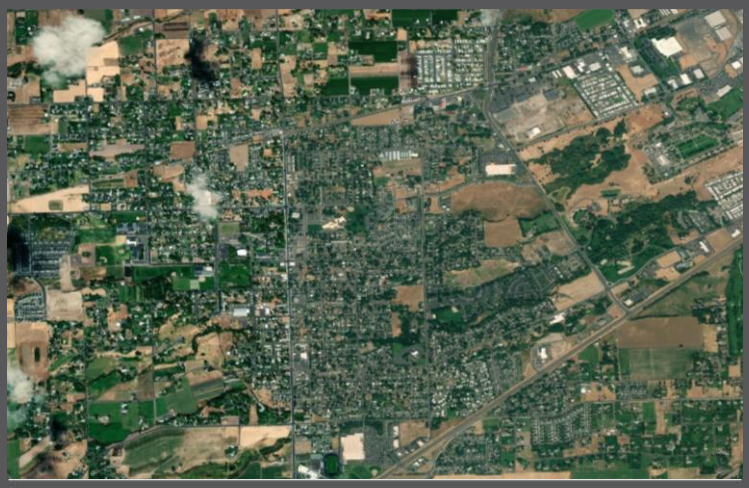
APRIL 30, 2021

City of College Place, WA
Urban Forestry Management Plan



Community Forestry Consultants

URBAN FOREST MANAGEMENT PLAN (UFMP)

City of College Place
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College Place, WA 99324

College Place, Walla Walla County, ca. 1930

APRIL 30, 2021

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EXECUTIVE SUMMARY

Urban forest management plans (UFMPs) are developed by many communities to provide a common vision for urban forest health and sustainability, establish goals, and coordinate actions toward achieving them. An urban forest includes street and park trees, remnant forested areas, and those planted in medians, parking lots, tree pits, and other urban spaces. An urban forest management plan recognizes the impacts of tough urban conditions on the natural landscapes and public trees and balances those impacts with the needs of humans who share this ecosystem. Urban forest management can help College Place provide environmental, social, and economic benefits that enhance the quality of life, minimize the effects of urbanization, foster civic pride, and contribute to community character; long-term benefits that residents, businesses, and visitors seek.

Trees make places work, look, and feel better. As well as playing a role in climate proofing our neighborhoods and supporting human health and environmental well-being, trees can also help to create conditions for economic success. This management plan takes a progressive, applied approach to urban trees, providing decision makers with the principles and references they need to fully realize this potential.

College Place has completed a partial inventory assessment of its urban forest. It will facilitate the ongoing commitment to maintain, enhance, and preserve College Place's tree canopy and guide College Place staff, landowners, contractors, utility companies, developers, planners, and residents in making decisions about their trees.

College Place's inventory and management plan was initiated to manage, maintain, enhance, and preserve the community tree canopy. Project funds were provided from a grant obtained from the USDA Forest Service Urban and Community Forestry Program administered by Washington State Department of Natural Resources Urban and Community Forestry Program (WADNRC). Technical and staff support was provided by the City of College Place staff.

Two primary methods of community outreach were used:

- Interviews with Parks, Arbor, and Recreation Board
- On-line public forum information meetings

Public Process

A crucial element of developing the UFMP was soliciting information from city staff, city boards, and citizens of College Place. Stakeholder input was used to assist CFC in identifying opportunities, issues, elements, actions, and goals for the UFMP. Methods of gathering public input included holding stakeholders' public meetings and conducting interviews and soliciting comments from city staff. Every attempt was made to engage community members in the process of developing the UFMP.

CoVid virus restrictions forced public meetings to be held online March 24 and April 7. Meeting notices were advertised throughout city communication channels. A copy of the draft plan was posted to the City's website for review. All comments were forwarded to CFC for inclusion in the plan.

S.W.O.T. Analysis

A Strengths, Weaknesses, Opportunities, and Threats (SWOT) assessment was completed to organize input and comments provided by the public, program affiliates, stakeholders, and city staff. The lists included in Appendix B offer a synthesis of the range of insights, perspectives, and opinions regarding the current and future state of the College Place Urban Forestry program; this information has helped inform the development of the program objectives and specific action steps in this plan. Please note that it is common for a specific issue to be identified in multiple, even contradictory, sections of the SWOT matrix because different perspectives yield different perceptions.

Purpose of the UFMP

The starting point for success understands where you are and where you want to go. The UFMP principles will help College Place staff integrate the goals and objectives of the City of College Place urban forestry program while managing the specific needs of the community trees.

Managing, maintaining, and preserving urban trees can only be achieved effectively by developing and implementing a strategic urban forest management plan. Positive and negative social impacts of implementation efforts influence the political standing of urban forestry programs, suggesting that the political and social skill of city staff, their superiors, and community advocates are key factors in the success of implementation. An urban forest management plan standardizes policies and practices for tree-related activities. This plan lays out components that encompass a long-term vision with short-term goals for the managing College Place's trees.

An Urban Forest Management Plan (UFMP) is a guide for ensuring that public trees and forests are appropriately cared for according to arboriculture standards and community goals. College Place's UFMP is a strategy to expand its urban forestry program to meet a range of policy, education, and management goals. The plan is a tool to explore community concerns and management conflicts, while offering a series of prioritized implementation actions based on inventory data, current urban forestry and arboriculture practices, and community outreach. The plan evaluates species composition, maintenance requirements, tree population trends, and the condition of the urban forest.

The capacity of the urban forest to provide benefits depends on how the resources are developed and managed. The UFMP will lead to improvements in urban tree management and stewardship in a coordinated, cooperative approach with city departments, program partners, and residents. The plan was prepared from a comprehensive analysis of tree inventory data, staff input, and community participation.

As a strategic and forward-looking document, this plan should be incorporated into the existing policies and requirements of the College Place City Parks and Recreation Comprehensive Master Plan, City Tree Ordinance, College Place Storm Water Management Program, other city master plans, and agreements with other government agencies, Homeowner associations, and local education institutions.

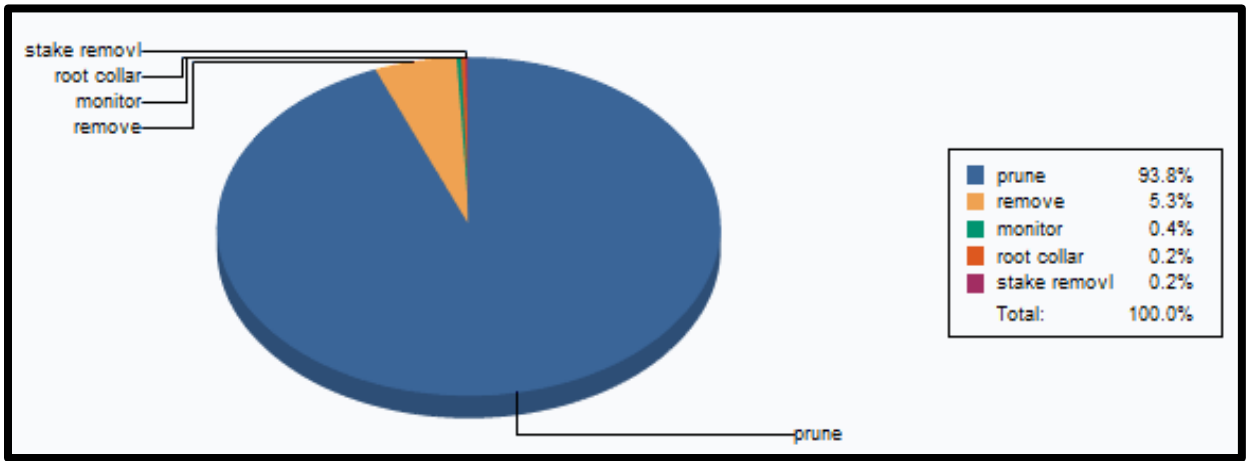
College Place Tree Inventory Summary

Community Forestry Consultants, Inc. (CFC) was provided a 546 tree inventory data base of federally classified street right-of-way (ROW) trees and park trees located in Lions, Veterans, Kiwanis, and Harvest Meadows parks. Attributes in the database

consisted of GPS location, species, condition rating, and trunk diameter. CFC verified existing data and collected street address and street where possible; grow space, land use, height and spread dimensions, trunk quantity, significant defects, maintenance requirements, and appraised value.

Data results

- Sites inventoried: 557.
- Appraised value of trees inventoried: $1,551,000.00.
- Trees requiring pruning maintenance: 439.
- Trees requiring removal: 25.



Major Issues

- Structural defects (co-dominant stems; dead branches)
- Improper planting practices
- Limited species diversity

Goals of the UFMP

The management plan supports the mission of improving College Place's tree population through proper management of a valuable asset. The UFMP follows the vision to retain a high quality of life by improving College Place's urban forest management and thereby increasing the numerous, proven benefits derived from trees.

Relying on the UFMP for guidance, the city will partner with or engage in the following:

- community members, organizations, and volunteers to encourage tree planting and stewardship
- preserve and protect existing trees
- promote public safety, tree health, and structure; implement cost-effective and proper arboriculture maintenance of the community forest
- increase public education and awareness of the value of the community forest
- maximize the social, economic, and environmental benefits of the community forest for current residents and future generations

The UFMP guidelines promote consideration of public trees as major and important urban infrastructure and outlines best practices to incorporate trees into the city fabric. It provides for the development of a progressive long-range urban forestry program that will result in a healthier and safer forest in College Place. The UFMP is a tool to use in guiding the tree program and garnering support, cooperation, and funding for the tree program.

Lastly, it is understood that woody shrubs and ground cover plant communities are part of, and integral to, the overall health of the urban forest, but the primary scope of this plan is to focus on trees – the largest, longest-lived and most significant member of the landscape community. The implementation of the UFMP will ultimately contribute to the quality of life in College Place through enhancements to the tree population.

College Place Urban Forestry Management Plan goals:

- College Place City Council adopts and implements an Urban Forestry Management Plan.
- Provide adequate tree maintenance funding to sustain College Place tree canopy based on council, stakeholder, and resident input.
- Maximize and expand the urban tree canopy. Create a tree planting plan; promote proper planting of new trees and diversification of species; incorporate tree planting into community planning.
- Coordinate and integrate local urban forestry goals into city and regional planning processes.
- Maintain and update the inventory of College Place trees to improve management and maintenance of the tree population.
- Review existing tree ordinance to incorporate the recommendations and goals of the city's tree management plan, adopt the ordinance into the city code, and implement ordinance enforcement practices.
- Provide education and public awareness of the importance of the trees to the community; educate city staff, contractors, and the community on proper tree care; and encourage greater participation in tree steward activities.

The recommendations made in this plan are intended to be considered and implemented over a period of five years. A systematic maintenance program, tree planting program, adequate funding, staffing, regulations, and resources today will allow College Place's urban forest to thrive, expand, and be sustainable.

The success of this plan is based on people's expectations of the benefits they may receive from the College Place's community forest and their willingness to invest in its sustainable management.

Urban Forestry Program Actions

The primary actions and objectives of the plan are listed below and described in detail in the body of the management plan.

- Application of arboriculture industry standards for College Place tree care

- Engage International Society of Arboriculture (ISA) certified arborists to perform tree maintenance
- Maintain tree inventory data
- Proactive tree maintenance of College Place trees
- Eliminate trunk damage caused by lawnmowers and weed eaters
- Annual analysis and mitigation of risk trees
- Implement a cyclic pruning program for young and mature trees
- Proper tree planting
- Proper tree maintenance
- Canopy preservation

The recommendations and actions will expand and conserve College Place's tree resource and sustain the tree canopy for future generations. Although this commitment will come with costs, the long-term benefits are significantly greater and will result in a sustainable asset for the citizens of College Place today and tomorrow.

INTRODUCTION

In 2020 the City of College Place Urban Forestry program received a grant from WADNRC to develop and generate an urban forestry management plan for street and park trees. The City of College Place contracted with Community Forestry Consultants, Inc. (CFC) to analyze inventory data, and engage the city staff, community, and elected officials in the development an urban forestry management plan. As the owner the City of College Place is responsible for the maintenance of trees at all publicly owned sites (Figure 1). Sites collected are listed below figure 1.

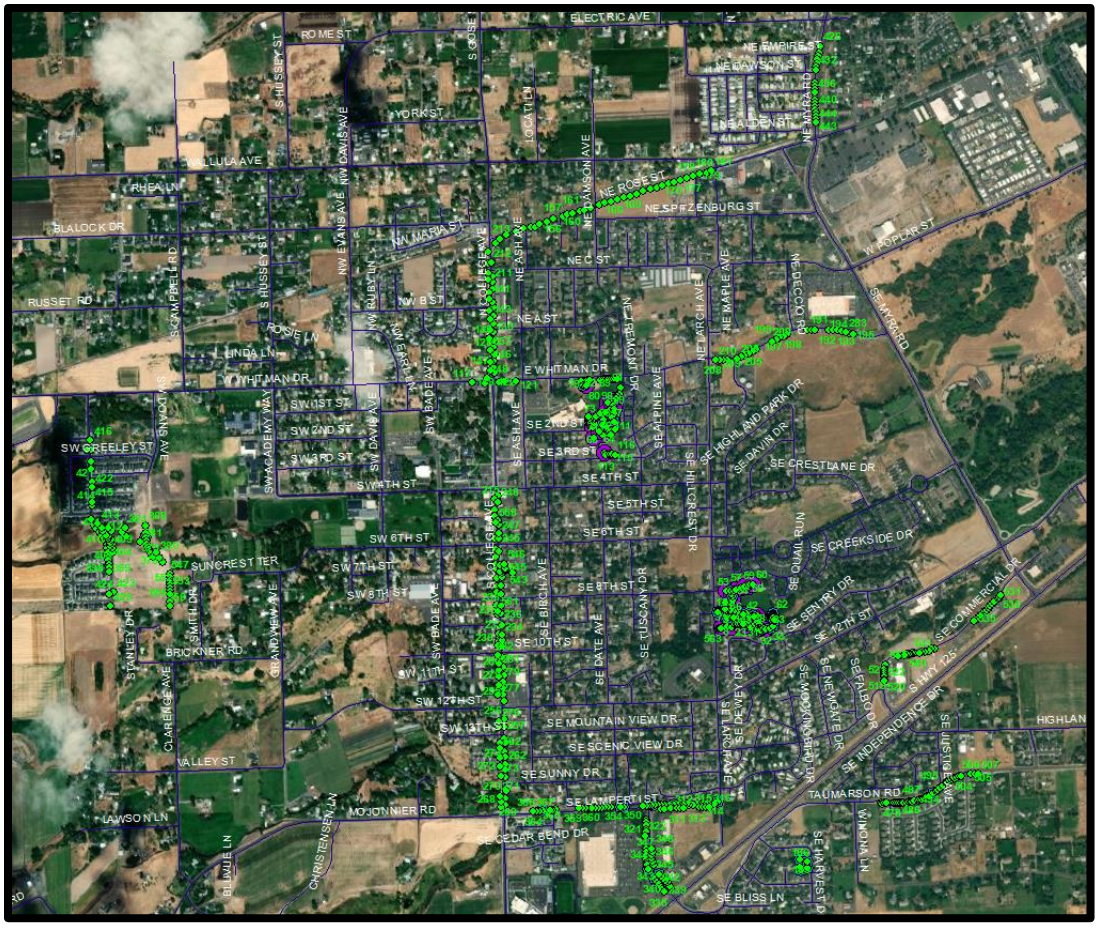


Figure 1 – Aerial photo of a portion of College Place trees inventoried. Green and purple dots represent trees of different trunk diameters.

City Parks

- Kiwanis Park (NE corner of 2nd & Date)
- Lions Park (SE corner of 8th & Larch)
- Harvest Meadows Park (West side of Harvest Drive, north of Larch)
- Veterans Park (South of 4th Street, between Doans and Homestead)
- Municipal Campus (625 S. College Ave)

Federally Classified Arterial Roadway Right-of-Way

- College Avenue (Blalock to SR 125)
- SE Tamaurson Rd (Justice Drive to Meadowbrook Blvd)
- SE Meadowbrook Blvd (Tamaurson to Lamperti St)
- SW Mojonnier Rd (College Ave to Bluvue Ln)
- SE Lamperti St (College Ave to Larch)
- SE Larch Ave (C Street to Dead End at SR 125)
- SE 12th Street (College to Myra Rd)
- SE 4th Street (College to Highland Park Dr)
- SW 4th Street (College to Academy Way)
- SW Academy Way (Whitman to 4th)
- SW Doans Ave (Whitman Drive to Julia)
- Whitman Drive (Martin Airfield Driveway to Myra Rd)
- NE C Street (College Ave to Myra Rd)
- NE Lambert (Rose to C Street)
- NE Rose (College Ave to Myra)
- NE Myra (Electric Ave to Rose Street)

Vision Statement

The vision statement describes how College Place should look and function now and in the future. It implies an action goal that facilitates objectives of proper arboriculture practices, preservation, restoration, and stewardship of trees in College Place. The College Place vision statement includes sentiments about the environmental, social, economic, and ecological importance of trees and natural resources to College Place in terms of management, benefits, and sustainability. The UFMP vision statement aligns with College Place's organizational values and "Where small-town living and learning meet."

College Place Urban Forestry Vision Statement

The City of College Place recognizing urban forestry as an equal part of the community infrastructure, will create, enhance, maintain, and sustain a vibrant, healthy, and structurally sound community forest resource for the benefit and enjoyment of College Place residents and visitors.

College Place Canopy Cover Goals

Canopy cover is the percentage of an area on the ground that, when considered in plan/map view, is covered by the crowns of trees. In a dense forest the canopy cover would be expected to approach 100%. On the other hand, open prairies are dominated by grasses and widely spaced trees creating canopy cover as low as 5%. In between lays a variety of treed urban environments.

In considering an urban forest canopy target, several factors should be noted. First, there are no widely agreed upon, figures for canopy cover targets in urban areas. A commonly cited figure is 40%, the recommendation of American Forests, based on their "professional opinion that this tree cover is a reasonable target".

Second, the issue of empirically deriving a percentage that is appropriate to the local environment seems to be given attention. Any study of canopy cover figures must

consider local climate and soil factors and take into account the differences in land development within a community.

Third, there is no attention given to the fact that the urban environment is far from homogeneous and varying local conditions within a city, particularly related to kind and design of development, will offer different constraints and opportunities. For example, it is unreasonable to expect that the same canopy cover can be achieved in a densely built industrial area as in a residential neighborhood dominated by single-family homes. Thus, the notion that a single canopy cover figure can be – or should be – applied city-wide, would appear to be difficult to defend.

Each urban land use environment is associated with a different set of opportunities and constraints to tree growth and target value selection must recognize these.

- Right-of-way target value is best measured by stocking level, not canopy cover. Stocking level is a proportion of existing street trees to the total number of potential street trees (number of trees plus the number of available planting spaces).
- Park canopy varies between natural areas and active recreation areas and between segments of a park; canopy cover figures should be developed by KUF and park planners on a site-by-site basis.
- Residential areas should seek to achieve 50% canopy.
- Commercial/Industrial areas should seek to achieve 15% canopy.

The City of College Place may establish land use canopy cover goals. Suggested land use areas and canopy cover goals are:

Canopy Coverage Goals

- Single family; multi-family residential – 50%
- Developed parks – 35%
- Undeveloped/Natural parks – 80%
- Commercial – 15%
- Streets, rights-of-way (ROW) – 80% stocking level

The bordering topography and its remnant vegetation create a prominent visual background of verdant natural landscape that contrasts with the landscape of the recent developed properties which essentially has limited canopy coverage currently due to the small size of the trees. In new sites planting density should be sufficient to achieve canopy goals. In established residential areas trees are a significant feature. They should be replaced when possible, following a removal and remaining trees maintained to sustain existing canopy cover. The challenge for College Place is clear: given the length of time that trees need to grow, efforts to increase canopy must continue today and maintenance and preservation of existing trees and forests needs to start now to improve the canopy coverage.

City Plan and Policy Coordination

There are many existing plans and policies in the City of College Place that affect and are affected by the tree population. The College Place UFMP will act as a stand-alone management tool for the agency but should function within the context of the City of College Place Urban Forestry Program plans and policies and other city plans and

policies impacting trees. Trees can provide solutions and fulfillment of goals in other city plans and should be integrated where appropriate. City plans should link together. Use the UFMP actively to seek linkages when working on other issues and then use trees to support and solve those broader public policy goals. Other city plans include but are not limited to:

- College Place Stormwater Management Plan 2020
- College Place Parks and Open Space Plan
- City of College Place, WA Updated Comprehensive Plan9, 2018
- Complete Street Policy

Tree Benefits

Few elements of the grey infrastructure of urban places can be said to boost property values, support retail activity, enhance tourism experiences, improve agency health, protect water quality, abate wind speeds, reduce air particulate, reduce storm water runoff, counter climate change, and ensure roadway safety all at once. Communities looking for these benefits may be surprised to find a solution right in their own backyards, along their streets, and in their parks. The green infrastructure of trees, along with parks and open space, provide a wealth of benefits to College Place (Figure 2).

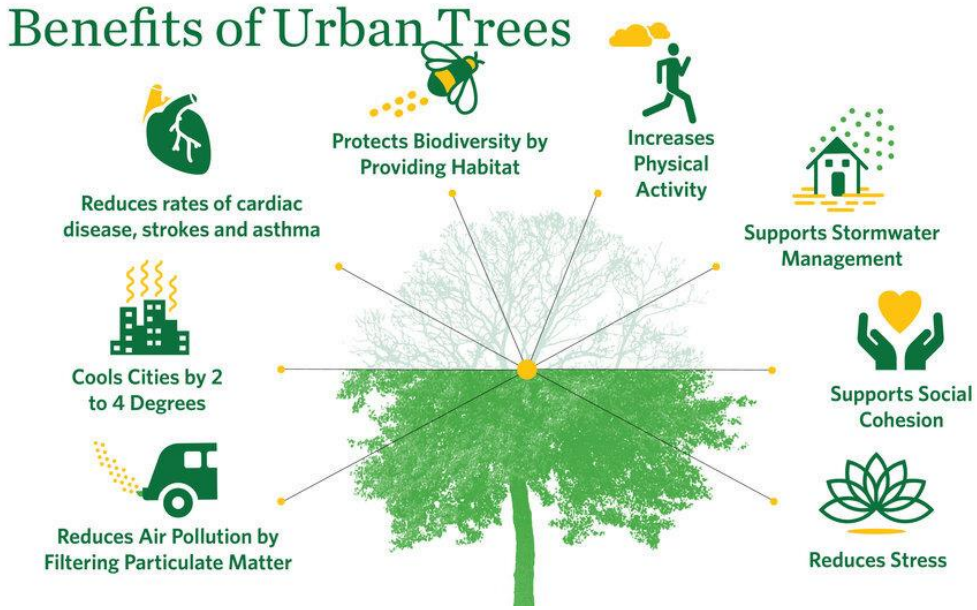


Figure 2 – Trees provide many benefits for College Place if maintained properly.

Many scientific studies in recent years have addressed the role of trees in urban environments. Trees and urban forests provide environmental, ecological, economic, and social benefits. Urban trees and natural forestlands play a huge role in the quality of life in College Place. A summary of key values and benefits, and some supporting sources, is provided below.

Street Tree Effect and Driver Safety. Research indicates that trees contribute to a sense of safety. The significant reduction in driver speeds in the suburban condition

indicates that street trees may provide positive operational values. Trees have a positive impact on the transportation network in the city and neighborhoods (Dumbaugh 2005; Wolf 2006; Naderi et.al. 2008). For the suburban landscape, the presence of trees significantly dropped the cruising speed of drivers by an average of 4.87 kilometers per hour (3.02 miles per hour). Faster drivers and slower drivers both drove slower with the presence of trees (Figure 3).

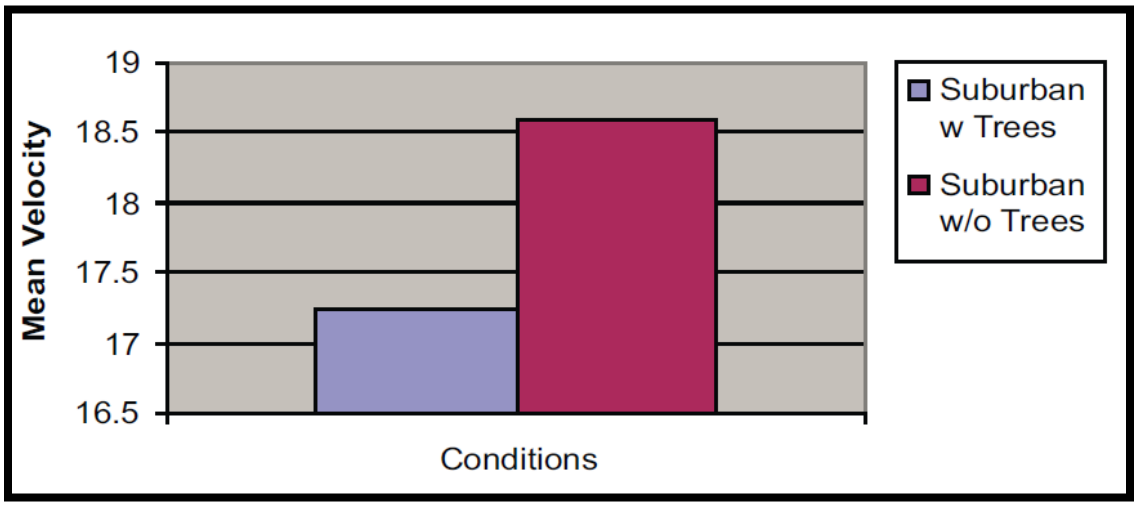


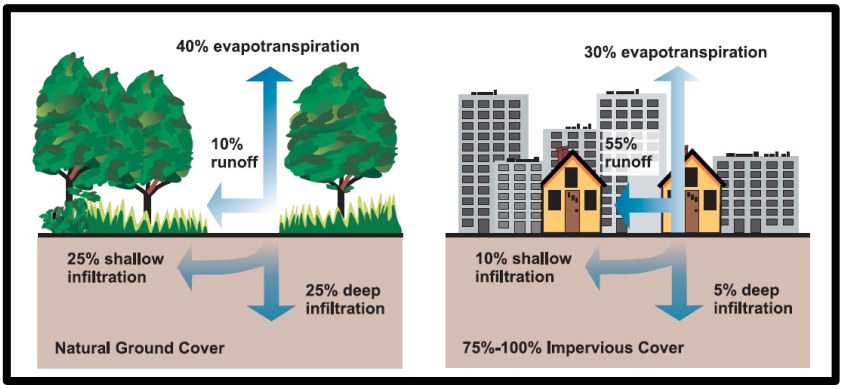
Figure 3 – Trees significantly drop cruising speed of faster and slower drivers.

Vegetation and Violence. A scientific study by the University of Illinois at Urbana-Champaign has demonstrated that contact with nature help reduce the incidence of aggression and violence in city neighborhoods. According to the study, levels of aggression were significantly lower among people who had some kind of nature outside of their apartments versus those who didn't. The impact of the physical environment on human aggression has been well established — crowding, high temperatures, and noise have all been linked to violent behavior. Some scientists believe that it is because people living under these conditions suffer from something called chronic mental fatigue, which can make them inattentive, irritable, and impulsive – all of which have been linked to aggressive behavior. It has been shown that exposure to green spaces, trees, and other vegetation can mitigate the harmful effects of chronic mental fatigue, reducing aggressive behavior in the process.

Water Quality, Storm Water Retention. Water quality continues to be an important issue to College Place and ways to avoid nutrient loading and other forms of water contamination to the city water and irrigation systems become critical. Water quality has the potential to be degraded by development due to erosion, storm water discharge, and on-site sewage treatment systems.

Urban trees are an effective tool available every day to improve water quality, conserve water resources, and reduce storm water runoff. Urban forests absorb rainfall, control surface water runoff, filter ground water and assist in ground water recharge. According to one study, 37,500 tons of sediment per square mile per year comes off developing and developed landscapes, and urban trees could reduce this amount by 95% (Coder 1996).

Trees can contribute to the overall goals of the College Place stormwater management and aid in solving water quality, retention, and discharge issues in the consolidated irrigation district. Trees are a current asset that can address stormwater and water quality issues important to the community and do it in an economically feasible manner.



Urban tree canopy reduces storm water runoff by intercepting and storing rainfall and increasing infiltration into the soil through improved soil structure. The US Environmental Protection Agency issued a report, *Using Smart Growth Techniques as Storm Water Best Management Practices*, which identified urban tree canopy as an innovative and sustainable means to dramatically reduce stormwater runoff and the costs associated with stormwater management. Trees contribute to water quality and quantity improvement through stormwater control, attenuation of peak flows, maintenance of base flow, erosion control and rainfall interception (Bernatzky 1983; Xiao et al 1998; Floyd 2002; American Forests 2007). Trees should be integrated into College Place's stormwater management program.

A tree canopy and continuous vegetation, which is adapted to the local environment, has a positive effect on slope stability (Reubens et al. 2007). Tree root systems enhance the shearing strength of the soil, enabling it to resist landslides and erosion (O'Loughlin 1974). Through interception, evapotranspiration and enhancing soil permeability, trees also improve the hydrological characteristics of the soil (Ziemer 1981). Trees on slopes can prevent, protect, and minimize the damage in the event of landslides or avalanches.

Air Quality Improvements. Particulate matter poses a dangerous threat to human health and the environment. Regional haze can impair visibility in all directions over a large area. Air toxins such as carbon monoxide and sulfur dioxide contribute to respiratory problems. Brown outs can be severe in Walla Walla county.

Trees absorb gaseous pollutants such as ozone, nitrogen oxides and sulfur dioxide; and they filter particulate matter such as dust, ash, pollen, and smoke. Reductions in these pollutants results in improved public health and reduces the severity of ozone-induced asthmatic responses and other respiratory illnesses. Urban trees absorb carbon dioxide, a major greenhouse gas, at an approximate rate of 230-lbs per year per tree. According to the U.S. Department of Agriculture, "one acre of forest absorbs six tons of carbon dioxide and puts out four tons of oxygen. This is enough to meet the bi-annual needs of 18 people."

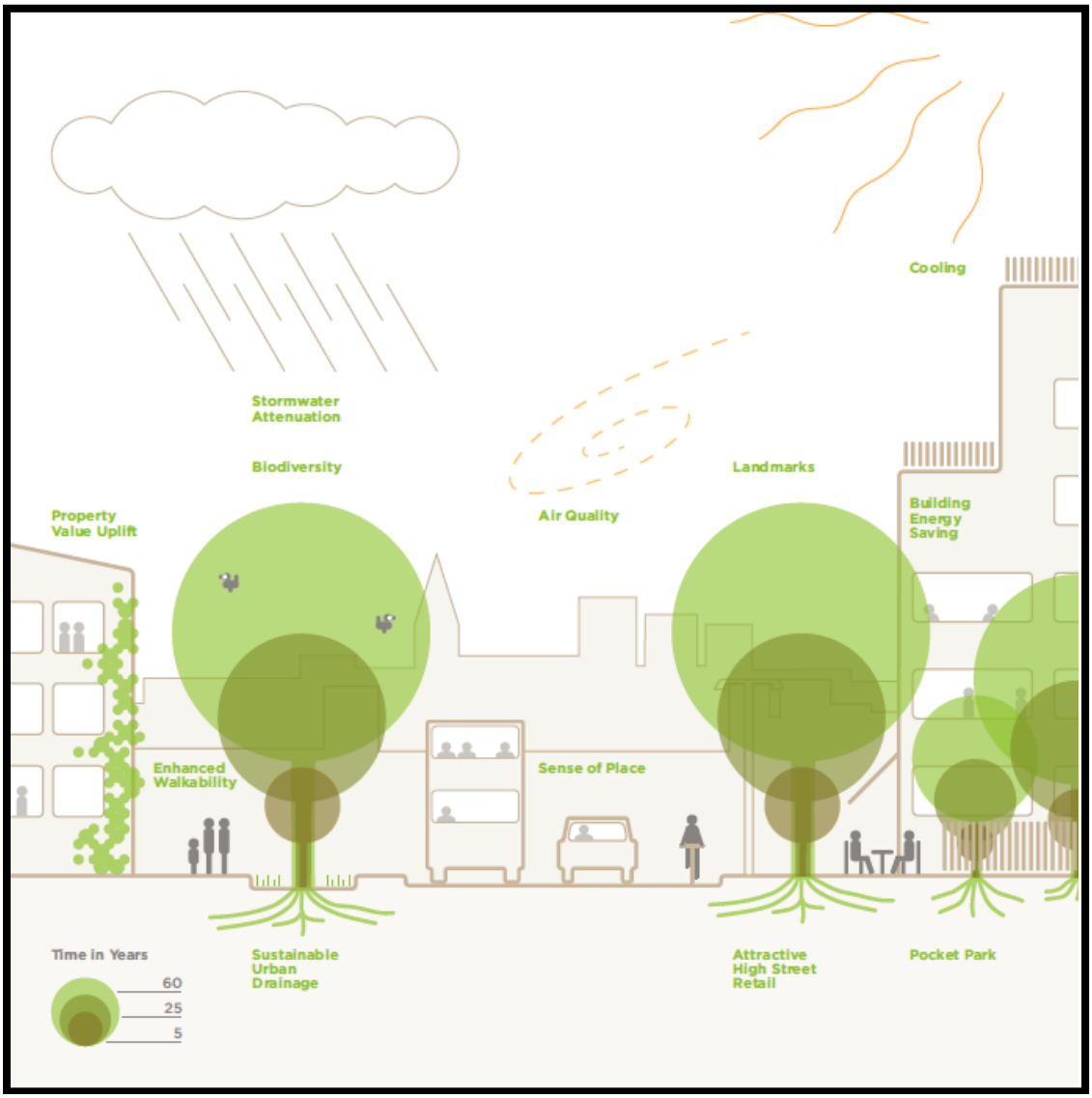
Trees improve air quality by producing oxygen, absorbing pollutants, and sequestering carbon (Rowntree and Nowak 1991; Nowak 1992; McPherson et al 1999; American Forests 2007). A regional ecosystem analysis specific to College Place using tree inventory data can estimate the monetary value of pollution removal services provided by the urban forest.

The Economics of Aesthetics. College Place is noted for its vibrant downtown with a mix of small businesses and housing that interfaces with Walla Walla University that give residents and a growing tourist trade the feeling of a small town. The City has attracted large-scale commercial development along its most trafficked roads, thus growing its tax base. It is important to the community and fiscal revenues to remain competitive and attractive to businesses and customers, and residents. Recent population and development increases in College Place and neighboring communities continue to increase competition for businesses and customers.

Improving aesthetics has tangible economic benefits. Networks of parks, natural areas, and trails give a community a reputation for being a good place to live and visit. Increased recreational and community activity attracts new businesses, fosters expressions of creativity, and stimulates tourism. Businesses locate or re-locate based on a community's quality of life, including an abundance of open space, nearby recreation, and pedestrian friendly neighborhoods. Nationwide, easy access to parks and open space has become a new measure of community wealth – an important way to attract businesses and residents by guaranteeing both quality of life and economic health.

Aside from the potential price effect on residential property sales, trees in retail settings increase shoppers' willingness to pay for goods and services by 12%. Shoppers also indicate that they are willing to drive farther and stay longer if a retail district is well-landscaped with trees. Also, respondents consistently reported greater willingness to pay values for goods and services in the landscaped mall at an overall rate of 8.8%. Urban forests create an appealing consumer environment in business districts (Wolf 2003, 2005). Trees provide a critical solution that allows College Place to maintain its role as a regional housing provider, generate higher tax revenues, and keep property taxes at a lower rate.

Increases in land values or sale prices because of quality landscaping and the presence or retention of trees offers a secondary benefit to the local jurisdiction. The adjustments relate to additional revenue from sources such as real estate transfer taxes and property tax assessments (Behe et. al. 2005; Wolf, 2007).



Health & Well-Being. Trees provide a benefit to the health care industry and improve the mental and physical states of the community residents and visitors. Trees foster safer, more sociable neighborhood environments and have been shown to reduce levels of crime, including domestic violence. Views of nature reduce the stress response of both body and mind when stressors of urban conditions are present. Hospital patients with window views of trees recover significantly faster and with fewer complications than comparable patients without access to such views.

Public spaces with trees receive more users, increasing the frequency of casual social interactions and strengthening the sense of community. Trees along transportation corridors narrow a driver's field of vision, reducing traffic speeds and increasing pedestrian safety by providing a natural, physical barrier. Studies have found that urban highways lined with trees decrease driver stress, resulting in fewer incidents of road rage.

Parks, green space, and trees are important assets for College Place residents and visitors. Use of these resources by the community promotes the health and well-being of the individuals as well as the sense of community.

Overall, the service value of individual urban trees can be quantified as shown in the table below. Small trees are 25 – 30 feet at maturity; medium trees are 30 – 50 feet at maturity; and large trees are greater than 50 feet at maturity.

Average annual net benefits values per tree by size

Small	Medium	Large
$13 - $17	$33 - $39	$60 - $71

Source: Western Washington and Oregon Community Tree Guide: Benefits, Costs, and Strategic Planning, March 2007

While real costs must be borne by College Place and its residents because of the urban forest (e.g., storm damage, removals, planting, care, leaf removal, infrastructure impacts, etc), the protection and expansion of the College Place urban forest will yield increased environmental, economic, and social benefits. This plan specifies several actions the City of College Place can take to maximize these benefits and engender community involvement and activism.

College Place Parks, Arbor, and Recreation Board (PAR Board)

The PAR Board is sanctioned by city ordinance. Their purpose is to celebrate trees and promote a community commitment to sustaining College Place's urban forest. The PAR Board forms the middle link, a communication link in a chain of moral authority among the community, city tree manager, and city council. PAR Board does not function as an operations board and should stay out of operational functions of the program. Individual committee members do not have authority other than that specifically authorized by ordinance. The committee provides leadership by first serving, and then seeking to put community interests ahead of any personal interests committee members may have.

A tree committee fulfills one of the criteria to become Tree City USA. A tree committee can be a particularly useful resource for busy College Place UF staff working to develop and implement a strategic vision since it provides additional opinions from individuals who are interested in, and typically knowledgeable about, the subject at hand, and also helps maintain relationships with groups and individuals that may be able to assist with implementation.

The primary role of the PAR Board for College Place's UFMP would be periodic (e.g., once a year) review of the plans, to track the status of the various recommendations, and evaluate the progress towards management goals.

The PAR Board is engaged in many activities promoting the planting and preservation of community trees such as Arbor Day celebrations, Fall Festival, Winterfest, and community education programs and presentations.

The PAR Board can continue to support and involve College Place residents in the tree program through:

- Reviewing a community tree plan
- Foster community support for the urban forestry program
- Public outreach meetings and presentations
- Program advocacy to city council, business leaders, civic groups, and other stakeholders
- Soliciting funds, including grants and donations
- Reviewing a street tree ordinance
- Assisting with Arbor Day celebrations, other events, and education programs

The PAR Board committee should report to and be overseen by the staff member responsible for directing and managing the implementation of the UFMP. City staff acts as an ex-officio member of the committee.

URBAN FOREST MANAGEMENT PLANNING

The pressures created by urban sprawl are leading to a reduction in forested land in North America. Poorly controlled land-use planning contributes to the haphazard urbanization of many small communities. Urban forests are largely ignored as an asset and the potential benefits they can offer to communities are often not acknowledged in the planning process. Relatively few communities across the United States have any form of urban forest management.

In natural forests trees in all stages of growth and decay are important to functioning of the ecosystem, and even when left alone a forest will convey many benefits to humans. The same cannot be said of city and park trees. The term “city trees” includes trees subjected to tough urban conditions including street and park trees and those planted along boulevards, in medians, in parking lots, in tree pits, and other urban open spaces. Their health and vitality are compromised primarily through limited soil volume, compacted soils, restricted root space, drought, and conflicts with other infrastructure.

Other urban activities such as mowing, leaf removal, vehicle and pedestrian traffic, vandalism, and pollutants submit community trees to additional stresses. Intense citizen

use necessitates pruning and prompt removal of high-risk trees to maintain high safety standards. A sustainable urban forest requires careful management to maximize the benefits of green infrastructure while addressing the direct and indirect human influences on the trees.

Trees play an important role in the livability of College Place. The urban forest has been recognized as a visual amenity and for its environmental benefits for several decades but has only recently begun to be considered as a vital component of a community's infrastructure and given the specific label of "green infrastructure" or "natural capital" (e.g., Benedict and McMahon 2002; Wilkie and Roach 2004; Ewing and Kostyack 2005). As a result, in College Place, as in many cities, resource allocation for management of urban trees has been relatively limited, and staff has largely been occupied with responding to emergency situations and minimal maintenance rather than having the opportunity to pursue more proactive management practices.

As with any type of infrastructure, the urban forest requires regular maintenance and monitoring to ensure that it continues to function properly and provide benefits to its maximum capacity. Infrastructure such as buildings, offices, and equipment that are neglected for many years can only be repaired at a great cost to College Place. For the urban forest, this neglect typically comes in the form of failure to plant young trees to replace maturing populations, to adequately diversify tree species to protect against species-specific diseases, to prune trees early on to limit the risks posed by trees as they mature and failing to maintain mature trees properly.

Fortunately for College Place there are many opportunities to improve the urban forest through well-planned active management over time. This is one key area in which green infrastructure differs from built infrastructure; trees in cities, like other infrastructure, require maintenance to remain safe and viable but their value to the community generally increases over time as they mature so that they become less and not more of a liability.

The recommended goals are for College Place to follow. It is up to College Place to provide the short and long-term support required to implement it. The goal is to provide specific guidance on managing, maintaining, and preserving trees within the urban and suburban infrastructure.

Employing the best management practices of the arboriculture and urban forestry industries, Community Forestry Consultants, Inc. offers the following management and maintenance recommendations to improve the health, quality, size, and diversity of the working forest of College Place.

PROGRAM MANAGEMENT OBJECTIVES

The overall goal of strategic planning and management of the urban forest is to ensure a healthy, aesthetic, safe, and diversified tree canopy that can provide a sustained supply of environmental, economic, and social benefit to College Place. Research shows the average city tree lives only 32 years (Moll and Ebenreck 1989) and the closer to the city's center, the shorter the life of the average tree. To help address issues like these, a long-range plan is essential for management of a resource that is by its very nature a long-term matter.

Strategic plans define long-term and short-term goals for the city's urban forestry program. Management plans define how individual goals are achieved through action plans and timelines. Each goal must have an achievable and discernible outcome. The objective of this report is to provide a framework for a Strategic Management Plan for a ten-year period.

Ordinance Review

Enacting laws and policies that make public prohibitions and direct action in a certain way is not a popular way of influencing behavior. However, sometimes an issue is so important and complex that legislation and official policies are appropriate tools for local governments to use to protect its citizens and property. Managing urban forests is an important complex issue.

In recognition of the many benefits conferred by trees, hundreds of local governments are adopting street and park tree ordinances. Street and park tree ordinances apply mostly to publicly owned trees, as well as nuisance trees on private property.

Tree ordinances reflect the values of a community and the worth of a community's trees. A tree ordinance encourages tree maintenance to secure the beautification, air purification, noise and dust abatement, storm water management, water quality, property value enhancements, public health and safety benefits trees provide.

The key benefits to revising the tree ordinance are:

- Helps establish the tree management program.
- Provides reference to permanent procedures and legal authority.
- Legalizes a tree program through authorization of a tree committee.
- Establishes a permit review, approval, and appeal process for tree removal, planting, and pruning.
- Establishes the nature and degree of public responsibilities to community's trees according to specific standards and specifications.
- Establishes an official tree policy for the community.
- Specifies and ordinates arboriculture standards for tree planting, pruning, and other tree work;
- Identifies standards and regulations for arboriculture practices.
- Ensures that the people who perform work on the trees are professionally qualified.

Street and park tree ordinances must resolve two key issues. First, the tree ordinance should identify municipal (and private property owner, if desired) responsibilities for tree

ownership and planting, pruning, removing, and maintaining trees. Second, the tree ordinance should establish a tree committee and provide the committee with authority to guide the management of public street and park trees.

It is apparent some common elements are present in College Place's tree ordinance. The city's tree ordinance requires minor revisions to existing components to align with goals and objectives of the UFMP and to address issues missing in most city and city tree ordinances. To ensure that public trees will be properly cared for, street tree ordinances usually contain most, or all the sections listed below. The comments and examples are intended to help in revising the city tree ordinance. Municipalities should understand and plan for their own needs and abilities and not rely only on model ordinances from other places. The common elements and a brief description of each element follow on page 17 in Table two. Table three on page 18 shows the common elements in selected ordinances from other cities in the Northwest United States.

The following are examples of proposed revisions and additions to the College Place tree ordinance:

1. The definitions section should be expanded to include definitions for industry terms such as species, pruning or street tree and public terms such as right-of-way or planting strip. The definition section needs expansion to cover more industry terms not familiar to the public.
2. The ordinance clearly stated the regulatory body and delegator for public trees but there is no language regarding ownership of the trees.
3. There is no definition or language addressing boundary or border trees.
4. Disposal of urban forest products is not addressed in the ordinance.
5. A recommended species list and a prohibited species list section should be referred to in the ordinance by a document name independent of the ordinance to clarify the use and ability to update the list as industry planting standards and specifications change.
6. The ordinance should be expanded to include other pest infestations or disease infections that are considered incurable and epidemic such as spruce bark beetle, emerald ash borer, or pine bark beetle.
7. Severe maintenance treatments such as banning topping of public trees deserve individual recognition in the ordinance.
8. There are sections that refer to permit requirements for tree maintenance activities but no sections referencing permit revocation. These sections could be consolidated into one section that clarifies the permit process and revocation for all public tree maintenance activities.
9. An Urban Forestry Specifications and Acceptance Criteria for Nursery Trees documents dealing with planting, pruning, and removing standards or specifications should be written and referenced in the ordinance. Neither of these documents is cited in the ordinance. A separate document such as "The College Place Arboriculture Specifications and Standards" could capture the content of both these documents and consolidate the standards and specifications into one concise document. Separation of these documents from the ordinance allows for incorporation of changes in industry standards and best management practices without revisions to the ordinance.
10. The incorporation of a Risk Management Policy in the tree ordinance is strongly recommended as part of the city's tree risk management program. A risk

management policy ensures continuity in the risk management program despite changes in the political and administrative components of the city.

11. A tree ordinance provides an opportunity to establish policy and back it with force of law if necessary. The infraction and damages section should address mutilation, damage, vandalism, illegal removals, and improper pruning, etc. Penalties, fines, and other levies should be based on the appraised value of the tree(s) as determined using the Council of Tree and Landscape Appraisal Guide, 9th Edition in addition to civil penalties.
12. As a rule the fundamental program guideline such as tree committee establishment and other more static items should be included in the ordinance. Industry standards and specifications that are subject to change as the arboriculture industry evolves should be placed in separate documents which can be cited in the ordinance.

Table 1 - COMMON ELEMENTS FOR ORDINANCE EVALUATION

Element	Explanation
Purpose	The goals and objectives of the ordinance. These are crucial to implementation, enforcement, and defense of the ordinance if challenged.
Authority	The source of the local government's authority to regulate – usually its own police powers and relevant state statutes (enabling legislation).
Definitions	Terms and phrases with special meaning within the body of the ordinance. Clear, concise definitions are important to ordinance comprehension.
Designation of Administrative Responsibility	The specification of a position, department, or committee responsible for enforcing the ordinance and carrying out specified duties. Ideally, limits of authority and responsibilities are clearly defined.
Plan and/or Permit Review Process	Explanation of how a new/proposed development or other action will be reviewed. Should detail information to be submitted with permit or platting requests, such as site survey of trees and proposed building locations.
Incentives	The methods that can be used to achieve conservation & compliance with ordinance (e.g. preserved trees credited to required project landscaping).
Preservation	What is to be preserved and how it is to be accomplished. There are many approaches to this, such as retaining ≥30% of existing tree canopy.
Construction Protection Measures	Specific measures required to protect trees during construction activities. Usually involves providing a protective zone for trunk and root structures.
Maintenance After Development	Specification of required maintenance of trees and vegetation after project has been completed, often including replacement for damage-killed trees.
Appeals	Provides for possible flexibility with a process for appealing decisions, which serves as a check on authority, but can potentially undermine management.
Enforcement	Provision for enforcement, and penalties for ordinance violations. May include fines, imprisonment, withholding of permits, work stoppage, etc.

Table 2 -COMMON ELEMENTS PRESENT IN SELECTED NORTHWEST CITY ORDINANCES

City	Purpose	Authority	Definitions	Designation of administrative responsibility	Permit Review Process	Incentives	Preservation	Construction Protection Measures	Maintenance after Development	Appeals	Enforcement
Bellevue	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Bellingham	✓	✓	✓	✓	✓					✓	✓
Bothell	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Clarkston	✓	✓									
Colville		✓	✓	✓					✓		
Covington	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ellensburg		✓	✓	✓	✓					✓	✓
Enumclaw	✓	✓	✓	✓	✓					✓	✓
Grandview		✓	✓	✓	✓					✓	✓
Helena	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
College Place	✓	✓	✓	✓	✓			✓			
Lacey	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Missoula	✓	✓	✓	✓	✓		✓	✓		✓	✓
Olympia	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Omak	✓	✓	✓	✓				✓			✓
Port Townsend	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pullman	✓		✓	✓	✓	✓	✓	✓	✓		✓
Redmond	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Spokane	✓	✓	✓	✓	✓	✓			✓	✓	✓
Vancouver	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Walla Walla	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Woodinville	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Tree ordinances provide the city an opportunity to set policy and back it with the force of law when necessary. It provides clear guidance for planting, pruning, removing and other maintenance on street, park, golf, and other public trees. The ordinance should be flexible enough to fit the needs and circumstances of the city. The inventory data can provide the quantitative evidence for ordinance policy development.

Arboriculture and tree care maintenance and operations are very specialized fields of work. Many years of education and training are required to perform competently in the field and without harm to the trees. **Tree care performed to College Place's public trees should be accomplished by International Society of Arboriculture (ISA) certified arborists or ISA certified tree workers. The language of the ordinance should reflect this standard of tree care.**

There are many existing tree ordinances and tree ordinance-writing resources. A comprehensive list is provided in Appendix A.

Tree Inventory

Many communities have public street and park trees, a shade tree commission, and plant trees, but how many know what the resource looks like, the condition it is in, the benefits it is providing, and how effective their program has been? Whether you are managing a retail store or natural resources, an inventory is critical. Without an inventory of the resource, you don't know what you have, its condition, and what kind of work is needed to maintain or manage it for the future.

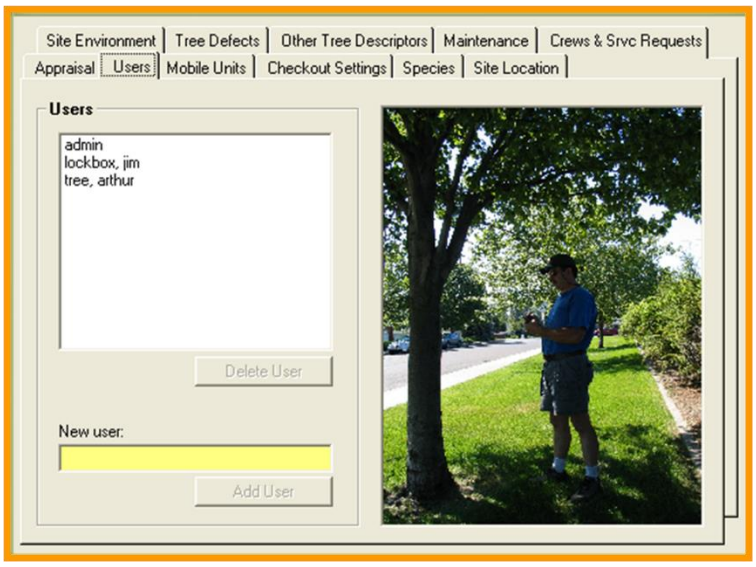


Figure 4 - Inventory data collection

As with any form of asset management, the foundation for ensuring maximum benefits from trees is a clear understanding of the characteristics of your tree population. An inventory also helps you better document the many benefits that trees are providing the community. Tree inventories are the foundation of an effective tree management program. It allows tree managers to identify current and potential problems and plan for budgets, removals, pruning, planting, and other maintenance requirements. An inventory is a record of objective and quantifiable information about the condition and value of College Place's tree resources that can be used to document estimates for funding, personnel, and equipment (Figure 4). Using and regularly updating the tree inventory moves the urban forestry program into proactive management.

A park and street tree inventory provides information for planning, design and development impacts to trees, and management information for tree maintenance and

plantings. It helps justify starting and managing a tree program and funding an existing program. An inventory of College Place's trees and planting spaces is a prerequisite for making sound decisions. Without an inventory management, decisions may be based on guesses rather than an accurate assessment. An inventory provides the location of risk trees, the number of trees within the public right-of-way, the value of street and park trees, and the number of available planting sites. It helps identify insect or disease problems, maintenance needs, and budget priorities.

With this information, College Place staff can better plan and prioritize tree removals, maintenance work, and plantings and coordinate with the City of College Place's urban forestry program with all city departments. They can also determine the value of College Place trees, which can help emphasize the importance of maintaining a valuable asset.

An inventory can be used to monitor tree conditions to answer management questions quickly and accurately, such as where and how many trees should be planted in a year. Over the years, changes can be seen in the number, age, condition, and species of trees. A well-maintained inventory can be used in cases of liability to demonstrate that there was no negligence in the inspection or care of these trees. An inventory will also improve the chances of receiving grants and other assistance by providing documentation of the extent and worth of street and park trees.

The following objective will enhance management of the urban forestry program.

- Contract for professional data collection of remaining tree population and audit of existing tree inventory data to insure accurate, consistent data collection and correct existing gaps in the tree inventory data such as available planting sites.
- Maintain the assessment of the tree population to obtain accurate, functional data necessary to manage the urban forestry program.
- Maintain and update the tree inventory regularly as part of the urban forestry management program.

It is important that inventory data be accessible to tree managers, consistent, and accurate. All efforts should be made to ensure that the local tree inventory survey results can be used in the City of College Place Geographic Information System (GIS).

Maintaining the tree inventory and using a tree management program such as TreeWorks™ to prioritize maintenance establishes a systematic tree maintenance program which reduces costs. This is primarily because systematic maintenance in general leads to healthier trees that require less expensive maintenance over the long run than unhealthy, high-risk trees. A computerized tree inventory aids in reducing the subjectivity of tree management decisions and stimulates proactive responses.

Embed tree inventory data updates into routine management procedures. Data needs to be kept up to date. Once a baseline has been created, updating can be conducted on a rolling basis, integrating as much as possible of the survey work within maintenance and other routine works conducted. Some areas experiencing strong pressures or fast changes might need to be surveyed bi-annually while others may only need to be looked at once every three years. Areas can be zoned based on level of use and development changes and surveyed accordingly.

Framework for the 5-year Strategic Management Plan (2021 – 2026)

The plan is intended primarily to provide guidance for College Place staff and the PAR Board using the tree information database and a management cycle approach to monitor short to long term trends.

Traditional forestry is the management of trees or stands of trees for timber production and other values including wildlife, water quality, and ecological health. Urban forestry is the management of trees and other forest resources in urban ecosystems for the environmental, economic, social, health, and aesthetic benefits trees provide society.

Agency tree plans provide policy and standards for implementing and managing community tree programs. A community tree plan is to guide the management and maintenance of a community tree program, including tree removal, pruning, planting, funding, and volunteer opportunities. Tree plans should be consistent with other agency planning strategies and usually include a vision statement, goals, objectives, and strategies.

In any given city nationwide, buildings and roads receive careful planning and scheduled maintenance. It is widely recognized that neglect can result in deterioration leading to numerous potential expenses and risks. Why should trees receive any less planning, attention, and care? Tree management plans help cities proactively manage their tree resources to avoid risk, reduce liability, cut maintenance costs, and increase the value of trees. A comprehensive plan helps promote the health and sustainability of the community's trees, while providing a framework to make difficult decisions about tree removal, preservation, pruning, and planting. A proactive approach to tree issues reduces costs for maintenance, removal, and liability associated with tree failures.

Community Forestry Consultants, Inc. developed this comprehensive UFMP after analyzing the tree inventory data; making field observations; and by applying national arboriculture standards and best management practices. This is a customized plan based on local conditions, resources, and priorities. The UFMP plan will help the members of the College Place staff, PAR Board, city council, and citizens understand the current condition of the community forest and shape its future.

While limited agency funds for urban forestry programs often constrain proactive tree care, management planning efforts can increase the effectiveness and reach of scarce resources and have significant impact on the landscape.

The UFMP can show College Place staff, appointed board members, and citizens how science informs tree management as well as promoting community values. It will help raise citizen awareness of the benefits of a healthy, diverse and well-managed urban forest. A strong management plan will serve as a tool to be used for garnering public support, cooperation, funds, and help the community sustain its trees for future generations.

The objectives of the College Place UFMP plan include:

- Review, update, and evaluation of operating plans.
- Annual analysis and mitigation of risk trees.
- Proper tree selection and purchase.

- Proper tree planting.
- Proper tree maintenance.
- Adequate funding and staffing.
- Staff training.
- Contractor quality control and monitoring.

Effective Administration

Like the gray infrastructure of streets and utilities, trees are an essential part of a community's green infrastructure and should be administered effectively. The responsibility for administering a community tree program must be clearly defined and carried out on a regular basis. These responsibilities often are divided among city departments, appointed board members, city officials, a tree committee, and agency employees.

The size and complexity of an agency will determine how to organize the tree program. College Place's tree population and maintenance requirements require a staff person's time is funded and allotted to manage the tree program and to coordinate work with the city tree program, agency departments, and the public. To ensure good program administration, responsibilities need to be directly assigned and procedures defined clearly.

Community tree plans provide overall guidance to the long-term administration of public trees and must then be translated into effective actions. Bi-annual work plans for tree removal, tree maintenance, tree planting, periodic inspections, task scheduling, securing funding, and public education and involvement should be used to schedule the work required to meet the plan's objectives and goals. By using a bi-annual work plan and a budget based on this plan to prioritize and schedule tasks for the upcoming years, a tree program can become more efficient and avoid crisis management.

Business Corridors and Downtown Trees

City streets are not just thoroughfares for motor vehicles. They often double as public spaces where people walk, shop, meet, and generally participate in many social and recreational activities that make urban living enjoyable. Urban foresters, designers, and planners encourage streetscape tree planting to enhance the livability of urban streets. Large, high quality trees play important roles in community improvement. Trees are as much a part of the city infrastructure as roads, buildings, and streetlights. Extensive research has documented the environmental, social, and economic benefits of large trees for communities, municipalities, and regions.

Trees in small city business districts influence retail and shopping behavior in positive ways. The results of several studies suggest that trees are good for business. Shoppers prefer trees and consider trees an important amenity. They spend more, shop longer, and are willing to pay more for goods in business districts with mature, healthy trees.

Yet, city trees are too often placed into "tree coffins", cutouts in the sidewalk with an insufficient soil volume, oxygen level and water availability for roots, where trees grow poorly, live fast, and die young (Figure 5). The sidewalk cutouts are enclosed with iron grates to create a contiguous surface for pedestrian travel. The iron grates usually girdle the trunk as the tree grows, damaging the tree they were intended to protect, and often lead to trip-and-fall hazards for people causing severe injuries.

Some common procedures exacerbate tree problems. For decades, it has been common to plant street trees in “tree pits.” But if these excavations are too small, the root system cannot support the tree for more than a few years, according to James Urban, an authority on trees in built-up areas. The lack of room for roots stunts the tree’s growth, and soon the tree begins to die, says Urban, principal of Urban Trees and Soils in Annapolis, Maryland.

Figure 5 – Trees and other infrastructure compete in business corridors and downtown areas for space.

The trees may lift adjacent sidewalks which lead to risk issues for the city. Confined to ever-smaller cutouts and planting strips, it is no wonder that roots carve out their space at the expense of sidewalks, curbs, and driveways. The typical public works response is tree removal or aggressive root pruning which often leads to a slow, agonizing tree mortality or tree failure. If the trees are removed the city is left with vacant tree pits. When this happens, trees lose and cities lose.

While some trees are associated with sidewalk damage, research in many cities has shown that trees are minor contributors to sidewalk failures. The soil type and soil’s suitability for sidewalk construction and root growth all have a bearing on tree-sidewalk conflicts.

Those trees that do survive tend to experience stunted growth, pest and disease problems, mutilation described as pruning for clearance issues, exposure to road pollution, and vandalism. The trees are stressed and often decline and die, creating a public eyesore during the process. It is not surprising that some city officials and the public have a poor opinion of trees in downtown business districts and along city streets. The trees never reach their potential to provide the benefits for city dwellers.

One of the biggest challenges for arborists, urban foresters, city planners, landscape architects, soil specialists, engineers, and public works staff is to provide sufficient soil space for root growth and tree health, in a situation where space is at a premium. The trend is to downsize the urban forest and plant smaller trees.

The College Place downtown business corridor is under constant competition for space. Many infrastructure items must share the same space and co-exist (Figure 8). The key site condition factor to consider in resolving tree-sidewalk conflicts is to integrate trees into the infrastructure design up front. The fundamental solution to most city tree problems is simple: Give each tree access to more and better soil.

The downtown business district is the heart of College Place. As might be expected in the downtown, several organizations, property owners and tenants are stakeholders in the management of trees. Many areas of the downtown are planted with trees, many are recent installations, and most are planted in tree pits. Development and redevelopment of property in the downtown can mean additional planting opportunities or it can mean facing the loss of established trees to development of buildings, parking lots and street redesign.

When development does occur where trees currently grow, great care must be taken to protect those trees that are healthy and structurally sound whether on public or private property.

An American Forests article published in the early 80's stated that an oak or maple tree is capable of living up to 400 years in the forest, up to 80 years on a college campus, up to 30 years in a heavily used park, up to 20 years along a city street and about 4 years in a downtown planting pit. Thirty years after the article was published, the same design mistakes are still being made in cities across the United States. There are several challenges when planting trees in any downtown area:

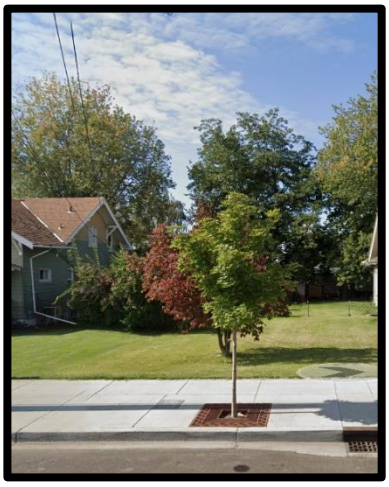


Figure 6 – Trees located in tree pits surrounded by excessive concrete.

- Limited Planting Space. This is one of the greatest challenges to maintaining a healthy urban forest in the downtown district (Figure 6, 7). These are typically concrete walls on all sides; four feet square and leave little space for root expansion necessary for vigorous tree growth.

- Availability of Irrigation. Water is vital to ensure trees thrive. Lack of water is a primary stress to the tree and often leads to poor growth, premature defoliation, and death. Installation of automated irrigation should be required on new development and new tree wells or water filtration systems that capture run off for trees before sending it down the drains.

- Difficult Growing Conditions. In any location tree growth is limited by the conditions present in its surroundings. In the downtown, limited growing space, poor soil, heat and exposure to sun and wind impose stress on trees. Incorporating new designs that find more growing space for trees and selecting trees more tolerant of harsh growing conditions will help.

- Owners and Tenants. Some business and property owners perceive trees to be an obstacle to business operations because trees create litter, block visibility of signs and displays and are difficult to maintain. The latest research indicates that trees in downtown corridors increase business, increase shopping time spent and increase the amount spent per visit (Wolf 2005). Trees and business owners in downtown corridors can co-exist and provide benefits to each other.

- Poor Maintenance. Many people do not understand how trees grow or how to best care for them. Trees in downtown areas often go without any regular care. Some trees are topped to clear signs and they become a liability to the adjoining property and the city. Education is crucial to helping owners, tenants and contractors understand proper pruning and tree care can create assets rather than liabilities.

- Tree Grates and Guards. As trees grow and mature, their trunks can come into conflict with the grates covering the planting hole. Roots from the trees often grow into the soil under the sidewalk, cracking and heaving the concrete (Figure 7). Grates can girdle trunks in a short time without maintenance. If left in place, the grates can damage the trees they were meant to protect. The grates are also trip hazards. Their use should be limited and temporary.

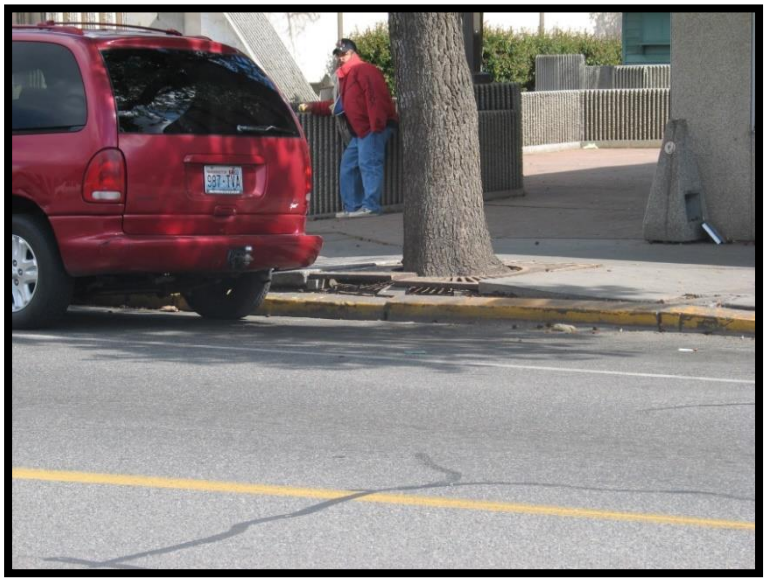


Figure 7 – As trees grow grates girdle trunks and creates trip hazards.

Often, the downtown and other business districts are selected as high priority areas to increase the beauty and attractiveness. Traditionally, downtown trees were installed according to traffic engineering design standards that did not consider the biology and culture requirements of trees. The business district of College Place is characteristic of this design concept. Unfortunately, little can be done to improve the current planting spaces without a major change to the infrastructure.

Tree plantings in the downtown business district and College Place add greatly to the economics and aesthetic appeal of the city. Tree selection for business and shopping areas must take into consideration the need for shoppers to view storefronts, as well as the need to provide enough shade for shoppers. **The branching habit must be high enough to allow pedestrians to walk comfortably beneath the trees.** Some options are tall, narrow growing (fastigiate) species. These trees can provide beauty, a look of uniformity, and a formal appearance to the shopping district.

Public streets and sidewalks constitute a large percentage of the College Place's impervious surface, generating runoff and pollutants. Reducing the amount of impervious surface, implementing low-impact development (LID) stormwater techniques, and increasing vegetation planting within College Place rights-of-way can assist in creating greener business districts and neighborhoods. Techniques to accomplish this include reducing the amount of pavement, utilizing pervious pavers, installing rain gardens, and installing traffic circles and medians which can be planted with vegetation. These techniques can also help to achieve traffic calming goals and a better balance

between vehicles, pedestrians, and bicycles, and are part of a “complete streets” approach.

“Complete streets” is a term used to describe streets designed to enable safe, attractive, and comfortable access for all users. Transportation engineers define “green streets” as streets where green infrastructure practices such as reducing road widths are integrated in the design. Within green streets, LID techniques and vegetation planting will be prioritized.

Objectives of urban forestry program for the downtown business district and other commercial corridors:

- To preserve existing trees in parks and green belts on public lands in the downtown core.

- Improve appearance of downtown public spaces/sidewalks – add trees and landscaping. Improve appearance and sense of welcome in key areas of downtown. Support efforts to clean up and landscape publicly owned portions of the downtown area. This includes lawns, landscaped areas, and street trees.

Tree-based Strategies to Reduce Infrastructure Damage

Methods to reduce infrastructure damage have been varied and numerous, with both preventive and remedial strategies employed. Three groups of strategies have been used based upon their action approach: tree-based strategies; infrastructure-based; or root zone-based. Often a combination of action types is used on the same tree to mitigate infrastructure conflicts.

Species selection is an important consideration in any planting situation and particularly important in downtown business districts. Matching a suitable species with the planting space is the first step in the process. Other considerations include drought tolerance, litter, maintenance requirements, and mature size. The trend is to plant small stature trees, but studies have shown that ultimate tree stature is not a good indicator of potential for hardscape damage. It is more important to consider the mature size of the trunk flare and buttress roots of the tree when selecting species for limited spaces.

Root system characteristics or root architecture is another tree-based strategy to consider when selecting plant material. There is little scientific research available about the root architecture differences between species or the differences within a species and the influence rootstocks may have on root architecture. Yet, there is some empirical experience that can be applied. Ash trees generally have a wide, lateral root system while oak trees tend to have an oblique root system. Ash trees may not be suited for downtown corridors because of their root architecture and emerald ash borer issues. However, other factors influence plant choice such as soil type, drought tolerance, and litter. Ash would be a suitable candidate for a downtown tree if these factors were the primary criteria. The point is many factors influence species choice for downtown sites.

Infrastructure-based Strategies to Reduce Infrastructure Damage

Infrastructure damage is often caused by trees that outgrow their planting space. The objective of design strategies is to maximize the distance between trees and

infrastructure to minimize the potential for conflict (Figure 8). Infrastructure-based strategies focus on prevention of problems. For new trees, providing adequate space by using larger planting spaces, tree islands, or narrower streets are key preventive strategies. The goal is to eliminate some hard surface when possible.

Figure 8 – The additional space available should have allowed greater space between the tree and the sidewalk.

For established trees, creating additional space using curving sidewalks and pop-outs, or eliminating sidewalks altogether are remedial strategies to consider. Bridges and ramps over existing root systems is an alternative but compliance with the Americans with Disabilities Act (ADA) must be considered.

Planting spaces of appropriate size for the desired species is critically important. The larger the planting space, the lower the potential for damage from trunk expansion, buttress root development, or surface root development. Various researchers have suggested planting strips be 10 feet wide and cutouts be 6.5 feet by 6.5 feet.

Although tree height provides some guidance in matching trees and planting space size, measuring the trunk diameter at ground level gives a direct assessment of the minimal planting space needed for a species. This measurement includes both the trunk flare and root buttress growth. To accommodate species with surface-rooting characteristics, additional space beyond that needed for trunk diameter at ground level will be required.

Curving sidewalks away from the tree increases the distance between the tree and the sidewalk and the damage potential decreases. Sidewalk meandering—realigning the sidewalk's direction of travel—enables the community to provide more growing space for trees in an aesthetically appealing way (Figure 9). The amount of growing space created can be substantial and, therefore, sidewalk meandering is usually the most feasible way to retain large, mature trees. Also, increased distance from sidewalk edge to lateral roots or trunk flare allows for root pruning, when necessary, to occur further from the trunk, which reduces direct contact between the sidewalk and tree roots or trunk. Sidewalk meandering often requires permission from the abutting property owner to dedicate more of their property to the public right-of-way.

Figure 9 - Re-routing sidewalks around a large tree is a successful option.

There several remedies for solving tree sidewalk conflicts. These are discussed in detail in Appendix D.

Recycling Wood Waste and Chip Disposal

Tree removal is typically the most expensive tree maintenance operation on a per tree basis. Other costs associated with tree removal include stump removal and wood waste disposal.

Currently, most of the wood generated from park tree removals brings little economic return to tree management budgets. The growing concern about the environment and overburdened landfills, coupled with an opportunity to augment the forestry budget, should prompt College Place to the possibility of utilizing waste wood for city and community programs.

There are many opportunities today to recycle tree residue. The following options are available for agency use.

- Mulch (new tree installation, trails, landscape beds)

- Biomass fuel production
- Small scale sawmill operators (building materials)
- Secondary product production (park benches, furniture, wood sculptures)
- Woodworker associations (knotted and twisted wood pieces)
- Composting
- Firewood

Which option(s) to apply and implement will depend on city laws, agency policies and resources. An internal review and revisions of existing laws and policies governing agency wood waste utilization can improve the agency's ability to sell this material (USDA, NA-TP-02-94).

INVENTORY and TREE MAINTENANCE SUMMARY

Appraised Value

Trees in urban areas are valued differently than the timber value of their forestry counterparts or trees in undeveloped areas of the community. Appraised value of urban trees is based on the species of tree, the trunk diameter, the condition of the tree, and the location of the tree. College Place trees represent a considerable economic, social, recreational, and environmental asset to the community. **The 557 trees inventoried thus far have a total appraised value over $1,551,000.00 (Table 1).**

The graph shows the number of trees in a range of dollar values. Most trees inventoried are in the small diameter class size. The median appraised value for College Place's trees is $430.00 because many of College Place's trees are in small diameter classes. Higher condition ratings come with improved maintenance which increases appraisal values.

Total Appraised Value: **$1,551,000.00**

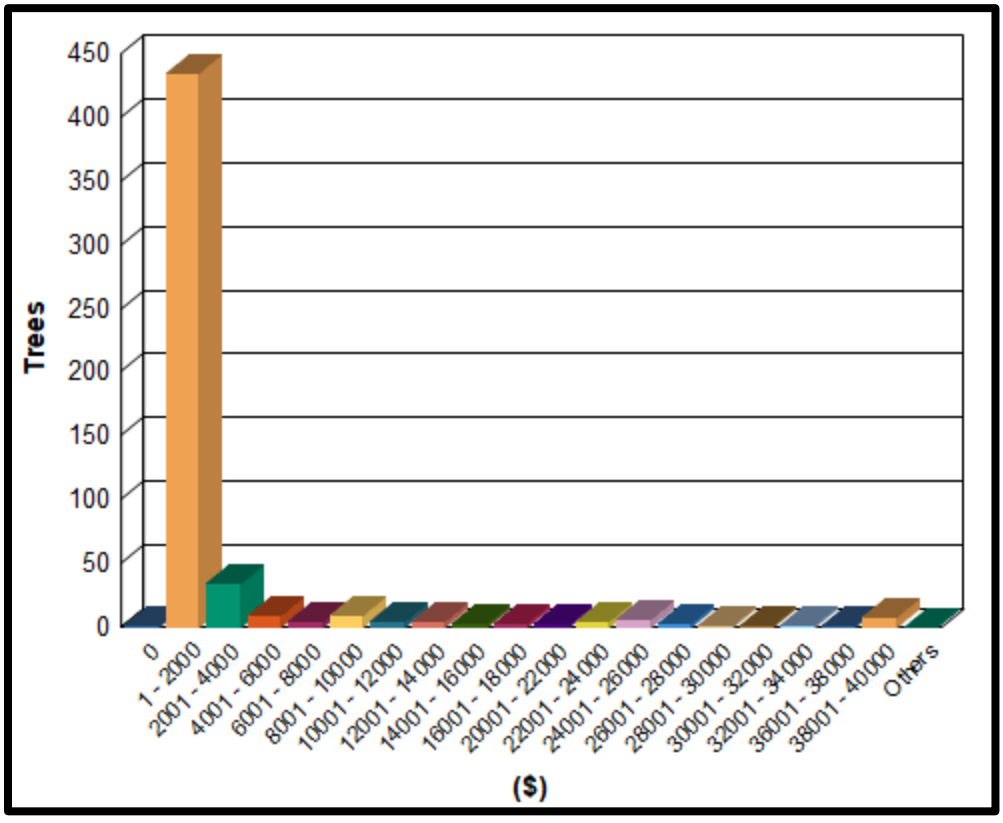


Table 1 – The appraised value of inventoried trees was determined from the Council of Tree & Landscape Appraisers Guide for Plant Appraisal, 9th Edition.

Trees are the only asset owned by the City of College Place that increases in value as they age, but only if they receive proper maintenance.

Ecosystem Services Benefits

As discussed in earlier sections of the UFMP trees provide many benefits beyond ornamental and aesthetic traits. Many of these values can be measured through use of regional computer modeling systems (I-Tree) developed by the USDA Forest Service to assist cities in assessing the value of these environmental benefits. Enumerations of the benefits College Place's public trees provide are described in this section.

Energy savings reflect cost savings in electricity and natural gas for cooling due to shading of buildings (energy units, economic value in $ based on energy costs).

Sequestration storage (Nowak et al. 2008) of carbon from atmospheric carbon dioxide (CO2), a greenhouse gas (mass units, economic value in $ based on CO2 emission control costs) is determined from allometric equations based on tree species, diameter, and crown light exposure.

Removal of air pollutants (Nowak et al. 2008) [nitrogen dioxide (NO2), ozone (O3), sulfur dioxide (SO2), and particulate matter < 10 microns in diameter (PM10)] (mass units, economic value in $ based on pollution control costs), including avoided emissions due to energy savings from pollution removal by trees is based on the median externality values for the United States for each pollutant.

Stormwater runoff reduction (water volume, economic value of stormwater management infrastructure savings in $) consider the seasonal variation in leaf area for evergreen vs. deciduous trees and calculate precipitation interception on an hourly basis from weather records.

Aesthetics as determined by annual increase in private real estate values are based on tree presence, size, and growth.

Tree Maintenance and Care

College Place staff makes decisions on tree maintenance and mitigation options and schedules the work. With populations of trees and limited funds, such as in College Place, scheduling becomes more important and requires prioritization. Pruning plans are essential, not only to ensure healthy, aesthetically pleasing trees but also to increase public safety, decrease liability, and demonstrate due diligence.

A variety of requirements can inform pruning plans, some more desirable than others. Common factors that determine pruning priorities are residential or business requests and emergency pruning. This kind of "reactive management" is most common in jurisdictions where no planning exists. Scheduling pruning based on these factors may increase liability for damages because many high and extreme risk trees remain unidentified until a failure occurs.

Healthy trees confer numerous benefits, yet poorly maintained trees can pose a considerable risk to the surrounding community. Broken branches and even entire trees can fall, especially during inclement weather. In paved areas, roots can cause cracks and buckles in pavement which may be tripping hazards. Leaves can clog gutters and fruits can rot and smell.

While the benefits of trees far outweigh the costs, careful maintenance is needed to manage risks that are often predictable, detectable, and preventable. Excluding immediate, acute problems (blow downs, pest outbreaks, and extreme vandalism) tree maintenance should be performed on mature trees following a two-to-five-year pruning cycle based on a management plan. The pruning cycle for College Place's mature trees is based on the severity of pruning that may be required due to deferring tree maintenance.

Tree health can be greatly increased by regular pruning, especially when the tree is young. Immature trees that are not pruned can develop many structural problems such as weak branch structure, crossing branches, and co-dominant leaders (ISA 2005) (Figure 10). If corrected early, the tree can develop a strong support structure with a healthy canopy. This in turn will reduce the necessity of more expensive and often intrusive corrective pruning during the normal life of the tree. If tree condition is improved at a young age and maintained during the tree's life, there will be less need for a reactive approach to pruning.

Figure 10 - Co-dominant stems are easily fixed on a young tree but often fail if not pruned correctly early in the life of a tree.

Most communities try to implement a two-to-five-year pruning cycle. The ability to implement a cyclic pruning program is limited by the staff and financial resources in College Place. Most cities and towns cannot afford to contract services for all trees. There are options available to deal with budget constraints. For example, contract pruning of large trees with significant structural defects near high use areas may be an initial management recommendation while small tree pruning is performed by College Place staff or trained volunteers. The objective is to start and maintain a cyclic pruning program within the fiscal and personnel resource constraints of College Place.

Industry standards such as ANSI 300, 133.1, or 60.1 define the standards and terms of arboriculture; specifications and best management practices determine how the agency applies the standards to manage its trees. The standards and specifications are applied universally to all public trees regardless of who is doing the work – College Place staff or contractor. The standards and specifications guarantee that, if invoked, a healthy, structural sound urban forest will be perpetuated. The standards and specifications also demonstrate College Place is implementing currently accepted practices by the urban forestry and arboriculture professions. The arboriculture specifications should, at a minimum, include specifications for removal, pruning, planting, species, tree preservation, risk rating system, and inventory methodology.

Objective for tree care maintenance that should apply to all College Place staff and contractors.

- Pruning treatments should follow the best management practices established by the ISA, ANSI Z133.1 and ANSI A300 standards and employ ISA certified arborists to perform tree maintenance. In addition to ANSI standards, the city should develop pruning specifications that serve to define treatments for different species, ages of trees, pruning techniques, and other pruning issues.

Proper pruning adds value to the landscape and is one of the few active management techniques that helps a landscape appreciate while minimizing liability concerns. Proper pruning, with an understanding of tree biology, can maintain good tree health and structure while enhancing the aesthetic and economic value the community forest creates for College Place.

Mature Tree Care

The benefits and values of trees are maximized when trees reach maturity. To maintain this high level of benefits for a longer period, College Place should commit to providing regularly scheduled maintenance to its mature trees and prepare for other, non-routine arboriculture treatments as needed. A comprehensive mature tree care program primarily centers on routine or preventive pruning, and the ability to fertilize, irrigate, control insects and diseases, and cable and brace trees when necessary.

If regular pruning is planned in a systematic manner, crews and equipment can work much more efficiently than if pruning is only done by request or in case of emergency. The cost difference can be dramatic. The ISA has compared efficiencies of both methods and found planned pruning to be at least twice as productive. When crews examine the urban forest regularly for possible risks and tree health problems, there is a reduction in citizen calls for emergency pruning (Luley et al. 2002). Additionally, the crews often find problems that would not have been reported by residents. Regular pruning cycles can also focus on certain species that may require more attention; this is common when a pest needs to be controlled, for example. Regular, cyclic pruning maintains a greater safety level in the urban forest and can decrease liability for the agency (McGauley et al 2000).

Over 95% of the trees inventoried in College Place require maintenance (Table 1, 2). Pruning represents more than 90% of the maintenance tasks. Regular pruning will improve the condition rating of the trees, reduce the potential for storm damage to trees, reduce the risk associated with community trees, and demonstrate proactive management of College Place's tree resources (Table 2, 3).

Planned Tree Maintenance

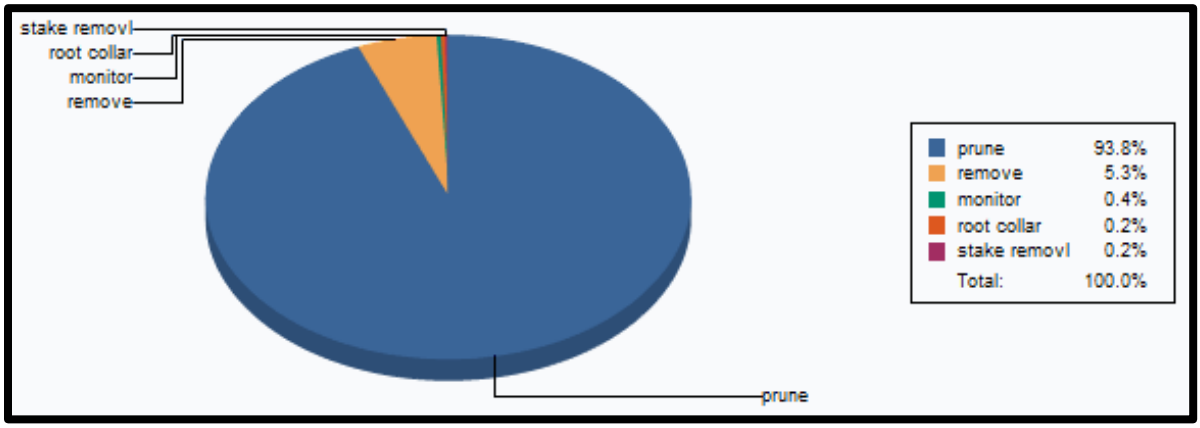


Table 1 – Planned Maintenance from Tree Inventory Data Collection

City of College Place Tree Maintenance Task Details	
Task	Tree Count
Remove – DBH* > 15 inch	2
Remove – DBH < 15 inch	23
Prune Standard – Crown clean DBH > 18 inch	51
Prune Standard – Crown clean DBH < 18 inch	73
Prune – Subordinate DBH > 18 inch	5
Prune – Subordinate DBH < 18 inch	300

* diameter breast height measured on trunk (4.5 feet above soil surface)

Table 2 – Tree maintenance tasks and tree count determined during inventory data collection.

<u>Removal:</u> There are 25 trees inventoried that require removal. Removals are primarily due to trees that are dead or have significant structural defects. Most of these trees are small diameter sizes.

<u>Prune:</u> There are 432 trees that require some type of pruning treatment. The common defects are co-dominant stems on younger trees which can be corrected by subordination pruning treatments and dead branches in older trees.

Tree Condition Distribution

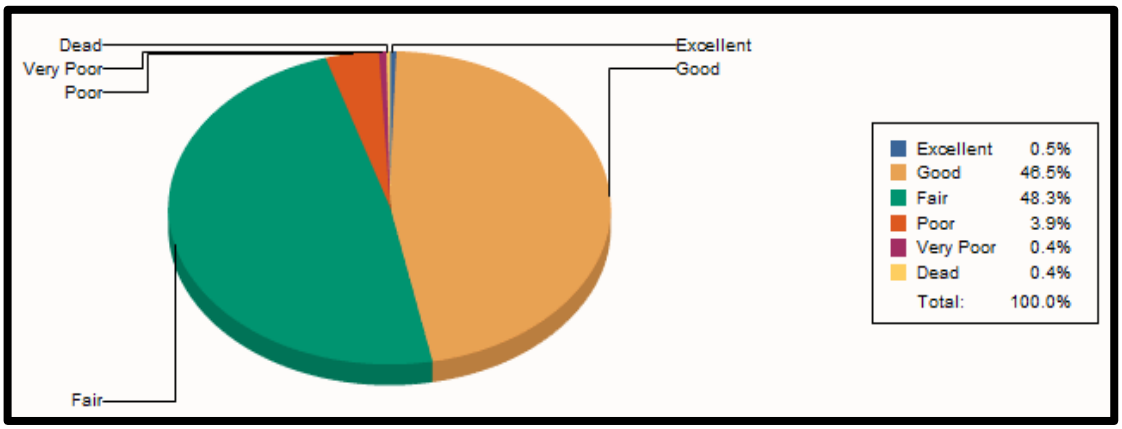


Table 3 – Condition ratings of inventoried trees.

Condition	Percent	Count
Excellent (90 - 100%)	0.5%	3
Good (80 - 90%)	46.5%	259
Fair (70 - 80%)	48.3%	269
Poor (50 - 70%)	3.9%	24
Very Poor (50 - 1%)	0.4%	2
Dead (0%)	0.4%	2
Total		**557**

Young Tree Pruning Program

There are many newly planted or young trees in College Place. More new trees will be added as trees are removed, development changes, and to diversify the existing tree population. It is critical to understand the proper maintenance techniques required to ensure the longest and safest service life of these trees. The major components of a young tree care program are pruning, mulching, and watering.

Pruning young trees to obtain good structure requires an understanding of the growth-habits of the various species being planted and of tree biology, anatomy, and physiology. Training pruning is used to develop a strong structural architecture of branches so that future growth will lead to a dominant central leader, strong branch attachment and proper branch spacing along the trunk.

Many young trees may have branch structure that can lead to potential problems as they grow, such as codominant stems, many limbs attaching at the same point on the trunk, or crossing/interfering limbs (Figure 11). When trees are small, these problems can be remedied easily and inexpensively.

Figure 11 – Young tree in Kiwanis Park with codominant stems.

If structural problems are not corrected while trees are young, they can become safety risks as they grow larger and create potential liability.

All newly planted trees should receive their first training pruning the third year following planting. Training pruning should not be done when a tree is planted, because it is already under stress from transplanting and needs as much of its leaf canopy as possible to manufacture food and increase root growth for proper establishment in its new site. Only dead or broken branches should be removed at the time of planting, and in the next two years.

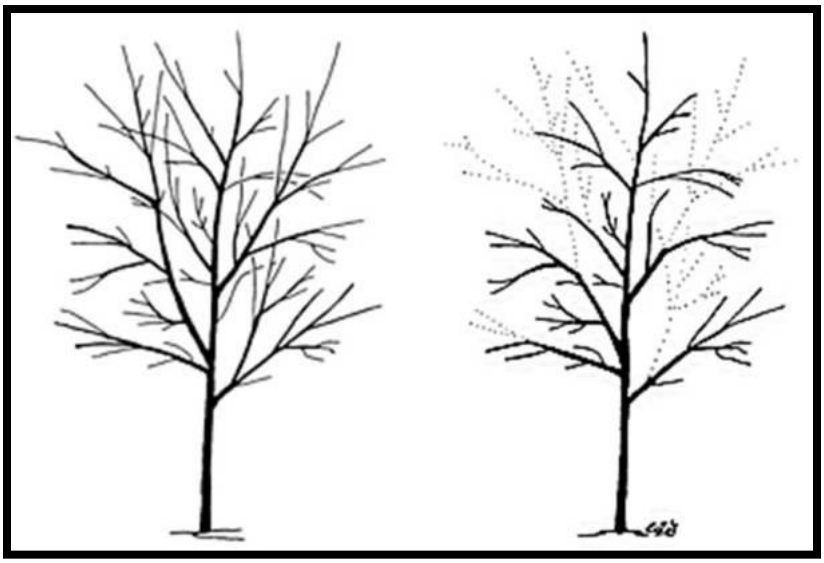


Figure 12 – Tree structure in young trees.

The training pruning program would also be accomplished on a cyclical basis, but the work would be scheduled during a three-year cycle rather than the two-to-five-year cycle for the routine pruning of larger established trees. As mentioned above, newly planted trees should receive their first training pruning three years after planting. This work can be accomplished throughout the year (Figure 12).

An optimum time to perform this pruning is late winter–early spring prior to bud break. The leaves are gone allowing clear visibility of the branches and trees will react positively to pruning at this time of year. Also, it is usually a time of the year when city staff workloads are less demanding. Training pruning can be accomplished from the ground with a minimum amount of equipment. College Place should develop an organized, documented approach to cyclical tree maintenance that can be easily managed by staff.

Objectives that promote stewardship, longevity, structural integrity, and health of the community forest.

- Educate mower and weed eater operators about equipment operation around tree trunks.
- Maintain the GIS-based inventory to manage the composition, character, and distribution of the urban forest.
- Establish a long-term tree care and management program for public trees to enhance urban forest and ecosystem health and function, that includes structural pruning of young trees, cyclical pruning and crown cleaning of older trees, line-of-sight and height clearance pruning of street trees, removal and replanting efforts, risk identification for street and park trees.

- Coordinate city departments to identify and address serious and persistent tree-related infrastructure conflicts, to include street, sidewalk and utility impacts along with maintenance and installation impacts within utility easements.
- Maintain industry-appropriate storm and risk tree response protocols.
- Maintain, promote, and apply industry-appropriate pruning and planting standards through staff training and hiring of ISA certified arborists.
- Monitor tree population for insect pests and diseases, particularly invasive.
- Review operating plans on a bi-annual basis.
- Review and update the Urban Forestry Management Plan on a 5-year cycle, or as needed, to adjust to changing circumstances.

Tree Maintenance Pruning Cycle

I. **Pruning Schedule:** The maintenance pruning schedule shall be dictated by tree species, age, function, and placement.

- Trees less than 7 years old should receive structural pruning on 3-year cycle.
- Trees 7-20 years old should receive structural pruning every two to five years.
- Trees 20 years old and older receive maintenance pruning every five to seven years to clean dead, diseased, dying, and defective branches from the crown.
- Trees adjacent to roadways, walkways, signs, and street lights are annually inspected for safety and clearance issues and maintenance pruned as necessary.

II. **Pruning Practices**: To encourage the development of a strong, healthy tree, the following guidelines shall be followed when pruning. General pruning shall not be conducted without a clear objective or outcome. Prune first for safety, next for structure, and finally for tree health. When removing branches, the pruning cut shall not damage the branch bark ridge and branch collar.

******Structural pruning and subordination should be the first pruning treatments applied to any tree regardless of size*******

Structural Pruning: Pruning to influence the orientation, spacing, growth rate, strength of attachment, and ultimate size of branches and stems resulting in a strong tree.

Subordination: Pruning to remove the terminal, typically upright or end portion of apparent branch or stem to slow growth rate so other portions of the tree grow faster.

Crown Cleaning: Crown cleaning shall be performed to remove dead, diseased, dying, and defective branches, which reduces branch failures and hangers, promotes, health, and improves appearance. Large branches should be removed

with the aid of ropes and rigging equipment to minimize the risk of tree injury from falling debris.

Crown Thinning: Pruning treatment used to remove lateral branches. It should be conducted from the outer edge of the canopy. It should be used judiciously.

Crown Raising: Raising shall be performed to provide vertical clearance from thoroughfares, signs, streetlights, and structures. Always maintain live branches on at least two- thirds of a tree's total height. Removing too many lower branches will hinder the development of a strong main stem.

Figure 13 – Many trees along streets have been pruned for clearance but no structural pruning occurred to create proper branch architecture.

All recently planted trees like the red maple in front of the municipal offices require subordination pruning to establish a strong central leader and proper branch architecture to avoid development of codominant stems (Figure 13, 14). This is easily accomplished without power tools or large equipment. The pruning should be performed by a skilled arborist.

Figure 14 – Red maple planted recently that should receive a subordination pruning treatment.

TREE RESOURCE EXPANSION

Tree Resource Expansion

There is a clear need for a tree planting plan to guide the arboriculture future of College Place's community trees. Such plans will minimize the unintended but gradual degradation of the urban forest over time, as well as maximize the potential for a sustainable and diversified tree canopy and the associated benefits. The trees in College Place—a relatively even-aged, limited, and undiversified population—are not only significant design elements but also represent the canopy cover at this stage.

A challenge for College Place is to plant enough new and replacement trees each year to increase the canopy cover, maintain newly planted trees, and ensure the trees thrive. Removals without replacement and planting small trees in large spaces lead to net canopy loss. Without a clear plan to guide tree plantings, the City of College Place may plant trees but not achieve a net increase in tree canopy.

Tree planting plans include input from local citizens, city staff, state agencies, organizations, businesses, planners, developers, city staff, affiliated green industry professionals, and elected officials. They are integrated with other comprehensive agency and city plans to create a blueprint for administration and management of the College Place planting program.

The goal is to provide specific guidelines on locating, planting, and caring for trees. Removing, pruning, planting, and preserving trees; educating stakeholders; and improving coordination and communication among citizens, city staff, and elected officials are critical components in the development of the tree planting plan. A tree planting plan will help College Place tree managers quickly determine how best to apply funding that often becomes available in small and unpredictable amounts. A plan should not only specify what (species) and where (location) but when (timeframe) and why (underlying goals).

The community tree plan should address some important questions about landscape design, development impacts, including the kinds of neighborhood and other landscapes that are present, their function, and their attractiveness; how the landscapes should look and function in the future; and how the landscapes should be protected or modified to reflect community goals.

Design objectives can include the following:

- Plant only the quantity of trees that can be maintained properly. If there is only funding to maintain 50 newly planted trees do not plant 100.
- Increase tree planting on College Place owned property, including parks, public buildings, ball fields, and other developed sites.
- Promote additional street tree plantings while considering infrastructure (e.g., utility) limitations.
- Review new site development proposals to maximize tree planting and preservation opportunities.
- Encourage tree planting and preservation on private property.

- Develop guidelines for reviewing tree selection and/or location regarding the aesthetics of specific architectural and development projects in the community core.
- Consider the development of a College Place Master Street Tree Plan to express unified visions and themes for street trees across the community.
- Important landscapes, such as main entrances and exits, will be identified, and considered in tree and flower planting. An overall image of College Place will be developed through the coherent planting of trees along streets and parks.
- The final selection of trees and their placement for a landscape shall be made in the field while considering the many elements of that landscape.
- The tree species chosen for planting, besides meeting design criteria, must be biologically adapted to site conditions and well suited for the level of care they will receive.

Implementing a tree planting plan and using inventory data to prioritize planting and maintenance establishes a systematic program which reduces costs (Figure 15). This is primarily because systematic, planned maintenance in general leads to healthier trees that require less expensive maintenance over the long run than unhealthy, high risk trees. Maintenance practices and standards for new tree plantings should be a component of the tree landscaping plan as well as strategies for funding maintenance programs. Developers should be encouraged and expected to use creative design strategies to achieve the intent of the tree planting plan.

Figure 15 - For every dollar spent on tree planting and establishment, a 250% return on investment is provided to the city in terms of the total services provided at tree maturity.

Tree planting in College Place can significantly impact that community's landscape for years to come. Yet planting decisions, including the selection of species and location, are often made without the benefit of a long-term strategy or plan. Tree planting might occur as part of a larger capital construction project or be driven by a donor request or the need for a volunteer project.

As the inventory of existing trees continues, places where trees could be planted should also be noted. Knowing the number of available planting sites can help when the community is budgeting for and ordering new trees.

There are many available new planting spaces College Place. It is a common activity promoted by cities, local and national trade, and professional and citizen organizations. These new trees are the future environmental, economic, and social fabric for the City of College Place. Many more exist in College Place, but parameters will need to be

established by site in conjunction with field evaluations to determine available planting spaces (Figure 16).

The key to maintaining a healthy, sustainable community forest is the implementation of regular, bi-annual tree plantings, regardless of grant money or catastrophic events. Many trees do not need be planted, but a consistent bi-annual addition of trees to the community forest is critical to maintain a perpetual canopy.

Objective to guide the College Place tree planting program.

- The bi-annual quantity of trees to plant is directly dependent on the quantity of trees College Place staff and resources can maintain.

Figure 16 – There are many opportunities to plant new along city streets.

Tree Planting Practices

Across the country we are striving to restore our community forests but the road from nursery to working forest is arduous. The sight of new trees struggling rather than thriving in the landscape is common whether the site is residential or commercial, public, or private.

As in most cities, trees planted in the past were planted too deeply. Root collars were buried and trees in this situation fail to thrive. Installation practices need to ensure the root collar is at grade level and the root system is free of defects (Figure 17).

Figure 17 - Maple tree planted too deeply.

In general, the tree-planting holes should be relatively shallow (typically slightly less deep than the measurement between the root collar and the bottom of the root plate) and quite wide (three to five times the diameter of the root system). Care should be taken so that the root collars of the new trees are at the same level or slightly higher than the surrounding soil grade (Figure 18).

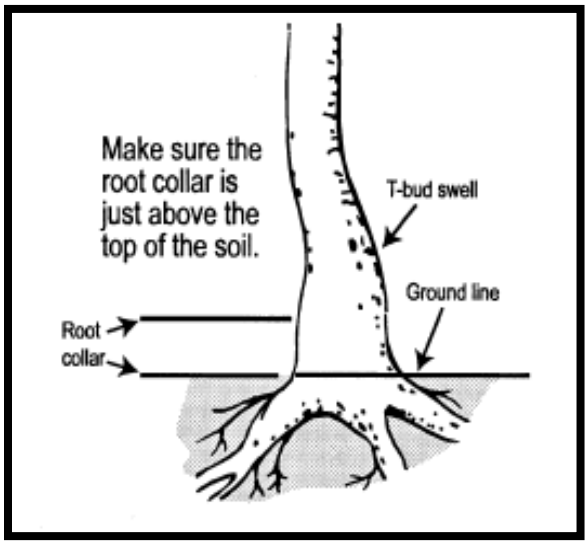


Figure 18 – Root collar at grade level

In most situations, it is not recommended to add soil amendments to the planting holes, as this can lead to differences between texture and structure of soils inside the planting holes and the surrounding soil. Such differences can lead to either water being wicked away from or accumulating in the planting holes.

Tree staking or guying should be the exception and not the rule. Tree staking hardware should only be installed when necessary, to keep trees from leaning (*e.g.,* windy sites) or to prevent damage from pedestrians and/or vandals. Stakes should only be attached to trees with a loose, flexible material, and all staking material must be removed as soon as the root system anchors the tree.

Mulching

Mulch should be applied to the surface of the soil around each newly planted tree. Mulch should never be piled up around the trunk (creating mulch volcanoes), but rather should be pulled away from the root collar (Figure 19). Mulch that buries the root collar provides shelter for insects, fungi, and mammals that could damage the tree. Mulch should be applied to an area three times the diameter of the root system to a depth of two to four inches. Mulch not only suppresses competition from grass and weeds, but also provides a zone where turf maintenance is not needed, thereby keeping lawn mowers and string trimmers safely away and thus preventing mechanical damage. Mulch also helps to hold moisture in the surface of the soil where most of the feeder roots are to be established.

Figure 19 - Incorrect mulch applications can degrade trunk tissue causing tree mortality.

Diversification

The current tree inventory data base includes more than 550 trees. There are more than 30 different species found in College Place's tree population (Table 4). This appears to be a diverse population, but distribution figures indicate the population is dominated by a

one genus. Ninety percent of the trees are represented by five genera. The five genera are maple (Acer), honeylocust (Gleditsia), flowering pear (Pyrus), cottonwood (Populus), and ash (Fraxinus). Maples comprise more than 60% of the population.

Species diversity in new plantings throughout the city should be a primary concern. The dangers (*e.g.*, disease and insects) of planting monocultures have proven to be devastating throughout the United States. An older, common industry guideline for maintaining species diversity in urban settings is the 10-20-30 rule. That is, no single species should make up more than 10 percent of the trees in a population, no more than 20 percent of any one genus, and no more than 30 percent of one family in the total tree population (Santamour, 1990). **Current industry standards recommend that no more than 10% of the tree population is comprised of any one genus as a guiding principle.**

Diversity is an important measure of a forest's resilience. A more diverse forest, both in total number of species represented and in their relative abundance, is better able to adapt to environmental changes as well as disease and insect infestations, particularly foreign invasive plants, pests, and diseases. When just a few species dominate the composition of a tree population, these changes or infestations will significantly impact the entire population.

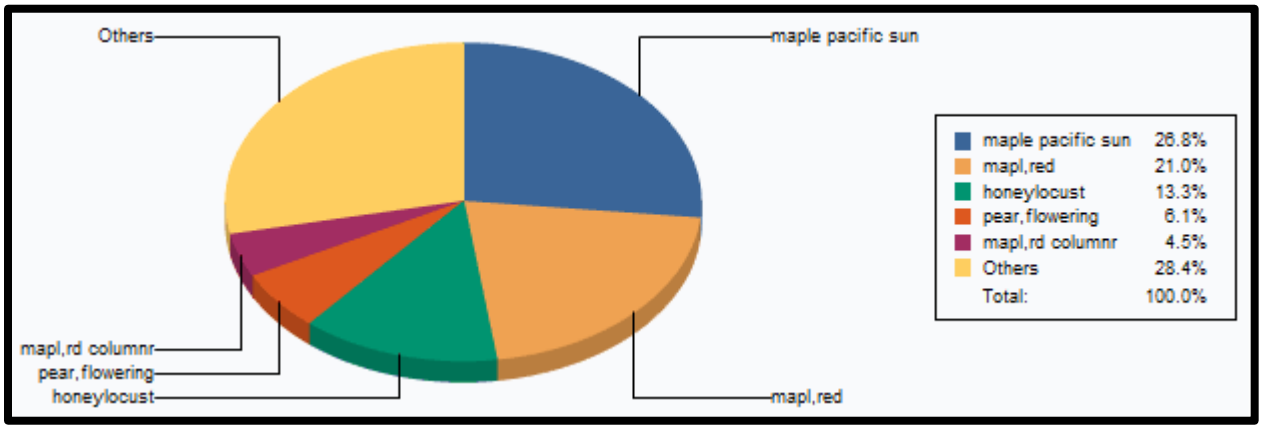


Table 4– Species distribution. The top five species are shown.

Over 60% of the public tree population is represented by seven genera.

Genus	Count	Percent
Maple	355	63.7%
Honeylocust	74	13.2%
Flowering pear	34	6.1%
Poplars	25	4.5%
Ash	14	2.5%
Others	55	10.0%
Total	**557**	**100%**

Objectives to increase species diversity.

- College Place should adopt a tree planting diversity guide that states that no more than 10% of the tree population is comprised of any one genus as a

guiding principle. **The city should enact a moratorium on planting any maple species in the public sectors.**

- College Place should emphasize a diversity of species in the planting program. Avoid species that have high maintenance costs, invasive characteristics, high storm damage potential or a history of failure such as Siberian elm, cottonwood, and willow. See appendix C for potential trees to plant.

Diameter Distribution

A well distributed age-class helps maintain a stable canopy cover. If all the trees within a particular area or neighborhood are approximately the same age they will mature and decline at the same time, leaving that area with a deficient urban forest canopy plus expense of replanting. In many parts of College Place, young trees of similar age class dominate the landscape. To mitigate the impacts of an even age canopy maturing at the same time, College Place should take steps to increase the age class and species distribution where possible (Miller, et. Al., 2015; Vargas, et. Al. 2007).

For example, western cities established the following standard for desired age structure:

- 40% young (< 6-inch DBH)
- 30% maturing (6 – 12-inch DBH)
- 20% mature (12 – 24-inch DBH)
- 10% old (> 24-inch DBH)

College Place's tree population ranges for the same categories of desired age structure:

- 57% young (< 6-inch DBH)
- 25% maturing (6 – 12-inch DBH)
- 10% mature (12 – 24-inch DBH)
- 8% old (> 24-inch DBH)

The graph (Table 5) below depicts the (DBH) diameter distribution for the trees inventoried. A population exhibiting the diameter distribution characteristics indicates College Place has planted many trees recently. This graph is one that mimics the ideal population, that is, a population that peaks in the smallest diameter class and gradually decreases as diameters increase. It represents a population that will perpetuate itself for some time in the future, since there is many trees in the lower diameter classes to replace trees that are over mature.

The optimum diameter distribution has the largest number of trees in the smallest diameter classes. As each group of trees within a specific diameter class matures, the numbers within the group diminish through attrition. To perpetuate a specific species, the largest representation must be in the smaller diameter classes. As a rule of thumb for any given species, twice as many trees need to be planted as are removed as in any one year to maintain the exponential shape of this graph. Management activities should strive to improve College Place's population distribution to reflect current industry standards and plant species that will become large trees.

Diameter Distribution (inches)

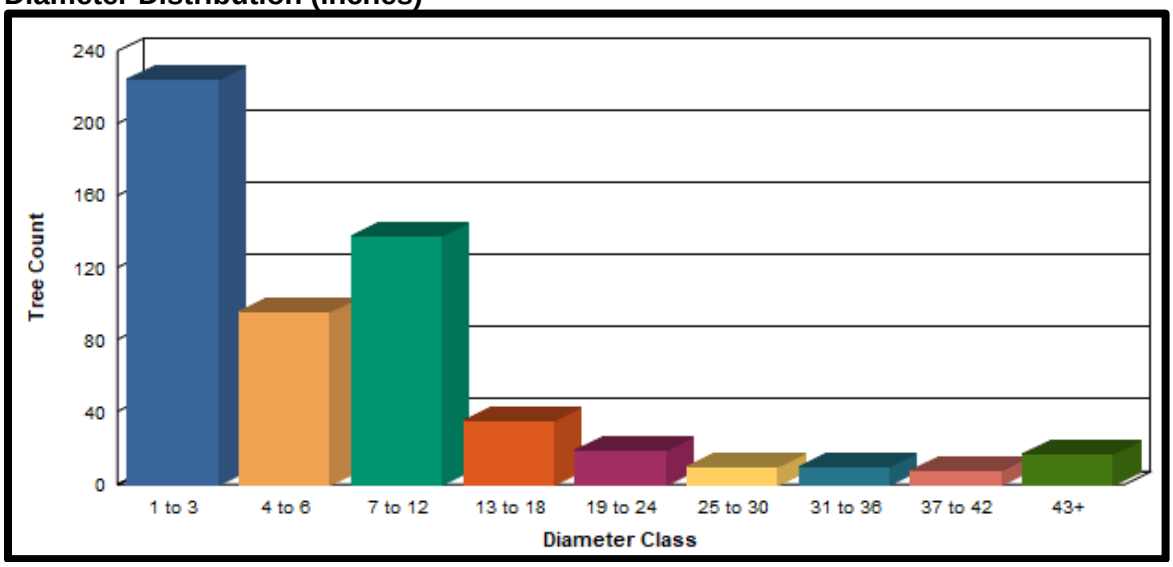


Table 5 – Diameter distribution of inventoried trees (Diameter breast height – 54 inches above grade level).

Diameter Class	Percent	Count
1 to 3	40.2%	224
4 to 6	17.2%	96
7 to 12	24.8%	138
13 to 18	6.3%	35
19 to 24	3.4%	19
25 to 30	1.8%	10
31 to 36	1.8%	10
37 to 42	1.4%	8
43 +	3.1%	17
Total	**100%**	**557**

The graph (Table 6) simulates a situation in which plantings of one species have tapered off in the recent past (10 – 30 years). The population peak is centered on the larger diameter class. This species will have peaks that continue moving up the scale over time as the few smaller diameter trees move into larger diameter classes. Silver maple is an example of this diameter distribution in College Place.

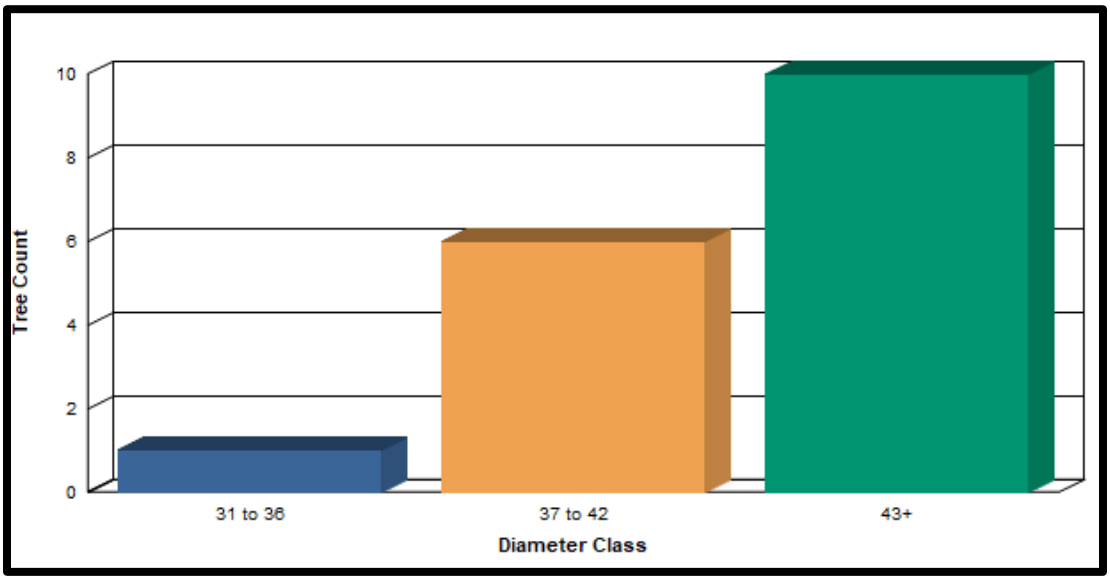


Table 6 – Diameter distribution showing population curve of silver maple where planting decreased in the last 40 years.

As species age the population curve is centered on the larger diameter classes. These species will soon be missing from College Place's landscape. This trend is good for some species that College Place may want to eliminate such as silver maple, boxelder, Russian olive, or Siberian elm. However, if the bur oak shows this trend, it means an important species is dwindling from the landscape.

Objectives to reach industry tree population ranges.

- College Place should reduce tree planting and increase maintenance of existing trees until tree population ranges reflect industry recommendations listed above.

Tree Establishment Plan

Mortality of landscape trees can reach 70% in the first year after planting. There are fundamental factors and procedures critical to tree establishment. If these are fully considered and acted upon, significant reductions in transplant losses can be expected. The principal elements essential for successful tree establishment have been identified as tree physiology; root quality; plant quality; correct planting depth; and post planting maintenance.

Tree physiology considers the genetic potential of trees to establish in each environment and species characteristics which may reduce the impact of a particular stress. High plant quality is an essential foundation for any planting project, particularly root quality. Planting and post-planting practices are fundamental to establishment success. The rooting environment is critical in ensuring future resource availability and College Place. Failure to consider fully any one of these factors increases the likelihood of a high mortality rate in a tree planting scheme.

While it is appreciated by professionals involved in urban tree management that trees are planted into suboptimal conditions for growth, the extent and diversity of stresses urban environments impose is frequently under-estimated. In view of the resource life-history an amenity tree has in terms of irrigation, fertilizers (if applied), transport costs, planting materials, labor, etc., in addition to the actual loss of the tree, the persistence of these failure rates can no longer be accepted.

The average historical cost to plant and water a new 2-inch caliper tree for the City of College Place is $400.00 per tree. **CFC recommends that 5% of tree management funds be dedicated to new tree planting in the initial operating plan.** This figure would include trees planted in new available planting spaces and tree planting connected to a tree removal. This percentage of a tree budget dedicated to tree planting reflects average municipal tree program budgets ((Hauer R. J. and Peterson W. D. 2016). This figure allows College Place to maintain industry target goals for tree population ranges and is a quantity College Place staff can maintain.

TREE RISK MANAGEMENT

Tree Risk Management

The forest is an integral part of a community's infrastructure, and trees often dominate the landscape. Trees are a very desirable landscape component of the urban and urban/rural interface. Trees provide numerous benefits to those living and working in College Place. These benefits increase as the age and size of the trees increase if the trees are maintained properly. All trees germinate, grow, mature, decline, and eventually die. Along the way, trees may undergo all sorts of physical alterations naturally or aided by poor maintenance practices, such as limb loss, onset of decay, structural changes or other conditions that can predispose a tree to fail. All trees have a varying level of risk for failure. In assessing and managing trees, we should strive to strike a balance between the risk that a tree poses and the benefits that College Place derives from trees.

Tree risk management is the application of policies, procedures, and practices to identify, evaluate, mitigate, monitor, and communicate risk. It is impossible to maintain trees free of risk; some level of risk must be accepted to experience the benefits that trees provide. These statements provide a foundation for balancing tree risk and the benefits that trees provide:

- Trees provide a wide variety of benefits to society.
- Trees are living organisms and naturally lose branches or fail.
- The risk to human safety is extremely low.
- The City of College Place has a legal duty of care.
- The City of College Place should take a balanced and proportionate approach to tree risk management.

Fortunately, tree failure is an infrequent occurrence. Serious damage, injury, or death from tree failure is rare. Tree failures during normal weather conditions are often predictable and preventable. However, any tree, whether it has visible weaknesses or not, will fail if the forces applied exceed the strength of the tree or its parts.

The trees inventoried in College Place are small stature (80% of the population inventoried) or have not reached their mature size yet and pose little liability concerns currently. It is important to manage risk trees despite the small number of risk trees in College Place. The tree inventory identified 25 trees for removal. All the trees are low risk removals. Ultimately College Place has the responsibility for maintaining a safe environment.

These responsibilities include high risk trees or limbs that could damage property and cause injuries or even death, trees that block required traffic sight lines and signs, or tree roots that raise sidewalks, invade segmented pipes, or disrupt activities. The human and financial impact of these problems can far outweigh the costs that an agency would have incurred in providing proper, proactive care.

No agency can budget for all removals at once so a priority of work must be established and implemented to demonstrate due diligence of care. For College Place tree removals this process begins by removing trees larger than 19-inch DBH designated for removal during tree inventory data collection. **There are two trees, one in Lions Park and one in Kiwanis Park, that are larger than 19-inch DBH designated for removal.**

College Place Tree Risk Policy Statement: College Place shall have an active policy to maintain the safety of people and property on roadways, parks, and other public property from potentially hazardous trees. The City of College Place will strive to mitigate, in a reasonable time, trees deemed high-risk. When available fiscal and human resources limit the ability of College Place staff to mitigate high-risk trees, priority shall be placed on trees deemed to carry the highest risk.

The standard of care for evaluating tree risk will incorporate the following International Society of Arboriculture (ISA) Guidelines: 1) ANSI A300 Pruning Standard, 2) ANSI A300 Tree Risk Assessment; 3) the International Society of Arboriculture's (ISA) Tree Risk Assessment-Best Management Practices (ISA-TRA-BMP); 4) ISA TRAQ tree risk rating system; and 5) College Place protocol described in this document.

Goals: Tree risk assessment has two primary goals. The first is to ensure the safety of people and property that may be in the range of one or more trees with a high potential of failure by identifying and mitigating the situation before damage is caused. The second is to promote tree health and structural integrity by practicing proper tree maintenance to reduce future hazardous trees by developing a tree risk management program that takes action to reduce risk to an acceptable level. This is accomplished by taking all reasonable steps to ensure the safety of people and/or property before accidents occur. The goal is not to strive for zero risk since this is unattainable. Rather, the goal is to identify the trees that pose risk beyond an acceptable level to public.

The City of College Place, or staff acting on their behalf, has a duty of care to ensure that the trees in their care do not create an unreasonable risk. The liability associated with trees can best be avoided by clearly assigning the responsibilities for tree inspection and care and then documenting that this responsibility is met. Cities and other property owners are expected to conduct bi-annual work, including yearly tree inspections, removal, pruning, and other maintenance. The goal of tree risk management is to provide a systematic and defensible approach by which those risks can be assessed and managed to a reasonable level.

Objectives for the tree risk management plan that reduce exposure to liability:

- A tree inventory will be completed and maintained. Dates of inspection, condition of inventoried trees, and pruning and other maintenance needs will be recorded.
- Bi-annual inspections of community trees should be completed, and accurate inspection records should be kept.
- High and extreme risk trees and tree branches should be removed as they become known.
- Only trained, ISA qualified tree risk assessors, and insured tree care professionals who follow arboriculture industry practices should be hired for any tree maintenance work on public trees.
- College Place park staff and other city staff as needed will participate in training on tree risk awareness and management, safe arboriculture procedures, first aid, safe equipment use, and tree risk incident procedures to develop basic surveillance skills for visually scanning trees to detect and report potentially high risk/ hazardous trees.

- Visual clearance for intersections, traffic signs, and signals shall be maintained.
- Requests by city departments, property owners, and others should be responded to promptly.
- Implement a risk tree mitigation action plan based on levels of risk.
- Implement a cyclic pruning program.

Tree risk assessment can also be used as an educational tool to demonstrate the necessity for urban forest planning. Proper planting and aftercare combined with regular pruning and periodic inspections, reduces the likelihood that weaknesses or defects will become hazardous. Proper management will lead to permanent reductions in liability.

Public safety is the major concern for urban forest managers. College Place has a legal duty to exercise reasonable care to protect residents and the public from foreseeable risks. College Place managers, administrators, staff, and elected officials must demonstrate reasonable care to minimize the risk associated with trees in public areas (Figure 20). It is imperative for all College Place city departments to follow established risk management policies.

Figure 20 – Norway spruce in Kiwanis Park with codominant stems.

Tree Inspections

College Place has a legal responsibility to exercise due diligence that trees in parks and streets adjacent to city properties are reasonably safe. The standard of care or due diligence is the action a reasonably prudent person should exercise in same or similar circumstances. College Place's UFMP defines the agency's standard of care for tree risk management and assessment. College Place shall meet or exceed all arboriculture industry standards in its tree risk management program through the following actions:

- Establish, adopt, and implement UFMP and policy.
- Ensure that all tree inspectors are trained and qualified to exercise due diligence while conducting tree risk assessments for College Place.
- Undertake systematic inspections of trees on a schedule as described in the UFMP.
- Document the inspections and communicate the results to the appropriate person as defined in the UFMP.
- Undertake/recommend appropriate risk management action according to guidelines in the UFMP to reduce tree failures in the management program.
- Adhere to industry standards for general tree care activities.

Tree risk assessment is the systematic process to identify, analyze, and evaluate tree risk (Figure 21). It requires assessing the tree or tree parts for the likelihood of failure

impacting a target and the consequences of failure impacting a target. Inspections are the first line of defense in proactive risk management and maintenance programs.

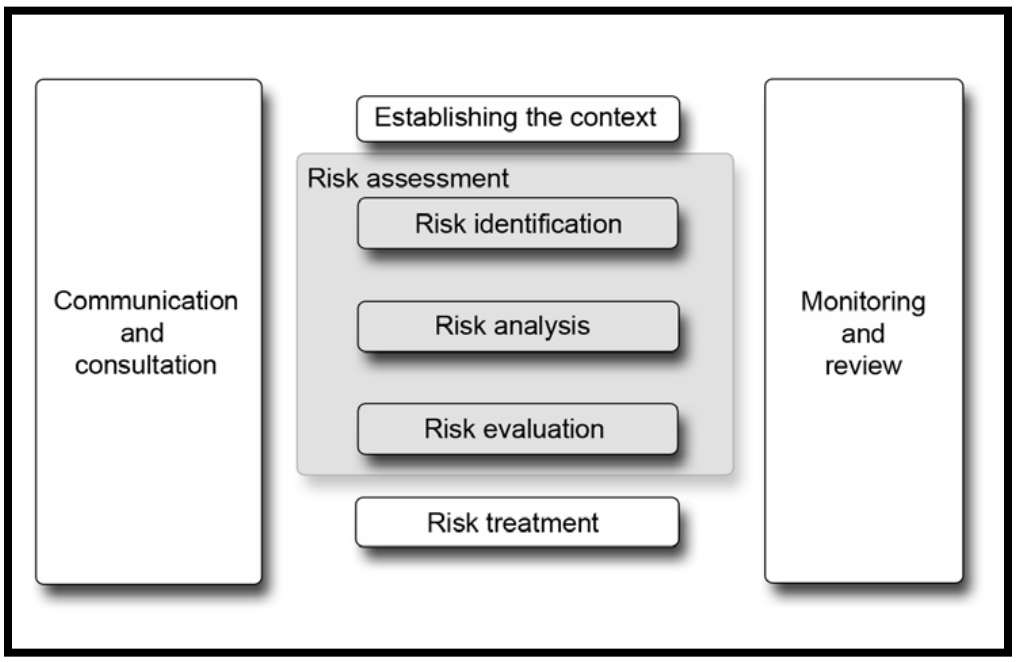


Figure 21 – Contribution of risk assessment (highlighted) to the risk management process (ISA Best Management Practices)

Major Defects and Conditions that Increase Potential for Tree Failure

- Dead parts (dead branches greater than 1-inch in diameter)
- Large broken and/or hanging branches greater than 2-inch diameter
- Cracks, splits, and cavities
- Codominant stems with weak branch attachments (included bark)
- Decayed wood or missing wood
- Unusual tree architecture – recent leans, topped trees, lack of trunk taper, asymmetric structure, excessive branch end weight
- Root loss – construction damage, under mining, decay
- Root defects – stem girdling roots, decay

Conditions affecting trees change constantly; none of us will ever be able to predict every tree failure. Conducting a tree risk assessment neither assures nor requires perfection. Risk assessment should, however, ensure that all reasonable efforts have been made to identify extremely and potentially high-risk trees present at the time of assessment.

College Place tree maintenance contracts shall include a qualified tree-care contractor with all necessary training, equipment, and qualified employees to evaluated tree risk. A list of qualified tree and available tree contractors shall be established that are available to assist in the case of natural events that create a high-risk tree situation if the primary contractor cannot handle the work within the allotted time frame.

Tree Risk Assessor Qualifications
Each assessor shall have a current certification as an ISA Certified Arborist and qualification as an ISA Tree Risk Assessor with a minimum of two years' experience in the field conducting tree risk assessments.

Risk Awareness Personnel and Qualifications
College Place staff, landscape and tree maintenance personnel, both contractors and College Place employees not meeting assessor qualifications shall attend an initial class on tree risk awareness, pruning maintenance, and tree risk incident procedures to develop basic surveillance skills for visually scanning the right-of-way plantings to detect and report potentially high risk/ hazardous trees.

A staff training log record verifies that College Place staff and subcontractors are receiving ongoing and pertinent continuing education. It serves as documentation if litigation occurs and demonstrates the agency is taking a proactive rather than a reactive tree risk management program.

Inspection Cycle: The evaluation cycle or inspection interval may range between one and five years, depending on the age of the tree, level of risk, specific conditions, College Place goals and resources, or regulations. The inspection may occur prior to normal storm seasons for the area. Mature trees and species with known failure histories may need to be inspected more frequently. Occurrence of tree or branch failures between inspections will indicate the adequacy of the interval between inspections. Additional inspections should be made following storm events. Intervals of 18 months between inspections alternate between leaf on and leaf off and provide opportunities for assessment during different growing seasons. An advantage to risk assessment during leaf off allows for a clear view of tree structure.

Risk Tree Abatement

Agencies, utilities, and property managers may have laws, ordinances, or risk management plans that define the level of acceptable risk. Safety is the priority but may not be the only basis used by the risk manager to establish acceptable levels of risk; budget, a tree's historical or environmental significance, public perception, and other factors may come into the decision-making process.

Mitigation and Action Strategy
The risk manager assisted by a qualified tree risk assessor/forestry staff organizes a tree risk team of employees and writes a Bi-annual Work Plan (BAWP). The goals, objectives, and activities are prioritized for the year based on funding, priorities, capabilities, assessment intervals, recent tree inventories, and previous year's failure logs.

Implementation of the BAWP includes:

- Pending mitigation actions from previous year.
- Identify trees and regions that need to be assessed or re-assessed based on assessment intervals.
- Assess the tree population by risk rating and condition classes. Trees with highest risk rating, in the poorest condition class, and with multiple targets

occupying the target zone are the most problematic in the short term for College Place.
- Document removals, prunes, and other mitigation requirements.
- Assignment and schedule of College Place staff and/or contractors to implement mitigation actions.
- Monitor and document work results.
- Report results of BAWP and review risk management actions.

Considerations to use in setting priorities are outlined in this plan. The risk manager/city forester takes action to reduce risk to acceptable levels by implementing correction measures based on thresholds from the tree risk rating system. Remedial actions are taken dependent on what part of the tree might fail; the likelihood of failure; the potential targets; and potential damage to the target. Extreme trees shall be removed, high-risk trees may be mitigated, while moderate risk trees may be mitigated/monitored/inspected and stabilized as appropriate. Trees that are retained should be inspected on a scheduled basis. The determination of which trees to inspect and how often should be part of a tree risk program. Tree risk inspections should be performed by an ISA TRAQ qulaified tree risk assessor.

With the initiation of a cyclic pruning program, at a minimum, each tree will be re-inspected once every cycle. Pruning crews will systematically work through the community and when they are assessing pruning needs, they can also evaluate risks. Any new risks can be added to the database and then further inspections can be requested if required. Simple risk abatement through pruning can be addressed as part of the cyclic pruning program.

OPERATING PLANS

Bi-Annual operating plans will direct the day-to-day operations and can be used to project budget requirements for all aspects of urban forest maintenance. The bi-annual plan will include contract inspection, contract monitoring, planting, pruning, removals, tree risk inspections, plant health care, and maintenance of the inventory. Initially, the bi-annual plan will need to address priorities derived from the inventory, but eventually will be focused on proactive management objectives. Preparation and review of the bi-annual plan is the responsibility of College Place staff. An example is provided in Table 8.

The preparation of operating plans for this management plan is based on information provided by College Place staff, College Place historical expenditures on tree maintenance, inventory data, and regional industry standards. Operational costs also consider industry estimates for community population size, annual tree care funding, tree management policy and planning, contract tree services, tree populations, tree operations, and staffing profiles. Industry costs in part are derived from the *Municipal Tree Care and Management in the United States: A 2014 Urban & community Forestry Census of Tree Activities* (Hauer R. J. and Peterson W. D. 2016).

Operational costs are based on College Place historical maintenance costs, and the tree inventory population of 550, and maintenance needs found during inventory data collection. Costs per tree are derived from the *Municipal Tree Care and Management in the United States: A 2014 Urban & community Forestry Census of Tree Activities* (Hauer R. J. and Peterson W. D. 2016).

Removal costs vary depending on tree size and location. Small tree removal cost is about $200.00/tree. Large tree removal costs can range from $1,500.00 to $3,000.00/tree. There are 23 small tree and two large trees designated for removal.

Tree pruning costs are variable depending on tree size and structural issues. Small tree (< 6-inch DBH) pruning costs should average $300.00/ tree. Large tree (> 6-inch DBH) can range from $800.00 to $1,500.00/tree. There are 439 trees that require some form of pruning.

PROGRAM ACTIVITY	J	F	M	A	M	J	J	A	S	O	N	D
PLANNING												
Work priorities												
Organize activities												
Modification												
TREE REMOVALS												
Review inventories												
Field inspections/Risk assessments												
Announce/hold public hearings												
Schedule tree crews - Conduct removals												
Stump grinding/reseeding												
Inspections												
TREE PRUNING												
Review inventories												
Field inspections/risk assessment												
Schedule crew - Conduct tree pruning												
Inspections												
TREE PLANTING												
Review inventories/survey potential planting sites												
Survey neighborhoods; notify adjacent property owners												
Purchase trees												
Install trees												
Water trees												
Inspections												
COMMUNITY EDUCATION AND OUTREACH												
Education programs												
Report to Park Board of Commissioners												
Arbor Day Recognition												
Neighborhood Tree Committee												
STAFF TRAINING												
Professional development												
Safety training												

Table 8 – Example of a Bi-annual Work Plan

OPERATIONAL REVIEW

Operational reviews may evaluate many components of an organization's forestry program. Reviews provide summaries of existing conditions, identify short-comings, and ultimately suggest goals, guidelines, and rationale that, once adopted will serve as a gauge for the standardization and optimization of program resources.

College Place's goal is to have a larger, healthy, diverse, functional, and structurally sound urban forest and thriving residential and business communities. The dynamics of balancing urban forest management and other city infrastructure needs, responsibilities, and assets are diverse and complex and suggest a dedicated, interdisciplinary, flexible approach and organization. However, the current constraints for comprehensive and effective urban forest management in College Place can be considered formidable.

Technical and Professional Resources

An adequate complement of professionals who, individually or collectively, understand the technical, operational, and administrative factors in urban forest management is needed to prescribe and monitor College Place's urban forestry activities, enforce policies and regulations, apply technical standards and practices, and review plans that affect the forest resource. Without this professional component in sufficient numbers, urban forest management decisions and actions often default to inadequately prepared decision-makers, which can have long-term, negative consequences for the forest resource.

Political Support

Support from elected officials and the citizens are critical to implement and maintain an effective comprehensive urban forest management program. The citizens own both the public and private urban forests, and without greater political support and increased citizen understanding and commitment, urban forest management in College Place may not reach its full potential.

Budget

The consulting team reiterates that to implement this UFMP and to realize the benefits of a healthy urban forest all aspects of this UFMP must be adequately supported with human and financial resources. Traditional funding comes from the city's tree assessment. An average of approximately 4/10 of one percent of municipal budgets across the western US go to urban forestry programs. This source of funding is in competition with all other city services and often urban forestry is considered an amenity rather than a necessity.

Urban forestry must generate enough interest in the stakeholders to position the program for recognition and sufficient funding. The program must change how stakeholders think about urban forestry and alter their beliefs about urban forestry. The role of urban forestry staff is not to move trees up the city list of importance. It is more critical to demonstrate how trees can help each city function whether it is police, fire, storm water management, water quality, or air quality. Urban forestry must be thought of as a solution to community problems and an economic engine worthy of city funding. Urban forestry provides essential benefits, opportunities for investment, solutions to city

problems, and connections to people. Many of the objectives and recommendations of the UFMP will assist in generating these outcomes.

Levels of Service (LOS) and Extrapolated Maintenance Costs

Levels of service are quantifiable measures of capacity, such as acres of park land per capita, labor hours per tree pruning based on DBH or visitor use per day. A budget plan is a function of the agency's priorities and preferred level of service toward achieving urban forestry objectives in the UFMP. The City of College Place must decide on an operating level of service it wishes to provide and accept the level of risk associated with the decision.

Typical tree budget allocations found in urban forestry programs across the United States allocate funding in these areas (Figure 23). College Place's current forestry budget allocations do not follow industry standards (Figure 24). These are approximations but provide an accurate representation of fund allocations. The priority should be to take care of what you have before substantially adding to the street tree population.

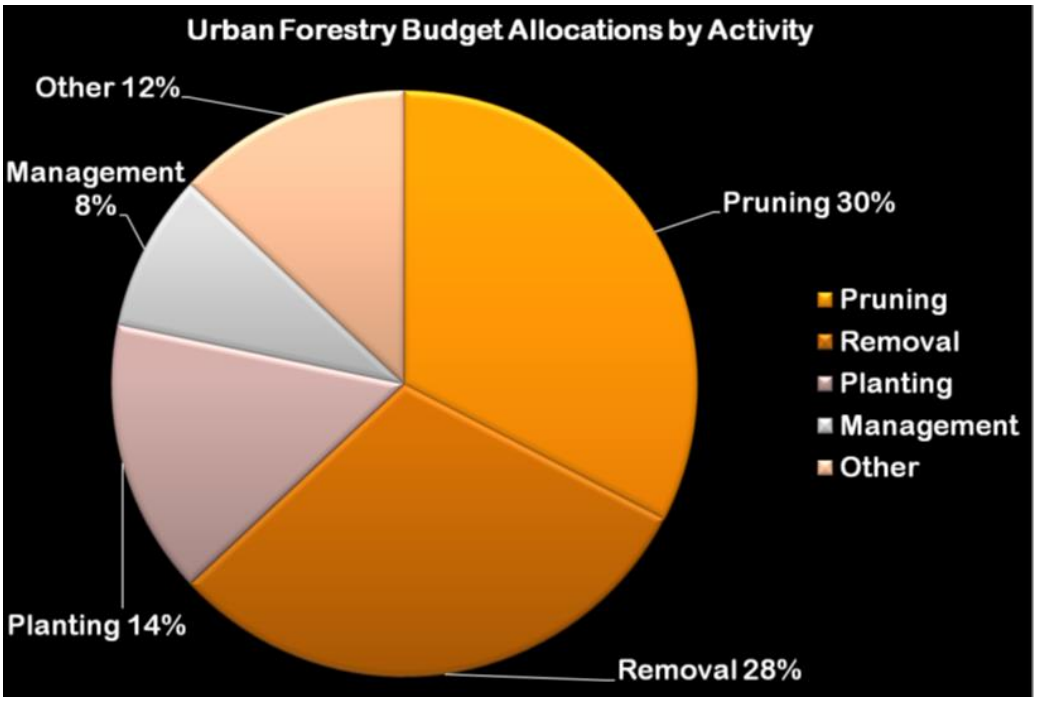


Figure 23 – Typical fund use in urban forestry tree budget allocations. College Place should adjust these figures to current conditions as outlined in the Extrpolated Maintenance Budget Table (Figure 22).

Operating budget estimates are based on 2019 city budget ($52,000,000.000) and industry guidelines of approximately 4/10 of one percent of municipal budgets (Figure 22). They provide an indication of where the urban forestry budget in College Place is and how it compares to industry guidelines in the cities of similar size in the Northwest.

Figure 22 – Extrapolated Maintenance Budget

College Place	Two Year Average (2019 – 2020)	Industry Guidelines
Program Areas	**Operating Budget**	**Operating Budget**
Removal Tree Abatement	$2,000.00	$20,000.00
Tree Pruning	$15,000.00	$135,000.00
Annual Tree Maintenance	$17,000.00	$155,000.00
Planting	$4,500.00	$35,000.00
Management	$13,000.00	$20,000.00
Totals	**$51,500.00**	**$210,000.00**
***Residential Property Assessment (estimate 6,500 homeowners)	$7.92 annually	$32.31 annually

*****An example of an urban forestry assessment based on property ownership to consider as a funding mechanism.**

Current College Place resources are not sufficient to address tree issues in a reasonable, timely and safe environment if the maintenance requirements and if tree conditions found in the sample inventory were extrapolated to the entire community tree population the gap in funding would be wider.

The personnel, equipment resources, and budgets of the urban forestry operations are not sufficient to meet the tree management and maintenance needs of the street, park, trail, and community forest system. A review of tree maintenance needs, maintenance schedules, crew configurations, personnel, equipment, and training required to manage and maintain trees in the city finds city insufficient. Current resource levels puts the city in a reactive management position that increases the liability of the agency and exposes the community to an increased risk.

Many cities operate under a mode of crisis management when it comes to tree care maintenance and correcting/removing high risk trees. Information from many U.S. cities shows that the cost per unit of maintenance is generally twice as high with crisis management that it is when maintenance is performed on scheduled or programmed basis (World Forestry Center 1993). In addition to higher maintenance costs, relying on crisis management may lead to injuries or deaths to park users and hazardous work environments for crews that eventually remove high risk trees.

Staff Training

The City of College Place staff and residents recognize the importance of trees to their community. Proper tree maintenance is critical to public safety, tree value, and realizing the benefits of trees. It is important that staff be professionally trained in tree maintenance to perform duties that are assigned. Proper tree maintenance by city staff illustrates city leadership and reinforces the objectives of the urban forestry program.

Arboriculture and tree care maintenance and operations are very specialized fields of work. Many years of education and training are required to perform competently and safely in the field and without harm to the trees. Tree care performed by city staff or contractors to College Place's public trees should be accomplished by ISA certified arborists or certified tree workers.

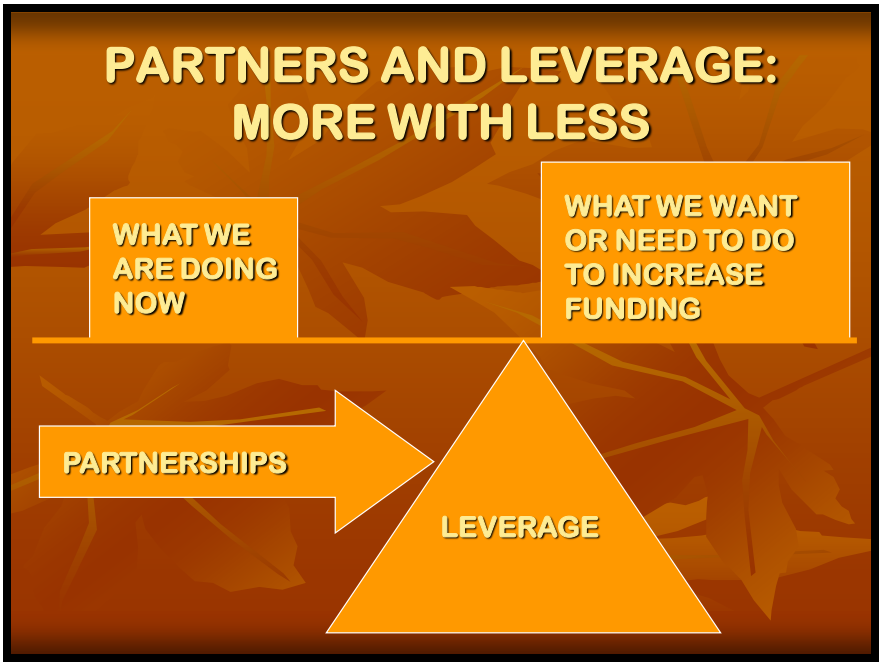
Annual training is a mandatory element in keeping staff updated on the current tree maintenance practices, risk assessment, and safety methods and practices in the arboriculture industry. Staff training is essential for working safe, efficient, following the best management practices of the arboriculture industry, and for advancing College Place's urban forestry program into the future. **The following objectives should be incorporated into College Place's urban forestry program.**

- Annual training for urban forestry staff.

Program Funding

College Place is aptly named, since the story of the city is dominated by the story of the college it hosts. Until the founding of Walla Walla College in 1892, the land that is now known as College Place was sagebrush-covered land three miles west of the city of Walla Walla. The university has a large impact on the community but also represents 15% of the city land mass in non-taxable status.

Alternative funding sources for community forestry programs are about associative re-positioning or changing who you partner with to leverage resources. In the graphic below 'What we are doing represents' tax dollars supporting our programs. These are dwindling and sporadic from year to year. By developing partnerships with various groups, we can leverage their resources to get 'What we want or need to do to increase funding'. Examples of partnerships and alternative fund sources are listed below the graphic.



Examples of alternative funding sources:

- Grants
  - Government
  - Private
- Inter-governmental charges: Maintenance fee recovery for road bond projects or right-of-way projects.
- ***Urban Forestry Assessments
- Captial Improvement Funds: Trees as infrastructure cited in ordinances (Austin and Houston, Texas)
- Direct Charges
- Mitigation Payments: You damage or destroy trees, you pay for it. Use ISA appraisal formulae to recover costs of damage or destruction of public property (trees).
- Special Events
  - Festivals
  - Tree Run/Walk
  - Christmas Tree Recycling
  - Business Grand Openings and Building Dedications
  - Birthday Milestones: First, 40th, 50th, etc.
  - Arboretum Plantings and Dedications
  - Community Entrance Tree Planting
  - Church Planting Projects
  - Civic Group Planting Projects
- Sales, Merchandising & Promotions
  - Historical Tree Merchandise
  - Trail of Trees/Tree Books
  - Tree Give-A-Ways
  - Firewood/Lumber/Nuts/Fruits and Other Tree Products
  - Memorial, Anniversary, and Tribute Trees
  - Sweepstakes/Contests
- Donations
  - Individuals
  - Utility Bill Donations
  - Donation Cans at Events
  - Trust In Agency Funds
  - Tourism Industry
  - Business Sponsorships
  - Event Sponsors
  - Carbon Credits
  - In-Kind by Citizens (NeighborWoods programs)

The City of College Place has taken proactive steps in conducting a partial inventory and developing a management plan. To accomplish the mission and to achieve and sustain the community forestry goals, College Place should strive to attain all aspects of this strategic management plan. The costs associated with the implementation of the management plan must be developed within the context of the overall financial structure and administration of the City of College Place. On adoption of this strategic

management plan, it is imperative that the City of College Place and PAR Board develop long-range budget forecasts for its implementation.

PROGRAM ACTIONS

There are five program management elements that must be addressed on a bi-annual basis: Community Forestry Management Plan Adoption and Implementation, Tree Inventory, Proper Tree Maintenance, Tree Planting, and Risk Mitigation Program. Although each is essential to the maintenance of the community forest, a bi-annual operating plan should be established to determine where budget dollars will be spent. College Place staff has established public safety, responsible management of existing trees, and tree planting as high priorities.

Priority: Urban Forestry Management Plan Adoption and Implementation.

The UFMP is straightforward and comprehensive and contains appropriate goals and activities for College Place. The objectives of the UFMP are clear and far-sighted. The goal is to change the forest as it is today into one that reflects the goals of the management plan. The 5-year plan should be reviewed bi-annually to determine progress, review the activities accomplished, aid in the development of bi-annual operating plans, and plan for future activities to complete the UFMP recommendations. This ensures important components of the UFMP are accomplished and progress is made towards achieving a sustainable tree program. Long-range planning time horizons can be several years or a decade, but five years is most used and is a realistic time frame for implementation of the goals and recommendations of the UFMP.

Priority: Tree Inventory Maintenance

A significant component of an urban forest program is a professional analysis of the tree population. Using an ArcGIS tree management software such as TreeWorks™, the inventory of all public trees should be maintained to provide an accurate accounting of public trees. Using accurate, consistent inventory data and professional interpretation and planning, leads to healthier, safer, trees with lower maintenance costs and increased benefits to the community provided by public trees.

Priority: Proper Tree Maintenance

After planting an appropriate species at a site that can support adequate growth, maintenance practices such as mulching, watering, and pruning should be employed for three to five years. If trees are pruned properly three or four times during the first twenty years, they will need less frequent and less costly pruning in later years. Pruning promotes sound structural development of a tree's trunk and branches. The most important period for pruning occurs when the tree is young. Pruning large trees is costly and usually consumes a large part of any tree program's budget. By prioritizing the proper planting and pruning of young trees, a substantial savings can be realized by the entire tree program.

Early pruning performed properly will lead to long-lived healthy and safe mature trees. Pruning young trees properly produces substantial cost savings for the city. Training young trees can provide a strong branching structure that requires less frequent pruning

as the tree matures. Improved stewardship to increase the health and survival of recently planted trees is one strategy for increasing cost-effectiveness.

Additional training in young tree structural pruning and education regarding the growth habits of the various species being planted, as well as tree biology, anatomy, and physiology would be beneficial for College Place staff responsible for this task. This training can be received through several sources, including urban forestry consultants, the state's Community Forestry Program, and the Pacific-Northwest Chapter of the International Society of Arboriculture. The tremendous aesthetic and financial benefits to be gained in the years to come from proper pruning of young trees are a strong incentive for educating personnel about proper pruning techniques. The added knowledge gained by the individuals could augment the sense of professionalism in their jobs.

Large trees are a significant component of College Place's landscape. They form a canopy over streets, parks, and private properties. A mature tree is a costly management element, but it is important element because of safety and tree health issues. The consequences of lack of care for large trees are the creation of more risk trees and poor tree health.

Enforcing standards for pruning and other tree care is crucial in providing correct and consistent plant health care. The International Society of Arboriculture has developed pruning standards for trees. In conjunction with industry standards specifications for pruning or any other tree maintenance are required.

Crown restoration, pruning for views, and other pruning are considered specialty pruning. Other helpful sets of standards to consider and include are the ANSI Standards for Arboricultural Operations—Pruning, Trimming, Repairing, Maintaining, and Cutting Brush—Safety Requirements (ANSI Z133.1) and the ANSI Standards for Tree Care Operations—Tree, Shrub, and Other Woody Plant Maintenance–Standard Practices, Pruning (ANSI A300 (Part 1), Pruning). These safety and pruning standards are designed specifically for tree care operations and should be incorporated into KUF standards for tree care.

The primary structural defects in trees in College Place are codominant stems and dead branches. These are defects that caused many of the previous failure events and have the potential to cause many future failures if not dealt with in a timely manner.

Priority: Risk Management and Mitigation Program

Risk management is the application of policies, procedures, and practices used to identify, evaluate, mitigate, monitor, and communicate tree risk. Risk mitigation is the process of reducing risk using an established hierarchy based on risk ratings, budget, resources, and policies. A tree risk management program provides information to develop a systematic approach to accurately identify the high to severe risk trees and initiate the timely removal or mitigation treatment to reduce the risk to an acceptable level.

Priority: Tree Planting

New tree planting is an essential part of College Place tree management. The health and stability of the College Place urban forest depends in large part on judicious tree

selection, location, and tree planting today, as well as regular maintenance of young trees.

The key for successful tree planting is to plant quantities College Place can maintain. Increase new plantings each year, but in quantities that match the maintenance abilities of College Place staff and resources.

To ensure that newly planted trees thrive and are healthy provide planting standards and specifications. These can best be expressed as general guidelines with references to technical publications. A great deal of information about the size of planting pits, staking, and other planting practices has been developed by International Society of Arboriculture. The City of College Place and the Washington DNRC Community Forestry Program can provide other resources and training programs to ensure successful tree planting programs.

The primary issue in tree planting is improper installation causing the root collar to be buried. This is a significant problem on trees planted recently in College Place. Many of these trees can be replanted since they were planted recently. Root collar depth issues often cause premature death and decline in young trees. In older trees it can be a source of stem girdling roots which may lead to whole tree failure.

CONCLUSION

Community Forestry Consultants, Inc. has completed its assignment of evaluating and making recommendations regarding the community forest of College Place. This management plan provides College Place with the framework to implement the best management practices for the community forest. The management and maintenance needs for a successful urban forestry program have been developed from the best management practices available in the urban forestry and arboriculture industry.

The urban forest management plan should be considered a “living,” working document. The work objectives recommended in it should be reviewed bi-annually and adjustments made appropriately for the following year. The entire document should be revised on a five- or ten-year basis to determine if management and urban forest conditions have changed significantly.

Timely action needs to be taken to prevent tree failures, preserve tree resources, and maintain the trees of College Place. Trees are valuable assets to College Place. The healthier the trees are the more College Place’s vision and livability for their community is achieved. To realize these benefits, tree planting, pruning, and removing; increased education, preservation and funding, and management is needed. The focus goes beyond the individual tree to trees throughout city…..to the working community forest.

The recommendations will help conserve College Place’s tree resource and sustain the tree canopy for future generations. Although this commitment will come with costs, the long-term benefits are significantly greater and will result in a sustainable asset for the citizens of College Place today and tomorrow.

APPENDIX A – Tree Ordinance Writing Resources

Guidelines for Developing and Evaluating Tree Ordinances
Bernhardt, E.A. and Swiecki, T.J.
California Dept. of Forestry and Fire Protection
https://www.isa-arbor.com/education/resources/educ_TreeOrdinanceGuidelines.pdf

American Society of Consulting Arborists
A list with links for cities is available to help develop ordinances that will ensure the future of their community forests.
https://www.asca-consultants.org/page/TreeOrdinances

Tree Ordinance Development Guidebook
Georgia Forestry Commission
http://www.actrees.org/files/Newsroom/georgia_tree_ordinance.pdf

U.S. Landscape Ordinances: An Annotated Reference Handbook
by Buck Abbey, D. Gail Abbey
This comprehensive reference brings together and explains the planning ordinances which govern the landscapes of 300 U.S. cities. In it, the author demystifies the complex planning laws that regulate such areas as the design of parking lots, vehicular use areas, landscape buffers, and tree plantings.

Tree Ordinances by State
Presented by the Friends of the Urban Forest. Summary – Tree Planting, Preservation, and protection ordinances.
https://friends.urbanforests.org/tree-ordinances-in-other-states/

Tree City USA Bulletin #9 How to Write a Municipal Tree Ordinance
National Arbor Day Foundation
https://www.arborday.org/trees/bulletins/documents/009-summary.pdf

Tree City USA Bulletin # 31 Tree Protection Ordinances
National Arbor Day Foundation
https://www.arborday.org/trees/bulletins/documents/031-summary.pdf

Guidelines for developing urban forest practice ordinances Bell, P.C., Plamondon, S., and Rupp, M. Oregon Department of Forestry, Forest Practices Program, Urban and Community Forestry Program. This guide is designed to assist cities and counties in the development of urban forest practice regulations.
https://oregonexplorer.info/content/guidelines-developing-urban-forest-practice-ordinances?topic&ptopic

A Guide to Community and Urban Forestry Programming – Washington
https://www.dnr.wa.gov/publications/rp_urban_guide_to_urban_forestry_programming.pdf?7c5u5

A Guide to Developing A Community Tree Preservation Ordinance. Hoefer, P.J., Himelick, E.B., and DeVoto, D.F., Urbana, IL, International Society of Arboriculture. 42 pp. Prepared in cooperation with the Municipal Arborists and Urban Foresters Society.

The purpose of this manual is to be a guide for preparing new, or revising old, municipal tree ordinances.
http://www.mnstac.org/treeordinances.html

General Code Publishers
https://www.generalcode.com/

LexisNexis Municipal Codes
https://www.lexisnexis.com/municipalcodes/

APPENDIX B – S.W.O.T. Analyses

College Place Parks Advisory Committee
2/19/21

Attendees: Randy Grant; Tito Espinoza; James Frey; Carolyn Holm; Michael Rizzitiello

Strengths
Initial framework developed with assistance from WallaWalla parks director
Community care for trees – receptive to trees
Four distinct seasons – allows for a variety of trees
Biodiversity in the area
People involvement
Park and Recreation plan; Comprehensive Plan; Development code; Stormwater master plan incorporate trees
Approved tree list
Partnership with Lions Club tree planting
Arbor Day celebration

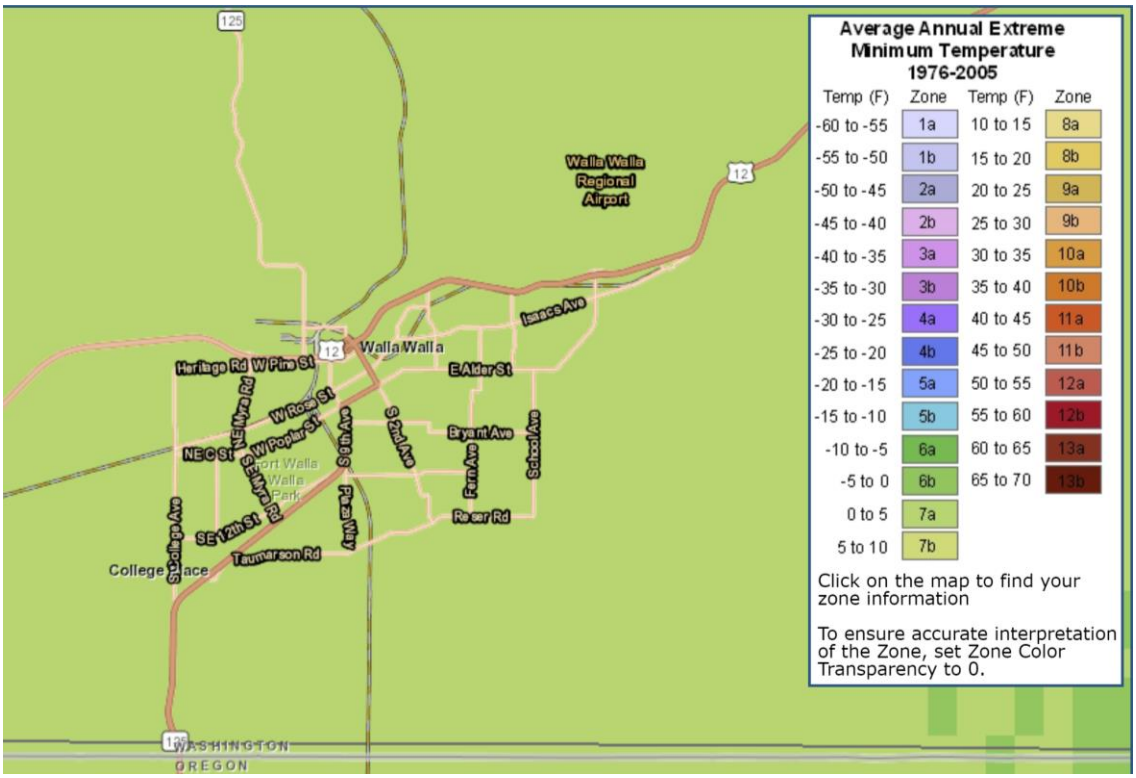
Weaknesses
Playing catch up, behind in park tree management
Budget constraints, funding
Staffing – no arborist on staff
Arterial streets – few or no trees along these streets
15% of land mass in city in non-taxable
Limited maintenance

Opportunities
Increasing community engagement – citizens groups
Continued community growth
Increasing species diversity – optimize planting
Partnering with other cities, towns, agencies
Arterial tree planting
Planting new trees

Threats
Diseases
Limited diversity
City growth and development – infrastructure conflicts
Behind in program development
Roads – older development left little to no space for trees
Types of trees planted
Weather events

APPENDIX C – Potential Landscape Plant List

College Place is in USDA hardiness zone 7a. Minimum temperatures average minus five to minus ten. Average number of days above 86 degrees is forty-five to sixty according to American Horticultural Society plant heat-zone map. In College Place, the climate is warm and temperate. The winters are rainier than the summers. College Place summers are hot, dry, and mostly clear and the winters have moderate temperatures, mostly cloudy and changeable rainy weather. In a year, the rainfall is 15.6 inch, most occurring during the winter. Over the course of the year, the temperature typically varies from 31°F to 93°F and is rarely below 17°F or above 102°F.



The plant list provides options to try. It is not finite and merely represents some potential choices to increase diversity in College Place. The plant list below is composed of many species not in the tree population of College Place or in limited quantities. These trees may be hardy to College Place and are not natives but will adapt to the area. Diversification and willingness to try new species are the keys to a successful planting program.

CLASS I TREES

Red Buckeye
Aesculus pavia
Height: 20'
Spread: 20'
Hardiness: -20
A small tree with a rounded or shrubby habit. Lustrous dark green palmate leaves accent the red flowers in April and May. No appreciable fall colors. Some tolerance for shade, drought and poor soils.

Autumn Brilliance Serviceberry
***Amelanchier x grandiflora* 'Autumn Brilliance' (treeform)**
Height: 20'
Spread: 15'
Hardiness: -30
Tree form of serviceberry with an upright spreading crown, white flowers and a reliable, bright red fall color. The fruit is edible. Tolerates some drought.

Cumulus Allegheny Serviceberry
***Amelanchier laevis* 'Cumulus' (treeform)**
Height: 25'
Spread: 20'
Hardiness: -30
A serviceberry with a distinct upright and oval tree habit, fleecy white flowers in spring and a yellowish to orange-scarlet fall color. Smooth gray bark.

American Hornbeam
Carpinus caroliniana
Height: 25'
Spread: 25'
Hardiness: -40
A small tree with an irregular spreading habit, with a rounded outline. Dark green leaves change to yellow, orange and scarlet in the fall. Smooth, gray, irregular twisting bark adds interest in winter. Will grow in heavy shade and wet soils.

Pagoda Dogwood
Cornus alternifolia
Height: 25'
Spread: 20'
Hardiness: -30
This small tree has a distinctive horizontal branching habit and will develop a flat-topped crown. Masses of creamy white flowers are produced in early summer. Blue/black clusters of fruit in late summer. Fall foliage is a mix of yellow, to red/purple.

Kousa Dogwood
Cornus kousa
Height: 25'
Spread: 20'
Hardiness: -20
A small tree, vase shaped in youth, forming a rounded habit with distinct horizontal layering of the branches and exfoliating bark with age. Creamy, white bracts, resembling flowers, in spring, dark green leaves that change to reddish purple in the fall.
C. 'Satomi'
Pink flowered selection. Very ornate with layered branches.

Golden Glory Dogwood
Cornus mas 'Golden Glory'
Height: 20 - 25'
Spread: 15'
Hardiness: -15
More upright and free flowering than species (Corneliancherry Dogwood). The tree takes on a mounded shape, like an inverted pear. Great show of yellow flowers in spring and later bright red fruit. Foliage is dark green and turns purple in fall. Excellent tree for contrast.

Lavalle Hawthorn
Crataegus x lavallei
Height: 25'
Spread: 20'
Hardiness: -40
A small, dense oval canopy tree with shiny dark green foliage turning to bronzy copper-red in the fall. Usually thornless or with small one-inch thorns. Quite free of rust and very adaptable.

Thicket Hawthorn 'Ohio Pioneer'
Crataegus punctata* var. *inermis
Height: 20 - 30'
Spread: 25 - 35'
Hardiness: -20
Broad-rounded tree, low branching usually becoming wider than tall at maturity. Thornless variety with excellent vigor. Foliage is gray green, contrasted by abundant white flowers in spring and dark red fruits in September and October. Fruits are usually persistent adding interest in winter.

Winterberry Euonymus
Euonymus bungeanus
Height: 20'
Spread: 20'
Hardiness: -20
A small, rounded, or shrubby tree with pendulous branches.

Leaves are light green and flowers are yellow. A beautiful tree in fruit.

European Euonymus
Euonymus europaeus
Height: 15-30'
Spread: 10-20'
Hardiness: -30
A narrowly upright tree in youth broadening as it ages with a rounded outline when mature. Early leaf out with a flat dark green color turning from yellow to reddish purple in fall. Fruits ripen pink to red in September and are quite attractive.

Korean Evodia
Evodia daniellii
Height: 25 - 30'
Spread: 25 - 30'
Hardiness: -20
Interesting small tree with a rounded shape. Lustrous dark green foliage complemented by profuse white flowers borne on stalks in June and July. No major insect or disease problems. Great mix of structure and ornamental display for urban area.

Golden Desert Ash
Fraxinus excelsior 'Aureafolia'
Height: 20'
Spread: 18'
Hardiness: -15
Small, rounded tree with bright yellow twigs and golden stems. Foliage emerges yellow and greens slowly through the spring and early summer turning back to gold in late summer. Beautiful specimen, great contrasting tree and attractive in winter.

Amur Maackia
Maackia amurensis
Height: 25'
Spread: 25'
Hardiness: -25
A small round headed tree. Leaves emerge a silvery gray and gradually become dark green. Fragrant pale white flowers light the tree in July and August. Bark peels with maturity exposing a shiny amber to brown color, becoming curly in texture. Prefers moist, well-drained soil, but is quite adaptable to environmental conditions.

Merril Loebner Magnolia
Magnolia x loebneri 'Merrill'
Height: 30'
Spread: 30'
Hardiness: -30
An upright habit becoming round with age. Leaves are thick and rigid, dark green and turn yellow in fall. Flowering peaks in April, where the tree resembles a white cloud covered with fragrant snowy blossoms. A vigorous grower and cherished landscape tree.

Yulan Magnolia
Magnolia denudata
Height: 35'
Spread: 30'
Hardiness: -30
Tree with spreading branches somewhat irregular, producing an informal outline. Leaves are thick and resilient turning yellow in fall. Flowers are fragrant, white and 4-6 inches wide, blooming in spring.

Elizabeth Magnolia
Magnolia x 'Elizabeth'
Height: 30-40'
Spread: 20'
Hardiness: -30
Compact oval tree, tall for a magnolia. Glossy green tough leaves and yellow flower (unique for magnolias), 6 inches wide and fragrant, bloom in spring before the leaves break.

Galaxy Magnolia
Magnolia x 'Galaxy'
Height: 20 - 25'
Spread: 15'
Hardiness: -20
A tree form magnolia with a strong central leader and pyramidal to oval shape. The foliage is lustrous green and flowers are large, 8 to 10 inches wide, blooming in spring on bare stems, pink outside and white inside. Good selection for a landscape or street where space is limited or confined.

Royal Star Magnolia
Magnolia stellata 'Royal Star'
Height: 20'
Spread: 15'
Hardiness: -30
A hardy, compact, rounded tree with deep green foliage and yellow fall color. The large fragrant flowers bloom in early spring, before the leaves break. An excellent ornamental tree for small sites in urban landscapes.

Flowering Crabapples
***Malus* sp. (Red Flowers)**
Hardiness: -20 (-30)
Malus 'Adams'
Height: 20'
Spread: 20'
Dense and rounded symmetrical habit. Pink flowers, red persistent fruit. American Masterpiece
Malus 'Amazam'
Height: 25'
Spread: 18 - 20'

Pyramidal habit. Bright red leaves emerge and mature to dark maroon. Brilliant red flowers change to unique pumpkin orange fruits in fall that persist through winter.
Klehm's Improved Crabapple
Malus 'Bechtel'
Height: 15 - 20'
Spread: 15 - 20'
Rounded form, dense dark green foliage, turning orange to orange red in fall. Large double pink flowers cover the tree in spring. Improved strain for disease resistance. Seldom fruits, very tidy tree.
Centurion Crabapple
Malus 'Centzam'
Height: 20'
Spread: 15'
Narrow upright habit, spreading slightly with maturity. Purple emerging leaves changing to bronze green. Rose-red flowers ripen to bright red fruits persisting through the winter.
Prairifire Crabapple
Malus 'Prairifire'
Height: 20'
Spread: 20'
Upright spreading habit becoming rounded. Reddish stems with foliage changing from purple to red hued green. Excellent color change from crimson buds to dark pink flowers to deep red fruits which persist through winter.

Flowering Crabapples
***Malus* sp. (White Flowers)**
Hardiness: -20 (-30)
Malus 'Adirondack'
Height: 18'
Spread: 10'
Densely upright inverted cone shape. The cut of this cultivar combined with an overabundant white flower in spring makes this a "standard" to which other flowering crabs are compared. Bright red fruits carry interest through winter.
Harvest Gold Crab
Malus 'Hargozam'
Height: 25'
Spread: 15'
Upright, moderately columnar habit. White flowers in spring are but a precursor to the golden fruits which adorn this tree through winter making it a showstopper in the landscape.
Malus 'Professor Sprenger'
Height: 20'
Spread: 20'
Stark upright habit makes for a larger statelier looking tree than other crabs. Red buds bloom white with pink tones ripening to orange-red fruits and endure on the noble frame through winter.
Malus 'Sentinel'
Height: 20'
Spread: 12'
Vase shaped, an unusual form for a crab makes its mark as an excellent street tree under power lines. Flowers are white with a touch of pink, fragrant, with bright red fruits that carry through the winter.
Malus 'Spring Snow'
Height: 25'
Spread: 20'
Dense and oval shaped, quite large for a flowering crab. Flowers are white and sterile; the tree is without fruit and is an excellent addition to the landscape where dropping fruits would be objectionable.
Sugar Tyme Crabapple
Malus 'Sutyzam'
Height: 18'
Spread: 15'
Upright spreading with a somewhat irregular oval outline. Great informal character, smothered in sweet white flowers in spring. Fruits are wine red and persist through winter.
Golden Raindrops Crabapple
Malus transitoria 'Schmidtleaf'
Height: 20'
Spread: 15'
Hardiness: -20
Upright vase shaped habit. Very unusual cherry, with a delicate appearance, slender branches are draped in uniquely cut glossy green leaves. An abundance of small white flowers ripen to tiny bright yellow fruits which hang like drops of rain from this elegant tree.

Persian Parrotia
Parrotia persica
Height: 20 - 30'
Spread: 15 - 25'
Hardiness: -20
Small single stemmed tree with upright to wide spreading branches, oval outline. Pink to purple emerging leaves blend to glossy green and turn a beautiful succession of yellow to orange to red in fall. An excellent selection for streets and landscapes, given size, color display and remarkable resistance to pests and disease.

Cascade Snow Cherry
***Prunus* 'Berry'**
Height: 25'
Spread: 20'
Hardiness: -20
Upright spreading vase form. Large pure white flowers cover this tree in spring followed by glossy dark green foliage which turns yellowish to bronze-orange in fall. This cultivar has shown an increased resistance to diseases that affect other ornamental cherries.

Prairie Gem Pear
Pyrus ussuriensis 'Mordak'
Height: 25'
Spread: 20'
Hardiness: -30
Densely branched and compact tree with a round canopy. Leaves are bright green, thick and leathery turning golden yellow in fall. White flowers blanket the tree in early spring. Excellent pear for urban plantings.

Ivory Silk Lilac
Syringa reticulata 'Ivory Silk'
Height: 25'
Spread: 15'
Hardiness: -20
Tree form lilac, oval and compact with upward curving branches. Foliage is dark green, flowering when young. Displays large white flower clusters in early July. Excellent choice for beauty and adds variety to urban landscapes.

CLASS II TREES

Italian Alder
Alnus cordata
Height: 30 - 45'
Spread: 25 - 35'
Hardiness: -15
A pyramidal to rounded tree with a rather dense canopy for alders. Leaves are spade shaped and finely toothed, dark green and lighter underneath. Trees are compared in outline to Little Leaf Lindens and Common Pear in appearance. Will tolerate poor soil conditions and does best near water. Little used, but highly recommended for urban landscapes.

Black Alder
Alnus glutinosa
Height: 40 - 50'
Spread: 30 - 35'
Hardiness: -30
Fast growing tree with a broadly pyramidal habit, somewhat irregular. Dark green leaves change to yellow in the fall. These trees thrive near water and perform well in poor soils. Good tree for an alternative to willows and other poplars. The 'Pyramidalis' cultivar has an excellent narrow form and recommended for confined space areas.

European Hornbeam
Carpinus betulus
Height: 25 - 40'
Spread: 25 - 35'
Hardiness: -20
Pyramidal shape, quite dense with dark green leaves. Fall color is usually yellow but during cold winters can turn dark red. Heat and drought resistant.
F. 'Fastigiata', a columnar cultivar, is taller, and in youth spreads 15', but tree will eventually become wide. Branching must begin at 5' or above if planted as a street tree.

Katsuratree
Cercidiphyllum japonicum
Height: 40 - 50'
Spread: 40
Hardiness: -20
In youth pyramidal and maturing to a variety of pyramidal rounding forms. Leaves are heart shaped and emerge red-purple and change gradually to bluish green with great fall colors, yellow to apricot and sometimes crimson. Per-forms better if shaded from afternoon sun.

American Yellowwood
Cladrastis lutea
Height: 30 - 50'
Spread: 40 - 55'
Hardiness: -20
Round tree, often wider than tall. Leaves are bright green, resembling those of English Walnut and turn brilliant to golden yellow in Fall. The bark is smooth and gray much like a Beech. The name derived from the color of the heartwood. Terrific displays of white flowers with a sweet fragrance in May and June.

Turkish Filbert or Hazel
Corylus colurna
Height: 50'
Spread: 30'
Hardiness: -20
Broadly pyramidal, somewhat compact. Dark green foliage with exfoliating bark when mature. Fall color of little significance. Tolerates environmental extremes and conditions exhibiting stress in other trees. No serious pest or disease problems. Stately and formal character, excellent for urban plantings.

Hardy Rubber Tree
Eucommia ulmoides
Height: 45'
Spread: 45'
Hardiness: -20
Tree with a rounded outline and ascending branches. Foliage is spectacular, glossy dark green and pest free. The bark of mature specimens adds to the trees interest. Fall color is minimal. Tolerates a variety of soil conditions. Unique tree species for cold climates.

European Beech
Fagus sylvatica
Height: 40 - 50'
Spread: 15 - 40'
Hardiness: -20
Stately tree, narrowly compact to densely pyramidal to broadly oval, branching close to the ground. Leaf color varies dramatically between cultivars. It is said that the right cultivar of this tree can enhance any landscape. Care should be used with planting lower branching

trees to avoid creating a traffic nuisance.
F. 'Fastigiata' Fastigate Beech
Trees deep green, tight form makes it one of the most striking columnar trees.
F. 'Riversii' Rivers Purple Beech
Broadly oval habit, foliage has striking purple shades, spring through summer.
F. 'Zlatia' Golden Beech
Upright pyramidal habit, young leaves are yellow maturing to golden green.

Maidenhair Tree
Ginkgo Biloba
Height: 40 - 55'
Spread: 15 - 35'
Hardiness: -25
Young trees are irregularly shaped but finish broadly symmetrical. Usually all marketed trees are male due to the offensive smell of the female trees in fruit. The leaves are uniquely lobed and bright green on both sides, changing to bright to golden yellow in fall. Having outlived most of its enemies Ginkgo is a fine specimen for urban planting. (Female trees produce fragrant fruit that some find offensive.)
G. 'Autumn Gold'
Very uniform and balanced pyramidal tree. Spreading at maturity.
G. 'Magyar'
Narrow pyramidal form with a strong central leader. Well-spaced branches.
G. 'Princeton Sentry'
Narrow tapering growth almost columnar. Tallest of the three.

Carolina Silverbell
Halesia Carolina
Height: 30' - 40'
Spread: 20' - 35'
Hardiness: -30
White, hanging, bell-shaped flowers are produced in May and give way to four-winged, brownish, fruit that is persistent through winter. Foliage on this broad, rounded tree will turn yellow in autumn.

Korean Mountain Ash
Sorbus alnifolia
Height: 40-50'
Spread: 30'
Hardiness: -20
Hardiness: -30
Full –Part Sun
Glossy dark green, simple leaves. The tree has an oval to rounded form. Clusters of white flower umbels develop in late spring. Orange/red berries are produced in late summer and fall. Robins and cedar waxwings love the berries when they return in late winter. Bark is gray with white markings. Leaves turn gold to orange in autumn. (Fruit set is not as abundant as the European Mountain Ash.)
S. 'Redbird
produces red fruit and has a more columnar habit.

Tupelo
Nyssa sylvatica
Height: 30 - 40'
Spread: 20 - 35'
Hardiness: -20
Also known as Black Gum, Sour Gum and Pepperidge. In youth the tree is pyramidal but becomes rounded or oval as it ages. Leaves are glossy green and fall color is excellent, turning bright yellow, orange coppery red, or purple. Tolerates poor drainage and some drought. Makes a great park or street tree for residential areas.

American Hophornbeam
Ostrya viginiana
Height: 30 - 45'
Spread: 25'
Hardiness: -30
Rounded oval shape made up of slender branches, sometimes arching up or down. Leaves are bright green turning yellow to brown in fall often persisting adding winter interest along with the hop like fruits. Tolerates dry conditions and free of major disease and insect problems.

Amur Cork Tree
Phellodendron amurense
'His Majesty'
Height: 40'
Spread: 35'
Hardiness: -30
This is a seedless selection of a fast growing broadly vase-shaped tree. It has a good branch-ing habit with interesting cork-like bark. Yellow fall color.

Sawtooth Oak
Quercus acutissima
Height: 40 - 50'
Spread: 50 - 60'
Hardiness: -20
Tree typically develops a widely spreading and dense canopy that is rounded at maturity. May need protection in youth, but once established the trees handle harsh winters well. Emerging leaves are brilliant yellow and fall color is bronze. Deeply ridged and furrowed bark adds winter interest. Lacks pest and disease problems. The only detraction for street tree use is acorn debris. (There will be fruit drop in the fall and could be hazardous under foot.)

Chinkapin Oak
Quercus muehlenbergii
Height: 40 - 50'
Spread: 50 - 60'
Hardiness: -15
In youth the tree is rounded and somewhat irregular, but gains stature and elegance with maturity. The leaves are indented to slightly lobed, lustrous yellow green turning to various shades of yellow to orangish brown in fall. Somewhat difficult to transplant and dislikes alkali soils, but once established it

performs well. (There will be fruit drop in the fall and could be hazardous under foot.)

Sassafras
Sassafras albidum
Height: 30 - 60'
Spread: 25 - 40'
Hardiness: -20
Pyramidal shape in youth changing to an irregular flat top with an oblong outline. Bright green leaves offset yellow, often, red stems which enhance an excellent fall display with shades of yellow and orange to scarlet and purple. The mahogany bark of mature trees and fragrance are additional interests.

American Linden
Tilia americana
Height: 35 - 50'
Spread: 20 - 35'
Hardiness: -40
Tall stately trees, cultivars generally smaller in size especially when used in urban areas. Leaves are generally 4 to 8 inches long and about as wide in a range of green shades. Bark is gray to brown with narrow lateral furrows. The wood is soft and easily pruned but is elastic enough to handle most weather extremes. These trees will entirely block the sun in their shadow so place them appropriately.
T. 'Boulevard'
Dense, narrow pyramidal habit with ascending branches. Yellow in fall.
T. 'Legend'
Rounded pyramidal habit, yellow fall color.
T. 'Lincoln'
Slender, upright and compact form with light green leaves, 25' by 15' in 25 years.
T. 'Redmond'
Full pyramidal form, uniform with large leaves and red branches, winter interest.

Littleleaf Linden
Tilia cordata
Height: 40 - 45'
Spread: 45'
Hardiness: -30
Trees are pyramidal, rounding with maturity. Leaves are generally smaller, 2 to 3 inches long and wide, (except Glenleven) finely serrated and turn yellow in fall. Trunks are usually straight and bark smooth. Likes well drained alkali soils, but pH adaptable and tolerates pol-lution well. Makes an excellent selection for any urban planting.
T. 'Chancellor'
Fastigiate in youth, becoming pyramidal with age. Good branch development.
T. 'Corzam' Corinthian Linden
Narrowly pyramidal, 15' spread. Yellow in fall. Excellent tree for limited space.
T. 'Glenleven' Glenleven Linden
Fast growing with a straight trunk, leaves twice the size of 'Greenspire'
T. 'Greenspire'
Single straight leader, good branch angle. Tolerates difficult conditions.
T. 'Olympic'
Very symmetrical pyramid form, better branch-ing than some other cultivars.

Sterling Silver Linden
Tilia tomentosa 'Sterling'
Height: 45'
Spread: 35'
Hardiness: -20
Upright pyramidal form with a superior branching frame, smooth bark and straight trunk makes it a very appealing tree for all seasons. Furry green leaves, silvery white underside, turn yellow in fall. Shows distinction from Tilia cordata cultivars and is an excellent addition to the Linden family.

Japanese Pagoda Tree
Sophora japonica
Height: 40 - 60'
Spread: 40 - 60'
Hardiness: -20
Broad crown. Creamy-white to yellowish-green large inflorescences blanket the tree anytime from early August to early September, with about a three-week bloom period. Thick green pods mature to yellow-green fruits, with the large beans appearing as knobs within the otherwise thin pods. Very urban tolerant (especially to heat, drought, pollution, compacted soils, and poor soils)

CLASS III TREES

Bitternut Hickory
Carya cordiformis
Height: 50 - 75'
Spread: 35 - 50'
Hardiness: -20
Usually, a slender tree with an irregular oval crown, often widest at the top. The foliage is light green turning yellow to bronze in fall. This hickory is free of most major pest and disease problems and seems to do better than most in restricted sites. Recommended for Park and Boulevard use because of fruit drop and can be hazardous underfoot.

Fagus sylvatica
European Beech
Height: 50' - 60'
Spread: 50'
Hardiness: -30
Broad pyramidal tree with wavy, shiny, dark green leaves. Foliage turns reddish/bronze in fall. Leaves persist through winter. Smooth, gray, wrinkled bark. Tree can grow very wide and branches will often touch the ground.

Kentucky Coffeetree
Gymnocladus dioicus
Height: 50 - 65'
Spread: 40 - 50'
Hardiness: -30
Sharply ascending branches, rising to form a narrow oval crown. The bark is unique, developing on young stems. Spring leaves are late to emerge, their pinks and purples are a nice contrast to greening trees. Seldom bothered by pests or disease, pollution tolerant and strong, upright growth make this an excellent street tree.

Butternut
Juglans cinerea
Height: 40 - 60'
Spread: 30 - 50'
Hardiness: -30
Round topped tree with wide spreading crown of large horizontal branches and stout laterals. Leaves are dark green and woolly, white ridges and gray furrows make up the mature bark. Fruit debris may be a nuisance. Performs well in the rocky, dry and limestone-based soils, a prevalent soil type in Spokane. Usable as Boulevard and Park tree.

Swamp White Oak
Quercus bicolor
Height: 50 - 60'
Spread: 40 - 50'
Hardiness: -25
A broad openly branching tree with rounded crown on a short trunk. Leaves are smoothly lobed, leathery and dark green, changing to orange and yellow brown in fall. Better transplant success than White Oak and does well in wet sites. Useful as a Park or Boulevard tree, acorns can be a nuisance.

Shingle Oak
Quercus imbricaria
Height: 50'
Spread: 40'
Hardiness: -20
Pyramidal form when young, maturing to a rounded habit. Leaves lacking lobes, wavy, bright glossy green changing from yellowish to rusty red in fall. Tolerates dry conditions and has small acorns making it an excellent tree for streets and other urban sites.

Chestnut Oak
Quercus prinus
Height: 50 - 60'
Spread: 50 - 60'
Hardiness: -20
Rounded and dense irregular spreading canopy. Leaves are bluntly and shallowly toothed, dark yellow green turning orange yellow to yellow-brown in fall. Performs well in dry, rocky and lime-based soils, a prevalent soil type in Spokane. Great informal character, good for Parks and Boulevards where acorn debris can be managed.

English Oak
Quercus robur
Height: 50'
Spread: 40'
Hardiness: -20
Short and stout tree with a large, rounded crown of open thick branches, somewhat irregular. Leaves are variably lobed, dark green upper and pale green lower surfaces. Adapts to soils and climate types well. Acorn debris may create a walking hazard.
Q. 'Fastigiata' Skyrocket Oak
Narrow oval form, uniform and stately, excellent for confined sites.
Q. 'Michround'
The Westminster Globe Oak is very uniform and symmetrical tree.

Red Oak
Quercus rubra
Height: 50 - 60'
Spread: 45 - 50'
Hardiness: -30
Broad headed tree with a rounded crown. Leaves are sharply toothed dark green and turning brilliant to deep red in fall. Rapidly growing and readily transplanted giving it advantages over other Oaks for use in urban landscapes. Acorn debris may create a walking hazard.

Shumard Oak
Quercus shumardii
Height: 40 - 60'
Spread: 40 - 60'
Hardiness: -15
Pyramidal form, becoming upright spreading and broadly oval. Sharply cut dark green foliage with reliable red fall color. Adapts to soil conditions and is drought tolerant. One of the better transplanting oaks. Acorn debris may create a walking hazard.

Japanese Zelkova
Zelkova serrata
Height: 40 - 60'
Spread: 30 - 50'
Hardiness: -20
Vase habit rounding with maturity. Leaves toothed like elm (same family), usually dark green with a choice of fall color, depending on the cultivar. Bark color and texture is of interest from youth to maturity. All cultivars are resistant to Dutch Elm Disease. Beetle damage also appears to be less problematic. Handsome

trees, excellent for urban landscapes and streets.
Z. 'Green Vase'
Fast growing, graceful vase form, dapple shade tree. Orange in fall.
Z. 'Halka'
Widening vase, with large feathery branches. Yellow in fall.
Z. 'Village Green'
Broad vase to rounded form, very vigorous. Rust red in fall.

Pioneer Elm
Ulmus x 'Pioneer'
Height: 50'
Spread: 50'
A Dutch Elm resistant cultivar that vigorously forms a rounded, spreading crown. The dark green foliage turns to yellow in autumn.

CLASS IV TREES

Shagbark Hickory
Carya ovata
Height: 100'-125'
Spread: 25'
Hardiness: -20
On mature trees the gray bark separates into interesting, wide plates that curve outward from the trunk giving it a shaggy appearance. The tree adapts well to dry or wet soil but prefers well-drained sites. The fruit is edible and gathered in the fall. It is a long-lived tree. Fruit debris may create a walking hazard.

Tulip Tree
Liriodendron tulipifera
Height: 70 - 90'
Spread: 35 - 50'
Hardiness: -20
Tree develops quickly with a tall straight trunk; several large sinuous branches develop a narrow oval frame. The leaves actually appear tulip like medium green changing to yellow and golden in autumn.

Cucumbertree Magnolia
Magnolia acuminata
Height: 50 - 80'
Spread: 40 - 80'
Hardiness: -25
Pyramidal growth habit when young aging to a broad-rounded outline with massive spreading branches often arching towards the ground. Foliage is dark green, flowers are smaller than some magnolias, but in abundance. Makes a great tree for parks, golf courses and other open areas, where it can have room to spread.

Black Walnut
Juglans nigra
Height: 50 - 75' (100')
Spread: 50 - 75'
Hardiness: -20
Develops a rounded well-formed crown that is devoid of branches a third to two thirds the way up the tree. It will become wide spreading. Leaves are finer than Bitternut and less furry. Bark is brown to grayish black and roughly diamond shaped. May inhibit the growth of other plants near the site. Tolerates dry conditions and can be used for streets where ground clearance is needed, but performs best when used for Parks and Boulevards, due to dropping fruit.

Dawn Redwood
Metasequoia glyptostroboides
Height: 60 - 100'
Spread: 25 - 40'
Hardiness: -20
Deciduous conifer, with a tall pyramidal or conical form. Large basal spread. Bright green foliage renewed every year. Grows rapidly and tolerate wet sites if drainage is not restricted. In winter the skeletal frame of larger trees is starkly majestic. Definitely a tree for large areas so select sites appropriately.

Bloodgood London Planetree
***Platanus x acerifolia* 'Bloodgood'**
Height: 50 - 80'
Spread: 40 - 60'
Hardiness: -15
Broadly pyramidal, rounding with thick spreading branches at maturity. Large basal spread. Large maple like leaves turn yellow in fall. Bark is peeling creating a brown/cream mottling with year-round interest. Better resistance to anthracnose disease than other sycamores but still can be a problem if trees are overused.

White Oak
Quercus alba
Height: 60 - 80'
Spread: 50 - 70'
Hardiness: -30
Juvenile shape is pyramidal maturing with a broad, wide spreading and majestic crown. Leaves are bluntly lobed, dark green to blue green. Autumn color varies from brown to red. A challenge to transplant and establish, but worth the effort. The tree is best when used in Parks and Boulevards, due to dropping fruit.

Bur Oak
Quercus macrocarpa
Height: 55 - 80'
Spread: 50 - 70'
Hardiness: -40
Weakly pyramidal or oval to start, developing into a large broad, rounded wide spreading tree with a massive trunk. Foliage is partially lobed, dark green above and grayish below, turning yellow brown to purplish in fall. Corky bark on smaller branches adds interest. Adapts to a wide range of soil types, drought and pollution tolerant, makes an excellent tree for urban areas where acorn debris can be managed.

Accolade Elm
***Ulmus japonica x wilsoniana* 'Morton'**
Height: 70'
Spread: 60'
Hardiness: -30
A graceful, vase shaped tree with arching branches. It is resistant to the elm leaf beetle and so is a great substitute for the American Elm. Foliage turns to yellow in the fall.

Appendix D – Tree Sidewalk Conflict Resolution Options

There are several other options to address tree sidewalk conflicts in addition to those mentioned in the body of the management plan. These are discussed and illustrated below.

Pop-outs or bulbs are like curving sidewalks. Space can be increased for newly planted or existing trees by removing a section of curb and extending the planting space into the street. Sidewalk cutouts or "borrowing" space from the adjacent sidewalk creates sidewalk cutouts. This alternative minimizes the sidewalk width for a limited distance adjacent to the tree. The cutout provides a larger grow space for trees and reduces the size of the pruned roots and their proximity to the root flare. Borrowing has limitations, as the room for tree expansion before infringing on the free passage of pedestrians is minimal. Furthermore, the ADA imposes strict regulations as to the amount of free space provided.

The sidewalk cutout option can be used in some scenarios on downtown streets. The trees are shown before mulch was applied.

Sidewalk ramping allows existing roots to remain intact by re-pouring concrete over the roots to create a gradually sloped ramp. It is used when removal of roots would compromise the stability of a high-quality tree. Damaged sidewalk slabs are removed, and 4-6 inches of topsoil is placed on top of the existing grade. A sand or foam backer is placed adjacent or around the subject roots. A new sidewalk is then installed on top of this new base material. This option enables the sidewalk to be replaced in its original position. Sidewalk ramping does not prevent future damage but can delay it by five years or more.

Concrete slabs of nonstandard size or shape can increase the space available for established trees. This technique serves as a design alternative to the curving sidewalk but produces a similar result.

Sidewalk ramping raises the sidewalk over the root system.

Infrastructure-based strategies can also include the use of certain materials that provide a larger, uncompacted soil volume, such as pervious concrete, asphalt, decomposed basalt, stone dust, pavers, or rubber sidewalks, instead of concrete.

Flexible paving comes in many forms, which include:

- Interlocking pavers
- Common brick and pavers
- Rubber bricks

Flexible paving is used in conjunction with root pruning when retaining original grade is required and when the level of the paving surface is ramped above or lowered below existing grade. The selected flexible paving material is installed over a compacted sand base. Cities have utilized rubberized, reusable brick in different dimensions that is bonded together with specialized glue. Some of the newer rubberized pavers do not require glue to bind them, but instead use specially designed dowels, which hold the pavers together. Although the use of flexible paving does not prevent future damage, it does provide more time between repairs making repairs easier and less costly. These materials may be used as alternative cover treatments when removing tree grates.

Rubber sidewalk installation.

Concrete modifications usually involve expansion joint materials such as dowels, rebar and sleeves, and articulating sidewalk joints. Sidewalk grinding can be employed as temporary measure that restores the offset or heaved portion of a sidewalk to original grade.

Root-based Strategies to Reduce Infrastructure Damage

Root-zone based strategies often use root guidance systems or soil replacement, modification, and management techniques. They include continuous trenches, engineered or structural soils, root channels or paths, steel plates, Silva cells, and root barriers.

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Root pruning may be considered an option, but it is a serious wound to the tree and may affect the stability of the tree. Age, tree condition, species, root size and location, and proximity to the trunk should be considered before using root pruning as a treatment.

Root pruning should be limited or not used.

There are limitations and constraints associated with each strategy. Typically, the solution to avoiding infrastructure conflicts in downtown areas involves a combination of techniques. Trees, in light of our ecological problems, are now being recognized as significant solutions to some of our urban problems. Trees are a necessary component of urban corridors, not just street side ornaments. Too often trees are not integrated into the infrastructure design up front. Consequently, a large amount of money is spent on mitigating root-hardscape conflicts.

Silva cells utilize a modular framework of interlocking cells. An underground planter is constructed which is backfilled with a large volume of high quality, uncompacted soil. The cells meet load bearing standards and can also help manage storm water on site.

Several new practices are being used in conjunction with the extensive construction and renovation occurring in the downtown (E.g. Silva cells, large raised planters, and moveable planters for trees in places they can't be planted). Tree grates are beginning to be removed, trees in pits are being raised to grade level, mulch installation, and planting a greater variety of species is happening in the downtown currently. In each of these scenarios it is critical to start with quality nursery stock and plant the tree correctly. Without these first steps an accurate assessment of these practices cannot be made. It is important to assess each of these tree planting treatments under conditions that have followed the best management practices of the arboriculture industry consistently. It provides College Place information about which treatments or combination of treatments succeeds in the downtown corridor.

GLOSSARY

Acceptable risk: degree of risk that is within the tolerance or threshold of the owner, manager, or controlling authority.

Advanced assessment: an assessment performed to provide detailed information about specific tree parts, defects, targets, or site conditions. Specialized equipment, data collection and analysis, and/or expertise are usually required.

Aerial inspection: inspection of parts of a tree not visible from the ground, including the trunk, stems and branches: aerial inspections may include evaluation of internal decay.

ANSI A300 standards: in the United States, industry-developed, national consensus standards of practice for tree care.

ANSI Z133.1 standards: in the United States, industry-developed, national consensus safety standards of practice for tree care.

Arborist: professional who possesses the technical competence gained through experience and related training to provide for or supervise the management of tree and other woody plants in residential, commercial, and public landscapes.

Best management practices (BMP): best available, industry-recognized courses of action, in consideration of the benefits and limitations, based on scientific research and current knowledge.

Boundary tree: a tree with the property line going through any part of the trunk.

Border tree: a tree located near a property line but has roots, branches, and leaves that extend over the property line.

Branch architecture: the normal structure of the scaffolding branches of a particular tree species compared to the tree you are assessing of the same species.

Canopy: refers to the upper layer or habitat zone, formed by mature tree crowns and including other biological organisms (epiphytes, lianas, arboreal animals, etc.).

Cavity: open or closed hollow within a tree stem, usually associated with decay.

Certified Tree Risk Assessor: An ISA Certified Arborist who has completed the Pacific Northwest (PNW) tree risk assessment course and/or ISA Tree Risk Assessment Qualification course.

Codominant stems: forked trunks, branches, or stems nearly the same in diameter, arising from a common junction and lacking a branch bark ridge.

Crown: Leaves and branches of a tree measured form the lowest branch on the trunk to the top of the tree.

DBH: diameter breast height measured on trunk (4.5 feet above soil surface)

Decay: process of degradation by micro-organisms.

Defect: an imperfection, weakness, or lack of something necessary. In trees, defects are injuries, growth patterns, decay, or other conditions that reduce the tree's structural strength.

Excellent condition: No apparent problems or maintenance required.

Exposed roots: roots growing on the surface, usually a species characteristic of compacted soil. Care not to damage exposed roots should be taken.

Fair condition: Trees in fair condition have well defined issues (dead branches; co-dominant stems) that warrant some corrective pruning or maintenance within the next pruning cycle.

Failure (tree failure): breakage of stem, branch, roots, or loss of mechanical support in the root system.

Failure potential: in tree risk assessment, the professional assessment of the likelihood for a tree to fail within a defined period of time.

Girdling roots: root that encircles all or part of the trunk of a tree, or other roots, that constricts the vascular tissue and inhibits secondary growth and the movement of water and photosynthesis.

Good condition: Trees in good condition have minor issues or defects that do not require immediate attention and maintenance could occur later in the city pruning cycle.

Harm: personal injury or death, property damage, or disruption of activities.

Hazard: situation or condition that has exceeded an acceptable threshold of risk and is likely to lead to a loss, personal injury, property damage, or disruption of activities; a likely source of harm. In relation to trees, a *hazard* is the tree part(s) identified as a likely source of harm.

Hazard tree (*synonym* hazardous tree): a tree identified as a likely source of harm.

High risk tree: The tree or part of it has reached a stage where it could fail at any time.

Impact *(verb)*: striking a target causing a disruption that affects activities.

Included bark: bark that becomes embedded in a crotch (union) between branch and trunk or between codominant stems. Causes a weak structure.

Inspection frequency: the number of inspections per given unit of time (for example, once every three years).

Inspection interval: time between inspections.

Owner/manager: the person or entity responsible for tree management, or the controlling authority that regulates tree management.

Poor condition: Trees in poor condition have irreversible problems.

Qualitative risk assessment: a process using ratings of consequences and likelihood to determine risk significance levels (that is, “extreme”, “high”, “medium”, or “low”) and to evaluate the level of risk against qualitative criteria.

Quantitative risk assessment: a process to estimate numerical probability values for consequences and to calculate numeric values for risk.

Residual risk: risk remaining after mitigation.

Risk: the combination of the likelihood of an event and the severity of the potential consequences. In the context of trees, risk is the likelihood of a conflict or tree failure occurring and affecting a target, and the severity of the associated consequences-personal injury, property damage, or disruption of activities.

Risk aggregation: the consideration of risks in combination.

Risk analysis: the systematic use of information to identify sources and to estimate the risk.

Risk evaluation: the process of risk identification, analysis, and evaluation.

Risk management: the application of policies, procedures, and practices used to identify, evaluate, mitigate, monitor, and communicate tree risk.

Risk matrix: a tool for ranking and displaying risks by assigning ratings for consequences and likelihood.

Shall: A word that designates a mandatory requirement within the ANSI standards or contract documents. Compare to should.

Should: word that designates an advisory recommendation in the ANSI standards or contract documents; compare to shall.

Standard of care: degree of care that a reasonable person should exercise in performing duty of care; a measurement used to assess whether an individual acted in a reasonable manner.

Stocking level: A proportion of existing street trees to the total number of potential street trees (number of trees plus the number of available planting spaces).

Structural defect: feature, condition, any naturally occurring or secondary conditions such as cavities, poor branch attachments, cracks, decayed wood or deformity of a tree that indicates a weak structure or instability that could contribute to tree failure.

Taper: change in diameter over the length of trunks, branches or roots.

Target (risk target): people, property, or activities that could be injured, damaged, or disrupted by a tree.

Target zone: The area where a tree or tree part is likely to land if it were to fail.
Tree risk assessment: systematic process used to identify, analyze and evaluate tree risk.

Tree risk management: the application of policies, procedures, and practices used to identify, evaluate, mitigate, monitor, and communicate tree risk.

Unacceptable risk: a degree of risk that exceeds the tolerance of the owner, manager, or controlling authority.

Urban forest: management of naturally occurring and planted trees in urban areas.

Visual tree assessment (VTA): method of assessing the structural integrity of trees using external symptoms of mechanical stress (such as bulges, reactive growth, etc.) and defects (cracks, cavities, etc.).

Wood decay: the process of wood degradation by micro-organisms.

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