



**Tacoma**



Office of  
Environmental Policy  
and Sustainability



**PLANIT GEO**  
mapping a greener future

# URBAN FOREST MANAGEMENT PLAN RESEARCH SUMMARY

## - TACOMA, WA -

# 2019

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## City of Tacoma

Mayor Victoria Woodards

As Tacoma community members, we are all part of “One Canopy”. This network of trees generates clean air and water, supports wildlife habitat, and moderates temperatures in our neighborhoods. But beyond these environmental benefits - properly managing our urban forest can increase civic engagement, community pride, and the quality of life for all Tacomans.

This Urban Forest Management Plan represents a meaningful step toward achieving harmony between our natural and built environments. From ensuring equitable distribution of services, to protecting our natural resources, this plan lays the groundwork for a healthy future for our trees and residents alike. With your input, the actions in this Plan are presented as a commitment to our community to work toward a more vibrant, healthy, and sustainable Tacoma for all.

Within this Plan there are specific actions City government, in collaboration with our community, will take together over the next ten years, which will have a lasting impact for generations to come. Core themes include Resource Management, Equity and Accessibility, Canopy Health & Growth, Long-Term Funding, Climate Resiliency, Enhanced Ecosystem Services & Benefits, and Community Engagement & Stewardship.

With each tree planted, we cultivate a lasting connection to our community. These actions taken to strengthen our urban forest today will serve as enduring investments in the health and wellbeing of future generations.

With that in mind, I invite you to join me in exploring this Urban Forest Management Plan and recognizing the importance of strengthening and protecting Tacoma’s urban forest for years to come. To learn more about the plan for Tacoma’s trees, visit [www.tacomatreeplan.org](http://www.tacomatreeplan.org).

Sincerely,

Victoria R. Woodards  
Mayor

# URBAN FOREST MANAGEMENT PLAN PHASE 1 RESEARCH SUMMARY - TACOMA, WA -

## *Acknowledgements*

*Funding for this effort supported by the City of Tacoma Environmental Services Department and Tacoma City Council*

### **- THE CITY OF TACOMA, WA CONTRIBUTORS -**

City of Tacoma Environmental Services Department  
City Council

City Council's Infrastructure, Planning, and Sustainability Subcommittee  
Sustainable Tacoma Commission  
Landmarks Preservation Commission  
Metro Parks Tacoma  
Residents of Tacoma

#### City Department Contributors

Environmental Services (EnvScs)	City Manager's Office (CMO)
Neighborhood & Community Services (NCS)	Community & Economic Development (CED)
Planning & Development Services (PDS)	Office of Equity & Human Rights (OEHR)
City Attorney (Legal)	Public Works (PWD)
Information Technology (IT)	Office of Arts & Cultural Vitality

### **- ADDITIONAL CONTRIBUTIONS FROM -**

Washington State Department of Natural Resources  
Pierce Conservation District  
Metropolitan Parks District, Tacoma  
Pierce County Health Department



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**CONSERVATION  
TECHNIX**

Anticipated acceptance in November 2019

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All other photos unless noted are from the City of Tacoma, WA*

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The Urban Forest Management Plan outlines meaningful actions that the City of Tacoma will take between 2019 and 2030 to support our community forest. To reach our goal of a healthy, thriving 30% overall tree canopy coverage, the City will create greater efficiencies in our operations, standardize our level of service, and respond to the challenges of climate change, as well as other environmental and fiscal factors. The Plan functions as a management tool as well as providing transparency to the community as it takes action to support Citywide environmental health on behalf of the entire community. The Plan also sets standards for tracking and reporting progress toward our goals.



Source: Hannah Letinich, on behalf of  
The Nature Conservancy at Green  
Tacoma Day 2019

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## EXECUTIVE SUMMARY



Trees along streets, in parks, open spaces, backyards, and across the City provide many essential benefits and constitute an "urban forest". Tacoma's urban forest is a valuable asset that, if planned and cared for, will continue to add to the health and well-being of a community for generations to come. We are all under *One Canopy* and benefit from the proper care and enhancement of Tacoma's trees.

A successful municipal forestry program contributes to vibrant and healthy communities, while promoting the safety of residents and visitors. The City of Tacoma's Urban Forest Management Plan ("Plan") effectively directs City resources towards this mission, supporting healthy neighborhoods and a thriving Puget Sound, growing a better Tacoma for all.

The main tenets of this Plan are ensuring public safety, increase operational efficiencies, facilitate short- and long-term sustainable urban forest planning, validate budgets and programs, ensure equitable distribution of green resources and services, and standardize methodology for asset management of the urban forest.

An Urban Forest Team (UF Team) was assembled to develop a plan specific to Tacoma's needs. The UF Team includes the City's Environmental Services Department and key stakeholders, and professional urban forestry consulting firms. The UF Team conducted extensive research and auditing to establish baseline conditions of Tacoma's urban forest as part of Phase 1 (October 2019) of this Plan. Phase 2 will establish specific actions tied to specific goals and timelines that better support urban forestry to meet the needs and goals expressed by the community. Following Phase 2 (December 2019), a third and final phase (2020) will provide supplemental studies that support implementation of the Plan.

### COMPONENTS OF THE TWO PLANNING PHASES



Phase 1 consists of an evaluation of five unique planning elements, the results of which were applied to a systematic and industry-approved audit system. Results from Phase 1 were used to develop the Phase 2 short- and long-term strategies, the targets for measuring progress, the actions to implement the strategies, and the evaluation criteria to adapt management approaches for future planning horizons.

This Phase 1 Research Summary establishes a baseline from which short- and long-term strategies can be developed and monitored over time. The baseline was established by conducting an audit of existing conditions and operations. This diligent approach to Tacoma’s urban forest management first looks at the resource at a broad scale—the existing policies and plans (element #1) to gauge the City’s readiness and available resources to achieve optimal levels of urban forest sustainability. Next, the existing City department workflows and operations (element #2) were evaluated to determine the existing infrastructure and processes around tree management and to identify gaps and areas for improvement. Results from the urban forest benchmarking research (element #3) can be applied to the analysis of the City’s operations and workflows. After the policy and operational framework were reviewed, the baseline conditions of the urban forest were assessed by analyzing existing high-level and in-depth data (element #4) to identify gaps in resourcing and canopy coverage. To inform the strategies for closing these gaps, extensive community outreach (element #5) was conducted to gather public input and viewpoints relating to the urban forest.

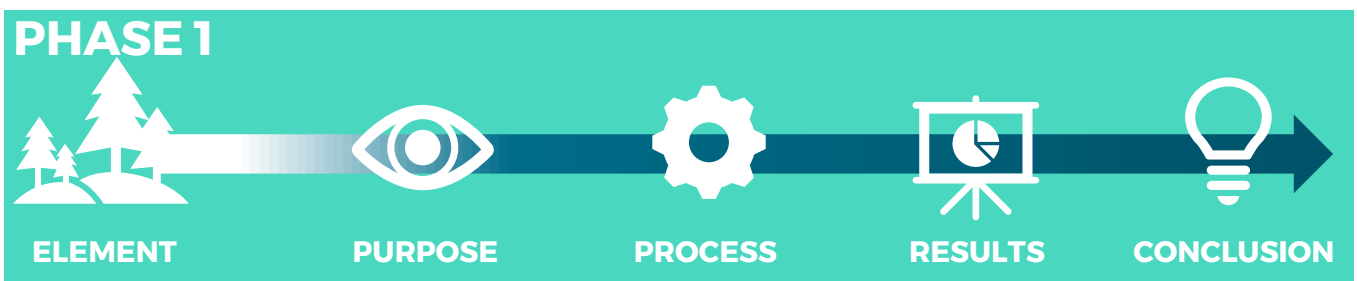
Lastly, outcomes of the planning elements were audited using the Urban Forest Sustainability and Management Audit system developed by the U.S. Forest Service and partners. Results of this audit identify the City’s strengths and vulnerabilities relating to urban forest management. The outcomes of this audit system provide the framework of the Plan’s short- and long-term strategies. Optimal levels of urban forest management identified through this audit establish goals and criteria to develop adaptive management processes for continual improvement as the City’s environment and public perception change over time.

This Plan supports and strengthens the City’s goals identified through the Comprehensive Plan, including management, equity and accessibility, canopy health and growth, long-term funding, climate resiliency, enhanced ecosystem services and benefits, and community engagement and stewardship.

## PHASE 1 RESEARCH SUMMARY FRAMEWORK










Elements relating to Tacoma’s urban forest management were identified for this research summary. This research summary consisted of an existing conditions and operations audit for each planning element and the findings are presented in the following format:

### FRAMEWORK OF THE PHASE 1 RESEARCH SUMMARY



This Phase 1 Report provides the results of the analysis of Tacoma’s urban forest to be used in the development of the short- and long-term strategies (Phase 2). The following provides an overview of the planning elements summarized in this report. Information and outcomes from the five planning elements were used to inform element #6, Urban Forest Sustainability and Management Audit, referred to as the “Urban Forest Audit”.

**TABLE 1. PLANNING ELEMENTS IN THIS URBAN FOREST RESEARCH SUMMARY**

 <b>ELEMENT</b>	 <b>PURPOSE</b>	 <b>PROCESS</b>
	<p>1) Existing Policies and Plans</p> <p><i>To gauge the City's commitment and readiness for urban forest sustainability</i></p>	<p>Research, City staff interviews, consultations</p>
	<p>2) City Staff Interviews</p> <p><i>To understand existing internal infrastructure and processes around tree management, and to further define areas of further investigation</i></p>	<p>Questionnaire, meetings, staff interviews, gap analysis</p>
	<p>3) Urban Forest Benchmarks</p> <p><i>To understand the level of effort and capacity necessary to satisfy the City's adopted goals, and to ensure urban forest sustainability</i></p>	<p>Research, analysis of Tacoma's Municipal Code, analysis of Tacoma's urban forestry program against other municipal forestry programs, regionally</p>
	<p>4) High-Level and In-Depth Data Analysis</p> <p><i>To identify gaps in resourcing and coverage across the entire City's geography and identify urban forest readiness, health, and resilience</i></p>	<p>Analysis of the Tree Canopy Assessments, tree inventories, and open space data</p>
	<p>5) Community Interests and Input</p> <p><i>To understand the interests of the community are, and how they can help to craft the level of service</i></p>	<p>Community meetings, surveys, call log and 311 analysis, City commission and special interest group meetings</p>
	<p>6) Urban Forest Sustainability and Management Audit</p> <p><i>To identify strengths and gaps relating to sustainable urban forest management</i></p>	<p>Analysis of 11 categories of urban forest sustainability and management</p>

# PHASE 1: TACOMA URBAN FOREST AUDIT RATING

Category	Audit Rating
Management Policy and Ordinances	86%
Professional Capacity and Training	81%
Funding and Accounting	67%
Decision and Management Authority	88%
Inventories	81%
Urban Forest Management Plans	79%
Risk Management	50%
Disaster Planning	57%
Policies, Standards, and Best Practices	84%
Community	86%
Green Asset Evaluation	60%
<b>Total</b>	<b>77%</b>

Based on the analysis of findings from the Phase 1 planning elements, Tacoma scored a **77%** in terms of urban forest sustainability, management, and equity organized into the above categories.

These ratings for Tacoma were derived from the findings of the Phase 1 Research Summary described in the following sections. The audit rating and the information gathered during Phase 1 were applied to Phase 2 to develop the primary framework of the Urban Forest Management Plan.

# PHASE 1 RESEARCH SUMMARY







## ELEMENT 1:



## EXISTING POLICIES AND PLANS



## PURPOSE

To gauge the City's commitment and readiness for urban forest sustainability.



## ELEMENT 1: EXISTING POLICIES AND PLANS



### PURPOSE

The purpose of this element is to gauge the City's commitment and readiness for urban forest sustainability. Measuring alignment of existing policies and plans ensures a strong connection among the Urban Forestry Program's high-level strategic goals, and the projects and initiatives that support these goals. A strategic plan without proper alignment runs the risk of wasting resources and time and can jeopardize the success of key projects that support the Urban Forestry Program's mission. Plans cannot live in isolation, therefore, cross-examining various plans brings to light any projects or initiatives that are a misplacement of resources and time.



### PROCESS

Extensive document gathering, research, interviews, consultations, and information discovery was conducted. This process used the information discovery framework outlined in the U.S. Forest Service's Urban Forest Sustainability and Management Audit system (see Appendix F for more information). Additional information was gathered from City staff interviews and project consultation meetings to provide additional context to these documents.

All documents and acquired information were uploaded and indexed. The relevant information was catalogued and summarized in the Urban Forest Sustainability and Management Audit's Information Discovery worksheet. Key information for this Plan and opportunities for alignment with existing plans was summarized and provided in this Phase 1 Research Summary. This summary provides the foundation for the Urban Forest Management Plan's strategies and actions.



### RESULTS

In 2010, the Tacoma City Council adopted a new chapter in Tacoma's Comprehensive Plan - the Urban Forestry Policy Element (UFP). This element describes Tacoma's vision for its urban forest resources, including increasing the tree canopy cover from approximately 19% in 2009 to 30% in 2030. The UFP also provides guidance on urban forest management goals such as:

- UW canopy cover analysis, 2018 canopy cover analysis, and subsequent studies
- Creating a citizen advisory board;
- Increasing education and outreach;
- Clarifying ownership and maintenance responsibilities of right-of-way trees;
- Maintaining public safety;
- Addressing diverse land uses;
- Building and supporting partnerships;
- Increasing the sustainability and health of the urban forest through species and age diversity, invasive species removal, creation of Heritage tree program;
- Establishing planting priorities;
- Coordinating planning and design of public infrastructure to include trees, both new and preservation of existing trees; and
- Supporting urban agriculture such as through community gardens and orchards.

Additionally, an expansive list of City policies and plans that influence urban forestry were identified by the UF Team.

## SUMMARY OF DOCUMENTS REVIEWED

### 1992 Urban Forest Management Plan

Initiated by the City of Tacoma's adopted Resolution No. 31309 to establish a comprehensive urban tree management program for the City of Tacoma, Metropolitan Park District, Port of Tacoma, and Tacoma Public Utilities. The 1992 plan provided the framework for the program's maintenance requirements, staffing, budgets, and outreach.

### 2008 Climate Action Plan

Tacoma's Climate Action Plan (CAP) was adopted to establish carbon reduction goals and strategies for the City and community. Urban tree canopy is noted for its ability to absorb and remove carbon from the air and various policies and strategies reference urban forests. The CAP was used to create the Environmental Action Plan (2016), which now supersedes the CAP.

### 2010 Urban Forest Policy Element

The UFMP serves as the foundation for this 2019 Plan and the Urban Forest Manual (2014) to advise City staff, agencies, contractors, developers, engineers, and others living or doing business in Tacoma on the maintenance, preservation, and enhancement of the urban forest using the best science and management practices available.

### 2011 Tree Canopy Assessment

In the summer of 2011, the University of Washington's Remote Sensing and Geospatial Analysis Laboratory completed an analysis of 2009 data (aerial photos and Light Detection and Ranging [LiDAR] elevation data), with funding support provided by the Washington State Department of Natural Resources Urban and Community Forestry Program, to provide Tacoma with an updated approximation of tree canopy cover. This assessment was conducted to support the City's tree canopy goal and was utilized in the City's Equity Index.

See [Tacoma's Citywide Tree Canopy Assessment](#) section of this report (page 35).

### 2014 Urban Forest Manual

The Urban Forest Manual (UFM) is a technical guide created to facilitate the planning, design, installation and maintenance of landscaping that is required for new development and redevelopment per Tacoma's Municipal Code (TMC) 13.06.502 Landscaping and Buffering Standards. It is designed to be used concurrently with TMC 13.06.502 to ensure the requirements and standards are executed properly.

### 2015 Tacoma 2025

Tacoma 2025 is the community's vision for Tacoma's future, and directs resources to reflect the growing community's evolving needs. With defined indicators and other ways to measure progress, it is a plan that guides where the City of Tacoma is going over the next 10 years. The plan's priorities fall into five key focus areas: livability, economy/workforce, education, civic engagement, and equity and accessibility—all elements that are supported by this Plan.

### **2015 One Tacoma – Comprehensive Plan**

One Tacoma guides Tacoma’s development over the long term, addresses the entire community, and describes how the community’s vision for the future is to be achieved. It is a blueprint for the future character of the City by guiding decisions on land use, transportation, housing, capital facilities, parks, and the environment. This Plan’s strategies align with the goals and objectives of One Tacoma.

### **2016 Tacoma Environmental Action Plan**

The Environmental Action Plan (EAP) is a list of meaningful, high-priority actions that the City of Tacoma and the community will take between 2016 and 2020 to meet the environmental goals outlined in the Tacoma 2025 Strategic Plan. The long-term goals for Tacoma’s “natural systems” described in the EAP related to urban forestry include: 1) Sustain and improve Tacoma’s natural environment; 2) ensure that all Tacomans have access to clean air and water, can experience nature in their daily lives, and benefit from low-impact development; 3) foster appreciation and stewardship of wildlife and natural resources; and, 4) restore damaged shorelines and marine ecosystems and protect salmon habitat along the many rivers and streams that flow into Commencement Bay.

### **2016 Right-Of-Way Design Manual**

The City of Tacoma (City) Right-of-Way Design Manual (Manual) applies to the construction of all street and right-of-way (ROW) improvements including stormwater and wastewater construction, streetlighting, traffic signalization, landscaping, ADA requirements, and channelization. The Manual provides the minimum technical standards required to construct improvements within the City ROW.

The minimum technical standards described in this Manual help ensure public infrastructure that is effective, efficient, economical, and sustainable.

### **2017 Strategic 20-Year Passive Open Space Plan**

In 2015-2016, Forterra and American Forestry Management (AFM) applied the Forest Landscape Assessment Tool (FLAT) to the nearly 500 passive open space acres owned by the City throughout Tacoma to develop a plan for City staff to focus efforts on prioritized areas.

See [Tacoma’s Open Space and Critical Areas](#) (page 41) of this report for more information.

### **2018 Environmental Services Strategic Plan 2018 – 2025**

In 2013, Environmental Services became a new department and implemented its first strategic plan (2013 – 2018). The updated 2018-2025 Strategic Plan serves as the Department’s agenda and guides decisions for through 2025 for healthy neighborhoods, a thriving Puget Sound, and better Tacoma for all. Environment, equity, and engagement are addressed in this strategic plan for its customers; communications, training, and culture for its employees; and practices, budgets, and planning for its operations.

## SUMMARY OF DATA AND STUDIES REVIEWED

### 2018 Tree Canopy Assessment

A high-resolution land cover assessment was performed to identify existing tree canopy cover, available vegetative planting space, and possible impervious planting space. Data was summarized Citywide and by land use, U.S. Census Block Groups, and watersheds. The assessment provides updated data to the 2009-2011 tree canopy assessment and is used to develop this Plan's short- and long-term strategies.

See [Tacoma's Citywide Tree Canopy Assessment](#) (page 35) of this report for more information.

### 2019 Sample Tree Inventory

As part of this Urban Forest Management Plan project, a sample inventory of trees within the public rights-of-way was conducted in April 2019. This sample was randomized across the City's five Councilmanic Districts and by land use type. The sample inventory was conducted for a better understanding of the City's baseline conditions to inform this Plan's strategies.

See [In-Depth Analysis of Tacoma's Public Trees](#) (page 44) of this report for more information.

### 2019 Tacoma Mall Tree and Planting Inventory (public & private)

In May of 2018 City Council adopted the Tacoma Mall Neighborhood Subarea Plan. This plan sets forth a vision for the neighborhood's future and is intended to reflect community aspirations for the neighborhood while planning for anticipated growth. To support implementation of the Subarea Plan's goals, an inventory of trees in the public rights-of-way and private property was conducted in 2019. During the inventory, possible planting spaces were also inventoried in the ROW. This information is being applied to a neighborhood urban forest action plan that will support the Citywide Urban Forest Management Plan.

See [In-Depth Analysis of Tacoma's Public Trees](#) (page 44) of this report for more information.

### 2019 Urban Heat Island Study

In 2018, researchers from the Sustaining Urban Places Research (SUPR) Lab at Portland State University visited Tacoma to collect high resolution urban heat data. The study describes levels of exposure to environmental stressors and the role of tree canopy on human health at the sub-neighborhood scale.

See [Tacoma Urban Heat Islands](#) (page 38) of this report for more information.

### 2019 Urban Forest Management Plan

The Plan will be finalized in late 2019 and is expected to be adopted by City Council by December 2019.

### Other Planning Resources

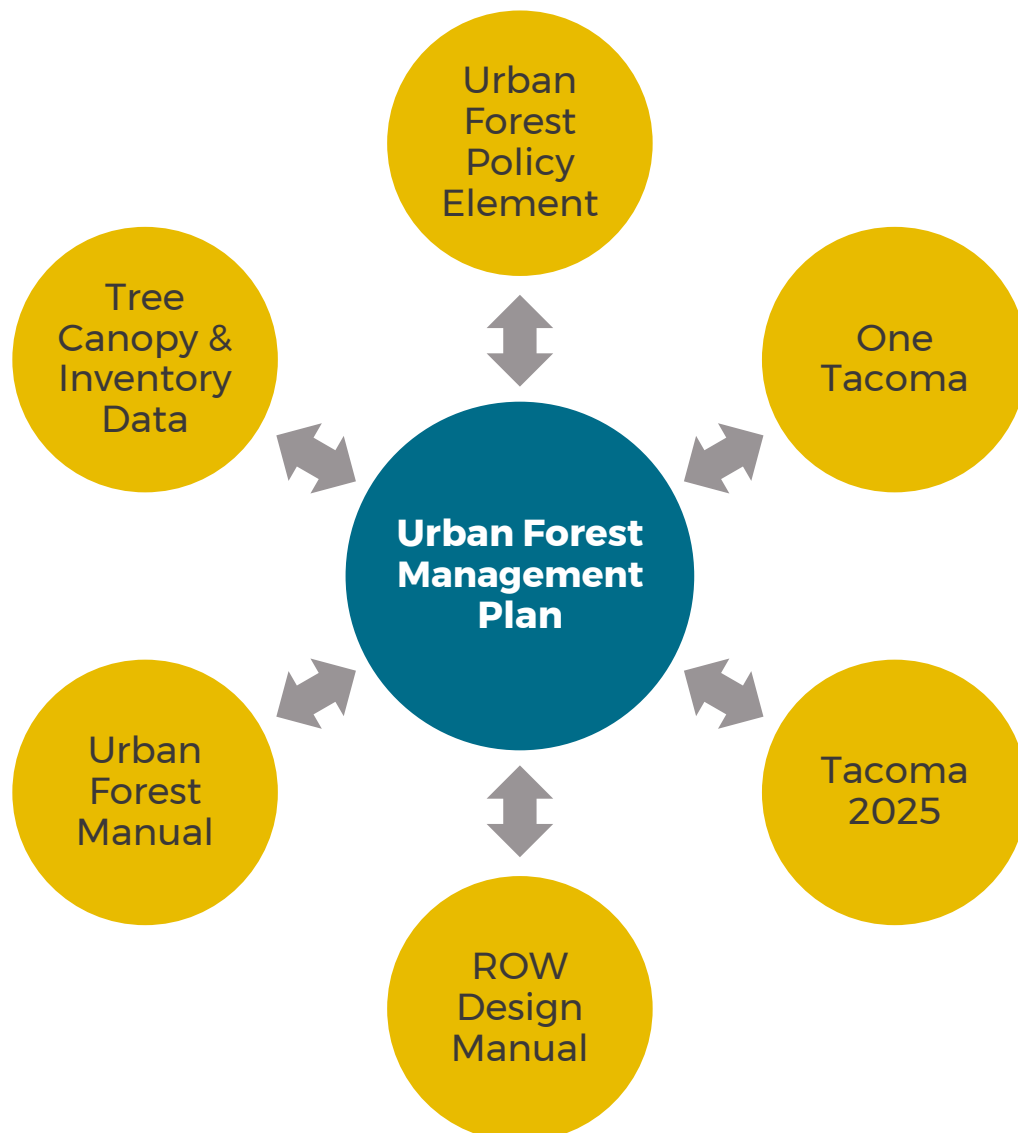
2010 Neighborhood Business Districts Urban Forest Management Plan, Tacoma Mall Subarea Plan, Tacoma Mall Strategic Urban Forest Management Plan, and various plans and standard operating procedures among other City Departments and stakeholders.

## CONCLUSION

The audit of existing conditions and operations included extensive reviews of City planning documents in order to align strategies, support ongoing efforts, and establish a context for the Plan.

The 2010 Urban Forest Policy Element is the foundation from which strategies in the Urban Forest Management Plan will be supported. The 1992 Urban Forest Management Plan established the framework for an urban forestry program and the 2019 Plan will provide the roadmap to achieve long-term urban forest sustainability. The Urban Forest Manual and the Right-of-Way Design Manual provide the guidance for supporting the Urban Forest Management Plan's strategies. These strategies will be developed based on the data from canopy assessments and inventories and will be aligned with relevant goals, objectives, and strategies in other plans such as One Tacoma, the Environmental Action Plan, and the Passive Open Space Plan. Implementation of the strategies in these plans will complement and support urban forestry and implementation of this Urban Forest Management Plan will support various goals in the other plans.

Figure 1. Policies and plans supporting urban forest management





## ELEMENT 2:

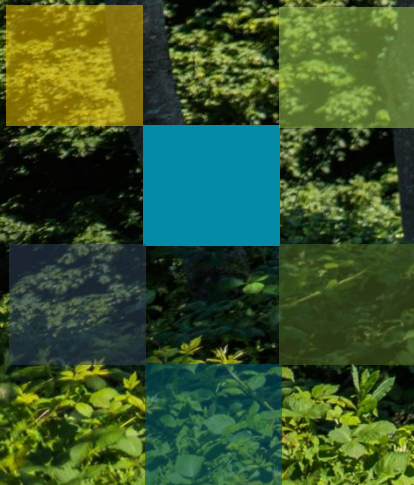


## CITY STAFF INTERVIEWS



## PURPOSE

To understand existing internal infrastructure and processes around tree management, and to further define areas of further investigation for the USFS Urban Forest Sustainability and Management Audit.



## ELEMENT #2: CITY STAFF INTERVIEWS

### PURPOSE

To understand existing internal infrastructure and processes around tree management, to define areas of further investigation, and to establish a shared vision for this Plan.

### PROCESS

The UF Team met with City staff in early May 2019 to discuss the interactions and operations relating to urban forestry throughout City departments. Interviews were organized into six staff groups, based on the structure of City departments, divisions, and work groups, and the understanding of their existing and potential influences on the urban forest:

- 1) Operations, Tree Hazards, & Risk Management
- 2) Planning & Design
- 3) Data & Information Technology
- 4) Outreach, Communication, & Marketing
- 5) Neighborhood Revitalization
- 6) City Code, Policies, & Standards

A total of 10 different departments or offices were represented at the meetings and a total of 25 Work Groups were interviewed. These Work Groups are listed in the meeting summaries below. The departments or offices represented include:

- Neighborhood & Community Services Department (NCS)
- City Attorney (Legal)
- Public Works Department (PWD)
- Planning & Development Services Department (PDS)
- Environmental Services Department (EnvScs)
- Information Technology Department (IT)
- City Manager's Office (CMO)
- Office of Equity & Human Rights (OEHR)
- Office of Arts & Cultural Vitality
- Community & Economic Development Department (CED)

An overview of the Departments, Divisions, and Work Groups represented at each of the interviews and meetings is represented below. Comprehensive notes were recorded for each meeting and these notes were synthesized. A summary of recurring themes, resource needs, and workflow gaps identified during the interviews are provided below. In addition, the existing workflows and structure of City departments is provided.



Table 2. Summary of departments and work groups represented at project interviews

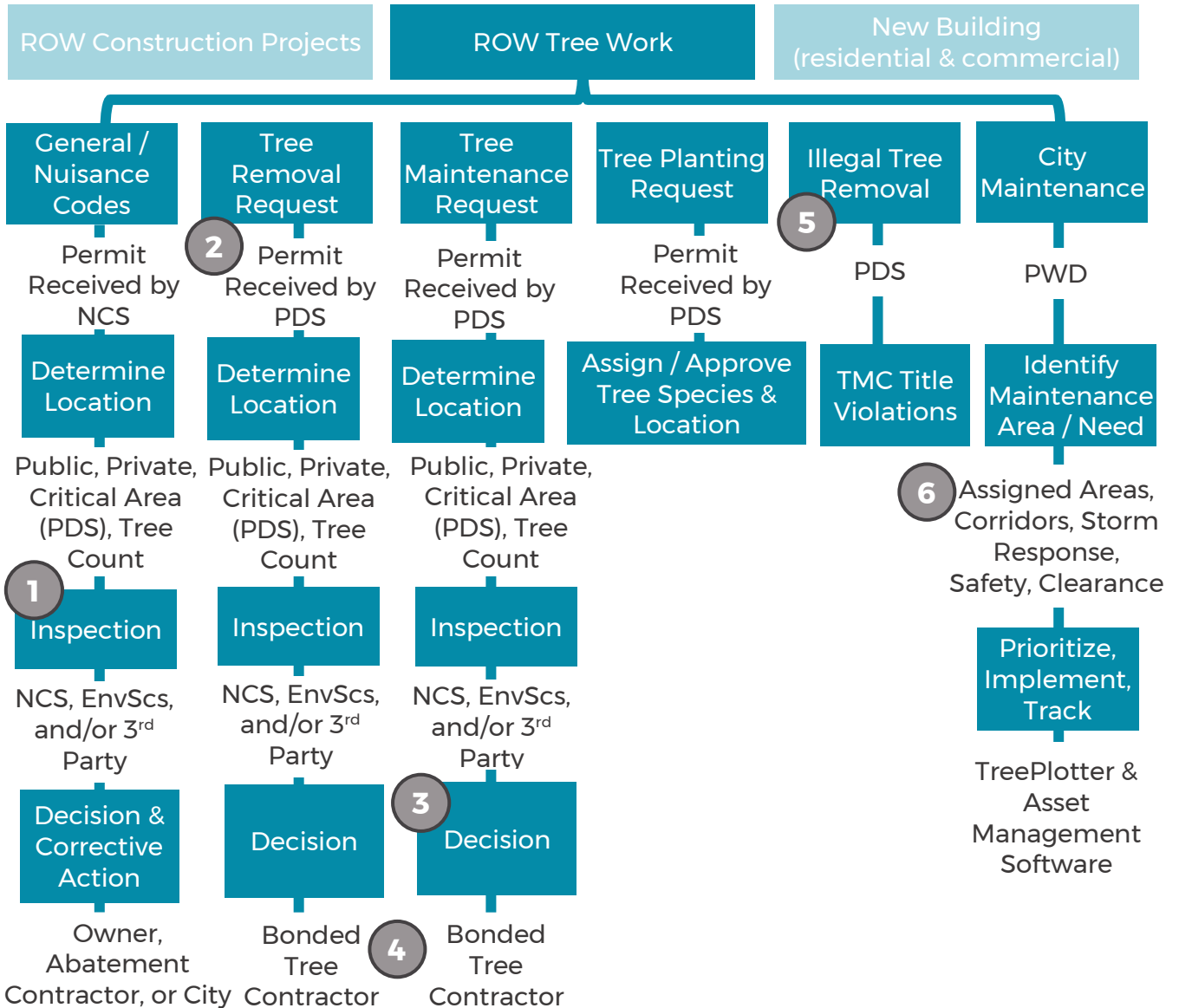
<b>1) Operations, Tree Hazards, and Risk Management Interviews</b>	
<i>Department/Division</i>	<i>Work Group</i>
NCS Code Enforcement	General/Nuisance Codes
NCS Community Based Services	Neighborhood Enhancement Team
City Attorney (Legal)	Civil Division
PWD Street Operations	Grounds Maintenance
EnvScs	Urban Forestry
<b>2) Planning and Design Interviews</b>	
PDS Site & Building	Site Review
PWD Engineering	Traffic Programs Engineering Street Design Sidewalk Program ADA Services
EnvScs	Urban Forestry
<b>3) Data and Information Technology Interviews</b>	
EnvScs Science & Engineering	Technical & Business Operations
IT Information Technology	GIS Service
PWD Street Operations	Grounds Maintenance
EnvScs	Urban Forestry
<b>4) Outreach, Communication, and Marketing Interviews</b>	
OEHR	OEHR
CMO	Media & Communications Customer Support Center (311)
PWD Engineering	Traffic Programs
EnvScs	Office of Environmental Policy & Sustainability Urban Forestry
<b>5) Neighborhood Revitalization Interviews</b>	
NCS Community Based Services	Neighborhood Council Liaison
Offices of Arts & Cultural Vitality	Tacoma Arts Commission
CED	Neighborhood Business District Revitalization
PDS Site & Building	Site Review
EnvScs	Urban Forestry
<b>6) City Code, Policies, and Standards Interviews</b>	
EnvScs Science & Engineering	Open Space
PDS Land Use	Critical Areas
PDS Site & Building	Planning Site Review
PDS	Land Use
EnvScs	Urban Forestry

# RESULTS

## Existing City Workflows and Operations

Based on the City staff interviews, existing workflows and operations were extensively detailed. Potential gaps, resource needs, inconsistencies, and conflicting workflows were identified in the process. The following diagram provides a summary of these operations, noted concerns, and recurring themes. The diagram provides a very broad description of the processes relating to trees though actual workflows are more intricate and complex.

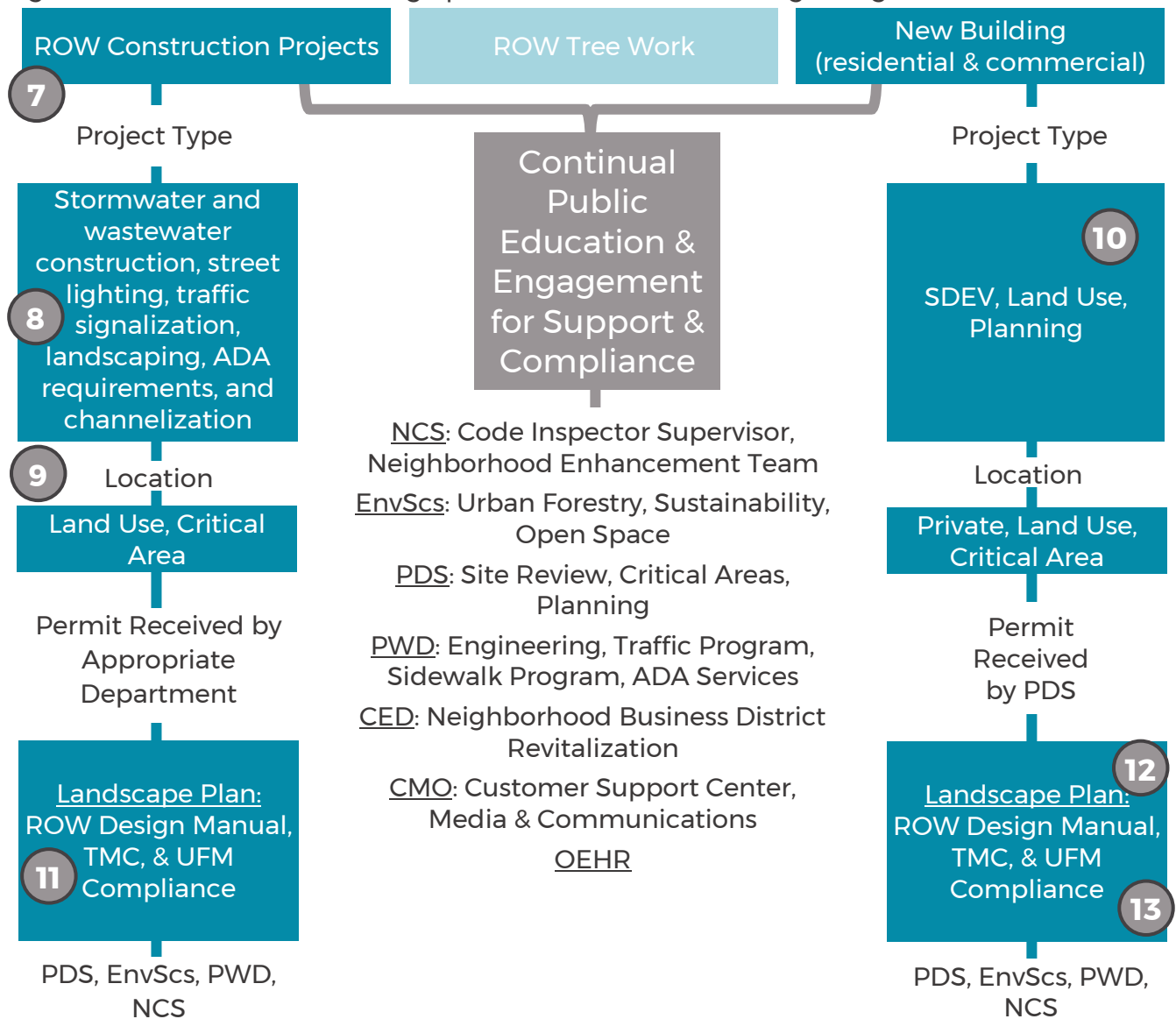
Figure 2. Overview of the existing operations and workflows for trees in the rights-of-way



### Workflow Improvements

- 1 -Tree Inspections: Inspectors are lacking arboricultural and tree risk assessment expertise. The on-call 3<sup>rd</sup> party inspector isn't local, resulting in long review turnarounds.
- 2 -Permit System: Inconsistent or unclear procedures, workflows, roles, and responsibility.
- 3 -Tree Maintenance Decision: Need consistent/enforced tree maintenance guidelines.
- 4 -Tracking: Lack of consistent tracking of requests, trees, and action in City's tree software.
- 5 -Illegal Tree Removal: Lack of heritage tree program or tree preservation enforcement.
- 6 -City Tree Maintenance: Reactive maintenance, limited resources, inconsistent maintenance approach. Lacking a clear understanding of City-maintained areas.

Figure 3. Overview of the existing operations and workflows regarding trees and construction



**Workflow Improvements**



- 7 -Permitting Process: Unclear roles and responsibilities in the permitting process.
- 8 -Utility ROW Projects: Permitting gaps exist for other government utility projects.
- 9 -City ROW Projects: Gaps exist in the permitting process for PWD projects in the ROW.
- 10 -Single-Family Land Use Development: Improvements can be made to tree requirements.
- 11 -Compliance: Gaps in policy existing for enforcement of compliance and penalties.
- 12 -Landscape Plan Review: Need ongoing training of department staff on tree-related issues.
- 13 -Fulfillment of Landscape Plan: Lack of resources to follow-up on project installation, aftercare of trees, and survival of newly planted trees even though a bond is in place.

UFM = Urban Forest Manual, TMC = Tacoma Municipal Code, ROW = Rights-of-Way  
 City Departments of Environmental Services (EnvScs), Planning & Development Services (PDS), Public Works (PWD),  
 Neighborhood & Community Services (NCS), Community & Economic Development (CED), City Manager's Office  
 (CMO), Office of Equity & Human Rights (OEHR)  
 ADA = Americans with Disabilities Act  
 SDEV = Commercial Site Development

## CONCLUSION

Recurring needs identified during workgroup discussions and City staff interviews that are within the scope of the Plan's strategies are listed below:

- Development or improvement of Standard Operating Procedures and workflows, to include issues like hazard tree evaluation, permit/plan review, capital project design, enforcement, and notification.
- Provide clarity on roles and responsibilities (City and public) regarding urban trees.
- Establish, revise, or clarify current permitting processes and triggers.
- Provide City staff training regarding Urban Forestry and tree management.
- Provide urban forestry resources/informational materials for City staff, property owners, developers, and occupants.
- Provide internal technical support, such as a City Arborist to support multiple departments and workgroups including hazard tree evaluation, permit/plan review, capital project design, and code enforcement.
- Identify priority “tree corridors” for City resource allocation, invest in tree maintenance, and identify planting opportunities.
- Develop and implement a voluntary heritage/historic tree program and protection regulations.
- Develop short and long-term strategies that support the Comprehensive Plan and the performance indicators/metrics to evaluate progress.
- Provide policy clarification and direction on critical issues including illegal tree cutting, inspection and enforcement for development, and handling competing interests such as infrastructure conflicts.

Detailed meeting notes were provided to the City’s Environmental Services Department. Items noted above are consistent with the Urban Forest Policy Element’s management goals, goals in One Tacoma, results of the tree canopy and inventory analyses, and outcomes from the public engagement exercises described in the Community Engagement section of this report.



## ELEMENT 3:



## URBAN FOREST BENCHMARKS



## PURPOSE

To understand the level of effort and capacity necessary to satisfy the City's adopted goals, to identify industry trends and best practices, and to ensure urban forest sustainability.

## **ELEMENT #3: URBAN FOREST BENCHMARKS**

### **PURPOSE**

To understand the level of effort and capacity necessary to satisfy the City's adopted goals, to identify industry trends and beset practices, and to ensure urban forest sustainability. Benchmarks help to gauge Tacoma's investment in community tree management compared to other communities facing similar issues in urban forest management.

### **PROCESS**

Below is an overview of the resources used to research the performance and standards of cities of similar sizes across Washington and the United States.

## **SUMMARY OF BENCHMARKING RESOURCES**

### **Arbor Day Foundation Tree City USA Database**

To qualify as a Tree City USA community, four standards established by the Arbor Day Foundation and the National Association of State Foresters must be met. These standards were established to ensure that every qualifying community would have a viable tree management program and that no community would be excluded because of size. Communities must submit documentation for these standards each year for Tree City USA accreditation. These standards include:

- 1) An established tree board or department
- 2) A tree care ordinance
- 3) A community forestry program with an annual budget of at least \$2 per capita
- 4) An Arbor Day observance and proclamation

This information submitted by communities is accessible for research and benchmarking purposes. The UF Team acquired this data for 2018 to analyze and compare urban and community forestry programs both regionally and nationwide. For more information about the Tree City USA program, visit [www.arborday.org/programs](http://www.arborday.org/programs).

### **Municipal Tree Care and Management in the United States: A 2014 Urban & Community Forestry Census of Tree Activities**

This report, produced by Richard Hauer of University of Wisconsin – Stevens Point and with support from numerous partners and organizations (Hauer and Peterson, et al.), includes research and analysis of data from 667 communities throughout the United States to summarize the many approaches communities take to manage public trees. This report shows how communities are managing their trees on average, and how their municipal urban forestry operations are organized and funded.

### **2015 Inventory of Trees on City-Owned Facility Properties**

In 2015 the City of Tacoma received a grant from the Washington Department of Natural Resources (WADNR) Urban and Community Forestry Program (UCF) and U.S. Forest Service (USFS) to inventory trees located on City-owned facility properties. The 69 sites inventoried included Fire Stations, Police Stations, Senior Centers, Parks, Libraries, Theaters, the Tacoma Dome, Municipal Buildings, Surface parking lots, and Power and Water Substations. The number of trees and maintenance recommendations were evaluated to assess the City's current maintenance responsibilities compared to similar jurisdictions.

## SUMMARY OF BENCHMARKING CATEGORIES

### Comparisons to Washington Communities

- A. *Washington Urban and Community Forestry Budgets*
- B. *Landmark and Heritage Tree Programs in Washington*
- C. *General Tree Regulations for WA Jurisdictions*

### Regional and Nationwide Comparisons

- D. *Regional Tree Canopy Cover, Canopy Goals, and Public Tree Numbers*
- E. *Regional and Nationwide Urban and Community Forestry Program Benchmarks*
  - *Municipal Code and Policy*
  - *Urban and Community Forestry Operations*
  - *Urban and Community Forestry Public Outreach*
- F. *Current Urban Forest Management Activities in Tacoma*
  - *Tree Maintenance Demands on City Facility Grounds*
  - *City Tree Planting Archives*
  - *2018 Urban Forestry Expenditures by Partners*

### Internal Benchmarking Research

- G. *Tacoma Municipal Code and Policy Review*

## RESULTS

Understanding the urban forest policies, management approaches, budgets, and programs of comparable communities and nationwide averages provides comparative data to benchmark Tacoma's performance; present and future. While existing tree data describe the current condition, benchmarks offer guidance to bring Tacoma's urban forestry policies and practices into alignment with similar-sized cities in Washington and nationwide, enhancing urban forest management. A summary of research into policies and practices of these cities follows.

### A. Washington Urban and Community Forestry Budgets

Budget data submitted by Washington cities to the Arbor Day Foundation's Tree City USA award was analyzed as part of the benchmarking research. Eleven municipalities were selected to benchmark across the City of Tacoma:

Table 3. 2018 Washington municipal urban forest per capita expenditures and maintenance responsibility

Rank	City	2018 Population	2018 U&CF Total Budget	2018 Per Capita	City Maintains ROW Trees?
1	Bellevue	139,014	\$7,287,080	\$52.42	No
2	Longview	36,740	\$858,720	\$23.37	Yes
3	Olympia	49,928	\$914,740	\$18.32	Yes
4	Kirkland	86,772	\$1,568,690	\$18.08	No, except CBD
5	Renton	99,692	\$1,771,581	\$17.77	No
6	Seattle	724,764	\$10,168,821	\$14.03	Select Areas
7	Redmond	60,712	\$679,079	\$11.19	No
8	Vancouver	171,393	\$1,524,385	\$8.89	Select Areas
9	Bellingham	85,388	\$672,118	\$7.87	Select Areas
10	Tacoma	207,280	\$1,609,909	\$7.77	No
11	Spokane	212,982	\$894,620	\$4.20	Select Areas
































Using Arbor Day Foundation data, not all costs associated with all urban and community forestry (U&CF) expenditures for the year may be included in the numbers, though, it is likely the numbers are relatively precise with true municipal expenditures.

“Maintains ROW Trees” is referring to systemic management of developed right-of-way tree populations, not reactive management to avoid or mitigate risk. “CBD” indicates Central Business District, commonly known as a downtown area or similar retail district.

There are 32 cities in Washington with dedicated municipal arborist staff, and/or urban & community forest staff, out of a total of 281 total municipalities. Of the 281 municipalities, 95 are designated Tree City USA by the Arbor Day Foundation, including Tacoma. Tacoma has been a Tree City USA for 25 years, the States 12<sup>th</sup> longest designated Tree City USA.

Compared to other Washington cities, Tacoma ranks 10<sup>th</sup> in terms of municipal urban forest per capita expenditures (\$7.77 per capita includes expenditures beyond the UF Program). 

Table 4. Summary of Tree City USA communities and 2018 U&CF expenditures

City	Tree City USA	Years TCUSA as of 2019	Total Accounted U&CF Expenditures 2018	Population (2018)
Auburn	Yes	16	\$181,419.40	 82k
Bainbridge Island	Yes	14	\$68,449.00	 25k
Bellevue	Yes	28	\$7,287,079.82	 139k
Bellingham	Yes	23	\$672,118.27	 85k
Bothell	Yes	19	\$119,763.19	 47k
Bremerton	Yes	23	\$85,904.67	 41k
Ellensburg	Yes	36	\$59,030.86	 21k
Everett	Yes	26	\$315,409.04	 111k
Issaquah	Yes	26	\$173,880.10	 39k
Kent	Yes	17	\$287,202.93	 130k
Kirkland	Yes	17	\$1,568,690.07	 87k
Lacey	Yes	28	\$260,964.73	 51k
Lake Forest Park	Yes	16	\$264,697.86	 14k
Longview	Yes	35	\$858,720.00	 37k
Mercer Island	Yes	2	\$621,757.38	 26k
Olympia	Yes	26	\$914,740.31	 50k
Pasco	Yes	12	\$148,218.00	 75k
Pateros	Yes	6	\$31,690.00	 <1k
Redmond	Yes	20	\$679,079.42	 61k
Renton	Yes	11	\$1,771,580.80	 100k
Richland	Yes	21	\$241,598.76	 57k
SeaTac	Yes	10	\$239,080.03	 29k
Seattle	Yes	34	\$10,168,821.00	 725k
Shoreline	Yes	7	\$278,515.27	 57k
Snoqualmie	Yes	9	\$410,637.30	 14k
Spokane	Yes	16	\$894,619.68	 213k
Sumner	Yes	25	\$87,938.06	 10k
Tacoma	Yes	25	\$1,609,909.35	 207k
Vancouver	Yes	30	\$1,524,385.13	 171k
Walla Walla	Yes	25	\$137,027.95	 33k
Yakima	Yes	3	\$263,600.00	 94k

 Provides representation of population ranges (0-10k, 10k-40k, 40k-80k, 80k-100k, 100k-140k, 140k-220k, >220k)  
k = 1,000



## B. Landmark and Heritage Tree Programs in Washington

Landmark and heritage tree programs are established in communities to protect trees that are significant in size, species, location, age, history, and/or culture. Such programs are often developed to protect and preserve trees in the public rights-of-way that provide significant benefit to the community's well-being, environment, economy, or other factors. Currently, Tacoma has no such program in place and this benchmarking research provides baseline data and approaches for consideration.

Table 5. Summary of landmark and heritage tree programs in the State of Washington

Jurisdiction	Description of Qualifying Trees	Voluntary?	Designation Committee	Recorded on Title?
<b>Auburn</b>	N/A	N/A	N/A	N/A
<b>Bainbridge Island (expired)</b>	Select species and diameter depended. Approx. 25 species were selected and supplied a diameter criteria.	No	N/A	No
<b>Bonney Lake</b>	Size ≥ 36" Distinctive in Size/Age	Yes	N/A	No
<b>DuPont</b>	White Oak Preservation	N/A	N/A	N/A
<b>Federal Way</b>	N/A	N/A	N/A	N/A
<b>Issaquah</b>	Any trees ≥ 30" diameter Distinctive in Size/Age	No	N/A	No
<b>Issaquah</b>	Historic or Ecological Value	Yes	Park Board Planning Director decision	No
<b>Lacey</b>	Historical value only	Yes		Yes
<b>Lake Forest Park</b>	Any tree ≥ 28" diameter	No	N/A	No
<b>Lakewood</b>	N/A	N/A	N/A	N/A
<b>Lynwood</b>	Size, Age, Usual Species, Historical Association	Yes	Park and Recreation Board	Yes
<b>Mercer Island</b>	Grove: mature, distinctive, historic. Tree: tree ≥ 36" diameter, unique/historic	Yes	City Arborist	Yes
<b>Olympia</b>	Historic, rare, unusual species or exceptional aesthetic quality	Yes	Planning Director decision	Yes
<b>Port Orchard</b>	Any trees ≥ 36" diameter	No	N/A	No
<b>Puyallup</b>	N/A	N/A	N/A	N/A
<b>Redmond</b>	Any healthy tree > 30" diameter	No	N/A	No
<b>Seattle (SDOT)</b>	Broad criteria: Specimen, Historic, Landmark, or Collection (groups of trees)	Yes	Volunteer committee	Voluntary
<b>University Place</b>	N/A	N/A	N/A	N/A
<b>Woodinville</b>	Tree(s) that are historic, rare/ unusual species or exceptional aesthetic quality	Yes	City Tree Board	No

### C. General Tree Regulations for Washington Jurisdictions

The following summarizes research conducted by the UF Team to identify regulations regarding trees for jurisdictions within Washington. The information provides potential considerations for addition or revision of Tacoma Municipal Code, policies, standards, and practices.

Table 6. Summary of tree regulations for jurisdictions in the State of Washington

Jurisdiction	ROW Tree Protection	Tree Requirements for Existing Single-Family Residential (SFR) Lots?	Tree Fee-in-Lieu?
<b>Bainbridge Island</b>	Road buffering & setbacks	Only >7,000 square foot clearing, requires 35% native lot conservation	No
<b>Bonney Lake</b>	Street tree protection	Only on sub-dividable lots	New in 2019
<b>King County</b>	Street tree protection	No	No
<b>Lacey</b>	Street trees, road buffering & setbacks	<p><u>For New SFRs:</u>                      Lots &lt; 7,500 ft<sup>2</sup> must have between 2-5 trees depending on lot size.                      Lots &gt; 7,500 ft<sup>2</sup> must have 4 trees per 5,000 ft<sup>2</sup> lot size</p> <p><u>For Existing SFRs:</u>                      4 trees per 5,000 ft<sup>2</sup> lot size</p>	No
<b>Lake Forest Park</b>	Parcel specific canopy goals, setbacks.	<p>Canopy Coverage Goal:                      Lots &gt; 15,000 ft<sup>2</sup>: 58%                      Lots: 10,000-15,000 ft<sup>2</sup>: 39%                      Lots &lt; 10,000 ft<sup>2</sup>: 28%</p>	No
<b>Lake Stevens</b>	Road buffering & setbacks	New residences shall preserve or plant trees to achieve 2 or 3 trees per lot depending on zoning district.	Yes
<b>Olympia</b>	Street trees	<p>30 Tree Units/acre or,                      1 Tree Unit per 1500 ft<sup>2</sup></p> <p>See Minimum Tree Units that vary by property size:</p>	Yes
<b>Pierce County</b>	None	<p>30% of significant trees on site shall be retained, preferably reflective of the diversity of species and age within the stand, up to the minimum tree density requirements.</p> <p><u>Minimum Tree Density Requirement:</u>                      Urban Residential: 30 Tree Units/acre                      Rural Residential: 40 Tree Units/acre</p>	No
<b>Redmond</b>	Street tree disfigurement	<p><u>New Additions:</u> A minimum of 35% of the existing healthy significant trees on the site must be retained.</p> <p>Maximum number of significant trees allowed to be removed per year is based on lot size.</p> <p>Up to 10,000 ft<sup>2</sup> – 2 significant trees                      10,001 – 20,000 ft<sup>2</sup> – 4 significant trees                      20,001 – 30,000 ft<sup>2</sup> – 6 significant trees                      30,001 ft<sup>2</sup> or larger – 8 significant trees</p>	Yes

## D. Regional Tree Canopy Cover, Canopy Goals, and Public Tree Numbers

LEARN WHAT OTHER  
 CITIES IN THE  
 REGION ARE DOING <sup>23%</sup>


Table 7. Summary of tree data for jurisdictions in the region

	Tacoma, WA	Seattle, WA	Shoreline, WA	Kirkland, WA	Lynnwood, WA	Mountlake Terrace, WA	Des Moines, IA	Salem, OR
<b>Existing Canopy Cover</b>	19%	28%	37%	38.30%	N/A	N/A	29%	18.30%
<b>Canopy Cover Goals</b>	30%	30%	40%	40%	N/A	N/A	N/A	30%
<b>City Acreage</b>	39,948 ac	53,619 ac	7,500 ac	13,196 ac	5,049 ac	2,662 ac	52,864 ac	31,008 ac
<b>Population</b>	207,280 pop.	724,764 pop.	55,431 pop.	86,772 pop.	37,242 pop.	20,922 pop.	214,778 pop.	424,982 pop.
<b>Mean Population Income</b>	\$55,506	\$86,822	\$67,076	\$104,319	\$58,852	\$69,727	\$46,430	\$56,163
<b>Mean Population Age</b>	35.9	35.6	41.7	38.2	39.6	36.7	33.9	36.6
<b>Urban Forest Emergency Mgmt. Plan?</b>	No	Yes	No	Yes	No	No	No	No

## E. Regional and Nationwide Urban and Community Forestry Program Benchmarks

In 2014 an analysis of Municipal Urban Forestry practices, management, budgets and benefits was conducted by the University of Wisconsin and Davey Resource Group. The following table provides a summary of nationwide averages, western region averages, and Tacoma's current standings. These values provide a general estimate of what may be feasible for Tacoma in terms of public trees per capita, canopy goals, future funding, staffing levels, and operations.

Table 8. Hauer and Peterson, et al. 2014 - urban forest benchmark analysis

	Average Across U.S.	Average Western Region	Average Population Group 100k - 250k	Tacoma
<b>General</b>				
Number of public trees	55,332	34,939	73,723	46,685
Public trees per capita	0.55	0.38	0.51	0.23
Canopy goals	44%	n/a	n/a	30%
<b>Funding</b>				
Total municipal budget, excluding school budget	\$200,316,126	\$205,786,179	\$331,018,081	\$2,700,114,363 (2-year)
Average annual tree care and program budget	\$801,595	\$675,314	\$1,368,607	\$1,609,909 (includes partners)
Average budget per public tree	\$37.5	\$33.72	\$44.85	\$34.48
Average budget per street tree	\$42.59	\$38.77	\$64.35	\$45.99
Average annual budget per capita	\$8.76	\$7.75	\$9.05	\$7.77 (includes partners)
Tree care and management program budget percent of total municipal operating budget	0.50%	0.40%	0.50%	0.07%
<b>Program Management</b>				
State License or Credential on staff	23%	n/a	31%	Yes
ISA Certified Arborist on staff	61%	n/a	92%	Yes
ISA Advanced Credential on staff	11%	n/a	26%	Yes
ISA Municipal Specialist on staff	15%	n/a	27%	Yes
How many cities have a public electric utility?	17%	n/a	n/a	Yes
Emergency management plan related to trees/UF?	55%	n/a	74%	No


(Table 8 continued)



	Average Across U.S.	Average Western Region	Average Population Group 100k - 250k	Tacoma
<b>Parks, Open &amp; Green Space</b>				
Acres park land	1010	637	1284	2,960 Metro Tacoma Parks, 496 City of Tacoma
<b>Municipal Code and Policy</b>				
Tree protection ordinances	89%	n/a	98%	Yes
Active enforcement of code?	64%	N/A	N/A	Yes
<b>Tree Operations &amp; Maintenance</b>				
Systematic tree care vs Relative Management	55.00%	n/a	48.00%	Current: Relative
Number of trees planted annually	629	356	634	150
Number of trees pruned annually	2108	2813	3897	<100
Number of trees removed annually	467	226	593	<100
Number of trees treated for pests annually	265	245	339	N/A
Rotational pruning goals?	5 year	n/a	5 year	5 year
<b>Tree Benefits</b>				
Total value of publicly owned trees	\$68,665,110	\$74,841,722	\$98,460,117	\$935,038 (i-Tree*, 2019)
<b>Community and Stakeholders</b>				
Tree City USA	73%	n/a	96%	Yes
Have volunteers taking part in tree activities	65%	n/a	75%	Yes
Have volunteers involved in tree planting	85%	n/a	n/a	Yes

\*A study in 2019 was conducted using the i-Tree suite of tools ([www.itreetools.org](http://www.itreetools.org)) with City tree inventory data.

Tacoma has an estimated 46,685 public trees and a goal of 30% tree canopy cover. In contrast to other cities, the percent of tree care and management program budget compared to the total operating budget is well below average (0.07% compared to 0.40% western community average).



Hauer & Peterson, et al. 2014 *Municipal Tree Care and Management in the U.S.*

Cities comparable in size to Tacoma (100,000 to 249,999 people) spent \$9.05 per capita on urban forestry.



Between 2011 through 2015, the City of Tacoma spent an average of \$1.31 per capita on the urban forestry program. If Metro Parks expenditures are included, urban forest expenditures in Tacoma total \$1.96 per capita, approximately 1/5 of the national average for cities the size of Tacoma.

Hauer & Peterson, et al. 2014 *Municipal Tree Care and Management in the U.S.*

## URBAN AND COMMUNITY FORESTRY PROGRAM BUDGET SUMMARY

In communities throughout the United States, funding for urban forestry primarily comes from the General Fund, making up 71.2% of the national average for funding. From 2011 to 2015, 61% of Tacoma's urban forestry funding came from the Surface Water Utility fee and 35% from Metro Parks Tacoma.

According to the 2014 report from Hauer, R., Peterson, W. et al., cities spend half of their urban forestry budget on tree pruning and tree removal. About 14% of municipal budgets go towards tree planting. 8% of the budget is used for supervision and 6.6% is used for administrative work. Most of the remaining 23% is used for various operating expenditures.

Between 2011 and 2015, the City of Tacoma spent an average 26% of the urban forestry budget on pruning and removals, 55% on planting, 5% on staffing and 14% on various operating expenditures. The exceptionally low tree maintenance budget (for pruning and removals), compared to national averages, prevents the City of Tacoma from having a systematic tree care program involving regularly scheduled tree maintenance.

In the 2014 report, 63% of communities have systematic tree care on a continual basis, with an average pruning cycle for each municipally-managed tree of 6.6 years. Systematic tree care is directly related to a significant reduction in tree failures affecting public health and safety.

### F. Current Urban Forest Management in Tacoma

#### **Tree Maintenance Demands on City Facility Grounds**

The inventory of trees on City facility property assessed 1,950 trees on 69 sites and included a technical report for the inventory. Not all properties owned by the City were completed nor were any portions of right-of-way that the City is responsible to maintain (such as medians). An inventory and assessment on the 52 remaining City-owned facilities and the portions of the ROW the City is responsible to maintain is still required.

To develop strategies for the care of City-owned trees, existing conditions were reviewed and summarized in planning Element #4, High-Level and In-Depth Data Analysis. To establish tree maintenance baselines and benchmarks, the trees on City-managed facilities were closely analyzed in this planning element (#3, Urban Forest Benchmarks).

The City is exploring options to complete tree inventories on City-owned properties and facilities. A City-staffed arborist crew could address tree maintenance needs, starting with high priority/highest risk tasks and progressing tree maintenance as funding follows. The current inventory results recommend maintenance for the majority of the trees inventoried (1,045) and about 3% require removal (68 trees).

Table 9. 2015 tree maintenance needs and responsibility for 69 inventoried City Facilities

Activity	City Facility					Total
	Public Assembly Facility	Tacoma Public Utilities	Public Works Grounds	Tacoma Public Library	Blank	
Prune	129	126	371	113	268	<b>1,007</b>
Remove	4	4	8	4	48	<b>68</b>
Remove Stake	0	0	0	0	19	<b>19</b>
No Action	32	174	193	50	396	<b>845</b>
<b>Total</b>	<b>165</b>	<b>304</b>	<b>572</b>	<b>167</b>	<b>731</b>	<b>1,939</b>

For detailed information regarding the specific maintenance needs by City facility, see Appendix C.

### City Tree Management Archives


In addition to efficient tree maintenance, this Plan's strategies address tree planting. By evaluating past planting efforts, specifically by the Environmental Services Department, and cross-examined with available and proposed budgets, realistic and achievable tree planting targets can be developed. The following provides a summary of past tree planting activities. This list identifies trees planted in public rights-of-way and excludes tree installations completed by development and redevelopment.

Table 10. 5-year urban forest management activities for all City partners (2013-2017)

	2013		2014		2015		2016		2017	
	\$	Total Trees	\$	Total Trees	\$	Total Trees	\$	Total Trees	\$	Total Trees
Trees Planted	\$247,217	1,842	\$144,731	1,313	\$42,230	1,163	\$173,558	1,672	\$199,725	731
Trees Maintained	\$112,159	3,000	\$51,801	3,526	\$144,315	3,526	\$220,447	--	\$229,831	--
Trees Removed	\$61,955	314	\$15,990	192	\$28,310	52	\$4,587	29	\$10,462	28
Management	\$414,425	--	\$390,301	--	\$613,255	--	\$242,118	--	\$244,400	--
Utility Line Clearance	\$391,168	--	\$670,423	--	\$659,746	--	\$684,570	--	\$862,134	--
Capital Improvement	\$931,468*	--	--	--	--	--	--	--	--	--
<b>Sub-Totals</b>	<b>\$2,158,392</b>		<b>\$1,273,246</b>		<b>\$1,487,856</b>		<b>\$1,325,280</b>		<b>\$1,546,579</b>	
Volunteers' Value (TCUSA)	\$48,670	4,700	\$42,430	1,588	\$45,937	2,077	\$30,526	1,404	\$26,225	--
<b>Total</b>	<b>\$2,207,062</b>		<b>\$1,315,676</b>		<b>\$1,533,793</b>		<b>\$1,355,806</b>		<b>\$1,572,804</b>	
City popul.	202,010		203,446		205,159		207,948		211,277	
<b>City per capita spend</b>	<b>\$10.93</b>		<b>\$6.47</b>		<b>\$7.48</b>		<b>\$6.52</b>		<b>\$7.44</b>	

\*Construction of City tree nursery

**5-YEAR URBAN FOREST ACTIVITY TOTAL**


 6,721 trees planted  
 10,052 trees maintained  
 615 trees removed (view 2018 on next page)

**AMOUNTS INCLUDE CITY PARTNERS  
(OEPS, TPU, METRO PARKS, PW)**



## 2018 Urban Forestry Expenditures by Partners

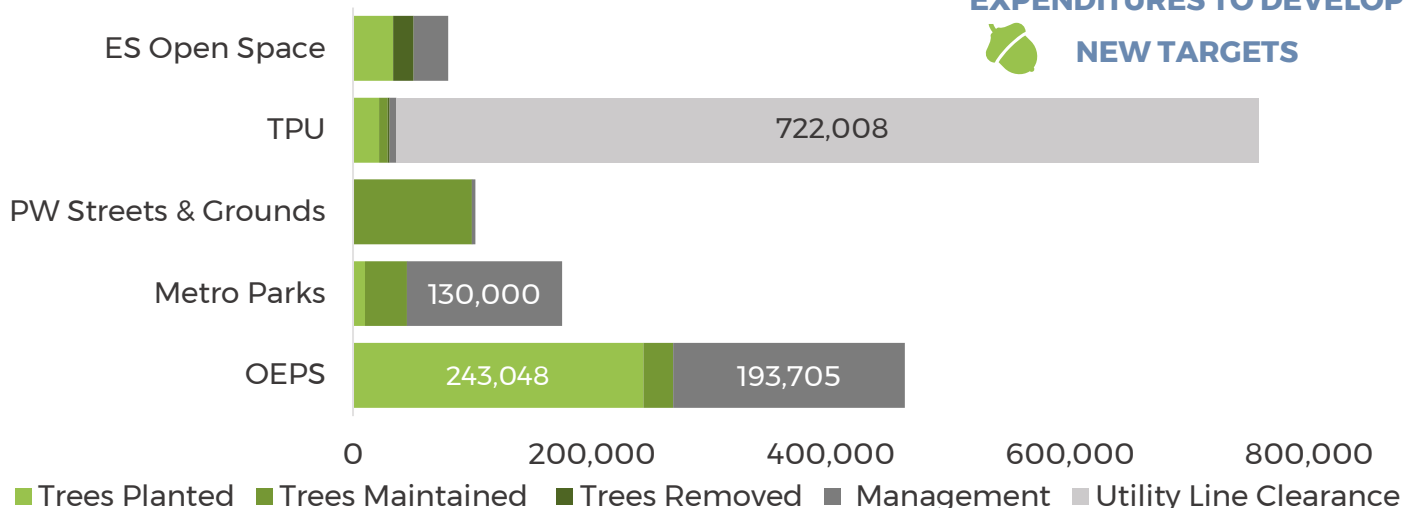
Table 11. Summary of expenditures by Tacoma partners and by management activity for 2018

	OEPS (\$)	Units	Metro Parks (\$)	Units	PW Streets & Grounds (\$)	Units	TPU (\$)	Units	ES Open Space (\$)	Units	Total Spend	Total Units
<b>Trees Planted</b>	243,048	1,086	10,000	168	0	0	21,900	146	33,630	1,235	<b>\$308,577</b>	2,635
<b>Trees Maintained</b>	25,048	39	35,000		99,388	2,300	7,040		0	0	<b>\$166,476</b>	2,339
<b>Trees Removed</b>		0	30		138	1	1,700	20	17,000	11	<b>\$18,868</b>	32
<b>Mgmt.</b>	193,705		130,000		3,000		5,589		29,095	NA	<b>\$361,389</b>	NA
<b>Utility Line Clearance</b>							722,008			NA	<b>\$722,008</b>	NA
<b>Sub-Totals</b>	461,801	NA	175,030	NA	102,526	NA	758,237	NA	79,725	NA	<b>\$1,577,319</b>	NA
<b>Volunteers</b>											<b>\$22,591</b>	
# of volunteers	275		30	<b>Total #</b>	<b>305</b>							<b>\$1,599,910</b>
# of hours	825		90	<b>Total hrs.</b>	<b>915</b>							
City per capita (2018 population: 213,418) spend (reported for TC USA)											\$7.50	

OEPS = Office of Environmental Policy and Sustainability, PW = Public Works Department, ES = Environmental Services Department, Mgmt = Management, NA = Not Applicable or Not Available, hrs = hours, TC USA = Arbor Day Foundation's Tree City USA Program

**USE CURRENT ACTIVITIES AND EXPENDITURES TO DEVELOP NEW TARGETS**

Figure 4. 2018 urban forestry expenditures by partner



The table and figure above describe the operations relating to urban forest management in Tacoma in 2018. A total of 2,635 trees were planted across all partners and a total of 2,339 trees were maintained in addition to 32 trees removed. A total of \$1,577,319 was spent on urban forest management and adding volunteer numbers and hours equates to \$1,599,910, or \$7.50 per capita. This summary of expenditures was prepared by the City as one of four requirements for Tree City USA accreditation by the Arbor Day Foundation.

In addition to the tree planting table on the previous page, this benchmark summary of urban forest management activities provides the baseline for strategies, targets for improvement, and the measurements which are provided in this Plan.



## G. Tacoma Municipal Code and Policy Review

A component of the Urban Forest Management Plan project included an analysis and revision to urban and community forestry policy and Tacoma Municipal Code (TMC) where necessary. The following information is summarized from the urban and community forest policy review. A more thorough analysis is provided as an Appendix (B) along with recommendations for revision. This review assessed the effectiveness of existing tree-related policy and municipal code within Tacoma and introduce new (to Tacoma) concepts standardized in the industry for urban and community forestry policy.

Based on the review of existing code and the benchmarking research completed, proposed recommendations for TMC were prepared and presented to City Council’s Infrastructure, Planning, and Sustainability (IPS) Committee in August 2019. These recommendations will be finalized for development of the Plan’s strategies.

The following provides seven key findings relating to urban forest policy and potential changes to Tacoma Municipal Code.

### **Key Findings - Opportunities for Alignment with One Tacoma Comprehensive Plan**

An analysis of One Tacoma was prepared with a focus on the urban forest to identify current policies and where improvement was necessary to meet the guidelines of One Tacoma. Nine urban forest principles were identified that directly associate with these policies. These nine elements, listed below, will facilitate the policies through direct, actionable policy items defined in the Urban Forest Management Plan Phase 2 document. The tables below provide a brief primer on how the urban forest elements correlate with One Tacoma, and how the two complement each other.

Table 12: Main urban forest elements associated with One Tacoma

One Tacoma Themes	
1) Resource Management a) Resilience and risk management b) Street trees c) Viewsheds	6) Long-term Funding  7) Climate Resiliency
2) Planning the Urban Forest	8) Municipal Code and Policy a) Preserving trees during development b) Landmark tree policy c) Single Title/consolidation
3) Education, Outreach, Collaboration	
4) Equity and Accessibility	
5) Canopy Growth-30/30	9) Environmental a) Net-loss b) Watershed-scale planning

**ALIGNING EFFORTS WITH  
OTHER PLANS IS RESOURCEFUL  
AND EFFECTIVE IN  
ACCOMPLISHING SHARED  
GOALS AND OBJECTIVES**




Table 13: Urban forestry companion to One Tacoma policies

1) Resource Management		
<b>1.a) Resilience and risk management</b> - Forest structure, composition and species diversity. - Risk management and avoidance. - Resource inventories and prioritization.	<b>1.b) Street trees</b> - Supportive places, improved livability. - Street design and engineering to support trees. - Street tree maintenance.	<b>1.c) Viewsheds</b> - Identification / management of preserved viewsheds. - Long-term ecological and geological net-loss reduction.
2) Planning the Urban Forest	3) Education, Outreach, Collaboration	4) Equity and Accessibility
- Inventories and assessments, levels of service.	- Targeted messages to various sectors.	- Equal levels of service and opportunities across Tacoma.
5) Canopy Growth - 30/30	6) Long-term Funding	7) Climate Resiliency
Maximize accessible planting areas and retain existing canopy to facilitate meeting a Citywide canopy cover goal of 30% by 2030.	- Diversified budget portfolio. - Encourage urban forest contribution from beneficiaries of tree benefits: stormwater, public health, energy distribution.	Risk Mitigation: identify and prioritize vulnerability to heatwave mitigation, urban heat island effect, and other climate-related emergencies.
8) Municipal Code and Policy		
<b>8.a) Preserving trees during development</b> Reduced canopy loss through preservation of trees during development action.	<b>8.b) Landmark tree policy</b> Voluntary preservation and catalogue of historic, cultural, memorial, and ecological significant trees.	<b>6.c) Single Title/consolidation</b> Clear access to Tacoma policies related to urban forestry.
9) Environmental		
<b>7.a) Net-loss</b> - No net loss of tree canopy. - Reduce tree canopy degradation within environmentally critical areas. - Reduce canopy fragmentation.	<b>7.b) Watershed-scale planning</b> - Plan and mitigate tree canopy connectivity on a watershed scale. - Track canopy and habitat connectivity across watersheds.	

**Key Findings - Current Organization of Urban Forest Policy**

It is important to promote and facilitate an inclusive and collaborative approach to urban forest planning that mitigates the barriers associated with interconnected and diverse public planning goals.

Currently, references to urban forest management components such as procedures, protocols, authority, and enforcement are dispersed inconsistently throughout Tacoma Municipal Code. Within the TMC, there exists no clearinghouse for these urban forestry components.

Elimination and/or prevention of organizational silos, workflow inconsistencies, permit ineffectiveness, and departmental disassociation are integral to the Plan's short- and long-term strategies. Strategies to advance tree planting and tree preservation to meet Tacoma's 30% tree canopy by 2030 goal—and supported by recommended changes to the TMC—will be developed based on the evaluations of existing conditions and operations of public agencies and departments across the municipal organization conducted for Phase 1 and summarized in this report.

Currently, tree-related code in Tacoma is generally accessed through an action occurring rather than the resource itself. Tree related code in Tacoma is activated through commercial and industrial development and through environmentally sensitive (Critical Areas) code.

### **Key Findings - Considerations for Plan Strategies Relating to Tacoma Municipal Code**

Development of this Plan's strategies will consider the following topics:



- 1) Urban Forestry Policy alignment with One Tacoma.
- 2) Location of urban forest policy for urban forest related topics that are not urban forest standards triggered through development/disturbance actions.
- 3) Current interdepartmental processes, permits, and workflows relating to urban forestry.
- 4) Opportunities for regulation, incentives, and stewardship.
- 5) Existing or absent definitions of roles and responsibilities of an existing committee / commission overseeing urban forestry such as the Sustainable Tacoma Commission.
- 6) Opportunities for expanding appropriate tree preservation.

### **Key Findings - Common Themes in Landmark Tree Ordinances**

Correlation between tree growth and tree benefits is exponential. Landmark tree policies acknowledge the scientific consensus that large trees provide substantially more social, public health and environmental benefits than small trees. Mature large trees deliver a greater annual net benefit than mature small trees. The presence and stature of large trees has a measurable human health impact—relieving stress, decreasing respiratory illness, and inspiring awe in the community.

As part of the benchmarking research, existing landmark / heritage / historic tree programs across the State of Washington were reviewed and summarized. Information from this research will be applied to the strategies and recommendations in this Plan.

### **COMMON THEMES IN LANDMARK TREE ORDINANCES ACROSS WASHINGTON AND THE NATION**

- 1) Potential Landmark trees can be voluntarily or non-voluntarily designated.
  - a) Voluntary designation by the property owner is generally coupled with title recording on the property mandating the preservation of the tree while the tree remains healthy.
  - b) Non-voluntary/mandatory - designation applies to trees that meet a certain criteria, most often a combination of size and species, that immediately protects a tree from removal or mal-pruning while the tree remains healthy.
- 2) Designation committees for voluntary designation of landmark trees can be a public urban forester, municipal arborist, City Council or committee, or tree board.
- 3) Documentation and inventorying of voluntary landmark trees is often facilitated through a landmark tree database and tree management software.

- a) This list is often in conjunction with a community’s historical society—similar to Tacoma’s Landmarks Preservation Commission. These organizations often host historical tours that include landmark trees.
- 4) Qualifying criteria for landmark trees normally contain subjective and/or objective requirements for historical, cultural, ecological significance, or other important qualifying attributes.
- 5) Variances and relief of landmark tree protection are often provided through the following:
  - a) High-risk rating through qualified Tree Risk Assessor and/or conspicuously dead trees.
  - b) Spatial conflict of actively permitted development/redevelopment are exempt.
  - c) Utility work as necessary to retain utility connectivity are exempt.
  - d) Other large public land-owning organizations can be exempt if they have their own plan for urban forest management or similar document that is supported by the municipal government.

**POTENTIAL OUTCOMES OF LANDMARK TREE PROTECTION AND INVENTORY FOR TACOMA**

- 1) Complements and implements Design and Development goals of One Tacoma into Urban Forestry Policy (DD-5.11, DD-13.5 and DD-13.6).
- 2) Conservation of culturally or historically relevant City landmarks that have importance to the community.
- 3) Ecological inventory of large, important trees and economic quantification of their provided ecosystem services.
- 4) Species diversity improvement; often landmark trees will be trees of special ecological significance and rare species presence, resulting in a higher species richness across the City.
- 5) Preservation of trees would support the City’s goal for 30% canopy cover by 2030.



**Key Findings - Importance of Protecting and Managing Trees in the Right-of-Way**

The “right-of-way” (ROW) is defined as (typically) an easement provided to the City over the land of the abutting property owner, which establishes an accessory right for public benefit or transportation, such as for roadways, sidewalks, or utilities. According to TMC 8.30.020,

“The public right-of-way includes the area of land, the right to possession of which is secured by the City for right-of-way purposes and includes the traveled portion of the public streets and alleys, as well as the border area, which includes, but is not limited to, any sidewalks, planting strips, traffic circles, or medians.”

The City of Tacoma requires abutting property owners to maintain adjoining rights-of-way. This includes streets and alleys extending from the owner's property lines out to the curbs or edges of pavement (includes sidewalks and planting strips) if improved, or if unimproved (unpaved), out to the centerlines of the road. There are several places in the Tacoma Municipal Code where these obligations are stated: Chapters 9.17, 9.18, 8.30, 8.31, and 12.09.

Street trees, curbs, sidewalks, and utilities play vital roles in Tacoma’s public realm, helping to make the City more livable and sustain the quality of life. It is not uncommon for conflicts to arise between trees and infrastructure, particularly in locations where they were installed some time ago. These conflicts can compromise pedestrian access to the sidewalk and/or tree health.

## **COMMON OUTCOMES OF RIGHT-OF-WAY TREE PROTECTION AND MANAGEMENT**

Based on the benchmarking research, the following outcomes from ROW tree protection and management for various cities were identified:

- 1) Maintained and enhanced urban forest accessibility to support equity and social justice.
- 2) Reasonable and justifiable tree preservation that considers all variables and impacts. Right-of-way tree protection does not imply all trees are absolutely preserved. Trees are inventoried and evaluated to determine their fate in an infrastructure conflict situation.
- 3) Protection of trees during construction and infrastructure repair / replacement / installation prevents devastating damage to trees which could otherwise cause tree decline, need for removal, and potential public hazard.
- 4) Reduced tree risk, increased tree longevity, tree canopy retention, reduced tree maintenance costs, proper tree care, improved public health, reduced infrastructure conflicts, and equitable access to the urban forest.
- 5) A decision matrix with various mitigation strategies or amendments to address the tree and infrastructure conflict by considering existing conditions among other variables. An example of this approach is the Seattle Trees & Sidewalks Operations Plan. A similar plan will be developed for Phase 3 of the Urban Forest Management Plan project.

## **POTENTIAL PLAN STRATEGIES TO SUPPORT RIGHT-OF-WAY TREE PROTECTION AND MANAGEMENT**

The final strategies recommended in this Plan will consider their impact to the protection and management of trees in the public rights-of-way. To develop these strategies, the following topics will be evaluated:



- 1) Existing permitting and alert system for City personnel who review and evaluate a situation(s) where trees may be impacted.
- 2) Current and potential inventory and assessment cycles for trees in the right-of-way to identify potential risks, trees in decline, pests and disease threats, monitoring needs, and treatment needs.
- 3) Current and potential procedures and considerations for tree species selection for new plantings in the rights-of-way.
- 4) Current and recommended implementation of tree planting best practices such as appropriate soil volume, irrigation needs, proper planting depth, quality tree nursery stock, and young tree care (e.g. scaffold branches, lowest permanent branch, central leader).

### ***Key Findings -Tree Planting Goals and Policies across Washington***

Communities in Washington with tree canopy cover goals were evaluated to determine existing policy and approaches in effect to support these initiatives. As stated in this report, Tacoma has established a canopy goal of 30% Citywide by 2030. Findings from this research will be applied to the strategies in this Plan.

Tacoma's 30% Citywide canopy goal is achievable with well-planned tree canopy growth. Planting trees without equitable access of benefits, adequate spatial capacities and poor genetic selection are common challenges that result in an unhealthy urban forest and misspent budgets. Solving these discrepancies requires careful consideration of urban design and engineering and tree-resource management, translated through the lenses of social equity and environmental justice. This may require tailored strategies, new policies and increased resourcing for these areas. The existing policies/procedures will not provide more equitable access to the urban forest resources. Proven tree planting policy goals and

municipal code are equity driven, prioritized by asset generation, contain measurable performance standards, are adaptive and provide feedback.

Citywide datasets were analyzed for tree canopy distribution, to reveal neighborhoods with missing or inequitable tree canopy and areas historically low in tree canopy. These analyses are described in Element #4: High-Level and In-Depth Data Analysis, page 32.

- 1) Canopy cover distribution
- 2) Availability and distribution of possible planting areas
- 3) Tacoma's Equity Index
- 4) Urban heat island index
- 5) Urban forest characteristics, structure, and maintenance needs

#### **COMMON THEMES OF COMMUNITY TREE PLANTING GOALS**

- 1) Consistent application, regulation, and stewardship across land uses, stakeholders, and time.
- 2) Long-term commitment to equitable tree canopy growth at all levels of city government.
- 3) Best management practices in tree planting and care are clearly defined and readily available. Internal procedures are adopted to ensure trees are not only planted properly, but also establish well into healthy, structurally sound trees.
- 4) Tree planting and mitigation designs and selection used environmental and physical criteria.
- 5) Street engineering and urban design promote maximum tree health and benefits within this environment.

#### **POTENTIAL OUTCOMES OF CITYWIDE TREE PLANTING GOALS**

A variety of outcomes may be expected from well-planned tree management goals, depending on the strategies adopted by the City to implement those goals.



- 1) Complement and support comprehensive plan strategies relating to urban forestry (e.g. EN-4.29 of One Tacoma).
- 2) Project designs, development, and tree preservation are based on or supported by tree canopy goals, including site-specific and environmentally accurate tree species selection.
- 3) Alignment of permitting and trigger processes for re/development actions where supplemental tree installation is a viable co-design to reduce missed opportunities for collaborative tree planting and green urban design.
- 4) Increased urban forest biodiversity and ecological resiliency through planned natural resource management techniques while adapting genetic diversity to climate change.
- 5) Accelerated growth of urban forest benefits. Large trees with contiguous tree canopy provide more environmental and ecological benefits than small trees and fragmented canopies.
- 6) Reduced conflict with City infrastructure. Planning for urban trees from the inception of project design alleviates common future conflicts with utilities, sidewalks and other street infrastructure. Currently, this is captured in Title 12 "Utilities" in the TMC.

### **Key Findings - Antiquated or Inconsistent Language in Tacoma Municipal Code**

The first tree protection ordinance in Tacoma, and Washington State, was adopted in 1927 as “9.18 Trees and Shrubs – Trimming and Removal”. This called for the protection of Tacoma’s street trees growing in the right-of-way (see 9.18.030). Since then, a number of related ordinances have been added through a long history of Tacoma ordinances. Some of this municipal code is heavily antiquated and its applicability has eroded with time.

For consistent implementation and enforcement of urban forest policy, the following concerns were identified within Tacoma Municipal Code:

- 1) Existing inaccuracies and discrepancies.
- 2) Antiquated municipal code and language relating to trees.
- 3) Inconsistencies/conflicts between existing code and policies.
- 4) Isolated, separated, or conflicting descriptions of authority to approve urban forestry related actions (e.g. City Manager, Director of Public Works, City Engineer, Committee).
- 5) References to permits and processes that no longer exist.
- 6) Inconsistencies with industry best management practices and American National Standards Institute (ANSI) Standards.
- 7) Conflicts between critical areas and right-of-way codes.

An example of a concern identified in the TMC is outdated reference information: of the 110 tree-related references, 37 contain outdated and inaccurate information regarding currently accepted, best available science of arboriculture and urban forestry.

Revised Municipal Code will be provided as a separate document but as part of the Urban Forest Management Plan project. A summary of this document will be provided as an appendix to this Plan.



## **CONCLUSION**

### **Municipal Benchmarks and Code Review**

Urban forests are integral to the fabric of city life. The planning, management, growth, preservation, and long-term funding of Tacoma’s urban forest are critical for public health, safety and well-being. These urban forestry actions result in amplified health, safety and welfare of Tacoma’s citizens. City growth and redevelopment impacts and influences the urban forest and the urban forest complements urban design.

One Tacoma is a fundamental piece of the 2019 Plan. The Plan focuses through the lens of One Tacoma to amplify and complement the vision set forth in the Comprehensive Plan. The 2019 Plan will implement actions to meet these City policies while focused on Tacoman’s values and responsibility towards a greener city. Actions are based on attainable municipal forest measurements as summarized in this section.

The Plan will consider ROW tree protection and management to implement practices and procedures that maintain the quality of life for all Tacoman's while supporting ongoing initiatives such as the 30% tree canopy goal and American Disabilities Act (ADA) compliance.



## ELEMENT 4

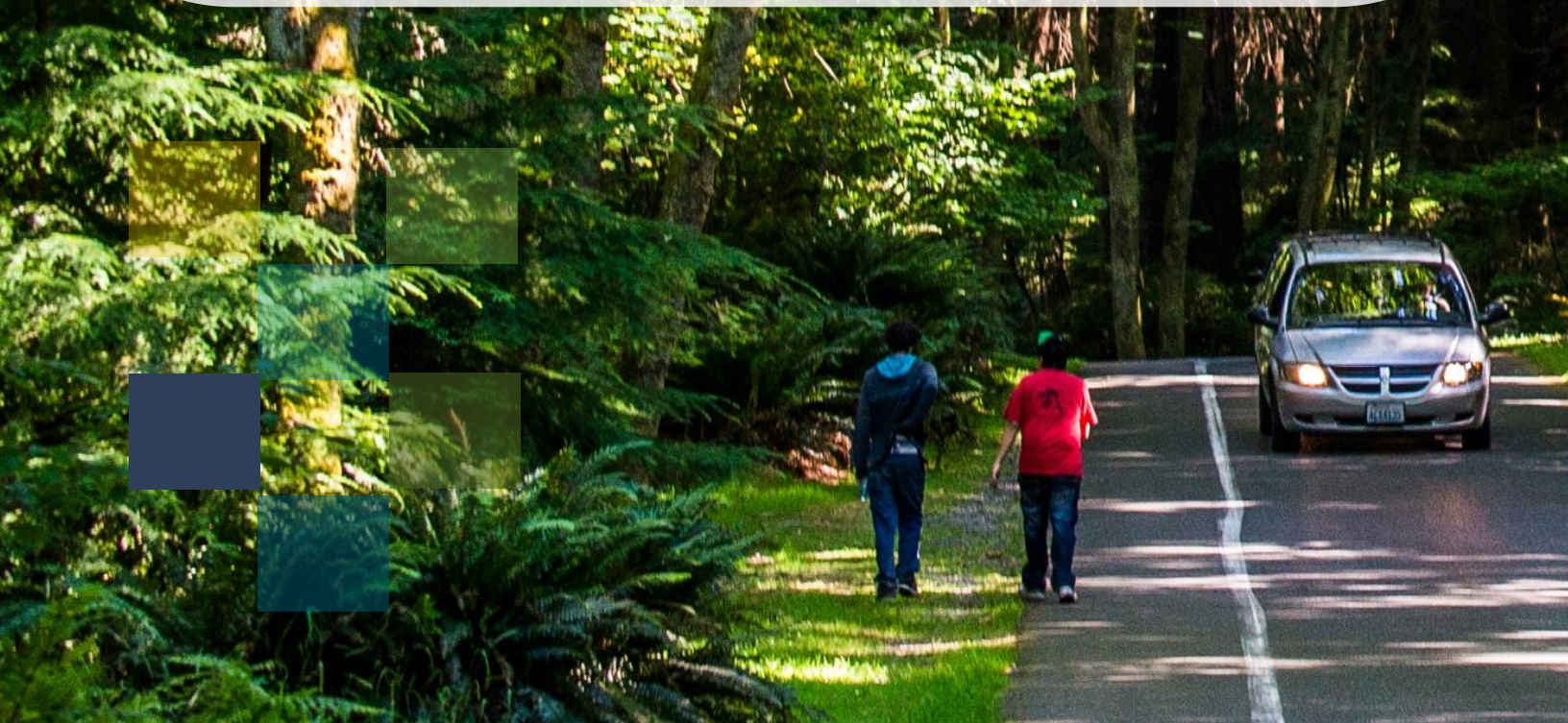


## HIGH-LEVEL AND IN-DEPTH DATA ANALYSIS



## PURPOSE

To identify gaps in resourcing and coverage across the entire City's geography and identify urban forest readiness, health, and resilience.





## ELEMENT #4: HIGH-LEVEL AND IN-DEPTH DATA ANALYSIS

### PURPOSE

To identify gaps in resourcing and coverage across the entire City's geography using high-level data and identify urban forest readiness, health, and resilience using available inventory data.

### PROCESS

The City does not have a comprehensive inventory of all public trees but has high-level data describing the extent and distribution of the Citywide urban forest to conduct coarse analyses and summaries. Multiple in-depth inventory datasets describing various elements of urban forestry exist but, when combined, do not form a comprehensive cumulation of data to represent the entire public tree population.

For this reason, summaries were obtained from the high-level data and the in-depth inventories to appropriately describe the City's tree population where possible. The datasets used in these analyses include data from aerial tree canopy assessments (2011 and 2018), a sample tree inventory project (2019), the Tacoma Mall subsample inventory (2019), the Business Districts tree inventory (2010), MetroParks tree inventory (2019), the City Facilities tree inventory (2015), urban heat island studies (2019), and canopy correlation studies (2019).



**Disclaimer:** The inventory data only covers a percentage of the City, and although it can be used to decipher general trends, it cannot be used to characterize the entire urban forest.

It cannot be inferred to represent the entire City because there are significant gaps in data (i.e. incomplete or unavailable inventories for various land uses classes).

All tree inventory data except for the MetroParks tree inventory is available and maintained on the City's tree management software application known as TreePlotter ([www.pg-cloud.com/TacomaWA](http://www.pg-cloud.com/TacomaWA)). The data analyses and summaries were conducted within TreePlotter and a combination of Microsoft Access, Microsoft Excel, and ArcGIS (Geographic Information System). Supporting charts, graphs, and tables were created in Excel and were provided as a supporting resource as part of the project.

The ecosystem services and benefits of the inventoried tree population were calculated using the U.S. Forest Service's i-Tree suite of tools. Benefits and services are based on the species of tree, its size (diameter), and land use. The totals are summarized as annual amounts.

Each data analysis section includes a description of the purpose and intent of the summary as well as the key findings which are discussed in this planning element's Results section. Results and conclusions will be used to develop the Plan's strategies.

The data were analyzed and summarized in the following formats and approaches to inform the Plan's strategies:

Table 14. Summary of the data analyses conducted as part of the existing conditions audit

Summary	Description	Datasets Used
<b>Tree Distribution</b>	The extent of tree canopy cover and passive open space.	2018 Tree Canopy Assessment, 2011 Tree Canopy Assessment, Strategic 20-Year Passive Open Space Plan.
<b>Urban Heat Islands and the Urban Forest</b>	Correlations between tree canopy, surface temperatures, and public health.	2019 Urban Heat Island Study, 2018 Tree Canopy Assessment.
<b>Environmental Justice and the Urban Forest</b>	Correlations between tree canopy and sociodemographic factors.	2011 Tree Canopy Assessment, 2018 Tree Canopy Assessment, U.S. Census Bureau data
<b>Tacoma Equity Index and the Urban Forest</b>	The Equity Index uses 20 data points to determine where people are not able to access services or where services do not meet the community needs. Tree canopy is an indicator for the “Livability” category.	Various datasets for the Equity Index including the 2011 Tree Canopy Assessment.
<b>Tree Diversity and Composition</b>	The most common, variety, and assortment of public trees.	Aggregation of all tree inventory data.
<b>Distribution of Tree Diameter Size Classes</b>	The relative age classes and structure of public trees.	Aggregation of all tree inventory data.
<b>Tree Condition</b>	The qualitative description of the health of trees based on observations of tree roots, trunk, branches, and canopy.	Aggregation of all tree inventory data.
<b>Tree Observations and Defects</b>	Description of tree and/or site factors potentially impacting tree health, maintenance needs, or corrective actions necessary.	Aggregation of all tree inventory data.
<b>Potential Tree Maintenance Needs</b>	The tree maintenance activity or technique recommended to remediate tree issues and/or improve tree health and public safety.	Aggregation of all tree inventory data.
<b>Cost-Benefit Analysis</b>	Analysis of the tree population’s structure to estimate the costs and benefits of that tree population.	Aggregation of all tree inventory data.

# RESULTS

## Tree Distribution

The focus of this report is to provide summaries of existing conditions to inform the Urban Forest Management Plan's short- and long-term strategies. Understanding the extent and distribution of existing tree cover and opportunities for tree planting across land use boundaries, neighborhoods, ownership type, and various sociodemographic variables enables the City's tree managers to prioritize, target, and plan effective urban forest management and community outreach. A comprehensive understanding provides the framework for an effective Urban Forest Management Plan that addresses resource management, equity and accessibility, canopy health and growth, long-term funding, climate resiliency, enhanced ecosystem services and benefits, and community engagement and stewardship.

Tree canopy is used as an analogy for and measurement of environmental health. In 2010, City Council adopted a new chapter in Tacoma's Comprehensive Plan - the Urban Forestry Policy Element (UFP). This chapter initiated the vision for Tacoma to enhance urban forest resources, including increasing the tree canopy cover from approximately 19% in 2009 to 30% in 2030.

In response to the canopy goal and for effective urban forest management, the UW Remote Sensing & Geospatial Analysis Laboratory completed an analysis of 2009 data (aerial photos and LIDAR) in 2011, with funding support provided by the WA Department of Natural Resources Urban and Community Forestry Program. This assessment provided Tacoma with a baseline approximation of tree canopy cover extent. See Appendix E for a quick summary.

For an updated analysis of canopy extent and opportunities, the City contracted with consultants for a 2018 tree canopy assessment to identify canopy gains and losses using the latest technology and imagery available for even greater assessment accuracy. This assessment allows the City to implement strategies to achieve local and Citywide short- and long-term canopy goals and targets.

### 2018 Tree Canopy Assessment

In 2018, the City contracted with consultants to assess the extent of tree canopy cover and available planting space Citywide and by various GIS planning boundaries. This assessment utilized 2017 high-resolution (1-meter) multispectral imagery from the USDA's National Agriculture Imagery Program (NAIP) and 2017 LiDAR data from the Washington State Department of Natural Resources to derive the land cover data set. The NAIP imagery is used to classify all types of land cover, whereas the LiDAR is most useful for distinguishing tree canopy from other types of vegetation. The following provides a high-level overview of the results used to inform the Urban Forest Management Plan's short- and long-term strategies. For the full report and assessment metrics, see Appendix D.

Figure 5. Land cover classes for Tacoma based on 2017 NAIP Imagery and 2017 WA State DNR LiDAR

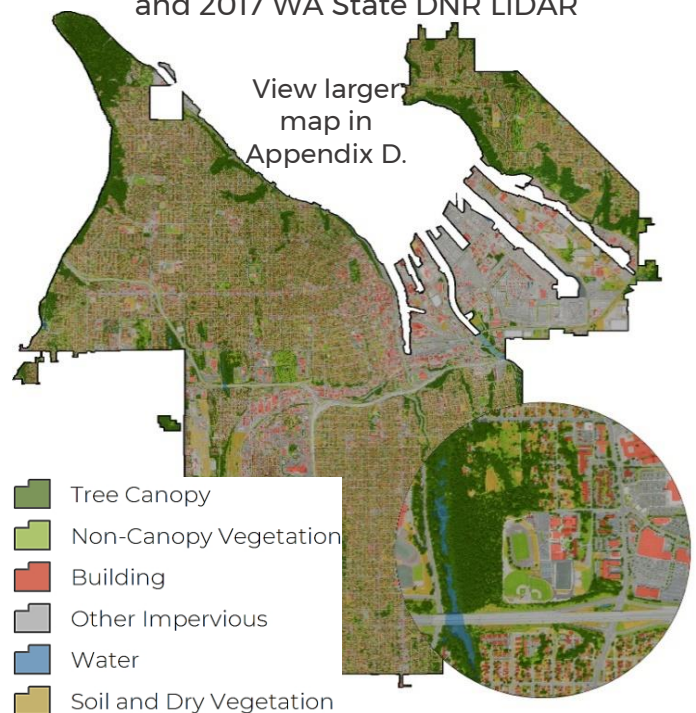


Table 15. Summary of the land cover data from the 2018 Tree Canopy Assessment

Tree Canopy Assessment Results	City Boundary	Tree Canopy	Impervious Surfaces	Non-Canopy Vegetation	Soil & Dry Vegetation	Water
Acres	31,607	6,406	16,344	4,257	4,469	132
% of Total	100%	20%	52%	13%	14%	<1%
Land use with the highest tree canopy %				#1 Parks and Open Space (56%) #2 Shoreline (21%) #3 Single Family Residential (17%)		
Land use with the most space for tree plantings (includes vegetative and impervious areas)				#1 Single Family Residential (2,318 acres) #2 Parks and Open Space (784 acres) #3 Heavy Industrial (235 acres)		
Count of Census Blocks (CB) with >30% (target) canopy				30 Census Blocks (15% of all CB's)		
Census Blocks with >10% available planting space				163 Census Blocks (81%)		
Stormwater Basins with high percentage (~25% or >) of canopy heights over 100 feet				North Tacoma (NT_01) Western Slopes (WS_02) Lower Puyallup (LP_05) North Tacoma (NT_03) Tideflats (TF_03)		

Information such as the summaries provided in the table above provide meaningful direction for prioritizing tree plantings (available planting space) and tree preservation (existing canopy and greatest tree heights) to achieve canopy goals and targets.

For an example of how to establish canopy goals and targets, the City should utilize and implement the canopy cover analysis of the Neighborhood Business Districts (NBD) completed by Tacoma using the 2009 data. In order to assist the Urban Forestry Program with achieving canopy goals, particularly in the NBDs which were identified as priority planting areas by the Urban Forest Policy Element, the City further analyzed canopy cover data to give approximations of the canopy cover in each NBD to determine what amount of growth is needed in each District. The table below shows canopy cover by NBD in both actual and needed cover for the entire NBD and for the rights-of-way (ROW) within each Neighborhood Business District. This information ties in with the Strategic Urban Forest Management Plan (SUFMP) for Neighborhood Business Districts and the strategies in the Citywide Urban Forest Management Plan.




Tacoma is comprised of 20% tree canopy cover. Single-Family Residential land use has over 2,300 acres of space available for tree plantings. To increase tree canopy and achieve a 30% canopy goal, the City needs the support from its residents. **Use the canopy data to prioritize tree planting and preservation.**

Table 16. Canopy by Neighborhood Business District and canopy cover targets (2009 data)

Neighborhood Business District (NBD)	Percentage of Right-of-Way (ROW) in NBD	Actual NBD Cover	NBD Cover Needed	Actual NBD ROW Cover	NBD ROW Cover Needed
Portland Avenue	42.2%	2.4%	12.6%	0%	30%
South Tacoma	39.7%	0%	15%	0%	30%
Stadium	49.6%	4.9%	10.1%	4.5%	25.5%
6th Ave	41.3%	2.1%	12.9%	2.3%	27.7%
Proctor	41.2%	4%	11%	7.3%	22.7%
Oakland/Madrona	41.3%	7.1%	7.9%	0.2%	29.8%
Fern Hill	34.4%	7.3%	7.7%	2.8%	27.2%
Lincoln	37.7%	0%	15%	0%	30%
McKinley	48.1%	1.1%	13.9%	1.2%	28.8%
Narrows	43.9%	3.3%	11.7%	2.7%	27.3%
Dome	36.1%	1.9%	13.1%	1.8%	28.2%
Hilltop	43%	0.9%	14.1%	1.1%	28.9%
Ruston/Pt. Defiance	41.2%	2.6%	12.4%	0%	30%
Old Town	44.8%	2.8%	12.2%	1.2%	28.8%
Pacific	40.7%	3.4%	11.6%	0.9%	29.1%

The distribution of existing canopy cover and possible planting space across geographies is just one component of a multi-faceted approach to the urban forest strategies presented in this Plan.

To inform strategies in this Plan, the extent of canopy and available planting spaces were cross-examined with the tree inventory datasets and other studies such as the Urban Heat Island (UHI) study and the City’s Equity Index.



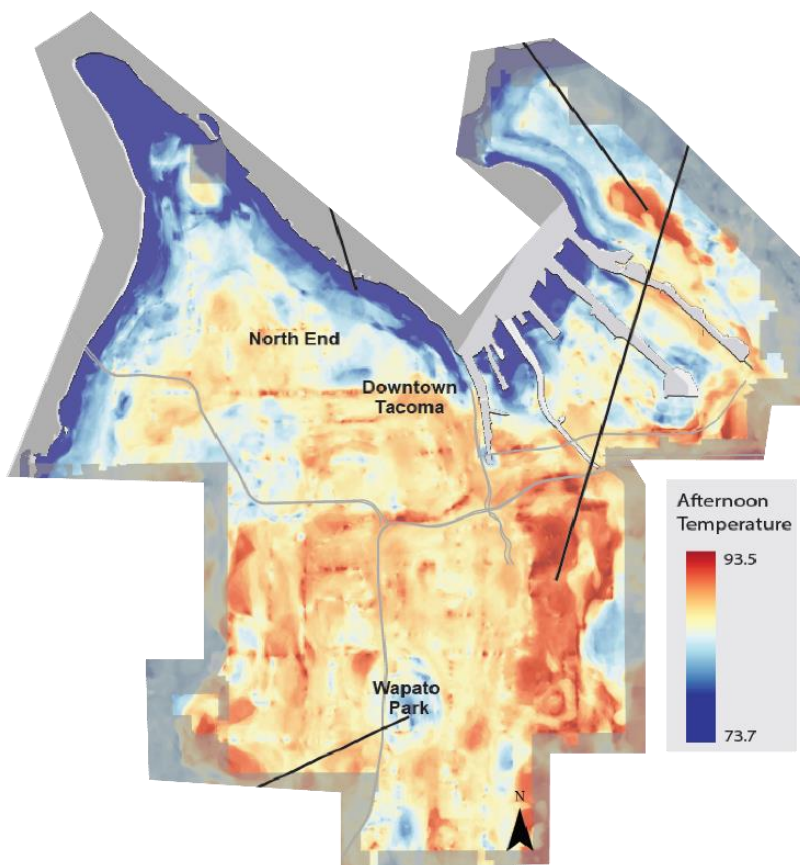
Establishing small-scale canopy goals and targets provides incremental steps in achieving a Citywide canopy goal of 30%. **In addition to Business Districts, canopy goals for other areas throughout the City will be established to achieve improvements in tree and human health equity.**

## Tacoma Urban Heat Islands and the Urban Forest

In 2018, researchers from the Sustaining Urban Places Research (SUPR) Lab at Portland State University visited Tacoma to collect high resolution urban heat data with the help of local volunteers. Tacoma is one of the five cities chosen for the Canopy Continuum study, which examines the implications of landscape conditions, extreme heat events, and human health. Of the five cities that are part of the study, Tacoma contains the highest canopy cover, middle value of impervious surface cover, and is located in a dry-summer, wet-winter climate – all of which makes it a very important point of study. For more information on the purpose, approach, and results visit [www.canopycontinuum.org](http://www.canopycontinuum.org).

The following maps provide an overview of how the tree canopy assessment data, tree inventory data, UHI data, and other supporting data can be utilized to inform tree planting and preservation approaches.

Figure 6. An urban heat island map showing afternoon temperatures



Also, in response to urban heat islands and the changing climates, the City's Environmental Services Department completed the Tacoma Climate Change Resilience Study in 2016. Information from this study is used to inform strategies in this Plan.

Trees provide many environmental benefits that have a direct positive effect on human health. Some of these benefits include cooling, air filtration, sun protection, and improved mental health. Yet, for all this to work, a host of challenges – funding constraints, lack of City tree maintenance responsibility, the design of Tacoma's streets, resident indifference or even resistance, the demands of utility companies – make it challenging to design a future with true tree

equity in Tacoma. Trees are more than just scenery, they are critical infrastructure for the health, wealth, and well-being of communities. Distributing the cooling shade of trees more equitably across Tacoma is an essential strategy. Improving the City's tree equity improves the City's health equity.



Trees provide benefits in terms of cooling, air filtration, and sun protection.

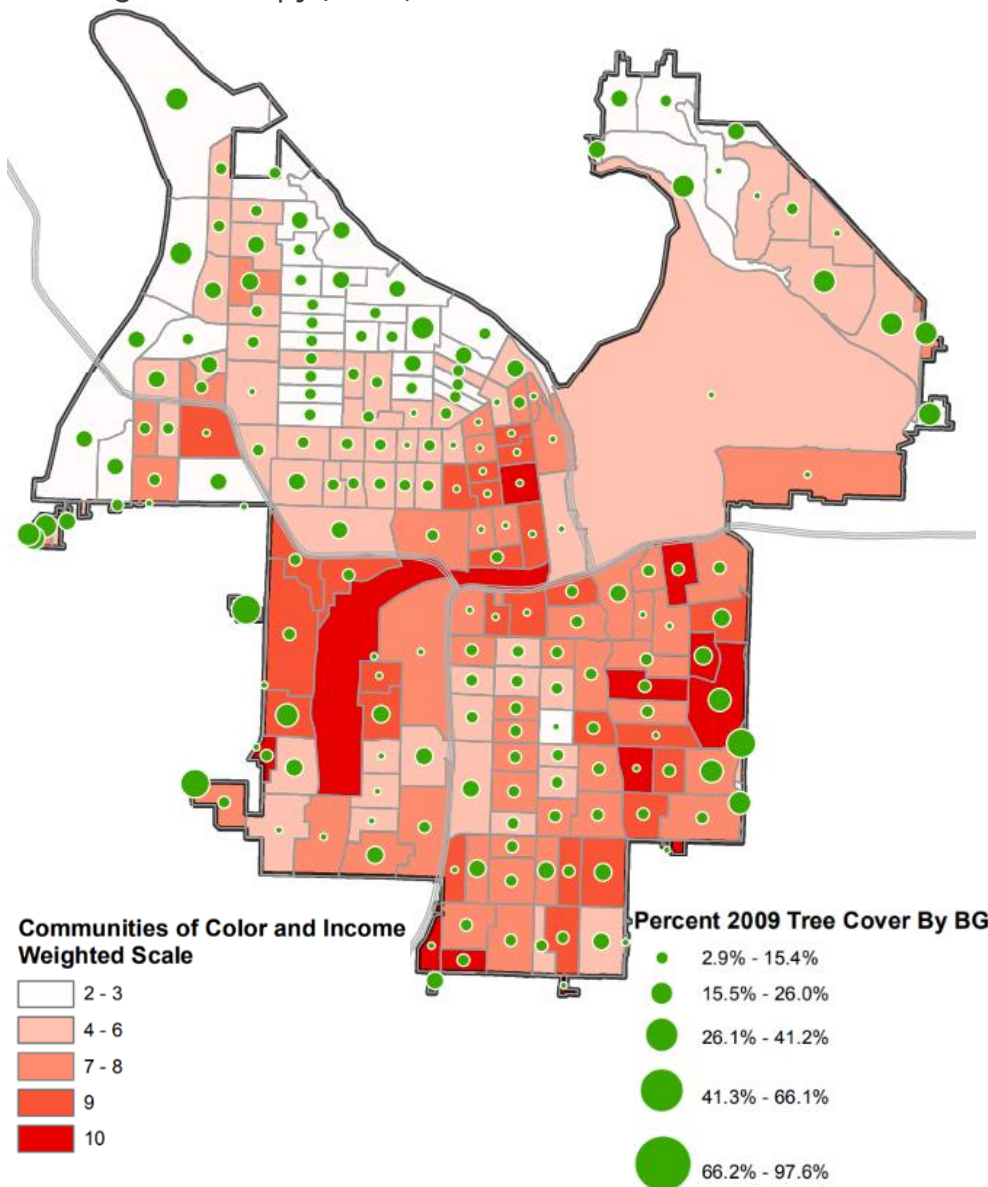
Dense clusters of large trees with expansive canopies reduce the sun's heat energy.

**Use the data to prioritize areas where trees can mitigate urban heat.**

**Environmental Justice and the Urban Forest**

In a City where addressing inequity is a primary goal, canopy cover has been historically distributed in unequal measure. The City’s impoverished areas tend to have less tree canopy than wealthier areas, a pattern that is especially pronounced in concrete-dense neighborhoods. The City is actively addressing canopy equity and the question of whether these trees will ever provide enough shade is critical to the health of people in Tacoma’s hottest neighborhoods, as they face a future of increasingly intense summers, driven by the climate crisis. The urban heat island effect makes Tacoma hotter than surrounding suburbs. A major reason: many of the materials that define Tacoma’s urban landscape – brick rowhouses, concrete sidewalks, black tar roofs, asphalt streets – are very effective at trapping, storing and then radiating heat. To cool neighborhoods, these materials could be removed or replaced with heat-repellent versions. Or some of the sun’s heat energy could be prevented from reaching those materials in the first place by planting trees – especially dense clusters of large trees with expansive canopies.

Figure 7. Map showing communities of concern (2014) each symbolized by the percent of existing tree canopy (2009)



The City is actively addressing canopy equity because more shade is critical to the health of people in Tacoma’s hottest neighborhoods, as they face a future of increasingly intense summers, driven by the climate crisis.

**Improving the City’s tree equity improves the City’s health equity.**

## Tacoma Equity Index and the Urban Forest

The Equity Index is comprised of 20 indicators within the 2025 Strategic Plan goals; Accessibility, Economy, Education, and Livability. Tacoma 2025 represents Tacoma’s vision for the future. With defined indicators and other ways to measure progress, it is a plan that guides where the City of Tacoma – as both a local government organization and a community – is going over the next 10 years. It is also a plan that helps the City direct its efforts and resources in ways that reflect the growing community’s evolving needs. This Phase 1 Research Summary and the Urban Forest Management Plan are vital components to Tacoma 2025’s vision as urban tree canopy cover is an indicator for the Livability category.

This Plan’s strategies for prioritizing tree preservation and plantings will consider the Equity Index among other criteria such as population density and Tacoma’s capacity and rate of growth. The following provides an illustration of the prioritization process for consideration.

Figure 8. Tacoma Equity Index showing equity opportunities and livability scores

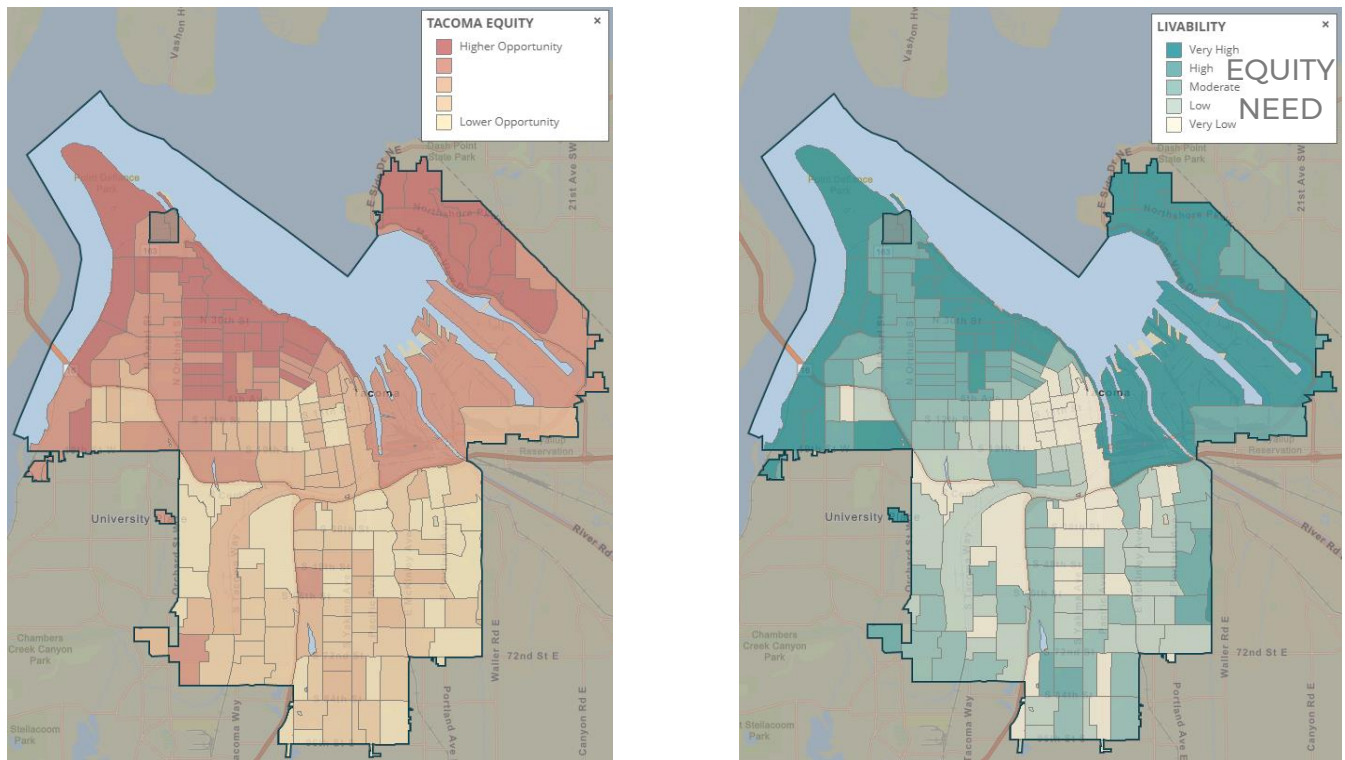
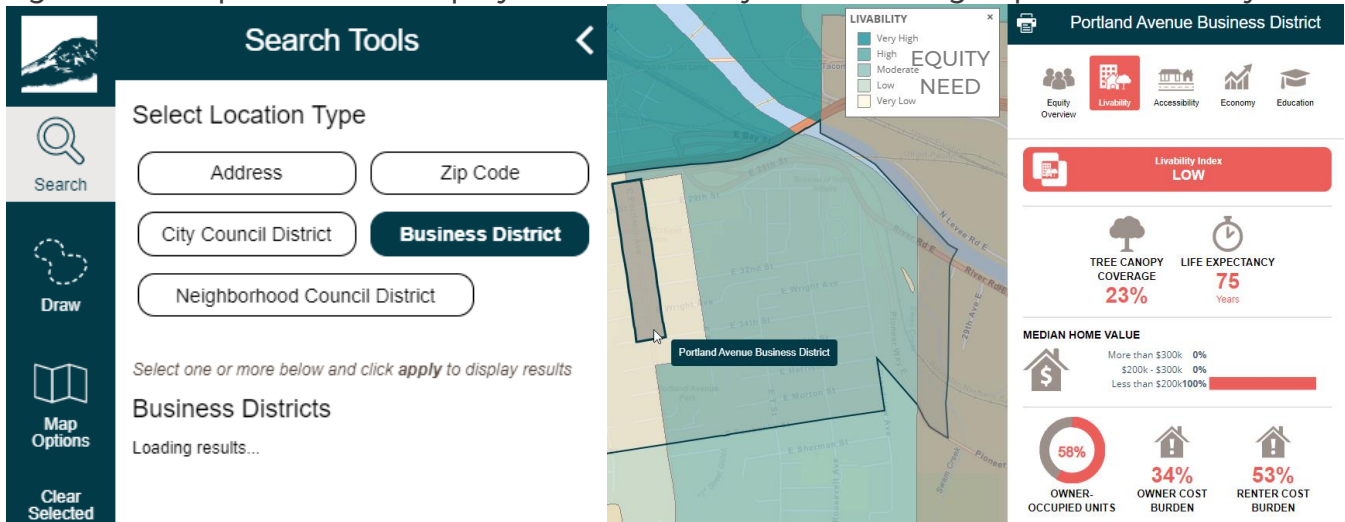


Figure 9. Example use of the Equity Index to identify areas needing improved “Livability”

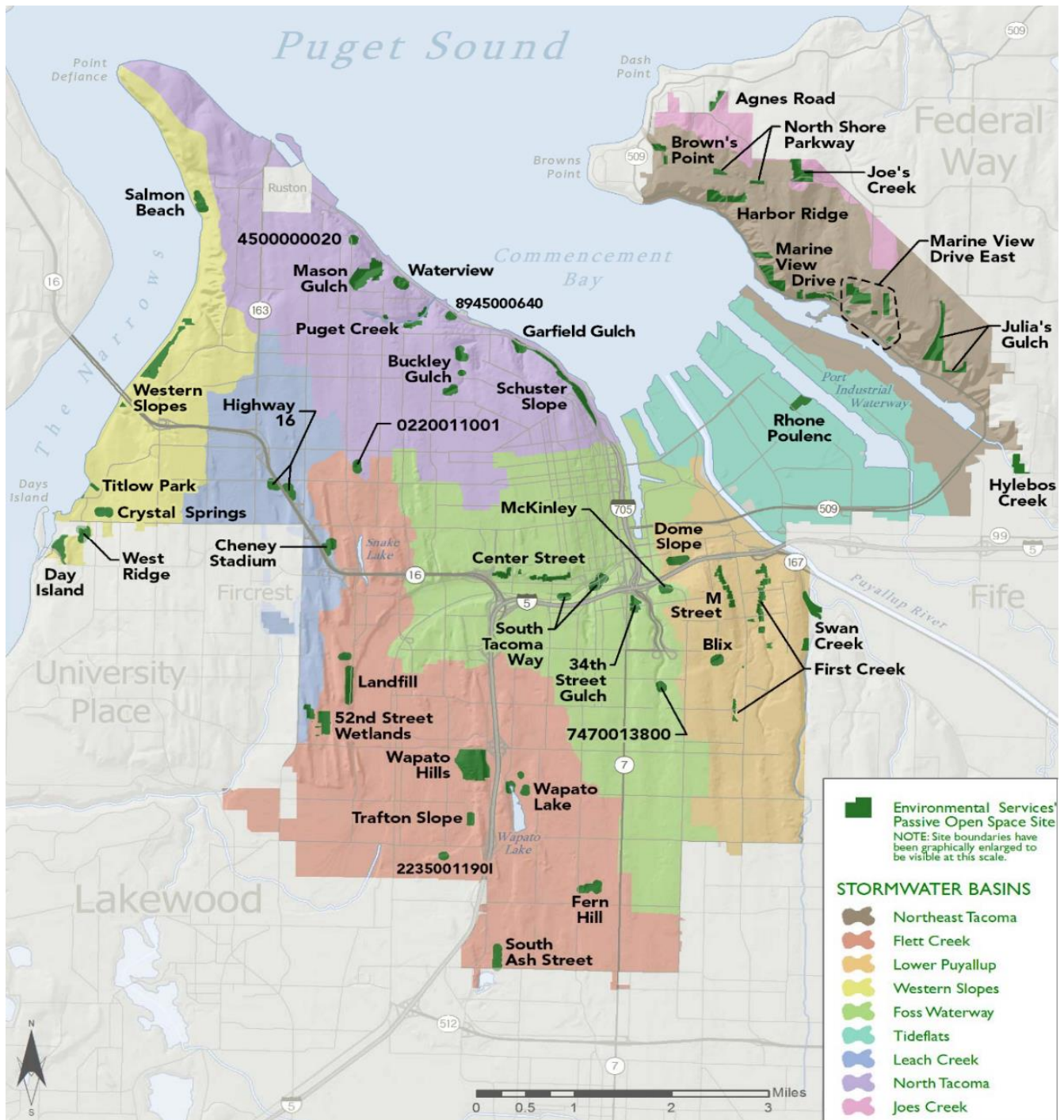




### Tacoma's Open Space and Critical Areas

In 2017, the City of Tacoma's Environmental Services Department, in partnership with Forterra and American Forest Management consulting firms, developed the Strategic 20-Year Passive Open Space Plan to provide a path forward for the active restoration and management of 496 acres of open space land. As described in the Passive Open Space Plan, many of the City's natural resources are held within open space properties. Open spaces, whether associated with active parks, passive natural areas or even non-publicly accessible spaces provide numerous public benefits to the City and its residents.

Figure 10. Tacoma's passive open space map (2017 Strategic 20-Year Passive Open Space Plan)



Map originally created by Forterra in partnership with the City of Tacoma

Restoring these lands is considered critical to the health and welfare of the citizens of Tacoma. Specifically, the Department is charged with managing passive open space (including many forested lands) for purposes of air quality, water quality and quantity benefits to the public. The intent of the plan is to articulate measurable goals and objectives, strategies for achieving these goals, and establish benchmarks for evaluating success and timing. To accomplish this, a complete analysis of all 496 acres of land managed by the Department was conducted. The results of the analysis provide the foundation for prioritizing restoration actions. To further guide prioritization and to ensure the ultimate success of this effort, a cost model was developed to determine the total cost of restoration and ongoing management of the City's passive open space lands.

#### KEY CONCERNS RELATING TO THE URBAN FOREST

##### ***Critical Areas***

Historically, many passive open space areas have remained undeveloped and dedicated to open space because of terrain, the lack of development feasibility, or utility corridors. These areas are now threatened due to increased pressure to infill to meet the demands of increases in population and density. Many of Tacoma's passive open space properties consist of wetlands, buffers, and/or steep and unstable slopes. The Critical Areas Preservation Ordinance of the Tacoma Municipal Code (TMC 13.11) guides activities within critical areas (e.g., steep slopes, wetlands, wetland buffers, streams, stream buffers, and biodiversity areas/corridors.).

##### ***Past Tree Management Practices***

In the past, many passive open space areas have been neglected and subject to mismanagement. In some areas, historic vegetation management techniques included the topping of trees which is currently prohibited within critical areas (TMC 13.11.210). This management technique was often used to enhance views and to reduce the height of a tree with minimal time or skill. However, this method starves the tree and leads to weaker and dense re-growth, and opportunities for pathogen and disease entry. This technique is not sustainable or healthy for the tree and where the tree is located on a steep slope, these actions increase the likelihood of slope instability by reducing soil binding root mass.

A host of other concerns exist for passive open spaces and are detailed in the Strategic 20-Year Passive Open Space Plan.

#### ASSESSMENT AND PLANNING

Effective and efficient passive open space management can only be accomplished if planners, field staff and decision makers have the environmental information on which to prioritize and guide restoration actions. In 2015, the consulting firm, Forterra, conducted a forest habitat assessment to characterize habitat conditions across 496 acres of passive open space under management of the Environmental Services Department.

Baseline ecological data was collected using a rapid assessment data collection protocol called the Forest Landscape Assessment Tool (FLAT) developed by the Green Cities Research Alliance in collaboration with the U.S. Forest Service ([www.fs.fed.us/pnw/research/gcra](http://www.fs.fed.us/pnw/research/gcra); see "Urban Landscape Assessment"). FLAT is based on the "Tree-iage" model, originally developed by the Green Seattle Partnership. Tree-iage is a prioritization tool, based on the concept of medical triage that uses habitat composition (e.g., canopy cover or native plant cover) and invasive plant cover as the two parameters to prioritize restoration.

Figure 11. Distribution of HMU acres across the Tree-iage Matrix established in the Passive Open Space Plan

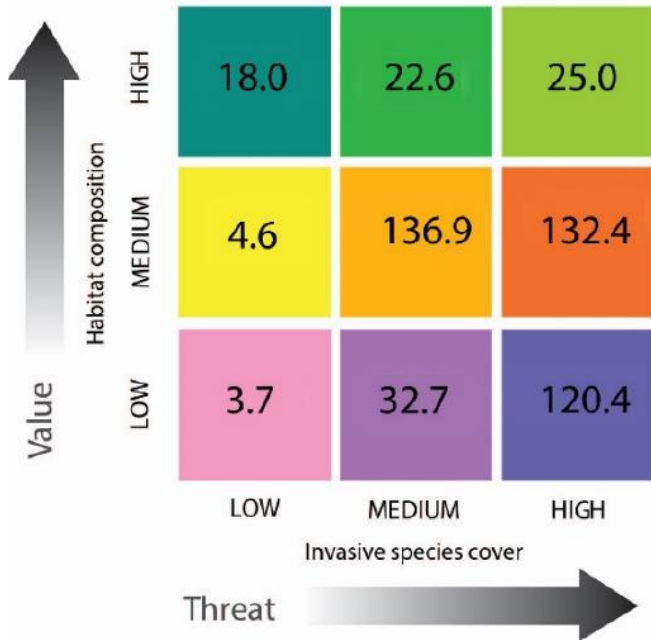
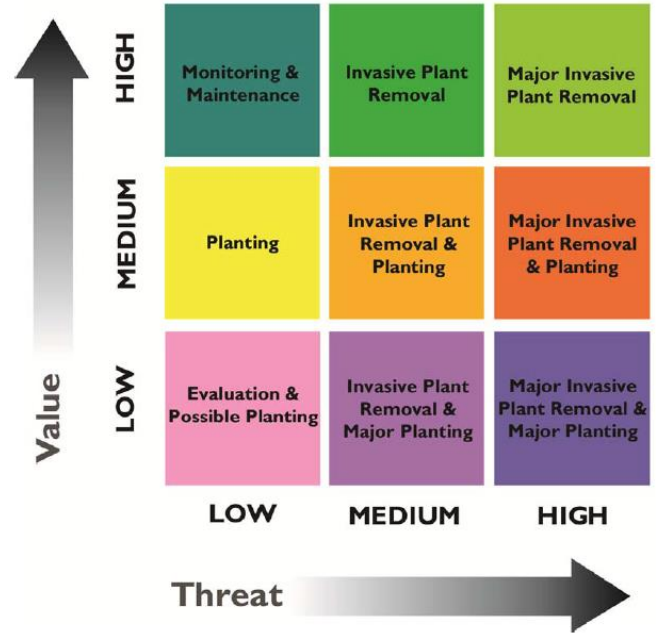


Figure 12. Restoration strategies and Tree-iage categories established in the Passive Open Space Plan



Prior to field data collection, passive open space areas were classified through digital orthophoto interpretation, dividing each tract of open space land area into one of five categories—forested, natural, open water, hardscaped, or landscaped Habitat Management Units (HMUs).

HMUs were assigned a value of High, Medium, or Low for habitat composition as well as for invasive species threats. Using the data gathered on all HMUs during the FLAT assessment, Tacoma’s open space forest conditions were described. As seen in the figure, over 136 acres are in the medium category of habitat value and invasive species concerns.

As seen in the figure above, management strategies were established based on each HMU’s assessment results. This assessment was used to provide prioritized restoration strategies over the 20-year planning and management horizon for each HMU comprising the 496 total acres of passive open space.

Implementation of the strategies are supported by extensive cost modeling provided in the Passive Open Space Plan. Passive open space areas identified in the plan will continue to face threats from invasive species, habitat fragmentation, adjacent land impacts and other influences that prevent native species from regenerating. To maintain the overall health and ecosystem functions of these passive open space areas, the Department should engage in active management and restoration. These activities will be guided by the plan and supported by this Plan and ensure that these lands are managed for stormwater quantity and quality benefits for the citizens of Tacoma and as charged in the mission of the Environmental Services Department.



Passive open space is a component of Tacoma’s urban forest and provides substantial environmental, social, and economic benefits.

**Strategies for maintaining these ecosystems are being implemented using the assessment, supported by this Plan.**

## In-Depth Analysis of Tacoma’s Public Trees Using Aggregated Data

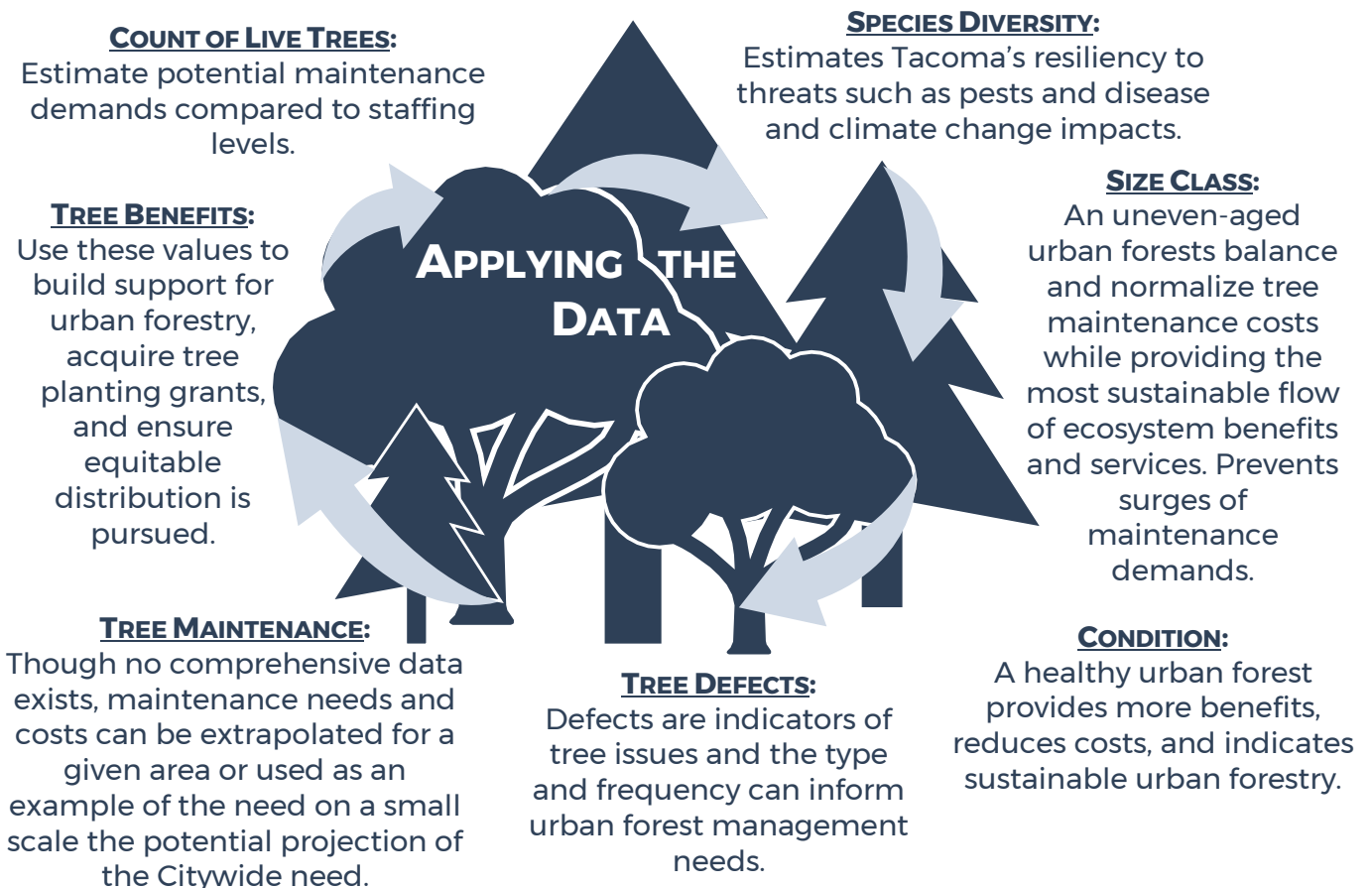
All available, current, and relevant data pertaining to Tacoma’s urban forest was gathered and aggregated as part of the Urban Forest Management Plan’s auditing processes. Data for trees in public rights-of-way, parks, Business Districts, City facilities, Tacoma Mall Subarea, and Metro Parks was attained from the City and/or collected by the project consultants. The collection of data was provided in Microsoft Excel spreadsheets or accessed via the City’s tree inventory management software, TreePlotter ([www.pg-cloud.com/TacomaWA](http://www.pg-cloud.com/TacomaWA)).

Since each dataset contains varying degrees of attributes, completion, accuracy, and maintenance, the information was carefully examined to determine relevant data summaries for this report and data to be applied to the Urban Forest Management Plan. The following provides the summaries of the aggregated datasets.

The following summaries use an aggregated tree inventory dataset to provide generalized urban forestry trends Citywide. These summaries describe Tacoma’s urban forest structure, condition, potential maintenance needs but are not assumed to depict exact characteristics of Tacoma’s urban forest. Comprehensive accurate data assessments can only be made through statistical analyses or a complete inventory of all public trees.

Figure 13. Summary of methods for applying the in-depth data analysis results

*The following provides suggested applications of the data as presented in this section.*



**Tree Inventory Data Overview**

Table 17. Summary of key attributes from the various tree and planting site inventories for Tacoma

	2019 Sample	Tacoma Mall		Business Districts	City Facilities	Metro Parks
		Public	Private			
<b>Data Points</b>	4,143	3,555	2,081	2,131	1,962	9,016
<b>Live Trees</b>	4,121	2,011	2,051	1,221	1,948	6,505
<b>Planting Sites</b>	N/A	1,517 Large (41%) Small (37%) Medium (22%)	N/A	906 Large (21%) Medium (40%) Small (39%)	N/A	N/A
<b>Genera Count</b>	68	62	45	37	57	129
<b>Common Genera</b>	<i>Acer</i> (22%) <i>Prunus</i> (19%) <i>Fraxinus</i> (7%)	<i>Acer</i> (17%) <i>Pseudotsuga</i> (15%) <i>Quercus</i> (12%)	<i>Acer</i> (14%) <i>Pseudotsuga</i> (11%) <i>Thuja</i> (7%)	<i>Pyrus</i> (21%) <i>Acer</i> (15%) <i>Prunus</i> (14%)	<i>Acer</i> (18%) <i>Chamaecyparis</i> (10%) <i>Prunus</i> (9%)	<i>Acer</i> (15%) <i>Pseudotsuga</i> (14%) <i>Quercus</i> (6%)
<b>Species Count</b>	165	123	89	64	112	431
<b>Common Species</b>	Cherry plum (11%) Nor. maple (9%) Green ash (6%)	Douglas fir (15%) OR white oak (10%) Red maple (5%)	Douglas fir (11%) Red maple (7%) Arborvitae (5%)	Flowering pear (21%) Cherry plum (13%) American sweetgum (7%)	Japanese cherry (7%) Red maple (5%) Hinoki cypress (5%)	Douglas fir (14%) Western red cedar (4%) Red maple (3%)
<b>Common Size Class</b>	3-6-inch (26%)	3-6-inch (23%)	3-6-inch (46%)	7-12-inches (36%)	3-6-inch (32%)	N/A
<b>Average Diameter</b>	10.1 inches	12.3 inches	6.4 inches	7.6 inches	8.9 inches	N/A
<b>Largest Diameter</b>	68 inches	84 inches	40 inches	56 inches	63 inches	N/A
<b>Common Condition</b>	Good (46%)	Good (50%)	Good (53%)	Good (70%)	Fair (59%)	N/A
<b>Poor/Dead Condition</b>	Poor (7%) Dead (1%)	Poor (7%) Dead (1%)	Poor (5%) Dead (1%)	Poor (10%) Dead (2%)	Poor (3%) Dead (1%)	N/A
<b>Tree Work Priorities</b>	Clearance Prune (8%) Sidewalk Damage (5%) Remove (3%) Routine Prune (3%)	Clearance Prune (19%) Remove (4%) Sidewalk Damage (2%)	(N/A) Observations: Co-dominant stems (44%) Dieback (31%) Trunk decay (28%)	Routine Prune (65%) Removal (27%)	Routine Prune (52%) Remove (3%) Stake Removal (1%)	(N/A) Reason for Removals: Unknown (26%) Construction (15%) Disease/Pests (14%)
<b>Appraisal</b>				\$1,642,550	\$4,176,170	N/A

## Summary of Aggregated Tree Inventory Data

Table 18/Figure 14. Summary of all tree and planting site data available for the City of Tacoma and a location of the data points

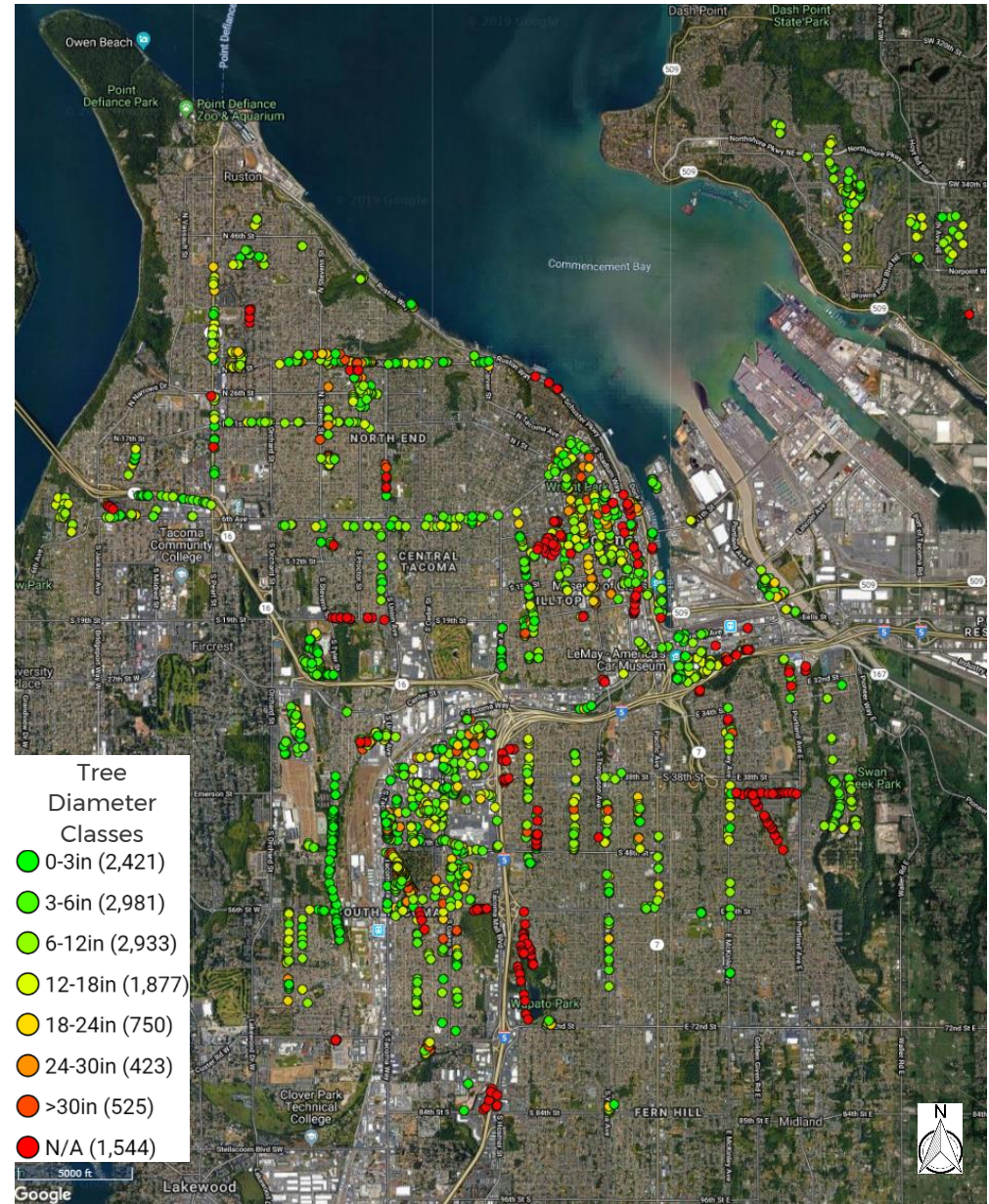
<b>Data Points*+</b>	17,870 trees
<b>Live Trees**</b>	13,452 trees
<b>Planting Sites</b>	2,423
<b>Genera Count*</b>	137
<b>Common Genera*</b>	<i>Acer</i> (17%), <i>Prunus</i> (9%) <i>Pseudotsuga</i> (9%), <i>Quercus</i> (5%) <i>Pyrus</i> (4%), <i>Fraxinus</i> (4%) <i>Thuja</i> (4%), <i>Pinus</i> (4%) <i>Chamaecyparis</i> (3%), <i>Betula</i> (3%)
<b>Species Count*</b>	525
<b>Common Species*</b>	Douglas fir (9%) Red maple (5%) Norway maple (4%) Flowering pear (4%) Cherry plum (4%)
<b>Common Size Class*</b>	3-6-inch (31%)
<b>Common Condition</b>	Good (48%)
<b>Poor/Dead Condition**</b>	Poor (5%) Dead (0.4%)
<b>Land Use Distribution**</b>	Single Family (26%) Industrial (24%) Park/Vacant (20%) Small Commercial (10%) Multi Family (6%) Not Specified (14%)
<b>Crow Space**</b>	Large - 8ft+ (25%)
<b>Average Diameter</b>	9.4 inches
<b>Tree Task**</b>	Clearance Prune (1,734)
<b>Tree Defect**</b>	Co-dominant stems (2,571)
<b>Appraisal*</b>	\$6,215,610***

\*From spreadsheet databases

\*\*From TreePlotter online reports

\*\*\*Values in spreadsheet obtained from the Council of Tree and Landscape Appraiser's Trunk-Formula method for appraisals. Does not represent the entire 13,452 trees in spreadsheet databases.

+Not in this summary: Univ. of Puget Sound's 1,500 tree database (32% Douglas fir, 11% western redcedar, 22% 3 to 6" DBH).

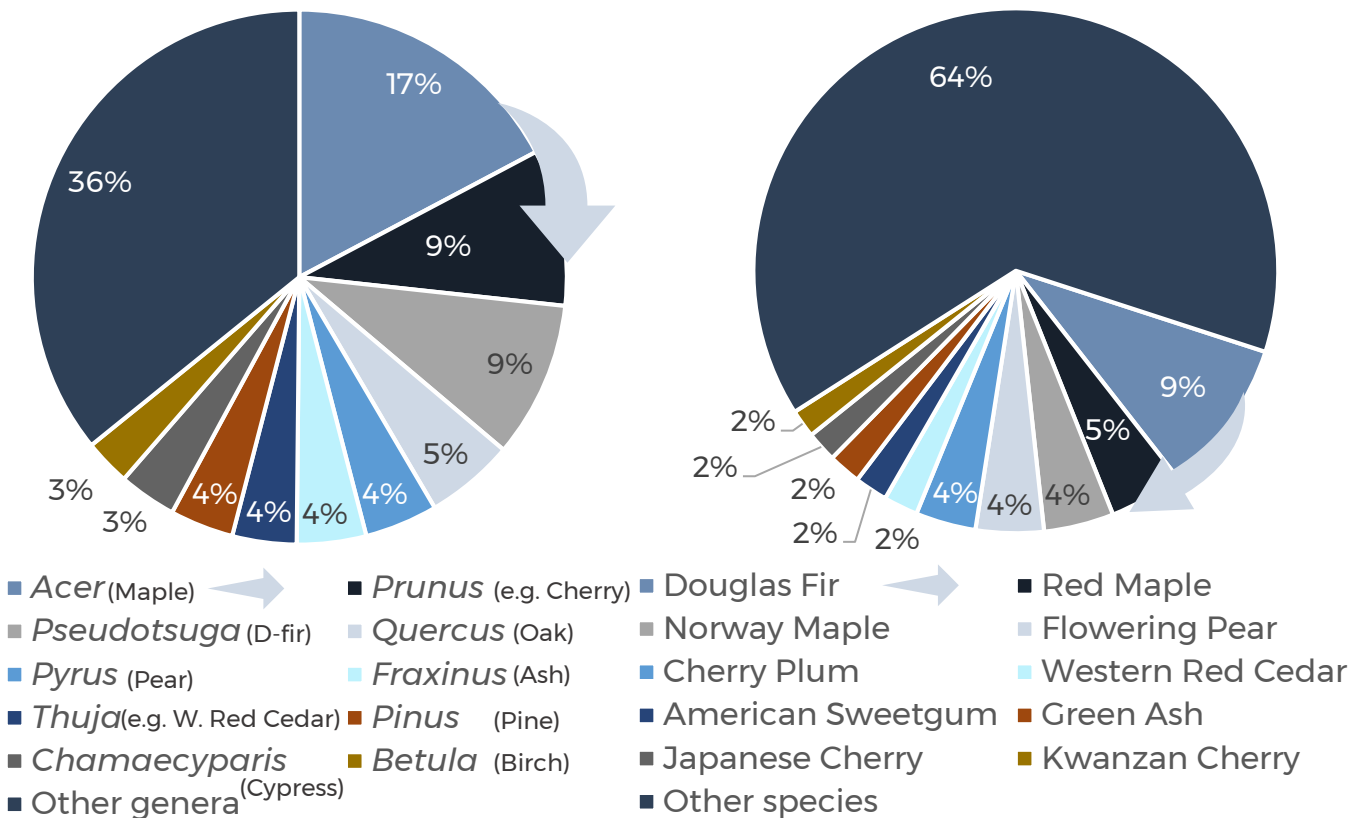


## Tree Diversity and Composition

Tree species composition data are essential since the species and size of trees present in a city greatly affect the level of benefits produced, tree maintenance activities, budgets, planting goals, canopy connectivity, and the City's ability to respond to threats from invasive pests and diseases. Low species diversity (large proportion of the population consisting of trees of the same species) can lead to severe losses in the event of species-specific epidemics such as the devastating results of tree pests and diseases. Tree species diversity is crucial to the resilience of the urban forest from these and future unknown threats.

Figure 15. Tree genera diversity (all data)

Figure 16. Tree species diversity (all data)



### Findings

Based on the aggregated datasets, there exists a total of 137 unique tree genera across this City. The top five most common genera include *Acer* (17%), *Prunus* (9%), *Pseudotsuga* (9%), *Quercus* (5%), and *Pyrus* (4%). Tree species within these five genera amount to a total of 8,214 trees or 46% of the population.

Regarding tree species diversity, there exists a total of 525 unique tree species, an impressive statistic for an urban forest. The most prevalent species are comprised of 9% (1,688) Douglas firs, 5% (808) red maples, 4% (771) Norway maples, 4% (749) flowering pears, and 4% (664) cherry plums.

It should be noted that this is based on the 17,870 live trees summarized from the April 2019 sample inventory, the Tacoma Mall Subarea inventory, City facilities, Business Districts, and Metro Parks datasets, so it is not necessarily representative of the entire City.



5 tree genera account for 46% of the population (8,214 trees).

Tacoma boasts a diverse urban forest (525 unique species).

**Use this data to inform selection of tree species for new plantings.**

(Based on available data, not all public trees represented)

## Distribution of Tree Diameter Size Classes (Relative Age)

The distribution of tree ages influences the structure of the urban forest as well as the present and future costs to the City or property owners. An uneven-age urban forest offers continued flow of benefits and a more uniform workflow allowing managers to more accurately allocate annual maintenance funds. For instance, large mature trees may require more maintenance to keep them in a healthy condition, so a population made of all large trees could be more expensive. The aggregated dataset of trees was categorized into the following diameter size classes: young trees (0-3 and 3-6 inches DBH or diameter at breast height measured at 4.5 feet), established (6-12 inches DBH), maturing (12-18 and 18-24 inches DBH), and mature trees (24-30 and >30 inches). Since tree species have different lifespans and mature at different diameters, heights, and crown spreads, actual tree age cannot be determined from diameter size class alone. However, general classifications of size can be extrapolated into relative age classes.

Figure 17. Tacoma's diameter distribution (all datasets\*) compared to the McPherson Ideal Distribution

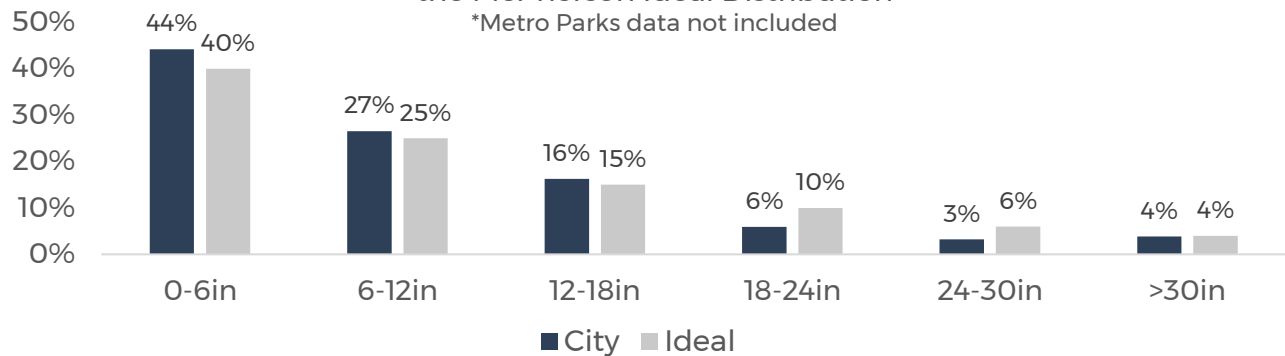
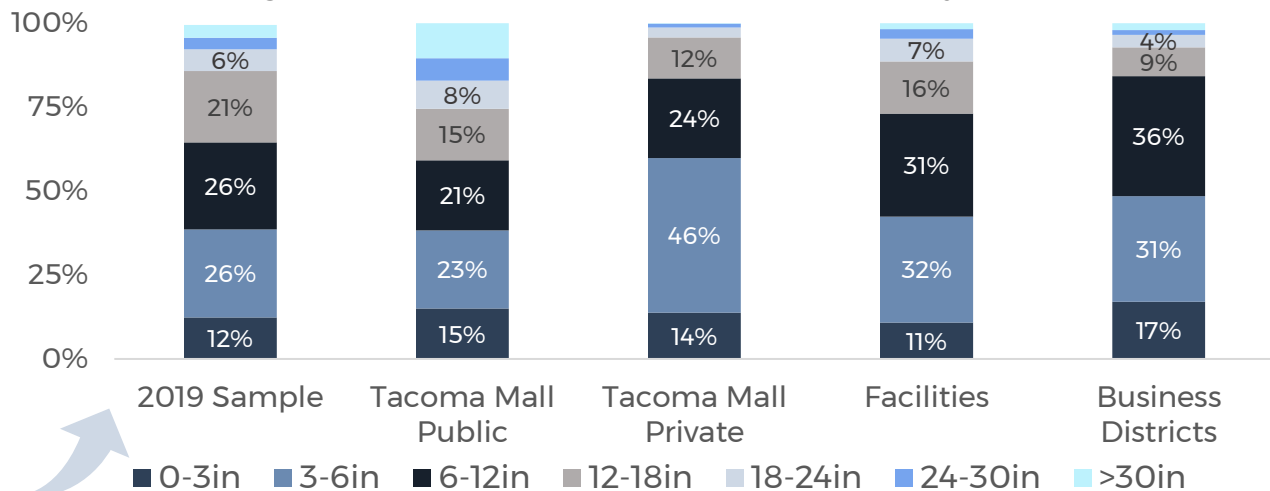


Figure 18. Diameter distribution for each inventory dataset



### Findings

The diameter classes were chosen so that the tree population could be analyzed according to the McPherson ideal distribution (McPherson, Soares et al. 2011). Based on the analysis, the distribution trends towards the ideal; there is an adequate distribution of young trees (44%) and established trees (27%). The City's level of maturing trees (trees in the 18-24-inch range) is below the ideal distribution levels.



Most trees are in trees in the 0-6 inch size class (44%).  
**Young tree pruning may reduce future maintenance costs.**

(Based on available data, not all public trees represented)



## Condition of the Public Trees

Tree characteristics and outside forces affect the management needs for urban trees. An analysis of the condition enables managers to plan the urban forest and target outreach to property owners and the community as a whole. Tree condition indicates how well trees are managed and how well they perform given site-specific conditions.

The condition of individual trees was summarized based on the information available in the 2019 sample inventory, Tacoma Mall Subarea inventory, Business Districts, City facilities, and Metro Parks datasets. Commonly, several factors are considered for assessing a tree's condition including root characteristics, branch structure, trunk, canopy, foliage condition, and the presence of pests. The condition values consist of Excellent, Good, Fair, Poor, or Dead.

Figure 19. Summary of tree condition Citywide (all data)

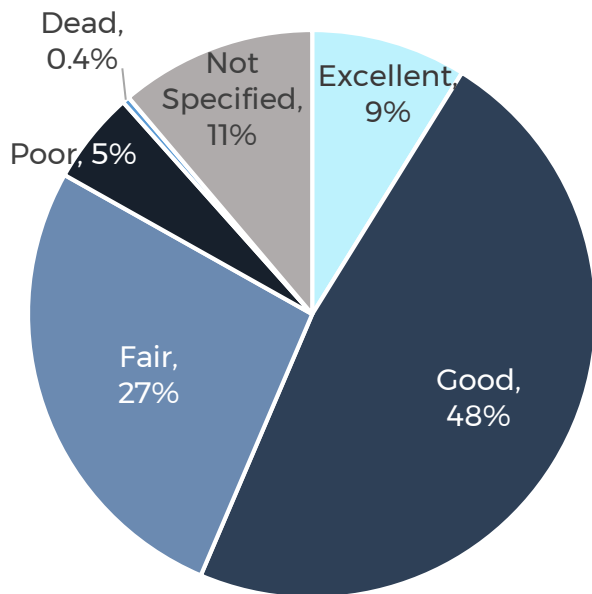
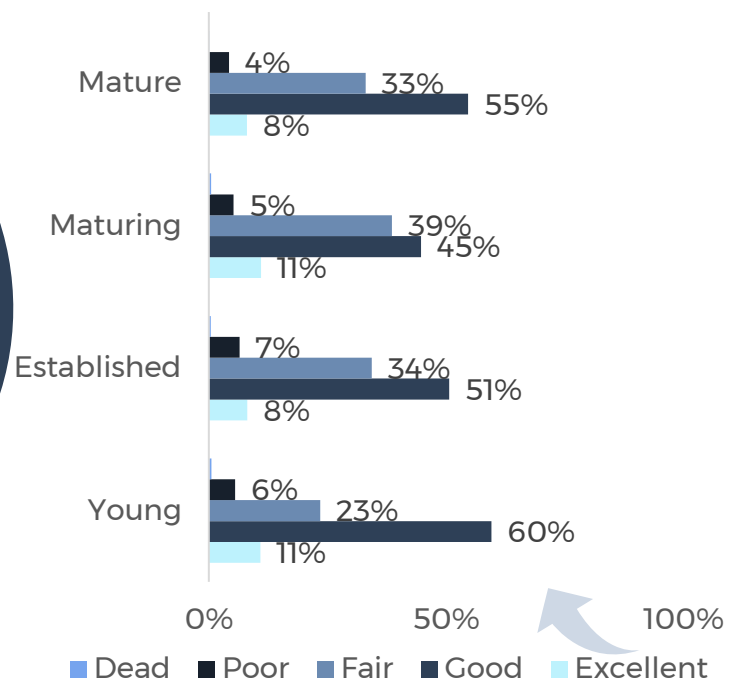


Figure 20. Summary of tree condition by age classes



### Findings

Tree condition summaries were performed using the City's TreePlotter application rather than the Excel spreadsheets since the software application provides the means to more frequently update and maintain tree condition values. It should be noted that the condition of trees may have changed since the drafting of this report.

Of the 13,452 trees in the City's TreePlotter, nearly half of the trees are in Good condition with a total of 6,400 trees or 48%. There are a total of 3,596 (27%) trees in Fair condition and 1,189 (9%) trees in Excellent condition. Only 5% were reported in Poor condition and less than 1% are Dead. There are 1,505 trees without a condition rating specified.

In addition, the condition was summarized by relative age classes. Most trees in all age classes are in Good condition. A higher distribution of Fair trees (39%) exists in the maturing age class and the established age class has the highest distribution of Poor conditioned trees with 7%.



Most trees are in Good condition (48%).

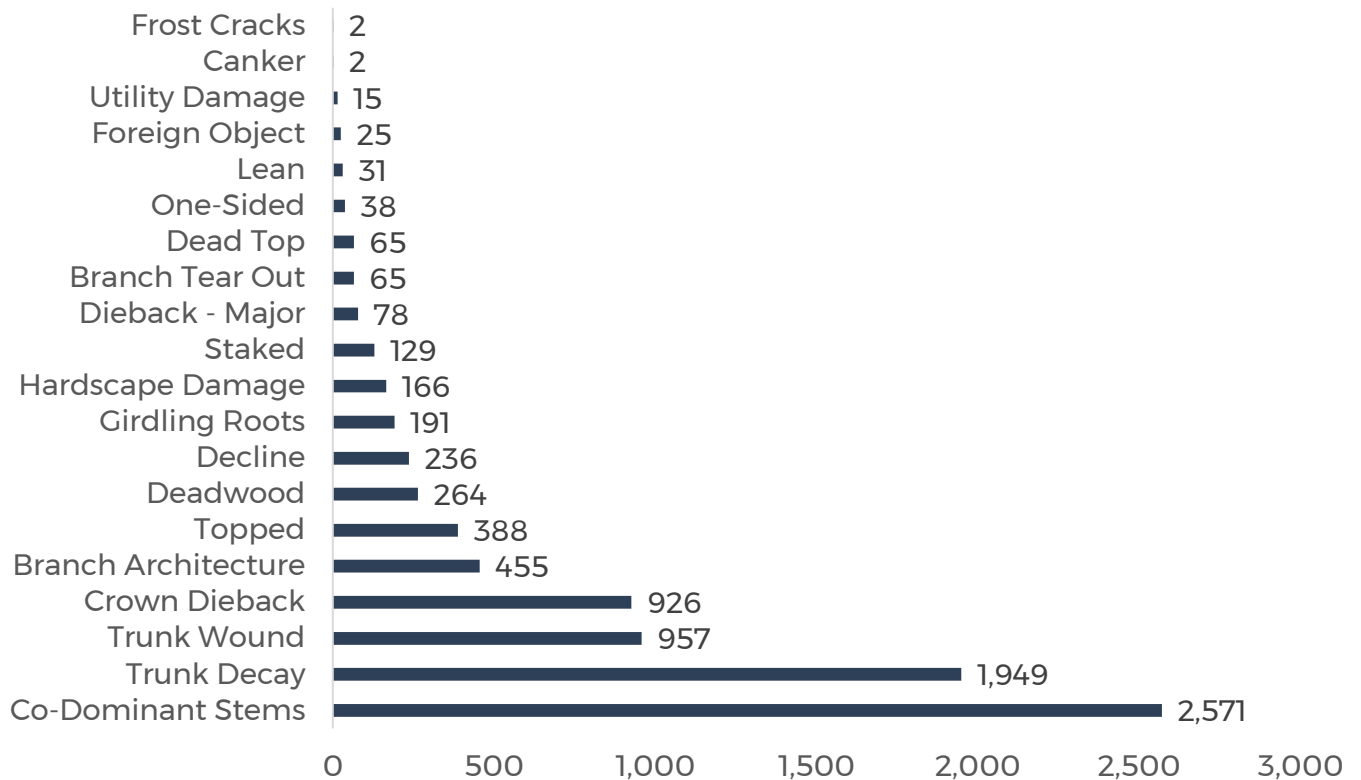
**Young trees in Fair Condition (23%) may improve with maintenance.**

(Based on available data, not all public trees represented)

## Tree Observations and Defects

Observing and recording tree defects and features during tree inventory activities help to inform managers of existing and potential issues facing trees as well as the possible causes of defects observed. Understanding the cause of these defects can inform managers of future communications, management, protection, and planning needs.

Figure 21. Summary of observed defects (all data)



### Findings

A total of 4,908 trees (36%) were recorded as having a defect. The most common defect observed was the presence of co-dominant stems (2,571 trees). A total of 1,949 trees were recorded as having trunk decay. Over 900 defects were recorded for both trunk wounds and crown dieback. The total number of defects recorded was 8,553 records meaning some trees had multiple defects. It should be noted that this information is based on the 13,452 living trees in the City's TreePlotter software application.



5,161 (60%) of recorded defects could potentially have been avoided.

These include utility damage, hardscape damage, girdling roots, topped, branch architecture, and trunk wounds.

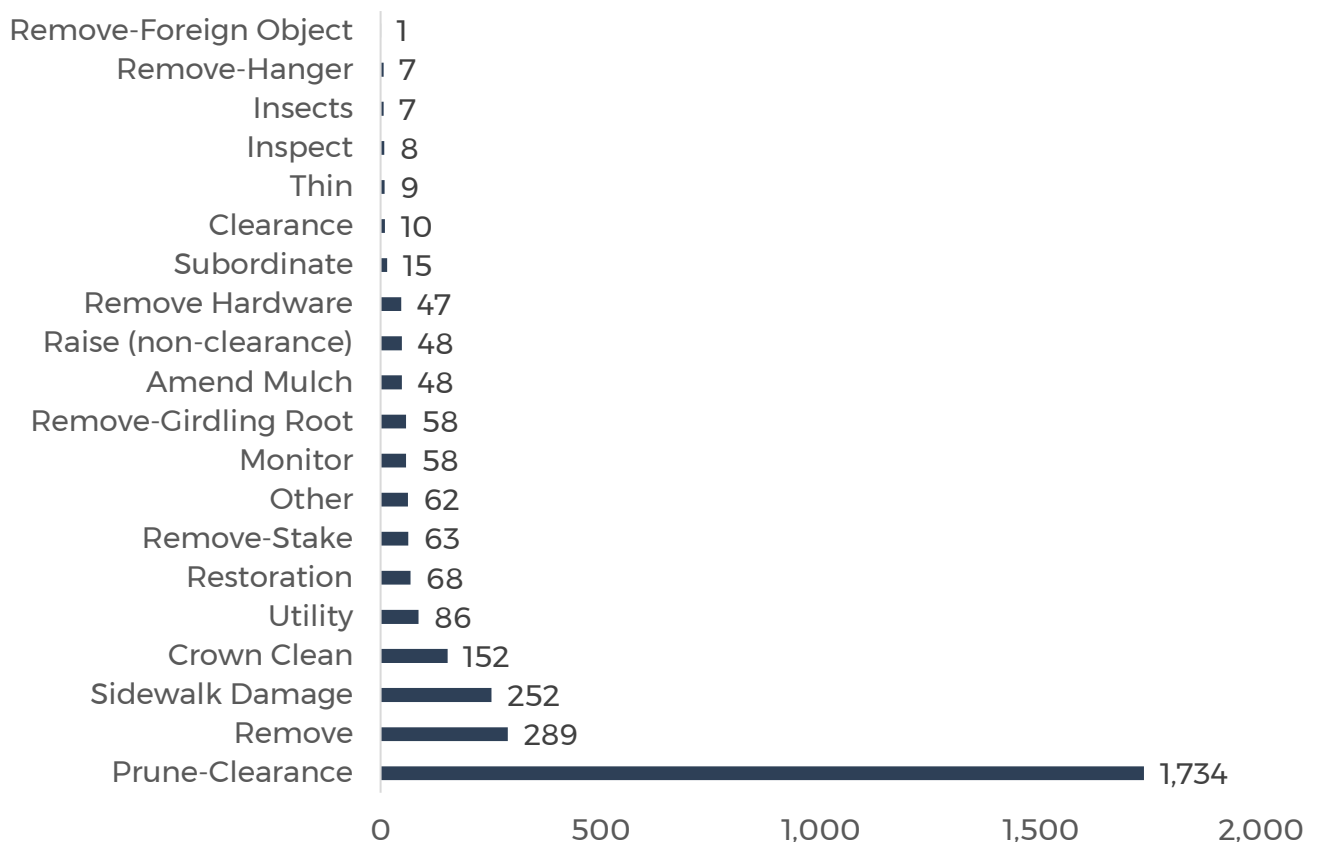
**Use this data to enforce best practices in tree care.**

(Based on available data, not all public trees represented)

## Potential Tree Maintenance Needs

An analysis of the potential maintenance requirements enables managers to plan the urban forest and target outreach to property owners and the City as a whole. Tree maintenance needs are inventoried for public safety reasons and for the health and longevity of the trees though a complete and comprehensive dataset is not available at this time. The following summaries provide an overview of potential maintenance needs based on the data available in the City’s TreePlotter software application. It should be noted that as the City and adjacent property owners actively maintain trees, these values may change, and may have done so since the writing of this report. For cities with the responsibility of maintaining trees in the public rights-of-way, data such as maintenance needs provides tree managers with an understanding of the demands, frequency, and concentration to establish daily work plans and prioritize maintenance and planting.

Figure 22. Recommended tree maintenance tasks (all data)



### Findings

A total of 2,715 trees were given a recommended tree maintenance task and a total of 3,022 tree tasks were assigned, meaning some trees have multiple recommended tasks. Clearance pruning is the most recommended maintenance task with 1,734 trees (57%). A total of 289 trees are recommended for removal.



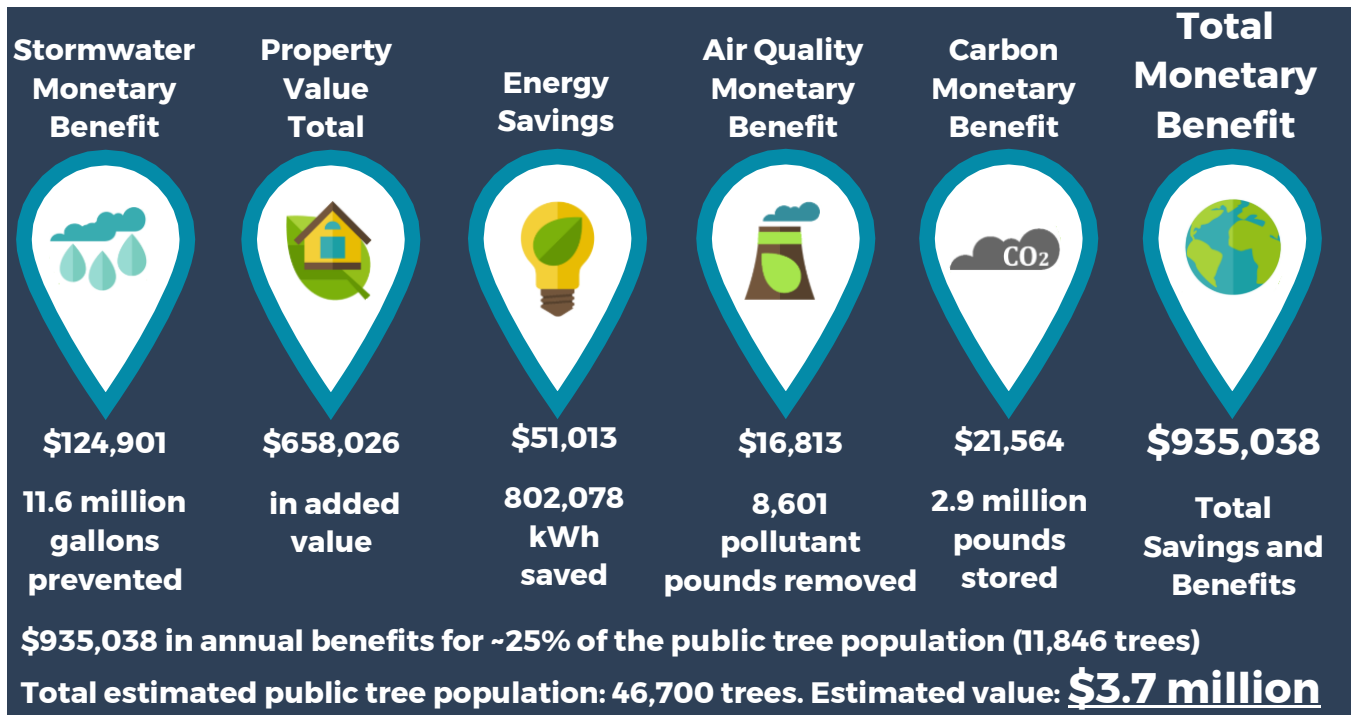
Most trees require pruning for clearance (57%)  
or a routine pruning (11%).

**A complete inventory will provide a comprehensive understanding of the maintenance needs.**

(Based on available data, not all public trees represented)

## Cost-Benefit Analysis of Tacoma's Urban Forest

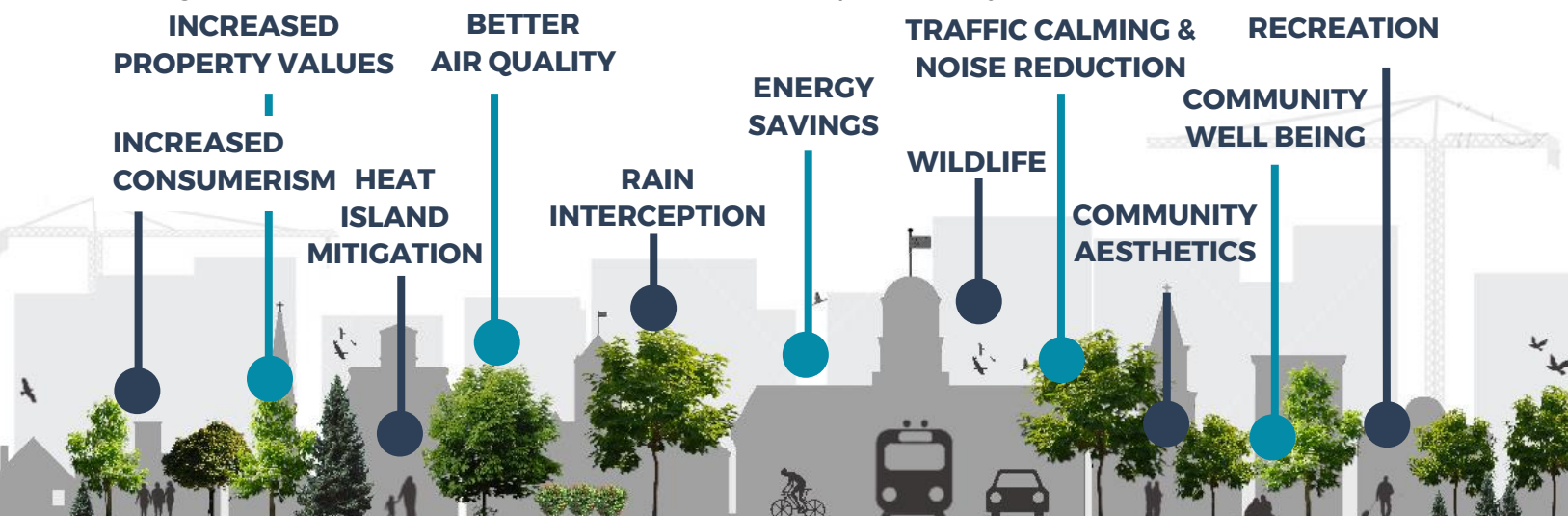
Figure 23. Summary of annual ecosystem services and benefits of Tacoma's trees (sample)



A total of 11,846 (88%) of the 13,452 total trees in the City's tree inventory management software, TreePlotter, have data to enable calculations of ecosystem services and benefits. In addition to the summaries provided in the figure above, the inventoried trees provide over \$72,700 in annual natural gas savings by preventing heat use by 80,235 Therms. Nearly 1.4 million pounds of carbon are sequestered annually and nearly 1.8 million pounds of carbon are avoided. Based on the estimated population of Tacoma in 2017 and the number of trees with ecosystem benefit values, the inventoried trees in the City provide nearly \$4.40 in benefits per capita and average \$79 in annual benefits per tree. With an estimated total public tree population of 46,700 trees, this equates to approximately \$3.7 million in total benefits.

This information, in conjunction with tree maintenance costs and costs for replacement, provide summaries of the costs-to-benefits of the City's public (partial) tree inventory population.

Figure 24. Illustration of the services and benefits provided by Tacoma's urban forest



## CONCLUSION

The analysis of existing tree inventory datasets has been presented in this section. As noted, not all data can be used to represent the Citywide urban forest. The following provides an interpretation of the data as presented in this section.

### **Tree Canopy, Urban Heat Islands, and Environmental Justice**

The results of the 2011 and 2018 tree canopy assessments can be used to develop a continuing strategy to protect and expand Tacoma's urban forest. The existing canopy and possible planting area data can be used as a guide to determine where the City has been successful in protecting and expanding its urban forest resource, while also targeting areas to concentrate future efforts based on needs, benefits, and available planting space. Tacoma can use these results to ensure that their urban forest policies and management practices continue to prioritize its maintenance, health, and growth.

This Plan's recommendations and strategies for achieving a 30% canopy goal by 2030 will use the data from these studies to prioritize tree plantings while addressing urban heat island issues and environmental justice. To plant for the future, trees need to be chosen that can cope with hotter, drier summers, wetter winters with more extreme storms, less snowpack and smaller water reserves.

Trees, planted to achieve the canopy goal, are most susceptible to disease or drought in their first years. Anything Tacoma plants will need adequate care or be tolerant to salt, pollution, wind, and drought, especially if City water restrictions come into effect as they have in the past.

In order to get to the 30% canopy by 2030 goal, the City and its partners must engage the community. As the data shows, most tree canopy and available planting space resides on residential land. In a sense, community residents are the wardens of the urban forest and its associated benefits. Preserving and enhancing the urban forest must be a collaborative effort.

### **Tree Diversity and Composition**

The aggregated dataset is not a complete dataset of all public trees but is adequately comprehensive to provide meaningful results to inform future urban forest management. Based on the data, the City is at several diversity thresholds. It is generally recommended that an urban forest not be comprised of more than 20% of any tree genus and no more than 10% of any tree species. While this guidance may be an umbrella recommendation, it does provide information for selection of tree species for future plantings. There are an abundant number of maples (*Acer*) and Douglas fir (*Pseudotsuga*). The abundance of these species in the urban forest makes it a limiting species. For a sustainable and resilient urban forest these tree species should be limited in new tree installations outside of natural areas where they may be performing a specific ecosystem function in their natural environment.

Maintaining and improving tree species diversity should also consider existing and potential tree pests and diseases, changing climates, enhancing ecosystem benefits, and equitable distribution Citywide. Diversity and potential threats can be properly managed with routine monitoring of the urban forest, routine pruning cycles, adequate tree plantings, and an engaged community.

### **Distribution of Tree Diameter Size Classes (Relative Age)**

McPherson et. al. proposed an ideal diameter size class distribution for street trees based on observations of well-adapted trees in urban environments. McPherson's ideal distribution

suggests that the largest fraction of trees (approximately 40% of the population) should be young (less than six inches DBH), while a smaller fraction (approximately 10%) should be in the large-diameter size class (greater than 24 inches DBH). A tree population with an ideal distribution would have an abundance of newly planted and young trees, and lower numbers of established, maturing, and mature trees. Based on the aggregated dataset, Tacoma is trending towards this ideal distribution.

Appropriate distribution of tree sizes and age classes can be achieved if trees are properly maintained and preserved. Proper urban forest management will allow the maturing trees to mature as the younger trees transition to established.

A goal for Tacoma's urban forest should be an uneven-aged distribution of trees at the street, park, and Citywide levels. An aging tree population poses a potential increase in maintenance and removal demands and may leave a void in tree canopy and associated benefits if tree planting levels are not elevated. The City should increase its tree planting efforts to prevent a loss of ecosystem services provided by the mature trees that reach senescence or early mortality.

It is recommended that Tacoma support a strong planting and maintenance program to ensure that young, healthy trees are in place to fill in gaps in tree canopy and replace older declining trees. The City must promote tree preservation and proactive tree care to ensure the long-term survival of older trees. Additionally, tree planting and tree care will allow the distribution to normalize over time.

The distribution of individual tree ages within a tree population influences present and future costs as well as the flow of benefits. Cities with the responsibility of tree maintenance within public rights-of-way experience an ideal age/size distribution in the tree population that allows managers to allocate annual maintenance costs uniformly over many years and assures continuity in overall tree canopy coverage and associated benefits which are often dependent on the growing space of individual trees (e.g. open grown versus restricted growing areas).

The relative age classes of trees per dataset can inform future maintenance needs and tree planting decisions.

### **Condition of the Public Trees**

Comparing the condition of the inventoried tree population with relative tree age (or size class distribution) can provide insight into the stability of the population. The condition of Tacoma's tree population based on the aggregated datasets is typical for a Citywide tree population and specifically for the age classes. The data analysis has provided the following insight into maintenance needs and historical maintenance practices.

The similar trend in condition across the tree population reveals that growing conditions and/or past management of trees were consistent.

- Younger trees rated in Fair or Poor condition may benefit from improvements in structure that may improve their health over time. Pruning should follow ANSI A300 (Part 1) standards.<sup>1</sup> Young tree pruning is less costly and has some significant impacts on the health outcomes of trees as they mature. Generally, as trees grow in size, the cost for maintenance increases. Some future maintenance costs can be prevented by conducting proper young tree pruning.

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<sup>1</sup>ANSI, American National Standards Institute. 2017. ANSI A300 (Part 1)-2017 Pruning

- Poor condition ratings among mature trees may be due to visible signs of decline and stress, including decay, dead limbs, sparse branching, or poor structure. These trees would require corrective pruning, regular inspections, and possible intensive plant health care to improve their vigor.
- Proper tree care practices are needed for the long-term general health of the urban forest. Following guidelines developed by ISA and those recommended by ANSI A300 (Part 5) standards<sup>2</sup> will ensure that tree maintenance practices ultimately improve the health of the urban forest.

### **Tree Observations and Defects**

5,161 (60%) recorded defects could potentially have been prevented. These defects include utility damage, foreign object, staked, hardscape damage, girdling roots, topped, branch architecture, trunk wound, and co-dominant stems. Defects such as branch tear out, major dieback, girdling roots, decline, topping, poor branch architecture, crown dieback, trunk wounds, trunk decay, and co-dominant stems can have long-term effects on the health and longevity of the tree and pose a potential risk to the public and property. This information should be used to enhance tree best management practices (“BMPs”). Proper young tree maintenance, tree protection, and monitoring will reduce these defects over time.

Corrective actions should be taken when warranted. If the tree’s condition worsens, removal may be required. The costs for treating deficient trees must be considered to determine whether removing and replacing the tree is the more viable option.

### **Potential Tree Maintenance Needs**

Tasks such as crown cleaning, utility, restoration, monitor, raise, reduce, clearance, thin, inspect, remove-hanger, remove-foreign object can be addressed during clearance pruning activities or during a routine pruning cycle if the City moves in this direction. Tasks such as remove-stake, monitor, remove-girdling root, amend mulch, raise, remove hardware, and inspect may apply to young trees which can be addressed by implementing a routine young tree training cycle which could possibly be administered by trained volunteers. Training of volunteers and tree stewards would reduce future tree maintenance demands within the public rights-of-way.

### **Cost-Benefit Analysis of Tacoma’s Urban Forest**

The trees growing along the public streets constitute a valuable community resource. They provide numerous tangible and intangible benefits such as pollution control, energy reduction, stormwater management, property value increases, wildlife habitat, education, and aesthetics.

The services and benefits of trees in the urban setting were once considered to be unquantifiable. However, by using extensive scientific studies and practical research, these benefits can now be confidently calculated using tree inventory information. The results of applying a proven, defensible model and method that determines tree benefit values for the City of Tacoma’s tree inventory data are summarized in this report. The results of Tacoma’s tree inventory provide insight into the overall health of the City’s public trees and the management activities needed to maintain and increase the benefits of trees into the future.

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<sup>2</sup> ANSI A300 (Part 5)-2012: Management of Trees and Shrubs During Site Planning, Site Development, and Construction

Based on U.S. Forest Research, on average the monetary cost-benefit ratio in dollars (\$) of urban trees is 1:2. For every dollar invested in tree planting, the community realizes a two dollar return in investment based on the ecosystem services and benefits provided.<sup>3</sup>

The total annual value and savings provided by Tacoma’s inventoried trees is over \$935,000, or approximately \$4.40 per capita (2017). A complete inventory of all public trees in Tacoma will provide greater and more accurate estimates of the value and benefits of the City’s trees. In addition, the benefits can be estimated for the future tree planting targets and canopy goals established in this Plan. This information can be used to build support for the implementation of this Plan, demonstrating the City’s efforts to improve the equity of distribution of trees and associated benefits.

## FINAL CONCLUSION

The summaries provided in this section use an aggregated tree inventory dataset to provide generalized urban forestry trends Citywide. These summaries describe Tacoma’s urban forest structure, condition, potential maintenance needs but do not depict exact characteristics of Tacoma’s urban forest. Comprehensive accurate data assessments can only be made through statistical analyses or a complete inventory of all public trees.

Generalized summaries of tree diversity, relative age, condition, and potential maintenance can inform tree species for new tree installations, ecosystem services and benefits of the public trees, and maintenance requirements of priority maintenance corridors recommended in this Plan.

### TREE CANOPY, UHI, EQUITY INDEX:

Figure 25. Summary of methods for applying the data analysis results. The data can be used to set small and large scale canopy goals, planting targets, tree preservation to improve environmental justice and equity).

### COUNT OF LIVE TREES:

This data can be applied to benchmarks in this Plan (staffing per tree, pruning cycles, budgets).

### TREE BENEFITS:

These values can build support for a program by quantifying the benefits trees have on human health, the environment, and the economy.

### TREE MAINTENANCE:

Data can be extrapolated to estimate demands.

### FULL PUBLIC INVENTORY:

A complete database of public trees provides better data and informed decisions.

### SPECIES DIVERSITY:

The data can be used to inform tree species selection for new plantings.

### SIZE CLASS:

Maintain an uneven-aged stand by continuing plantings, and proper maintenance. Use size class to estimate maintenance demands and use tree stewards for

### CONDITION:

Condition can inform better monitoring and care approaches and ID species performing well.

### TREE DEFECTS:

Abiotic, biotic, and anthropomorphic causes of defects can inform future maintenance, planting, and outreach approaches.



<sup>3</sup> U.S. Forest Service, Urban & Community Forestry Program and Vibrant Cities Lab 1-pager. February 2018, [www.fs.fed.us/ucf/supporting\\_docs/UCF-Brief-Feb2018.pdf](http://www.fs.fed.us/ucf/supporting_docs/UCF-Brief-Feb2018.pdf)





## ELEMENT 5:



# COMMUNITY INTERESTS AND INPUT



## PURPOSE:

To understand the interests of the community, and how they can help to craft the level of service.



Source: Make It Tacoma

## **ELEMENT #5: COMMUNITY INTERESTS AND INPUT**

### **PURPOSE**

To understand the interests of the community, and how they can help to craft the level of service.

### **PROCESS**

Community outreach and engagement for the Urban Forest Management Plan centers around the phrase, “One Tacoma, One Canopy”. This is in reference to the City’s comprehensive plan and the science that proves Tacoma residents benefit from a healthy, thriving, and sustainable urban forest.

## **OVERVIEW OF COMMUNITY INPUT DATASETS**

### **A. Community Surveys**

Consisted two rounds of surveys to gather community input. The first round included an online version and a mailed version to 3,000 Tacoma addresses randomly selected across the five councilmanic districts and randomized by land use. The second round was limited to online. Both surveys were translated into the five most common non-English languages spoken in Tacoma.

### **B. Community Meetings**

A total of three community meetings were held throughout the course of the planning effort for this project.

### **C. Community Service Requests and Call Logs**

An analysis of service requests received from December 2015 through April 2018 was conducted to identify trends in community concerns and interests.

### **D. Meetings with City Commissions, Committees, and Special Interest Groups**

Throughout the course of this planning effort, meetings and presentations were conducted to City and special interest groups to provide updates, gather feedback, and accordingly adjust this Plan.

### **E. Urban Forest Management Plan Website**

A website was launched by the UF Team to provide a platform for the community to learn more about urban forestry, review Plan components completed, and provide feedback.

## **DETAILED PROCESS FOR GATHERING COMMUNITY INPUT**

### **A. Community Surveys**

A series of questions were created for the first round of surveys and distributed to the public. The question of desired outcomes, planned achievements, information uncovered, and topics to address were determined for development of the questions.

The first survey consisted of 21 questions focused on primarily gathering feedback regarding community viewpoints and perceptions relating to trees and the urban forest. The questions gathered information about the public’s opinion of current tree management performance, overall view on the health of the urban forest, important ecosystem benefits and services provided by trees, potential risks posed to the urban forest, and primary concerns regarding

issues potentially caused by trees. Sociodemographic and geographic questions were also included to inform the analyses and subsequent surveys, meetings, and educational materials.

The first survey was released on August 26, 2019 and open until October 5, 2019. Online and printed copies were translated into the five most common non-English languages spoken in the City: Spanish, Russian, Vietnamese, Korean, and Mandarin. These surveys were available online via SurveyMonkey and the City's Urban Forest Management Plan website, [www.TacomaTreePlan.org](http://www.TacomaTreePlan.org) (see below for more information about the website).

In addition to the online survey, 3,000 randomized addresses were generated across Tacoma's five Councilmanic Districts and further randomized by land use (600 addresses per District) for printed mailings of the survey. This process included a reminder postcard sent two weeks after issuing the mailed survey. Recipients were offered the option to complete the mailed version or complete the survey online. Furthermore, hard copies of the survey were distributed at community meetings and lead-up events to Green Tacoma Day—distributed by Tacoma Tree Foundation and the Environmental Services Department—and also offered as requested. The City also utilized interns and AmeriCorps members to advertise the surveys at various locations across the Tacoma.

After closing the first round of community surveys, the data and summaries were exported from SurveyMonkey to complete more extensive analyses to inform the second round of surveys, community meetings, and strategies in this Plan. Completed hard copy surveys were manually entered into SurveyMonkey for analysis.

The second round of surveys consisted of eight questions pertaining to potential short- and long-term urban forestry strategies as well as the demographic and geographic questions provided in round one. Only an online version was offered this round and it was available from October 15, 2019 to October 30, 2019.

To incentivize survey responses for both rounds, all survey respondents not affiliated with the City were entered into a drawing for a \$50 gift card to a Tacoma restaurant of their choice.

## **B. Community Meetings**

The planned community engagement process for development of the Urban Forest Management Plan consists of three public meetings throughout the course of the project. In addition, City Communications, the Environmental Services Department, and Tacoma Tree Foundation have and will be hosting public meetings, events, and informative sessions specifically for the Plan. City Communications is also continually providing content on City social media, the City's website, and email listservs regarding the Plan and related events.

The first community meeting was held on September 18<sup>th</sup>, 2019 at Washington Elementary School in Tacoma and the second was held the evening of October 22<sup>nd</sup>, 2019 at the Eastside Community Center. The meetings provided the attendees with an overview of the City's urban forestry program, the current state of and potential risks to the urban forest, benefits of the urban forest, a visioning exercise, participating in a One Canopy Story Map, strategy building exercises and open discussion. At the first meeting, attendees were asked to write on a large adhesive note a response to the question, "What brought you here today?". Additional questions were then addressed during the visioning exercise, facilitated by a series of questions relating to the future of Tacoma's urban forest. These questions included:



What do you want the urban forest to look like 10 years from now? For future generations?

What would 30% tree cover look and feel like and what would it take to achieve this?

If you could change Tacoma's environment in one way, what would it be? How would the City's urban forest be different than it is now?

The visioning exercise and the open discussion afforded the opportunity to hear the public's ideas and opinions, but also for the City to describe current practices and procedures that might not have been understood by the public prior to meeting.

Notes were taken throughout the course of the two meetings and were synthesized and posted on the project's website (TacomaTreePlan.org). These notes provide information and context for development of future meeting agendas, community outreach and education, the Plan's vision, and the Plan's strategies.

The November 2019 meeting will consist of discussions about the Phase 1 and Phase 2 completed reports and provide information to incite action and support for implementation.

### **C. Community Service Requests and Call Logs**

The City's Customer Support Center ("311") receives and responds to community questions, concerns, complaints, and service requests. When a tree-related issue or topic is received, the Customer Support Center responds if the personnel have an available answer. If a response is not available, the personnel direct the message to the Environmental Services Department's Urban Forestry or Open Space Work Group. The Customer Support Center keeps records of all community requests as does the Environmental Services Department when it is tree-related. In addition, the Environmental Services Department and the Urban Forestry Program is frequently contacted directly by community residents and visitors and the Urban Forestry Program keeps records of these call logs.

All tree-related 311 messages (December 2015 to April 2018) and calls to the Urban Forestry Program were gathered from the City and analyzed to identify trends in topics and geographic origin of the call or area of concern.

### **D. Meetings with City Commissions, Committees and Special Interest Groups**

To develop a shared vision and road map for sustainable urban forestry, City stakeholder meetings were held in addition to the community meetings. City commissions and committees who oversee City operations that impact or influence urban forestry were introduced to the Urban Forest Management Plan project. In most cases, these commissions and committees were well aware of the effort due to the ongoing communications, presentations, and discussions facilitated by the City's Urban Forestry Program in recent years. The meetings with these stakeholders provided information and context to inform Plan development and were intended to garner support for the short- and long-term strategies proposed in the Plan.

One or more meetings and presentations were held with the following entities:

- ***Infrastructure, Planning, and Sustainability Committee to City Council (IPS)***
  - This City Council Committee addresses policies, issues, programs and services that may include, but are not limited to arterial streets; open space habitat management; infrastructure funding programs and plans; growth management, building codes, land use, planning and zoning; environmental and sustainability issues and plans; Local Improvement Districts (LIDs); public transit systems; transportation related matters; urban forestry and critical areas; and environmental issues associated with public utilities.
  - For the purposes of the Urban Forest Management Plan, this Committee oversees proposed strategies and recommendations that impact or influence the Committee's appointed topics of concern.
- ***The City of Tacoma's Landmarks Preservation Committee (LPC)***
  - This Committee was established to oversee the establishment and regulation of landmarks, local historic districts, proposed name changes for public facilities, and certain property tax incentives.
  - For the purposes of the Urban Forest Management Plan, the Committee reviews any proposed strategies relating to a heritage tree program and tree preservation.
- ***The Sustainable Tacoma Commission (STC)***
  - This Commission works with Tacoma's Office of Sustainability, which is responsible for implementing the strategies in the Environmental Action Plan. The purpose of the Sustainable Tacoma Commission is to bring citizen accountability, transparency, and vigilance to the long-term implementation of Tacoma's Environmental Action Plan, and to oversee, coordinate, communicate, and encourage public involvement regarding sustainability initiatives as are consistent with the City's vision and definition of sustainability.
  - For the purposes of the Urban Forest Management Plan, the Commission supports public engagement in the planning process and encourages stewardship, support, and involvement in the Plan's implementation.
- ***Master Builders Association (MBA Pierce) of Pierce County, WA***
  - MBA Pierce is a trade association representing more than 650 builders, remodelers and industry professionals employing over 10,000 people in Pierce County. MBA Pierce works on behalf of the industry to promote and protect the local building industry by providing benefit programs, networking opportunities and representation to builders, developers, subcontractors, suppliers and service providers.
  - For the purposes of the Urban Forest Management Plan, MBA Pierce provided input and feedback regarding tree preservation and design standards. Goals of MBA Pierce are an important consideration and factor in developing this Plan's strategies.
- ***Puyallup Watershed Initiative Forest Communities of Interest (PWI FCOI)***
  - The PWI FCOI provides coordinated, focused outreach in order to drive conversation about sustainable management strategies for forests to contribute to the quality of life with jobs, cleaner air and water, and recreation opportunities. The PWI focuses its work on forestlands and urban forest habitats within the Puyallup Watershed and it is the PWI's hope that the watershed will become a model for conservation and stewardship of forest resources that will eventually be adopted by other watersheds.

## E. Urban Forest Management Plan Website

A website was developed by consultants for the Urban Forest Management Plan project. The primary objectives of this website are to provide information, educate the public about urban forestry, provide easy access to events and updates relating to the project, and document tasks and components of the planning effort for public absorption.

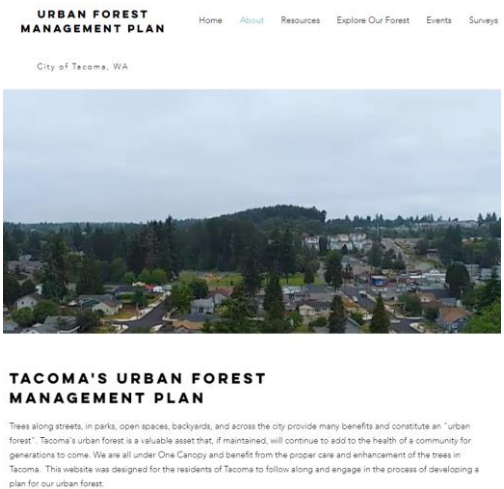
The website, [www.TacomaTreePlan.org](http://www.TacomaTreePlan.org) was launched in August 2019 and uses the established tagline, “One Tacoma, One Canopy” to deliver up-to-date information to the public. The website consists of the following main webpages:

- Home
- About
- Resources
- Explore Our Forest
- Events
- Surveys

The website is updated by the urban forestry consultants.

Additional features on this website include embedded community surveys, community survey language translations, Tacoma’s TreePlotter software application, project and event timeline, and blog-style page with supporting resources.

Google Analytics has been set up for this site to track information about the website visitors such as location, page visits, users per day, and general demographics. This information will be utilized in this Plan’s community outreach strategies and efforts.



## RESULTS

The Plan development process provided a broad perspective of the challenges that face Tacoma’s urban forest as well as the available support and potential opportunities. Through community meetings, events, and other engagement exercises, the City found an energetic set of residents with varying opinions on matters pertaining to the care of the urban forest. Connections and relationships that develop among stakeholders are valuable outcomes of the urban forest outreach process. As community awareness and actions associated with urban forestry move forward, it will be the people of Tacoma that ultimately realize the value of their contributions to their community in the trees that grow around them.

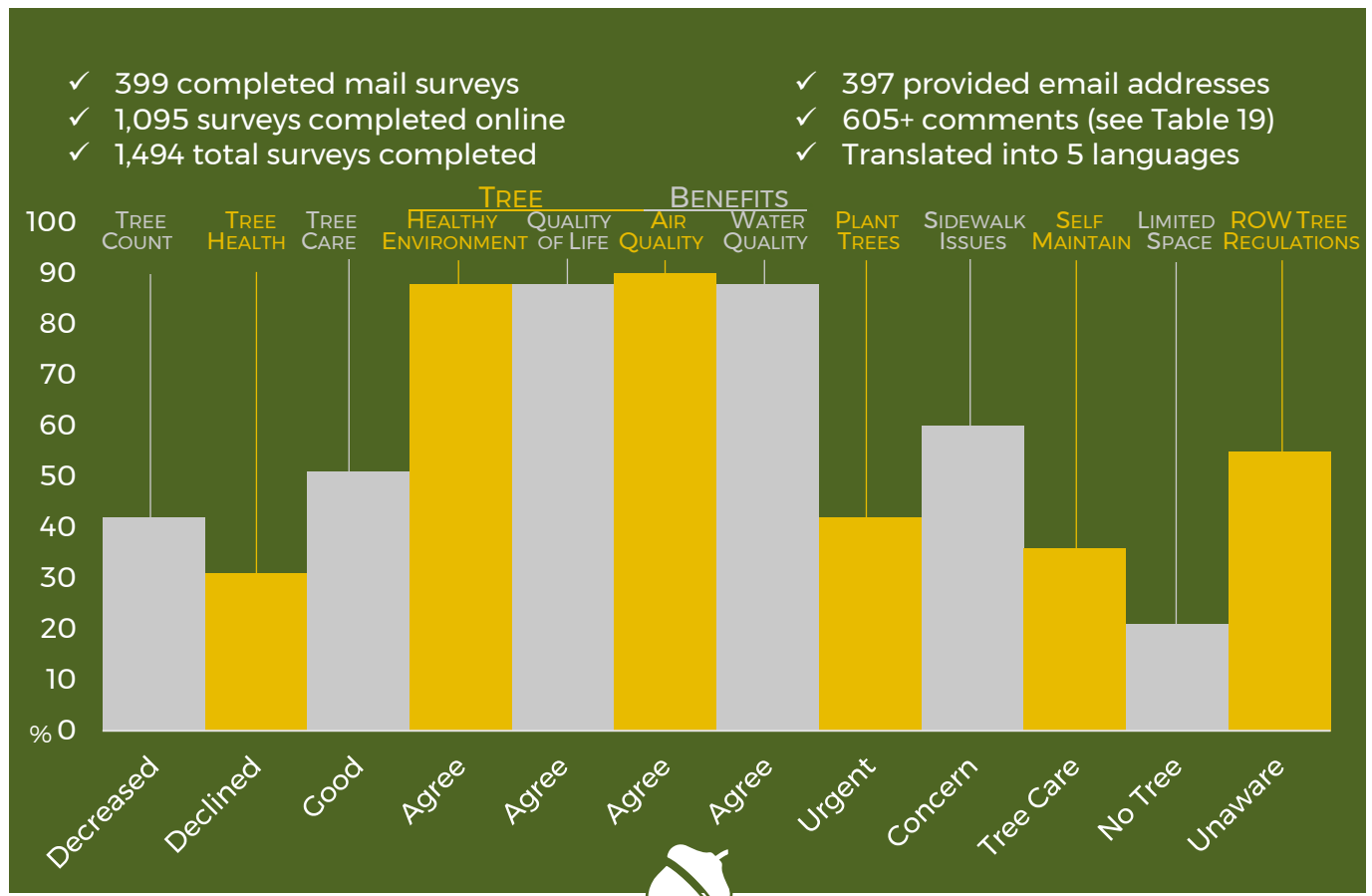
### A. Community Survey Results

Though the surveys results are not meant to be a consensus of Citywide values, concerns, ideas, or questions relating to the City's urban forest and is not the sole source of information used to develop this Plan's vision, goals, and strategies, they do provide valuable input for consideration. Additional opportunities for feedback were available at the October and November community meetings.

#### **Results of the First Community Survey**

The following provides a summary of the survey responses for round one. A complete summary of responses is available in Appendix F.

Figure 26. Summary results of the first survey for the Urban Forest Management Plan



Based on the first survey (1,494 surveys), the community generally (42%) feels the number of trees as well as the health of trees (31%) has decreased or declined over the last ten years, though. 51% consider the overall management of public trees to be “Good” or “Very Good”.

The majority (88%) strongly agree that public trees contribute to a healthy environment and improve the overall quality of life (88%) and urban trees are very important because of their ability to improve air quality (90%) and water quality (88%).

Most survey respondents (42%) feel tree planting and adding more trees is an urgent tree-related need though the majority (60%) agree that sidewalk and pavement damage due to roots and roots damaging underground utilities (58%) is the most important concern.

Most survey respondents with trees adjacent to their home or business conduct the tree pruning or have a neighbor or family member conduct the pruning (36%). Those that do not have a street tree adjacent to their property (36%) report the reason is due to the limited space (21%). 14% would like a tree but haven’t planted one yet. 48% of the survey respondents consider it a high priority to offer free street trees through the City’s programs though 55% did not know that the City has tree regulations in place for trees in the rights-of-way.

The community generally does not seek information regarding tree care (78%) but 45% would prefer internet and online resources.

Most survey respondents are white non-Hispanic or Latino (85%) homeowners (80%) in the 35-44 age range (22%) and live in northwest Tacoma (32%). Of the 1,494 surveys from round one, 26% of respondents have provided their contact information to stay in touch.


For the first survey, 605 survey respondents provided additional comments regarding urban forestry (question #15). Responses were analyzed to align with the strategy development process, community outreach, and One Tacoma components. Most (22%) comments relate to resource management. It is anticipated that strategies developed to appropriately address the comments and concerns of the public will garner additional support and action.

Table 19. Summary of question #15 in the first community survey

<b>Components of Urban Forestry in One Tacoma</b>	<b>Count &amp; % Referenced in Q15</b>	
Resource Management - Street Trees	146	(22%)
Canopy Growth 30/30	132	(20%)
Education, Outreach, Collaboration	99	(15%)
Urban Forest Equity & Accessibility	79	(12%)
Preserve Existing Trees	59	(9%)
Planning the Urban Forest	58	(9%)
Resource Management: Environmental & Watershed	26	(4%)
Resource Management: Viewsheds	25	(4%)
Climate Adaption	13	(2%)
Resource Management: Resiliency & Risk Management	12	(2%)
Urban Forest Long-term Funding	9	(1%)
Landmark/Heritage Trees	4	(1%)
<b>Total</b>	<b>662</b>	<b>100%</b>

**Results of the Second Community Survey**

Results of the second survey (**375 surveys**) were reviewed and used for this Plan’s strategy development process. [Appendix C](#) has the list of survey questions and detailed results.

Table 20. Summary results of the second survey for the Urban Forest Management Plan 	
<b>30% Canopy Goal (374 responses)</b>	<b>Very Supportive</b>
The City should aggressively work toward meeting the 30% tree canopy cover goal	91%
The City should encourage property owners to plant & care for private property trees	89%
<b>Tree and Sidewalk Conflicts (367 responses)</b>	<b>Very Supportive</b>
The City should encourage wider tree planting strips during its review of new development proposals	82%
The City should allocate resources for qualified people to provide an unbiased, logical, and consistent assessment	76%
<b>Heritage Tree Program (362 responses)</b>	
I support reasonable and appropriate tree protection of heritage street trees	94%
I support voluntary designation of private property heritage trees (people can nominate their own trees for protection)	72%
<b>Street Tree Maintenance Responsibility (358 responses)</b>	
I support a City program for the proper care of all street trees	64%
I support the allocation of City resources for more tree maintenance responsibility	63%
I support the City establishing priority corridors where the City is responsible	62%
<b>Tacoma Residency (357 responses)</b>	
Live in Tacoma	90%
District 1 (NW)	41%



## B. Community Meeting Results

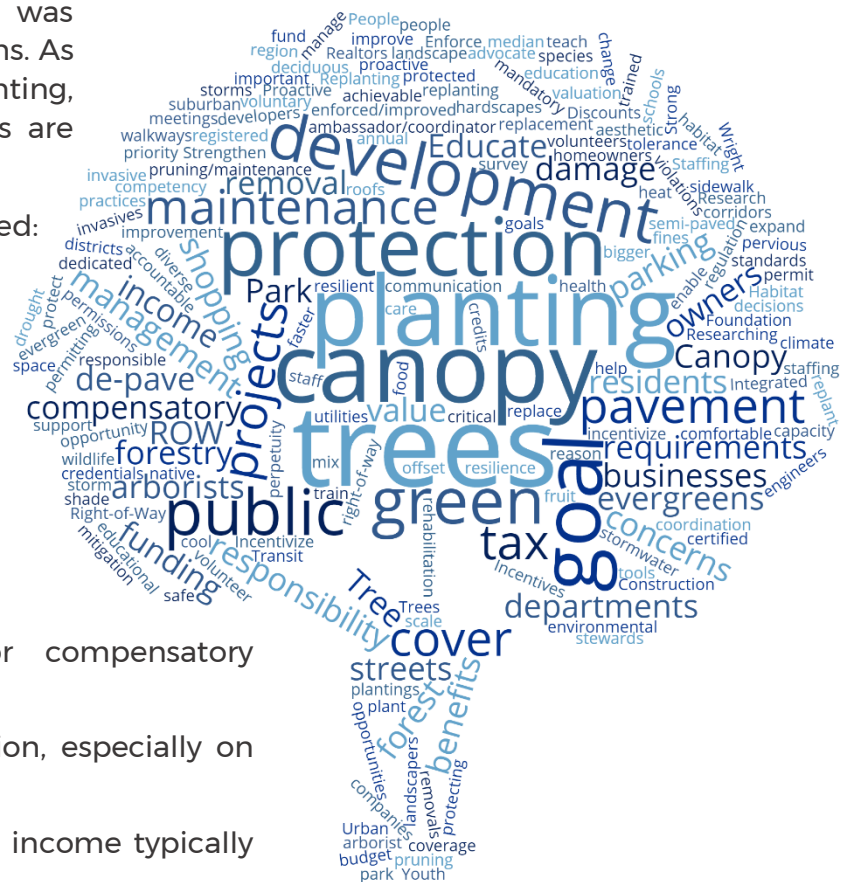


### Community Meeting #1

The first community meeting held on September 18<sup>th</sup> provided the City and urban forestry consultants with an opportunity to present the planning project and key issues inciting action. The majority of the meeting was open to hear the concerns, ideas, and questions of the public. In addition to the four meeting facilitators, there were a total of 18 attendees. These attendees provided insight into the key issues facing trees, areas for improvement regarding tree management and resource allocation, and overall vision for the future of Tacoma's trees.

A word cloud listing the recurring comments, themes, and phrases gathered from the meeting notes was created to summarize the discussions. As seen in the figure, canopy, planting, protection, maintenance, and goals are primary interests.

Figure 27. Word cloud summarizing recurring comments during the first community meeting



General summary comments included:

- Tax credits to incentivize planting and/or maintaining trees.
- Would like to see the City take responsibility for street trees.
- Valuation of established trees for fines in case of damage or removal.
- Required green roofs and/or compensatory replanting during development.
- Would like to see tree protection, especially on City projects.
- Consideration that areas of low income typically also have fewer trees.



### **Community Meeting #2**

The second community meeting held on October 22<sup>nd</sup> focused on more engagement exercises compared to the first meeting which emphasized background information. In addition to four team members from the UF Team, there were a total of 27 attendees.

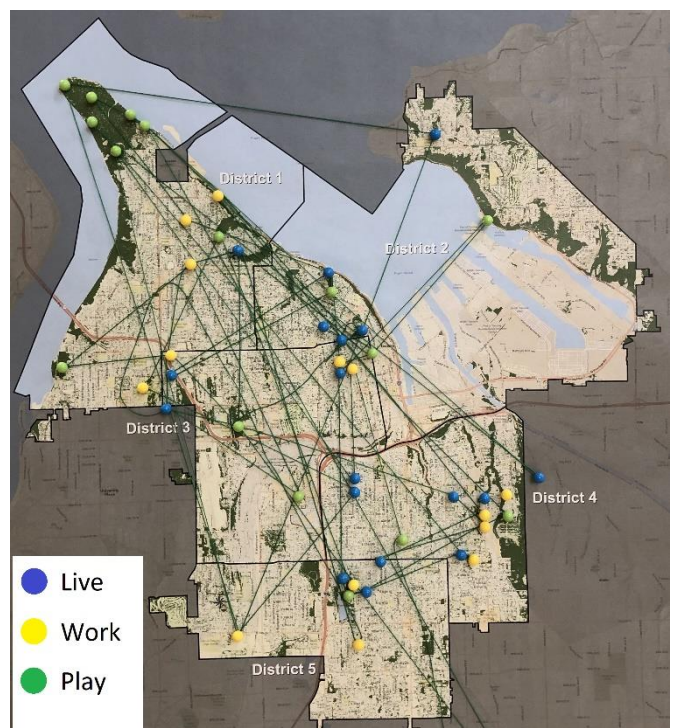
To generate initial thoughts about the Plan vision and potential strategies, attendees were asked to place pins on a large map of Tacoma with the 2018 tree canopy cover layer overlaid on the street map. Pins for where attendees live, work, and play were connected with one continuous string to illustrate the interconnections shared under “One Canopy” and to also identify trends or missed opportunities.

Based on the map, almost all regions of Tacoma were represented and there was a broad distribution of areas where attendees live and work. **Most pins marked for “play” fell within the more densely tree-canopied areas**, specifically Point Defiance Park. This information helps the UF Team strategize the November meeting and future outreach efforts. This map may also be a potential resource for volunteer requests given most attendees provided their contact information to stay connected.

After a brief introduction and overview of the project, the Plan vision was revisited by providing attendees with four draft vision statements to review and discuss. Participants were asked to place a star sticker next to their favorite or least unfavorable if none appealed to them. These draft vision statements are available in Appendix H.

The results of the visioning exercise are provided on the following page:

Figure 28. Attendees were asked to participate in the One Canopy Story Map, pinning where they live, work, and play



## **Community Meeting #2: Urban Forest Visioning Exercise**

**Vision Statement #1** \_\_\_\_\_ **9 Votes**

**Vision Statement #2** \_\_\_\_\_ **8 Votes**

**Vision Statement #4** \_\_\_\_\_ **7 Votes**

**Vision Statement #3** \_\_\_\_\_ **0 Votes**

Further review and refinement will be made to the vision statement based on the community feedback, City and partner objectives, and the Phase 1 Research Summary.

The following provides a summary of the discussion about the vision statements:

- Need to include human and physical health benefits from trees.
- Unclear on the meaning of “cohesive”.
- Some of the statements sound like it is the community’s sole responsibility; it needs to be a partnership between the City and its residents.
- Multiple attendees liked the words “healthy”, “dynamic”, and “diverse” in #3 but it received no votes because it did not mention the partnership that must exist between the City and its residents.
- A question about #2 mentioning “understory vegetation” generated a discussion that the urban forest is more than trees and more so, not just public trees but also the “forest” and ecosystems around generated by urban trees.
- Need the statement to be more than a “feel good” statements. Need to state commitments to action.
- Need to mention the pursuit of equitable access to the urban forest across the City.
- The statement needs to consider that most urban forests are human-made and require human attention and that humans are part of the same ecosystem as the urban forest.
- Need to include the mention of historic trees adding to the heritage and value of the City.
- Need to think about steps to improve/maintain the Grit City Tree Program and how that’s woven into the statement.



### **DRAFT VISION STATEMENT #1**

*One Tacoma, One Canopy:* Tacoma’s trees are recognized as integral to the quality of life for all City residents as well as for the City’s urban character and natural environments. A healthy, thriving, and sustainable urban forest remains a longstanding community priority and will be thoughtfully managed in a way to maximize a range of public benefits including a thriving ecosystem, a vibrant economy, and a livable community shared by all.

## **Community Meeting #2: Strategy Building Exercise**

Meeting attendees were provided a list of six potential Plan strategies, derived from stakeholder and community interest, ranging from short to long-term. The UF Team began the exercise by defining the strategy, explaining the current status, outlining the resource “costs”, and other details for consideration. Next to each strategy were a number of coins representative of the “relative cost” to implement, meaning the allocation or reallocation of City resources. Each attendee was given a total of 10 tokens that he or she could spend on implementing a strategy but full payment for each strategy was required. This demonstrated the compromise that must occur to implement urban forest strategies. The following provides a summary of the strategies and outcomes of the exercise.

# Tacoma's Strategy Menu

Limited resources and availability. Full menu available upon request.

- A) City Street Tree Maintenance Responsibility\_\_\_\_\_ \$\$\$\$  
 This strategy could range from prioritized corridors, limited timeframe, shared responsibility, Citywide, incremental stages, varied crew sizes, etc.
- B) Tree & Sidewalk Conflicts / Tree Protection\_\_\_\_\_ \$\$\$  
 This strategy could range from cost-share programs for sidewalk repair, City staffing for assessing conflicts, tree mitigation or fines for illegal removal or poor tree pruning practices, policy changes, resources for alternative remediation materials and methods.
- C) Tree Planting (30% goal, fruit trees, other)\_\_\_\_\_ \$\$  
 This strategy could include resources for planting trees, policy changes, staffing, volunteer programs, cost-share programs, etc.
- D) Tree Code Revision / Enforcement\_\_\_\_\_ \$\$  
 Actions for this strategy would look at tree protection in the public rights-of-way, adequate staffing and resources to monitor adherence to Tree Code, changes in the permitting and fee process, changes in design standards, proper tree maintenance practices, etc.
- E) City Staffing (Outreach/Education)\_\_\_\_\_ \$\$  
 This strategy would establish an additional position for urban forestry though it may serve multiple Departments and partners. This position would support implementation of this Plan's other strategies and improve the responsiveness to community requests and actively engage the community.
- F) Heritage Tree Program\_\_\_\_\_ \$  
 A heritage tree program may be voluntary or non-voluntary designation of significant trees to remain protected unless deemed unsafe or in decline beyond remediation. Heritage trees may be of significant size, age, species, and/or location or may have historical or cultural significance. New programs typically begin with trees in the public rights-of-way and are defined and authorized in municipal code.
- G) Other\_\_\_\_\_ Cost not considered at this stage  
 Comment cards for describing decision points for allocating resources, questions, or other strategies not included on the list.

## Favorite Strategies on the Menu

**Ranked #1\_\_C)** Tree Planting (\$\$) → 21 entries → 42 tokens

**Ranked #2\_\_E)** City Staffing (\$\$) → 20 entries → 41 tokens

**Ranked #3\_\_F)** Heritage Tree Program (\$) → 19 entries → 19 tokens

**Ranked #4\_\_A)** City Street Tree Maintenance Respons... (\$\$\$\$) → 13 entries → 54 tokens

**Ranked #5\_\_D)** Tree Code Revision/Enforcement (\$\$) → 10 entries → 19 tokens

**Ranked #6\_\_B)** Tree & Sidewalk Conflicts/Tree Protection (\$\$\$) → 6 entries → 19 tokens

**Other\_\_\_\_\_** 17 tokens and 7 written comments submitted and recorded in meeting notes

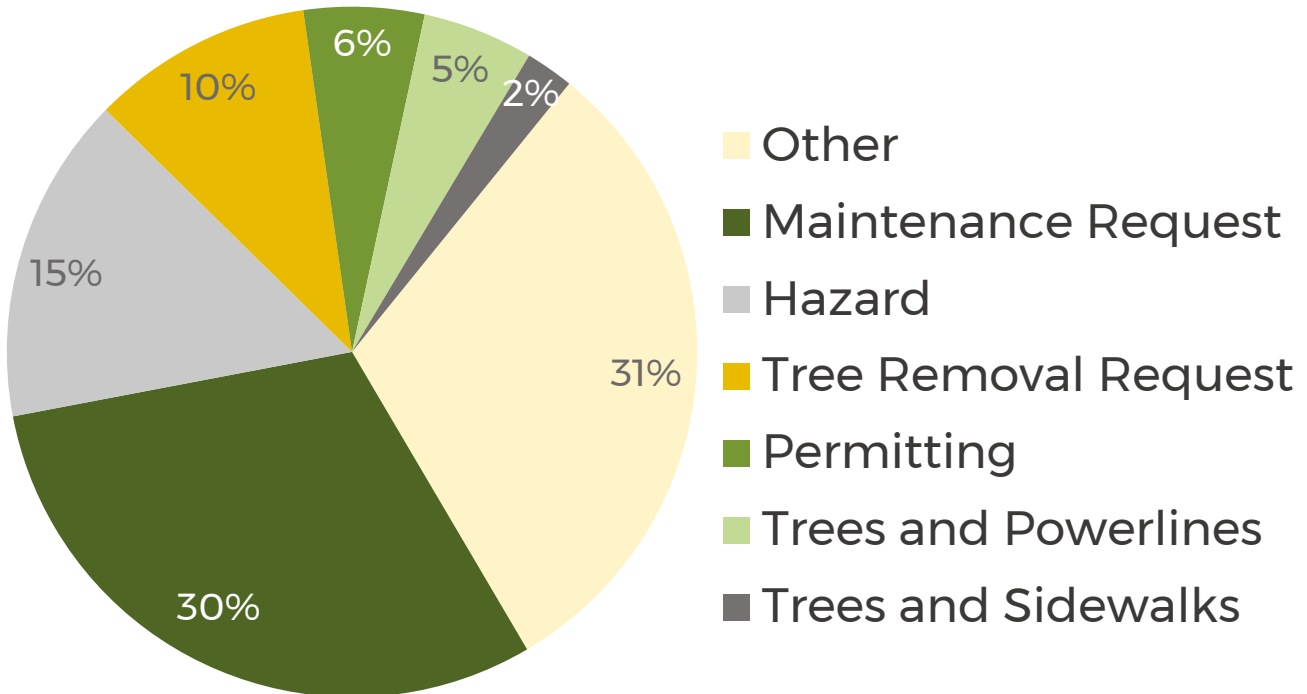


### C. Community Service Requests and Call Logs

These records provide information on the volume of requests received by the Urban Forestry Program either directly or redirected from the City's Customer Support Center. As the City considers staffing levels, these numbers and the results of the benchmarking research (Element #3) should be evaluated.

Based on the analysis of community service requests from December 2015 to April 2018 and the Urban Forestry Program's call logs from August 2014 to August 2017, a total of 443 tree-related issues, concerns, or questions were brought to the attention of the City.

Figure 29. Summary of 311 Service Requests and Urban Forestry Program call logs (August 2014 - April 2018)



In the 44-month span of records, a total of 135 (30%) tree issues are categorized as Maintenance Request. At least 99 of these were reports of trees overgrown on the sidewalk or street. 68 trees (15%) were reported as a Hazard and at least 49 trees were specifically noted as dead trees in the right-of-way or private property. A total of 46 (10%) were requests for trees to be removed. Other categories such as Construction, Trees and Sewers, Views, Financial Assistance, Tree Planting, and Tree Planting Opt-Out had 1% or less frequency and were grouped as Other (136 records).




#### **SERVICE REQUESTS AND CALL LOGS:**

Requests for street tree maintenance is most common (30%) and is often a request for clearance of limbs (73%).

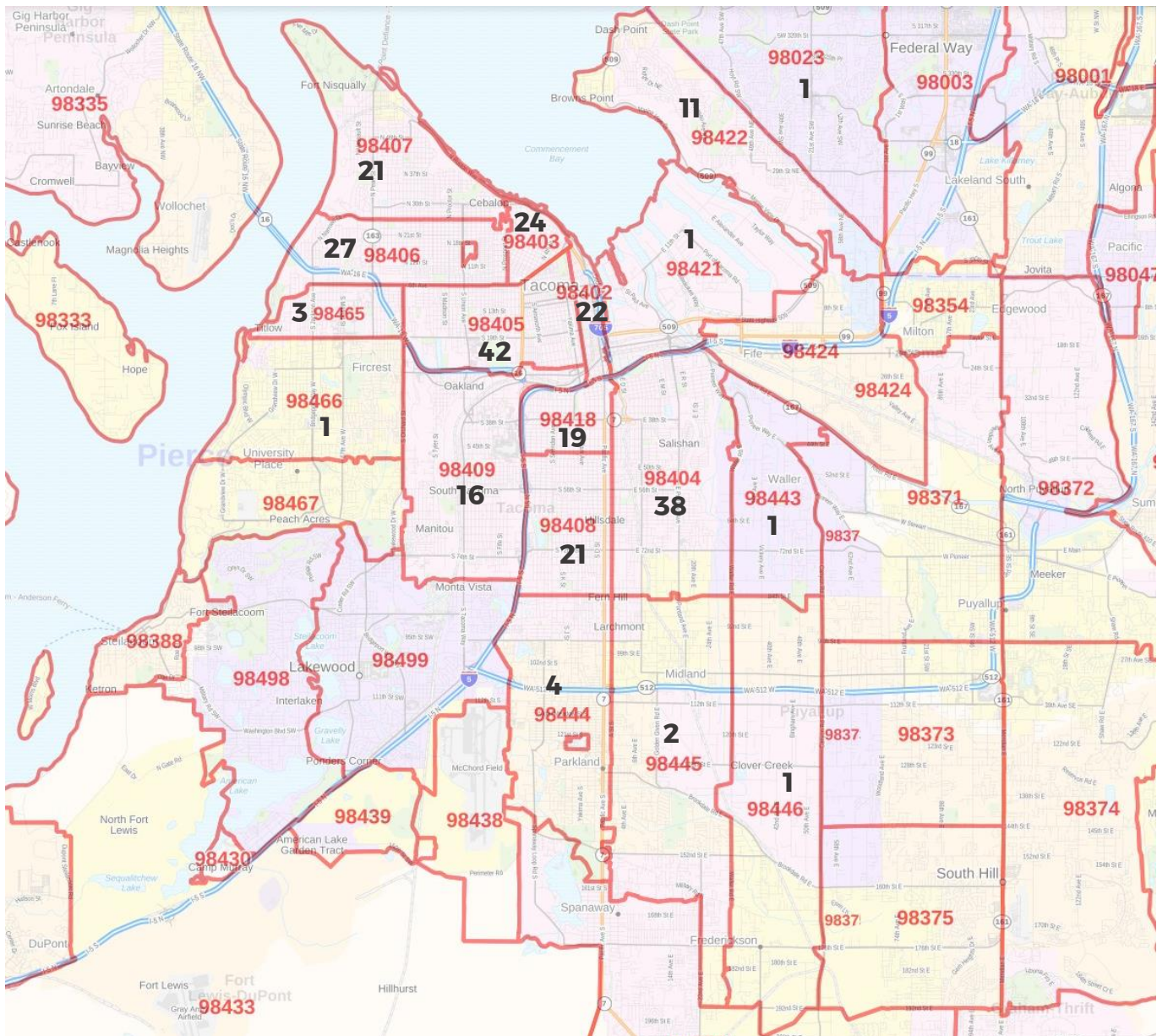
Concerns regarding hazard trees in the right-of-way or private property have been recorded 68 times (15%) in a 44-month span.

The tree-related service requests received through the City's 311 system from December 2015 to April 2018 were also summarized by zip code. The count and location of each zip code are provided in Figure 30. 16% (42) of the service requests originate from the 98405 zip code (approximately the Central Neighborhood). Of these requests, 38% (16) are tree clearance-related.

 **SERVICE REQUESTS:**  
 256 tree-related service requests in ~2.5 years.  
 Central Tacoma had the highest count (42).  
 Primary concern is tree limb clearance.

**URBAN FORESTRY PROGRAM CALL LOGS:**  
 75 of 251 (30%) call logs originated in District 2 (NE Tacoma).

Figure 30. Count of tree-related service requests by zip code (December 2015 - April 2018)



## **D. Summaries of Commission, Committee and Special Interest Group Meetings**

The following provides an overview of the discussions at each of the meetings.

### ***Infrastructure, Planning, and Sustainability Committee to City Council (IPS)***

On August 21, 2019 the City's Urban Forestry Program and urban forestry consultants presented the progress to date on the Urban Forest Management Plan. In addition, during this informational briefing Staff presented recommendations for improving Tacoma Municipal Code (TMC)—with regard to urban forestry—in effort to encourage long-term sustainability of the City's urban forest asset. It was requested of the Committee to provide feedback on recommended Municipal Code actions (if any) to explore in further detail prior to providing draft code for review.

The meeting summary:

- Council representation, City staff, and general public comments have all voiced a direction towards the City of Tacoma maintaining right-of-way trees as a public good (both social & environmental) and mechanism of public safety.
- A potential approach to tree maintenance was discussed and outlined as priority areas in the short term (5 years) then long-term (10 years) priority areas.
- Possible pruning rotation periods should be explored. Historically, the cycle was seven years.
- Considerations for prioritizing tree maintenance include main arterials, high vehicle occupancy, and on the basis of environmental justice.
- Council mentioned they will review a budget for a 3-person tree maintenance crew for 2021-2022. This crew may focus on City-owned right-of-way tree maintenance—primarily street trees—and identified high-risk unimproved ROW trees.
- The Committee suggested including goals in this Plan for budgeting for a second 3-person crew.
- Regarding a potential heritage tree program, it was recommended that this Plan include options for implementation from the voluntary level to the non-voluntary, mandatory level for the Committee and Council to consider.
- The Committee mentioned concerns regarding poor and improper tree pruning practices on trees in the rights-of-way (not City-maintained trees).
- The Committee recommended continued and enhanced community education on proper tree pruning methods.

### ***The City of Tacoma's Landmarks Preservation Committee (LPC)***

The meeting with the Landmarks Preservation Committee was held on October 9, 2019 to discuss potential options for a heritage tree program.

The meeting summary:

- The best way to secure preservation of landmark trees is to have it recorded on the title of the property.
- They would like to see tree preservation in Tacoma as “common knowledge”, so that it is generally understood that in order to remove a tree in Tacoma approval is needed.
- If LPC and residents are required to hire an arborist to prune ROW trees (they are in support of this), or to provide reports deeming trees as hazards, there may not be enough available professionals to initially address the demand. There are already long waitlists to find an arborist who is willing to do work in the area.

- There is a clear connection between historic trees and the LPC. LPC’s mission is to preserve the heritage of Tacoma, specifically the man-made/created things. It was stated that urban forests are not “born” they are planned and created, and this resonated with them as needing protection and care, similar to historic homes.
- The Landmarks Commission role in heritage tree preservation was discussed at length. One idea mentioned would be LPC review the proposals for tree pruning/removal if an application comes in for a tree on the registry.
- Designation of street tree species that meet the character of the neighborhood, e.g., the original species planted as street trees along the streets should be used for future plantings as well.
- The topic of fruit trees in the ROW was discussed, and some polarized points of view. Some were for planting them for food security, and the opportunity to use a gleaning program to collect the fruit so that it didn’t drop on the ground. Others were against them in the ROW for the public health perspective.
- For tree preservation penalties for illegal removal, a “fee by inch” penalty was suggested.
- Recommendations for other organizations to engage in the outreach: 1) Tribe; 2) architects, designers and builders; 3) American Institute of Architects (Tacoma chapter).

***The Sustainable Tacoma Commission (STC)***

Continual presentations and meetings to inform the STC about the project, completed tasks, and opportunities for feedback were held prior to project launch and throughout the entirety of the Plan project. STC provided feedback on recommended approaches to strategies relating to community education and outreach for the Plan and for the Urban Forestry Program as a whole. The STC will be providing a letter to City Council with their recommendations.

***Master Builders Association (MBA Pierce) of Pierce County, WA***

The City’s Environmental Services Department met with MBA Pierce on August 13, 2019 to discuss the Plan project and specifically, existing and potential tree preservation and retention approaches and goals.

While there were some hesitations to tree preservation due to the restrictions this places on development, there were valuable considerations discussed where both the urban forest and goals for development benefit.

The meeting summary:

- Initiatives such as reduced setbacks to provide space for trees, fees in-lieu, and stormwater incentives provide opportunities for trees while not limiting development.
- Strategies for the urban forest must consider and balance costs of tree preservation on housing prices and consider the City’s current and future level of build out.
- Consensus was a belief that the City owns the right-of-way, and it should be responsible for the care, removal, and planting of trees in the right-of-way.
- In-lieu fees could be a good way to address the equity issue, as the fees could be used to plant trees in low-income neighborhoods.
- The low-hanging fruit for tree planting is the right-of-way. 26% of the City is ROW, but only has about 9.2% canopy cover. This is area that does not directly impact the building footprint or use of the lot.
- Perform an analysis of institutions to see if they would be suitable for tree planting and new partnerships.



- Increased housing density has more impact on tree canopy because it leaves open space for planting.
- Concerns were expressed regarding trees and public safety.
- If trees are planted, make sure it is quality nursery stock so the trees are not short-lived or create future infrastructure problems. This is especially important since the adjacent property owner is responsible for sidewalk repair/replacement.

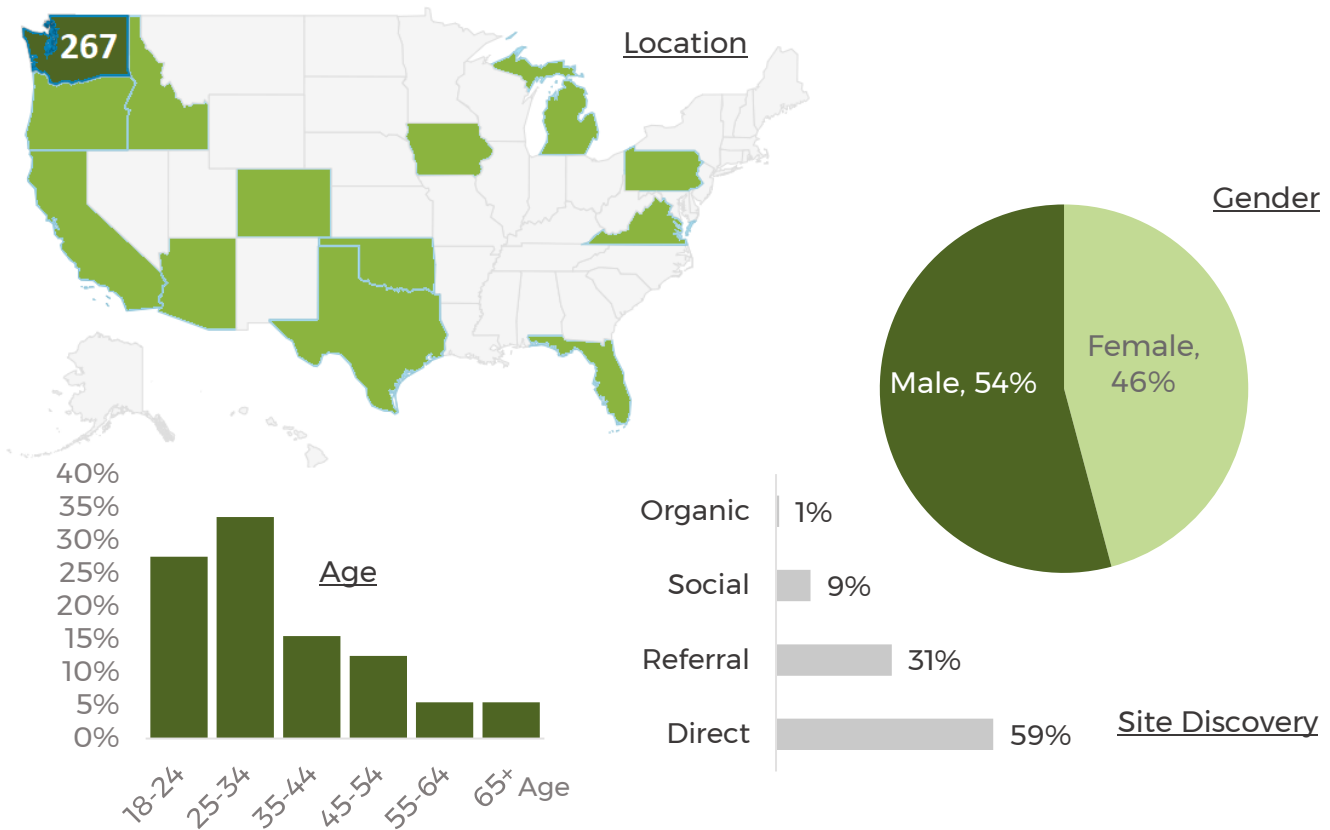
**Puyallup Watershed Initiative Forest Communities of Interest**

On September 20, 2019 the City’s Urban Forestry Program presented the Urban Forest Management Plan project and tasks completed to date to the PWI FCOI.

**E. Outcomes of the Urban Forest Management Plan Website**

Google Analytics were activated for the Plan website ([www.TacomaTreePlan.org](http://www.TacomaTreePlan.org)). The analysis informs future urban forestry messages and approaches based on the demographics of users who accessed the site and those who did not. Messages and information will also be tailored based on the distribution of activity across all website pages.

Figure 31. Project website analytics for October 2019



Website analytics were reviewed for a 30-day period in the month of October 2019. Based on the analytics, there were a total of 399 visitors to the website in October, 267 of which were in WA. An increase in daily users occurred around mid-October when the City launched several outreach campaigns regarding this Plan’s community meeting and second survey. The visitors to the site viewed a total of 1,116 webpages with an average site visit time of 1.5 minutes. Most visitors in October were males (54%) between the ages of 25-34 (34%) who directly entered the link (59%). This information should be used to align future outreach efforts or for continued use of the website after the project is completed.

## **CONCLUSION**

Tacoma Urban Forestry has succeeded in outreach and volunteerism in more affluent parts of the City where residents have more time and resources. Generating community participation in lower-income neighborhoods will require a much greater investment from the City in order to build stronger relationships with residents and community advocates. Different approaches to community engagement may be necessary to meet the needs of these areas. This project aimed to address this concern through various community outreach and engagement efforts.

### ✓ **Community Surveys**

Feedback from the surveys was considered during the development of this Plan's strategies. In addition to the questions, the community shared over 600 comments. There is a passion for trees in Tacoma and much of the urban forest resides on residential land. Successful implementation of this Plan requires a partnership between the City and its residents.

### ✓ **Community Meetings**

Helped shape this Plan's vision and strategies by identifying key words and topics necessary for a vision and the selection of desired strategies with finite resources. The strategies in this Plan were established, in part, from this exercise and the linkages are detailed in Phase 2.

### ✓ **Community Service Requests and Call Logs**

Identifies trends, frequency, and location of tree-related requests. This information is used to identify potential tree maintenance corridors and the need for internal support (staffing).

### ✓ **Meetings with Commissions and Interest Groups**

Ongoing meetings strengthens the partner and stakeholder network and serves as an additional opportunity for public engagement and feedback. This Plan has a list of collaborators and leads for implementing actions and these groups have a support role therefore communications and feedback loops need to continue.

### ✓ **Urban Forest Management Plan Website**

Keeps the community current on this Plan's components, events, and general urban forestry information. The analytics should be considered for future outreach and education efforts. If the website is maintained after completion of this project, webpages and messages should be accordingly tailored.

### **Success of a Plan Requires Community Support**

A successful Urban Forest Management Plan is a plan that contains short- and long-term strategies that benefit the urban forest, the community, and the multitude of organizations and programs affected. This Plan's strategies incorporate the feedback from the community, stakeholders, planning committees, and special interest groups to achieve this objective.

Continuous community outreach and engagement using these platforms should occur for successful implementation of this Plan. The annual monitoring of community viewpoints and opinions as well as the monitoring of the urban forest will allow the City to adjust long-term strategies over time to meet the needs of the City in an ever-changing environment. This is known as adaptive management. Goals for equity and accessibility, canopy health and growth, long-term funding, and climate resiliency cannot be achieved without this City/resident partnership and approach.





# THE CULMINATION OF ELEMENTS:



## URBAN FOREST SUSTAINABILITY AND MANAGEMENT AUDIT



### PURPOSE

To apply the findings from the planning elements to identify strengths and opportunities relating to Tacoma's sustainable urban forest management.



Source: Hannah Letinich, on behalf of  
The Nature Conservancy at Green  
Tacoma Day 2019

# THE CULMINATION OF ELEMENTS: THE URBAN FOREST AUDIT SYSTEM

## PURPOSE

The findings from the five planning elements are evaluated to identify strengths and opportunities relating to Tacoma’s sustainable urban forest management. The research conducted for Phase 1 provides the information needed to complete a comprehensive evaluation of Tacoma’s urban forest resource and management procedures. The outcomes of this evaluation, herein referred to as the Urban Forest Audit, is a culmination of all planning elements to define the framework of the Phase 2 plan.

The Urban Forest Audit system identifies the strengths and vulnerabilities in urban forest management to accurately and effectively define Phase 2’s strategies, targets, actions, and future evaluations. This system documents the City’s level of urban forest sustainability and management as defined by the U.S. Forest Service, industry professionals and researchers, and local parameters from which progress can be measured.

## PROCESS

Developing this Plan was a systematic process where the results of each step inform the next, leading to development of the goals, objectives, strategies, actions and adaptive management measures. Careful evaluation of Tacoma’s urban forest was conducted by using a combination of information obtained through the five planning elements evaluated in this Phase 1 Plan:



**#1: EXISTING  
POLICIES  
& PLANS**



**#2: CITY STAFF  
INTERVIEWS**



**#3: URBAN FOREST  
BENCHMARKS**



**#4: IN-DEPTH &  
HIGH-LEVEL DATA  
ANALYSIS**



**#5: COMMUNITY  
INTERESTS  
& INPUT**

Information from these elements such as—existing legislation and planning documents (Element #1); current operations and workflows (Element #2); levels of service (Element #3); urban forest conditions and trends (Element #4); and community viewpoints (Element #5)—was documented and then systematically evaluated following the U.S. Forest Service’s Urban Forest Sustainability and Management Audit (UFSMA) system<sup>4</sup>. The following provides an overview of the approach. For a comprehensive summary of the process, see Appendix I.

### Information Discovery

The first step in the planning process involved an extensive review of existing plans, policies, ordinances, practices, data, and initiatives to establish a baseline using the UFSMA (see Appendix I). This audit is an industry-accepted process and region-specific evaluation of 11 categories of urban forest sustainability and management as they relate to the City of Tacoma. 154 documents and resources were identified, reviewed, and indexed as part of the information discovery process.

<sup>4</sup> The Urban Forest Sustainability and Management Audit, developed by the USDA Forest Service Urban Forestry South, is based on the urban forest sustainability and management review checklist developed in cooperation with Agnes Scott College Office of Sustainability and the ASC Arboretum Advisory Council and the City of Austin, TX. J. Abbot, et al., 2015. [www.urbanforestrysouth.org](http://www.urbanforestrysouth.org)

## Urban Forest Sustainability and Management Audit

This auditing system is designed to provide a framework for comprehensively evaluating urban forest management programs. The primary objectives of the audit are defined by the UFSMA authors and adapted by the UF Team:

- Engage the full spectrum of the organizations' management team.
- Provide program direction that increases the level of professionalism in management.
- Conduct a gap analysis of management practices and the health of urban forests.
- Provide strategic direction to improve the health of the urban forest.
- Optimize management for environmental justice and equitable distribution of resources.

The process of analyzing the urban forest involved extensive information and document gathering and research to identify policies, practices, programs, and standards pertaining to 11 categories of urban forest sustainability and management as defined by Clark et al. (1997), Kenney et al. (2011), and the Forest Service. The 11 categories are listed in the following table.

Table 21. Urban Forest Sustainability and Management Audit summary for the City program

### Categories of the Urban Forest Sustainability and Management Audit

Management Policy and Ordinances

Professional Capacity and Training

Funding and Accounting

Decision and Management Authority

Inventories

Urban Forest Management Plans

Risk Management

Disaster Planning

Policies, Standards, and BMPs (Best Management Practices)

Community

Green Asset Evaluation

Each category has a series of subcategories pertaining to the specific category. As an example, the following subcategories are in the Management Policy and Ordinances category:

- |  |  |
|--|--|
| 1.01 Climate Change (Sustainability)       | 1.08 Wildlife Diversity / Habitat / Protection |
| 1.02 No Net Loss                           | 1.09 Performance Monitoring                    |
| 1.03 Risk Management                       | 1.10 Private Tree Ordinances                   |
| 1.04 Tree Canopy Goals                     | 1.11 Public Tree Ordinances                    |
| 1.05 Tree Protection                       | 1.12 Development Standards                     |
| 1.06 Utility                               | 1.13 High-Conservation Value Forests           |
| 1.07 Human Health (Physical/Psychological) | 1.14 Urban Interface (WUI)                     |

All available documents and plans were reviewed and tallied in the audit worksheet as part of the information discovery phase. Based on the evaluation of the documents and outcomes of all five planning elements (i.e., Policies and Plans, City Staff Interviews, Urban Forest Benchmarks, High-Level and In-Depth Data Analysis, and Community Interests and Input) each subcategory within the 11 categories was "ranked" using the following system:

- 0) Not Practiced = component doesn't exist or is not practiced; 0 points
- 1) In Development = component is in development as part of or aside from this Plan; 1 point
- 2) Adopted Practice = component is routinely practiced; 2 points
- 3) Exceeds Adopted Practice = the component is exceeded; 3 points

The points were then totaled for an overall rating to provide a summary of Tacoma's level of achieving each category of urban forest management and sustainability.



## RESULTS

### Information Discovery

Table 22. Summary of documents and resources pertaining to Tacoma’s urban forest

Category	Count
Management Policy and Ordinances	105
Professional Capacity and Training	9
Funding and Accounting	3
Decision and Management Authority	8
Inventories	35
Urban Forest Management Plans	15
Risk Management	15
Disaster Planning	1
Policies, Standards, and BMPs*	98
Community	77
Green Asset Evaluation	NA
<b>Count Total</b>	<b>366</b>

BMP = Best Management Practices, NA = not applicable

To develop this Plan, over 150 documents, plans, and resources were gathered and reviewed by applying the U.S. Forest Service’s Urban Forest Sustainability and Management Audit’s Discovery Matrix. This matrix includes a total of ten urban forest categories, each containing a multitude of supporting elements. All resources were reviewed to identify references regarding each of the categories and supporting elements. Examples of the elements supporting the Management Policy and Ordinances category include (but not limited to) climate change,

no net loss, risk management, canopy goals, tree protection, and human health. Based on the review of resources, a total of 105 resources mention one or more elements within this category. As seen in the table, the Management Policy and Ordinances category has the highest count of existing resources followed by the Policies, Standards, and BMPs (Best Management Practices) with a total of 98 resources. There are a total 366 instances where the 150+ resources reference the ten categories and supporting elements. The number of resources referencing elements of urban forest sustainability and management demonstrate Tacoma’s readiness for this Plan. Strategies and recommendations in this Plan align and/or complement components of these supporting resources. For a complete list of categories, elements, and supporting resources, see Appendix J.



366 instances where 150+ existing City planning documents reference the categories of urban forest sustainability and management.

105 instances for the Management Policy & Ordinances category.

### Results of the Urban Forest Sustainability and Management Audit

Based on the Urban Forest Sustainability and Management Audit of Tacoma’s urban forest completed in 2019, the City is at a management and sustainability level of 71%. The relatively high score is primarily due to the City’s effective Urban Forest Manual, One Tacoma, and efforts in place surrounding the Urban Forest Management Plan project. Significant improvements could be made in the professional capacity and training, funding and accounting, inventories, risk management, disaster planning, and green asset evaluations.

The urban forest sustainability and management objective for Tacoma is to achieve a level of Adopted Practice for all subcategories. This means that the Total Possible equates to the count of subcategories for a given category multiplied by the Adopted Practice multiplier of “2”. For example, there are 14 subcategories in Management Policy and Ordinances, therefore, a the Total Possible is 28. Long-term goals in this Plan may acquire the level of Exceeding Adopted Practice for multiple subcategories but this audit focuses on the attainable and measurable level of Adopted Practice.

Table 23. Results of the evaluations of subcategories in the UFSMA system

UFSMA Category	Not Practiced (x0)	In Development (x1)	Adopted Practice (x2)	Exceeds Adopted Practice (x3)	Overall Rating (count x multiplier)	Total Possible
1) Management Policy & Ordinances	0	4	<b>10</b>	0	24	28
2) Professional Capacity & Training	0	3	5	0	13	16
3) Funding & Accounting	0	4	2	0	8	12
4) Decision & Management Authority	0	1	<b>3</b>	0	7	8
5) Inventories	1	3	9	0	21	26
6) Urban Forest Management Plans	1	3	8	0	19	24
7) Risk Management	1	7	1	0	9	18
8) Disaster Planning	1	4	2	0	8	14
9) Policies, Standards, & BMPs	0	9	<b>20</b>	0	49	58
10) Community	0	4	<b>10</b>	0	24	28
11) Green Asset Evaluation	0	8	2	0	12	20
<b>TOTAL (count)</b>	<b>4</b>	<b>50</b>	<b>72</b>	<b>0</b>	<b>194</b>	<b>252</b>

\*BMP = Best Management Practices

Based on the audit of 126 subcategories (11 primary categories) to urban forest sustainability and management, Tacoma is achieving “Adopted Practice” for 72 (29%) of these. 50 subcategories (20%) are “In Development”. Applying the multipliers of 2 for Adopted Practice and 1 for In Development results in a total score of 194 out of 252 possible points, or 77% (detailed in the following table). Cells in bold font indicate a high level of Adopted Practice subcategories for the given category. “Exceeds Adopted Practice” was not considered for any category because the Urban Forest Management Plan was in development during the time of this evaluation.

The Overall Rating for each category in the table above is detailed in the following table that summarizes the overall percent achieved for each category. A complete breakdown of rankings by subcategory/category is available in Appendix K.



Table 24. Outcomes of the urban forest auditing process for Tacoma, WA

Category	Description	SOC* (% Achieved)	Base** (% Achieved)	Overall Rating	Overall (% Achieved)
1	Management Policy & Ordinances	75%	83%	24	<b>86%</b>
2	Professional Capacity & Training	100%	NA	13	<b>81%</b>
3	Funding & Accounting	75%	NA	8	<b>67%</b>
4	Decision & Management Authority	100%	100%	7	<b>88%</b>
5	Inventories	NA	75%	21	<b>81%</b>
6	Urban Forest Management Plans	NA	67%	19	<b>79%</b>
7	Risk Management	58%	50%	9	<b>50%</b>
8	Disaster Planning	NA	67%	8	<b>57%</b>
9	Policies, Standards, & BMPs***	75%	88%	49	<b>84%</b>
10	Community	100%	NA	24	<b>86%</b>
11	Green Asset Evaluation	NA	NA	12	<b>60%</b>
<b>Total</b>		<b>77%</b>	<b>76%</b>	<b>194</b>	<b>77%</b>

\*Standard of Care (SOC) elements represent the minimum group of urban forestry management “best practices” that a municipality should consider for implementation. SOC refers to the degree of prudence and caution required of an individual who is under a duty of care (i.e. legal obligation of the controlling authority, owner, or manager) to minimize risk. Neither state, regional, nor national minimum management components have been established for SOC but these are interim recommendations for consideration.

\*\*Base Practices (BP) elements represent additional urban forest management activities or components that may effectively expand a program beyond the SOC group (see footnote above). These elements are typically precursors to other “non-core” elements in the category.

\*\*\*BMPs = Best Management Practices



The Audit places Tacoma at an overall score of 77% in terms of urban forest sustainability and management.

Tacoma’s Decision & Management Authority scored the highest with 88%.

Management Policy & Ordinances as well as the Community category are at 86% but Tacoma scored low for Risk Management (50%), Disaster Planning (57%), Green Asset Evaluation (60%), and Funding & Accounting (67%).

The Phase 2 Plan will provide the strategies for advancing all categories.




## CONCLUSION


This systematic approach to evaluating Tacoma’s current levels of urban forest management and sustainability provide the framework and reference point for establishing and implementing strategies. The ranking as determined by the audit justifies the need for appropriate actions to be supported and implemented in order to effectively achieve improved urban forest sustainability and management levels. These levels are balanced with the City’s resource capacity, baseline conditions of the urban forest, and viewpoints gathered from the community.


Table 25. Explanation and implications of the UFSMA results

Category	Implications
<p><b>1) Management Policy and Ordinances</b></p> <p><b>Rating of 86%</b></p> 	<p><b>STRENGTHS:</b> Tacoma scored relatively high due to the existing climate change and sustainability efforts (CAP, Tacoma 2025, EAP), tree canopy goals, development standards, and recognition of trees as positive influencers on human health.</p> <p><b>OPPORTUNITIES:</b> Proper tree protection and enforcement in the ROW will support a “no net loss” strategy for retaining the benefits of urban forests. Appropriate levels of public and private tree ordinances as well as a heritage tree program would advance Tacoma in this category.</p>
<p><b>2) Professional Capacity and Training</b></p> <p><b>Rating of 81%</b></p> 	<p><b>STRENGTHS:</b> Staff have industry certifications, qualifications, and training.</p> <p><b>OPPORTUNITIES:</b> Additional staffing for internal technical support, community outreach and education support staff, as well as expansion of an in-house arborist crew to support current and future tree maintenance and planting demands would benefit Tacoma in all categories of this audit.</p>
<p><b>3) Funding and Accounting</b></p> <p><b>Rating of 67%</b></p> 	<p><b>STRENGTHS:</b> Urban forestry is budgeted annually.</p> <p><b>OPPORTUNITIES:</b> Based on benchmarking research, Tacoma is well below regional averages in terms of budget per capita and per tree even if expenditures from partners are included. A diversified, sustainable, and dedicated funding source is needed. Tacoma has a strong network of engaged community residents who are in support of reallocating resources for urban forestry and provide tree stewardship support (i.e. young tree training).</p>
<p><b>4) Decision and Management Authority</b></p> <p><b>Rating of 88%</b></p> 	<p><b>STRENGTHS:</b> Tacoma’s Urban Forestry Program has authority over day-to-day activity and closely engages other City Departments and Work Groups. The City scored high in this category because the audit only contains four subcategories but can be expanded as described in the opportunities below.</p> <p><b>OPPORTUNITIES:</b> If Tacoma were to create, revise, and/or clarify standard operating procedures, refine workflows, clarify policy, bolster staff trainings, and acquire additional internal technical support, the City would see advancement in this category. To lead by example, the City should consider incremental stages of acquiring street tree maintenance responsibility in priority areas.</p>

Category	Implications
<p><b>5) Inventories</b></p> <p><b>Rating of 81%</b></p> 	<p><b>STRENGTHS:</b> Tacoma has multiple datasets describing the broad distribution of urban tree canopy and data-driven indicators to prioritize tree planting and preservation for environmental justice and equity. The City has recently acquired innovative software for managing public trees and has pioneered green stormwater infrastructure (and mapping of) in the region.</p> <p><b>OPPORTUNITIES:</b> A better understanding of the public tree population is needed with a comprehensive inventory focused on street and median trees. Potential threats such as pests and diseases are unbounded by land ownership, therefore, a better understanding of private trees is needed. Inventories should remain current and frequently updated.</p>
<p><b>6) Urban Forest Management Plans</b></p> <p><b>Rating of 79%</b></p> 	<p><b>STRENGTHS:</b> Tracking and reporting of urban forest management activities, this Plan, and urban forestry referenced in One Tacoma resulted in a relatively high score for this category. Plans for compartments of the urban forest such as open space, grounds on public facilities, campus/university trees, and green stormwater management, is a strength of Tacoma.</p> <p><b>OPPORTUNITIES:</b> Implementation of this Plan will increase the rating as will plans for private trees and street tree management such as a strategic tree planting plan.</p>
<p><b>7) Risk Management</b></p> <p><b>Rating of 50%</b></p> 	<p><b>STRENGTHS:</b> Staff trained in tree risk assessments.</p> <p><b>OPPORTUNITIES:</b> Additional internal technical support for assessing trees questioned for removal would improve the efficiency, effectiveness, resourcefulness, and appeal of City operations. An inventory of trees in public rights-of-way is necessary to identify, monitor, plan, prioritize, and mitigate risk. A comprehensive understanding of the urban forest through inventories would determine in detail Tacoma’s vulnerabilities to tree pests and diseases, climate change impacts, storm events, invasive species, and the natural or premature senescence of trees. The City will establish tree risk management procedures in Phase 3 of the Urban Forest Management Plan project which will greatly increase the rating of this category.</p>
<p><b>8) Disaster Planning</b></p> <p><b>Rating of 57%</b></p> 	<p><b>STRENGTHS:</b> Debris management following a disaster is outlined in the Pierce County Hazard Mitigation Plan. The City’s Grounds Maintenance crew does conduct post-storm cleanup to the extent the resources allow.</p> <p><b>OPPORTUNITIES:</b> Implementation of Phase 3 to this Plan project will increase the rating for this category. Primarily, a multi-faceted disaster plan for public trees is needed.</p>

Category	Implications
<p data-bbox="219 184 430 315"><b>9) Policies, Standards, and BMPs</b></p> <p data-bbox="235 451 414 546"><b>Rating of 84%</b></p> 	<p data-bbox="495 184 1494 325"><b>STRENGTHS:</b> Tacoma has a high rating for this category due to the Urban Forest Policy Element, the Urban Forest Manual, the ROW Design Manual, and references to urban forest management throughout TMC.</p> <p data-bbox="495 346 1494 850"><b>OPPORTUNITIES:</b> A heritage tree program to protect significant trees is recommended along with improvements to the tree permitting process. Public education regarding proper tree BMPs needs to be conducted and supported with enforcement. There is a growing interest from the community for the acceptance of fruit trees in the ROW. Trees required for development projects should be monitored and their health needs maintained through enforcement and bonds. Proper tree preservation while not inhibiting smart development is needed. The City should explore cost-share options for hazard tree removal in the ROW and the potential acquisition of tree maintenance responsibility, first in priority regions such as underserved priority areas according to the Equity Index. Implementing strategies directed at these objectives would increase the rating of this category and be better suited to achieve a goal of a healthy 30% tree canopy.</p>

<p data-bbox="170 850 462 903"><b>10) Community</b></p> <p data-bbox="235 1249 414 1344"><b>Rating of 86%</b></p> 	<p data-bbox="495 850 1494 1239"><b>STRENGTHS:</b> Tacoma is a Tree City USA city for 25 years (as of June 2019), demonstrating the value placed on urban forests. This Plan included public surveys with almost 1,500 respondents in the first survey alone and has engaged the public in community meetings and the Plan website. The City has a successful Grit City Trees and Coupon Program, an extensive network of partners, conducts events such as tree walks, engages the public through social media, website, radio, and other platforms, has an extensive email listserv, addresses service requests, presents to City organizations and special interest groups, enables stewardship activities, and works closely with Tacoma Tree Foundation.</p> <p data-bbox="495 1260 1494 1627"><b>OPPORTUNITIES:</b> Continue to utilize this Plan’s website, address the concerns and questions posed in the surveys and meetings, conduct outreach to the public based on survey feedback, establish a heritage tree program and recognition program by sector for exemplary urban forest considerations, address underserved areas as identified in the 2018 tree canopy assessment, the 2018 urban heat island study, the Tacoma Equity Index, and other resources, and facilitate more trainings both internally and for the public. Align efforts with ongoing initiatives such as One Tacoma, Tacoma 2025, the EAP, and the Neighborhood Business District Urban Forest Management Plan.</p>
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<p data-bbox="178 1627 462 1711"><b>11) Green Asset Evaluation</b></p> <p data-bbox="235 1764 414 1858"><b>Rating of 60%</b></p> 	<p data-bbox="495 1627 1494 1701"><b>STRENGTHS:</b> The urban forest is diverse, relatively young, and mostly in good condition.</p> <p data-bbox="495 1722 1494 1984"><b>OPPORTUNITIES:</b> This category is for documenting observed outcomes and improvements which will occur as this Plan is implemented and a comprehensive public tree inventory is maintained. The development of a new critical area code restricting clearing and development in biodiversity areas will provide a layer of protection for much of the City’s large greenbelts in private and public ownership (open space).</p>
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## CONCLUSION TO THE PHASE 1 RESEARCH

The UF Team developed this Plan to address concerns around urban forest management in Tacoma. The main tenets of this Plan are to ensure public safety, increase operational efficiencies, facilitate short- and long-term sustainable urban forest planning, validate budgets and programs, ensure equitable distribution of resources and services, and standardize methodology for asset management of the urban forest. In order to achieve these goals, during Phase 1 of the planning project, extensive research and auditing processes were conducted to establish baseline conditions of Tacoma's urban forest. This deep dive examined six planning elements that resulted in the following recommendations:

### RESEARCH SUMMARY AND POTENTIAL RECOMMENDATIONS (TABLE 26)

	ELEMENT		CONCLUSION
	<b>1) Existing Policies and Plans</b>		The City has a strong framework of policies and plans that allude to or reference urban forestry but a strategic plan (the UFMP) is needed to connect the elements in these documents to achieve improvements in urban forest management and sustainability while supporting Citywide initiatives.
	<b>2) City Staff Interviews</b>		Improve operations and workflows through standard operating procedure (SOP) development, workflow refinement, internal technical support (City Arborist), and policy clarification.
	<b>3) Urban Forest Benchmarks</b>		Based on the existing conditions and operations and cross-examined with programs and resources of comparable cities, Tacoma should evaluate strategies for adequate urban forestry funding and resources, street tree maintenance responsibility, updates to TMC, alignment of strategies with One Tacoma, landmark tree preservation, and ROW tree protection—all in an effort to achieve 30% canopy and a healthy urban forest.
	<b>4) High-Level and In-Depth Data Analysis</b>		Achieving 30% canopy Citywide and addressing issues of equity should be strategically implemented by utilizing available data. The selection of tree species and timing should consider the analysis of inventory data. The planting strategy can be strengthened by conducting a comprehensive, Citywide inventory of all public trees that is well-maintained.
	<b>5) Community Interests and Input</b>		The community considers trees as important to the overall quality of life and the environment in Tacoma but have seen a decline in tree numbers and tree health. The community would like to see increased tree planting while considering the site and the species. The community suggests investing in additional resources (staff and funding) to achieve this. Efforts for inclusion of all residents of Tacoma in the planning process were implemented and it is recommended that education and outreach continue across the City but also with an emphasis on underrepresented groups.
	<b>6) Urban Forest Audit System</b>		Overall, the City scored 77% in terms of urban forest sustainability and management, largely due to the existing policies, standards, and community efforts. This Plan addresses all categories of the audit but should emphasize improvements in professional capacity, funding, and risk management.

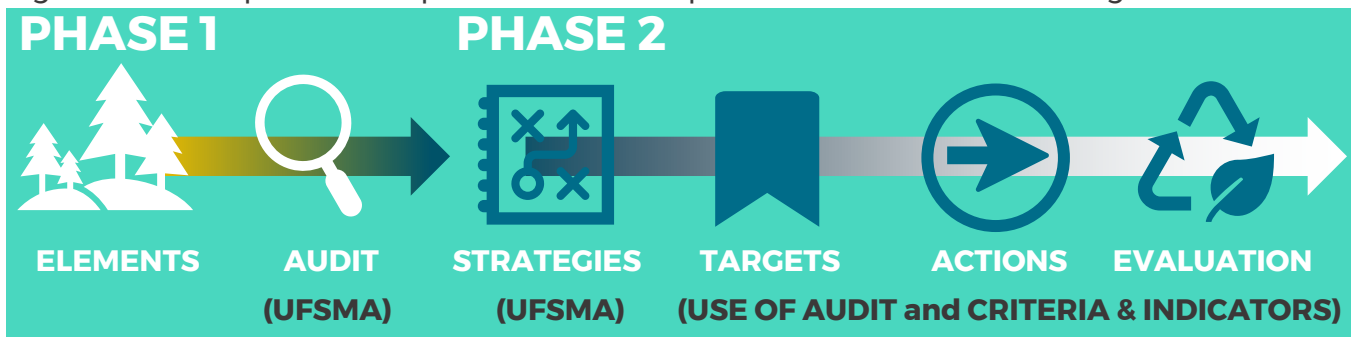
## APPLYING PHASE 1 TO THE PHASE 2 PLAN FRAMEWORK

The results and conclusions were thoroughly reviewed for all five planning elements (Element #1: Existing Policies and Plans; Element #2: City Staff Interviews; Element #3: Urban Forest Benchmarks; Element #4: High-Level and In-Depth Data Analysis; Element #5: Community Interests and Input) to complete the Urban Forest Sustainability and Management Audit.

The results of the audit were used to establish this Plan’s strategies, targets, actions, and monitoring/evaluation methods that are aligned with goals of the City, its partners, and the community. Each category of the UFSMA is a theme of the Phase 2 UFMP Framework.

For example, a series of short- and long-term strategies were developed in Phase 2 for the Management Policy and Ordinances category of the UFSMA. Actions responsible for advancing Tacoma in this category based on the audit results were then established. The targets were assembled based on the criteria required to achieve or maintain “Adopted Practice” levels of urban forest sustainability and management. To further define these targets, the Criteria and Indicators for Urban Forest Planning and Management<sup>5</sup>— a modification to A Model of Urban Forest Sustainability<sup>6</sup>—was utilized. This method uses over 30 unique urban forest criteria that pertain to the urban forest resource (the trees), the resource management (the staff), the community framework (the people), and the institutional framework (the agencies) and align with the UFSMA categories used for this Plan.

Figure 32. Description of the process of next steps for the Urban Forest Management Plan



## ADAPTIVE MANAGEMENT

Adaptive management is a scientific approach to an urban forest management decision process. It promotes flexible decision-making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes helps adjust policies and operations as part of an iterative learning process. Adaptive management is a means to more effective decisions and enhanced benefits—environmental, social, and economic. Using an adaptive management approach will require the consistent monitoring of all the City’s criteria and established targets for this Plan. The City will be able to judge if its new approaches to urban forest management are being effective and identify significant trends. This will allow the City to adjust management actions over time as changes occur both in the physical / biological environment and in the expectations of the City’s residents.

<sup>5</sup> Kenney, A. et al., *Criteria and Indicators for Urban Forest Planning and Management*. Arboriculture & Urban Forestry 2011. 37(3): 108-117

<sup>6</sup> Clark, J. et al., *A Model of Urban Forest Sustainability: Applications to Cities in the United States*. Journal of Arboriculture 24: 112-120. 1998

## ONE TACOMA, ONE CANOPY

The results of the research summary were applied to the strategies in this Plan to support goals for a thriving and resilient urban forest that provides benefits to a supporting community. This Plan will serve as a road map outlining meaningful, high-priority actions that the City will take to strive towards the vision of a healthy, thriving urban forest—30% tree canopy by 2030. This means creating greater efficiency in City operations, standardizing the level of service to meet the needs of the community, and responding to the challenges of climate change and other environmental factors. This Plan functions both as a management tool for City staff and provides transparency to the public regarding the actions the City will take to support environmental health on behalf of the broader community.

Understanding the existing conditions, the City workflows and operations, and the community's viewpoints of the urban forest provides the information and context for developing a shared vision and road map for the care and enhancement of trees throughout Tacoma.



Top to bottom left to right: Aerial View - University of Washington, Snake Loop Trail - Tacoma Nature Center, Ruston Way Waterfront - Travel Tacoma, University of Puget Sound, Residential Trees - Breakaway Vacation Rentals, Wapato Park - Wildlife Recreation, Port of Tacoma, Pacific Avenue to Downtown - South Sound Talk, Tree Planting - Pierce County Conservation District



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## **APPENDIX A. ONLINE SOURCES FOR EXISTING POLICIES AND PLANS**

### **2008 Climate Action Plan**

<https://cms.cityoftacoma.org/enviro/sustain/ClimateActionPlanJuly2008.pdf>

### **2010 Urban Forest Policy Element**

<https://cms.cityoftacoma.org/Planning/Comprehensive%20Plan/10%20-%20Urban%20Forest%20Policy%206-15-10.pdf>

### **2011 Tree Canopy Assessment**

<https://www.cityoftacoma.org/cms/one.aspx?pagelId=35885>

### **2014 Urban Forest Manual**

[https://cms.cityoftacoma.org/surfacewater/UrbanForestManual/UrbanForestManual\\_Volume3.pdf](https://cms.cityoftacoma.org/surfacewater/UrbanForestManual/UrbanForestManual_Volume3.pdf)

### **2015 Tacoma 2025**

[https://www.cityoftacoma.org/tacoma\\_2025](https://www.cityoftacoma.org/tacoma_2025)

### **2015 One Tacoma - Comprehensive Plan**

<https://www.cityoftacoma.org/cms/one.aspx?portalId=169&pagelId=15801>

### **2016 Tacoma Environmental Action Plan**

[https://cms.cityoftacoma.org/Sustainability/Tacoma\\_EAP.pdf](https://cms.cityoftacoma.org/Sustainability/Tacoma_EAP.pdf)

### **2016 Right-Of-Way Design Manual**

<https://cms.cityoftacoma.org/enviro/DesignManual.pdf>

### **2017 Strategic 20-Year Passive Open Space Plan**

[https://cms.cityoftacoma.org/enviro/OpenSpace/City%20of%20Tacoma\\_Passive%20Open%20Space\\_January2017.pdf](https://cms.cityoftacoma.org/enviro/OpenSpace/City%20of%20Tacoma_Passive%20Open%20Space_January2017.pdf)

### **2018 Environmental Services Strategic Plan 2018 - 2025**

[https://cms.cityoftacoma.org/enviro/ThinkBig/StrategicPlan\\_12012017.pdf](https://cms.cityoftacoma.org/enviro/ThinkBig/StrategicPlan_12012017.pdf)

### **2019 Sample Tree Inventory**

<https://pg-cloud.com/TacomaWA>

### **2019 Tacoma Mall Tree and Planting Inventory (public & private)**

<https://pg-cloud.com/TacomaWA>

### **2019 Urban Heat Island Study**

<https://canopycontinuum.org/>

### **2008 Climate Action Plan**

<https://cms.cityoftacoma.org/enviro/sustain/ClimateActionPlanJuly2008.pdf>

### **2010 Neighborhood Business Districts Urban Forest Management Plan**

<https://cms.cityoftacoma.org/enviro/UrbanForestry/sufmp-nbd.pdf>

### **Tacoma Mall Subarea Plan**

<https://www.cityoftacoma.org/cms/one.aspx?pagelId=67757>

# APPENDIX B. URBAN FOREST POLICY PRE-PROSPECTUS AND RECOMMENDATIONS

# TACOMA, WA

MEMORANDUM

## URBAN FOREST CODE & POLICY PRE-PROSPECTUS

### DESCRIPTION

**Project Name:** Urban Forest Management Plan | Urban Forest Code & Policy: Recommendations for Municipal Code & Policy relating to Tacoma's Urban Forest

**Report Date:** August 12, 2019

**To:** City of Tacoma, WA & the Environmental Services Department

**Prepared By:** Peninsula Environmental Group, Inc. & PlanIT Geo

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### 1. EXECUTIVE SUMMARY

**Trees in communities amplify human experience and wellbeing.** Their provision of valuable economic and environmental benefits as natural resources is well documented<sup>7</sup>. Even so, urban and community tree canopy cover is decreasing across the nation. Urban tree cover in the U.S. dropped by 0.2 percent between 2000 and 2018 while impervious cover increased 2.8 percent<sup>8</sup>. This reduction of community tree canopy cover occurred concurrently while many tree protection ordinances, canopy cover goals and land conversion policies across the country attempted to arrest or reduce canopy decline. Community leaders and planners focused on urban tree canopy growth must encourage comprehensive and diverse tree resource policies for their community in order to promote equitable access to the benefits of urban canopy.

**Trees make cities more livable.** Research on the public health, economic and social benefits of urban forests and their relative economic value, is relatively new but well documented. Community leaders and planners who interact with projects through the lens of urban and community forestry will improve the wellness and quality of life for Tacomans. Enabling tree planting for public health, as well as the urban forest's other benefits, will improve public health across the City for future generations.

**Urban tree canopy benefits vulnerable populations.** Urban tree canopy reduces ambient temperatures within cities substantially. Research shows a casual reduction of heat-related illnesses throughout a city with advanced urban tree canopy. Trees reduce concentrations of airborne particulate matter, the most damaging type of air pollution globally and clinically more represented in industrial cities. The environmental benefits for urban trees directly correlate with improved human wellbeing and public health.

It is this public health initiative that strongly factors urban forestry and green infrastructure into environmental justice and social equity. A successful urban and community forest is qualified by more than the measurement of its benefits, but by definition includes the fair and equitable access to such provided benefits to all community members.

<sup>7</sup> Nowak, D.J., Greenfield, E.J., 2018. U. S. urban forest statistics, values and projections. J. For. 116, 164–177.

<sup>8</sup> Nowak, David; Greenfield, Eric. November 2017. Declining urban and community tree cover in the United States. USDA Forest Service, Northern Research Station, Syracuse, NY; Urban Forestry & Urban Greening 32 (2018)32-55

**Long-term urban and community forestry funding is multi-faceted.** There is no single beneficiary of urban tree benefits and likewise, limiting the funding source to one source (utility or the general fund) puts limitations on how that budget can be spent, as well as placing unintended barriers on collaboration across departments. Long-term funding for urban forests requires budget portfolio diversification to be successful. Urban forestry is a complex ecology which intertwines many different agencies and organizations, both public and private. Urban forestry and City-wide tree canopy care is not an isolated concern, it is impacted by many of the goals and policies with Tacoma's comprehensive plan.

**A comprehensive urban forest strategy will guide us towards a sustainable urban forest future.** In early 2019, the City of Tacoma solicited the development of the Urban Forest Management Plan (UFMP), subsequently awarding the contract to urban forest and green industry planning firms PlanIT Geo, Peninsula Environmental Group and Conservation Technix (collectively the "Urban Forestry Team").

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A component of the project -an analysis and revision of urban and community forestry policy and Tacoma Municipal Code (TMC)- where necessary. This document, the urban and community forest policy pre-prospectus, intends to assess the effectiveness of existing tree-related policy and municipal code within Tacoma, and introduce new (to Tacoma) concepts standardized in the industry for urban and community forestry policy.

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To date, the Urban Forestry Team has conducted multiple phases of collaborative stakeholder engagement aimed at identifying existing policy and processes. Staff interviews were conducted including nearly 30 staff members representing multiple departments, workgroups and commissions. Informal meetings were conducted with multiple Councilmembers to better capture the intent and feasibility of conceptual urban & community forestry policy and TMC revisions.

### **1.1 EXISTING POLICY AND CODE:**

**Urban Forest Policy (UFP) Element.** In 2010, Council adopted the UFP Element of the Comprehensive Plan (later referred to as "One Tacoma"), which identified a 30% tree canopy cover goal by the year 2030, "30 by 30". This UFP defines core focus areas including changes to regulations and standards to address tree retention, as well as leading by example through responsible planting, care and maintenance of trees on City-owned property.

**Tacoma 2025.** In 2015, Tacoma's ten-year, City-wide Strategic Plan and Vision (Tacoma 2025) was adopted. Several key community priorities were identified, including improving community health and the vitality of our Neighborhood Business Districts, and sustaining and improving Tacoma's Natural Environment. Studies show a direct correlation between improved human health and more vibrant and profitable business districts in areas with higher quality tree canopy.

**Urban Forest Manual (UFM).** In 2014, Tacoma's Environmental Services Department published Volume 3 of the Tacoma UFM. The UFM is a technical guide created to facilitate the planning, design, installation and maintenance of landscaping that is required for new development and redevelopment per TMC, Title 13.06.502 Landscaping and Buffering Standards. The UFM is intended to be used concurrently with TMC, Title 13.06.502 to ensure the requirements and standards are executed properly. This manual can also be used as a guide for the planning, design, installation and maintenance for any landscaping project.

**Environmental Action Plan.** In 2016, the City's EAP was adopted by Council with a focus on increasing healthy urban forest canopy. Specific EAP actions include improving regulations to encourage tree preservation and protection on private property and in the City right-of-way, as well as developing an Urban Forestry Implementation Strategy that identifies and prioritizes strategic and equitable planting locations, incentives, public engagement and education, retention strategies and maintenance.

**TMC benchmarking and analysis.** Peninsula Environmental Group analyzed existing TMC related to the urban and community forest. This analysis of TMC identified discrepancies and informed us further on staff challenges brought up during the staff interviews. Existing TMC was then benchmarked across multiple Washington communities, ranging in size and population. This benchmark informs community leaders and planners on the regional status of urban and community forest planning and protection, and effective regulatory vehicles applied in the process.

## 1.2 SUMMARY RECOMMENDATIONS

The Urban Forestry Team has identified updates to specific urban and community forestry policy to amplify the sustainability of the urban forest, resulting in a greener and healthier city for all Tacomans.

- 1) *Identify and align Urban Forestry Management Plan goals and actions with One Tacoma policy.*
- 2) *Develop new independent Urban and Community Forestry Title in TMC.*
- 3) *Renovate existing sections of TMC to remove discrepancies and align with best-management-practices.*

## 2. ALIGN URBAN FOREST POLICY WITH ONE TACOMA

How can adaptive and deliberate urban forest planning complement the efforts of One Tacoma?

One Tacoma is a fundamental piece of the Urban Forest Management Plan. Collectively the Urban Forestry Team will prepare recommended policies and actions through this lens, to both amplify and complement its visioning. While focused on Tacomans value and responsibility towards a greener city, the Urban Forest Management Plan will implement actions to meet these city policies.

An analysis of One Tacoma was prepared with a focus on the urban forest to identify current policies and where improvement was necessary to meet the guidelines of One Tacoma. We identified seven urban forest elements directly associated with these policies. These seven elements, listed below, will facilitate the policies through direct, actionable policy items defined in the Urban Forest Management Plan. Table 2, on the following page, is a brief primer on how the urban forest elements correlate with One Tacoma, and how the two complement each other.

Table 1: Main Urban Forest Elements Associated with One Tacoma

<b>1) Resource Management</b>
a) Resilience and risk management
b) Street trees
c) Viewsheds
<b>2) Equity and Accessibility</b>
<b>3) Canopy Growth–30/30</b>
<b>4) Long-term Funding</b>
<b>5) Climate Resiliency</b>
a) Risk mitigation
b) Energy savings
<b>6) Municipal Code and Policy</b>
a) Preserving trees during development
b) Landmark tree policy
c) Single title/consolidation
<b>7) Environmental</b>
a) Net-loss
b) Watershed scale planning

Table 2: Urban Forestry Companion to One Tacoma Policies

1) Resource Management		
<p><b>1.a) Resilience and risk management</b> Structure, composition and species diversity. Risk management and avoidance. Resource inventories and prioritization.</p>	<p><b>1.b) Street Trees</b> Supportive places, improved livability. Street design and engineering to support trees. Street tree maintenance.</p>	<p><b>1.c) Viewsheds</b> Identification/management of preserved viewsheds. Long-term ecological and geological net-loss reduction.</p>
2) Equity & Accessibility	3) Canopy Growth—30/30	4) Long-Term Funding
<p>Enable equitable disbursement and access to open areas, street trees, parks and environmentally protected areas.</p>	<p>Maximize accessible planting areas and retain existing canopy to facilitate meeting a City-wide canopy cover goal of 30% by 2030.</p>	<p>Diversified budget portfolio. Encourage urban forest contribution from beneficiaries of tree benefits: stormwater, public health, energy distribution.</p>
5) Climate Resiliency		
<p><b>5.a) Risk Mitigation</b> Identify and prioritize vulnerability to heatwave mitigation, urban heat island effect, and other climate-related emergencies.</p>	<p><b>5.b) Energy Savings</b> Reduce energy costs, and associated combustible emissions, through tree benefits.</p>	
6) Municipal Code and Policy		
<p><b>6.a) Preserving Trees During Development</b> Reduced canopy loss through preservation of trees during development action.</p>	<p><b>6.b) Landmark Tree Policy</b> Voluntary preservation and catalogue of historic, cultural, memorial, and ecological significant trees.</p>	<p><b>6.c) Single Title/Consolidation</b> Clear access to Tacoma policies related to urban forestry.</p>
7) Environmental		
<p><b>7.a) Net-loss</b> No-net-loss of tree canopy. Reduce tree canopy degradation within environmentally critical areas. Reduce canopy fragmentation.</p>	<p><b>7.b) Watershed Scale Planning</b> Plan and mitigate tree canopy connectivity on a watershed scale. Track canopy and habitat connectivity across watersheds.</p>	

### 3. CONSOLIDATED URBAN FORESTRY TITLE

Urban forests are instrumental to the fabric of city life. The planning, management, growth, preservation, and long-term funding of Tacoma’s urban forest are necessary actions for the public good. These urban forestry actions result in amplified health, safety and welfare of Tacoma’s citizens. City growth and redevelopment impacts and influences the urban forest. The urban forest complements urban design. Therefore, the new Consolidated Urban Forestry Title should be implemented.

It is important for community leaders and planners to facilitate a deliberate inter-sectoral and collaborative approach to urban forest planning that mitigates the barriers associated with interconnected and diverse public planning goals.

A focused, single-source for urban and community related municipal code, located in a new Title, will help Tacoma achieve its goal of 30% City-wide tree canopy by 2030. A new Urban & Community Forestry Title will document the importance of trees and urban canopy for community leaders, City staff and citizens well into the future.

This effort will mitigate inconsistencies across TMC chapters and provide a “one-stop shop” for tree related issues, topics, and procedures. Developers and other permittees will more clearly understand requirements as it relates to the urban forest.

A recent study by Nature Conservancy<sup>9</sup> noted a barrier to long-term urban forest funding are informational and organizational silos. To prevent these silos, **redeveloping City staff workflow, permit effectiveness and departmental collaboration is a focus of this recommended Title consolidation.** Focusing the efforts of multiple public agencies and departments across the municipal organization, and structured by the new Title, creates opportunities to advance tree planting and tree protection to meet Tacoma’s 30/30 goal.



A single-source chapter for City ordinances related to tree planting and protection align to One Tacoma through multiple urban forestry references, particularly Environmental + Watershed Health Policy EN-4.30, “Increase awareness of urban forest best management practices...”

Currently, tree-related code in Tacoma is generally accessed through an action occurring rather than the resource itself. Tree related code in Tacoma is activated through commercial and industrial development and through environmentally sensitive (Critical Areas) code. At this time, the Urban Forest Team plans to retain development triggered tree-related code in development sections. Lateral transition of these specific codes may result in confusion for property owners, developers and staff.

#### Outcomes from a consolidated Urban Forestry Title in Tacoma Municipal Code:

- 1) Compliments and implements UF-1.5, EN-1.1, EN-4.30, EN-4.31 of One Tacoma into Urban Forestry Policy.
- 2) Single source of policy for urban forest related topics, outside of urban forest standards triggered through development/disturbance actions.
- 3) Improve cross-sectoral urban forestry processes; increase permit efficiency and workflow processes.
- 4) Promote greening policies through regulation, incentives and stewardship.
- 5) Define roles and responsibilities of an existing committee/commission such as the Sustainable Tacoma Commission or newly created committee/commission to manage the new Title.

<sup>9</sup> McDonald, R., Ijbar, L., et al. *Funding Trees for Health: An analysis of finance and policy actions to enable tree planting for public health.* 2018, The Nature Conservancy. Arlington. VA.

Table 3: Preliminary Urban and Community Forestry Title Topics:

- 1) Definition of Tacoma’s Urban Forest
- 2) Landmark Tree Protection
- 3) Right-of-way Tree Protection and Management
- 4) City-wide Tree Planting Goals
- 5) Reference to Tacoma Urban Forest Manuals and other Policies
- 6) Tree Pruning Standards
- 7) Urban Forest Committee/Commission

### 3.1 LANDMARK TREE PROTECTION AND INVENTORY – SUMMARY

Landmark tree policies acknowledge the scientific consensus that large trees provide substantially more social, public health and environmental benefits than small trees. Tree growth correlation to tree benefits is an exponential one. Mature large trees, those greater than 40 feet tall and/or 30 inches in diameter, deliver on average an annual net benefit two to six times greater than mature small trees<sup>10</sup>. The presence and stature of large trees has a measurable human health impact, relieving stress, decreasing respiratory illness by providing particulate matter deposition on leaves, and inspiring awe in the community<sup>11</sup>.



One Tacoma Design + Development Goal 5 and 13 align with the protection, preservation and resilience of historic, cultural, and landmark elements within Tacoma. Specifically, policies DD-5.11, DD-13.5 and DD-13.6 correlate with the protection of landmark trees.

#### Common themes in landmark tree ordinances across Washington and the nation:

- 1) Potential Landmark trees can be voluntarily or non-voluntarily designated.
  - a) Voluntary designation by the property owner is generally coupled with title recording on the property mandating the preservation of the tree while the tree remains healthy.
  - b) Non-voluntary/mandatory – designation applies to trees that meet a certain criteria, most often a combination of size and species, that immediately protects a tree from removal or mal-pruning while the tree remains healthy.
- 2) Designation committees for voluntary designation of landmark trees can be a public urban forester, municipal arborist, City Council or committee, or tree board.
- 3) Documentation and inventorying of voluntary landmark trees is often facilitated through a landmark tree database and tree management software.
  - a) This list is often in conjunction with historical society’s and historical tours, and could potentially be managed through the City’s Landmarks Preservation Commission.
- 4) Qualifying criteria for landmark trees normally contain subjective and/or objective requirements for historical, cultural, ecological significance, or other important qualifying attributes.

<sup>10</sup> McPherson, E.G.; et. al. 2003. Northern mountain and prairie community tree guide: benefits, costs and strategic planting. Center for Urban Forest Research, Pacific Southwest Research Station, USDA Forest Service. 92p.

<sup>11</sup> McDonald, R.I., et al, Planting Healthy Air: A global analysis of the role of urban trees in addressing particulate matter pollution and extreme heat. 2016, The Nature Conservancy Arlington, VA.



- 5) Variances and relief of landmark tree protection are often provided through the following:
  - a) High-risk rating through qualified Tree Risk Assessor and/or conspicuously dead trees.
  - b) Spatial conflict of actively permitted development/redevelopment are exempt.
  - c) Utility work as necessary to retain utility connectivity are exempt.
  - d) Other large public land-owning organizations with their own Urban Forest Management Plan or similar document can be exempt.

**Outcomes landmark tree protection and inventory:**

- 1) Compliments and implements DD-5.11, DD-13.5 and DD-13.6 of One Tacoma into Urban Forestry Policy.
- 2) Conservation of culturally or historically relevant City landmarks that have importance to a community.
- 3) Ecological inventory of large, important trees and economic quantification of their provided ecosystem services.
- 4) Species diversity improvement – often landmark trees will be trees of special ecological significance and rare species presence, resulting in a higher species richness across the City.

**3.2 RIGHT-OF-WAY TREE PROTECTION AND MANAGEMENT**

The “right-of-way” (ROW) is defined as (typically) an easement provided to the City over the land of the abutting property owner, which establishes an accessory right for public benefit or transportation, such as for roadways, sidewalks, or utilities. According to TMC 8.30.020,

“The public right-of-way includes the area of land, the right to possession of which is secured by the City for right-of-way purposes and includes the traveled portion of the public streets and alleys, as well as the border area, which includes, but is not limited to, any sidewalks, planting strips, traffic circles, or medians.”

Currently, the City of Tacoma requires abutting property owners to maintain adjoining rights-of-way. This includes streets and alleys extending from the owner's property lines out to the curbs or edges of pavement (includes sidewalks and planting strips) if improved, or if unimproved (unpaved), out to the centerlines of the road. There are several places in the Tacoma Municipal Code where these obligations are stated: Chapters 9.17, 9.18, 8.30, 8.31, and 12.09.

Street trees, curbs, sidewalks, and utilities play vital roles in Tacoma’s public realm, helping to make the City more livable and sustain the quality of life. It is not uncommon for conflicts to arise between trees and infrastructure, particularly in locations where they were installed some time ago. These conflicts can compromise pedestrian access to the sidewalk and/or tree health.

Each tree and infrastructure conflict is unique and should be appropriately addressed given the conditions of the multiple elements impacted or impacting the situation. Instilling proper right-of-way tree protection and management will enable the City to implement practices and procedures that maintain the quality of life for the citizens of Tacoma while supporting ongoing initiatives such as the 30% tree canopy by 2030 and requirements set by ADA.

**Common outcomes of right-of-way tree protection and management include:**

- 1) Maintained and enhanced urban forest accessibility to support equity and social justice.
- 2) Reasonable and justifiable tree preservation that considers all variables and impacts. Right-of-way tree protection does not imply all trees are absolutely preserved. Trees are inventoried and evaluated to determine their fate in an infrastructure conflict situation.
- 3) Protection of trees during construction and infrastructure repair/replacement/installation prevents devastating damage to trees which could otherwise cause tree decline, need for removal, and potential public hazard.
- 4) Reduced tree risk, increased tree longevity, tree canopy retention, reduced tree maintenance costs, proper tree care, improved public health, reduced infrastructure conflicts, and equitable access to the urban forest.
- 5) A decision matrix with various mitigation strategies or amendments to address the tree and infrastructure conflict by considering existing conditions among other variables. See the [Seattle Trees & Sidewalks Operations Plan](#) as an example.

### Outcomes of the UFMP to support right-of-way tree protection and management:

- 1) Improved permitting system that will alert the appropriate City personnel for reviewing and evaluating a situation where trees may be impacted.
- 2) Cyclical inventory and assessment of trees in the right-of-way to identify potential risks, trees in decline, pests and disease threats, monitoring needs, and treatment needs. Continual monitoring of trees in the ROW will inform future management decisions and tree/infrastructure mitigation approaches.
- 3) Appropriate tree species selection for new plantings in the rights-of-way.
- 4) Tree planting best practices such as appropriate soil volume, irrigation needs, proper planting depth, quality tree nursery stock, and young tree care (e.g. scaffold branches, lowest permanent branch, central leader).

### 3.3 CITY-WIDE TREE PLANTING GOALS

Tacoma's 30% City-wide canopy goal is achievable with well-planned tree canopy growth. Planting trees without equitable access of benefits, adequate spatial capacities and poor genetic selection are common challenges that result in an unhealthy urban forest and misspent budgets. Solving these discrepancies requires careful consideration of urban design and engineering and tree-resource management, translated through the lenses of social equity and environmental justice. This may require tailored strategies, new policies and increased resourcing for these areas. The existing policies/procedures will not provide more equitable access to the urban forest resources. Proven tree planting policy goals and municipal code are equity driven, prioritized by asset generation, contain measurable performance standards, are adaptive and provide feedback.

In pursuit of Tacoma's 30/30 goal, the Urban Forestry Team are strategically applying the following datasets to inform decisions on canopy growth priorities, areas with missing or inequitable tree canopy, and areas historically low in tree canopy.

- 1) Land-use and environmental characterization data
- 2) Canopy cover data & tree inventory data
- 3) Tacoma's Equity Index
- 4) Urban heat island index



One Tacoma's Environmental + Watershed Health chapter, policy EN-4.29 calls out Tacoma's initiative to have 30% City-wide tree canopy by 2030.

### Common themes in tree planting goals and policies across Washington:

- 1) Consistent application, regulation and stewardship across land-use, stakeholders and time.
- 2) Long-term commitment to equitable tree canopy growth at all levels of City government.
- 3) Identify and define best management practices in tree planting and care, as well as adopting internal procedures to ensure trees are not only planted well but also succeed and establish into mature trees.
- 4) Sequence tree planting and mitigation designs and selection using environmental and physical criteria.
- 5) Coordination with street engineering/design and urban design to promote maximum tree benefits with the built environment.

#### Outcomes from outlining City-wide Tree Planting Goals:

- 1) Compliments and further implements EN-4.29 of One Tacoma into Urban Forestry Policy.
- 2) Focus budgets and planning mechanisms to realize the goal of 30% City-wide tree canopy by 2030.
- 3) Accelerate informed decision making on site-specific and environmentally accurate tree species. Improved access to information on approved and prohibited tree species within the City.
- 4) Align permitting and trigger processes for re/development actions where supplemental tree installation is a viable co-design. Reduce missed opportunities for collaborative tree planting and green urban design.
- 5) Increased urban forest biodiversity and ecological resiliency through planned natural resource management techniques. Appropriate species selection while adapting genetic diversity to climate change.
- 6) Accelerate growth of urban forest benefits. Large trees with contiguous tree canopy provide scientifically more environmental and ecological benefits than small trees and fragmented canopies.
- 7) Reduced conflict with City infrastructure. Planning for urban trees from the inception of project design alleviates common future conflicts with utilities, sidewalks and other street infrastructure. Currently, this is captured in Title 12 “Utilities” in the TMC.

## 4. EXISTING TACOMA MUNICIPAL CODE RENOVATION

The first tree protection ordinance in Tacoma, and Washington State, was adopted in 1927 as “9.18 Trees and Shrubs – Trimming and Removal”. This called for the protection of Tacoma’s street trees growing in the right-of-way (see 9.18.030). From then, a number of tree, vegetation, plant and forest-related municipal codes have been added through a long history of Tacoma ordinances. Some of this municipal code is heavily antiquated and its applicability has eroded with time.

#### The TMC Renovation task is aimed at the following:

- 1) Fix inaccuracies and discrepancies in existing code.
- 2) Updating old antiquated municipal code relating to trees.
- 3) Addressing several inconsistencies/conflicts between existing TMC and Policies.
- 4) Updating and consolidate authority to approve actions (e.g. City Manager, Director of Public Works, City Engineer, Committee).
- 5) Resolving references to permits and processes that no longer exist.
- 6) Removing inconsistencies with industry best-management-practices.
- 7) Fixing conflicts between critical areas and right-of-way codes.

We’ve identified 110 tree-related code references with existing TMC, of which 37 contained outdated and inaccurate information related to current urban forest policy.



Environmental + Watershed Health Policy EN-4.30 mentions the importance of actively pursuing urban forest best management practices.

## APPENDIX C. TREE MAINTENANCE NEEDS ON CITY FACILITY PROPERTY

Table 27. Maintenance needs and responsibility for the 2015 inventory of City-owned trees

Location	Tree Maintenance Action				Total	Maintenance Responsibility*
	Prune	Remove	Remove Stake	No Action		
tacoma convention ctr	98	4		31	133	PAF
union sta federal court	30				30	
fire comm elec ctr	4			2	6	PW-Grounds
fire prevention ctr				2	2	PW-Grounds
fire station 1	10			12	22	PW-Grounds
fire station 2	3	2		7	12	
fire station 3	7	2		8	17	
fire station 4	2			9	11	
fire station 5	12			5	17	PW-Grounds
fire station 6	5			14	19	
fire station 8	27			2	29	PW-Grounds
fire station 9	10	1		4	15	
fire station 10	1		3	1	5	
fire station 13	1				1	
fire station 14				2	2	
fire station 15	1		3		4	
fire station 15 old				8	8	
fire station 16	25			12	37	PW-Grounds
fire training ctr	15	1		5	21	PW-Grounds
14th & pacific lot	15	2	4		21	
bicentennial pavilion	9				9	PAF
bicentennial plaza	22			1	23	PAF
fallen riders memorial	7	1		6	14	
fern hill square park	9	1		7	17	
fireman's park	40			9	49	PW-Grounds
frost memorial	6			4	10	PW-Grounds
gas station park				2	2	
harborview	2			1	3	PW-Grounds
hillclimb	33	2		34	69	PW-Grounds
jefferson ave mini park				1	1	PW-Grounds
lighthouse senior ctr	1			5	6	PW-Grounds
mccormick	21			7	28	PW-Grounds

muni dock totem marina	1			2	3	
municipal parking lot	7				7	
municipal services ctr	2			1	3	
proctor comm garden	1				1	
public wks str grounds				6	6	PW-Grounds
ray roberts memorial	1	1		1	3	
tacoma municipal bldg	37			13	50	PW-Grounds
tacoma park	5			9	14	PW-Grounds
glass park	21			27	48	
museum glass land	26			13	39	
pantages	2				2	PW-Grounds
parking totem marina	16	1	1	4	22	
peoples community center	17			5	22	Metro Parks
police hdqtrs fleet ser	79	4		46	129	PW-Grounds
police substation	28			13	41	PW-Grounds
beacon senior center	5			2	7	PW-Grounds
point defiance ruston sr	19	1		3	23	PW-Grounds
lamay dome	28	27	8	98	161	
tacoma dome	60	9		157	226	
fern hill library	8	1		27	36	TPL
kobetich library				2	2	TPL
main library	35			7	42	TPL
moore library	39	1		5	45	TPL
mottet library	4				5	TPL
swasey library	16			3	19	TPL
wheelock library	11	2		6	19	TPL
adams substation	3	1		13	17	TPU
cedar substation	5	2		11	18	TPU
cushman substation				9	9	TPU
fletcher hgts standpipe	18			10	28	TPU
gove substation	4			7	11	TPU

highland substation	3			3	TPU
hilltop substation	11		6	17	TPU
nisqually substation		1	27	28	TPU
tpu building	82		91	173	TPU
well site 12a	2	1		3	
well site 9a	12		25	37	
<b>Grand Total</b>	<b>1,024</b>	<b>68</b>	<b>19</b>	<b>850</b>	<b>1,962</b>

\*PAF = Public Assembly Facility

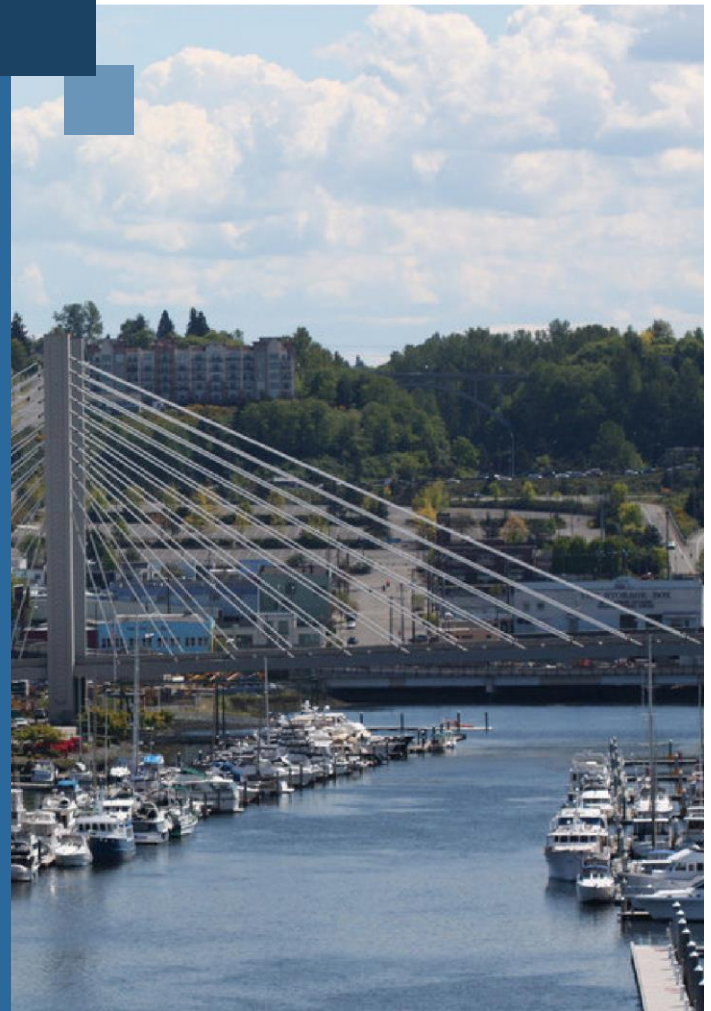
\*PW-Grounds = City Department of Public Works Grounds Maintenance

\*TPU = Tacoma Public Utility

APPENDIX D. 2018 TACOMA TREE CANOPY ASSESSMENT

URBAN TREE CANOPY  
**ASSESSMENT**

TACOMA,  
WASHINGTON  
DECEMBER | 2018





AN ASSESSMENT OF  
URBAN TREE CANOPY

# TACOMA, WASHINGTON



**Someone is  
sitting in the  
shade today  
because someone  
planted a tree a  
long time ago.**

**-Warren Buffet**



**PREPARED BY**

Plan-It Geo, LLC, Arvada, Colorado

**PREPARED FOR**

City of Tacoma, Washington



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6,406

**ACRES OF TREE CANOPY****EXECUTIVE****SUMMARY****PURPOSE OF THIS ANALYSIS**

The City of Tacoma is located within Pierce County, Washington, south of the Seattle metropolitan area (Figure 1). It is approximately 49 square miles or 31,607 acres of which 31,476 are land acres. Across the city, trees along streets, in parks, yards, and natural areas constitute a valuable urban and community forest. This resource is a critical element of the region's green infrastructure, contributing to environmental quality, public health, water supply, local economies and aesthetics. The primary goal of this assessment was to provide a baseline and benchmark of the City's tree canopy and interpret the results across a range of geographic boundaries.

**URBAN TREE CANOPY IN TACOMA**

Results of this study indicated that in 2017, the city of Tacoma contained 20 percent urban tree canopy (or 6,406 of the city's 31,607 total acres); 13 percent noncanopy vegetation (4,257 acres); 14 percent soil/dry vegetation (4,469 acres); 52 percent impervious (16,344 acres); and less than 1 percent water (132 acres). Existing urban tree canopy covers 20 percent of Tacoma's land area (6,406 of the city's 31,476 land acres). Of the city's 80 percent of land area not presently occupied by tree canopy, 13 percent (4,604 acres) was suitable

for future tree plantings and 67 percent (21,006 acres) was

unsuitable due to its current land use or other restraint. surfaces.

**ASSESSMENT BOUNDARIES**

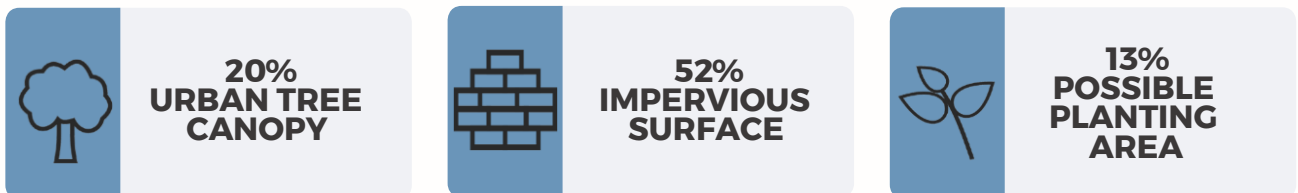
This study assessed urban tree canopy (UTC) and possible planting areas (PPA) at multiple geographic scales in order to provide actionable information to a diverse range of audiences. By identifying what resources and opportunities exist at these scales, the City can be more proactive in their approach to protect and expand their urban tree canopy. Metrics were generated at the following geographies: the citywide boundary; watersheds (8); land uses (14); and census block groups (202).

**RECOMMENDATIONS**

The results of this analysis can be used to develop a continuing strategy to protect and expand Tacoma's urban forest. The UTC and PPA metrics should be used as a guide to determine where the city has been successful in protecting and expanding its urban forest resource, while also targeting areas to concentrate future efforts based on needs, benefits, and available planting space. Tacoma can use these results to ensure that their urban forest policies and management practices continue to prioritize its maintenance, health, and growth.



**Figure 1. | Tacoma occupies approximately 49 square miles in Pierce County, Washington.**



**Figure 2. | Based on an analysis of 2017 high-resolution imagery, Tacoma contains 20% tree canopy, 13% areas that could support canopy in the future, and 52% total**

# PROJECT

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# METHODOLOGY

This section describes the methods through which land cover, urban tree canopy, and possible planting areas were mapped. These datasets provide the foundation for the metrics reported at the selected target geographies.

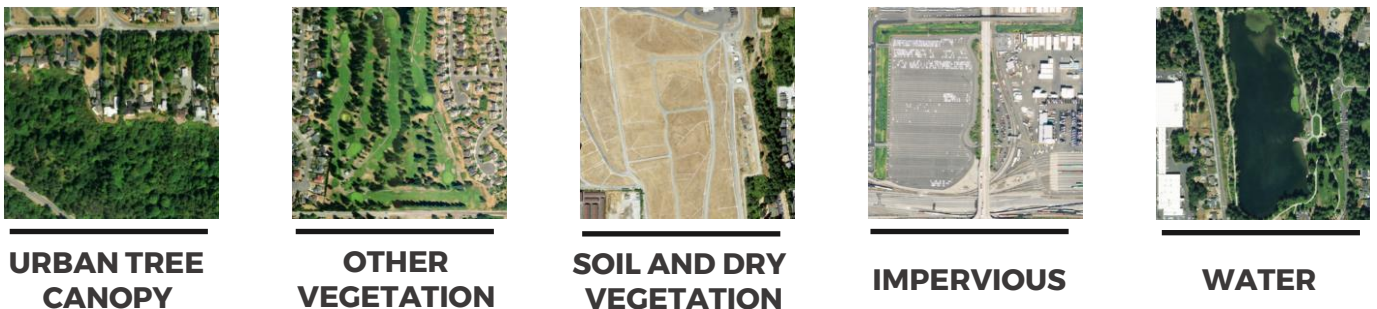
## DATA SOURCES

This assessment utilized 2017 high-resolution (1-meter) multispectral imagery from the U.S. Department of Agriculture's National Agriculture Imagery Program (NAIP) and 2017 LiDAR data from the Washington State Department of Natural Resources to derive the land cover data set. The NAIP imagery is used to classify all types of land cover, whereas the LiDAR is most useful for distinguishing tree canopy from other types of vegetation. Additional GIS layers provided by the City of Tacoma were also incorporated into the analysis.

## MAPPING LAND COVER

An initial land cover dataset was to be created prior to mapping tree canopy and assessing change. The land cover data set is the most fundamental component of an urban tree canopy assessment. An object-based image analysis (OBIA) software program called Feature Analyst was used to classify features through an iterative approach. In this process, objects' spectral signatures across four bands (blue, green, red, and near-infrared), textures, pattern relationships, and object height were considered. This remote sensing process used the NAIP imagery and LiDAR to derive five initial land cover classes. These classes are shown in Figure 3.

After manual classification improvement and quality control were performed on the remote sensing products, an additional data layer from the city (buildings) was utilized to capture finer feature detail and further categorize the land cover dataset.



**Figure 3. | Five (5) distinct land cover classes were identified in the 2017 tree canopy assessment: urban tree canopy, non-canopy vegetation, bare soil and dry vegetation, impervious (paved) surfaces, and water.**

## CLASSIFYING URBAN TREE CANOPY

Following the remote sensing classification and final QA/QC of the tree canopy data layer, this output was used as a mask to extract tree height composition using LiDAR height information from a Normalized Digital Surface Model (nDSM). Tree canopy throughout the city was classified into four different height ranges: between 0 and 25 feet tall, 25 to 50 feet, 50 to 100 feet, and greater than 100 feet tall. There were no accuracy standards required or assessed for this classification. Additionally, using impervious surface data provided by the city (buildings) and the amount of tree canopy overhanging impervious surfaces was quantified to assist with hydrologic modeling and gain a better understanding of the benefits that the City's trees are providing..

## IDENTIFYING POSSIBLE PLANTING AREAS AND UNSUITABLE AREAS FOR PLANTING

In addition to quantifying Tacoma's existing tree canopy cover, another metric of interest in this assessment was the area where tree canopy could be expanded. To assess this, all land area in Tacoma that was not existing tree canopy coverage was classified as either possible planting area (PPA) or unsuitable for planting. Possible planting areas were derived from the Non-Canopy Vegetation class. Unsuitable areas, or areas where it was not feasible to plant trees due to biophysical or land use restraints (e.g. airport runways, golf course playing areas, recreation fields, etc.), were manually delineated and overlaid with the existing land cover data set (Figure 4). The final results were reported as PPA and Unsuitable Vegetation, Unsuitable Impervious, Unsuitable Soil, and Total Unsuitable.



**Figure 4. | Vegetated areas where it would be biophysically feasible for tree plantings but undesirable based on their current usage (left) were delineated in the data as “Unsuitable” (right). These areas included recreational sports fields, golf courses, and other open space.**

## DEFINING ASSESSMENT LEVELS

In order to best inform the City Council and all of Tacoma's various stakeholders, urban tree canopy and other associated metrics were tabulated across a variety of geographic boundaries (Figure 5). These boundaries include the city boundary, watersheds, land use classes, and census block groups.

- The City of Tacoma's citywide boundary is the one (1) main area of interest over which all metrics are summarized.
- Eight (8) HUC-12 watersheds intersect the city of Tacoma. Delineated by the U.S. Geological Survey, each unique 12-digit identification code represents a different subwatershed. They were analyzed to explore differences in tree canopy across a naturally-occurring geographic boundary.
- Fourteen (14) land use classes provided by the City were analyzed to assess differences in tree canopy across different human uses of land.
- Two hundred and two (202) census block groups were assessed to provide information at a small geographic scale. Census block groups (CBGs) are used by the U.S. Census Bureau to assure statistical consistency when tracking populations across the United States and can be valuable indicators of environmental justice as they are directly linked with demographic and socioeconomic data.

PROJECT METHODOLOGY



City of Tacoma



Watersheds



Land Use



Census Block Groups

**Figure 5. | Four distinct geographic boundaries were explored in this analysis: the full city boundary, watersheds, land use classes, and census block groups.**

# STATE OF THE CANOPY AND KEY FINDINGS



This section presents the key findings of this study including the land cover base map and canopy analysis results which were analyzed across various geographic assessment boundaries. These results, or metrics, help inform a strategic approach to identifying existing canopy to preserve and future planting areas. Land cover percentages are based on the total area of interest while urban tree canopy, possible planting area, and unsuitable percentages are based on land area. Water bodies are excluded from land area because they are typically unsuitable for planting new trees without significant modification.

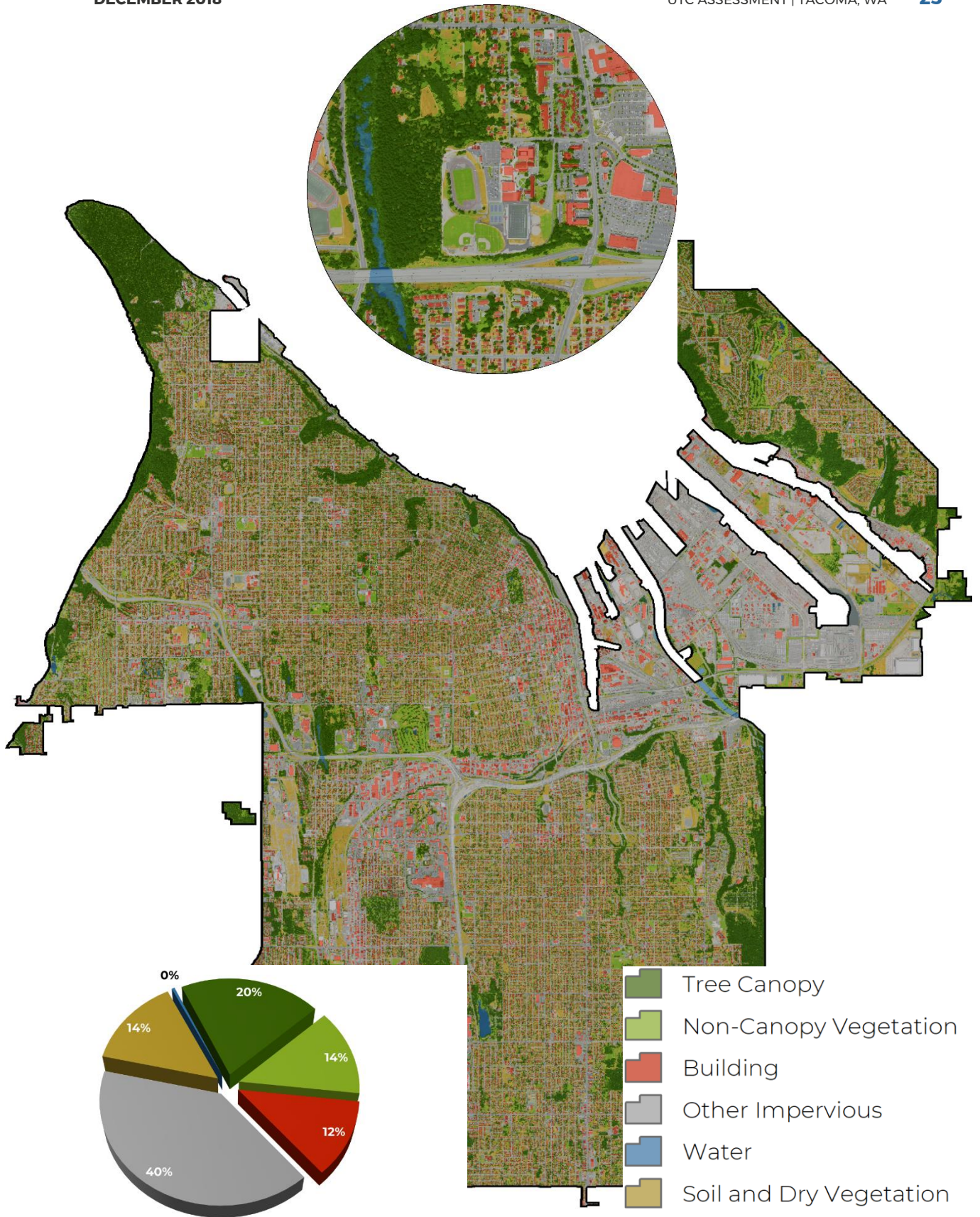
## CITYWIDE LAND COVER

In 2017, tree canopy constituted 20 percent of Tacoma’s land cover; non-canopy vegetation was 13 percent; soil/dry vegetation was 14 percent; impervious was 52 percent; and water was less than 1 percent. These generalized results are presented in Table 1 below. In further dividing the impervious surfaces, 12 percent of Tacoma’s total area was buildings and 40 percent was “other impervious” (such as roads, sidewalks, and parking lots). These detailed results are presented in Figure 6 on the next page.

**Table 1. | Generalized land cover classification results for the City of Tacoma, Washington.**

Tacoma	City Boundary Tree Canopy	Impervious Surfaces	Non-Canopy Vegetation	Soil & Dry Vegetation	Water	
<b>Acres</b>	31,607	6,406	16,344	4,257	4,469	132
<b>% of Total</b>	100%	20%	52%	13%	14%	<1%





**Figure 6. | Land cover classes for Tacoma, Washington based on 2017 NAIP imagery and 2017 Washington**

**State DNR LiDAR data. (Percentages based on total acres.)**

## CITYWIDE URBAN TREE CANOPY

This urban tree canopy assessment utilized the land cover map as a foundation to determine Possible Planting Areas throughout the City. Additional layers and information regarding land considered unsuitable for planting were also incorporated into the analysis. Note that the results of this study are based on land area as opposed to total area (note the difference between Total Acres and Land Acres in Table 2).

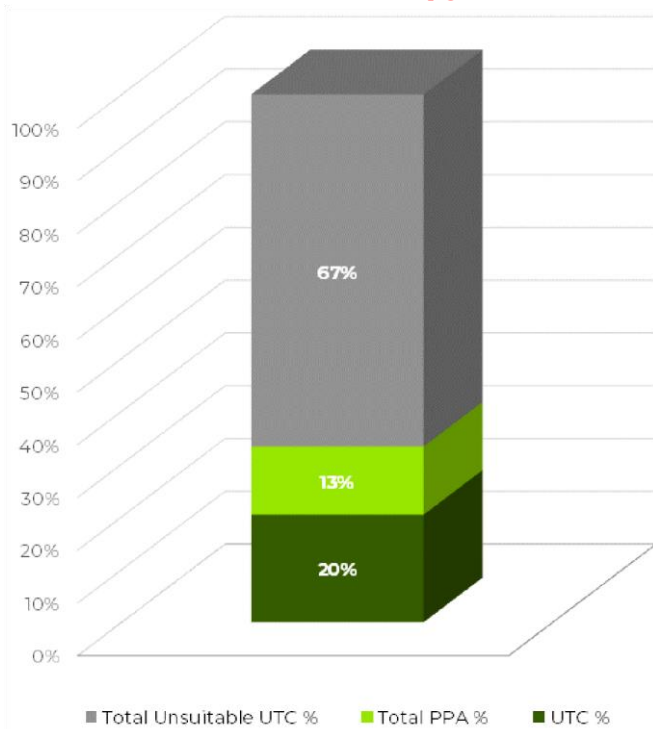
Results of this study indicate that within the city of Tacoma, 6,406 acres are covered with urban tree canopy, 4,064 acres are covered with other vegetation where it would be possible to plant trees (PPA), making up 13 percent of the city, 4,604 acres, or 13 percent, are areas where it would be possible to plant trees (PPA), and the other 21,006 acres were considered unsuitable for tree planting, making up 67 percent of the city. The unsuitable areas include recreational sports fields, golf course playing areas, impervious surfaces, and areas of bare soil and dry vegetation.

**Figure 7. | Urban tree canopy, potential planting area, and area unsuitable for UTC in the City of Tacoma.**

**Table 2. | Urban tree canopy assessment results, by acres and percent. (Percentages based on land acres.)**

City of Tacoma	Acres	%
<b>Total Area</b>	31,607	100%
<b>Land Area</b>	31,476	100%
<b>UTC</b>	6,406	20%
<b>Total PPA</b>	4,064	13%
<b>Total Impervious</b>	16,344	52%
<b>Total Unsuitable UTC</b>	21,006	67%

### Tacoma Urban Tree Canopy Potential



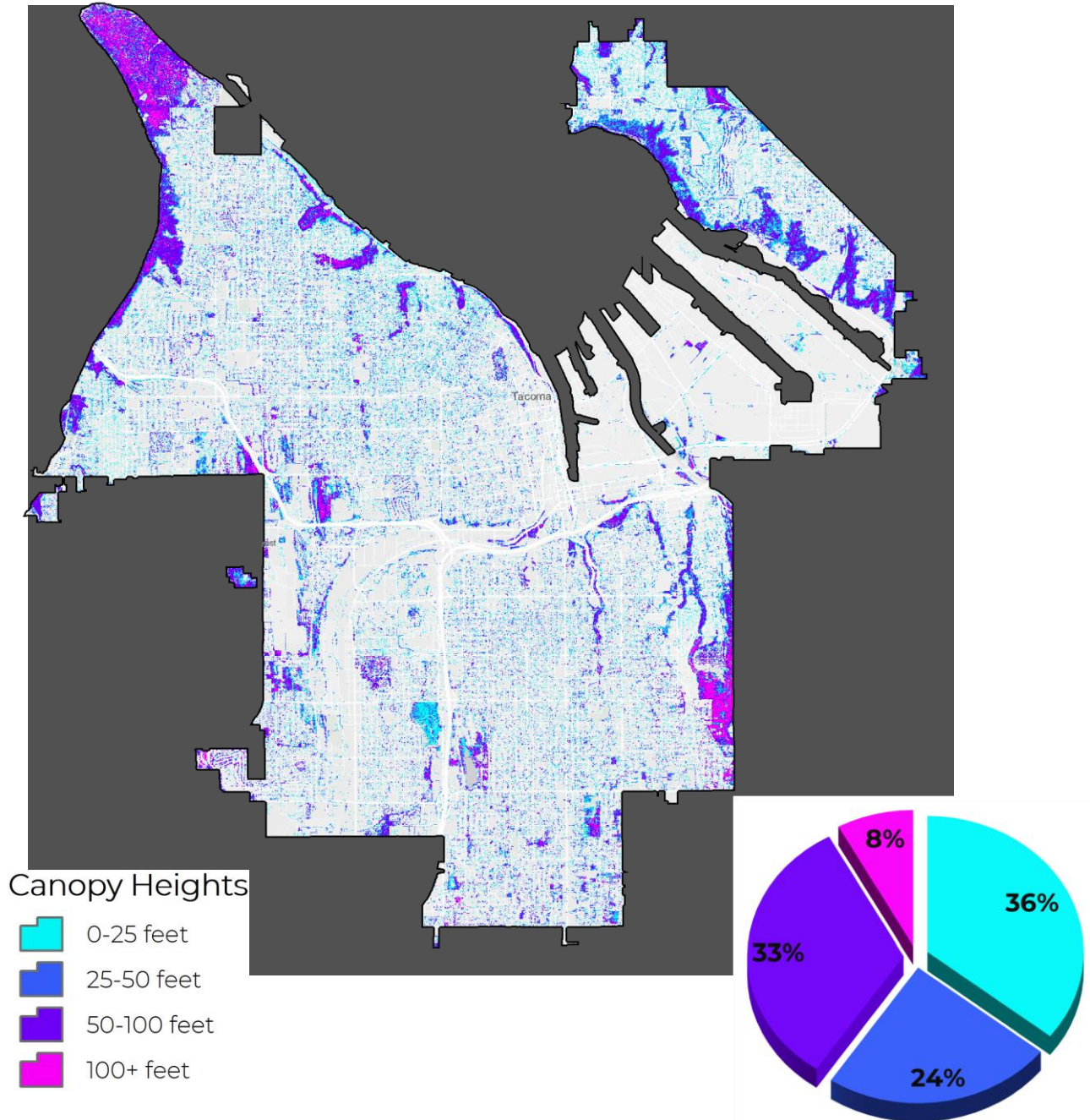


**Figure 8. | Urban tree canopy, possible planting area, and area unsuitable for UTC in the city of Tacoma.**

The city’s 6,406 acres of urban tree canopy were further divided into two subcategories based on whether the trees’ canopy had an impervious or pervious understory. Tree canopy overhanging an impervious surface can provide many benefits through ecosystem services such as localized cooling provided by shading of impervious surfaces and increased stormwater absorption. Results indicated that 4 percent of Tacoma’s 6,406 acres of UTC had an impervious understory. Data on other impervious surface types such as roads and parking lots were not available at the time of this study. Inclusion of such datasets in future studies may indicate a higher percentage of impervious understory.

## URBAN TREE CANOPY HEIGHT ANALYSIS

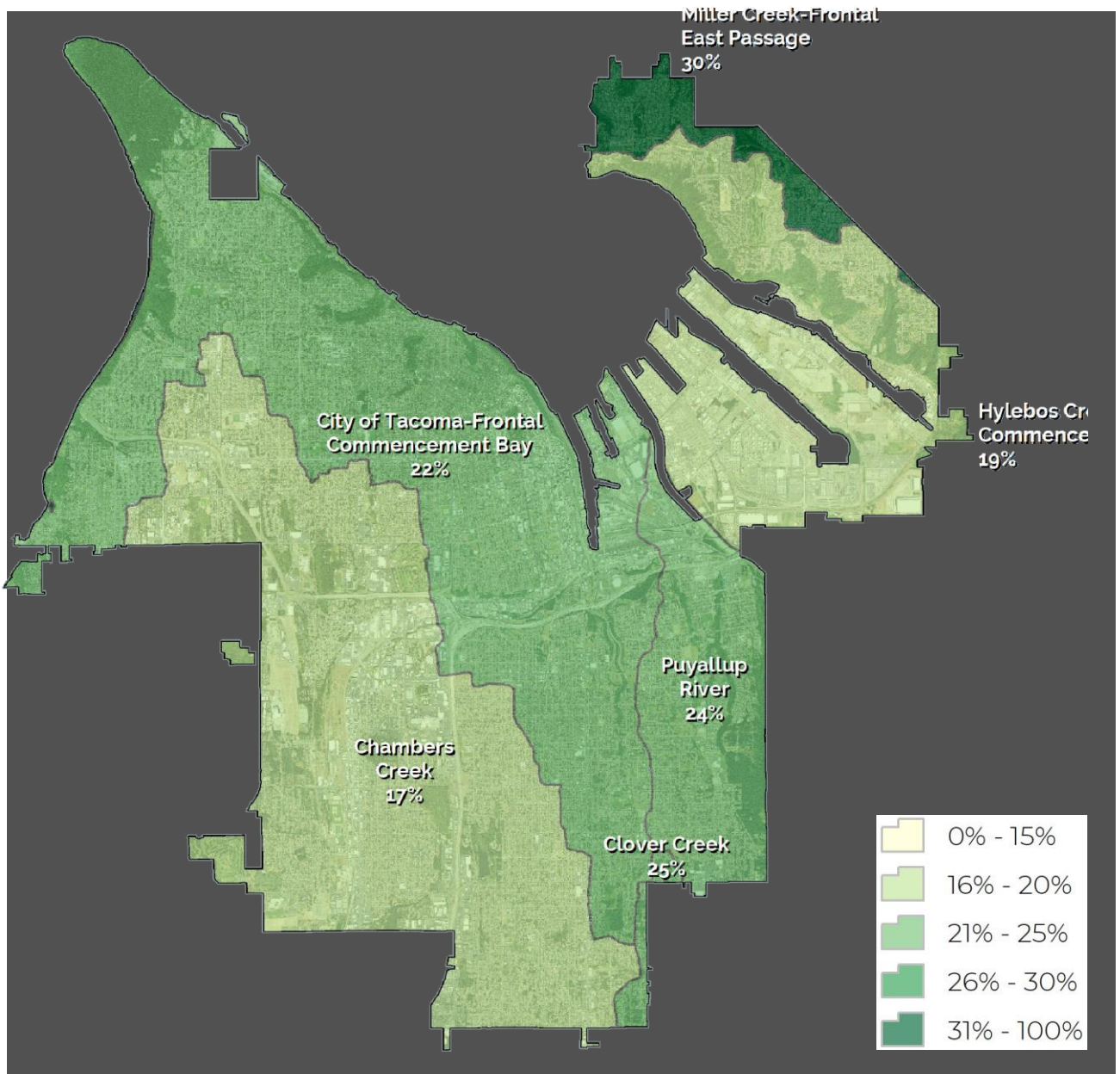
Tree canopy height across Tacoma’s urban forest was analyzed. This analysis was conducted by clipping the LiDAR nDSM to the tree canopy layer. A smoothing filter was then applied to the nDSM to remove small discrepancies in the height data. The canopy height data were then grouped into four height classes: 0-25 feet, 25-50 feet, 50-100 feet, and taller than 100 feet. The analysis showed that 36 percent of Tacoma’s canopy was between 0 and 25 feet tall, 24 percent was between 25 and 50 feet, 33 percent was between 50 and 100 feet, and 8 percent was taller than 100 feet.



**Figure 9. | Urban tree canopy height in the City of Tacoma.**

## URBAN TREE CANOPY BY WATERSHEDS

UTC and PPA were also assessed for the HUC-12 watersheds found within Tacoma. Watersheds are commonly analyzed to explore differences in tree canopy across a naturally-occurring geographic boundary. The watershed with the lowest existing canopy cover was the highly industrial and impervious Hylebos Creek Frontal Commencement Bay watershed with 19 percent UTC. The watershed with the highest canopy cover was the Miller Creek Frontal East Passage watershed with 30 percent UTC. PPA ranged from 11 percent in Hylebos Creek Frontal Commencement Bay to 21 percent in Miller Creek Frontal East Passage. The largest watershed, City of Tacoma Frontal Commencement Bay, did not have the highest percentage of either UTC or PPA but contained the greatest proportion of the city’s overall UTC (42 percent) and PPA (39 percent).

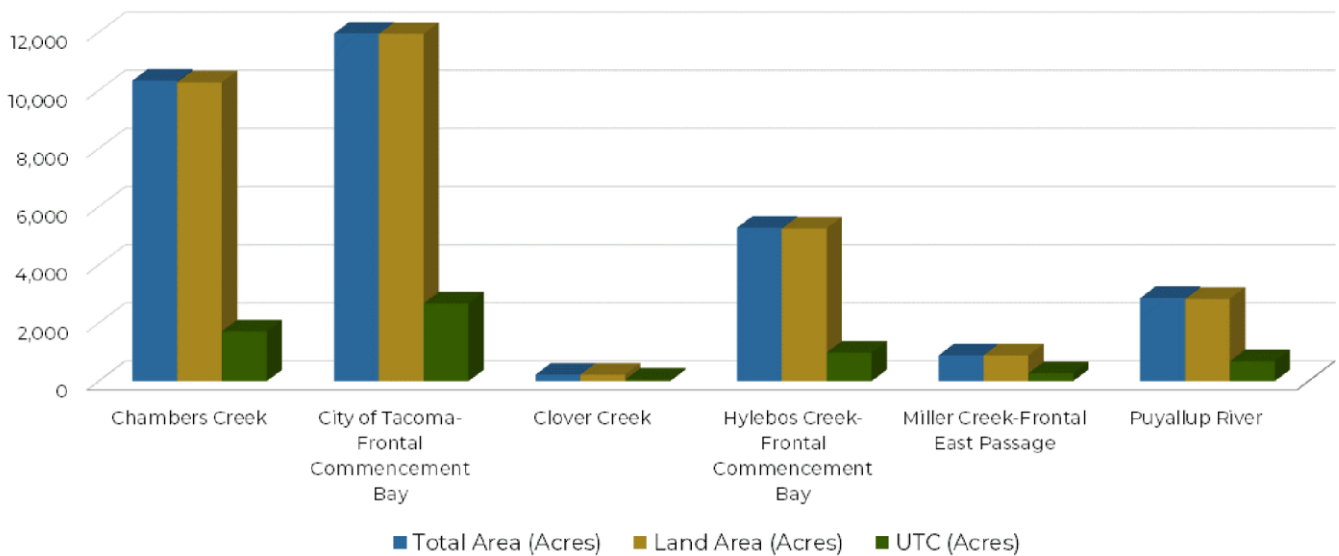


**Figure 10. | Urban tree canopy (UTC) by watersheds in the City of Tacoma.**

**Table 3. | Urban tree canopy in Tacoma by watersheds. UTC and PPA results include acres, percent of area covered by UTC or PPA (%), and distribution of the city’s total UTC or PPA within each watershed (dist.).**

Watershed	Land Area		Urban Tree Canopy			Possible Planting Area		
	Acres	Dist.	Acres	%	Dist.	Acres	%	Dist.
<b>Chambers Creek</b>	10,333	33%	1,720	17%	27%	1,264	12%	31%
<b>City of Tacoma Frontal Commencement Bay</b>	11,956	38%	2,673	22%	42%	1,589	13%	39%
<b>Clover Creek</b>	225	1%	56	25%	1%	37	17%	1%
<b>Hylebos Creek Frontal Commencement Bay</b>	5,282	17%	983	19%	15%	578	11%	14%
<b>Miller Creek Frontal East Passage</b>	890	3%	269	30%	4%	186	21%	5%
<b>Puyallup River</b>	2,858	9%	688	24%	11%	403	14%	10%
<b>Totals</b>	<b>31,607</b>	<b>100%</b>	<b>6,406</b>	<b>20%</b>	<b>100%</b>	<b>4,064</b>	<b>13%</b>	<b>100%</b>

**Urban Tree Canopy, Total Area, and Land Area by Watersheds**



**Figure 11. | Urban tree canopy compared to land area and total area for HUC-12 watersheds in the City of Tacoma.**

## URBAN TREE CANOPY BY LAND USES

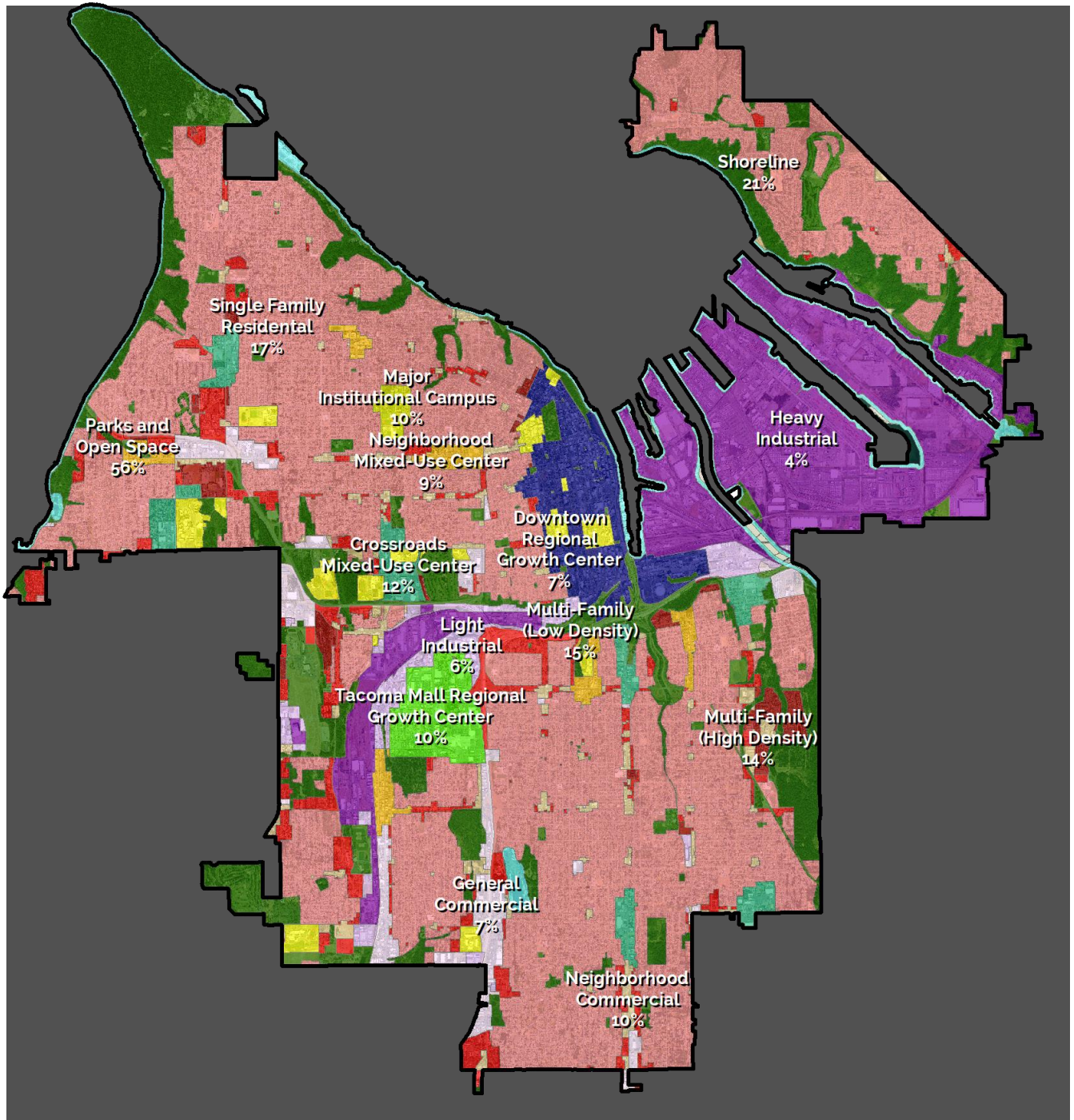
UTC and PPA were assessed for 13 different land use categories (Table 4) provided by the City of Tacoma. Land use classes with the lowest UTC included Heavy Industrial (4 percent), Light Industrial (6 percent), Downtown Regional Growth Center (7 percent), and General Commercial (7 percent), while the highest were Parks and Open Space (56 percent), Shoreline (21 percent) and Single Family Residential (17 percent). Single Family Residential areas offered the greatest opportunities for future canopy expansion, with 16 percent PPA contributing 57 percent of the city’s total PPA. Parks and Open Space also had 16 percent PPA, but the suitability and human uses of these areas for new tree plantings must be evaluated to

determine whether they are actually good candidates for urban forest expansion. Heavy Industrial areas only contain 6 percent PPA but make up 6 percent of all PPA throughout the city. These 235 acres provide great opportunities for mitigating stormwater runoff, air pollution, and urban heat island effect from planting new trees in these highly industrial and impervious landscapes.

**Table 4. | Urban tree canopy assessment results by land uses. UTC and PPA results include acres, percent of area covered by UTC or PPA (%), and distribution of the city's total UTC or PPA within each land use (dist.).**

Land Use	Land Area		Urban Tree Canopy			Possible Planting Area		
	Acres	Dist.	Acres	%	Dist.	Acres	%	Dist.
<b>Crossroads Mixed-Use Center</b>	644	2%	80	12%	1%	59	9%	1%
<b>Downtown Regional Growth Center</b>	978	3%	73	7%	1%	63	6%	2%
<b>General Commercial</b>	818	3%	56	7%	1%	52	6%	1%
<b>Heavy Industrial</b>	4,015	13%	147	4%	2%	235	6%	6%
<b>Light Industrial</b>	538	2%	34	6%	1%	36	7%	1%
<b>Major Institutional Campus</b>	626	2%	65	10%	1%	69	11%	2%
<b>Multi-Family (High Density)</b>	389	1%	56	14%	1%	54	14%	1%
<b>Multi-Family (Low Density)</b>	1,480	5%	226	15%	4%	178	12%	4%
<b>Neighborhood Commercial</b>	597	2%	59	10%	1%	44	7%	1%
<b>Neighborhood Mixed-Use Center</b>	386	1%	33	9%	1%	24	6%	1%
<b>Parks and Open Space</b>	5,006	16%	2,805	56%	44%	784	16%	19%
<b>Shoreline</b>	1,048	3%	208	21%	3%	110	11%	3%
<b>Single Family Residential</b>	14,499	46%	2,507	17%	39%	2,318	16%	57%
<b>Tacoma Mall Regional Growth Center</b>	483	2%	48	10%	1%	33	7%	1%
<b>Totals</b>	<b>31,508</b>	<b>100%</b>	<b>6,399</b>	<b>20%</b>	<b>100%</b>	<b>4,060</b>	<b>13%</b>	<b>100%</b>



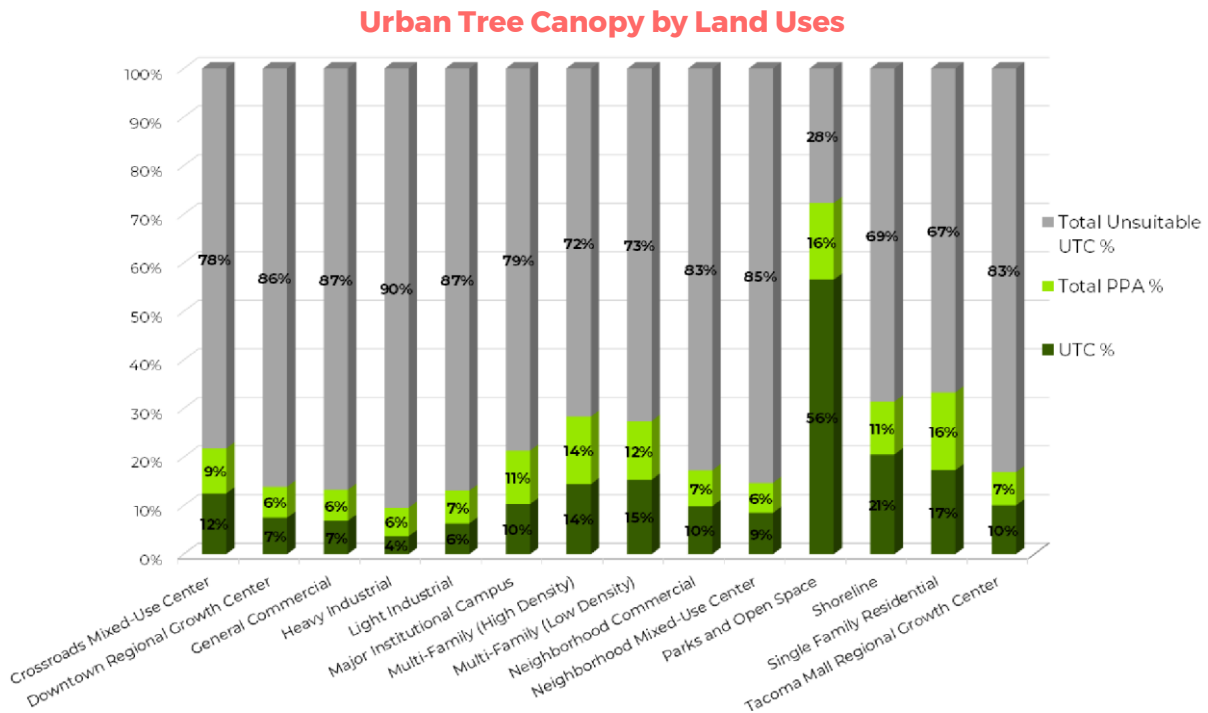


Land Use

- |                                 |                                    |
|---------------------------------|------------------------------------|
| Crossroads Mixed-Use Center     | Multi-Family (Low Density)         |
| Downtown Regional Growth Center | Single Family Residential          |
| General Commercial              | Neighborhood Commercial            |
| Heavy Industrial                | Neighborhood Mixed-Use Center      |
| Light Industrial                | Parks and Open Space               |
| Major Institutional Campus      | Shoreline                          |
| Multi-Family (High Density)     | Tacoma Mall Regional Growth Center |

**Figure 12. | Urban tree canopy in Tacoma by city land uses.**

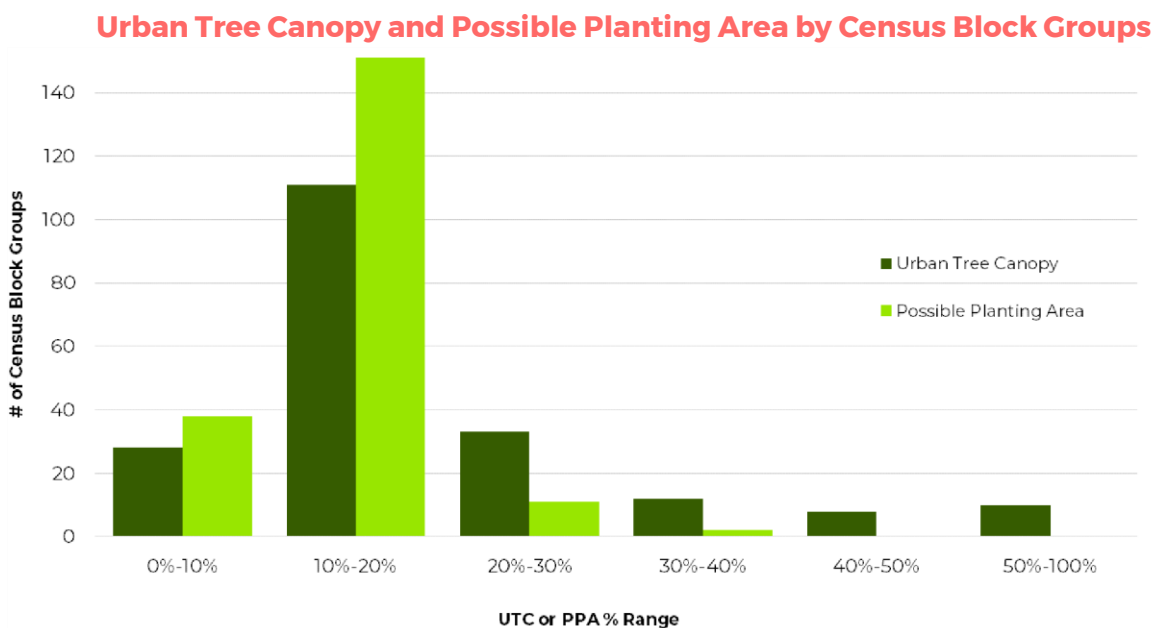




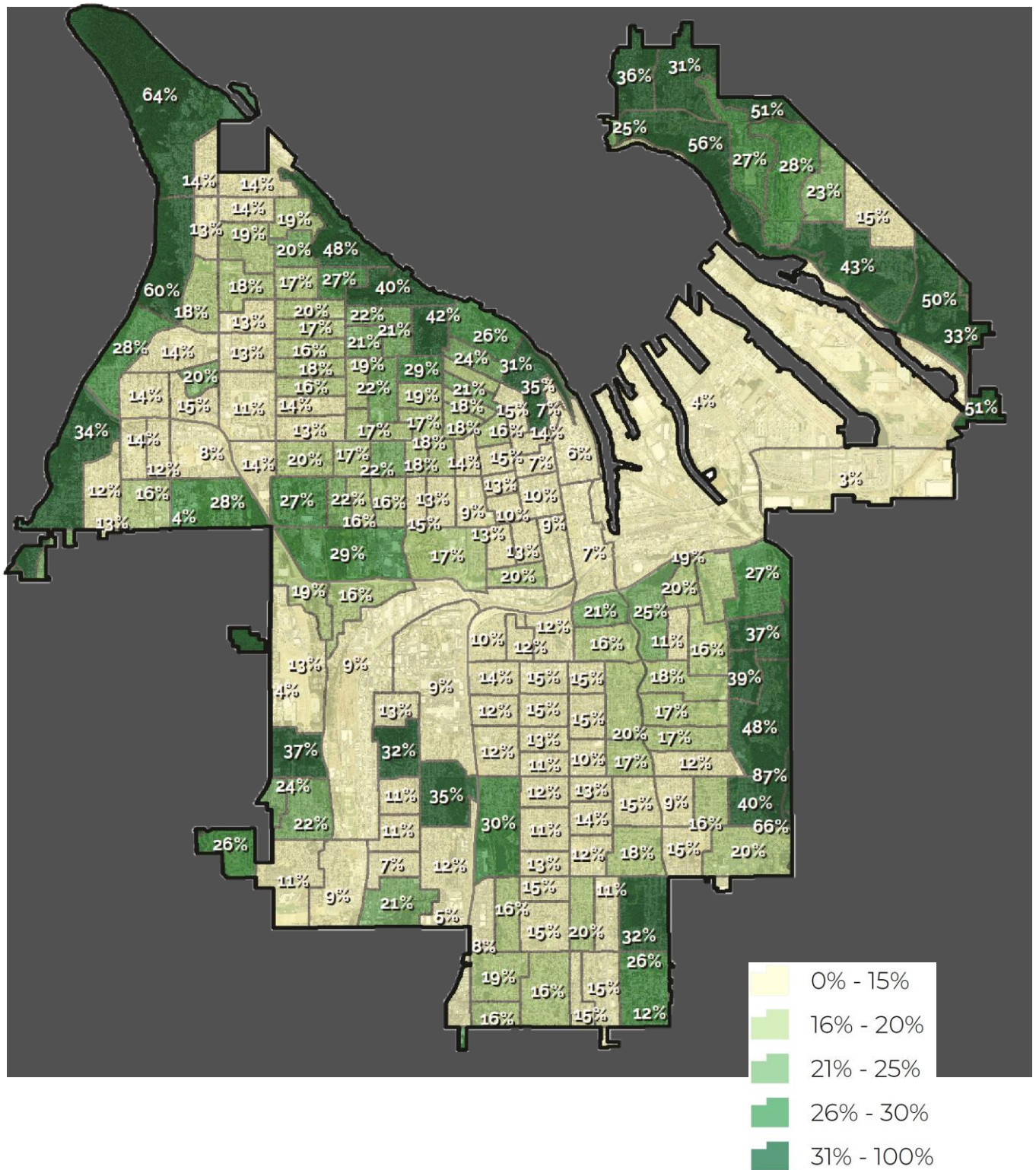
**Figure 13. | Urban tree canopy, potential planting area, and area unsuitable for UTC by land uses.**

## URBAN TREE CANOPY BY CENSUS BLOCK GROUPS

UTC and PPA were assessed at the census block group level. This geographic unit of measure is linked to all demographic and socioeconomic U.S. Census data which makes it useful for assessing the equitable distribution of tree canopy within a city. Results indicated that Tacoma’s UTC is not uniformly distributed throughout the city boundary. Some of the City’s 202 census block groups contained less than 10 percent cover while others contained up to 87 percent. PPA also varied greatly and ranged from less than 1 percent to 39 percent. For the complete results by census block groups, refer to the UTC Results spreadsheet.



**Figure 14. | Urban tree canopy and possible planting area in Tacoma by U.S. census block groups.**



**Figure 15. | Urban tree canopy in Tacoma by U.S. Census block groups.**

# RECOMMENDATIONS

An important step in preserving, protecting, and maintaining a city's valuable urban forest resource is to have a canopy assessment performed on a regular interval. The City of Tacoma has started this process by assessing their canopy in 2017. As the City continues to grow and change, they will be able to use these recommendations to ensure that their urban forest policies and management practices prioritize its maintenance, health, and growth. A nationwide analysis conducted by USFS researchers stated that

**Over 200 acres of plantable space are found in Heavy Industrial areas**

under ideal conditions, forested states such as Washington could achieve a canopy cover of 40-60 percent. With an existing canopy cover of 20 percent and PPA of 13 percent, Tacoma will need to be strategic with its future planning and development to ensure the sustained health of its trees if it hopes to meet this goal. The City can put these results to work to preserve, promote, and expand its tree canopy.

The results of this assessment should be used to encourage investment in forest monitoring, maintenance, and management; to prepare supportive information for local budget requests/grant applications; and to develop targeted presentations for city leaders, planners, engineers, resource managers, and the public on the functional benefits of trees in addressing environmental issues. The land cover data should be disseminated to diverse partners for urban forestry and other applications while the data is current and most useful for decision-making and implementation planning. The information from this study can help establish and refine canopy cover goals for the short- and long-term.

The City of Tacoma and its various stakeholders can utilize the results of the UTC and PPA analyses to identify the best locations to focus future tree planting and canopy expansion efforts. The City's canopy coverage varies throughout its entire area and breaking up the results by several different geographic boundaries demonstrated where the areas containing dense and sparse tree canopy are located. For example, Tacoma's Downtown Regional Growth Center land use had one of the lowest canopy covers in the city at 7 percent, whereas other land uses such as Single-Family Residential and Parks and Open Space had more than twice that. City should look to use planting opportunities in downtown areas where it is viable as trees will benefit a greater number of people in a densely populated area. However, a majority of Tacoma's planting opportunities are found outside of the downtown area, so the City should focus the majority of its efforts elsewhere. Parks and Open Spaces contained more than double the UTC percentage of the next highest land use category, but they also contained the highest PPA percentage of any land use. The City should take efforts to maintain or expand this concentration of UTC within its parks and open spaces by conducting field surveys of the plantable space available to determine actual suitability for new tree plantings. Also, Heavy Industrial areas contain over 200 acres of PPA. Trees planted in industrial areas have potential to make big impacts in these areas through ecosystem services such as stormwater mitigation, air quality improvement, and localized cooling through shade.

To maximize citywide canopy expansion, Tacoma's residential areas are a great place to prioritize as they cover the majority of the City's area and contain the vast majority of its PPA. The City should conduct public outreach in residential areas to engage residents interested in working together to improve the neighborhoods where they live. The Single Family Residential land use has below average existing UTC (17 percent) but contains over half of all PPA throughout the city (57 percent), so existing tree maintenance and planting efforts should be evaluated to preserve and enhance tree canopy in these areas. The results by geographic area (such as census block groups) can also be overlaid with the land use layer to determine which residential areas have the greatest need.

**SINGLE FAMILY  
RESIDENTIAL AREAS  
CONTAIN  
THE MOST POSSIBLE  
PLANTING AREA.**

Finally, Tacoma should integrate these data into its larger citywide planning efforts. While valuable, this assessment is only the first step in protecting, preserving, and expanding Tacoma's valuable urban forest resource. The City must establish set policies and guidelines for the preservation of tree canopy amidst future development and planning. The UTC data can assist implementation of the City Comprehensive Plan, VISION 2040, and environmental goals mentioned in Chapter 4, 'Environment + Watershed Health', of the One Tacoma Plan. Specifically, the City should take action to achieve its goal of 30 percent citywide tree canopy coverage by 2030 (30-by-30). Tacoma's urban forest provides the City with a wealth of environmental, social, and even economic benefits which relate back to greater community interest in citywide initiatives and priorities. The City should use these UTC and PPA metrics in combination with the results of the recent i-Tree Hydro analysis that was also performed in Tacoma to interpret where tree canopy gains would be felt most significantly and where there is still work to be done in accordance with the city's broader goals and vision for its future.



# APPENDIX

## ACCURACY ASSESSMENT

Classification accuracy serves two main purposes. Firstly, accuracy assessments provide information to technicians producing the classification about where processes need to be improved and where they are effective. Secondly, measures of accuracy provide information about how to use the classification and how well land cover classes are expected to estimate actual land cover on the ground. Even with high resolution imagery, very small differences in classification methodology and image quality can have a large impact on overall map area estimations.

The classification accuracy error matrix illustrated in Table A1 contain confidence intervals that report the high and low values that could be expected for any comparison between the classification data and what actual, on the ground land cover was in 2017. This accuracy assessment was completed using high resolution aerial imagery, with computer and manual verification. No field verification was completed.

## **THE INTERNAL ACCURACY ASSESSMENT WAS COMPLETED IN THESE STEPS**

1. Seven hundred and thirty seven (737) sample points, or approximately 15 points per square mile area in Tacoma (49 sq. miles), were randomly distributed across the study area and assigned a random numeric value.
2. Each sample point was then referenced using the NAIP aerial photo and assigned one of five generalized land cover classes ("Ref\_ID") mentioned above by a technician.
3. In the event that the reference value could not be discerned from the imagery, the point was dropped from the accuracy analysis. In this case, no points were dropped.
4. An automated script was then used to assign values from the classification raster to each point ("Eval\_ID"). The classification supervisor provides unbiased feedback to quality control technicians regarding the types of corrections required. Misclassified points (where reference ID does not equal evaluation ID) and corresponding land cover are inspected for necessary corrections to the land cover.]

Accuracy is re-evaluated (repeat steps 3 & 4) until an acceptable classification accuracy is achieved.

## **SAMPLE ERROR MATRIX INTERPRETATION**

Statistical relationships between the reference pixels (representing the true conditions on the ground) and the intersecting classified pixels are used to understand how closely the entire classified map represents Tacoma's landscape. The error matrices shown in Table A1 represent the intersection of reference pixels manually identified by a human observer (columns) and classification category of pixels in the classified image (rows). The gray boxes along the diagonals of the matrix represent agreement between the two-pixel maps. Off-diagonal values represent the number of pixels manually referenced to the column class that were classified as another category in the classification image. Overall accuracy is computed by dividing the total number of correct pixels by the total number of pixels

<sup>1</sup> Note that by correcting locations associated with accuracy points, bias is introduced to the error matrix results. This means that matrix results based on a new set of randomly collected accuracy points may result in significantly different accuracy values.

reported in the matrix ( $142 + 90 + 383 + 81 + 3 = 699 / 737 = 95$  percent), and the matrix can be used to calculate per class accuracy percent's. For example, 146 points were manually identified in the reference map as Tree Canopy, and 142 of those pixels were classified as Tree Canopy in the classification map. This relationship is called the "Producer's Accuracy" and is calculated by dividing the agreement pixel total (diagonal) by the reference pixel total (column total). Therefore, the Producer's Accuracy for Tree Canopy is calculated as: ( $142/146 = .97$ ), meaning that we can expect that ~97 percent of all 2017 tree canopy in the Tacoma, WA study area was classified as Tree Canopy in the 2017 classification map.

Conversely, the "User's Accuracy" is calculated by dividing the total number of agreement pixels by the total number of classified pixels in the row category. For example, 142 classification pixels intersecting reference pixels were classified as Tree Canopy, but one pixel was identified as Vegetation in the reference map. Therefore, the User's Accuracy for Tree Canopy is calculated as: ( $142/145 = 0.98$ ), meaning that ~98 percent of the pixels classified as Tree Canopy in the classification were actual tree canopy. It is important to recognize the Producer's and User's accuracy percent values are based on a sample of the true ground cover, represented by the reference pixels at each sample point. Interpretation of the sample error matrix results indicates this land cover, and more importantly, tree canopy, were accurately mapped in Tacoma in 2017. The largest sources of classification confusion exist between tree canopy and vegetation.

**Table A1. | Error matrix for land cover classifications in Tacoma, WA (2017).**

		Reference Data					Total Reference Pixels
		Tree Canopy	Vegetation	Impervious	Soil / Dry Veg.	Water	
Classification Data	Tree Canopy	142	2	1	0	0	145
	Vegetation	1	90	2	3	1	97
	Impervious	0	2	383	9	0	394
	Soil / Dry Veg.	3	2	11	81	0	97
	Water	0	0	1	0	3	4
	Total	146	96	398	93	4	737

**Overall Accuracy = 95%**

Producer's Accuracy		User's Accuracy	
Tree Canopy	97%	Tree Canopy	98%
Veg./ Open Space	94%	Veg./ Open Space	93%
Impervious	96%	Impervious	97%
Bare Ground / Soil	87%	Bare Ground / Soil	84%
Water	0%	Water	75%

**ACCURACY ASSESSMENT RESULTS**

Interpretation of the sample error matrix offers some important insights when evaluating Tacoma’s urban tree canopy coverage and how land cover reported by the derived rasters and the human eye. The high accuracy of the 2017 data indicates that Tacoma’s current tree canopy can be safely assumed to match the figures stated in this report (approximately 20 percent).

**GLOSSARY/KEY TERMS**

**Land Acres:** Total land area, in acres, of the assessment boundary (excludes water).

**Non-Canopy Vegetation:** Areas of grass and open space where tree canopy does not exist.

**Possible Planting Area - Vegetation:** Areas of grass and open space where tree canopy does not exist, and it is biophysically possible to plant trees.

**Possible Planting Area - Impervious:** Paved areas void of tree canopy, excluding buildings and roads, where it is biophysically possible to establish tree canopy. Examples include parking lots and sidewalks.

**Possible Planting Area - Total:** The combination of PPA Vegetation area and PPA Impervious area.

**Shrub:** Low-lying vegetation that was classified based on interpretation of shadows and texture in vegetation. Shrubs produce little to no shadow and appeared smooth in texture compared to tree canopy.

**Soil/Dry Vegetation:** Areas of bare soil and/or dried, dead vegetation.

**Total Acres:** Total area, in acres, of the assessment boundary.

**Unsuitable Impervious:** Areas of impervious surfaces that are not suitable for tree planting. These include buildings and roads.

**Unsuitable Planting Area:** Areas where it is not feasible to plant trees. Airports, ball fields, golf courses, etc. were manually defined as unsuitable planting areas.

**Unsuitable Soil:** Areas of soil/dry vegetation considered unsuitable for tree planting. Irrigation and other modifiers may be required to keep a tree alive in these areas.

**Unsuitable Vegetation:** Areas of non-canopy vegetation that are not suitable for tree planting due to their land use.

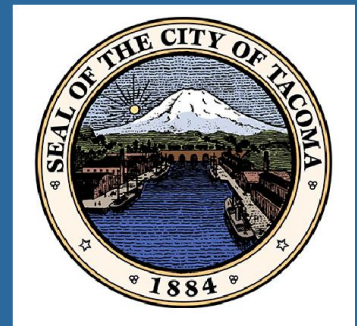
**Urban Tree Canopy (UTC):** The “layer of leaves, branches and stems that cover the ground” (Raciti et al., 2006) when viewed from above; the metric used to quantify the extent, function, and value of Tacoma’s urban forest. Tree canopy was generally taller than 10-15 feet tall.

**Water:** Areas of open, surface water not including swimming pools.



# DECEMBER | 2018

URBAN TREE CANOPY  
**ASSESSMENT**  
TACOMA, WASHINGTON

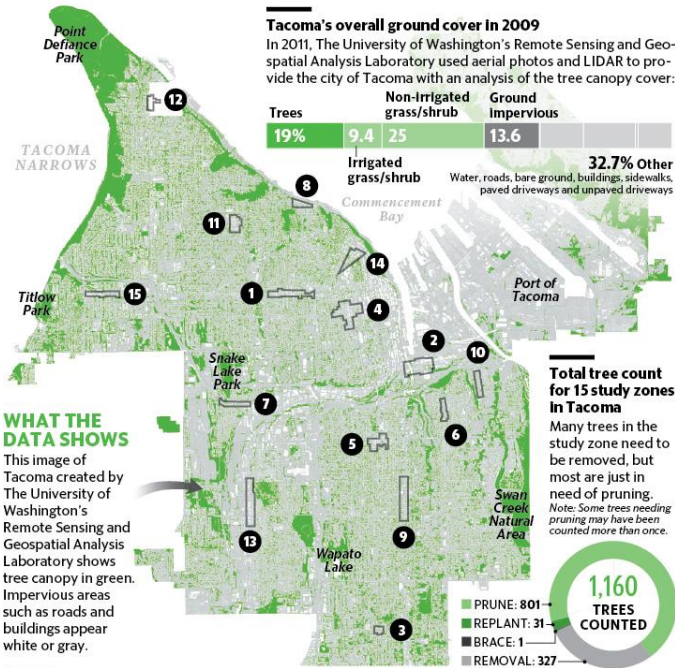


# APPENDIX E. INFOGRAPHIC FOR 2011 TREE CANOPY ASSESSMENT

## Tree canopy cover is low in Tacoma

Trees clean air, absorb stormwater, cool the planet and give social and financial benefits. Right now, Tacoma has only 19 percent tree canopy cover. The city's goal is to get to 30 percent by 2030. It's planting more trees on city-owned land, but two-thirds of Tacoma's land is privately owned. One solution? Partnering with business districts, such as those on this map, to count trees and set goals for more.

Source: 2010 Tacoma Neighborhood Business District Urban Forest Management Plan



**A breakdown of Tacoma's 15 tree canopy study zones**  
 A look at the tree count, canopy cover goals and planting options for each area:

ZONE	CANOPY BREAKDOWN	2009 CANOPY AND 2030 GOAL	PLANTING SPACES AND TREE SIZES
1 6th Avenue	131	2009: 2.1%   2030: 12.9%	61 (Large: 10, Medium: 10, Small: 10)
2 Dome	138	1.9%   13.1%	138 (Large: 10, Medium: 10, Small: 10)
3 Fern Hill	2	7.3%   7.7%	21 (Large: 10, Medium: 10, Small: 10)
4 Hilltop	234	0.9%   14.1%	129 (Large: 10, Medium: 10, Small: 10)
5 Lincoln Int'l	35	0%   15%	77 (Large: 10, Medium: 10, Small: 10)
6 McKinley Hill	50	1.1%   13.9%	22 (Large: 10, Medium: 10, Small: 10)
7 Oakland/Madrona	19	7.1%   7.9%	27 (Large: 10, Medium: 10, Small: 10)
8 Old Town	73	2.8%   12.2%	37 (Large: 10, Medium: 10, Small: 10)
9 Pacific Avenue	36	3.4%   11.6%	89 (Large: 10, Medium: 10, Small: 10)
10 Portland Avenue	66	2.4%   12.6%	42 (Large: 10, Medium: 10, Small: 10)
11 Proctor	174	4%   11%	14 (Large: 10, Medium: 10, Small: 10)
12 Ruston/Pt. Defiance	2	2.6%   12.4%	30 (Large: 10, Medium: 10, Small: 10)
13 S. Tacoma Way	17	0%   15%	123 (Large: 10, Medium: 10, Small: 10)
14 Stadium	153	4.9%   10.1%	107 (Large: 10, Medium: 10, Small: 10)
15 Tacoma Narrows	30	3.3%   11.7%	53 (Large: 10, Medium: 10, Small: 10)

Source: City of Tacoma's Strategic Urban Forest Management Plan-Neighborhood Business Districts

Staff graphic

## APPENDIX F. COMPLETE SUMMARY OF THE FIRST PUBLIC SURVEY (TABLE 28)

#	Question	Common Response/Key Points
1	In general, do you think the total number of trees (both public and private) in the city has increased, decreased or stayed the same over the past 10 years?	42% "Decreased"
2	Do you think the overall health and quality of Tacoma's public trees has improved, declined or stayed the same in the last 10 years?	31% "Decreased"
3	How would you rate the overall care and management of Tacoma's public trees?	44% "Good"
4	Please rate your level of agreement with each of the following statements.	88% "Strongly Agree" with "Public street trees are important for maintaining a healthy community environment", "Public street trees properly planted and cared for enhance the overall quality of life in a community", and "Large public street trees properly planted and cared for improve the appearance of a community."
5	Understanding which urban tree benefits are most appreciated by residents can help guide long-term management strategies. Please rate the importance of each of the following benefits.	90% "Very Important" for "Improve air quality by filtering airborne pollutants and dust." 88% Very Important for "Improve water quality by controlling pollution, preventing erosion and reducing flooding from stormwater runoff" and "Provide shading over streams, which helps to maintain cooler water temperatures for fish."
6	Of the following tree planting and care issues, which are the most important concerns to you? (select up to 3)	60% "Sidewalk and pavement cracking due to tree roots" 58% "Roots damaging underground utilities (such as sewer, water lines, natural gas)"
7	What is the most urgent tree-related need in your neighborhood? (select only 1)	42% "Tree planting - adding more trees"
8	If you have street trees planted adjacent to your home or business, who prunes and performs other maintenance on your street tree(s)?	36% "Not applicable, no trees in the street right-of-way". 35% "Myself or a friend, neighbor, or family member"
9	If you do not have street trees adjacent to your home or business, which factors affect your decision about having street trees (mark all that apply)?	39% "Not Applicable" 21% "There is not enough planting space because of sidewalks, utilities, or other conflicts"
10	Below is a list of services provided by the City of Tacoma. Please rate by circling each of the following services using a scale	48% "High Priority" for "Offer free street trees and other tree incentives to Tacoma residents to plant through the

of 1 to 5, with 1 being a “very high priority” and 5 being a “very low priority.”

Grit City Trees and tree coupon programs”  
39% “Hazard tree assessment and response”  
55% “No”

11	Did you know that Tacoma currently has tree regulations in place for the planting, pruning and removal of street trees?	55% “No”
12	Have you ever tried to find tree care, tree planting or recommended tree species list information on the City’s website?	78% “No”
13	If answering “yes” to question 12, how would you rate the ease of accessing the information you were seeking, using a scale of 1 (very easy / found info quickly) to 5 (very difficult / unable to find info)?	35% “Neutral” 32% “Somewhat difficult”
14	Which of the following is your most preferred method for learning about trees and tree care? (choose one)	45% “Internet/online resources (websites, social media and publications)” 38% “A combination of written text, multimedia and hands-on exercises”
15	Please share any other comments and suggestions for the City of Tacoma regarding tree planting and/or maintenance in urban areas?	See Table 19 and page AAA for a summary of the 605 survey #1 responses analyzed and aligned with One Tacoma and recurring themes
16	If you wish to learn more and sign-up for Tacoma’s urban forestry news, go to <a href="http://tacomatreeplan.com">tacomatreeplan.com</a> or leave your email address.	397 survey respondents provided their contact information
17	What is your age?	22% “35-44” 21% “65 and older” 20% “20-34” 20% “55-64” 16% “45-54” 1% “Younger than 20”
18	Do you live, work or go to school in Tacoma? (select all that apply)	83% “Live in Tacoma”
19	Using the map, in which area of Tacoma do you live?	32% District 1 (NW) 17% District 3 (W Central) 16% District 2 (NE) 14% District 5 (S) 12% District 4 (E Central) 9% Don’t live in Tacoma
20	Do you own or rent your residence?	80% “Own”
21	Please specify your race/ethnicity. (select all that apply)	85% “White – Non-Hispanic or Latino” 6% “Hispanic or Latino” 6% “Asian” 5% “Other” 4% “Black or African American” 3% “American Indian or Alaska Native” 2% Native Hawaiian or other Pacific Islander

## APPENDIX G. QUESTIONS AND RESULTS OF THE 2ND PUBLIC SURVEY

- 1) Based on a 2018 assessment, about 20% of the City's land is covered with tree canopy—the lowest in the Puget Sound region compared to other cities. In 2010, the City Council adopted a new chapter in Tacoma's Comprehensive Plan - the Urban Forestry Policy Element (UFP). This chapter initiated the vision for Tacoma to enhance urban forest resources, including increasing the tree canopy cover from approximately 19% in 2009 to 30% in 2030. By increasing the urban tree canopy, the City will more broadly and equitably distribute the benefits that trees provide (reduced surface temperatures, reduced energy use, reduced stormwater runoff, improved air quality, increased property values, increased wildlife habitat, and restorative effects of human wellbeing). If we were to achieve this, more trees would need to be planted while protecting the ones we have.

**Please indicate your level of support for the following:**

*(Very Supportive - Somewhat Supportive - Somewhat Unsupportive - Very Unsupportive)*

- The City should aggressively work toward meeting the 30% tree canopy goal by 2030
- The City should encourage property owners to plant / care for trees on private property
- I would plant trees on my property in support of the goal
- The City should plant trees in the public rights-of-way
- The City should encourage fruit tree plantings in appropriate and supported locations
- Other (please specify)

- 2) In some cases, trees have outgrown the available space, resulting in hardscape damage, such as sidewalk lifting or cracking.

**Please indicate your level of support for the following:**

*(Very Supportive - Somewhat Supportive - Somewhat Unsupportive - Very Unsupportive)*

- The City should allocate resources for qualified people to provide an unbiased, logical, and consistent assessment to determine the course of action where tree and sidewalk conflicts exist
- The City should encourage wider tree planting strips during its review of new development proposals to avoid future conflicts with infrastructure
- The City should consider options to retrofit existing streets by widening tree planter strips (reducing road width) to save existing trees
- The trees should be removed if there is a conflict with infrastructure
- The infrastructure should be built around existing trees (if possible) to save the trees
- The current process works and does not need to change

- 3) Certain trees across the city are unique in size, species, and/or age and may have significant cultural and/or historical importance, adding to Tacoma's character and heritage. Some cities establish a "heritage tree program" which protects these unique trees. Once protected by a heritage tree program, these trees shouldn't be removed unless an assessment determines their condition poses a potential safety issue.

**Please review the following and select any and/or all that apply:**

- I support reasonable and appropriate tree protection of heritage street trees
- I do not support the designation of heritage street trees
- I support reasonable and appropriate tree protection of heritage private property trees
- I do not support the reasonable and appropriate tree protection of heritage private property trees
- I support voluntary designation of private property heritage trees (people can nominate their own trees for protection)
- I am unsure
- Other (please specify)

4) In general, the City of Tacoma does not maintain street trees that are not abutting City-owned property (this includes pruning and removal); exceptions may occasionally be made due to easement stipulations, construction, abatement, and other specific reasons.

**Please review the following and select any and/or all that apply:**

- I support a City program for the proper care of all street trees
- I support the City establishing priority maintenance corridors in which the City is responsible for the care of trees in some designated areas
- I do not support any new City programs for street tree maintenance
- I support the allocation of City resources for increased tree maintenance responsibility
- I want to take care of my own street trees

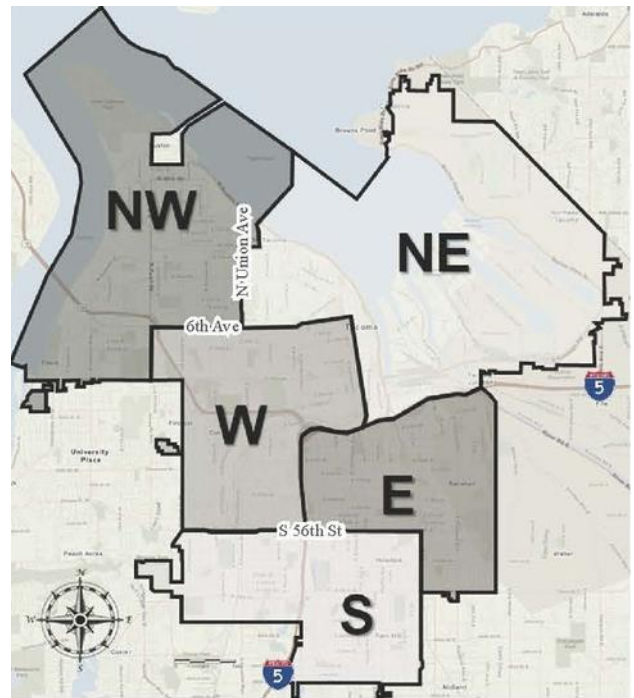
5) Please share any other comments and suggestions for the City of Tacoma regarding tree planting and/or maintenance in urban areas?

6) Do you live, work or go to school in Tacoma? (select all that apply)

- Live in Tacoma
- Work in Tacoma
- Own a business in Tacoma
- Attend school in Tacoma
- N/A - Not Applicable

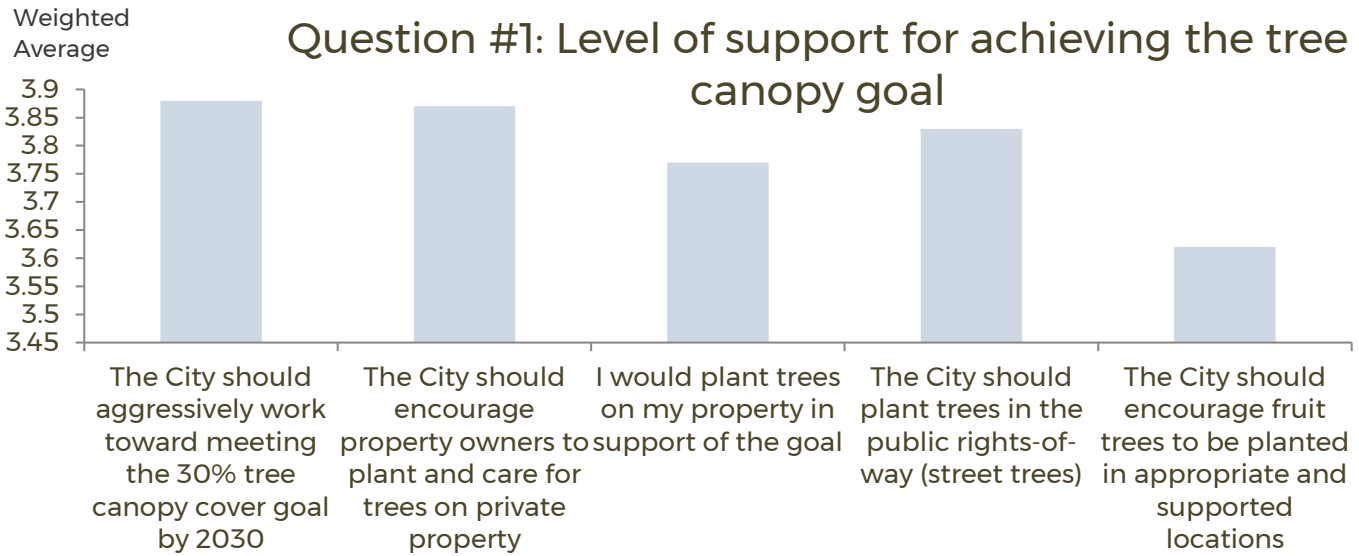
7) Use the map to answer the following question:  
Using the map, in which area of Tacoma do you live?

- District 1 (NW)
- District 2 (NE)
- District 3 (W Central)
- District 4 (E Central)
- District 5 (S)
- Don't live in Tacoma



8) Please include your name and email if you want to be entered into a drawing to win a \$50 gift card to a local restaurant of your choice.

**Question #1:** Based on a 2018 assessment, about 20% of the City’s land is covered with tree canopy—the lowest in the Puget Sound region compared to other cities. In 2010, the City Council adopted a new chapter in Tacoma's Comprehensive Plan - the Urban Forestry Policy Element (UFP). This chapter houses the vision for Tacoma to enhance urban forest resources, including increasing the tree canopy cover from approximately 19% in 2009 to 30% in 2030. By increasing the urban tree canopy, the City will more broadly and equitably distribute the benefits that trees provide (reduced surface temperatures, reduced energy use, reduced stormwater runoff, improved air quality, increased property values, increased wildlife habitat, and restorative effects of human wellbeing). If we were to achieve this, more trees would need to be planted while protecting the ones we have. Please indicate your level of support for the following:



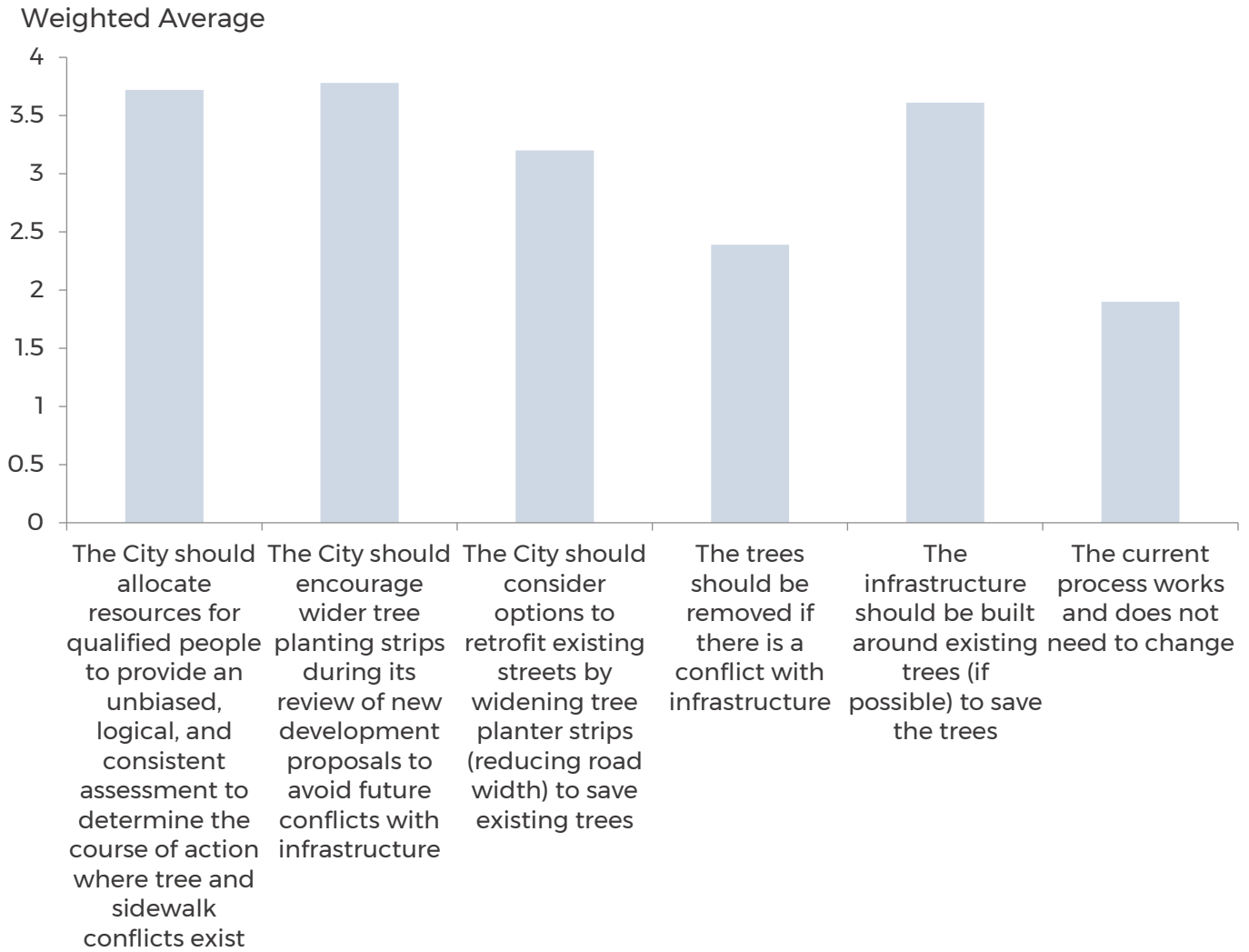
Question #1	Very Supportive		Somewhat Supportive		Somewhat Unsupportive		Very Unsupportive		Total	Weighted Average
The City should aggressively work toward meeting the 30% tree canopy cover goal by 2030	91%	338	8%	29	1%	2	1%	4	373	3.88
The City should encourage property owners to plant and care for trees on private property	89%	331	10%	37	1%	4	0%	1	373	3.87
I would plant trees on my property in support of the goal	82%	301	14%	53	2%	9	1%	4	367	3.77
The City should plant trees in the public rights-of-way (street trees)	87%	325	10%	37	2%	9	1%	3	374	3.83
The City should encourage fruit trees to be planted in appropriate and supported locations	71%	264	22%	81	5%	18	2%	8	371	3.62
Other (please specify)	62									
									<b>Answered</b>	<b>374</b>
									<b>Skipped</b>	<b>1</b>

**Question #2:** In some cases, trees have outgrown the available space, resulting in hardscape damage, such as sidewalk lifting or cracking. Please indicate your level of support for the following:

<b>Question #2 Tree and Sidewalk Conflict Options</b>	Very Supportive		Somewhat Supportive		Somewhat Unsupportive		Very Unsupportive		Total	Weighted Average
The City should allocate resources for qualified people to provide an unbiased, logical, and consistent assessment to determine the course of action where tree and sidewalk conflicts exist	76%	277	21%	77	2%	8	1%	3	365	3.72
The City should encourage wider tree planting strips during its review of new development proposals to avoid future conflicts with infrastructure	83%	300	15%	55	2%	6	1%	4	365	3.78
The City should consider options to retrofit existing streets by widening tree planter strips (reducing road width) to save existing trees	46%	169	32%	116	18%	65	4%	16	366	3.2
The trees should be removed if there is a conflict with infrastructure	14%	50	31%	111	36%	130	20%	71	362	2.39
The infrastructure should be built around existing trees (if possible) to save the trees	68%	248	26%	95	4%	16	1%	5	364	3.61
The current process works and does not need to change	1%	5	18%	63	49%	166	31%	107	341	1.9
<b>Answered</b>									<b>367</b>	
<b>Skipped</b>									<b>8</b>	



## Question #2: Tree and sidewalk conflicts



**Question #3:** Certain trees across the city are unique in size, species, and/or age and may have significant cultural and/or historical importance, adding to Tacoma’s character and heritage. Some cities establish a “heritage tree program” which protects these unique trees. Once protected by a heritage tree program, these trees shouldn’t be removed unless an assessment determines their condition poses a potential safety issue. Please review the following and select any and/or all that apply:

<b>Question #3 Heritage Tree Program Options</b>		
I support reasonable and appropriate tree protection of heritage street trees	94%	339
I do not support the designation of heritage street trees	2%	9
I support reasonable and appropriate tree protection of heritage private property trees	68%	247
I do not support the reasonable and appropriate tree protection of heritage private property trees	8%	30
I support voluntary designation of private property heritage trees (people can nominate their own trees for protection)	72%	260
I am unsure	4%	13
Other (please specify)	7%	27
	<b>Answered</b>	<b>362</b>
	<b>Skipped</b>	<b>13</b>

### Question #3: Heritage Tree Program



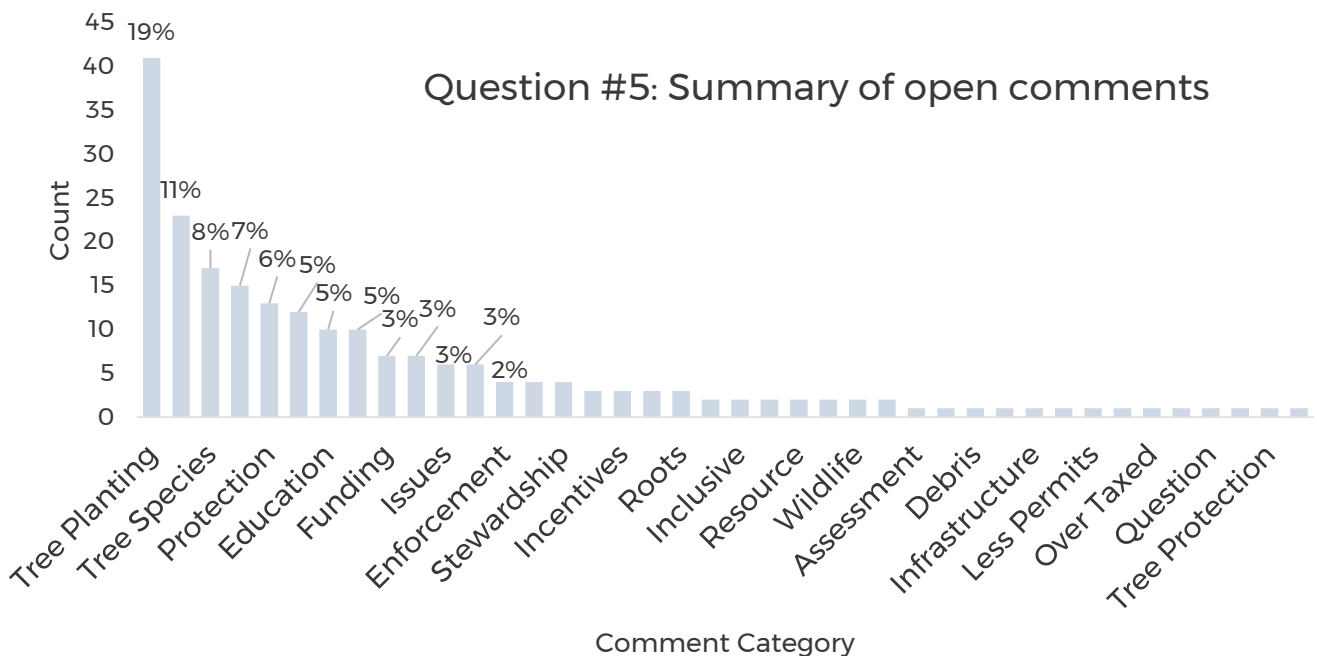
**Question #4:** In general, the City of Tacoma does not maintain street trees that are not abutting City-owned property (this includes pruning and removal); exceptions may occasionally be made due to easement stipulations, construction, abatement, and other specific reasons. Please review the following and select any and/or all that apply:

<b>Question #4 City Tree Maintenance Responsibility Options</b>		
I support a City program for the proper care of all street trees	64%	231
I support the City establishing priority maintenance corridors in which the City is responsible for the care of trees in some designated areas	62%	222
I do not support any new City programs for street tree maintenance	1%	4
I support the allocation of City resources for increased tree maintenance responsibility	63%	226
I want to take care of my own street trees	22%	77
	<b>Answered</b>	<b>358</b>
	<b>Skipped</b>	<b>17</b>

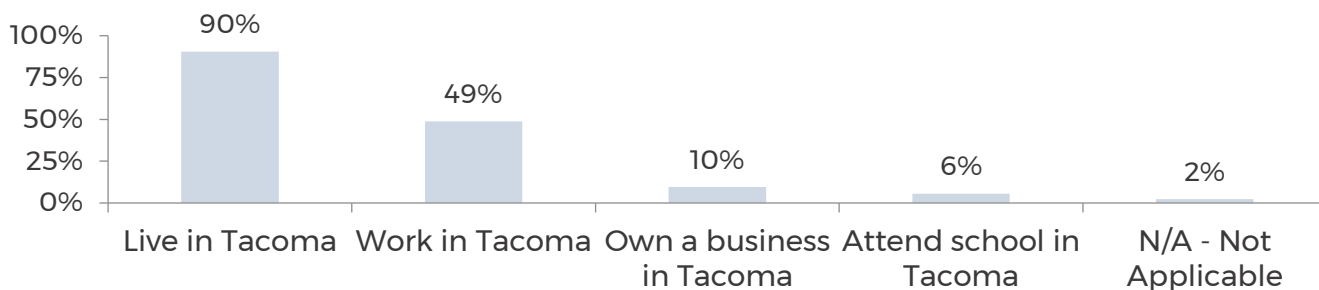
### Question #4: City Tree Maintenance Responsibility



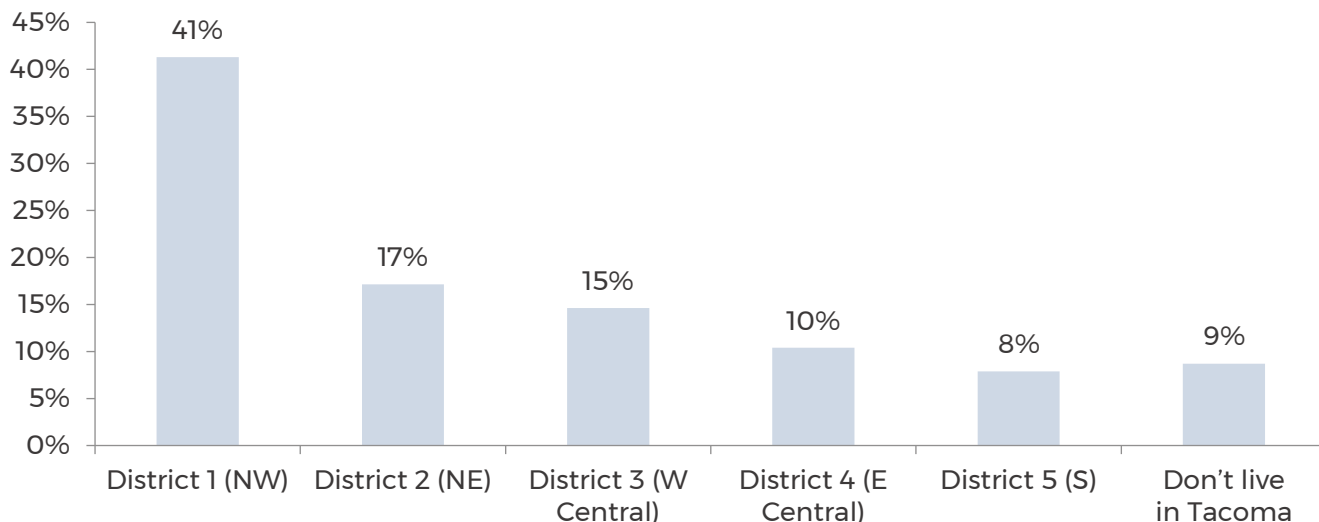
**Question #5:** Please share any other comments and suggestions for the City of Tacoma regarding tree planting and/or maintenance in urban areas? **(185 comments, 190 skipped)**



**Question #6:** Do you live, work or go to school in Tacoma? (select all that apply)



**Question #7:** Using the map, in which area of Tacoma do you live?



## Common Themes Expressed in Both Surveys

Survey responses from both survey rounds were further characterized based on their level of interest, or engagement in their comments. Response criteria were Supportive, Engaged, Concerned or Unsupportive, all of which are defined below.

Of the total 1,789 survey responses between the two rounds, 753 respondents submitted their own comments.

Survey 1 Question 15:	Please share any other comments and suggestions for the City of Tacoma regarding tree planting and/or maintenance in urban areas?
Survey 2 Question 5:	Please share any other comments and suggestions for the City of Tacoma regarding tree planting and/or maintenance in urban areas?

### **Supportive 328**

Positive responses are those which salute or commemorate urban forest planning, maintenance, or other city or public process.

These may include responses requesting additional urban forest services or requesting urban forest services which don't currently exist, or simply praising urban forest staff and city officials in urban forest planning and practice.

### **Engaged 175**

Engaged responses are constructive and insightful to urban forest planning and practices. They include recommendations, considerations, and other information sharing comments intended to educate and inform the process of planning.

Some engaged responses included questions or sought information regarding urban forest practice or city planning.

### **Concerned 116**

Concerned responses included comments which identified perceived problems in urban forest planning or practice. These comments included stories of historical or current urban forest issues.

Concerned comments can be interpreted as opportunities for improvement in the planning and damaging the urban forest.

### **Unsupportive 10**

Negative responses are those unsupportive of urban forest planning, practices or funding.

Positive responses inform decision makers how appropriate current urban forest planning is to Tacomans. Likewise, concerned responses inform decision makers where urban forest planning and practice could be improved or modified to better suit the nature of Tacoma and its citizens. Engaged responses can be used by decision makers and City staff to better listen to Tacomans and understand urban forest planning and practice at the sidewalk level.

Furthermore, all responses which include questions or actionable content were counted. These comments are potentially tied to citizen e-mail addresses. City staff or Consultants should respond to questions and actionable content where reasonably achievable.

## **Snapshot of Responses from Both Surveys**

### **Level of Engagement**

- 89 submissions provided questions or other content actionable to the City.
- 328 comments were directly supportive of urban forest practices and policies.
- 175 were engaged with improving such practices and policies.
- 116 had concerns over past or current policies and practices.
- 10 respondents were unsupportive of urban forest investment.

### **Canopy Growth 30/30**

- 132 supported the equitable increase in tree canopy across Tacoma.
- 85 comments asking or recommended increasing planting and “more trees” throughout the City, within street right-of-way, green belts, City property and natural areas.
- One commenter envisioned a city program where private properties who achieve their preferred tree canopy ratio for their zoning could apply to become Certified Urban Canopy, much like Washington State Fish & Wildlife’s Certified Backyard Wildlife program.

### **Resource Management - Street Trees**

- 61 comments specifically on right-of-way responsibilities: hazard identification, trimming and removal of right-of-way trees and infrastructure damage caused by right-of-way trees. A common theme was the lack of information available regarding the responsibilities of adjacent homeowner and the City.
  - Solutions provided included the City of Tacoma taking on street tree maintenance, easier access to information regarding street tree maintenance and incentives for businesses and property owners to maintain trees themselves.
- 24 submitted references to sidewalk and infrastructure damage caused by right-of-way and street trees.
- 48 comments concerning street tree maintenance including tree watering, street signs, streetlight trimming, and clearance trimming.
- 18 commenters had reservations with planting trees, or having trees planted, in their rights of ways for fear of tree maintenance and infrastructure repair costs.
- 4 comments supported the implementation of road diets or similar language. Road diets are lane reduction and equitable road usage, often through the addition of more street trees and bike lanes, and reduction of automobile lane width.
- 18 respondents were supportive of more street trees.

### **Education, Outreach, Collaboration**

- 15 submissions requested information on volunteer activities, indicating volunteer interest in the general community and opportunity for increased exposure.
- 6 commenters asked for incentives to increase private property tree canopy.
- 11 comments supported Grit City Trees, of which 4 noted specifically that local nurseries don’t take Grit Coupons. Others mentioned low-income tree give-a-way opportunities.
- Most of the comments in this category revolved around the need to improve accessibility to information about trees and their care, or about city policies regarding trees.

### **Urban Forest Equity & Accessibility**

- 18 comments supported increasing access to tree planting for low income citizens, seniors and citizens with disabilities. These comments specifically mentioned the scientifically understood public and individual health benefits of trees in cities.

- Another 16 comments individually referenced public and private health benefits of trees in cities, mentioning things like decreased stress and mental fatigue, increased air quality.
- 7 comments identified tree canopy inequalities across Tacoma, noting affluent neighborhoods had more tree canopy than low-income neighborhoods. A concern consistent with the Tacoma equity map and tree canopy map.
- 6 comments supported the additional planting of trees near schools, or the facilitation of youth to engage in urban forest planting projects.
- 47 references supported gleaning – or the collecting and harvesting of edible fruits provided by trees which normally would go to waste, often for contribution to a local food bank. Supporters included representatives from the Pierce County Gleaners Association and Tacoma Gleaners Guild.
  - 1 comment was unsupportive of fruit trees in the city.

### **Municipal Code & Policy – Preserve Existing Trees**

- 21 comments supported methods to increase tree protection for existing trees, and noted the special benefits large, existing trees provided in comparison to newly planted trees.
- 16 enforcement related comments, including tree replacement, development protection, and general tree protection.
- 4 comments supported protection of heritage or landmark trees.

### **Climate Adaption**

- 13 references to climate change (increased planting to mitigate climate change).
- 12 references to climate issues, including drought, effects of climate change on trees, and the carbon sequestration potential of city trees.

### **Other**

- 25 supporting taking viewsheds into consideration with tree planning.
- 4 comments supporting and calling out the benefits of urban trees.
- 5 comments specifically commented on invasive and noxious weed growth in Tacoma green belts and open spaces. Weeds of concern mainly included the tenacious English ivy as damaging native tree canopy and choking out native plants.

## APPENDIX H. DRAFT PLAN VISION STATEMENTS PROVIDED AT THE SECOND COMMUNITY MEETING

### A VISION FOR OUR URBAN FOREST

Tonight's meeting will continue the visioning discussion conducted at our September meeting. Based on the meeting discussion, results of the first public survey, and the Phase 1 Research Summary completed by urban forestry consultants, several vision statements have been drafted.

Please skim these statements during the presentation and identify key words, phrases, topics, etc. that stand out to you as necessary for Tacoma's Urban Forest Management Plan vision. Following the introductory presentation, we will ask that each of you select your favorite vision statement and we'll discuss the key words that appeal to you and helped you make the choice.

Please note that these statements are drafts and we ask that you provide feedback so that we can fine-tune to the final vision statement. We will also be incorporating feedback from the second public survey. The vision of the Plan will help guide the strategies and recommendations.

We appreciate your participation!

**Scope of the Urban Forest Management Plan:** This Plan serves as a road map outlining meaningful, high-priority actions that the City of Tacoma will take to support our community between 2019 and 2030 to strive towards our goal of a healthy 30% overall tree canopy coverage. This means creating greater efficiency in our City operations, standardizing our level of service to meet the needs of our community, and responding to the challenges of climate change and other environmental factors. This Plan will also standardize a reporting system for tracking progress toward our goals. In this way, it functions both as a management tool for City staff and provides transparency to the public regarding the actions the City will take to support environmental health on behalf of the broader community.

### POTENTIAL VISION STATEMENTS

- 1) One Tacoma, One Canopy: Tacoma's trees are recognized as integral to the quality of life for all City residents as well as for the City's urban character and natural environments. A healthy, thriving, and sustainable urban forest remains a longstanding community priority and will be thoughtfully managed in a way to maximize a range of public benefits including a thriving ecosystem, a vibrant economy, and a livable community shared by all.
- 2) One Tacoma, One Canopy: Tacoma's urban forest is a thriving and sustainable mix of tree and understory species and ages that creates a contiguous and healthy ecosystem that is valued and cared for by the City and all of its residents as an essential environmental, economic, and shared community asset that reinforces Tacoma's identity and legacy as a forested, livable city.
- 3) One Tacoma, One Canopy: Tacoma's urban forest is a healthy, dynamic, diverse, and cohesive ecosystem that is valued and cared for through community stewardship because it balances economic vitality with the conservation of natural resources now and for future generations.
- 4) One Tacoma, One Canopy: Tacoma's urban forest is a healthy and cohesive ecosystem that is valued and cared for through community stewardship. The City is dedicated to protect and manage the vibrant urban forest to enhance its benefit to the environment and its contribution to the livability of the community today and for generations to come.



# APPENDIX I. OVERVIEW OF THE URBAN FOREST SUSTAINABILITY AND MANAGEMENT AUDIT SYSTEM

## 1) Identify documents and resources pertaining to each of the categories

Category & Element	Count
Management Policy and Ordinances	105
Professional Capacity and Training	9
Funding and Accounting	3
Decision and Management Authority	8
Inventories	35
Urban Forest Management Plans	15
Risk Management	15
Disaster Planning	1
Policies, Standards, and Best Management Practices	98
Community	77
Green Asset Evaluation	NA

## 2) Example of the resources and documents listed for Management Policy & Ordinances Category

Management Policy and Ordinances		
1.01	Approved Policy Statements	See below
1.02	Climate Change (Sustainability)	CAP, EAP, One Tacoma, Tacoma 2025...
1.03	No Net Loss	TMC, UFM, NBD UFMP...
1.04	Risk Management	TMC, UFM...
1.05	Tree Canopy Goals	TMC, One Tacoma, UFM....

## 3) Rate the level at which the City is achieving the element

Management Policy & Ordinances			
Element	Component Evaluated	Description or Criteria for Evaluation	Assigned Status
1.00	Approved Policy Statements	Written policy statements approved by a governing body.	Score: 2 "Adopted Common Practice"
1.01	Climate Change (Sustainability)	Also referred to as Sustainability. With reference to urban trees. Addresses the long-term health and productivity of the natural resource.	Score: 2 "Adopted Common Practice"
1.02	No Net Loss	Can refer to trees, basal area, or canopy.	Score: 1 "In Development"
1.03	Risk Management	Should reference: ANSI A300 Part 9, ISA BMP, and prioritization funding mechanisms.	Score: 2 "Adopted Common Practice"
1.04	Tree Canopy Goals	Overall community/campus goal, or by designated "zone".	Score: 1 "In Development"

**4) The level at which the City is attaining optimal levels for each category element is calculated**

<b>Management Policy &amp; Ordinances Attainment</b>	
Line Items Applicable (Count):	14
Category Goal (Sum):	28
Category Evaluation (Sum):	24
Category Percent Attained:	85.7%
<b>Category Standard of Care (SOC) Count</b>	
SOC Applicable (Count):	2
SOC Goal (Sum):	4
SOC Sum:	3
% Category SOC Attained:	75.0%
<b>Category Base Practices (BP) Count</b>	
BP Applicable (Count)	3
BP Goal (Sum):	6
BP Sum:	5
% Category BP Attained:	83.3%

**5) Determines the level at which the City is achieving urban forest sustainability and management to inform criteria and performance indicators, measures and milestones, goals, and strategies**

Category	Description	Sum of Evaluations			
		SOC (% Achieved)	Base (% Achieved)	Overall Rating	Overall (% Achieved)
1	Management Policy and Ordinances	%	%	%	%
2	Professional Capacity and Training	%	%	%	%
3	Funding and Accounting	%	%	%	%
4	Decision and Management Authority	%	%	%	%
5	Inventories	%	%	%	%
6	Urban Forest Management Plans	%	%	%	%
7	Risk Management	%	%	%	%
8	Disaster Planning	%	%	%	%
9	Practices, Standards, and BMPs	%	%	%	%
10	Community	%	%	%	%
11	Green Asset Evaluation (Observed Outcomes)	%	%	%	%
<b>Total</b>		<b>%</b>	<b>%</b>	<b>%</b>	<b>%</b>

## APPENDIX J. UFSMA DISCOVERY MATRIX RESULTS

Table 29. Summary results of the information discovery process

<b>Management Policy and Ordinances</b>			
<b>Category &amp; Element</b>	<b>Element Description</b>	<b>Item(s) Provided (Title or ID)*</b>	<b>Count</b>
1.01		Approved Policy Statements	
1.02	Climate Change (Sustainability)	CAP, EAP, CAP progress reports, Tacoma 2025, One Tacoma, EnvScs Strategic Plan, NBD UFMP, Open Space Plan, Tacoma Mall Subarea Plan, UF Manual, TMC Title 13	11
1.03	No Net Loss	EAP, ROW Design Manual, Tacoma 2025, 2018 TCA, EAP, ROW Design Manual, CAP, TMC Title 13	8
1.04	Risk Management	ROW Design Manual, NBD UFMP, TMC Title 13	3
1.05	Tree Canopy Goals	2018 TCA, Tacoma Mall Subarea Plan, NBD UFMP, EnvScs Strategic Plan, CAP, TMC Title 13, City Website, Tacoma Tree Plan Website	8
1.06	Tree Protection	2018 TCA, UFM, Tacoma Mall Subarea Plan, Open Space Plan, NBD UFMP, ROW Design Manual, EAP, Tacoma 2025, CAP, TMC Title 13, TMC Title 9, City Website	12
1.07	Utility	UFM, Tacoma Mall Subarea Plan, NBD UFMP, COT Tree Placement Flier, COT Shade Tree Flier, ROW Design Manual, TMC Title 13	7
1.08	Human Health - Physical & Psychological	Tacoma 2025, EAP, ROW Design Manual, COT Shade Tree Flier, NBD UFMP, Open Space Plan, Tacoma Mall Subarea Plan, UFM, 2018 TCA, TMC Title 13, City Website, Tacoma Tree Plan Website	12
1.09	Wildlife Diversity/Habitat/Protection	CAP, EAP, NBD UFMP, UFM, Open Space Plan, Tacoma Mall Subarea Plan	6
1.10	Performance Monitoring	Tacoma 2025, EAP, ROW Design Manual, EnvScs Strategic Plan, Open Space Plan, Tacoma Mall Subarea Plan, UFM	7
1.11	Ordinance (Private) V	EAP, ROW Design Manual, NBD UFMP, Open Space Plan, Tacoma Mall Subarea Plan, UFM, CAP, TMC Title 13	8
1.12	Ordinance (Public)	EAP, ROW Design Manual, NBD UFMP, Open Space Plan, Tacoma Mall Subarea Plan, UFM, CAP, TMC Title 13	8
1.13	Development Standards	CAP, EAP, ROW Design Manual, COT Tree Placement Flier, NBD UFMP, Open Space Plan, Tacoma Mall Subarea Plan, UFM, 2018 TCA, TMC	10
1.14	High-Conservation Value Forests	Open Space Plan, NBD UFMP, Pierce Conservation District	3
1.15	Urban Interface (WUI)	2015 Pierce County Hazard Identification & Risk Assessment, Pierce Conservation District	2
<b>Total Count</b>			<b>105</b>

<b>Professional Capacity and Training</b>			
<b>Category &amp; Element</b>	<b>Element Description</b>	<b>Item(s) Provided (Title or ID)*</b>	<b>Count</b>
2.01	Certified Arborist - Staff	ROW Design Manual, NBD UFMP, UFM, TMC Title 13	4
2.02	Certified Arborist - Contracted	ROW Design Manual, TMC Title 13	2
2.03	Certified Arborist - Other Resource	ROW Design Manual, UFM, TMC Title 13	3
2.04	Other Professional - Advising/directing UF management		0
2.05	Municipal Forestry Institute		0
2.06	Urban Forestry Institute or Similar Training		0
2.07	Campus/city arborist - ISA CA instructor for CEUs		0
2.08	Tree Board University		0
2.09	Organizational Communications	Take 5, City Website, City Meetings, Other	0
<b>Total Count</b>			<b>9</b>

<b>Funding and Accounting</b>			
<b>Category &amp; Element</b>	<b>Element Description</b>	<b>Item(s) Provided (Title or ID)*</b>	<b>Count</b>
3.01	Budgeted Annually	Capital Facilities Program document	1
3.02	Contingency Budget Process	Capital Facilities Program document	1
3.03	Funding Calculated from Community Attribute		0
3.04	Funding Based on Performance Monitoring		0
3.05	Urban Forestry Line Item	Capital Facilities Program document	1
3.06	Green Asset Accounting		0
<b>Total Count</b>			<b>3</b>

<b>Decision and Management Authority</b>			
<b>Category &amp; Element</b>	<b>Element Description</b>	<b>Item(s) Provided (Title or ID)*</b>	<b>Count</b>
4.01	Urban Forest Manager	ROW Design Manual, UFM	2
4.02	Staff Authority	ROW Design Manual, UFM	2
4.03	Communication Protocol	ROW Design Manual, EnvScs Strategic Plan, UFM	3
4.04	Tree Board, Commission, or Advisory Council	City Website	1
<b>Total Count</b>			<b>8</b>

<b>Inventories</b>			
<b>Category &amp; Element</b>	<b>Element Description</b>	<b>Item(s) Provided (Title or ID)*</b>	<b>Count</b>
5.01	Canopy Inventory (UTC)	2011 TCA, 2018 TCA	2
5.02	Ecosystem Services	1992 UFMP	1
5.03	Public Trees V	ROW Design Manual, Open Space Plan, UFM, 2018 TCA, TMC Title 13	5
5.04	Street Trees	ROW Design Manual	1
5.05	Parks/Riparian Areas	TMC Title 13	1
5.06	Other Public Trees	Open Space Plan, UFM, TMC Title 13	3
5.07	Continuous inventory on a cycle (≤5 years; i.e. panel)		0
5.08	Private Trees	ROW Design Manual, UFM	2
5.09	Campus (Educational)	University of Puget Sound	1
5.10	Corporate	Tacoma Mall Regional Growth Center	1
5.11	Other Private Property	UFM, Tacoma Mall Regional Growth Center	2
5.12	Continuous inventory on a cycle		0
5.13	Green Stormwater Infrastructure	EnvScs Strategic Plan, NBD UFMP, Tacoma Mall Subarea Plan, TMC Title 13, Tacoma Green Living Guide	5
5.14	Spatial	Tacoma Equity Index, AccessES, GeoHub, SAP, Dart Map, TreePlotter, Open Space Plan, Tacoma Green Living Guide	8
5.15	Maintenance & Planting Records Maintained	TreePlotter, Excel, 311	3
<b>Total Count</b>			<b>35</b>

## Urban Forest Management Plans

Category & Element	Element Description	Item(s) Provided (Title or ID)*	Count
6.01	Annual Maintenance Calendar	Yes	1
6.02	Public Trees V	1992 UFMP	1
6.03	Street Tree Management	1992 UFMP	1
6.04	Parks/Riparian Area Management	MetroParks Strategic Plan, Open Space Plan	2
6.05	Other Public Trees	NBD UFMP	1
6.06	Private Trees		0
6.07	Campus (Educational)		0
6.08	Corporate		0
6.09	Other Private Property		0
6.10	Green Infrastructure	Stormwater Management Manual, City Website, Tacoma Green Living Guide	3
6.11	Other Written Plans	1992 UFMP, Open Space Plan, NBD UFMP, Tacoma Mall Subarea Plan	4
6.12	Tree Planting		0
6.13	UF as Part of a Comprehensive Plan	One Tacoma	1
6.14	Urban Forest Planning and Management Criteria and Performance Indicators	2019 UFMP	1
<b>Total Count</b>			<b>15</b>

<b>Risk Management</b>			
<b>Category &amp; Element</b>	<b>Element Description</b>	<b>Item(s) Provided (Title or ID)*</b>	<b>Count</b>
7.01	TRAQ Attained		0
7.02	Annual Level 1 (ANSI A300 Part 9 & ISA BMP)		0
7.03	Mitigation Prioritization	City	1
7.04	Occupancy Areas Mapped	City	1
7.05	Recordkeeping, Reporting, and Communications	City	1
7.06	Standard of Care Adopted		0
7.07	Tree Risk Specification	ROW Design Manual, TMC Title 13	2
7.08	Urban Tree Risk Management	ROW Design Manual, NBD UFMP, TMC Title 13	3
7.09	Invasive Management	EAP, ROW Design Plan, COT Tree Selection Flier, NBD UFMP, Open Space Plan, UFM, TMC Title 13	7
<b>Total Count</b>			<b>15</b>

<b>Disaster Planning</b>			
<b>Category &amp; Element</b>	<b>Element Description</b>	<b>Item(s) Provided (Title or ID)*</b>	<b>Count</b>
8.01	Response/Recovery Mechanism V		0
8.02	Urban Forestry as part of the County Disaster Plan V	2015 Pierce County Hazard Identification & Risk Assessment	1
8.03	Urban Forestry Disaster Plan		0
8.04	Pre-disaster Contracts		0
8.05	Mitigation Plan		0
8.06	EMAC Mission Ready Packages (MRP) V		0
8.07	Urban Forest Strike Team		0
<b>Total Count</b>			<b>1</b>

## Standards and Best Management Practices

Category & Element	Element Description	Item(s) Provided (Title or ID)*	Count
9.01	ANSI Standards	ROW Design Manual, NBD UFMP, UFM,	3
9.02	Ages/Diameter Distribution	ROW Design Manual, NBD UFMP, Open Space Plan, UFM, TMC Title 13	5
9.03	Arborist Standards	NBD UFMP,	1
9.04	Best Management Practices (BMPs)	NBD UFMP,	1
9.05	Fertilization and Mulching	CAP, EAP, ROW Design Manual, COT Healthy Growth Flier, COT Tree Planting Flier, NBD UFMP, Open Space Plan, UFM, TMC Title 13, City Website	10
9.06	Lightning Protection Systems		0
9.07	Planting	CAP, EAP, ROW Design Manual, COT Tree Placement Flier, COT Tree Planting Flier, NBD UFMP, Open Space Plan, Tacoma Mall Subarea Plan, UFM, TMC Title 13, TMC Title 10, TMC Title 9, City Website	13
9.08	Pruning	NBD UFMP, TMC Title 9, City Website	3
9.09	Removal	NBD UFMP, TMC Title 9, City Website	3
9.10	Support Systems (Guying and Bracing)		0
9.11	Tree Risk	ROW Design Manual, NBD UFMP, TMC Title 13	3
9.12	Construction Management Standards	TMC Title 13	1
9.13	Design Standards	CAP, EAP, ROW Design Manual, COT Tree Placement Flier, NBD UFMP, Open Space Plan, Tacoma Mall Subarea Plan, UFM, 2018 TCA, TMC, City Website	11
9.14	Genus/Species Diversity	ROW Design Manual, NBD UFMP, Open Space Plan, UFM, TMC Title 13	5
9.15	Green Stormwater Infrastructure (GSI)	Tacoma Mall Subarea Plan, TMC Title 13	2
9.16	Inventory Data Collection		0
9.17	Minimum Planting Volume	ROW Design Manual, NBD UFMP, Open Space Plan, UFM, TMC Title 13	6



9.18	Minimum Tree Size	UFM, TMC Title 13, City Website	2
9.19	Root Protection Zone (CRZ)	ROW Design Manual, NBD UFMP, UFM	3
9.20	Safety	ROW Design Manual, UFM	2
9.21	Topping	ROW Design Manual, COT Healthy Growth Flier, UFM, City Website	4
9.22	Tree Species List	UFM, TMC Title 13, City Website	3
9.23	Tree Quality Standards	UFM, TMC Title 13	2
9.24	Utility Right-of-Way ( ROW) Management	UFM, Tacoma Mall Subarea Plan, NBD UFMP, COT Tree Placement Flier, COT Shade Tree Flier, ROW Design Manual, TMC Title 13	7
9.25	Urban Agriculture	EAP	1
9.26	Wood Utilization	Pierce County mulch	1
9.27	Third-party forest products certification compliance		0
9.28	Energy generation	Tacoma Public Utilities 2017 Biomass Use - 1.5%	1
9.29	Composting of Leaf and/or Other Woody Debris	TMC Title 13	1
9.30	Watering Standards	NBD UFMP, UFM, TMC Title 13, City Website	4

**Total Count**

**98**

<b>Community</b>			
<b>Category &amp; Element</b>	<b>Element Description</b>	<b>Item(s) Provided (Title or ID)*</b>	<b>Count</b>
10.01	American Grove or Other Social Media	Yes see below	1
10.02	Education	Fliers, Website, Workshops, Events, Social Media, Pres Releases, Tacoma Report, Other	8
10.03	Community Tree Steward Program	TTF	1
10.04	Tree Inventory Management Software	TreePlotter, AccessES, GeoHub, SAP, Dart Map,	5
10.05	Public Perception	UFMP Surveys, UFMP Community Meetings, 311, Call Logs, City Survey, Tacoma Report	6
10.06	Recognition Programs	Yes	1
10.07	Arbor Day Celebration	Yes	1
10.08	Arboretum designation	Wright Park, Seymour Botanical Conservancy	2
10.09	Significant trees		0
10.10	Memorial / Honorarium		0
10.11	Social Media	Tree coupon, news releases, webpage, TV Tacoma, Urban Green Show, Tacoma Report, City Line, TV Tacoma, Urban Green, Tacoma Report, CityLine, Facebook, Instagram, Twitter, EnviroTalk, Utility Bill Inserts, Take 5, Tacoma Sustainability Facebook, Tacoma Mobility Facebook, EnviroChallengers, Tacoma Tree Plan website	21
10.12	Active Communications	Tree coupon, news releases, webpage, TV Tacoma, Urban Green Show, Tacoma Report, City Line, TV Tacoma, Urban Green, Tacoma Report, CityLine, Facebook, Instagram, Twitter, EnviroTalk, Utility Bill Inserts, Take 5, Tacoma Sustainability Facebook, Tacoma Mobility Facebook, EnviroChallengers, Tacoma Tree Plan website	21
10.13	Tree Care	EnviroHouse, COT Fliers, City Website	3
10.14	Tree Campus USA, Tree City USA	Tree City USA, UPS Tree Campus USA	2
10.15	Volunteer Opportunities	TTF, Green Tacoma Partnership, EnviroHouse, Green Tacoma Day, Pierce Conservation District	5
<b>Total Count</b>			<b>77</b>

\*2012 Climate Action Plan (CAP), 2016 Environmental Action Plan (EAP), Urban Forest Management Plan (UFMP), Urban Forest Manual (UFM), Tacoma Municipal Code (TMC), 2010 Neighborhood Business District Urban Forest Management Plan (NBD UFMP), 2016 Right-of-Way Design Manual (ROW Design Manual), Strategic 20-Year Passive Open Space Plan (Open Space Plan), City of Tacoma (COT), Tacoma Comprehensive Plan (One Tacoma), 2018 Environmental Services Strategic Plan (EnvScs Strategic Plan), International Society of Arboriculture (ISA)

## APPENDIX K. COMPLETE RESULTS OF THE UFSMA

Table 30. Summary of the urban forest sustainability and management audit for Tacoma

<b>1) Management Policy and Ordinances</b>			
<b>Category</b>	<b>Component Evaluated</b>	<b>Description or Criteria for Evaluation</b>	<b>Status</b>
1.00	Approved Policy Statements	Policy statements approved by governing body.	
1.01	Climate Change (Sustainability)	Also referred to as Sustainability. With reference to urban trees. Addresses the long-term health and productivity of the natural resource.	2) Adopted Practice
1.02	No Net Loss	Can refer to trees, basal area, or canopy.	1) In Development
1.03	Risk Management	Should reference: ANSI A300 Part 9, ISA BMP, and prioritization funding mechanisms.	2) Adopted Practice
1.04	Tree Canopy Goals	Overall community/campus goal, or by designated "zone".	2) Adopted Practice
1.05	Tree Protection	Construction and/or landscape maintenance.	2) Adopted Practice
1.06	Utility	Utility pruning, planting, and installation policy (e.g. boring vs. trenching).	2) Adopted Practice
1.07	Human Health - Physical & Psychological	Recognizes and addresses the human health benefits of the natural resource (e.g. exercise, air quality, stress management, shade). Could also include Urban Heat Island (UHI) policies.	2) Adopted Practice
1.08	Wildlife Diversity / Habitat / Protection	Mammals, birds, or reptiles.	2) Adopted Practice
1.09	Performance Monitoring	Recognizes the annual or biennial calculation of metrics (e.g. some component of ecosystem services) for the purpose of tracking management performance.	1) In Development
1.10	Ordinance (Private)	Tree protection and management for private trees.	1) In Development
1.11	Ordinance (Public)	Tree protection and management for public trees.	1) In Development
1.12	Development Standards	US Green Building Council's LEED® rating systems (or similar internationally) LEED v4 BD+C (Sustainable Sites) LEED 4 ND (Neighborhood Pattern & Design, Green Infrastructure) ASLA's SITES® Rating System	2) Adopted Practice
1.13	High-Conservation Value Forests	Programs or policies for identification, acquisition, and/or protection of groups of trees or forests that provide public benefits.	2) Adopted Practice
1.14	Urban Interface (WUI)	Programs or policies that improve management of the urban interface for fire and/or invasive species.	2) Adopted Practice

## 2) Professional Capacity and Training

Category	Component Evaluated	Description or Criteria for Evaluation	Status
2.00	Professional Management	Provision for professional consultation.	
2.01	Certified Arborist - Staff		2) Adopted Practice
2.02	Certified Arborist - Contracted		2) Adopted Practice
2.03	Certified Arborist - Other Resource		2) Adopted Practice
2.04	Other Professional - Advising/Directing UF Management	This could be a professional in an allied field like: LA.	2) Adopted Practice
2.05	Municipal Forestry Institute	Graduate of Society of Municipal Arborist's MFI program.	2) Adopted Practice
2.06	Organizational Communications	Process, procedures, and protocol for cross-professional communications within the organization (all departments "touching" trees).	1) In Development
2.07	Outreach & Education Coordinator	Urban forest-specific, full-time for Adopted Practice	1) In Development
2.08	In-House Arborist Crew	1) Response crew or multi-person crew in development 2) Staffing levels and resources enable maintenance of all City-maintained trees within 10 years	1) In Development

## 3) Funding and Accounting

Category	Component Evaluated	Description or Criteria for Evaluation	Status
3.00	Urban Forestry Budget		
3.01	Budgeted Annually	Budget authorized/required for tree board, tree maintenance, and/or tree planting.	2) Adopted Practice
3.02	Contingency Budget Process	A protocol is in place to prioritize urban forestry management activities during budget shortfalls; e.g. during times of limited funding for: <sup>1)</sup> risk management, <sup>2)</sup> young tree care, <sup>3)</sup> mulching.	1) In Development
3.03	Funding Calculated from Community Attribute	Budget in terms of per capita, per tree, or for performance (e.g. per tree weighted by size class or age).	1) In Development
3.04	Funding Based on Performance Monitoring	Budget connected with/based on ecosystem service (ES) monitoring and performance.	1) In Development
3.05	Urban Forestry Line Item	Is the budget specific to urban forest management?	2) Adopted Practice
3.06	Green Asset Accounting	Maintain green infrastructure data in the "unaudited supplementary disclosure of an entity's comprehensive annual financial report (CAFR)". GASB 34 implementation for municipalities.	1) In Development

## 4) Decision and Management Authority

Category	Component Evaluated	Description or Criteria for Evaluation	Status
4.00	Authority		
4.01	Urban Forest Manager	Professional urban forester with authority over the program and daily activity. Including designated budget.	2) Adopted Practice
4.02	Staff Authority	Designated staff with authority over the program and day-to-day activity. Including designated line item.	2) Adopted Practice
4.03	Communication Protocol	Established protocol and mechanism(s) for communication among all members of the urban forest management "community" in your municipality or organization (e.g. manager, department under control, advisory board, finance, field operations, public, NGOs, business community, developers).	1) In Development
4.04	Tree Board, Commission, or Advisory Council	Establishes a board for public participation (advisory or with authority).	2) Adopted Practice

## 5) Inventories

Category	Component Evaluated	Description or Criteria for Evaluation	Status
5.00	Inventories and Assessments		
5.01	Canopy Inventory (UTC)	Periodic ( $\leq 5$ year) canopy inventory and assessment. Public & private.	2) Adopted Practice
5.02	Ecosystem Services	Is there a recent ( $\leq 5$ year) ecosystem services (ES) inventory & assessment. Public: 100% or street trees; Public & Private: Sample; or Campus. Or, are ES calculated annually or biennially based on partial re-inventory and projected growth as a monitoring tool.	1) In Development
5.03	Public Trees↓	The publicly controlled urban forest. ↓	↓
5.04	Street Trees	Is there a recent (5 year) inventory? Partial?	2) Adopted Practice
5.05	Parks/Riparian Areas	Is there a recent (5 year) inventory? Partial?	2) Adopted Practice
5.06	Other Public Trees	Public landscaped areas, industrial parks, green space.	2) Adopted Practice
5.07	Continuous Inventory On a Cycle ( $\leq 5$ years; i.e. panel)	Partial re-inventory to support continuous forest inventory, growth projections, and the calculation of ecosystem services for the purpose of long-term monitoring of urban forest management performance (e.g. carbon or leaf surface).	1) In Development
5.08	Private Trees↓	↓	↓
5.09	Campus (Educational)	Is there a recent (5 year) inventory?	2) Adopted Practice
5.10	Corporate	Is there a recent (5 year) inventory? (Tacoma Mall)	1) In Development
5.11	Other Private Property	Is there a recent (5 year) inventory?	2) Adopted Practice
5.12	Continuous Inventory On a Cycle ( $\leq 5$ years; i.e. panel)	Partial re-inventory to support continuous forest inventory, growth projections, and the calculation of ecosystem services for the purpose of long-term monitoring of urban forest management performance (e.g. carbon or leaf surface).	0) Not Practiced
5.13	Green Infrastructure (GSI)	BMP stormwater mitigation practices and locations	2) Adopted Practice

5.14	Spatial	GIS inventory data addresses the spatial relationship between the natural resource and people that would help manage the resource for benefits associated with air quality, recreation, stress mitigation, improved educational opportunity.	2) Adopted Practice
5.15	Maintenance and Planting Records Maintained	Planting details (nursery, species, size, cost, contractor, etc.) maintained with inventory or as separate database or recordkeeping system. Also pruning and removal history. To be improved with TreePlotter.	2) Adopted Practice

## 6) Urban Forest Management Plans

Category	Component Evaluated	Description or Criteria for Evaluation	Status
6.00	Management Planning Activities		
6.01	Annual Maintenance Calendar	An annual calendar that defines typical activity by season. To support scheduling.	2) Adopted Practice
6.02	Public Trees↓	The publicly controlled urban forest.	↓
6.03	Street Tree Management	Is there a recent (5 year) plan for street trees?	1) In Development
6.04	Parks/Riparian Area Management	Is there a recent (5 year) plan? (Open Space Plan)	2) Adopted Practice
6.05	Other Public Trees	Public facility landscaped areas, Industrial parks, green space.	2) Adopted Practice
6.06	Private Trees↓	↓	↓
6.07	Campus (Educational)	Is there a recent (5 year) plan for Campus trees?	2) Adopted Practice
6.08	Corporate	Is there a recent (5 year) plan? (Tacoma Mall)	1) In Development
6.09	Other Private Property	Is there a recent (5 year) plan?	0) Not Practiced
6.10	Green Infrastructure	Is there a plan for green infrastructure (i.e. nodes & linkages)? Large-scale projects.	2) Adopted Practice
6.11	Other Written Plans	Other natural resource plans (e.g. tree canopy). May be a component of another plan.	2) Adopted Practice
6.12	Tree Planting	Is there a recent (3 year) tree planting plan? . May be a component of another plan.	1) In Development
6.13	Urban Forest as Part of a Comprehensive Plan	Is any UF management plan referenced in the comprehensive plan (i.e. county or municipality) or master plan (i.e. Campus)?	2) Adopted Practice
6.14	Urban Forest Planning and Management Criteria and Performance Indicators	Criteria and indicators based on <i>A Model of Urban Forest Sustainability</i> (Clark, J.R., Matheny, N.P., Cross, G., and Wake, V. 1997 Journal of Arboriculture.) or on work of W.A. Kenney, P.J.E. van Wassenauer, and A.L. Satel in <i>Criteria and indicators for strategic urban forest planning and management</i> . (2011)	2) Adopted Practice

## 7) Risk Management

Category	Component Evaluated	Description or Criteria for Evaluation	Status
7.00	<i>Risk Management Activities</i>		
7.01	TRAQ Attained	At least one staff or consultant is TRAQ.	2) Adopted Practice
7.02	Annual Level 1 (ANSI A300 Part 9 & ISA BMP)	All trees in high occupancy areas visited annually.	1) In Development
7.03	Mitigation Prioritization	A protocol for prioritizing mitigation following Level 1 and Level 2 assessments. Reflects the controlling agency's threshold for risk.	1) In Development
7.04	Occupancy Areas Mapped	Has TRAQ staff/consultant discussed/mapped occupancy levels with controlling authority?	0) Not Practiced
7.05	Recordkeeping, Reporting, and Communications	A process has been put in place to maintain records on requests, inspections, evaluations, and mitigation of risk; and on the communications among the managers related to those risk assessments.	1) In Development
7.06	Standard of Care Adopted	Controlling authority has adopted a Standard of Care (SOC) or risk management policy.	1) In Development
7.07	Tree Risk Specification	Is there a written specification that meets requirements of ANSI A300 (Part 9)? <b>And</b> , has it been discussed with the controlling authority with relevance to the controlling authority's threshold for acceptable risk?	1) In Development
7.08	Urban Tree Risk Management	The community has prepared and follows a comprehensive program for urban tree risk management.	1) In Development
7.09	Invasive Management	Plan to address and manage invasive: plants, insects, and disease.	1) In Development

## 8) Disaster Planning

Category	Component Evaluated	Description or Criteria for Evaluation	Status
8.00	<i>Disaster Planning Activities</i>		
8.01	Response/Recovery Mechanism	Staff knowledge of the municipality's protocol for requesting disaster resources through the county or state with access to mutual aid and EMAC.	1) In Development
8.02	Urban Forestry as part of the County Disaster Plan	The UF plan (8.3) is incorporated into the county/municipal disaster plan; specifically in reference to debris management and risk mitigation. (Pierce County Mitigation Plan page 5-1)	2) Adopted Practice
8.03	Urban Forestry Disaster Plan	A separate/specific plan within the urban forestry management program (i.e. who to call, priorities).	1) In Development
8.04	Pre-disaster Contracts	Contracts are in place for critical needs.	2) Adopted Practice

8.05	Mitigation Plan	A mitigation plan has been developed for pre-disaster, recovery, and post-disaster.	1) In Development
8.06	EMAC Mission Ready Packages (MRP)	Municipality has published disaster resources with state EM and participates in inter-state Mutual Aid to support Urban Forest Strike Teams (UFST).	1) In Development
8.07	Urban Forest Strike Team	Participation in the UFST project.	0) Not Practiced

<b>9) Standards and Best Management Practices</b>			
<b>Category</b>	<b>Component Evaluated</b>	<b>Description or Criteria for Evaluation</b>	<b>Status</b>
9.00	<i>ANSI Standard &amp; BMP Activities</i>		
9.01	ANSI Standards	Reference and adherence to ANSI Standards for arboricultural practices (A300), safety (Z133), or Nursery Stock (ANSI Z60.1) (any or all).	2) Adopted Practice
9.02	Ages/Diameter Distribution	Specific management for the development of an age-diverse tree population	1) In Development
9.03	Arborist Standards	Standards of practice for arborists (i.e. Certification).	2) Adopted Practice
9.04	Best Management Practices (BMPs)	Establishes or references tree maintenance BMPs (i.e. written comprehensive standards & standards).	2) Adopted Practice
9.05	Fertilization and Mulching	Fertilization or mulching standards required for conserved & planted trees.	2) Adopted Practice
9.06	Lightning Protection Systems	BMP written to the ANSI A300 Standard.	1) In Development
9.07	Planting	Planting and transplanting standards required/specified.	2) Adopted Practice
9.08	Pruning	Pruning standards required for conserved & planted trees.	2) Adopted Practice
9.09	Removal	Infrastructure damage, stump grinding, etc.	2) Adopted Practice
9.10	Support Systems (Guying and Bracing)	BMP written to the ANSI A300 Standard.	1) In Development
9.11	Tree Risk	Tree risk assessment procedures; ISA BMP or equivalent.	1) In Development
9.12	Construction Management Standards	Written standards for: tree protection, trenching/boring in CRZs, pre-construction mulching, root or limb pruning, watering (any or all).	2) Adopted Practice
9.13	Design Standards	Standards for design that specifically require trees; standards for tree placement (i.e. location), soil treatment, and/or drainage.	2) Adopted Practice
9.14	Genus/Species Diversity	Suggests or requires diversity of plant material.	2) Adopted Practice
9.15	Green Stormwater Infrastructure (GSI)	BMPs for site level GI practices like rain gardens and swales. Small-scale projects.	2) Adopted Practice



9.16	Inventory Data Collection	Community has adopted or developed applicable (written) standards for local urban tree inventory data collection to support QA/QC. Currently, there is no identified national standard. But, the following have components and elements worth noting.	1) In Development
9.17	Minimum Planting Volume	Minimum required root zone volume.	2) Adopted Practice
9.18	Minimum Tree Size	Minimum caliper for tree replacements, and/or minimum size of existing trees to receive tree density or canopy credit.	2) Adopted Practice
9.19	Root Protection Zone (CRZ)	Defines adequate root protection zone; Critical Root Zone (CRZ).	2) Adopted Practice
9.20	Safety	Referenced ANSI Z133:1 in the UFM	2) Adopted Practice
9.21	Topping	Prohibits topping or other internodal cuts (public & private). (COT Healthy Growth Flier and website)	2) Adopted Practice
9.22	Tree Species List	Identifies and publishes a list of the most desirable, recommended, and/or preferred species (may include native and non-native species); alternatively, a list of species prohibited. (In COT's UFM)	2) Adopted Practice
9.23	Tree Quality Standards	Written standards for tree selection at nursery in addition to Z60.1.	2) Adopted Practice
9.24	Utility Right-of-Way (ROW) Management	Requirements for planting, pruning, and/or removal of trees within a utility ROW.	2) Adopted Practice
9.25	Urban Agriculture	Enabled urban food forestry practices.	1) In Development
9.26	Wood Utilization	Larger diameter material is processed for wood products.	1) In Development
9.27	Third-party Forest Products Certification Compliance	Adoption of international standards for production of wood products. Example: Forest Stewardship Council™ (FSC®)	1) In Development
9.28	Energy Generation	Local or regional use of chips or other woody debris for co-generation facilities.	1) In Development
9.29	Composting of Leaf and/or Other Woody Debris	Leaves and small woody debris are captured and used on-site or processed by someone by composting for reuse.	2) Adopted Practice

## 10) Community

Category	Component Evaluated	Description or Criteria for Evaluation	Status
10.00	<i>Community Building</i>		
10.01	Education	The urban forest is used as an educational laboratory for class activity; Kids in the Woods, PLT, high school, or college level.	2) Adopted Practice
10.02	NeighborWoods® Program or Similar	Does your community sponsor this or similar private tree program locally?	2) Adopted Practice
10.03	Public Web-mapping Inventory Software	Public access to the community tree resource via an on-line mapping program	2) Adopted Practice
10.04	Public Perception	Is public management consistent with private property requirements for tree protections and care? Does the public tree management reflect neighborhood norms?	1) In Development
10.05	Recognition Programs	Programs that raise awareness of trees or that use trees to connect the community to significant events or activities.	1) In Development
10.06	Arbor Day Celebration	Whether or not associated with Tree City USA.	2) Adopted Practice
10.07	Arboretum Designation	Internal or third party arboretum designation.	2) Adopted Practice
10.08	Significant Trees	For example: size, history.	1) In Development

10.9	Memorial/Honorarium	Tree planting or tree care programs that honor individuals, organizations, or events.	1) In Development
10.10	Social Media	Does your community make use of social media for internal or external outreach?	2) Adopted Practice
10.11	Active Communications	Press releases, regular news articles (print), "State of the Urban Forest" reports, periodic analysis of threats and opportunities.	2) Adopted Practice
10.12	Tree Care	Are volunteers trained and used for basic tree care (e.g. mulching, pruning, planting). (TTF and other)	2) Adopted Practice
10.13	Tree City	Community meets current qualifications for either of these programs.	2) Adopted Practice
10.14	Volunteer Opportunities	Ad hoc or scheduled. Any/all age groups. Tree City USA youth and volunteer activities.	2) Adopted Practice

## 11) Green Asset Evaluation

Category	Component Evaluated	Description or Criteria for Evaluation	Status
11.00	<i>Observed Outcomes</i>		
11.01	Deadwood	Look for evidence of periodic or ad-hoc deadwood removal (i.e. lack of dead limbs $\geq 2"$ in the trees or on the ground).	1) In Development
11.02	Genus Diversity	No genera exceed <u>20%</u> of population (Based on 2019 analysis of all datasets no genus is $>20\%$ )	2) Adopted Practice
11.03	Mature Tree Care	Mature trees are retained in the landscape, and are of acceptable risk; i.e. veteran tree management.	1) In Development
11.04	Mulching	Evidence of adequate (i.e. spatial extent, depth, and material) roots zone mulching for all age classes.	1) In Development
11.05	Planting Site Volume Optimization	Are species & sites matched for optimization of above ground canopy; right tree in the right spot concept.	1) In Development
11.06	Rooting Volume Optimization	Are species & sites matched for optimization for below ground rooting volume; right tree in the right spot concept.	1) In Development
11.07	Species Diversity	No species/cultivars exceed <u>10%</u> of population; make specific observations for <i>Acer</i> , <i>Quercus</i> , and <i>Ulmus</i> genera. Also evaluate the role of regionally local native species. (Based on 2019 analysis of all datasets no species is $>10\%$ )	2) Adopted Practice
11.08	Soil Compaction	Observe evidence of soil compaction during maintenance.	1) In Development
11.09	Tree Health	Rate the overall tree health in all size (age) classes	1) In Development
11.10	Young Tree Pruning	Look for evidence of periodic structural pruning	1) In Development

## APPENDIX L. GLOSSARY OF TERMS

**Aesthetic/Other Report:** The i-Tree Streets Aesthetic/Other Report presents the tangible and intangible benefits of trees reflected by increases in property values in dollars (\$).

**Air Quality Monetary Benefit:** Trees improve air quality when air pollutants (O<sub>3</sub>, NO<sub>2</sub>, SO<sub>2</sub>, Particulate Matter) are deposited on tree surfaces and absorbed, and from reduced emissions from power plants (NO<sub>2</sub>, Particulate Matter, VOC's (Volatile Organic Compounds), SO<sub>2</sub>) due to reduced electricity use (see Energy Conservation definition). This is the monetary amount of this benefit.

**American National Standards Institute (ANSI):** ANSI is a private, nonprofit organization that facilitates the standardization work of its members in the United States. ANSI's goals are to promote and facilitate voluntary consensus standards and conformity assessment systems, and to maintain their integrity.

**ANSI A300:** Tree care performance parameters established by ANSI that can be used to develop specifications for tree maintenance.

**Arboriculture:** The branch of horticulture concerned with the cultivation, management and study of individual trees.

**Benefit-Cost Ratio (BCR):** The i-Tree Streets (BCR) is the ratio of the cumulative benefits provided by the landscape trees, expressed in monetary terms, compared to the costs associated with their management, also expressed in monetary terms.

**Biodiversity:** the variety of life in the world or in a particular habitat or ecosystem. For the sake of this Plan, the variety of life primarily refers to vegetation but also beneficial fungi, microorganisms, decomposers, pollinators, and seed harvesters.

**Carbon Avoided (lb):** Annual reductions in atmospheric CO<sub>2</sub> due to sequestration by trees and reduced emissions from power plants due to reduced energy use (in pounds).

**Carbon Monetary Benefit:** The dollar value associated with the amount of carbon stored or sequestered by trees based on calculations of the social cost of carbon.

**Carbon Sequestered (lb):** The amount of carbon annually removed from the atmosphere and stored in the canopy's biomass (in pounds).

**Carbon Stored (lb):** All carbon dioxide stored in the urban forest over the life of the trees as a result of sequestration (in pounds). This measurement is not the same as annual carbon sequestered.

**City-maintained land:** Freehold land that is owned by the City, State land vested in or managed by the City under a statutory order, and land that is leased by the City from an external party.

**Community forest:** see **urban forest**.

**Condition (data field):** The general condition of each tree rated during the inventory according to the following categories adapted from the International Society of Arboriculture's rating system: Excellent (100%), Very Good (90%), Good (80%), Fair (60%), Poor, (40%), Critical (20%), Dead (0%).

**Cycle:** Planned length of time between vegetation maintenance activities.

**DBH:** Diameter at Breast Height, is a standard measurement of a tree's size. It is measured at 4.5 feet above ground.

**Diameter at breast height (DBH):** See **tree size**.

**Diameter:** See **tree size**.

**Ecosystem benefits:** Values of ecosystem services generated by trees and derived from research.

**Ecosystem services:** Provided by trees and the overall urban forest are generated as a result of healthy urban and rural forest ecosystems that serve as ecological life-support systems. Urban and rural forests provide a full suite of goods and services that are vital to human health and livelihood natural assets. Many of these goods and services are traditionally viewed as free benefits to society, or "public goods" - wildlife habitat and diversity, watershed services, carbon storage, and scenic landscapes, for example<sup>3</sup>.

**Energy Saved (kWh):** Contribution of the urban forest toward conserving energy in terms of reduced natural gas use in winter (measured in therms) and reduced electricity use for air conditioning in the summer (measured in kwh).

**Energy Savings:** Monetary increases due to the contribution of the urban forest toward conserving energy in terms of reduced natural gas use in winter (measured in therms) and reduced electricity use for air conditioning in the summer.

**Forest:** An area where the dominant vegetation comprises trees and large shrubs with a mature height of more than 10 feet.

**Genus:** A taxonomic category ranking below a family and above a species and generally consisting of a group of species exhibiting similar characteristics. In taxonomic nomenclature, the genus name is used, either alone or followed by a Latin adjective or epithet, to form the name of a species.

**Geographic Information System (GIS):** A technology that is used to view and analyze data from a geographic perspective. The technology is a piece of an organization's overall information system framework. GIS links location to information (such as people to addresses, buildings to parcels, or streets within a network) and layers that information to provide a better understanding of how it all interrelates.

**Global Positioning System (GPS):** GPS is a system of earth-orbiting satellites that make it possible for people with ground receivers to pinpoint their geographic location.

**Green infrastructure:** Purposes of this Plan, is an approach to water management that protects, restores, or mimics the natural water cycle. Green infrastructure is effective, economical, and enhances community safety and quality of life. It means planting trees and restoring wetlands, rather than building a costly new water treatment plant. It means choosing water efficiency instead of building a new water supply dam. It means restoring floodplains instead of building taller levees. Green infrastructure incorporates both the natural environment and engineered systems to provide clean water, conserve ecosystem values and functions, and provide a wide array of benefits to people and wildlife. Green infrastructure solutions can be applied on different scales, from the house or building level, to the broader landscape level. On the local level, green infrastructure practices include rain gardens, permeable pavements, green roofs, infiltration planters, trees and tree boxes, and rainwater harvesting systems. At the largest scale, the preservation and restoration of natural landscapes (such as forests, floodplains and wetlands) are critical components of green infrastructure<sup>2</sup>.

**Green space:** Vegetated outdoor space within the urban environment, whether on public or private land, and includes but is not limited to areas of urban forest.

**Hardscape damage (data field):** Indicates trees damaged by hardscape or hardscape damaged by trees (for example, damage to curbs, cracking, lifting of sidewalk pavement 1 inch or more).

**Heat Prevention (Therms):** Contribution of the urban forest toward conserving energy in terms of reduced natural gas use in winter (measured in therms).

**High Risk tree:** The High Risk category applies when consequences are "significant" and likelihood is "very likely" or "likely," or consequences are "severe" and likelihood is "likely." In a population of trees, the priority of High Risk trees is second only to Extreme Risk trees.

**Importance Value (IV):** A calculation in i-Tree Streets displayed in table form for all species that make up more than 1% of the population. The i-Tree Streets IV is the mean of three relative values (percentage of total trees, percentage of total leaf area, and percentage of canopy cover) and can range from 0 to 100, with an IV of 100 suggesting total reliance on one species. IVs offer valuable information about a community's reliance on certain species to provide functional benefits. For example, a species might represent 10% of a population, but have an IV of 25% because of its great size, indicating that the loss of those trees due to pests or disease would be more significant than their numbers suggest.

**Invasive, exotic tree:** A tree species that is out of its original biological community. Its introduction into an area causes or is likely to cause economic or environmental harm, or harm to human health. An invasive, exotic tree has the ability to thrive and spread aggressively outside its natural range. An invasive species that colonizes a new area may gain an ecological edge since the insects, diseases, and foraging animals that naturally keep its growth in check in its native range are not present in its new habitat.

**i-Tree Streets:** i-Tree Streets is a tree management and analysis tool that uses tree inventory data to quantify the dollar value of annual environmental and aesthetic benefits: energy conservation, air quality improvement, CO<sub>2</sub> reduction, stormwater control, and property value increase.

**i-Tree Tools:** State-of-the-art, peer-reviewed software suite from the USDA Forest Service that provides urban forestry analysis and benefits assessment tools. The i-Tree Tools help communities of all sizes to strengthen their urban forest management and advocacy efforts by quantifying the structure of community trees and the environmental services that trees provide.

**Land Acres (Tree Canopy Assessment):** Total land area, in acres, of the assessment boundary (excludes water).

**Low Risk tree:** The Low Risk category applies when consequences are "negligible" and likelihood is "unlikely"; or consequences are "minor" and likelihood is "somewhat likely." Some trees with this

level of risk may benefit from mitigation or maintenance measures, but immediate action is not usually required.

**Management Costs:** Used in i-Tree Streets, they are the expenditures associated with street tree management presented in total dollars, dollars per tree, and dollars per capita.

**Moderate Risk tree:** The Moderate Risk category applies when consequences are “minor” and likelihood is “very likely” or “likely”; or likelihood is “somewhat likely” and consequences are “significant” or “severe.” In populations of trees, Moderate Risk trees represent a lower priority than High or Extreme Risk trees.

**Natural Gas Savings:** Monetary increase due to the contribution of the urban forest toward conserving energy in terms of reduced natural gas use in winter.

**Net Annual Benefits:** Specific data field for i-Tree Streets. Citywide benefits and costs are calculated according to category and summed. Net benefits are calculated as benefits minus costs.

**Nitrogen Dioxide (NO<sub>2</sub>):** Nitrogen dioxide is a compound typically created during the combustion processes and is a major contributor to smog formation and acid deposition.

**Non-Canopy Vegetation (Tree Canopy Assessment):** Areas of grass and open space where tree canopy does not exist.

**Open space:** In urban planning terms, means a non-enclosed area, usually unroofed and/or open on at least two sides. It includes both natural (vegetated) and artificial ground surfaces. Most green space is open space, but not all open space is green space. Public open space is defined in planning legislation.

**Ordinance:** See **tree ordinance**.

**Overhead utilities (data field):** The presence of overhead utility lines above a tree or planting site.

**Ozone (O<sub>3</sub>):** A strong-smelling, pale blue, reactive toxic chemical gas with molecules of three oxygen atoms. It is a product of the photochemical process involving the Sun’s energy. Ozone exists in the upper layer of the atmosphere as well as at the Earth’s surface. Ozone at the Earth’s surface can cause numerous adverse human health effects. It is a major component of smog.

**Particulate Matter (PM<sub>10</sub>):** A major class of air pollutants consisting of tiny solid or liquid particles of soot, dust, smoke, fumes, and mists.

**Pollutants Removed (lb):** Trees improve air quality when air pollutants (O<sub>3</sub>, NO<sub>2</sub>, SO<sub>2</sub>, Particulate Matter) are deposited on tree surfaces and absorbed, and from reduced emissions from power plants (NO<sub>2</sub>, Particulate Matter, VOC’s (Volatile Organic Compounds), SO<sub>2</sub>) due to reduced electricity use (see Energy Conservation definition). This is the measured amount of this benefit in lbs.

**Possible Planting Area - Impervious (Tree Canopy Assessment):** Paved areas void of tree canopy, excluding buildings and roads, where it is biophysically possible to establish tree canopy. Examples include parking lots and sidewalks.

**Possible Planting Area - Total (Tree Canopy Assessment):** The combination of PPA Vegetation area and PPA Impervious area.

**Possible Planting Area - Vegetation (Tree Canopy Assessment):** Areas of grass and open space where tree canopy does not exist, and it is biophysically possible to plant trees.

**Property Value Total:** Monetary increases in tangible and intangible benefits of trees reflected in increases in property values.

**Pruning:** The selective removal of plant parts to meet specific goals and objectives.

**Right-of-way (ROW):** See **street right-of-way**.

**Right-of-Way:** The public easement (typically) over the land of the abutting property owner. According to our TMC 8.30.020, public right-of-way includes the area of land, the right to possession of which is secured by the City for right-of-way purposes and includes the traveled portion of the public streets and alleys, as well as the border area, which includes, but is not limited to, any sidewalks, planting strips, traffic circles, or medians. The City of Tacoma requires abutting property owners to maintain adjoining rights-of-way. This includes streets and alleys extending from the owner’s property lines out to the curbs or edges of pavement (includes sidewalks and planting strips) if improved, or if unimproved (unpaved), out to the centerlines. There are several places in the Tacoma Municipal Code where these obligations are stated: Chapters 9.17, 9.18, 8.30, 8.31, and 12.09<sup>3</sup>.

**Risk assessment (data fields):** The risk assessment is a point-based assessment of each tree by an arborist using a protocol based on the U.S. Forest Service Community Tree Risk Rating System. In

the field, the probability of tree or tree part failure is assigned 1–4 points (identifies the most likely failure and rates the likelihood that the structural defect(s) will result in failure based on observed, current conditions), the size of the defective tree part is assigned 1–3 points (rates the size of the part most likely to fail), the probability of target impact by the tree or tree part is assigned 1–3 points (rates the use and occupancy of the area that would be struck by the defective part), and other risk factors are assigned 0–2 points (used if professional judgment suggests the need to increase the risk rating). The data from the risk assessment is used to calculate the risk rating that is ultimately assigned to the tree. **risk rating:** Level 2 qualitative risk assessment will be performed on the ANSI A300 (Part 9) and the companion publication *Best Management Practices: Tree Risk Assessment*, published by International Society of Arboriculture (2011). Trees can have multiple failure modes with various risk ratings. One risk rating per tree will be assigned during the inventory. The failure mode having the greatest risk will serve as the overall tree risk rating. The specified time period for the risk assessment is one year.

**Risk:** Combination of the probability of an event occurring and its consequence.

**Runoff Prevention (Gallons):** Reductions in annual stormwater runoff due to rainfall interception by tree canopy.

**Shrub (Tree Canopy Assessment):** Low-lying vegetation that was classified based on interpretation of shadows and texture in vegetation. Shrubs produce little to no shadow and appeared smooth in texture compared to tree canopy.

**Soil/Dry Vegetation (Tree Canopy Assessment):** Areas of bare soil and/or dried, dead vegetation.

**Species:** Fundamental category of taxonomic classification, ranking below a genus or subgenus, and consisting of related organisms capable of interbreeding.

**Stem:** A woody structure bearing buds and foliage and giving rise to other stems.

**Stored Carbon Report:** While the i-Tree Streets Carbon Dioxide Report quantifies annual CO<sub>2</sub> reductions, the i-Tree Streets Stored Carbon Report tallies all of the Carbon (C) stored in the urban forest over the life of the trees as a result of sequestration measured in pounds as the CO<sub>2</sub> equivalent.

**Stormwater Monetary Benefit:** Monetary savings due to reductions in annual stormwater runoff due to rainfall interception by tree canopy.

**Stormwater Report:** A report generated by i-Tree Streets that presents the reductions in annual stormwater runoff due to rainfall interception by trees measured in gallons (gals.).

**Street right-of-way (ROW):** A strip of land generally owned by a public entity over which facilities, such as highways, railroads, or power lines, are built.

**Street tree:** A street tree is defined as a tree within the right-of-way.

**Structural defect:** A feature, condition, or deformity of a tree or tree part that indicates weak structure and contributes to the likelihood of failure.

**Stump Removal (Primary Maintenance Need):** Indicates a stump that should be removed.

**Sulfur Dioxide (SO<sub>2</sub>):** A strong-smelling, colorless gas that is formed by the combustion of fossil fuels. Sulfur oxides contribute to the problem of acid rain.

**Sustainability:** Avoidance of the depletion of natural resources in order to maintain an ecological balance.

**Sustainable:** See Sustainability.

**Thin (Secondary Maintenance Need):** Signifies a maintenance need for a tree. Thinning the crown is the selective removal of water sprouts, epicormic branches, and live branches to reduce density.

**Topping:** Characterized by reducing tree size using internodal cuts without regard to tree health or structural integrity; this is not an acceptable pruning practice.

**Total Acres (Tree Canopy Assessment):** Total area, in acres, of the assessment boundary.

**Tree benefit:** An economic, environmental, or social improvement that benefits the community and results mainly from the presence of a tree. The benefit received has real or intrinsic value associated with it.

**Tree Canopy Assessment (TCA):** See Urban tree canopy (UTC) assessment.

**Tree canopy cover:** The percentage of a given area of land that lies directly below the canopy of trees taller than 10 feet. It is approximately equal to the area of midday shade provided by the canopy. Climbing plants (vines) and giant grasses are not counted as part of the tree canopy cover regardless of height.

**Tree canopy:** Defined as the layer of tree leaves, branches and stems that cover the ground when viewed from above.

**Tree Clean (Primary Maintenance Need):** Based on *ANSI A300 Standards*, these trees require selective removal of dead, dying, broken, and/or diseased wood to minimize potential risk.

**Tree inventory:** Comprehensive database containing information or records about individual trees typically collected by an arborist.

**Tree ordinance:** Tree ordinances are policy tools used by communities striving to attain a healthy, vigorous, and well-managed urban forest. Tree ordinances simply provide the authorization and standards for management activities.

**Tree size (data field):** A tree's diameter measured to the nearest inch in 1-inch size classes at 4.5 feet above ground, also known as diameter at breast height (DBH) or diameter.

**Tree:** Defined for the purposes of this Plan as any perennial woody plant, including single-stemmed trees and multi-stemmed shrubs, with a potential mature height of more than 10 feet and a canopy of branches and leaves extending from the upper parts of the stem(s).

**Unsuitable Impervious (Tree Canopy Assessment):** Areas of impervious surfaces that are not suitable for tree planting. These include buildings and roads.

**Unsuitable Planting Area (Tree Canopy Assessment):** Areas where it is not feasible to plant trees. Airports, ball fields, golf courses, etc. were manually defined as unsuitable planting areas.

**Unsuitable Soil (Tree Canopy Assessment):** Areas of soil/dry vegetation considered unsuitable for tree planting. Irrigation and other modifiers may be required to keep a tree alive in these areas.

**Unsuitable Vegetation (Tree Canopy Assessment):** Areas of non-canopy vegetation that are not suitable for tree planting due to their land use.

**Urban forest sustainability:** Everything needed to assure that the entire forest system achieves and maintains a healthy overall extent and structure sufficient to provide the desired benefits, or ecosystem services, over time. While this definition is narrowly focused on the urban forest resource, it's important never to lose sight of the broader view that places the urban forest in the context of overall sustainability and a sustainable community. This can include such intersecting areas as waste reduction and recycling, stormwater management, energy use, air and water quality, wildlife habitat, public health, economic viability, social equity, overall livability, and so on. Clearly, the sustainable urban forest fits well within that conceptual framework. See also Sustainability.

**Urban forest:** All of the trees and associated understory plants within a municipality or a community. This can include the trees along streets or rights-of-way, in parks and greenspaces, in forests, and on private property.

**Urban forestry:** Means the planned, integrated and systematic management of the urban forest for its collective contribution to the physical, social, environmental, and economic wellbeing of the community. For the purposes of this Plan, the terms urban forestry and urban forest management refer to the management of the component of the urban forest growing on City-controlled land.

**Urban Tree Canopy (UTC) (Tree Canopy Assessment):** The "layer of leaves, branches and stems that cover the ground" when viewed from above; the metric used to quantify the extent, function, and value of Tacoma's urban forest. Tree canopy was generally taller than 10-15 feet.

**Urban tree canopy (UTC) assessment:** A study performed of land cover classes to gain an understanding of the tree canopy coverage, particularly as it relates to the amount of tree canopy that currently exists and the amount of tree canopy that could exist. Typically performed using aerial photographs, GIS data, or Lidar.

**Utility (Secondary Maintenance Need):** Selective pruning to prevent the loss of service, comply with mandated clearance laws, prevent damage to equipment, avoid access impairment, and uphold the intended usage of the facility/utility space.

**Vista Prune (Secondary Maintenance Need):** Pruning to enhance a specific view without jeopardizing the health of the tree.

**Volatile Organic Compounds (VOCs):** Hydrocarbon compounds that exist in the ambient air and are by-products of energy used to heat and cool buildings. Volatile organic compounds contribute to the formation of smog and/or are toxic. Examples of VOCs are gasoline, alcohol, and solvents.

**Water (Tree Canopy Assessment):** Areas of open, surface water not including swimming pools.

**Young Tree Train (Primary Maintenance Need):** Data field based on *ANSI A300 standards*, this maintenance activity is characterized by pruning of young trees to correct or eliminate weak, interfering, or objectionable branches to improve structure. These trees can be up to 20 feet tall and can be worked with a pole pruner by a person standing on the ground.

## APPENDIX M. WORKS CITED

- <sup>1</sup> ANSI, American National Standards Institute. 2017. ANSI A300 (Part 1)-2017 Pruning Plan Section: In-Depth and High-Level Data Analysis, page 54.
- <sup>2</sup> ANSI A300 (Part 5)-2012: Management of Trees and Shrubs During Site Planning, Site Development, and Construction  
Plan Section: In-Depth and High-Level Data Analysis, page 55.
- <sup>3</sup> U.S. Forest Service, Urban & Community Forestry Program and Vibrant Cities Lab 1-pager. February 2018, [http://www.fs.fed.us/ucf/supporting\\_docs/UCF-Brief-Feb2018.pdf](http://www.fs.fed.us/ucf/supporting_docs/UCF-Brief-Feb2018.pdf)  
Plan Section: In-Depth and High-Level Data Analysis, page 56.
- <sup>4</sup> The Urban Forest Sustainability and Management Audit, developed by the USDA Forest Service Urban Forestry South, is based on the urban forest sustainability and management review checklist developed in cooperation with Agnes Scott College Office of Sustainability and the ASC Arboretum Advisory Council and the City of Austin, TX. J. Abbot, et al., 2015. [www.urbanforestrysouth.org](http://www.urbanforestrysouth.org)  
Plan Section: Urban Forest Audit System, page 77.
- <sup>5</sup> Kenney, A. et al., *Criteria and Indicators for Urban Forest Planning and Management*. *Arboriculture & Urban Forestry* 2011. 37(3): 108-117  
Plan Section: Conclusion, page 87.
- <sup>6</sup> Clark, J. et al., *A Model of Urban Forest Sustainability: Applications to Cities in the United States*. *Journal of Arboriculture* 24: 112-120. 1998  
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- <sup>7</sup> Nowak, D.J., Greenfield, E.J., 2018. U. S. urban forest statistics, values and projections. *J. For.* 116, 164-177. Plan Section: Appendices, page C.
- <sup>8</sup> Nowak, David; Greenfield, Eric. November 2017. Declining urban and community tree cover in the United States. USDA Forest Service, Northern Research Station, Syracuse, NY; *Urban Forestry & Urban Greening* 32 (2018)32-55 Plan Section: Appendices, page C.
- <sup>9</sup> McDonald, R., Iljabar, L., et al. Funding Trees for Health: An analysis of finance and policy actions to enable tree planting for public health. 2018, The Nature Conservancy. Arlington. VA. Plan Section: Appendices, page G.
- <sup>10</sup> McPherson, E.G.; et. al. 2003. Northern mountain and prairie community tree guide: benefits, costs and strategic planting. Center for Urban Forest Research, Pacific Southwest Research Station, USDA Forest Service. 92p. Plan Section: Appendices, page H.
- <sup>11</sup> McDonald, R.I., et al, *Planting Healthy Air: A global analysis of the role of urban trees in addressing particulate matter pollution and extreme heat*. 2016, The Nature Conservancy Arlington, VA. Plan Section: Appendices, page H.





Source: Tacoma Sustainability



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