking lots should be edged with trees providing a canopy over walkways.

I. Buffers should emphasize preservation where practical, considering tree health and longevity and should emphasize re-planting native vegetation and evergreens where re-vegetation is necessary.

J. In both residential and commercial developments emphasis for preservation should be focused on selected sites or groves of healthy trees. Design of the site should protect these groves as part of the open space or as part of the overall landscape theme and requirement.

4. GOAL - Recognize the benefits of tree cover in consideration of drainage and watershed planning, habitat management, passive recreation opportunities, urban aesthetics and pedestrian benefits for street design, and maintain and improve Lacey's overall tree canopy for these benefits and purposes.

Policies:

A. Develop a no net loss standard for maintenance of Lacey's tree canopy. Consider a tree density requirement for each land use zone based upon the zones capability for supporting tree cover.

B. Strive to achieve no net loss of forest canopy through preservation of conservation tracts, sensitive areas, community planting programs, and replanting of properties developed under the vision of the Comprehensive Land Use Plan.

C. Apply a tree canopy requirement, or tree density requirement considering canopy, to individual development projects and require each project to comply with the standard by preservation of existing trees during construction, providing or replacing trees through intensive landscaping of development sites after construction, and/or designation and preservation of tree tracts.

D. Base plans for tree preservation or replacement upon expectations for the specific zoning designation the project is located in.

E. Craft development regulations to emphasize and promote saving existing trees with size and age by providing more credit towards established trees.

5. GOAL - Provide significant habitat value in Lacey's urban forest.

Policies:

- A. As is appropriate to the location and function, trees should be considered for wildlife habitat value. Trees well adapted to our area that provides food value and cover to wildlife is preferred in development of landscaping plans.
- B. Consideration needs to be given to sighting of certain trees to avoid dropped fruit on sidewalks, patios and parking areas, or enticing animals into dangerous areas of roads that will result in road kill, but where landscaping opportunities allow for placement of trees in appropriate areas trees with food value for wildlife should be given special emphasis.

6. GOAL - Integrate urban forestry concepts and preferences with development design.

Policies:

- A. Designation of tree tracts, preserving and planting trees in common areas, and landscaping of individual lots with tree cover shall be strategies used to meet a tree density/canopy requirement. This shall be required in the zoning and subdivision ordinances to support Lacey's urban forestry program. The tree density/canopy standards shall be applied during review and conditioning of the land division, prior to final approval of the land division. These standards shall also be applied to individual lots over the long term as building permits are approved. This can provide an expectation for a certain percentage of tree cover over the long term. It can also promote preservation or establishment of preferred species and tree stands.
- B. Consider establishing a fee-in-lieu of program as an option to meet tree tract requirements for redevelopment and infill projects in the City's Woodland District and Central Business District 5 in situations where no stands of trees currently exist. Fees collected should be used to plant new trees or expand the urban forest canopy on public property.
- C. Tree protection, preservation and/or replacement plans shall be considered early during land division planning, prior to preliminary approval, to promote integration of urban forestry concepts with the overall land division design.
- D. Create a balanced look in landscaping plans between natural and manicured landscape. Consider the urban context, site use, location, and zoning designation in designing the landscaping plans.

- E. Promote creative landscape designs that avoid a cookie cutter design but still provide interest, visual relief, and break up expanses of hard surface and walls.
- F. Allow flexibility in landscaping development sites to preserve areas of native vegetation where appropriate or create areas of native vegetation design by providing credit towards traditional prescriptive landscape methods and requirements.
- G. Consider crown-raising on street and landscape trees to improve visibility into commercial properties consistent with sub-area or district-wide planning efforts.

7. GOAL - Maintain tree canopy in developed areas.

Policies:

- A. Developed residential lots will be required to maintain a certain minimum canopy/tree density over the long term to promote the overall urban forestry program. This expectation or minimum standard should be based upon what is reasonable to expect based upon the size and design of the individual lot and the zoning designation it is located in, and the longevity of the trees planted.
- B. A certain amount of flexibility will be provided for individual lot owners once lots are purchased to allow for individual tastes and landscaping preferences and needs. However, the goal of maintaining Lacey's tree canopy/density should be maintained. Unless physical constraints make it impractical, each lot should support its prorated share of the tree canopy/density.
- C. Develop a program to monitor trees required in landscaping plans that are the responsibility of the land owner, lot owners association, or home owners association. Provide assistance in educating responsible parties regarding strategies and techniques of tree maintenance, and enforce landscaping requirements for trees.

8. GOAL - Develop a street tree program as an essential component of Lacey's Urban Forestry Plan.

Policies:

- A. Provide for a street tree program with specific emphasis on designing streets for pedestrian comfort and security and promote species that provide the desired street canopy, are disease resistant, low maintenance, have root systems that do not create street and sidewalk buckling, and have attractive features adding interest to the urban street environment.
- B. Provide for a street tree program that has both naturalized and non-indigenous species components.

- C. Develop a street tree program that is integrated with landscaping plans and design for specific street corridors.
- D. Develop an ongoing tree planting program to replace mortality, damaged trees, and to increase canopy cover.
- E. Develop a program to monitor street trees and follow up on enforcement where street trees are part of a required landscape plan and the maintenance is the responsibility of the land owner.
- F. Explore establishment of a dedicated street tree maintenance fund, utility fund, or other similar program that would fund street tree replacement in neighborhoods.

9. GOAL - Create a heritage and specimen tree program that recognizes special trees worthy of extra attention, notoriety and protection.

Policies:

- A. Develop definitions of heritage and specimen trees that emphasize the special distinctions that lead to such characterization, in context with Lacey's history.
- B. Hold contests annually on Arbor Day for identification and qualification of these special trees.
- C. Develop standards for protection of such trees and methodology for registering trees so that new land owners are notified of what they are purchasing and expectations associated with the distinction, including the tree's health and expected life cycle

10. GOAL - Develop an Urban Forestry Plan that promotes safety and healthy trees.

Policies:

- A. Develop a program that incorporates decisions for preservation of trees that are related to development projects that consider safety issues associated with the potential built environment.
- B. Assure that safety issues are considered by a qualified tree professional when developing plans for tree protection, preservation or landscaping design.
- C. Develop a program that assures that tree species are considered for adaptation to our area, localized environmental conditions, resistance to disease, and compatibility with the planned urban use of the site.

- D. Develop a program for regular inspection and maintenance of street trees that is ongoing to promote healthy well formed and functional street tree resources.
- E. Provide for a tree removal process for removal and replacement of dead, dying or diseased trees.
- F. Maintain the program for the tree professional(s) to be available to the public for tree inspections, and considerations of tree issues on individual lots, at cost for review.

11. GOAL - Create an Urban Forestry Program that is publicized, easily understood, has broad support, promotes pride in our Tree City USA distinction and is enforced.

Policies:

- A. Develop a public education program that promotes Lacey's distinction as a Tree City USA and provides support to individual citizens and home owner associations concerning tree issues.
- B. Develop a program for meetings with home owner associations to help associations manage privately owned tree resources.
- C. Develop and implement a program of informing new residents of expectations for tree emphasis and tree regulations.
- D. Develop and implement an enforcement method that is fair, based upon professional evaluation, and promotes the vision of the Urban Forestry Plan.
- E. Develop an enforcement program that includes education of the benefits of trees and maintenance of trees, and involves fines for non-compliance. Fines shall be based upon a fair value of the trees lost and replacement of trees. Fines may be used to support the city urban forestry program through maintenance and planting of street and park trees.
- F. Work with private and public entities to create partnerships for developing education and community action programs promoting the value of maintaining and conserving natural vegetation and habitats.
- G. Develop interpretive trails and view sheds within conservation areas and natural parks to provide recreation opportunities and education to the citizens of Lacey.

12. GOAL - Create a citizen advisory board for urban forestry issues.

Policies:

- A. Develop an Urban Forestry Board that is made up of tree specialists and citizens representative of the scope of urban forestry issues in our city.
- B. Develop a set of operation criteria for the Urban Forestry Board that has it develop and consider urban forest plan amendments, work on special urban forestry projects and advise the council on urban forest issues.

13. GOAL - Develop a method to process Class IV Forest Practice Applications pursuant to requirements of RCW 76.09.240.

Policies:

- A. Develop a process to include in the city tree and vegetation protection ordinance for review and action on Class IV Forest Practice Applications.
- B. Require all Class IV Forest Practice Applications to satisfy the intent and vision of the Urban Forestry Management Plan.

APPENDIX 1

Background and Baseline Information

A

Council's First Visioning Work-session for the Development of the Urban Forestry Plan

In early February of 2005, the Council held a work session to determine what each individual member thought was important in regards to maintaining trees and vegetation. Without priority, the following results are individual thoughts of Council members from that visioning effort

1. Observation: “don’t like – for site planning and tree retention; need to know where building footprint is in relation to trees – keep tree clusters if possible.”
2. Retain the “NW Woodland Character” – we are losing this. NW look and feel which is not just “ornamental” or “street trees” look.
3. Don’t need cookie cutter designs: be more innovative in our designs. Develop designs to look more natural than the street trees on 35’ centers. (Retail vs. Commercial).
4. No net loss of trees; need to preserve rather than replant.
5. Not real interested in large firs in residential, one ice storm will cause problems. Need to breakup walls with plantings.
6. Like mixing oil & water – have natural look at entry points or “open spaces”, buffers native doesn’t mix with density we are trying to keep or develop.
7. Replace trees with trees that meet our vision (rather than replacing like for like)
8. Find appropriate trees for a given area which retains the look and feel of the NW Woodlands. Not the typical street/landscape sculptured look.
9. Heritage/specimen trees need a definition – look at location and health. Be sure evaluation looks at long term.
10. Protection of the natural habitat – trees are a key component of this.
11. Look at when and where we plant trees. Don’t waste the resource (mindless construction projects)
12. Heritage or specimen trees on private property. Owners need to understand what they are buying. Our vision can’t take away personal property rights by imposing “our vision” on them.
13. Look and feel should apply to housing development and commercial. Hard on very small lots. Set aside tree tracts instead of how we do it now, trees in parking lot landscaping.
14. Need balance between natural and “landscaped look”.
15. Adjoining development and differing standards and look/feel. Like, orchard style – urban environment looks urban. Entry ways – public spaces (parks, open spaces and planters)

16. With innovative thought from our engineers, landscape architects, etc. we can have more natural looking parking lots.
17. Like: “the green of Lacey”
18. Trees that grow where you plant them. Species selected need to be the right choice for the location.
19. Education of public Home Owners Associations (HOA’s). HOA’s need to be aware of our tree preservation ordinances and the importance of trees. Use public events to promote healthier urban forest.
20. Exercise more judgment to all the NW look and feel – change landscaping ordinances to accommodate trees. (meander sidewalks)

It was also mentioned that there should be some public education about what does “Tree City USA” mean and what an urban forest is.

As with our citizens, opinions of individual council members vary greatly in regards to tree and vegetation preservation. But, when working together, as was done during the vision exercise, you can see that similar interests are reflected in their statements. It is the intent of this plan to take advantage of the common themes which have developed to create a plan that is widely supported by the Citizen’s of Lacey.

B

Soils and Site Information

The City of Lacey occurs entirely within the Puget Sound Trough which extends the entire length of Washington from the Canadian border to Oregon. The soils were formed during the most recent Vashon glaciation epoch. The terminal moraine of the Vashon glaciation is found in southwest Thurston County.

The topography of Lacey is undulating to rolling on uplands. 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. The predominant gravelly soil types formed from this material include the Alderwood gravelly sandy loam, Everett very gravelly sandy loam, and the Spanaway gravelly sandy loam. Also commonly found are the Indianola loamy sand, Nisqually loamy fine sand, Skipopa silt loam, and Yelm fine sandy loam. These sandy soil types are formed from outwash material and are found along the major stream courses and broad flats.



Photo A. Typical glacial till derived soils found in Lacey.

The windthrow potential for all of the soil types found in Lacey is slight (except the Alderwood which is moderate); meaning that blowdown of healthy trees is less likely during normal winter storm events. The moderate windthrow risk indicates a higher windthrow potential, especially during periods of wet weather and high winds. Perched water tables above the Alderwood hardpan contribute to this increased hazard. Inclusions of poorly drained soils such as the McKenna gravelly loam (small areas that generally occur within wetlands) also have a moderate to high potential for windthrow.

The productivity of these upland soils is moderate to high, and competition for new seedlings is moderate to high. Weed control is usually necessary during the first 3 years after planting seedlings in forested areas or gaps in the canopy.

The soils found on the outwash materials are slightly drier, but have no barriers to root penetration and a slight windthrow potential.

C Forested Cover

The forest cover in the City of Lacey is within what is classified in forestry as the *Tsuga heterophylla* Zone, the most extensive vegetation zone in western Washington. It is famous for its subclimax Douglas-fir and climax western hemlock-western red cedar formations. The seral stands that occur today are dominated by second-growth Douglas-fir. Though they are climax associations, even old-growth stands (400 to 600 years old)

still have significant components of Douglas-fir in addition to the climax western hemlock, western red cedar, and grand fir species.



Photo B. View of remnant second-growth Douglas-fir along Golf Club Road SE in Lacey.

In east Lacey, an oak woodland type occurs that is often intermixed with Douglas-fir. The Oregon white oak (*Quercus garryana*) colonized former prairies and is now being overtopped by invading Douglas-fir. The Oregon white oak occurs predominantly on the excessively drained Spanaway gravelly sandy loam soil type, but scattered trees and groves of trees are found on other types (Photo C). Common snowberry and Oregongrape are the predominant shrub species under the oak stands.

Douglas-fir is the most common native tree found in Lacey. Western red cedar, western hemlock, bigleaf maple, black cottonwood, red alder, cherry, and Scouler willow are also found depending on the location with the topography and level of disturbance. The understory is dominated by salal, Oregongrape, bracken fern, swordfern, red mountain huckleberry, common snowberry, and *Rubus* species. This combination of conifer overstory and diverse understory, with the productive soils produces good to excellent wildlife habitat potential.



Photo C. View of a majestic Oregon white oak protected during development of the Senior Center in Lacey, WA.

The forest canopy is becoming more fragmented as development has spread into the urban growth areas, particularly in the Hawks Prairie Area. The industrial development on Marvin Road and Willamette Drive NE areas, along with Britton Parkway and the large commercial project development are impacting the forest canopy significantly.

On the other hand, some areas are growing trees that were non-forested in 1966. Undeveloped prairie areas are reforesting on their own, the city is planting trees on rights-of-ways, and residents are planting trees in yards and open space areas. This has combined to increase the forest cover in the original core of Lacey, and slow the overall forest loss since 1966. Figures 1 and 2 are based on examination of aerial photos from 1966 and 2001 (plus known changes in 2002-04).

Figure 1. % Forest Cover in Lacey - 2004

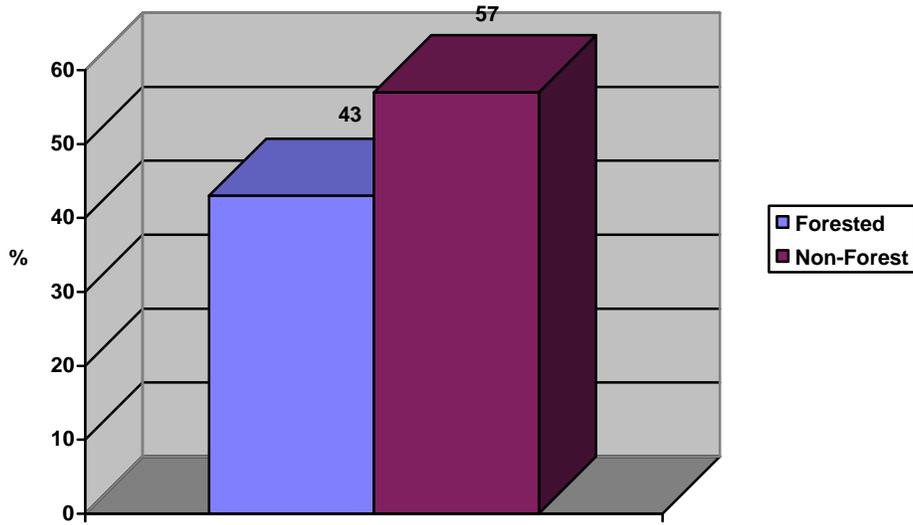
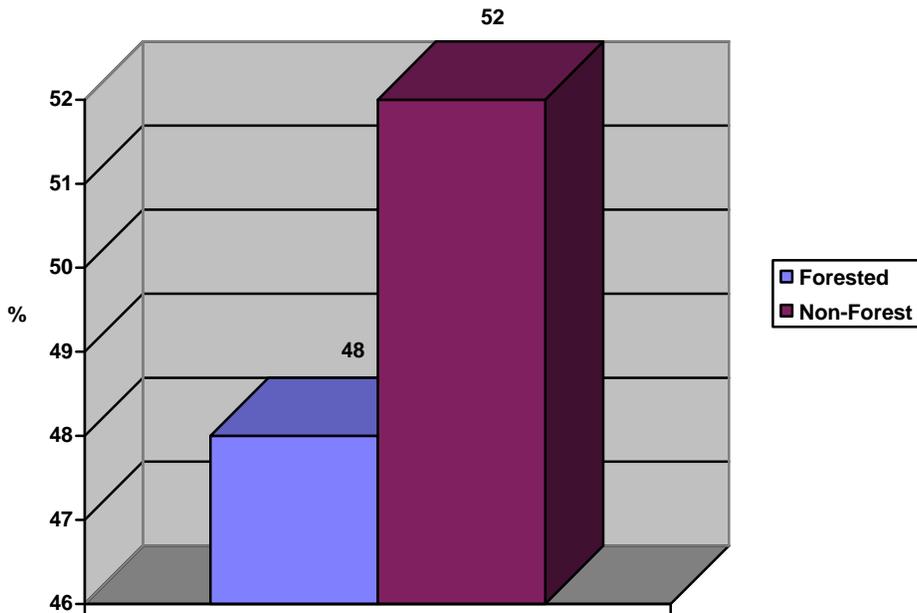


Figure 2. % Forest Cover in Lacey - 1966



Figures 1 and 2 illustrate the changes in forest cover between 1966, several years before Lacey became a City, and 2004. The 2001 photos were updated to 2004 by removal of acreage for projects constructed since 2001 to determine an approximate acreage.

D Street Trees and Maintenance Evaluation

Private Street Trees

A 100% inventory of all ‘private street trees’ was completed for all major and minor arterials and collectors in Lacey. A ‘private street tree’ is one that is maintained by the adjacent property owner and is situated in the curb lawn zone or behind the sidewalk, and serves as the street tree for that location. These are areas where there are no city maintained street trees.

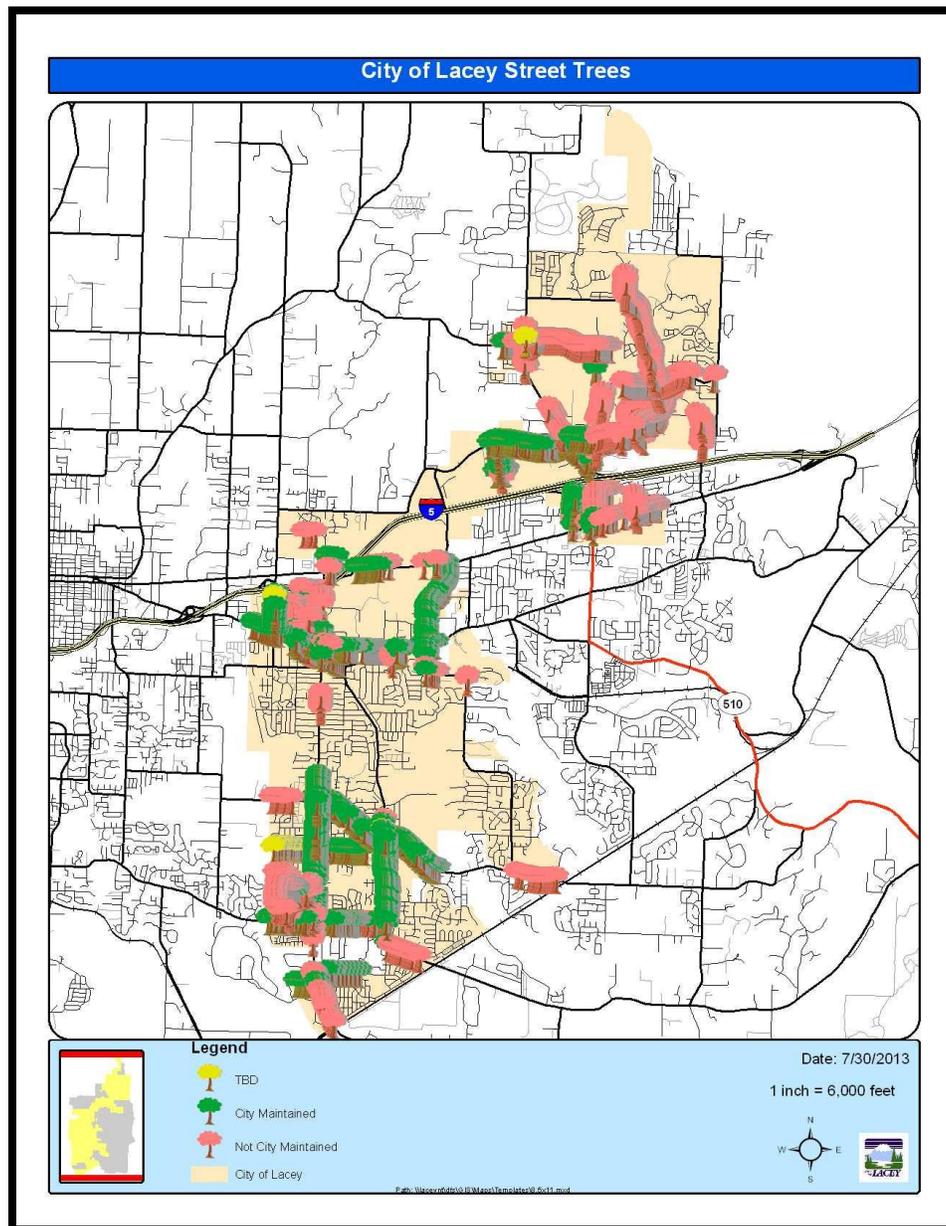


Figure 3. 2012 Street Tree Inventory

Table 1. Summary list of street trees on all arterials and collectors.

Species	Diameter Range (inches)	# Trees	% Composition
Ash – Green/White	1-26	1,102	19.08
Sweetgum	1-19	839	14.53
Ash – Patmore	1-22	692	11.98
Pear - Callery	1-12	547	9.47
Oak – Red	2-17	349	6.04
Maple – Red	2-26	217	3.76
Crabapple	1-8	197	3.41
Cherry – Kwanzan	3-19	161	2.79
Maple – Norway	2-10	153	2.65
Ash – Autumn Purple	2-10	142	2.46
Maple - Vine	1-6	114	1.97
Dogwood – Flowering	1-6	100	1.73
Cherry - Flowering	1-9	91	1.58
Zelkova – Japanese	4-10	80	1.39
Maple – Norway Sunset	2-7	79	1.37
Plum - Flowering	1-16	75	1.30
Various Other Species		837	14.49
		5,775	100.00

Sweetgum and ash (green and white ash cultivars) dominate the streets of Lacey and its urban growth area. This is due to a Merritt and Pardini study of 1985 that recommended ash and sweetgum as the main trees for Lacey’s central business district, plus the availability at nurseries and general popularity of the species among landscape architects for years. Red maple, flowering plum, and flowering cherry were the next most populous species found along streets that were under private maintenance. The private street trees were, for the most part, in good condition.



Photo D. View of privately maintained street trees in SE Lacey. A case where trees are well-maintained.

The two major exceptions were:

1. Sweetgum trees that were heavily damaged by the 1996 and 2012 ice storms and other heavy wet snowstorms, and
2. Trees that have been topped or otherwise mal-pruned by the landowners.



Photo E. View of recent topping of private street trees in 'Old Lacey' area.

Few of the trees were receiving maintenance such as corrective pruning, including crown raising or crown cleaning to remove dead, dying, diseased, defective, crossing, or extra

branches. These trees will continue to be more susceptible to storm damage, will be more costly to maintain as they get large, and their useful lifespan will be shorter.

The majority of these private trees are located in the required landscaping of commercial properties. In some cases the form and severity of pruning has destroyed the trees natural shape, and shortened its projected lifespan. In some cases, it does not appear that the trees meet the intent of the requirements in the landscaping ordinance.

City-Maintained Street Trees

A 100% inventory of city-maintained right-of-way trees was conducted by Washington Forestry Consultants, Inc. in 2012. Individual trees were evaluated and data on species, size, location, and condition was collected.

Tree Diversity and Planting Spot Data

The inventory found 2,973 street trees. Trees were identified and recorded by common name. Specific cultivars were determined in the field. The average diameter measured at 4.5 feet above the ground line was 8 inches. This is a reflection of how young the street tree population is in the City of Lacey, however this has increased from an average of 4-inch diameter since the last inventory was completed in 2001. The majority of the trees are planted in curb lawn zones, though some are in tree grates within the sidewalks.

Diversity is key in any urban forest. This helps insure that entire urban canopies are not wiped out by common maladies such as 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.

As a rule of thumb, no more than 10% of the urban tree population should be of the same species, no more than 20% of any genus, and no more than 30% of any family. Some tree species such as red maples, green ash, London plane, and sweetgum tend to be over planted in the Pacific Northwest urban areas. In Lacey, the green ash cultivars, cherry and flowering plum, and sweetgums are over planted. The focus for future street tree plantings should shift away from ash, cherry, flowering plum and sweetgum to other quality species and cultivars.

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 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. Even some resistant varieties will still have problems.

It is recommended that the species selection for street trees be diversified to improve the quality of the urban forest.

City Street Tree Maintenance Evaluation

The 2,973 street trees maintained by the City of Lacey are generally described as being young, and in fair to good condition. Staff has routinely raised crowns on young trees to provide sidewalk and street clearances, performed some corrective pruning, and day lighted trees from overtopping competition by adjacent forest trees. The quality of this work is excellent when evaluated against the current standard for proper pruning¹.



Photo F. Street trees planted in the urban growth area. Design is the City of Lacey’s standard which is working very well.

Normally, in cities with more and larger trees, all work is prioritized based on the urgency of the work. Future evaluations will require prioritization. The following is the recommended prioritization for the trees.

¹ ANSI A300 (Part 1) – 2001 --Pruning for Tree Care Operations – Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices, American National Standards Institute, New York, NY.

- *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 are many and varied. Planting shock or lack of irrigation are the most common causes of mortality for newly planted trees. 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 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 (2001). 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 the City of Lacey retain at least one member of the parks maintenance staff that is certified.

Condition of the Urban Forest

A condition rating was assigned to each street 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: Good, fair, poor, or dead.

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 94% of Lacey's trees were rated as fair to good. Based on this data more corrective pruning is needed to develop the crowns on the newly planted trees.

Priority Pruning

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

All pruning should conform to the ANSI A300 (Part 1)—2008. 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. American National Standards Institute, Washington, D.C.

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 to occur 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 trimmed 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.

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 inches 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 many trees and planting spots. Trees with a mature height of 20 feet or less should be planted under utility lines to avoid costly pruning and deformation of the appearance of trees.



Photo G. Tall growing green ash on Ruddell Road just south of Pacific Ave. SE. Trees require repeated pruning to prevent utility conflicts.

Overhead electrical wires were located over a portion of the existing street trees. Many of the street trees are inappropriate for these locations and will require extensive and repeated pruning to maintain reliability and safety for the public. If these 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 optimum width. Currently the average curb lawn zone width is 5.5 feet.

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 Urban Forest

During the street tree inventory and evaluation, certain maintenance needs were identified for a small number of trees that are required for public safety. These needs include sign clearance, hazard tree removal, pruning, and sidewalk clearance pruning. As this work is completed, *systematic pruning programs* and *tree planting programs* can be considered.



Photo H. View of large stem failure on a bigleaf maple at the community center.

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.

Removals

The hazard tree evaluation program in parks has already identified a number of removals that are necessary. These trees should be removed or pruned as recommended immediately to protect public safety. Staff has done a good job in the past of completing hazard tree mitigation in a timely fashion.

The small street trees, and dead trees recommended for removal are less of a hazard, but should be scheduled for replacement.

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 Lacey are smaller trees, so sidewalk heaving is not 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 heaving, 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.

Stump Removal

Stump removal is necessary if a new tree will be planted in the same location. If the new tree can be moved to avoid costly stump grinding tree planting costs will be reduced. Stumps do need to be cut low to avoid safety problems with pedestrians and cars. In many cases grinding to a level 6 inches below the surface is recommended since safety concerns are eliminated and lawn can be established. Small stumps may be cut at the groundline and left in many cases. In cases of disease caused mortality, excavation of the stump is recommended to reduce the inoculum from the pathogen.

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

- A minimum of 4 feet is needed for a plantable area.
- The minimum distance to the adjacent planted trees is 25 feet.
- All planting spots are at least 25 feet away from intersections.
- All planting sites are at least 10 feet away from fire hydrants, driveway, utility poles and street lights.
- All planting sites are at least 10 feet 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 feet) 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.

Size Class Distribution

All tree diameters were measured 4.5 feet above the groundline (called diameter at breast height or DBH).

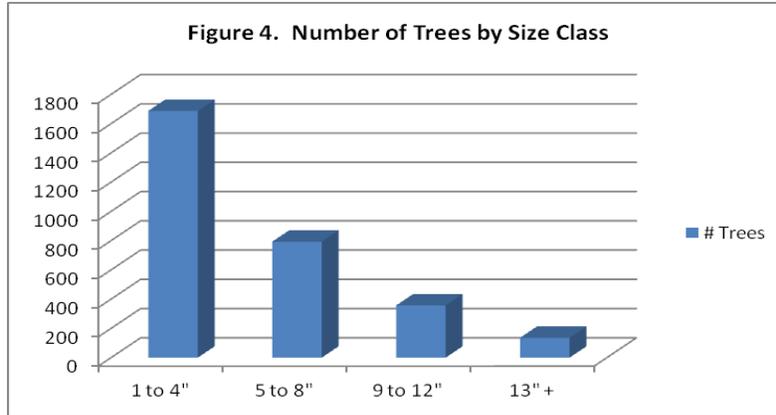


Figure 4 illustrates the young age of the Lacey city maintained street tree population. The urban forest should have a diversity of size classes as well as species. This helps assure that the entire urban forest does not mature at the same time causing excessive maintenance costs, replanting costs, and major changes in the cities appearance.

The smaller trees grow vigorously and after establishment and early corrective pruning require low maintenance inputs. Ideally the urban forest would have a regular distribution of size classes from small to large trees, as well as a diverse species composition. Immediate replacement of dying trees or newly opened planting spots is recommended. The management practices help to spread and smooth annual maintenance costs over time.

APPENDIX 2

Tree Protection Objectives, Issues and Forester Recommendations for Ordinance Adjustments

Objectives /Activities of an Urban Forestry Program

The following are the basic activities recommended for Lacey’s urban forestry program:

- Maintaining the safety of the urban forest under management by the City of Lacey. Removing dead and dying trees, pruning trees for traffic and pedestrian clearances, mitigating other hazardous conditions that accomplish this goal.
- Maintaining the Health of the Urban Forest will reduce maintenance and replanting cost associated with the trees. Corrective pruning of young trees will eliminate costly pruning in later years, and will protect tree health by eliminating large diameter wounds from delayed corrective pruning. A healthy, properly pruned tree requires protection but very little maintenance.
- Perpetuating the Urban Forest through replacement tree planting, planting open planting spots, and filling gaps in forested stands must be done to perpetuate the forest. Trees and stands of trees are dynamic, living things. They live and die, and they respond to management and protection.
- Management of the Urban Forest, like other city services is a benefit to the citizens. Public relations are fostered as the city works with adjacent landowners to manage trees on the rights-of-way.
- Create public education programs that will assist the Citizens in perpetuating the goals of this plan.
- Continue to support the “Tree City USA” designation of the City of Lacey.

Protection Vs Re-planting

Protection of existing trees should be given precedence over replanting in new developments. Native trees should be protected in clusters or in tree tracts as opposed to retaining individuals or a few trees. Projects should be evaluated by a qualified professional forester who has academic and field experience in urban forestry to identify trees for potential retention in new development.

Healthy, long-term trees that are identified to be protected must be fenced during construction to avoid damage to the root protection zone (RPZ). This protection is illustrated and described in III page 73.

Urban Forestry Advisory Board

It is recommended that the city consider the formation of a tree advisory board. The purpose of the board is to review city ordinances, practices, and policies with regard to trees and make recommendations back to council and staff.

The board can help find and recognize historic, rare, or specimen trees and to recognize the individuals who have cared for them. A 'Friend of Lacey Trees' awards can be given to citizens who have done an exceptional job of tree protection, tree planting, or other tree related community service. The tree board generally helps coordinate Arbor Day and other tree related activity. As with any city appointed board, staff time will be required to support the board along with a small budget to purchase plaques, educational materials, tree seedlings, and other items for activities the tree board generates.

Another concept is to appoint Tree Stewards. Tree Stewards promote tree protection, tree planting, tree care, and environmental stewardship in the community. Tree Stewards are provided annual training in different areas of urban forestry and asked to assist with Arbor Day, inventory projects in parts of the City, and for input on ordinance related tree issues. The idea is that the knowledge gained by Tree Stewards is spread through their contacts in the community. They are also a source of ideas, information, and enthusiasm for protection and planting of trees in the community.

Summary

This study found that 43% of Lacey is covered with native forests and planted or ornamental trees, with the remainder being developed.

We found 2,973 planted city maintained street trees and 3,208 private street trees. Few open planting spots occur within city maintained areas. Many open planting spots occur in privately maintained areas.

Street tree maintenance is good, but requires additional corrective pruning on the planted street trees. Species selections for planting, and matching species to site need to be modified. We need to diversify the species mix on Lacey's streets. Ongoing training is recommended and the staff should include at least one International Society of Arboriculture Certified Arborist®.

Based on our evaluation of the urban forest in Lacey, the ordinances, visits with staff and citizens, and maintenance procedures - the following priority is recommended to improve protection and management of the Lacey urban forest:

- Continue annual maintenance activity on the existing street trees for sign clearance, corrective and clearance pruning, and complete annual hazard tree evaluations.
- Budget adequate annual funding to complete basic maintenance tasks for city street trees and some replanting.
- Continue to require review of all commercial and industrial projects with one or more trees. This is important in cases when only a few Oregon white oaks occur on the site. Tree retention may have an even higher impact in areas devoid of trees. Also consider a minimum percentage area for tree tracts in all types of developments. Language regarding tree removal on private property needs to be clarified.
- Continue to educate the public to prevent improper pruning of required landscape trees. A procedure for inspection of required landscaping for compliance 3 plus years after the bond has been released needs to be established.
- Continue to involve the Lacey contract urban forester in the site plan review process on new projects, require the urban forester attend pre-construction conferences when trees are to be protected on site, and utilize the urban forester more in inspection of required landscaping on completed projects.
- Consider appointing a tree advisory board.
- Create a ‘Lacey Friend of Trees’ award to be given to citizens, developers, or companies that have taken special care to protect, plant, or maintain significant trees or stands of trees in Lacey.
- Conduct a ‘Big Trees in Lacey’ contest to find and recognize large or specimen trees in the city.
- All new street tree plantings should be taken from the prescribed species list and matched to the growing space of the planting site. All landscape tree plantings in required landscaping on projects should be taken from the general tree list for Lacey. Other trees can be incorporated in the design upon approval of the site plan review committee.
- Solicit grant funding, corporate donations, and other funds to expand tree planting and maintenance.
- Revise the urban forest management plan every 5 years.

APPENDIX 3

Tree Planting Specifications for Lacey Street Tree Planting Projects

Tree Planting Specifications

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*. 2004. 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, contaminants, 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 matter (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 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 $\frac{3}{4}$ 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 repellent 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 intact.**

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.

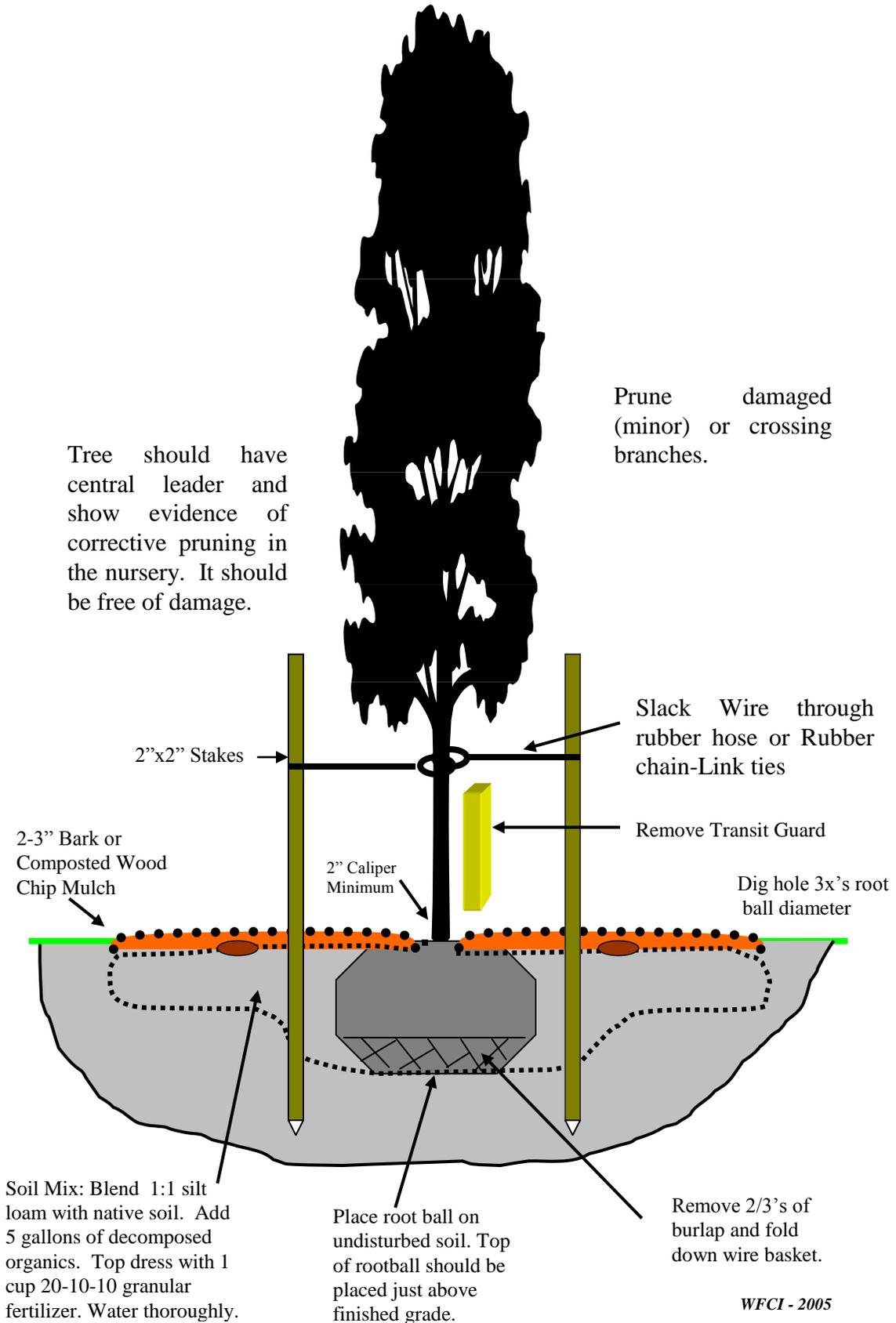
E. The guarantee of all replacement plants shall extend for an additional period of 1 year from the date of their acceptance after replacement. In the event that a replacement plant is not acceptable during or at the end of the said extended guarantee period, the Owner's Representative may elect subsequent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



APPENDIX 4

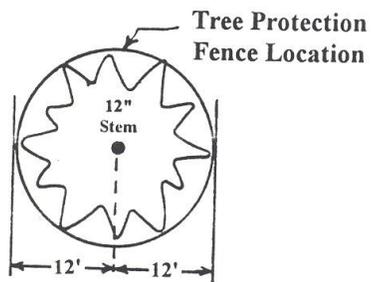
Tree Protection Guidelines

Pacific Northwest Native Trees

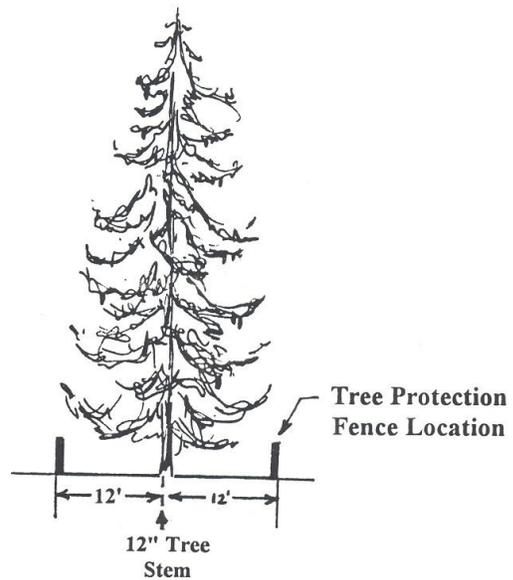
TREE ROOT PROTECTION ZONES

The root protection zone (RPZ) for Pacific Northwest native trees extends a distance of one (1) foot for every inch of tree diameter, measured 4.5' above the ground line. For example, the RPZ for a 12" diameter tree has a radius of 12' measured from the center of the tree stem. Ornamental or other high value or large trees should have the RPZ determined on a case by case basis.

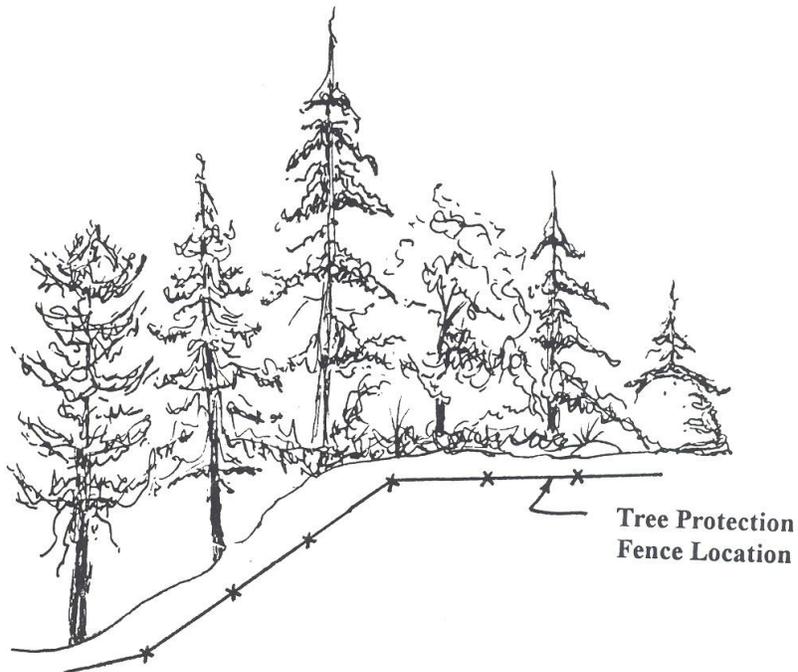
TOP VIEW



SIDE VIEW



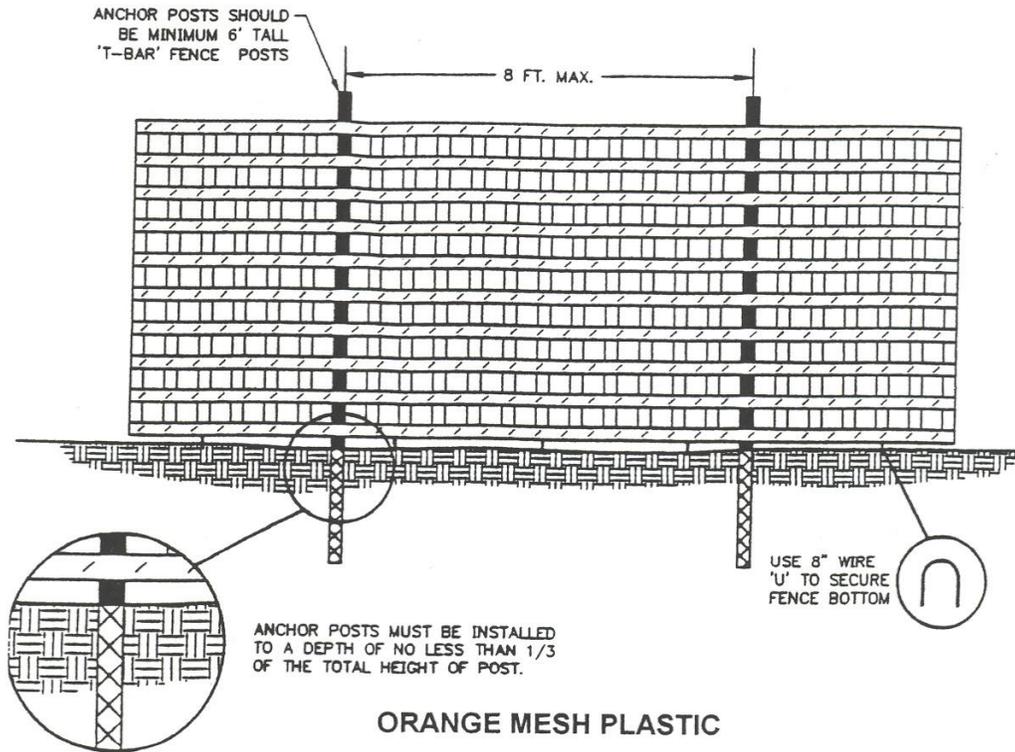
The RPZ for the edge of a forested area is determined using the diameters of the dominant edge trees, meandering the tree protection fence to correspond with the required RPZ distances.



The tree protection fence must be a minimum of 4' tall and be made of orange mesh plastic or chain link depending on recommendations in the tree plan. Posts must be T-top metal fence posts or a minimum 5/8" diameter rebar driven well into the soil. Posts should be spaced a maximum of 10' apart.

The fence should be maintained throughout the construction and grading, and not be removed until final landscaping is in progress. At no time should equipment enter into the RPZ and all brush clean-up should be completed by hand to prevent disturbance to native groundcovers. No cuts or fills, utility trenching, modifications to drainage, or concrete rinse water should impact the RPZ. No wires, cables, or other devices should be attached to protected trees during construction.

If impacts must occur within the RPZ, contact Washington Forestry Consultants prior to the operations to determine the proper procedure to protect the tree's health.



THE TREE PROTECTION FENCE SHOULD BE MAINTAINED THROUGHOUT THE CONSTRUCTION AND GRADING, AND NOT TO BE REMOVED UNTIL FINAL LANDSCAPING IS IN PROGRESS. AT NO TIME SHALL EQUIPMENT ENTER INTO THE ROOT PROTECTION ZONE (RPZ). ALL BRUSH CLEANUP WITHIN THE RPZ SHOULD BE COMPLETED BY HAND TO PREVENT DISTURBANCE OF NATIVE GROUND COVERS NO CUTS OR FILLS, UTILITY TRENCHING, MODIFICATIONS TO DRAINAGE, OR CONCRETE RISE WATER SHOULD IMPACT THE RPZ. NO WIRES, CABLES, OR OTHER DEVICES SHOULD BE ATTACHED TO PROTECTED TREES DURING CONSTRUCTION.

IF IMPACTS MUST OCCUR WITHIN THE RPZ, CONTACT WFCI PRIOR TO THE OPERATIONS TO DETERMINE THE PROPER PROCEDURE TO PROTECT THE TREE'S HEALTH.

TREE PROTECTION FENCE DETAIL



City of Lacey

APPENDIX 5 COMPREHENSIVE STREET TREE PLAN

Introduction

The City of Lacey’s “physical and aesthetic character” will be preserved and 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.

Goals of the Comprehensive Street Tree Planning Process

The following are the goals of the 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.



The Goal: Streets lined with canopy forming trees (City of Milwaukee, WI).

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. This approach was used by WFCI to develop the Hawks Prairie Annexation Area Beautification Plan in 1992.

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. Power lines, 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 Lacey 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. Monument-style signs work well with trees.

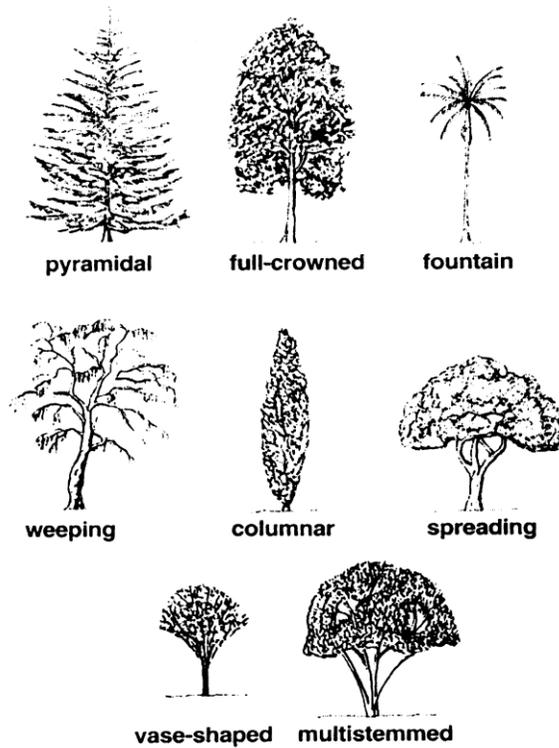


Figure 10. Illustration of Tree Shapes.

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 Lacey (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 Lacey 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.

Current Tree Conditions

Lacey is currently stocked with remnant second-growth conifer stands of the *Tsuga heterophylla* forest type. Douglas-fir, western red cedar, western hemlock, and grand fir are the dominant conifers. The deciduous associates include bigleaf maple, red alder, cherry, and black cottonwood.

Planted ornamental and native trees occur in residential and commercial properties, and a scattering of public street trees occur on major and minor arterials. Most of the older neighborhoods do not have street trees. In many cases, street designs did not provide space for them.

In commercial areas, sidewalks usually abutted the street on both sides, with occasional medians, planter strips, or other variations in design. If trees were planted, they were planted on private property behind the sidewalk. In many cases, this did not occur or plantings have failed or been removed over time.

Where trees were planted on commercial projects, the most common species encountered were flowering cherries and red maple. In virtually all cases these trees had been topped relegating them to the status of an overgrown shrub.

In short, the long-term outlook for Lacey's inventory of older street trees is poor. The species monoculture of flowering plum and the lack of continuity in plantings will not form the linkages and tree-lined streets until additional plantings occur.

Recent Plantings

Recently, the newer subdivisions have been stocked with more durable, long-term tree species. Ash and Norway maple varieties, northern red oak, littleleaf linden, callary pear, and red maple, all better street tree species, appear to dominant the streetscape in these areas. Planter strips are being provided in many cases; however there are still many open planting spots.

The same is true for the major and minor arterials. Past losses of planted trees have created open planting spots, species were varied within short distances, street designs changed with no space for trees, stands of native trees encroaching on street rights-of-ways, and/or buildings abutting the street have prevented the visual and spatial unity created by rows of street trees.

Soils in Lacey

Most soils in Lacey tend to be moderately well- or somewhat excessively drained. Pockets of poorly drained soils occur in some drainages or wetlands. These soil types allow a wide variety of trees to be grown as street trees, often with only the addition of organic matter, water, and nutrients to provide an excellent growing media.

In the cases where trees will be planted in amended fill or disturbed or compacted soils, soil tests should be taken prior to planting of street trees to insure that the nutrient content, pH, water holding capacity, organic matter content, and bulk density will support healthy tree growth. Where hardpans occur, the pan should be fractured under the tree planting spot to allow drainage and added rooting zone. In all cases, supplemental irrigation will be required for at least 3 years after planting to re-establish the roots lost during transplanting.

Trees species planted into tree grates in the sidewalk will need to be more tolerant of elevated soil and ambient temperatures due to reflected and absorbed heat. Trees tolerant of drought tend to be more resistant to the harsh conditions when planted into a sidewalk or parking lot. Special consideration will need to be given for tree species selection for trees planted in grates.

Microclimatic Considerations

Street trees planted adjacent to native forest stands may need to be more shade tolerant than trees planted in open areas. Littleleaf linden and Norway maple are examples of more shade tolerant species.

Low points in the topography may be more susceptible to frost (frost pockets) than slopes or flats. Damage may occur to southern varieties of street trees in these areas. Other microclimatic features that may negatively impact trees include cold air drainages, areas

where wind tunnel effects develop, poorly drained soils, or areas downwind of industry. Other types of pollution or air flow patterns may cause localized tree damage.

Tree Selection

The following selection of trees in Table 1 is suitable for planting as street and landscape trees within the city of Lacey. 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 Lacey'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 2.

Table 2. General list of trees for Lacey.

COMMON NAME	BOTANICAL NAME	CULTIVAR	MATURE HEIGHT	CROWN SPREAD	SPACING
Large >50' Tall					40-50'
Northern Red Oak	<i>Quercus rubra</i>		70'	45'	
Tuliptree	<i>Liriodendron tulipifera</i>		70'	35'	
Autumn Purple Ash	<i>Fraxinus americana</i>	Autumn Purple	50'	35'	
Sugar Maple	<i>Acer saccharum</i>	Commemoration/ Bonfire	60'	35'	
European Beech	<i>Fagus sylvatica</i>		50'	35'	
Scarlet Oak	<i>Quercus coccinea</i>		60'	40'	
Medium-Narrow Crowns 40-50' Tall					25-35'
Columnar Tuliptree	<i>Liriodendron tulipifera</i>	Fastigiatum	50'	15'	
Armstrong Red Maple	<i>Acer rubrum</i>	Armstrong	45'	15'	
Bowhall Red Maple	<i>Acer rubrum</i>	Bowhall	40'	15'	
Parkway Maple	<i>Acer platanoides</i>	Columnar-broad	40'	25'	
Skyrocket Oak	<i>Quercus robur</i>	Fastigiata	45'	15'	
Medium – Wider Crowns 40-50' Tall					35-40'
Littleleaf Linden	<i>Tilia cordata</i>	Greenspire	40'	30'	
Summit Ash	<i>Fraxinus pennsylvanica</i>	Summit	45'	25'	
Patmore Ash	<i>Fraxinus pennsylvanica</i>	Patmore	45'	35'	
Norway Maple	<i>Acer platanoides</i>	Emerald Queen	45'	40'	
Red Sunset Maple	<i>Acer rubrum</i>	Red Sunset	45'	35'	
October Glory Red Maple	<i>Acer rubrum</i>	October Glory	45'	35'	
Honeylocust	<i>Gleditsia triacanthos</i>	Shademaster	45'	35'	
Katsura Tree	<i>Cercidiphyllum japonicum</i>		40'	40'	
Red Horsechestnut	<i>Aesculus x carnea</i>	Briotti	30'	35'	
Autumn Gold Ginkgo	<i>Ginkgo biloba</i>	Autumn Gold	35'	30'	

COMMON NAME	BOTANICAL NAME	CULTIVAR	MATURE HEIGHT	CROWN SPREAD	SPACING
Small Trees <35' Tall					25-40'
Norwegian Sunset Maple	<i>Acer truncatum x A. platanoides</i>	Keithsform	35'	25'	
Pacific Sunset Maple	<i>Acer truncatum x A. platanoides</i>	Warrenred	30'	25'	
Crimson Sentry Maple	<i>Acer platanoides</i>	Crimson Sentry	25'	15'	30-40'
Japanese Stewartia	<i>Stewartia pseudocamellia</i>		30'	20'	
Snowgoose Cherry	<i>Prunus spp.</i>	Snowgoose	20'	20'	
Spire Cherry	<i>Prunus x hillieri</i>	Spire	30'	10'	
Flowering Crabapple	<i>Malus spp.</i>	Snowdrift, Red Baron, Prairiefire	20'	20'	
Japanese Snowbell	<i>Styrax japonicus</i>		25'	25'	
Black Tupelo	<i>Nyssa sylvatica</i>		35'	20'	
Goldenrain Tree	<i>Koelreuteria paniculata</i>		30'	30'	
Rocky Mt. Maple	<i>Acer grandidentatum</i>	Schmidt	25'	15'	
Galaxy Magnolia	<i>Magnolia spp.</i>	Galaxy	30'	15'	
Rustica Rubra Saucer Magnolia	<i>Magnolia soulangiana</i>	Rustica Rubra	20'	20'	
Golden Desert Ash	<i>Fraxinus oxycarpa</i>	Aureafolia	20'	18'	
Chinese Kousa Dogwood	<i>Cornus kousa</i>	Chinensis	20'	20'	
Pink Flowering Dogwood	<i>Cornus florida</i>	Rubra	20'	20'	
Flowering Plum	<i>Prunus cerasifera</i>	Thunder-cloud	20'	20'	
Paperbark Maple	<i>Acer griseum</i>		25'	20'	
Tatarian Maple	<i>Acer tatarian</i>		25'	20'	
Trident Maple	<i>Acer buergeranum</i>		20'	20'	
David's maple	<i>Acer davidii</i>		30'	25'	
Flame Maple	<i>Acer ginnala</i>	Flame	20'	20'	
Sargent Cherry	<i>Prunus sargentii</i>		30'	30'	
Amur Maple	<i>Acer ginnala</i>	Flame	20'	20'	
Black Tupelo	<i>Nyssa sylvatica</i>		30'	20'	
Small Trees – Narrow <35' Tall					25-30'
Redmond Linden	<i>Tilia americana</i>	Redmond	35'	25'	
Pyramidal European Hornbeam	<i>Carpinus betulus</i>	Fastigate	35'	25'	
Hedge Maple	<i>Acer campestre</i>	Evelyn	35'	30'	
Callery Pear	<i>Pyrus calleryana</i>	Redspire or Cleveland Select	35'	25'	
Red Cascade Mt. Ash	<i>Sorbus americana</i>	Dwarfscrown	18'	8'	
Tree Lilac	<i>Syringa meyeri</i>	Palibin	7'	5'	

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

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

Western red cedar (*Thuja plicata*)
Mt. Hemlock (*Tsuga mertensiana*)
Douglas-fir (*Pseudotsuga menziesii*)
Canada Hemlock (*Tsuga canadensis*)
Western Hemlock (*Tsuga heterophylla*)
Giant sequoia (*Sequoia gigantea*)
Alaska Yellow Cedar (*Chamaecyparis nootkatensis* and 'Pendula')
Austrian pine (*Pinus nigra*)
Deodar Cedar (*Cedrus deodara*)
Incense Cedar (*Calocedrus decurrens*)
Serbian Spruce (*Picea omorika*)
Noble Fir (*Abies procera*)
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 Lacey 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 be 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 Lacey 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.

Martin Way – Desmond Drive to Marvin Road (Mostly Urban Growth Area)

This major arterial serves as a linkage between the Lacey Central Business District and Hawks Prairie area. It includes only a few mixed species of street trees maintained by the City of Lacey, a few private trees, and barren street sides the remainder of the way. The sidewalks and ditches were reconstructed by Thurston County; however no street trees were planted.

The street profile for almost the entire corridor is a four lane boulevard with sidewalks abutting a narrow grader ditch. There is space for trees, both on rights-of-way and on private property behind the sidewalk, depending on the location.

It is suggested that funding be sought to re-tree Martin Way to provide the linkage between the two commercial zones. It is recommended that canopy forming trees be planted in all possible locations. In many cases these trees would be planted on private property.

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

Summary: Planting design – Formal

Primary street tree species – Autumn purple ash, Scarlet oak, and Shademaster Honeylocust

Secondary street tree species – Saucer magnolia, Norwegian sunset maple and scarlet oak

Accent tree species – Amur maple, black tupelo, and snowgoose cherry

Utility Trees –Kousa dogwood, Japanese snowbell, and flowering plum

This planting scheme, coupled with replacement of some poor quality trees and creation of additional planting spots will change this segment of Martin Way 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. Residents will find this a friendly and comfortable street to walk, bike and jog along, most unlike the conditions today. The linkage between the Hawks Prairie and Martin Village areas will be complete.

The following is a listing of other high need sections of Lacey streets that would benefit from trees. Refer to Table 3 – Street Tree Themes for recommended tree species:

1. Lacey Blvd from Sleater-Kinney Road to Golf Club Road.
2. Pacific Ave. from Sleater-Kinney Road to Golf Club Road.
3. 3rd Ave. from I-5 off ramp to College St.
4. Rainier Road from Yelm Hwy. to the south city limits.
5. Kinwood Street – entire length.
6. Union Mills Road – entire length
7. Marvin Road from 3rd Ave. to Pacific Ave.

Only arterials and collectors in developed areas that are not likely to have projects are listed. Undeveloped areas will likely be planted as adjacent parcels develop.

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

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				
Sleater-Kinney Road	Martin Way	14 th Ave.	Autumn Purple Ash	Northern Red Oak	Flowering plum	Snowdrift crabapple
Sleater-Kinney Road	14 th Ave.	Chambers Lk. Rd.	Emerald Queen Norway Maple	Parkway Maple Redmond Linden	Prairiefire crabapple	Prairiefire crabapple
Golf Club Road	I-5	Chambers Lk. Rd.	Patmore Ash	Rustica Rubra Saucer Magnolia	Japanese Snowbell	Prairiefire crabapple
Judd St.	Ruddell Road	28 th Ave.	Japanese Stewartia	Rustica Rubra Saucer Magnolia	Kousa Dogwood	Trident Maple
Clearbrook Dr.	Lacey Blvd.	To End	London Plane	Emerald Queen Norway Maple	Rustica Rubra Saucer Magnolia	Galaxy Magnolia
College St.	15 th Ave.	Pacific Ave.	Northern Red Oak	Shademaster Honeylocust	Galaxy Magnolia	Trident Maple
College St.	Pacific Ave.	32 nd Lane	Norwegian Sunset Maple	Shademaster Honeylocust	Prairiefire crabapple	Desert Ash
College St.	32 nd Lane	Yelm Hwy.	Patmore Ash	Norwegian Sunset Maple	Snowdrift Fl. Crab	Pacific Sunset Maple
Rainier Road	Yelm Hwy.	City Limits	Greenspire Linden	Emerald Queen Norway Maple	Rustica Rubra Saucer Magnolia	Trident Maple
Ruddell Road	Martin Way	Yelm Hwy.	Summit Ash	Tuliptree	Japanese Snowbell	Pacific Sunset Maple
Ruddell Rd. Extension	Israel Road	Dennis St.	Summit Ash	Tuliptree	Flowering Cherry	--
Carpenter Road	Hawks Pr. Road	Pacific Ave.	Tuliptree	Rustica Rubra Saucer Magnolia-	Japanese Snowbell	Pacific Sunset Maple
Carpenter Road	Pacific Ave.	Mullen Road	Sugar Maple	Emerald Queen Norway Maple	Kousa Dogwood	Hedge Maple
Kinwood St.	Capitol Blvd.	City Limits	Shademaster Honeylocust	Patmore Ash	Flowering Plum	Pacific Sunset Maple
Hensley, Ranger, School St.	14 th Ave. NE	Pacific Ave.	Red Horsechestnut	Redmond Linden	Rustica Rubra Saucer Magnolia	Amur Maple
Union Mills Rd.	Pacific Ave.	Marvin Rd.	Scarlet Oak	Shademaster Honeylocust	Amur Maple	Underground

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STREET	SEGMENT		PRIMARY TREE	SECONDARY TREE	ACCENT TREE	UTILITY TREE
	FROM	TO				
Kagy Rd.	Mullen Rd.	58 th Ave.	Sugar Maple	Norwegian Sunset Maple	Flowering Dogwood	Rocky Mt. Maple
Marvin Road	44 th Ave. NE	Martin Way	Northern Red Oak	Emerald Queen Norway Maple	Flowering Plum	Galaxy Magnolia
Marvin Road	Martin Way	Pacific Ave.	Scarlet Oak	Shademaster Honeylocust	Snowgoose Cherry	Red Cascade Mt. Ash
Marvin Road	Pacific Ave.	City Limits	Norwegian Sunset Maple	Red Maple	Rocky Mt. Maple	Rocky Mt. Maple
Hogum Bay Road	Willamette Pkwy.	Marvin Road	Summit Ash	Callary Pear	Kousa Dogwood	Amur Maple
Willamette Pkwy.	Marvin Road	Hogum Bay Rd.	Sweetgum	Patmore Ash	Kousa Dogwood	Rocky Mt. Maple
Hoh St.	Martin Way	Steilacoom Rd.	Scarlet Oak	Shademaster Honeylocust	Prairiefire Fl. Crab	Golden Desert Ash
Meridian Road	46 th Ave. NE	Martin Way	Tuliptree	Patmore Ash	Black Tupelo	Rocky Mt. Maple
Meridian Road	Pacific Ave.	Yelm Hwy.	Katsura Tree	Pacific Sunset Maple	Snowgoose Cherry	Flowering Dogwood
Dutterow/Deerbrush Dr.	Martin Way	Pacific Ave.	Katsura Tree	Norwegian Sunset Maple	Rocky Mt. Maple	Trident maple
Hawks Prairie Road	Carpenter Road	Hogum Bay Road	Norwegian Sunset Maple	Tuliptree	Sargent Cherry	Flowering Plum
31 st . Ave. NE	Marvin Road	Meridian Road	Emerald Queen Norway Maple	Red Sunset Maple	Flowering Plum	Golden Desert Ash
Britton Parkway	Carpenter Rd.	Hogum Bay Rd.	Sugar Maple	Autumn Purple Ash	Sargent Cherry	Japanese Snowbell
Orion Drive	Willamette Pkwy.	Meridian Road	Northern Red Oak	Sugar Maple	Snowgoose Cherry	Amur Maple
Martin Way	College St.	Kinwood St.	Autumn Purple Ash	Rustica Rubra Saucer Magnolia	Amur Maple	Kousa Dogwood
Martin Way	Kinwood St.	Ranger Dr.	Scarlet Oak	Norwegian Sunset Maple	Black Tupelo	Japanese Snowbell
Martin Way	Ranger Dr.	Marvin Road	Shademaster Honeylocust	Scarlet Oak	Snowgoose Cherry	Flowering Plum
Steilacoom Road	Pacific Ave.	City Limits	Katsura Tree	Pacific Sunset Maple	Snowgoose Cherry	Flowering Dogwood
Pacific Ave.	West City Limits	Carpenter Road	Patmore Ash	Autumn Purple Ash	Kousa Dogwood	Amur Maple
Pacific Ave.	Carpenter Road	Marvin Road	Tuliptree	Greenspire Linden	Black Tupelo	Japanese Snowbell

Lacey Urban Forest Management Plan

STREET	SEGMENT		PRIMARY TREE	SECONDARY TREE	ACCENT TREE	UTILITY TREE
	FROM	TO				
Pacific Ave.	Marvin Road	City Limits	Greenspire Linden	Tuliptree	Flowering Plum	Golden Desert Ash
14 th Ave.	Carpenter Road	Union Mills	Norwegian Sunset Maple	Parkway Maple	Red Cascade Mt. Ash	Amur Maple
Lacey Blvd.	Sleater-Kinney Rd.	Pacific Ave.	Patmore Ash	Autumn Purple Ash	Paperbark Maple	Golden Desert Ash
21 st Ave.	Chambers Lk. Dr.	Golf Club Rd.	Red Maple	Pacific Sunset Maple	Photinia Tree	Galaxy Magnolia
22 nd Ave.	Golf Club Rd.	Shady Lane	Redmond Linden	Scarlet Oak	Galaxy Magnolia	Japanese Snowbell
Shady Lane	Lilac St.	Carpenter Road	Sargent Cherry	Flowering Plum	Paperbark Maple	Tree Lilac
25 th Ave.	Ruddell Road	Lilac St.	Redmond Linden	Sargent Cherry	Goldenrain Tree	Kousa Dogwood
Mullen Road	West City Limits	Ruddell Road	Red Horsechestnut	Black Tupelo	Japanese Snowbell	Amur Maple
Mullen Road	Ruddell Road	Carpenter Road	Tuliptree	Black Tupelo	Snowgoose Cherry	Amur Maple
Mullen Road	Carpenter Road	Meridian Road	Sugar Maple	Northern Red Oak	Sargent Cherry	Japanese Snowbell
54 th Ave.	East of Ruddell Rd.	To End	Redspire Callery Pear	Scarlet Oak	Flowering Plum	Galaxy Magnolia
58 th Ave.	Kagy Road	Meridian Road	Greenspire Linden	Black Tupelo	Rocky Mt. Maple	Trident Maple
Yelm Hwy.	West City Limits	Ruddell Road	Norwegian Sunset Maple	Flowering Plum	David's Maple	Red Cascade Mt. Ash
Yelm Hwy.	Ruddell Road	Fair Oaks Road	Sugar Maple	Northern Red Oak	Tree Lilac	Trident Maple
Yelm Hwy.	Fair Oaks Road	Meridian Road	Autumn Purple Ash	Pacific Sunset Maple	Paperbark Maple	Japanese hornbeam
Compton Blvd. Ext.	Rainier Road	Yelm Hwy.	Greenspire Linden	European Beech	Tatarian Maple	Tree Lilac

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 Lacey. To achieve this effect, we must plan for it and plant it today.

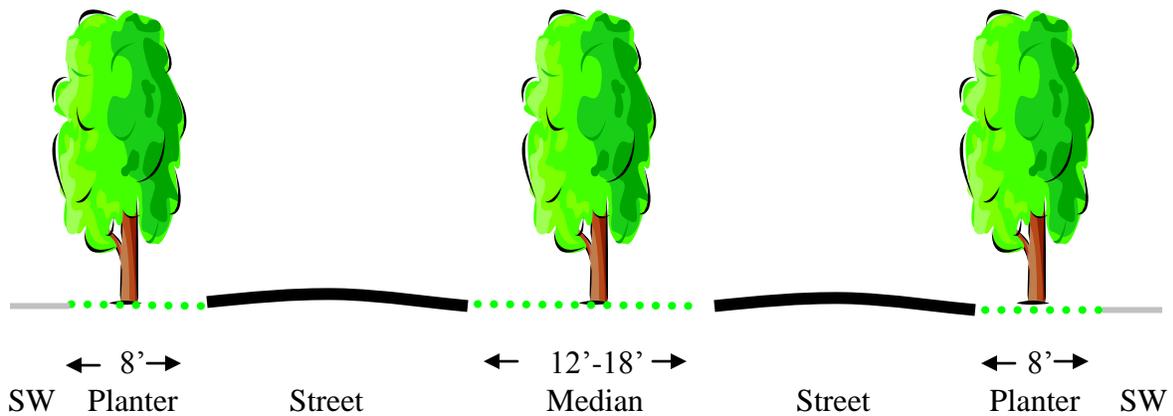


Figure 12. Ideal street design for development of maximum canopy, while providing separation between streets and sidewalks.

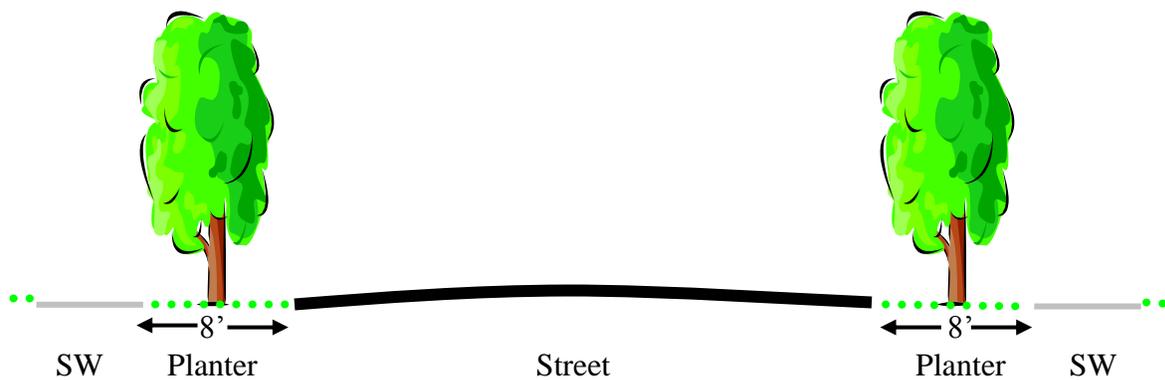


Figure 13. When space does not allow development of a full median, providing 8' planter strips will allow development of large, canopy forming trees. Planter strips should not be less than 6' wide. These narrow widths will only allow planting of small to medium sized trees that will not produce the canopy effect.

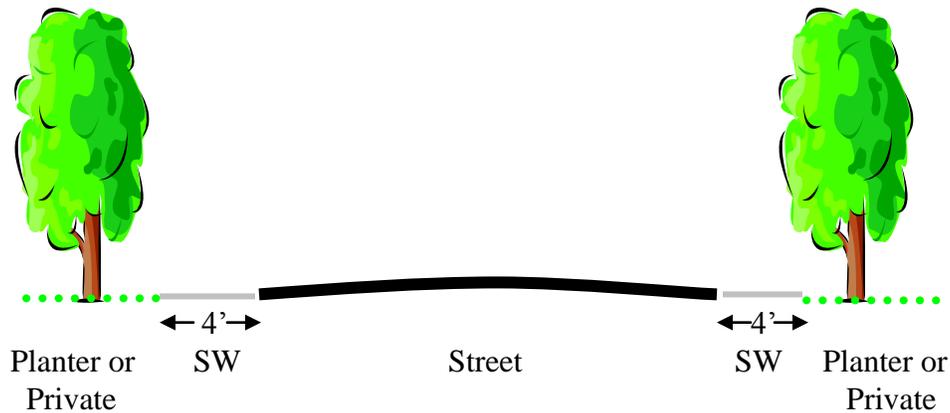


Figure 14. This is a commonly occurring street design in Lacey. Street trees, when they occur, are located on private property, or occasionally in planter strips.

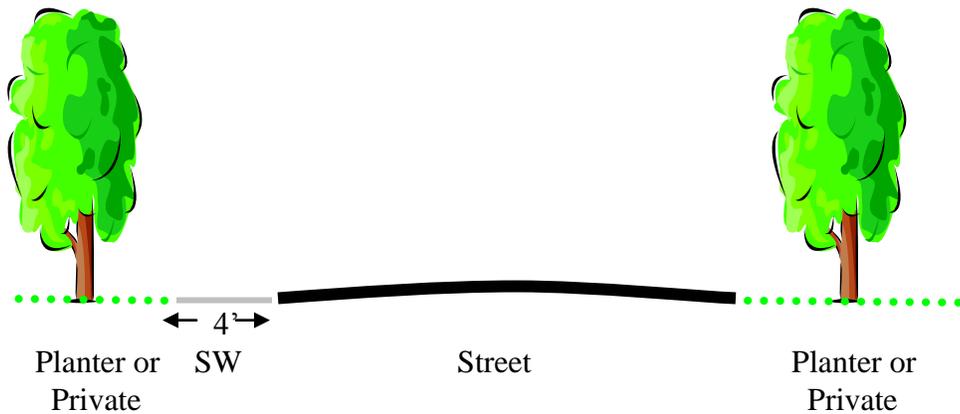


Figure 15. This is a commonly occurring street design in older neighborhoods in Lacey. In some cases no sidewalks occur. Most street trees are privately planted, without uniformity of design or occurrence.

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. 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.

<u>Tree Type/Size</u>	<u>Spacing Between Trees</u>
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.

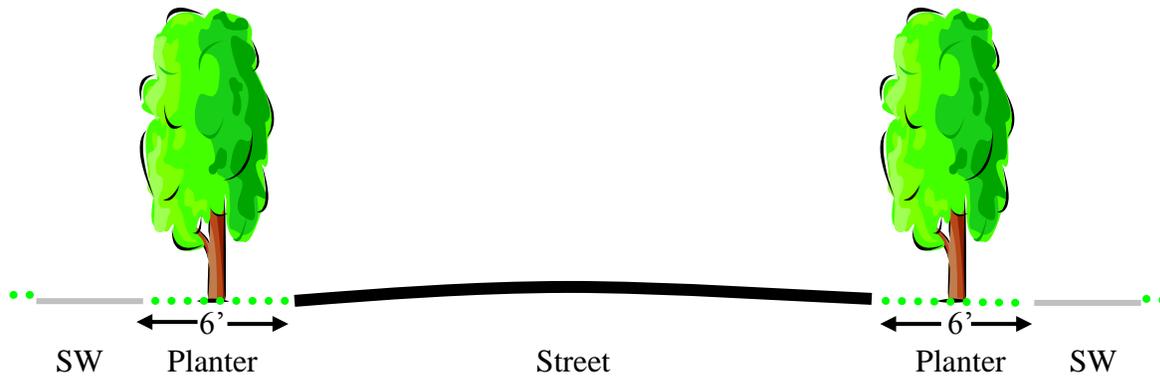


Figure 16. If space does not allow for 8' wide planter strips, then 6' can still be planted with medium to large street trees, however potential for root damage is higher.

Street Tree Planting and Maintenance

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 Community Development Department and the Parks Maintenance Division to insure that it furthers goals outlined in the comprehensive 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. An adequate annual budget dedicated to street tree maintenance 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 A60.1-1996), 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 be 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 Lacey 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 inch 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

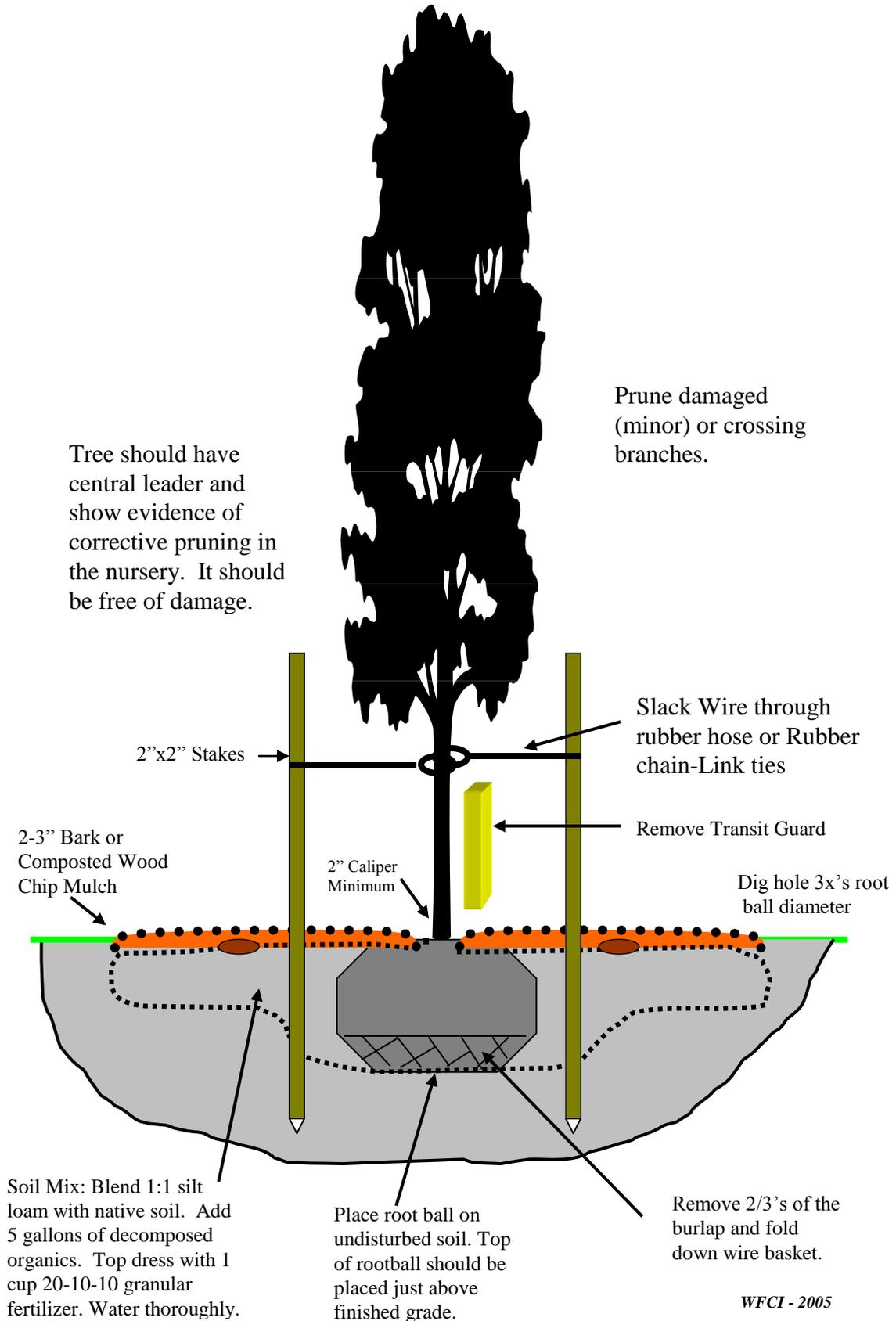
Plant the tree in the same orientation as it grew in the nursery. Most trees will be marked at the base to indicate the north side of the tree. This will reduce the potential for sunburn of the bark.

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 ft. x 5 ft. 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 17. 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. If the tree has been in-ground fabric bag grown, remove all synthetic and plastic material materials prior to tree placement the planting hole.

Complete backfilling with the topsoil mix. In areas with gravelly soils, blend the topsoil with native soils. In areas of Lacey with sandy loams, utilize the native material or imported topsoil 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 watered in to eliminate air pockets and settle the soil around the rootball. Create a small 4 inch high berm with soil to create a well for holding water from irrigation. This berm should be located 12 inches outside of the rootball.

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

<u>Tree Caliper (in)</u>	<u>Gallons per Week</u>
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 inches of bark mulch or composted wood chips.

Staking

All deciduous trees 1.5 inch to 2.5 inches caliper and conifers taller than 5 feet should be staked with two stakes. Trees should be staked with 2 in. x 2 in. or round wooden stakes that are 6 feet 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 inches caliper will require 3 stakes. Trees larger than 4 inches 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 weed eat 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.

<u>Stock Type</u>	<u>Timing of Planting</u>
Balled and Burlap	October 15 th through May 1 st
Containerized	October 15 th through May 1 st
Bare-Root Stock	February 15 th through April 15 th
In-ground Fabric Bag	October 15 th through May 1 st

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 Lacey, 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 Lacey 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 Lacey planning areas.

Figure 19. 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.

APPENDIX 6

WASHINGTON FORESTRY CONSULTANTS, INC.
FORESTRY AND VEGETATION MANAGEMENT SPECIALISTS



W F C I

360/943-1723
FAX 360/943-4128

1919 Yelm Hwy SE, Suite C
Olympia, WA 98501

-Street Tree Inventory-

CITY OF LACEY STREET TREES

Lacey, WA

Prepared for: Ryan Anderson
Community Development Department

Prepared by: Washington Forestry Consultants, Inc.

Date: October 22, 2012

Introduction and Purpose

We have completed an evaluation and inventory of the city maintained street trees in the City of Lacey. In addition, we did the street trees in the Lacey Corporate Center.

The purpose was to map the street trees, and provide an inventory and assessment of trees. This will be a brief summary report in lieu of a formal report as requested.

Methodology

Washington Forestry Consultants, Inc. (WFCI) was provided with an aerial photo layer of the city along with shapefiles for the arterials and collectors and parcel layers in the City of Lacey. We designed a data collection template for ArcPad 10.0 for ease of collection of the inventory information on the street trees. The following is a list of all of the major data collection parameters for the inventory:

- Species
- Diameter
- Condition
- Tree problems
- Work needed
- Work priority
- Field notes

The work was completed by a ground inventory using a Trimble Nomad GPS handheld data collector. All trees within what appeared to be the city rights-of-way were inventoried. The rights-of-way edge was not always clearly defined in the field.

Native trees and planted trees on the rights-of-way were inventoried. Smaller, quality native tree species (e.g. a free-to-grow 3 inch caliper Douglas-fir) were also inventoried.

Observations

Tree Species

We found 5,557 trees of over 60 species of trees on the City of Lacey rights-of-ways that are maintained by the city. They ranged from 1 to 49 inches DBH.

Table 1. Species Summary of City of Lacey Street Trees.

Species	Diameter Range (inches)	# Trees	% Composition
Ash - Autumn Purple	2-10	142	2.46%
Ash - Golden Desert	2-4	19	0.33%
Ash - Green/White	1-26	1,102	19.08%
Ash - Mountain	2-3	4	0.07%
Ash - Patmore	1-22	692	11.98%
Ash - Raywood	1-9	53	0.92%
Ash - Summit	2-6	22	0.38%
Basswood - American	6-9	17	0.29%
Birch - Jacquemontii	2-7	53	0.92%
Birch - Paper	4-14	14	0.24%
Cascara	3	1	0.02%
Cedar - Deodar	1-2	4	0.07%
Cedar - Incense	1-12	37	0.64%
Cedar - Port Orford	6	1	0.02%
Cedar - Weeping Alaska	1-16	69	1.19%
Cedar - Western red	2-6	10	0.17%
Cherry - Flowering	1-9	91	1.58%
Cherry - Kwanzan	3-19	161	2.79%
Cherry - Other	6	1	0.02%
Crabapple	1-8	197	3.41%
Cypress - Other	2-6	30	0.52%
Dogwood - Flowering	1-6	100	1.73%
Fir - Douglas	1-49	29	0.50%
Fir - Grand	19-26	2	0.03%
Giant Sequoia	18-20	2	0.03%
Hawthorne	2-9	16	0.28%
Hemlock - all	1-4	25	0.43%

City of Lacey –Street Tree Inventory - Summary

Species	Diameter Range (inches)	# Trees	% Composition
Hornbeam - American	2-9	69	1.19%
Hornbeam - European	3-7	18	0.31%
Katsura tree	2-14	61	1.06%
Lilac - Jap. Tree	2-3	13	0.23%
Linden	3-6	46	0.80%
Magnolia	3	8	0.14%
Maple - Nor. Sunset	2-7	79	1.37%
Maple - Norway	2-10	153	2.65%
Maple - Other	2-5	18	0.31%
Maple - Pacific Sunset	4-6	4	0.07%
Maple - Paperbark	2-3	8	0.14%
Maple - Parkway	3-6	24	0.42%
Maple - Red	2-26	217	3.76%
Maple - Sugar	6-12	5	0.09%
Maple - Tatarian	2-3	10	0.17%
Maple - Vine	1-6	114	1.97%
Oak - OR White	1-22	23	0.40%
Oak - Other	2-8	15	0.26%
Oak - Red	2-17	349	6.04%
Oak - Scarlet	2-4	3	0.05%
Other - Deciduous	2-10	16	0.28%
Pear - Callery	1-12	547	9.47%
Persian Perrotia	1-2	4	0.07%
Pine - Austrian	3-14	26	0.45%
Pine - Other	4-6	4	0.07%
Pine - Shore	2	1	0.02%
Plum - Flowering	1-16	75	1.30%
Redwood - Coast	2	3	0.05%
Spruce- other	2-3	14	0.24%
Sweetgum	1-19	839	14.53%
Sycamore	21-32	6	0.10%
Tuliptree	3-13	29	0.50%
Zelkova - Japanese	4-10	80	1.39%
Summary		5,775	100.00%

A rule of thumb when managing a cities street trees is to avoid having more than 10% or so of a single genus of tree species to avoid major tree loss if an insect or disease outbreak occurs that affects a particular genus of trees. The following table shows that the City of Lacey is heavy to trees in the Fraxinus genus, but fairly well balanced overall.

Table 2. Breakdown of individual genera as a % of the street tree population.

Genera-Species	% of Total
Fraxinus-Ash species	35.2%
Liriodendron -Sweetgum	14.5%
Acer - Maple species	10.9%
Callery Pear	9.5%
Prunus - cherry cultivars	4.4%
Malus - crabapple cultivars	3.4%
Summary of Major Species	77.9%

The surprising number is that maple only makes up 10.9% of the street tree population. Over time the Sweetgum population will go down since it is no longer being planted as a street tree due to structural concerns in storms.

Tree Condition

The condition of each tree was recorded as good, fair, poor, dead, or hazardous. We found over 56% of the street trees to be in Good condition and 30 trees that were dead or hazardous.

Table 3. Summary of Tree Conditions of City of Lacey Street Trees.

Condition	# of Trees	%
Good	3,212	56%
Fair	2,263	39%
Poor	270	5%
Dead	18	<1%
Hazard	12	<1%
Summary	5,775	

Tree Maintenance

Hazard pruning was prescribed for trees damaged by the recent 2012 ice storm. Necessary pruning included broken and hanging branches or where pruning was necessary to stabilize or balance the crown of a tree.

More often, structural pruning was prescribed to raise and thin crowns on the smaller street trees that needed cultural pruning to develop long-term scaffold branches or required lifting of the crown to provide future sidewalk and road clearances.

Sidewalk, road clearance, and corner pruning were prescribed when branches were already encroaching into these zones. Generally, the parameters were 8 ft. over sidewalks, 15 ft. over roads, and anything impacting stop sign or corner visibility. Many trees were prescribed to receive sidewalk and road clearance pruning. A small number of trees required corner or sign visibility pruning.

Table 4. Summary of Tree Work Needed for City of Lacey Street Trees.

Work Needed	# of Trees	%
None	4,792	83%
Prune	566	10%
Remove	255	4%
Other	162	3%
Summary	5,775	

Tree work categorized as 'Other' includes work to remove tree stakes, adjusting tree grates and removing nails from trees.

Most of the trees require only routine maintenance. However there are 14 trees that require immediate action to mitigate potential threats posed by the tree.

Table 5. Summary of Work Priority for City of Lacey Street Trees.

Work Priority	# of Trees	%
Routine	5,761	99.8%
Immediate	14	<1%
Summary	5,775	

The effort of the City of Lacey to encourage and plant new street trees is evident by thousands of new street trees in the city. However, many opportunities still exist to plant new street trees where there are no planted or native trees today. These opportunities occur in planter strips that are empty or are being used as parking strips, and in front yards along streets with no sidewalks.

Lacey Corporate Center

In addition to the City of Lacey trees we inventoried one area of private trees. This area was the Lacey Corporate Center Drive, and the Roxanna Drive and Loop. These trees were summarized separately from the city owned trees. The following tables include those areas.

Table 6. Species Summary of Lacey Corporate Center street trees.

Species	Diameter Range (in.)	# Trees	%
Ash - Green/White	2-18	198	49%
Birch - Paper	8-14	5	1%
Hawthorne	6-9	5	1%
Maple - Red	2-12	157	39%
Oak - Red	3-5	22	5%
Pear - Callery	2-6	11	3%
Plum - Flowering	2-5	6	1%
Sweetgum	2	2	<1%
Summary	2-18	406	

Table 7. Summary of Tree Conditions of Lacey Corporate Center.

Condition	# of Trees	%
Good	225	55%
Fair	161	40%
Poor	16	4%
Dead	1	<1%
Hazard	3	<1%
Summary	406	

Table 8. Summary of Tree Work Needed for Lacey Corporate Center.

Work	# of Trees	%
None	349	86%
Prune	37	9%
Remove	18	4%
Other	2	<1%
Summary	406	

Table 9. Summary of Work Priority for Lacey Corporate Center.

Work Priority	# of Trees	%
Routine	398	98%
Immediate	8	2%
Summary	406	

Summary

In summary, we inventoried 5,775 City of Lacey street trees that are maintained by the city. Four hundred six private trees were also inventoried and assessed for a total of 6,181 trees.

The City of Lacey Public Works staff is doing an excellent job of maintaining the trees with over 95% being classified as being in Fair or Good condition and only 17% requiring some type of maintenance work at this time.

Please give me a call if you have further questions.

Respectfully submitted,

Washington Forestry Consultants, Inc.



Galen Wright, ACF, ASCA
ISA Board Certified Master Arborist PN-0129
Certified Forester No. 44