RESOLUTION NO. 1450

A RESOLUTION OF THE CITY OF DAYTON, WASHINGTON, ADOPTING THE URBAN FORESTRY MANAGEMENT PLAN BY COMMUNITY FORESTRY CONSULTANTS FOR MANAGEMENT OF THE MAIN STREET TREES

WHEREAS, the City of Dayton (City) owns and maintains 30 trees along Main Street; and,

WHEREAS, the Main Street trees are planted within the developed right-of-way, adjacent to the City sidewalk; and,

WHEREAS, City staff observed ongoing and progressive disrepair to sidewalk panels in the vicinity of the Main Street trees; and,

WHEREAS, the City applied for and received grant funding from the Washington State Department of Natural Resources (DNR) to develop an Urban Forestry Management Plan (UFMP) to inventory the trees and study the cause of sidewalk disrepair; and,

WHEREAS, the City utilized the grant monies to hire an experienced and trained consultant to inventory and study the trees, to evaluate the cause of damage to the sidewalk, and to develop a UFMP; and,

WHEREAS, pursuant to a contract with the City, Community Forestry Consultants (Consultant) inventoried 30 trees and three tree plantings sites and examined the root structure of two trees where adjacent sidewalk panels were showing signs of severe damage; and,

WHEREAS, the Consultant determined that damage to the City's sidewalk was causally unrelated to the root systems of the trees, that the Main Street trees were quite healthy, and that the species of tree is suitable for urban forest practices; and,

WHEREAS, the Consultant conducted an open house on February 24, 2020 to share the results of the study with the City Council, staff, and the public at large; and,

WHEREAS, COVID restrictions limited the opportunity to conduct a secondary open house, but the City utilized the website and USPS to encourage additional public engagement; and,

WHEREAS, the additional comments and feedback received were incorporated into the final draft plan; and,

WHEREAS, the adoption and implementation of the UFMP will assist the City in achieving the goals as outlined in the City Comprehensive Plan and allow for

appropriate and necessary infrastructure improvements to increase pedestrian safety within the commercial core of the City and within a timely manner.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF DAYTON, WASHINGTON, DOES HEREBY RESOLVE AS FOLLOWS:

<u>SECTION 1:</u> The City Council hereby adopts the UFMP by reference as included herein as Exhibit A.

SECTION 2: This resolution shall take effect immediately upon adoption.

PASSED by the City Council of the City of Dayton, Washington on this 16th day of December, 2020.

City of Dayton

ac Weatherford, Mayor

Attested/Authenticated by:

Trina Cole, City Administrator

Approved as to form:

Quinn Plant, City Attorney









URBAN FOREST MANAGEMENT PLAN (UFMP) MAIN STREET LONDON PLANE TREES

FOR

City of Dayton 111 S 1st Street Dayton, WA 99328

PREPARED BY:



Planning and Managing Urban Greenspace

2020 E. 36TH AVENUE SPOKANE, WA 99203 509-954-6454 E-mail: cfconsults@comcast.net

APRIL 27, 2020

COMMUNITY FORESTRY CONSULTANTS, INC. APRIL 27, 2020

ACKNOWLEDGMENTS



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COMMUNITY FORESTRY CONSULTANTS, INC. APRIL 27, 2020

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EXECUTIVE SUMMARY

An urban forest includes street and park trees and those planted in medians, parking lots, tree pits, and other urban spaces. An urban forest management plan (UFMP) 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. An ecosystem approach to urban forest management can help Dayton maintain its character and provide environmental, social, and economic benefits.

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 21st century approach to urban trees, providing decision makers with the principles and references they need to fully realize this potential.

Dayton has completed an inventory assessment of its Main street trees. The inventory will facilitate the ongoing commitment to maintain, enhance, and preserve Dayton's tree canopy and guide Dayton staff, landowners, contractors, utility companies, developers, planners, and residents in making decisions about their trees.

Dayton's Main Street tree inventory, root system investigations, and management plan were initiated to facilitate the city's ongoing commitment to maintain, enhance, and preserve the community tree canopy. Project funds were provided from a grant obtained from the USDA Forest Service administered by Washington State Department of Natural Resources Urban and Community Forestry Program (WADNR). Staff support was provided by the City of Dayton Departments of Administrative and Community Services and Public Works.

Three primary methods of community outreach were used:

- > Interviews and group discussions with key stakeholders
- City staff interviews
- Public forum information meetings

Public Process

A crucial element of developing the UFMP was soliciting information from city staff, key stakeholders, and citizens of Dayton. 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. A public meeting was held on February 24, 2020.

CoVid virus restrictions forced cancellation of the second public meeting. In lieu of the second public meeting a copy of the draft plan was posted to the City's website for review; a letter was sent to all property owners along Main Street asking them to review and provide feedback on the draft plan no later than April 16, 2020; and a legal notice was posted in editions of the local papers requesting review and public comment of the plan, also to be provided not later than April 16, 2020. All comments were forwarded to CFC for inclusion in the plan. Public comments received are in Appendix D. COMMUNITY FORESTRY CONSULTANTS, INC. URBAN FORESTRY MANAGEMENT PLAN APRIL 27, 2020

Purpose of the UFMP

The starting point for success understands where you are and where you want to go. The UFMP principles will help Dayton staff integrate the goals and objectives of the City of Dayton while managing the specific needs of the Main Street trees. Managing, maintaining, and preserving urban trees can only be achieved effectively by developing and implementing a strategic urban forest management plan. 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 Dayton's Main Street 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. Dayton's UFMP is a strategy to enhance its tree care program to meet a range of policy, community, 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-sidewalk infrastructure conflicts and remediation, and the condition of the Main Street trees.

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, adjoining business owners, 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 City of Dayton 2019 Comprehensive Plan; Cooperative Parks Master Plan; Transportation Improvement Plan; Water System Plan; and agreements with other government agencies.

Dayton Tree Inventory Summary

Community Forestry Consultants, Inc. (CFC) inventoried 28 London plane trees, one cherry plum, one flowering pear, and three planting sites on East and West Main Street from North 4th Street to North Cottonwood Street as a basis for data results, maintenance requirements, and tree/sidewalk mitigation actions. Two trees were selected for examination of the root systems. Sidewalk panel sections were removed, and soil excavations were conducted on trees located at 427 E Main Street and 103 W Main Street (Figure 1) on February 24th, 2020.



Figure 1 – Sidewalk panel removal at 103 W Main Street. Note no roots present. Data results

- Trees inventoried: 30
- > Appraised value of trees inventoried: \$244,000.00
- Trees requiring pruning maintenance: 0
- Trees requiring removal: 2
- Available street tree planting sites: 3



Figure 2 – Tree grate embedded in trunk. All tree grates and grate frames should be removed. Grates embedded in the trunk may remain since removal would cause more damage to the tree.

Major Issues

- Tree grates embedded in trunk bases (Figure 2)
- Lifted sidewalks
- Limited open soil volume around trees

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Goals of the UFMP

The management plan supports the mission of improving Dayton's Main Street tree population through proper management of a city asset. The UFMP follows the vision to retain a high quality of life by improving Dayton's Main Street trees growing environment and thereby increasing the numerous, proven benefits derived from these trees.

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

- > attain Tree City USA status (See Appendix B)
- > community members, organizations, and volunteers to encourage stewardship
- preserve and protect existing trees
- > promote public safety, tree health, and structure
- implement cost-effective and proper arboriculture maintenance of the community trees
- increase public education and awareness of the value of community trees
- maximize the social, economic, and environmental benefits of the Main Street trees and other community trees 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 retain Main Street trees while minimizing infrastructure conflicts. It provides for the development of a progressive management and mitigation of tree/sidewalk conflicts that will result in a healthier and safer forest in Dayton. 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 Dayton through enhancements to the tree population.

Dayton Urban Forestry Management Plan goals:

- > Attain Tree USA status (See Appendix B).
- Dayton City Council adopts and implements an Urban Forestry Management Plan.
- Provide adequate tree maintenance funding to sustain Dayton tree canopy based on council, stakeholder, business owner, 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 Dayton 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 three to five years. A systematic tree/sidewalk maintenance program, adequate funding, staffing, regulations, and resources today will allow Dayton's urban Main Street trees 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 Dayton's Main Street trees 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 Dayton tree care
- Engage International Society of Arboriculture (ISA) certified arborists to perform tree maintenance
- > Maintain tree inventory data
- Proactive tree maintenance of Dayton trees
- Implement a cyclic pruning program for young and mature trees
- Proper tree planting
- Mitigate tree/sidewalk conflicts
- Proper tree maintenance
- Canopy preservation

The recommendations and actions will expand and conserve Dayton'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 Dayton today and tomorrow.

INTRODUCTION

In 2019 the City of Dayton received a grant from Washington Department of Natural Resources Urban and Community Forestry program (WADNR) to inventory the London plane trees along Main Street, expose and investigate the root systems of one to three trees, and develop and generate an urban forestry management plan for the London plane trees along Main Street. The City of Dayton 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 Dayton is responsible for the maintenance of trees at all publicly owned sites (Figure 3).



Figure 3 – Aerial photo of Dayton trees inventoried along Main Street. Green and dots represent trees. Yellow dots indicate potential new tree planting sites.

City Plan and Policy Coordination

There are existing plans and policies in the City of Dayton that affect and are affected by the tree population. The Dayton UFMP will act as a stand-alone management tool for the city but should function within the context of other city plans and policies impacting trees. Trees can provide solutions and fulfillment of goals stated 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 town plans include but are not limited to:

> 2019 Comprehensive Plan

- > 2019 2024 Transportation Improvement Plan
- > 2018 Cooperative Parks Master Plan
- > 2015 Water System Plan

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 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 Dayton (Figure 4).



Figure 4 – Trees provide many benefits for Dayton 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 Dayton. 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 5).

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Vegetation and Violence. A scientific study by the University of Illinois at Urbana-Champaign has demonstrated that contact with nature may 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's 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 the community. It is critical to avoid nutrient loading and other forms of water contamination to the Touchet River and Patit Creek drainage and the city well system. Trees are a solution. 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 Dayton stormwater management and aid in solving their water quality issues in the surface water drainage basins. 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 Dayton's Water System Plan management program.

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. 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).

The Economics of Aesthetics. The Dayton area has a limited economic base with agriculture and tourism being the largest contributors to the local economy, followed closely by county administrative services. It is important to the community and fiscal revenues to remain competitive and attractive to businesses and customers, residents, and tourists. Recent population changes in Dayton 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 Dayton 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 directly 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.

COMMUNITY FORESTRY CONSULTANTS, INC. APRIL 27, 2020 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 Dayton 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 Dayton 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 Dayton urban forest will yield increased environmental, economic and social benefits. This plan specifies several actions the City of Dayton can take to maximize these benefits and engender community involvement and activism.

URBAN FOREST MANAGEMENT PLANNING

The pressures created by urban development 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 in order 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 Dayton. 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). In many cities and towns, 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 Dayton. 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 managing infrastructure conflicts properly.

Fortunately for Dayton 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 and towns, 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.

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The recommended goals are for Dayton to follow. It is up to Dayton to provide the short and long-term support required to implement it. The goal is to provide specific guidance on managing, maintaining, and preserving the Main Street trees within the urban 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 mitigate the tree/sidewalk conflicts associated with the Main Street trees while retaining the health, quality, and benefits they provide to Dayton.

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 cover that can provide a sustained supply of environmental, economic and social benefit to society. 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 five-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 of a tree ordinance are:

- > One of four standards for Tree City USA status (Appendix B).
- Helps establish the tree management program.
- > Provides reference to permanent procedures and legal authority.
- Legalizes a tree program through authorization of a tree board/commission.
- 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 well 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 COMMUNITY FORESTRY CONSULTANTS, INC. URBAN FORESTRY MANAGEMENT PLAN APRIL 27, 2020 CITY OF DAYTON, WASHINGTON

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.

The City of Dayton does not have a tree ordinance. 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 developing 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 this page in Table one. Table two on page 22 shows the common elements in selected ordinances from other cities in the Northwest United States.

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 \geq 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.

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

Table 2 -COMMON ELEMENTS PRESENT IN SELECTED NORTHWEST CITY ORDINANCES

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 Dayton.

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 Dayton'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.

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,



Figure 6 - Inventory data collection

pruning, planting and other maintenance requirements. An inventory is a record of objective and quantifiable information about the condition and value of Dayton's tree resources that can be used to document estimates for funding, personnel and equipment (Figure 6). Using and regularly updating the tree inventory moves the urban forestry program into proactive management.

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URBAN FORESTRY MANAGEMENT PLAN CITY OF DAYTON, WASHINGTON A park and street tree inventory provide 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 Dayton's trees and planting spaces is a prerequisite for making sound decisions. Decisions may be based on tradition or poor judgement without an inventory 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, Dayton staff can better plan and prioritize tree removals, maintenance work, and plantings and coordinate with the Town of Dayton's urban forestry program with other city departments. They can also determine the value of Dayton trees, which can help emphasize the importance of maintaining an asset. An inventory can be used to monitor tree conditions to quickly and accurately answer management questions, 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 to complete inventory of the tree population.
- 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 Dayton's tree 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 by the City of Dayton.

Maintaining the tree inventory and using an ArcGIS-based tree management software to manage trees 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.

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Framework for the 5-year Strategic Management Plan (2020 – 2025)

The plan is intended primarily to provide guidance for Dayton staff, residents, business owners, and elected officials 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.

Community 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; acquiring community input; root investigations; 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 Dayton staff, Dayton administrators, city council, and other concerned 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 city staff and residents 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.

Main Street London Plane 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 (Figure 7). 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.



Figure 7 – Trees and other infrastructure compete for space along streets, particularly in downtown areas.



Figure 8 – Tree grates and grate framework eventually girdle the trunk and create trip and fall hazards along Main Street.

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. The sidewalk cutouts are enclosed with iron grates to create a contiguous surface for pedestrian travel. The iron grates usually girdle the trunk

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URBAN FORESTRY MANAGEMENT PLAN CITY OF DAYTON, WASHINGTON as the tree grows (Figure 8), 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's 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.

The trees may lift adjacent sidewalks which lead to risk issues for the town. 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. Most concrete cracks are due to the expansion and contraction of the concrete and soil caused by temperature changes. The sidewalk grinding in Figure 9 did not occur in conjunction with any tree. The nearest London plane tree is 35 feet from the lift, yet the sidewalk lifted (Figure 9).



Figure 9 – Sidewalk grinding near 440 E Main street. No trees are associated with the sidewalk lifting.

Coarse gravel applied under pavement during construction has been shown to reduce root growth immediately below the pavement on well-drained sites (Kopinga 1994; Gilman 2006). This is the result of the large pores in gravel, which, when installed in a well-drained site, do not retain water and nutrients needed for root growth. COMMUNITY FORESTRY CONSULTANTS, INC. APRIL 27, 2020 URBAN FORESTRY MANAGEMENT PLAN CITY OF DAYTON, WASHINGTON Sidewalk construction and soil heaving (Figure 10) are the primary causes of sidewalk lifting along Main Street in Dayton. Excavation of two root systems of London plane trees located at located at 427 E Main Street and 103 W Main Street found no roots beneath the sidewalk panels (Figure 11). Missing beneath the sidewalk panels was a base layer of coarse gravel.



Figure 10 – Sidewalk excavation at 427 E Main Street. Soil heaving is lifting the sidewalk (between red lines). No roots were found under the sidewalk.



Figure 11 – Sidewalk panels removed at 427 E Main. No roots were found under the sidewalk. No gravel base layer was present under the sidewalk.

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 which decreases benefits provided by trees.

The Dayton downtown business corridor is under constant competition for space. Many infrastructure items must share the same space and co-exist. 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 Dayton. As might be expected in the downtown, several organizations, property owners, and tenants are stakeholders in the management of trees. All the trees along Main Street referenced in this report 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.



Figure 12 – Limited growing space for trees restricts access to water and nutrients. Tree grates girdle trunks and create trip hazards.

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:

Limited Planting Space. This is one of the greatest challenges to maintaining a healthy urban forest in the downtown district. Small tree wells are the norm in

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URBAN FORESTRY MANAGEMENT PLAN CITY OF DAYTON, WASHINGTON downtown Dayton (Figure 12). These are typically sidewalk on all sides; four feet square and leave little space for root expansion necessary for vigorous tree growth.

- Availability of Irrigation. There are trees planted in the downtown without an automatic irrigation system. They do not have automated irrigation, so rely on adjacent property owners for water, natural rainfall, or use of expensive water trucks. 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 pruned improperly 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 Grate Framework. 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. 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 eliminated.

Often downtown business districts are selected as high priority areas to increase the aesthetics and attractiveness of the city. 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 Dayton 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 Dayton's downtown business district 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. Tree canopies should be open, and the branching

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URBAN FORESTRY MANAGEMENT PLAN CITY OF DAYTON, WASHINGTON habit must be high enough to allow pedestrians to walk comfortably beneath the trees. Other options are tall, narrow growing (fastigiate) species. These trees can provide beauty, a look of uniformity, and a formal appearance to the shopping district.

Main Street and the sidewalks constitute a large percentage of the Dayton'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 Dayton 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, eliminating parking slots near trees, and increasing soil volume near trees which can be planted with ornamentals or mulched. These techniques can also help to achieve traffic calming goals and a better balance between vehicles, pedestrians and bicycles.

Objectives of Main Street tree management for the downtown business district:

- > To preserve existing trees 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.
- Reduce infrastructure conflicts.

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 very 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. The point is many factors influence species choice for downtown sites.

Wong et. al. (1988) surveyed more than 2200 out of 17000 trees in the City of Manchester and ranked the species in terms of both damage to curbs and to pavements. The researchers found *Platanus sp.* (London plane) caused no damage (77%) or minor damage (17%) to sidewalks in the trees surveyed. The researchers found *Platanus sp.* caused no damage (94%) or minor damage (5%) to curbs.

Objectives of Main Street tree species management:

London plane tree root architecture systems are a good choice for tree-based strategies to reduce infrastructure damage. The London plane trees along Main Street should be retained and maintained to enhance their health, vigor and structure.

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. 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. 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 much longer. Long tree openings provide the greatest amount of open soil with the least intrusion into walking spaces. When designing or adjusting existing space around a tree ask what the minimum size of the paving would be instead of the minimum size of the tree opening (Figure 13).



Figure 13 – New sidewalk placement maximizes distance between trees and infrastructure. New sidewalk width is five 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 a surface-rooting characteristic, additional space beyond that needed for trunk diameter at ground level will be required.

Relocating sidewalks away from the tree increases the distance between the tree and the sidewalk and the damage potential decreases. Sidewalk reduction—realigning the sidewalk's direction of travel—enables the community to provide more growing space for trees in an aesthetically appealing way (Figure 14). The amount of growing space created can be substantial and, therefore, pavement reduction 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.



Figure 14 – Additional growing space around the tree benefits the tree, reduces incidences of sidewalk conflicts, and allows for ornamental plants or application of mulch materials to improve Main Street aesthetics.

There several remedies for solving tree sidewalk conflicts. These are discussed in detail in Appendix C.
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 (9th Edition, Guide to Plant Appraisal). Dayton trees represent a considerable economic, social, recreational, and environmental asset to the community. **The 30 trees inventoried have an appraised value of \$244,000.00 (Figure 15).**



Total Appraised Value: \$244,000.00

Figure 15 – The appraised value of inventoried trees was determined using processes from the Council of Tree & Landscape Appraisers Guide for Plant Appraisal, 9th Edition.

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

Tree Maintenance and Care

Dayton staff makes decisions on tree maintenance and mitigation options and schedules the work. With populations of trees and limited funds, such as in Dayton, scheduling becomes more important and requires prioritization. Pruning plans are essential, not only

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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



Figure 16 – Cyclical pruning by ISA certified arborists maintains tree health and structure while minimizing infrastructure conflicts.

(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 Dayton'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). 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.

Most communities try to implement a two to five-year pruning cycle (Figure 16). The ability to implement a cyclic pruning program is limited by the staff and financial resources in Dayton. 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

COMMUNITY FORESTRY CONSULTANTS, INC. APRIL 27, 2020 URBAN FORESTRY MANAGEMENT PLAN CITY OF DAYTON, WASHINGTON initial management recommendation while small tree pruning is performed by Dayton staff or trained volunteers. The objective is to start and maintain a cyclic pruning program within the fiscal and personnel resource constraints of Dayton.

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 – Dayton 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 Dayton 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 Dayton 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 or certified tree workers 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 increase in value 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 Dayton.

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, Dayton 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

COMMUNITY FORESTRY CONSULTANTS, INC. APRIL 27, 2020 maintains a greater safety level in the urban forest and can decrease liability for the agency (McGauley et al 2000).

Pruning is the primary maintenance requirement for the Main Street London plane trees. Regular pruning will improve the condition rating of many trees, reduce the potential for storm damage to trees, reduce the risk associated with trees, minimize infrastructure conflicts, reduce tree litter, and demonstrate proactive management of Dayton's tree resources. **The Main Street London plane trees are in good condition and do not require any immediate tree maintenance (Table 3).**



Tree Condition Distribution

Fable 3 –	Condition	ratings	of	inventoried	trees.
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Condition	Percent	Count		
Excellent (90 - 100%)	0.0%	0		
Good (80 - 90%)	93.3%	28		
Fair (70 - 80%)	3.3%	1		
Poor (50 - 70%)	3.3%	1		
Very Poor (50 - 1%)	0.0%	0		
Dead (0%)	0.0%	0		
Total		30		

Young Tree Pruning Program

There are few newly planted or young trees in Dayton. 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 (Figure 16). 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 growthhabits 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. It consists of removal of dead, dying, diseased, interfering, conflicting, and/or weak branches.

COMMUNITY FORESTRY CONSULTANTS, INC. APRIL 27, 2020 URBAN FORESTRY MANAGEMENT PLAN CITY OF DAYTON, WASHINGTON 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. When trees are small, these problems can be remedied easily and inexpensively. 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 be minimal when a tree is planted, because it is already under stress from transplanting and needs as much of its leaf canopy as possible in order 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.

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 fiveyear cycle for the routine pruning of larger established trees. As mentioned above, newly planted trees



Figure 17 – Tree structure in young trees.

should receive their first training pruning three years after planting. This work can be accomplished throughout the year (Figure 17).

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. Dayton 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.

- 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

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URBAN FORESTRY MANAGEMENT PLAN CITY OF DAYTON, WASHINGTON trees, line-of-sight and height clearance pruning of street trees, removal and replanting efforts, risk identification for street and park trees.

- 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 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 3year 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. This cycle includes Main Street trees.
 - Trees adjacent to roadways, walkways, signs, and streetlights 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 health, and finally for aesthetics. When removing branches, the pruning cut shall not damage the branch bark ridge and branch collar.

****Structural pruning, subordination, and crown cleaning 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 hazards, 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.

The average cost to perform structural pruning and crown cleaning to the London plane trees on a cyclical pruning schedule by an ISA certified arborist is \$400.00/tree.

TREE RESOURCE EXPANSION

Tree Resource Expansion

There is a clear need for a tree planting plan to guide Dayton's future Main Street tree planting. 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 along Main Street—a relatively evenaged, limited, and undiversified population—are not only significant design elements but also represent the canopy cover at this stage.

A challenge for Dayton 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 Dayton 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, elected officials, and arboriculture professionals. They are integrated with other comprehensive agency and city plans to create a blueprint for administration and management of the 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 city 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 Dayton tree planting plan should address some important questions about landscape design, infrastructure conflicts, tree maintenance, 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 10 newly planted trees don't plant 50.
- Increase tree planting on Dayton 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 Dayton 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 Dayton 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. 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.

Tree planting in Dayton 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.



Figure 18 - 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.

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 three available new planting spaces along Main Street and two more associated with removals. Tree planting 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 Dayton (Figure 18).

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URBAN FORESTRY MANAGEMENT PLAN CITY OF DAYTON, WASHINGTON The key to maintaining a healthy, sustainable community forest is the implementation of regular, annual tree plantings, regardless of grant money or catastrophic events. Many trees do not need be planted, but a consistent annual addition of trees to the community forest is critical to maintain a perpetual canopy.

Objective to guide the Dayton tree planting program.

The annual quantity of trees to plant is directly dependent on the quantity of trees Dayton staff and resources can maintain.

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 19).

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 20).

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



Figure 19 - Tree planted too deeply.



Figure 20 – Root collar at grade level

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 COMMUNITY FORESTRY CONSULTANTS, INC. APRIL 27, 2020 URBAN FORESTRY MANAGEMENT PLAN CITY OF DAYTON, WASHINGTON 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 21). 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



Figure 21 - Incorrect mulch applications can degrade trunk tissue causing tree mortality.

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.

Trees and Water

Trees growing in urban and forest situations experience internal water stress. Water may be a significant growth limiting factor in both situations. Observations of urban trees across a wide geographic range has demonstrated some clear patterns: newly transplanted street and park trees die if supplemental water is not provided, mature trees may die during mild, periodic droughts, and climate conditions in Dayton dictate the need for supplemental water for newly transplanted trees and mature trees.

How should trees be watered? It seems like a simple question, but providing a helpful answer is difficult. The subject is complex and there are no simple answers. There are many factors to consider, e.g., time of year; species; age; and size of tree; soil texture, structure and depth; area of root zone; distance from trunk; topography; irrigation system and frequency; local rainfall patterns; and water quality. That's more than most people want to think about.

Dayton staff will need to know the rootzone depth, surface area of soil accessible for irrigation, soil textural class, and the amount of plant available water. With these four pieces of information an assessment of the amount of water held in the tree root zone can be made, which provides a determination of the amount of water that should be applied via irrigation.

Diversification

One street or a portion of a commercial landscape often looks best when planted with one species, especially if trees will be placed in a row. This ties the design together. This is the conceptual design for Main Street trees between from North 4th Street to North COMMUNITY FORESTRY CONSULTANTS, INC. URBAN FORESTRY MANAGEMENT PLAN APRIL 27, 2020 CITY OF DAYTON, WASHINGTON

Cottonwood Street which led to one species, London plane tree. Beyond this stretch of Main Street different species of trees should be planted. Some potential species to plant along West Main Street are: hedge maple (*Acer campestre*); pyramidal European hornbeam (*Carpinus betulus* 'Fastigiata'); Hackberry (*Celtis occidentalis*); American yellowwood (*Cladrastis kentukea*); Ginkgo (*Ginkgo biloba*); and Zelkova (*Zelkova serrata*).

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.

Objectives to increase species diversity.

- Dayton 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.
- Dayton 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, black locust, cottonwood, and willow.

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; rooting environment; plant quality and planting and post planting maintenance.

Tree physiology considers the genetic potential of trees to establish in a given environment and species characteristics which may reduce the impact of a stress. High plant quality is an essential foundation for any planting project. Planting and postplanting practices are fundamental to establishment success. The rooting environment is critical in ensuring future resource availability and Dayton. Failure to consider 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 lifehistory 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 in eastern Washington is \$500.00 per tree. This may be higher for trees planted along Main Street due to infrastructure considerations. CFC recommends that 10% 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 Dayton to maintain industry target goals for tree population ranges and is a quantity Dayton 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 Dayton. These benefits increase as the age and size of the trees increase. 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 Dayton 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 Dayton has a legal duty of care
- The City of Dayton 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. It is important to manage risk trees despite the small number of risk trees in Dayton. The tree inventory identified two trees for removal. All the trees are low risk removals. Ultimately Dayton 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.

Dayton Tree Risk Policy Statement: Dayton shall have an active policy to maintain the safety of people and property on roadways, parks, and other public property from potentially high and extreme risk trees. The City of Dayton will strive to mitigate, in a reasonable time, trees deemed high-risk. When available fiscal and human resources limit the ability of Dayton 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 Part 1- 2008, 2) ANSI A300 Part 9-2011 Tree Risk Assessment; COMMUNITY FORESTRY CONSULTANTS, INC. URBAN FORESTRY MANAGEMENT PLAN APRIL 27, 2020

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) City of Dayton protocol described in this document. The Public Works manager shall administer this program and have final judgment in all matters concerning the mitigation measures taken for any tree considered a hazardous.

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 acts 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 Dayton, 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 regularly 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 (TRAQ), and insured tree care professionals who follow arboriculture industry practices should be hired for any tree maintenance work on public trees.
- Dayton 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. Dayton has a legal duty to exercise reasonable care to protect residents and the public from foreseeable risks. Dayton managers, administrators, staff, and elected officials must demonstrate reasonable care to minimize the risk associated with trees in public areas (Figure 19). It is imperative for all Dayton departments to follow established risk management policies.

Tree Inspections

Dayton 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. Dayton's UFMP defines the standard of care for tree risk management and assessment. Dayton 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 Dayton.
- 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 22). 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 22 – 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 2-inches 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.

Dayton 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

Dayton staff, landscape and tree maintenance personnel, both contractors and Dayton 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 Dayton 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, KUF 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 Annual Work Plan (AWP). 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 AWP 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 Dayton.

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- > Document removals, prunes, and other mitigation requirements.
- Assignment and schedule of Dayton staff and/or contractors to implement mitigation actions.
- Monitor and document work results.
- > Report results of AWP and review risk management actions.

Considerations to use in setting priorities are outlined in this plan. The risk manager/city forester acts 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 and high-risk trees shall be removed, 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 certified tree risk assessor.

With the initiation of a cyclic pruning program, at a minimum, each tree will be reinspected 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.

All trees inventoried along Main Street represent a low risk. Pruning is the main arboriculture treatment required to mitigate minor issues such as small dead branches and clearance issues.

OPERATING PLANS

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 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 city staff. An example is provided in Table 4.

The preparation of operating plans for this management plan should be based on 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.

PROGRAM ACTIVITY	J	F	Μ	Α	Μ	J	J	Α	S	0	Ν	D
PLANNING												
Work priorities												
Organize activities												
Modification												
TREE REMOVALS												
Review inventories												
Field inspections/Disk	-											
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												
Review inventories/survey												
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 4 – Example of an 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.

Dayton'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 Dayton can be considered formidable.

Budget

The lack of sufficient dedicated financial resources for the urban forestry program precludes making significant improvements to the tree population. Currently, the line item assessment does not provide sufficient operational funds for tree planting, preventive tree maintenance, increased staff and support personnel, or equipment to meet industry standards for a town the size of Dayton. The minimum annual budget would meet Tree City USA standards.

Existing public funds for urban forest management are dispersed for various tasks, and are usually expended only on an emergency basis, by limited citizen requests, for individual capital projects, or for limited aspects of urban forest management, such as development site inspection. The Public Works Superintendent position has management authority over dedicated funds for comprehensive urban forest management activities and input on the expenditures made by other departments that impact city trees.

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 Dayton'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 decisionmakers, 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 Dayton may not reach its full potential.

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 Dayton must decide on an operating level of service it wishes to provide and accept the level of risk associated with the decision. The current level of service associated with tree management and maintenance is without a dedicated budget.

Typical tree budget allocations found in urban forestry programs across the United States allocate funding in these areas (Figure 23). Dayton's current forestry budget allocations do not follow industry standards. 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

A systematic approach accurately identifies moderate to high risk trees and initiates the timely removal or corrective treatment of hazardous trees. The level of service associated with proactive management defines and funds specific goals such as eliminate extreme and high trees in ten years or prune cyclically every five years.

Program Funding

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 COMMUNITY FORESTRY CONSULTANTS, INC. URBAN FORESTRY MANAGEMENT PLAN APRIL 27, 2020 CITY OF DAYTON, WASHINGTON

human and financial resources. Traditional funding comes from the city's budget and capital funds.

The Main Street trees and surrounding environment must generate enough interest in the stakeholders for recognition and enough funding to properly preserve and retain their benefits. It is critical to demonstrate how trees can help each city function whether it is police, fire, storm water management, riparian sites or air quality. Community trees must be thought of as a solution to community problems and an economic engine worthy of city funding. Urban forests provide 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.

Alternative funding sources for community forestry programs are about associative repositioning 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.



Both the State of Washington and the US Department of Transportation offer grant programs designated for non-motorized transportation facilities, which can be used for new sidewalks and crossing improvements.

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Examples of alternative funding sources:

- Grants
 - Government
 - Private
 - WSDOT Transportation Improvement Board: Small City Sidewalk Program. The intent of the Small City Sidewalk Program is to provide funding for projects that address safety, access to generators, and system continuity by filling in gaps within the system. All projects must be transportation related on a federally classified route and be consistent with the American with Disabilities Act (ADA).
 - General criteria for the Sidewalk Program include:
 - Funds are distributed across three regions based on small city populations
 - Local match is required if the population is over 1,000 residents
 - Local match requirements: Under 1,000 population no match required; Over 1,000 - 5% local match required
 - WSDOT Small City Preservation Program. The Small City Preservation Program provides funding for chip seal and overlay of existing pavement and sidewalk maintenance in incorporated cities with populations less than 5,000.
 - WSDOT Complete Streets Grant Program
- Vehicle License Fee to fund an ongoing sidewalk repair program (e.g. Shoreline, WA).
- Sales and Use Tax Funds collected from the increased sales and use tax can only be used for constructing new sidewalks or repairing and maintaining existing sidewalks.
- Inter-governmental charges: Maintenance fee recovery for street/sidewalk bond projects or right-of-way projects.
- Captial Improvement Funds: Trees as infrastructure cited in ordinances 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.
 - 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
- Donations
 - Individuals
 - Utility Bill Donations
 - Donation Cans at Events
 - Tourism Industry Fee Assessments
 - Business Sponsorships
 - Event Sponsors

The City of Dayton has taken proactive steps in conducting an inventory and developing a management plan for the Main Street London plane trees. To accomplish the mission and to achieve and sustain the community forestry goals, Dayton 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 Dayton. On adoption of this strategic management plan it is imperative that the City of Dayton develop long-range budget forecasts for its implementation.

PROGRAM ACTIONS

There are four 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. KUF 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 Dayton. 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 annually to determine progress, review the activities accomplished, aid in the development of 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. The inventory of all public trees should be completed and 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

Removing tree grates and grate framework should be an immediate maintenance action. This should be followed by removal of sidewalk panels to increase open soil space around the Main Street trees (Figure 13).

After planting an appropriate species at a site that can support adequate growth, maintenance practices such as mulching, watering, and pruning should be employed cyclical. 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 Dayton staff, and volunteers 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 Dayton'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. The standards are divided into four categories: crown cleaning, crown thinning, crown raising, and crown reduction.

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

URBAN FORESTRY MANAGEMENT PLAN CITY OF DAYTON, WASHINGTON Brush—Safety Requirements (ANSI Z133.1, 2000) and the ANSI Standards for Tree Care Operations—Tree, Shrub, and Other Woody Plant Maintenance–Standard Practices, Pruning (ANSI A300(Part 1), 2001, Pruning). Safety and pruning standards are designed specifically for tree care operations and should be incorporated into Dayton standards for tree care.

The primary structural defects in Main Street trees are small dead branches and clearance issues.

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. The Main Street trees present a low risk currently. There are no major structural issues. Regular pruning will keep the risk low.

Priority: Tree Planting

New tree planting is an essential part of Dayton tree management. The health and stability of the Dayton 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 Dayton staff can maintain. Increase new plantings each year, but in quantities that match the maintenance abilities of Dayton staff and resources.

To ensure that newly planted trees thrive and are healthy provide planting standards. 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 primary issue in tree planting is improper installation causing the root collar to be buried and timely watering. 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 Dayton. This management plan provides Dayton 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 Dayton. Trees are valuable assets to Dayton. The healthier the trees are the more Dayton'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 Dayton'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 Dayton 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://wwv.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-practiceordinances?topic&ptopic

A Guide to Community and Urban Forestry Programming – Washington https://www.dnr.wa.gov/publications/rp_urban_guide_to_urban_forestry_programming.p df?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 – Standards for a Tree City USA

Standard 1. A Tree Board or Department

Someone must be legally responsible for the care of all trees on city- or town-owned property. By delegating tree care decisions to a professional forester, arborist, city department, citizen-led tree board or some combination, city leaders determine who will perform necessary tree work. The public will also know who is accountable for decisions that impact community trees. Often, both professional staff and an advisory tree board are established, which is a good goal for most communities.

Standard 2. A Tree Care Ordinance

A basic public tree care ordinance forms the foundation of a city's tree care program. It provides an opportunity to set good policy and back it with the force of law when necessary. A key section of a qualifying ordinance is one that establishes the tree board or forestry department—or both—and gives one of them the responsibility for public tree care (as reflected in Standard 1). It should also assign the task of crafting and implementing a plan of work or for documenting annual tree care activities. Ideally, the ordinance will also provide clear guidance for planting, maintaining and removing trees from streets, parks and other public spaces as well as activities that are required or prohibited. Beyond that, the ordinance should be flexible enough to fit the needs and circumstances of the particular community.

Standard 3. A Community Forestry Program with an Annual Budget of at Least \$2 Per Capita

City trees provide many benefits—clean air, clean water, shade and beauty to name a few—but they also require an investment to remain healthy and sustainable. By providing support at or above the \$2 per capita minimum, a community demonstrates its commitment to grow and tend these valuable public assets. Budgets and expenditures require planning and accountability, which are fundamental to the long-term health of the tree canopy and the Tree City USA program.

To meet this standard each year, the community must document at least \$2 per capita toward the planting, care and removal of city trees—and the planning efforts to make those things happen. At first this may seem like an impossible barrier to some communities. However, a little investigation usually reveals that more than this amount is already being spent on tree care. If not, this may signal serious neglect that will cost far more in the long run. In such a case, working toward Tree City USA recognition can be used to reexamine the community's budget priorities and redirect funds to properly care for its tree resources before it is too late. For Dayton an annual budget between \$5,400.00 and \$6,000.00, depending on 2020 census, would meet the standard.

Standard 4. An Arbor Day Observance and Proclamation

An effective program for community trees would not be complete without an annual Arbor Day ceremony. Citizens join to celebrate the benefits of community trees and the work accomplished to plant and maintain them. By passing and reciting an official Arbor Day proclamation, public officials demonstrate their support for the community tree program and complete the requirements for becoming a Tree City USA!

This is the least challenging—and probably most enjoyable—standard to meet. An Arbor Day celebration can be simple and brief or an all-day or all-week observation. It can include a tree planting event, tree care activities or an award ceremony that honors leading tree planters. For children, Arbor Day may be their only exposure to the green world or a springboard to discussions about the complex issue of environmental quality.

The benefits of Arbor Day go far beyond the shade and beauty of new trees for the next generation. Arbor Day is a golden opportunity for publicity and to educate homeowners about proper tree care. Utility companies can join in to promote planting small trees beneath power lines or being careful when digging. Fire prevention messaging can also be worked into the event, as can conservation education about soil erosion or the need to protect wildlife habitat.

Appendix C – 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. Infringement from sidewalk reduction on the free passage of pedestrians is minimal. Furthermore, the ADA imposes strict regulations as to the amount of free space provided.



The concrete sidewalk cutout option can be used in some scenarios on downtown streets. A minimum of five feet width of sidewalk is required to meet ADA requirements. The trees are shown before mulch was applied.

Concrete on the plus side, is the accepted standard material, doesn't need an edge treatment, and can be permeable, reinforced, tinted, textured, and shaped and formed into curves around trees. It also can be leveled by slab jacking and grinding raised edges. On the minus side, it is rigid and not reusable, is usually not very porous, and depending on soil conditions and building codes may require a minimum 4-inch base beneath 4-inch sections.

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Install alternate sub-base material beneath sidewalk.

The roots remained under the gravel when a layer of washed gravel was installed as sub-base material - roots remained under the gravel (left). Roots did not grow directly under the slab as they often do when a sand, limestone, or no sub-base is used (right). Gravel installation helped prolong the life of sidewalks.

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.



Roots usually will stay beneath a gravel base layer installed beneath the concrete.

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
- Polymer-bonded aggregate

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.

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Flexi[™]Pave material installed with a base layer.

The square foot price for Flexi[™]Pave product is \$5.35. The material cost for 23 London plane trees is \$21,000.00. This figure includes installer training but does not include travel expenses for on-site training and sidewalk demolition.



Terrewalk™ panel.

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Terrewalk[™] panel installation.

The square foot (sf) price for the TerrewalksTM product is \$6.89. The panels are 2' X 2.5' so the square feet need to be a factor of 5 sf. 25 'x 5'= 125 sf per tree site, and the product cost is 125 sf x \$6.89 per sf = \$861.25. The installation is probably around \$5-7 per SF, depending on the contractor, and someone will be available to assist with the installation work as a consultant/trainer. The important thing is to get the base very level, and if a geotextile is put under the base to minimize the compaction of the sub-base that must be considered in the pricing.

The cost for 23 London plane Terrewalk[™] installations is \$861.25/tree = \$19,808.75. This figure does not include demolition of the existing sidewalks. The real savings is the next time there is any sidewalk displacement, the product gets picked up, the base leveled, roots managed if necessary and put the product back down.

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.

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.

Appendix D – Public Comments

Thank you for your April 6 letter inviting feedback about the Main Street Trees Plan.

The Liberty Theater values Main Street trees and is supportive of maintaining them. We reviewed the Plan and agree it is solid overall.

Our own urban arborist expert agrees that there is high priority in removing the present physical contact between the grates and the base of the tree.

Does a business, such as Liberty Theater, bear any liability for changes the City makes in the sidewalk/treewell regarding tripping hazard?

Michael Luce, Treasurer Touchet Vallet Arts Council, dba The Liberty Theater.

I have recently bought a property on East Main Street in Dayton and I am relieved that the city wants to conserve their trees. The Urban Forest Management Planning (UFMP) Draft is very through and covers aspects of tree care from planting through the care of mature trees. Per the Draft there were stakeholders' public meetings, interviews conducted and comments from city staff. That included community members in the process of developing the UFMP. The Community Forestry Consultants should be congratulated for a job well done!

Michael Deines.....

I am in total support of the new management plan for the Main Street trees based on the excellent work recently completed that revealed causes of the issues were in the lack of gravel bed under the concrete, the tree grates being too tight and the poor planting in tree coffins. With this information the way forward that has been recommended is the best solution. I am very excited that it will be part of the City ordinance in the City code. These trees are a beautiful addition to our Main Street and this plan will ensure their proper care long into the future. It also provides for trees to be planted in the empty space, which is long overdue. I support this plan without reservation.

Ginny Butler

Good Morning, Mr. Luce, First and foremost, thank you for your feedback; it is greatly appreciated.

You asked, "Does a business, such as Liberty Theater, bear any liability for changes the City makes in the sidewalk/treewell regarding tripping hazard?" This a very good question.

Unlike most sidewalks and trees located within a public right way, the City of Dayton is the owner and operator of the sidewalks and trees along Main Street beginning at the Main Street Bridge and continuing to 4th Street. As a result, the City of Dayton is liable for hazards created by the City's maintenance, operation, or improvements to the Main Street sidewalks and/or trees. Attached is a copy of the Main Street Regulations for your use. Again, thank you for reaching out to the City regarding the Main Street Trees Inventory and Management Plan.

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.

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.

Consequences: effects or outcome of an event. In tree risk assessment, consequences include personal injury, property damage, or disruption of activities due to the event.

Cracks: separation in wood fibers.

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. COMMUNITY FORESTRY CONSULTANTS, INC. APRIL 27, 2020 URBAN FORESTRY MANAGEMENT PLAN CITY OF DAYTON, WASHINGTON **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.

Drive-by windshield assessment: limited visual inspection from only one side of the tree performed from a slow-moving vehicle; also may be called a "windshield" assessment.

Duty of care: legal obligation that requires an individual to use a reasonable standard of care when performing tasks that may potentially harm others.

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; codominant 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.

Lean: angle of the trunk.

Likelihood: the chance of an event occurring. In the context of tree failures, the term may be used to specify: 1) the chance of a tree failure occurring; 2) the chance of impacting a specified target; 3) the combination of the likelihood of a tree failing and the likelihood of impacting a specified target.

Limited visual assessment: a visual assessment from a specified perspective such as foot, vehicle, or aerial patrol of an individual tree or a population of trees near specified targets, to identify specified conditions or obvious defects.

Mallet: a broad-headed hammer made of wood, plastic, or resin used for "sounding" a tree.

Mitigation: the process for reducing risk.

Negligence: failure to exercise due care.

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.

Probability: the measure of the chance of occurrence expressed as a number between 0 and 1, where 0 is impossibility and 1 is absolute certainty.

Probe: a stiff, small-diameter rod, stick, or wire that is inserted into a cavity or crack to estimate its size or depth.

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.

Sounding: process of striking a tree with a mallet or other appropriate tool and listening for tones that indicate dead bark, a thin layer of wood outside a cavity, or cracks in wood.

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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