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

Table 2: Urban Forestry Companion to One Tacoma Policies

1) Resource Management		
<b>1.a) Resilience and risk management</b> 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.
<b>2) Equity &amp; Accessibility</b> Enable equitable disbursement and access to open areas, street trees, parks and environmentally protected areas.	<b>3) Canopy Growth—30/30</b> Maximize accessible planting areas and retain existing canopy to facilitate meeting a City-wide canopy cover goal of 30% by 2030.	<b>4) Long-Term Funding</b> Diversified budget portfolio.  Encourage urban forest contribution from beneficiaries of tree benefits: stormwater, public health, energy distribution.
5) Climate Resiliency		
<b>5.a) Risk Mitigation</b> Identify and prioritize vulnerability to heatwave mitigation, urban heat island effect, and other climate-related emergencies.	<b>5.b) Energy Savings</b> Reduce energy costs, and associated combustible emissions, through tree benefits.	
6) Municipal Code and Policy		
<b>6.a) Preserving Trees During Development</b> Reduced canopy loss through preservation of trees during development action.	<b>6.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.
7) 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.	

### 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., 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.

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					Maintenance Responsibility*
	Prune	Remove	Remove Stake	No Action	Total	
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

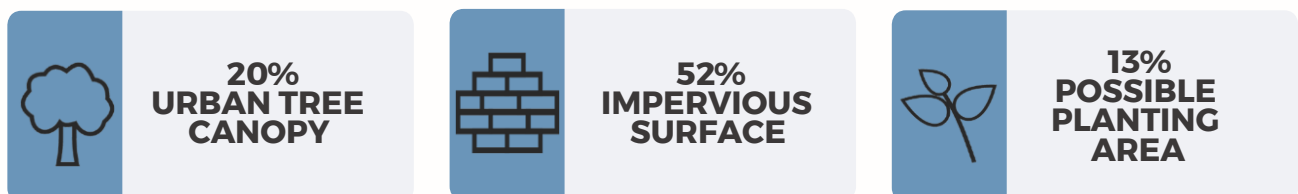
This study assessed urban tree canopy (UTC) and possible planting areas (PPA) at multiple geographic scales in order to provide actionable information to a diverse range of audiences. By identifying what resources and opportunities exist at these scales, the City can be more proactive in their approach 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

# 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.

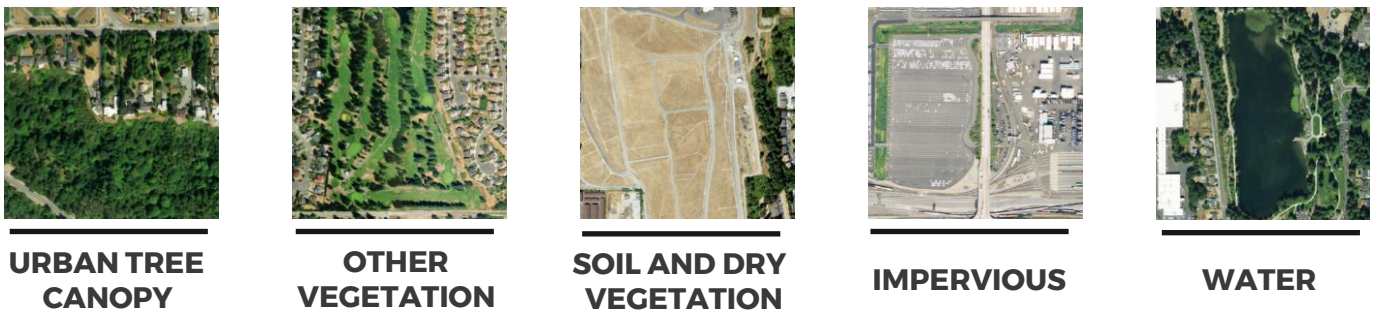
### DATA SOURCES

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.

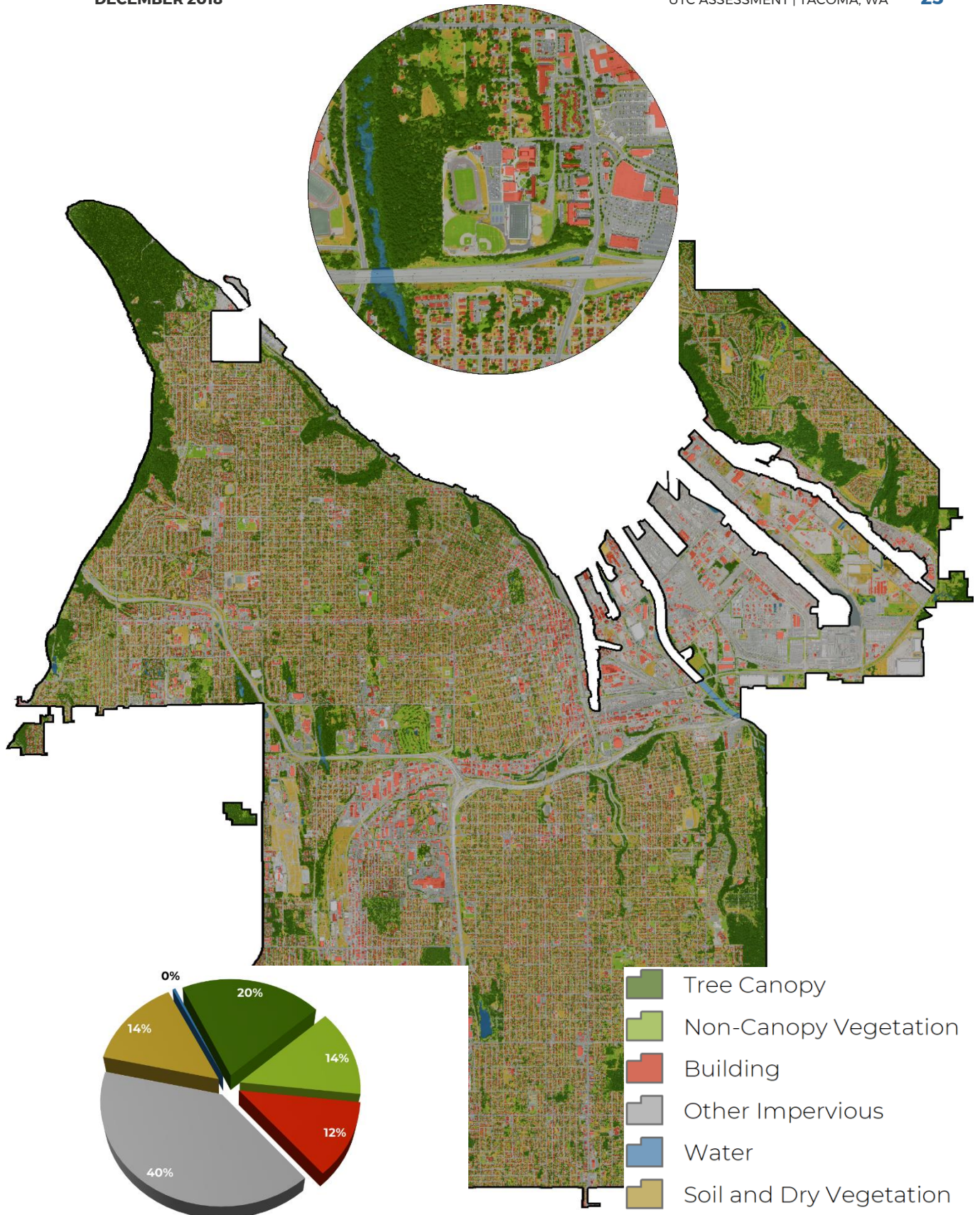
## CITYWIDE LAND COVER

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

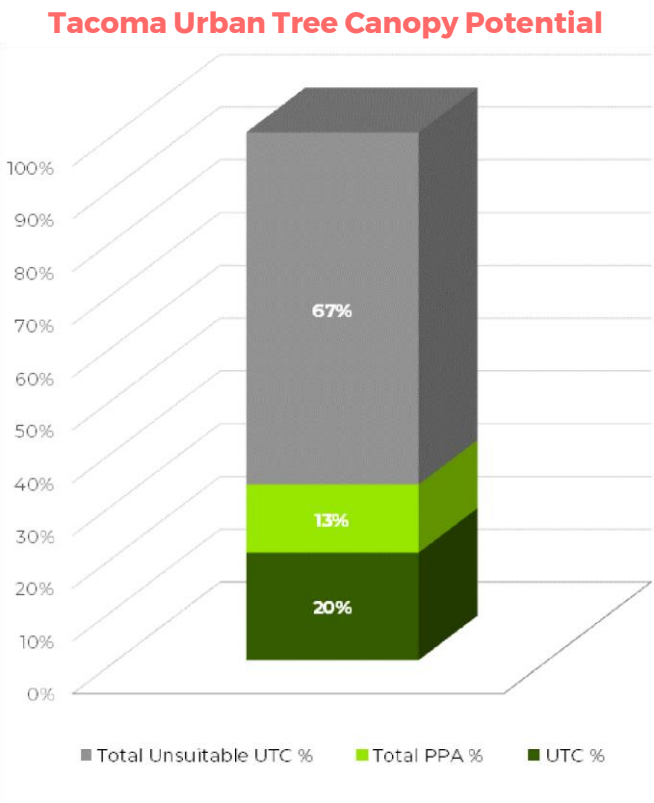
This urban tree canopy assessment utilized the land cover map as a foundation to determine Possible Planting Areas throughout the City. Additional layers and information regarding land considered unsuitable for planting were also incorporated into the analysis. Note that the results of this study are 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	%
Total Area	31,607	100%
Land Area	31,476	100%
UTC	6,406	20%
Total PPA	4,064	13%
Total Impervious	16,344	52%
Total Unsuitable UTC	21,006	67%





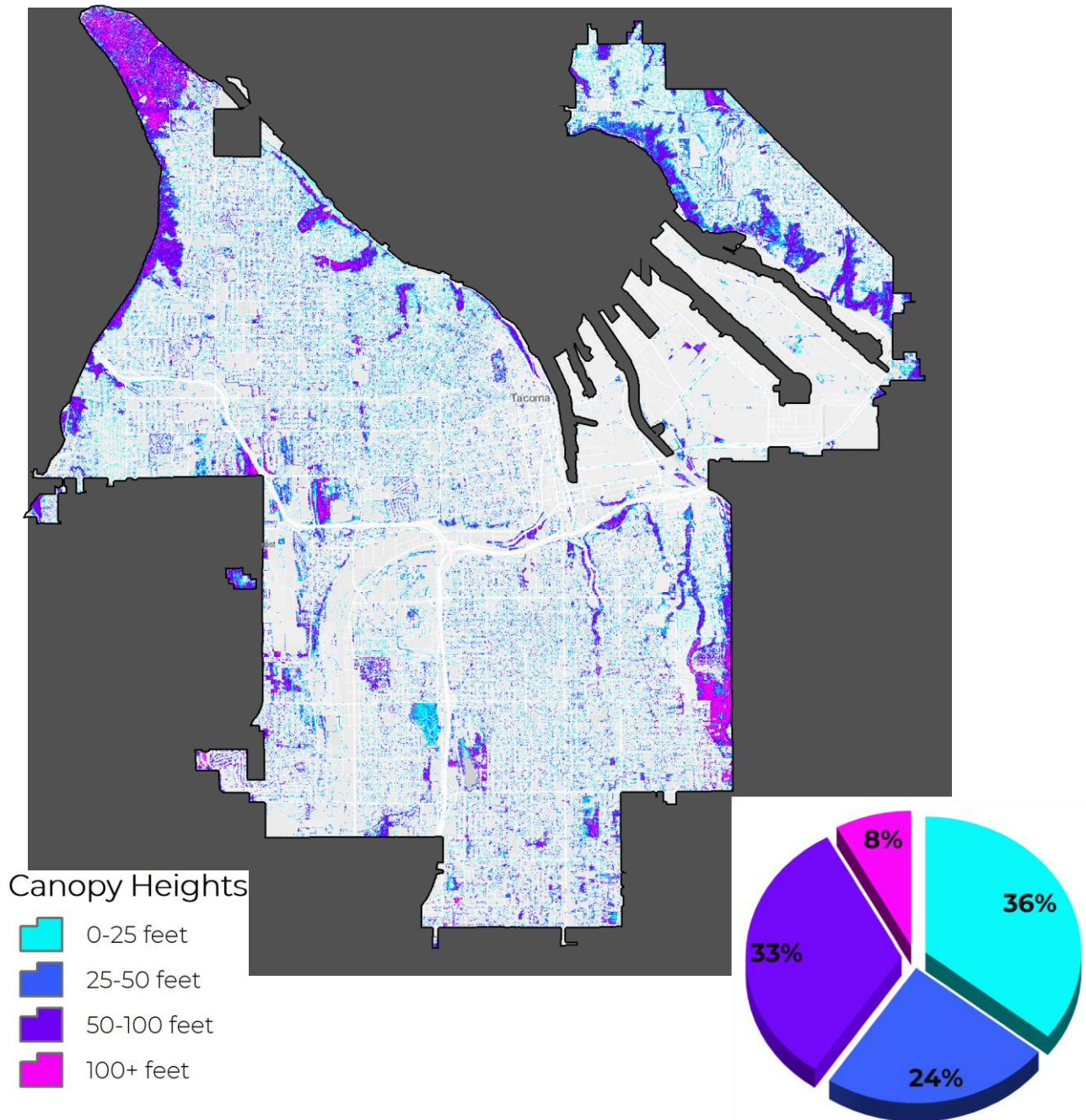


**Figure 8. | Urban tree canopy, possible planting area, and area unsuitable for UTC in the city of Tacoma.**

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.

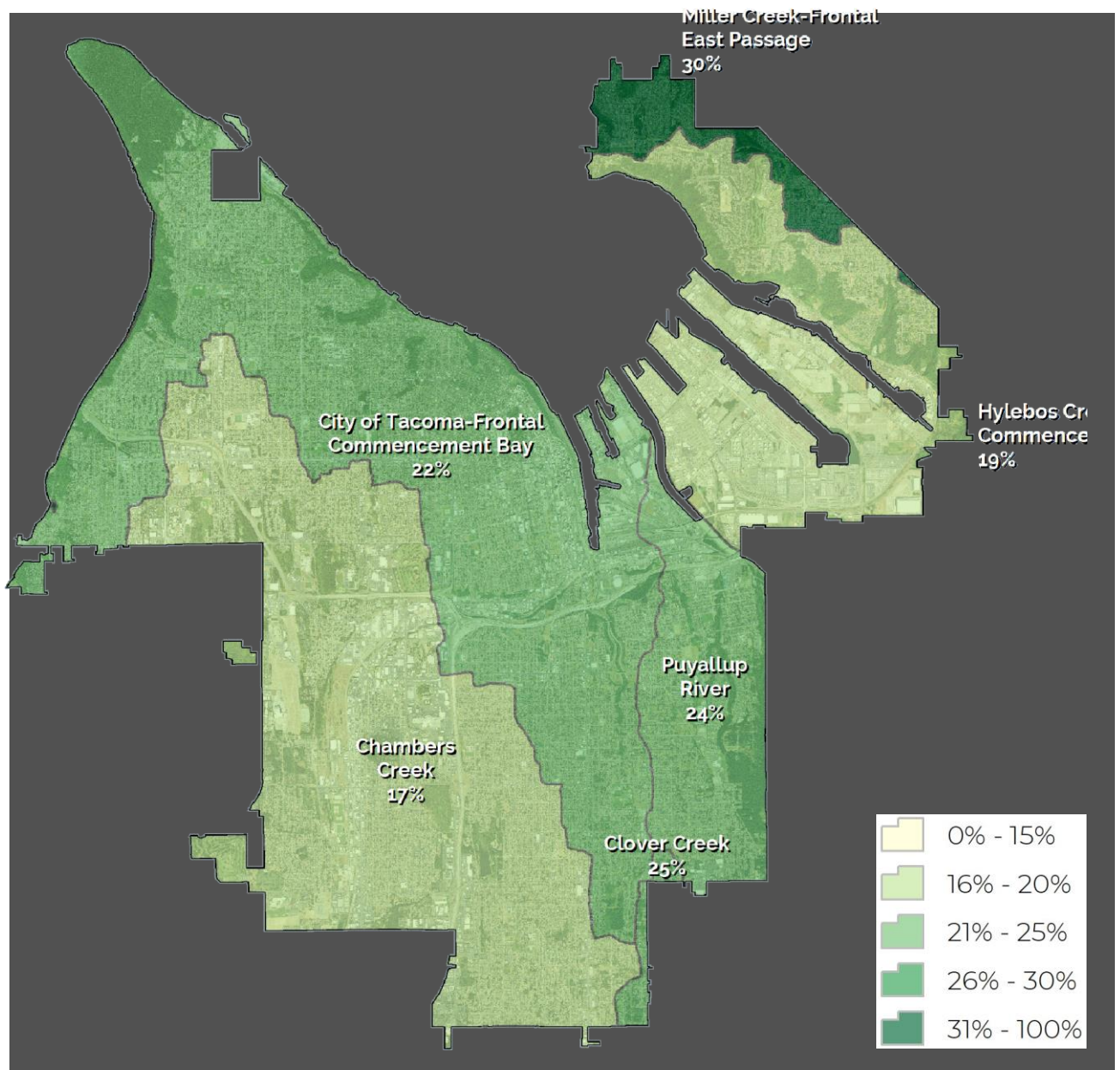


**Figure 9. | Urban tree canopy height in the City of Tacoma.**



## 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).

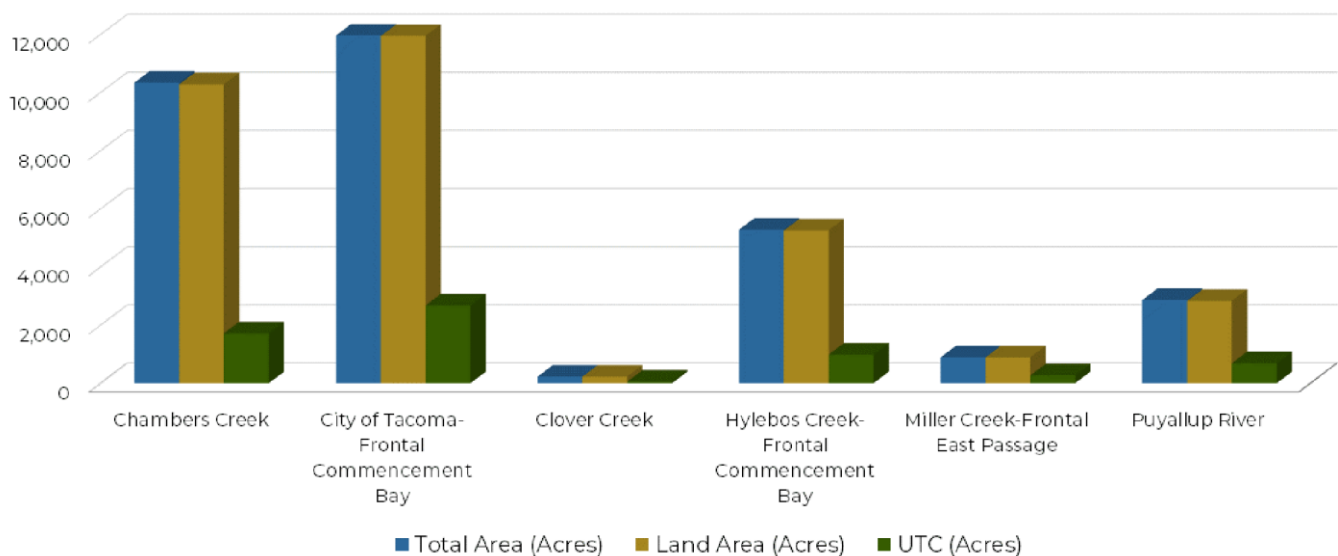


**Figure 10. | Urban tree canopy (UTC) by watersheds in the City of Tacoma.**

**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

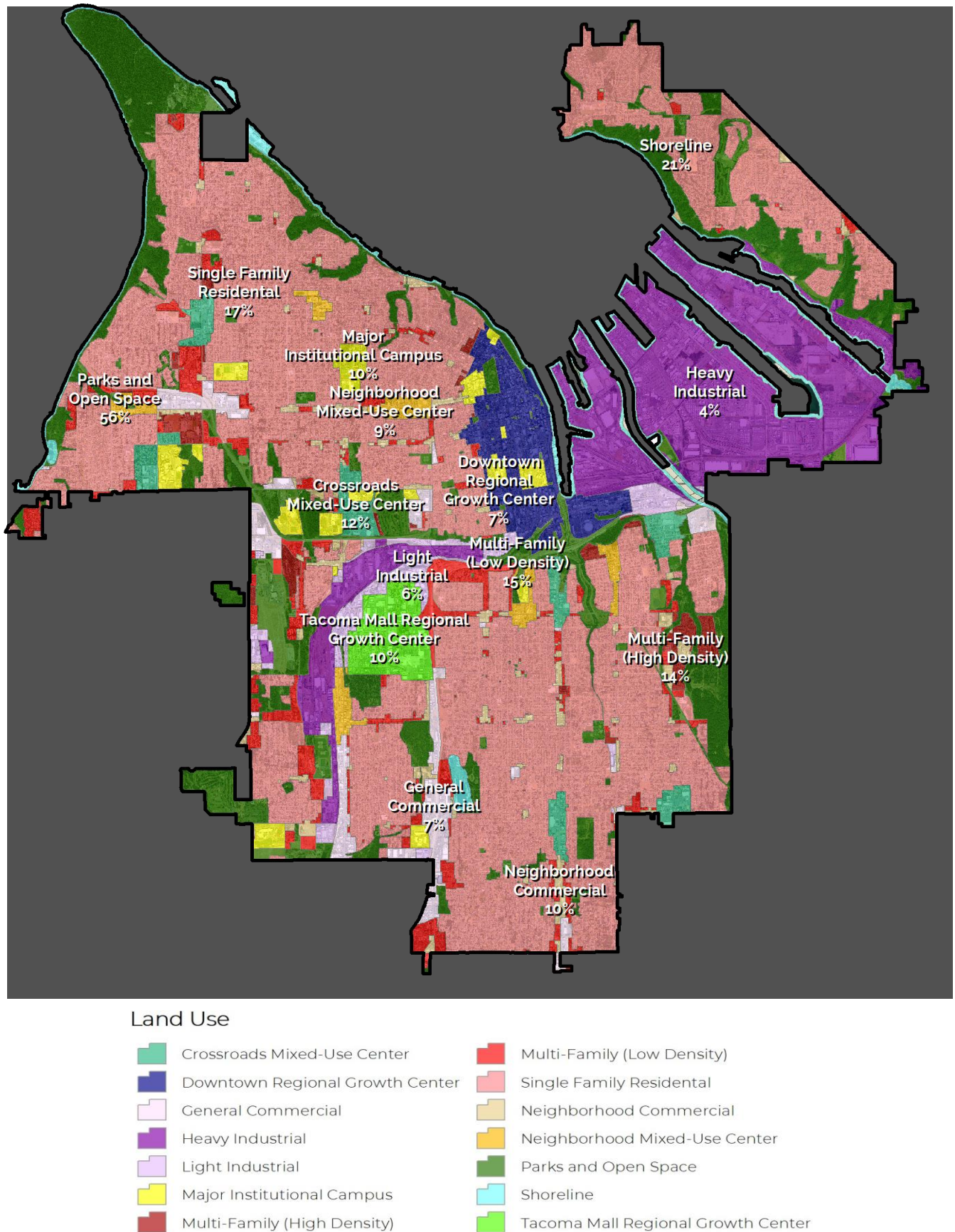


determine whether they are actually good candidates for urban forest expansion. Heavy Industrial areas only contain 6 percent PPA but make up 6 percent of all PPA throughout the city. These 235 acres provide great opportunities for mitigating stormwater runoff, air pollution, and urban heat island effect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

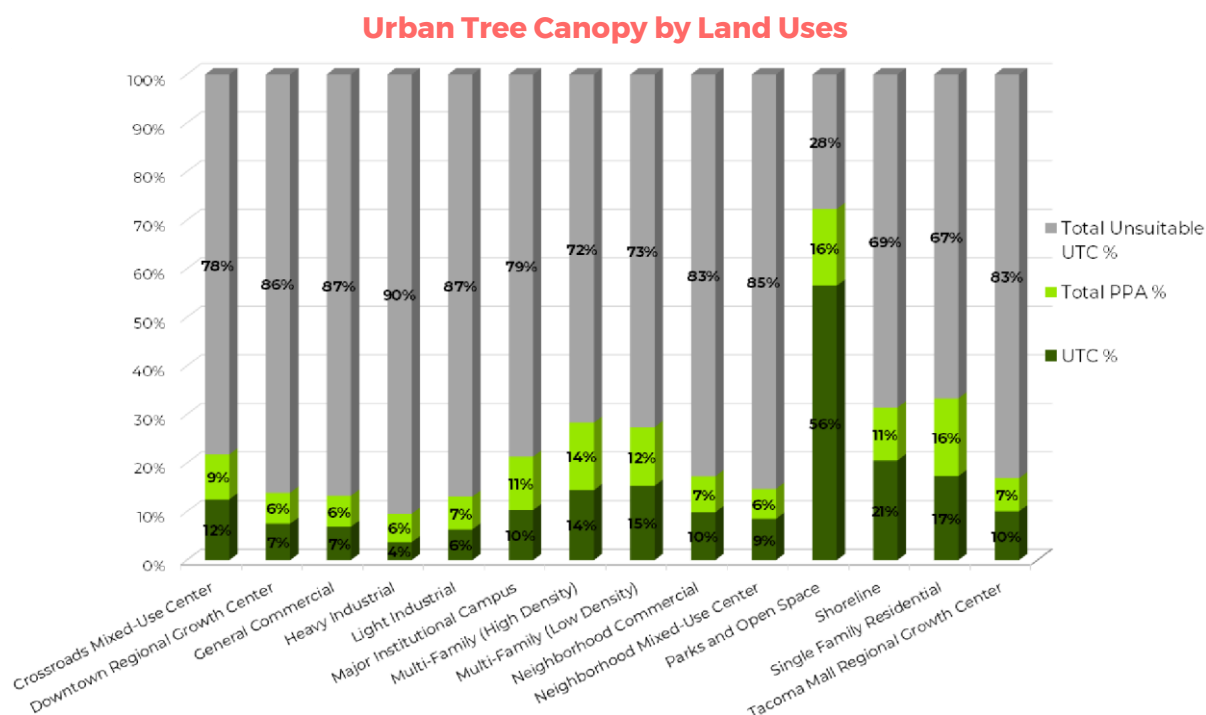
**Table 4. | Urban tree canopy assessment results by land uses. UTC and PPA results include acres, percent of area covered by UTC or PPA (%), and distribution of the city's total UTC or PPA within each land use (dist.).**

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>





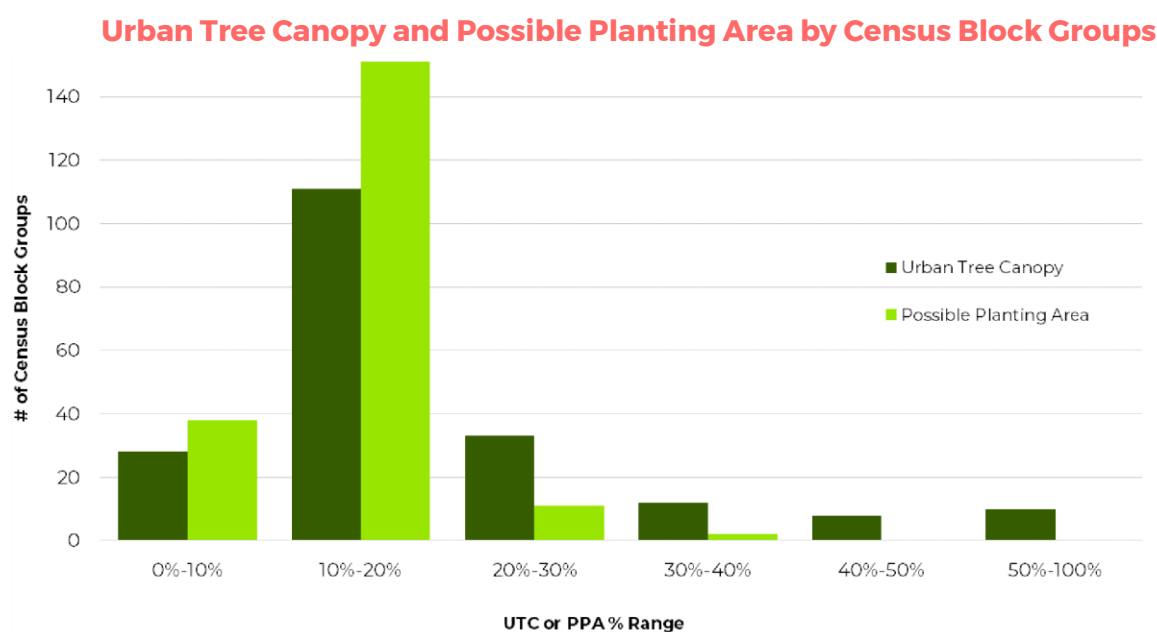
**Figure 12. | Urban tree canopy in Tacoma by city land uses.**



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

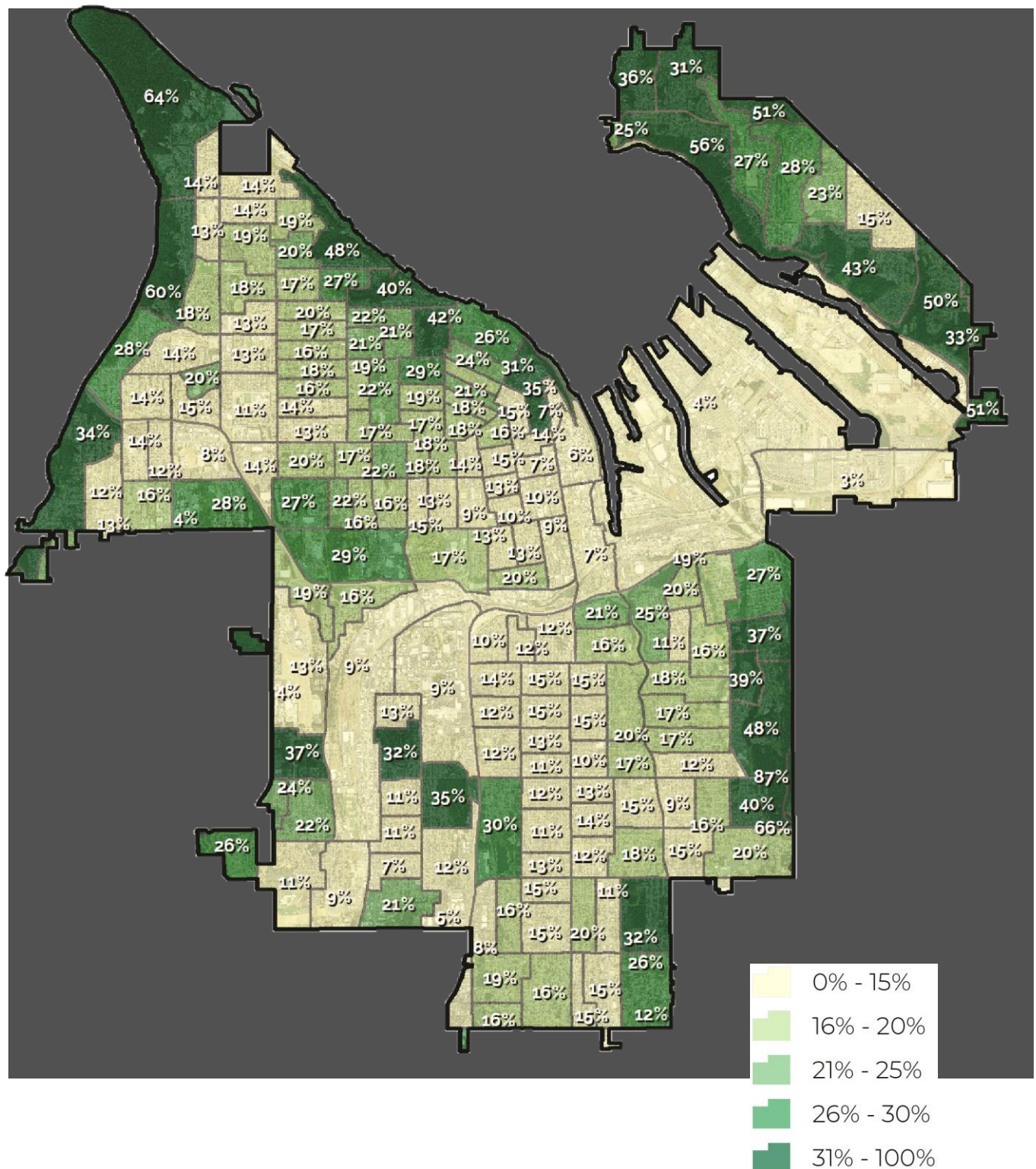
## URBAN TREE CANOPY BY CENSUS BLOCK GROUPS

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.<sup>1</sup>

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					
Classification Data		Tree Canopy	Vegetation	Impervious	Soil / Dry Veg.	Water	Total Reference Pixels
	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.

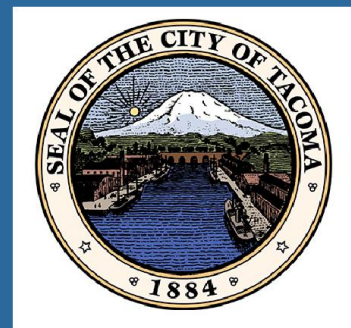
**Unsuitable Vegetation:** Areas of non-canopy vegetation that are not suitable for tree planting due to their land use.

**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



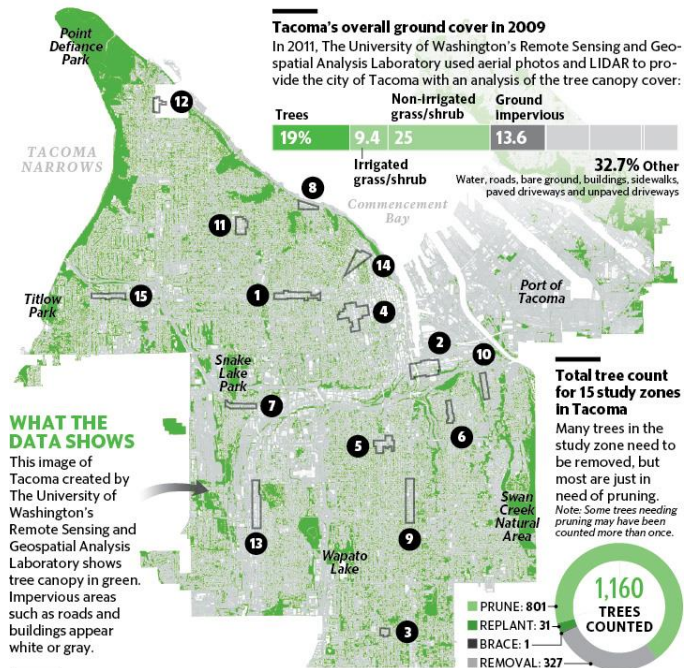


# APPENDIX E. INFOGRAPHIC FOR 2011 TREE CANOPY ASSESSMENT

## 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
2 Dome	138	1.9% 13.1%	138
3 Fern Hill	2	7.3% 7.7%	21
4 Hilltop	234	0.9% 14.1%	129
5 Lincoln Int'l	35	0% 15%	77
6 McKinley Hill	50	1.1% 13.9%	22
7 Oakland/Madrona	19	7.1% 7.9%	27
8 Old Town	73	2.8% 12.2%	37
9 Pacific Avenue	36	3.4% 11.6%	89
10 Portland Avenue	66	2.4% 12.6%	42
11 Proctor	174	4% 11%	14
12 Ruston/Pt. Defiance	2	2.6% 12.4%	30
13 S. Tacoma Way	17	0% 15%	123
14 Stadium	153	4.9% 10.1%	107
15 Tacoma Narrows	30	3.3% 11.7%	53

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

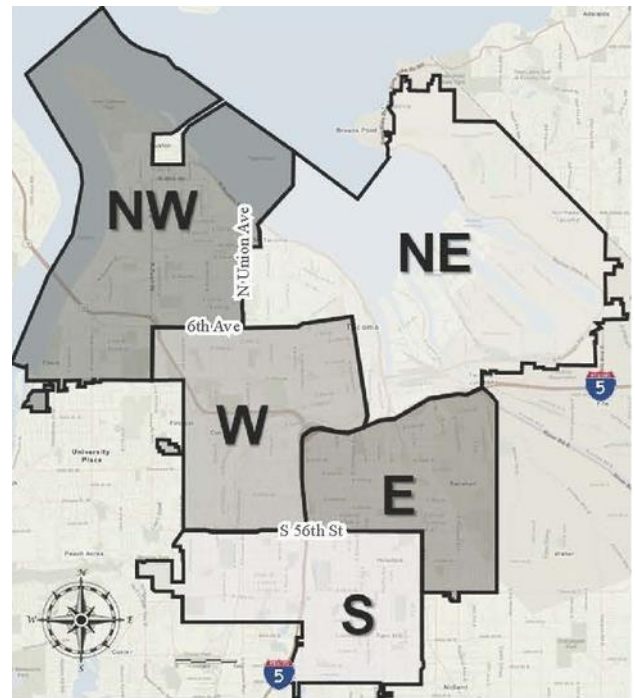
- 5) Please share any other comments and suggestions for the City of Tacoma regarding tree planting and/or maintenance in urban areas?

- 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?

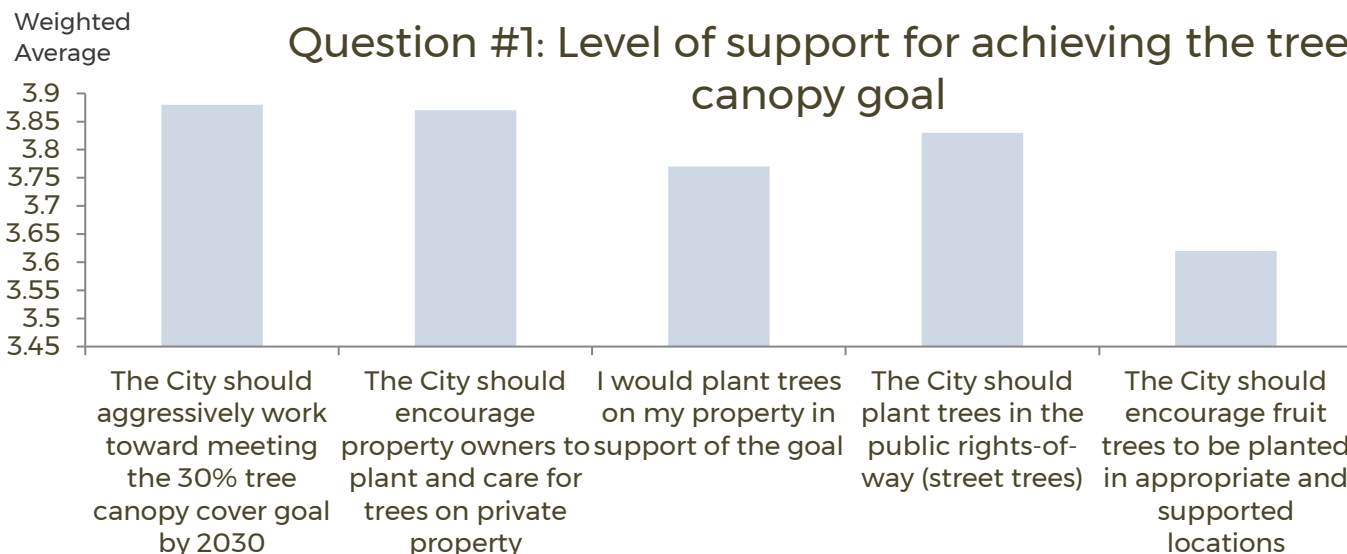
- ☐ District 1 (NW)
- ☐ District 2 (NE)
- ☐ District 3 (W Central)
- ☐ District 4 (E Central)
- ☐ District 5 (S)
- ☐ Don't live in Tacoma



- 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:

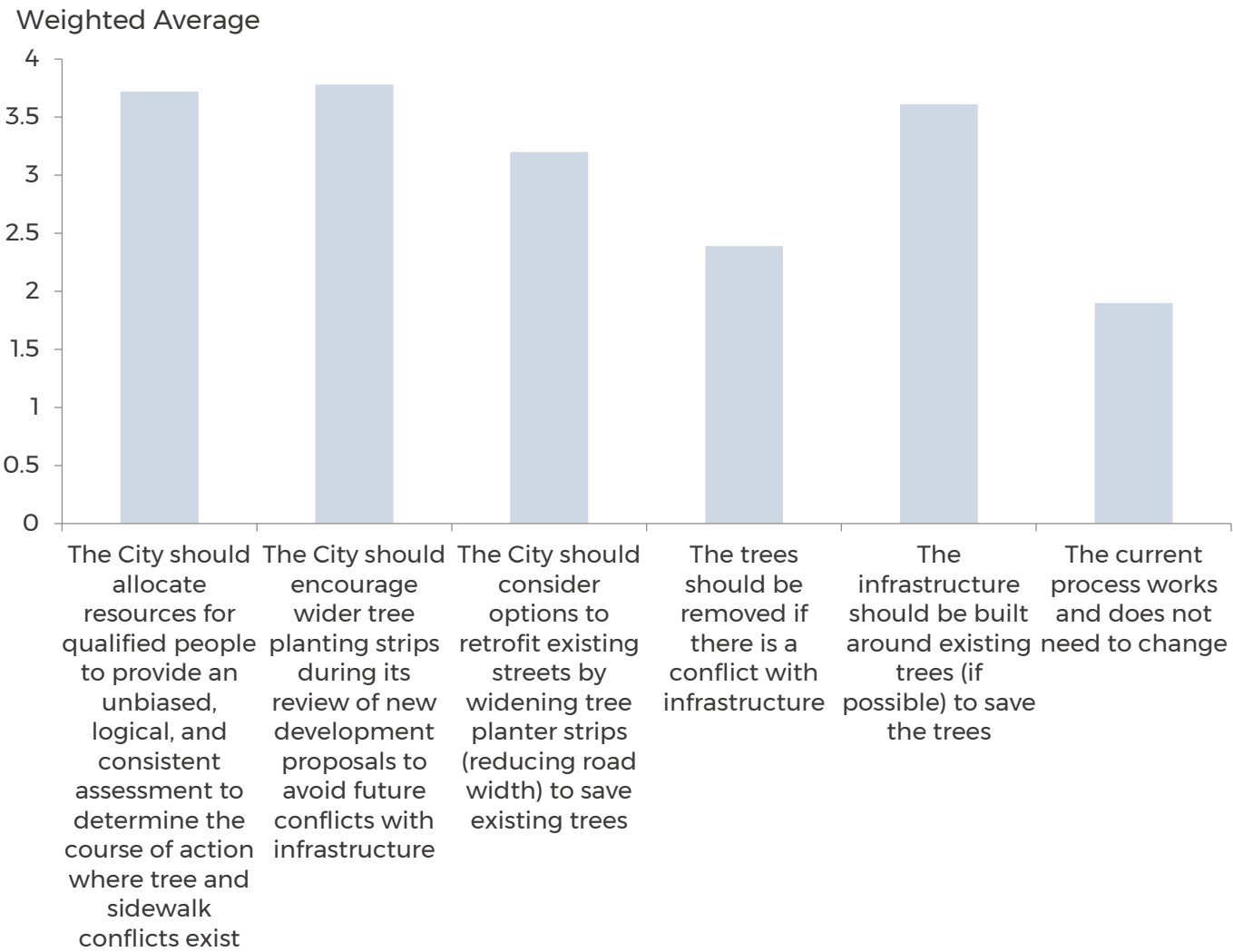


Question #1	Very Supportive		Somewhat Supportive		Somewhat Unsupportive		Very Unsupportive		Total	Weighted Average
The City should aggressively work toward meeting the 30% tree canopy cover goal by 2030	91%	338	8%	29	1%	2	1%	4	373	3.88
The City should encourage property owners to plant and care for trees 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									
Answered									374	
Skipped									1	

**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>	

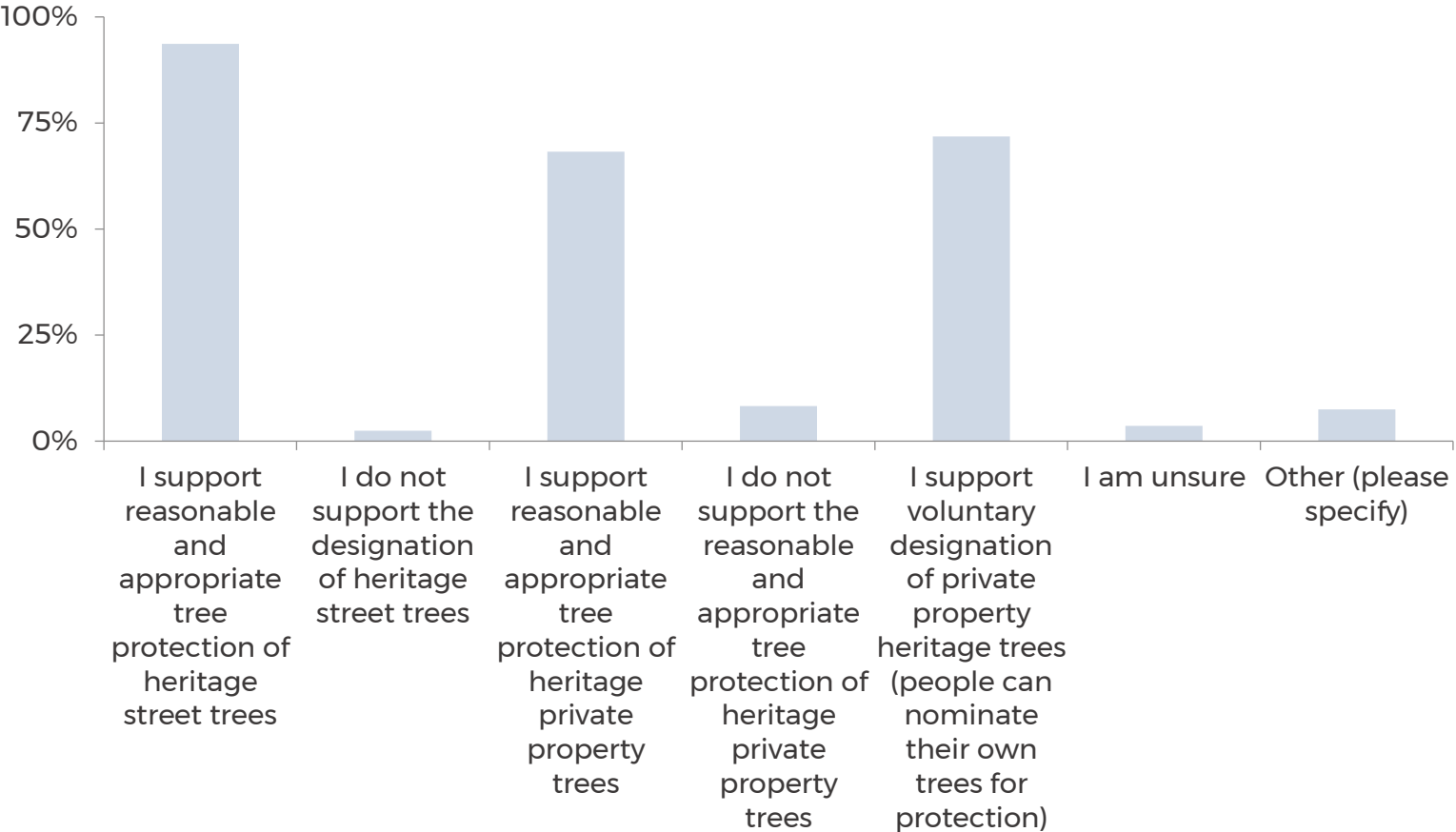
Question #2: Tree and sidewalk conflicts



**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:

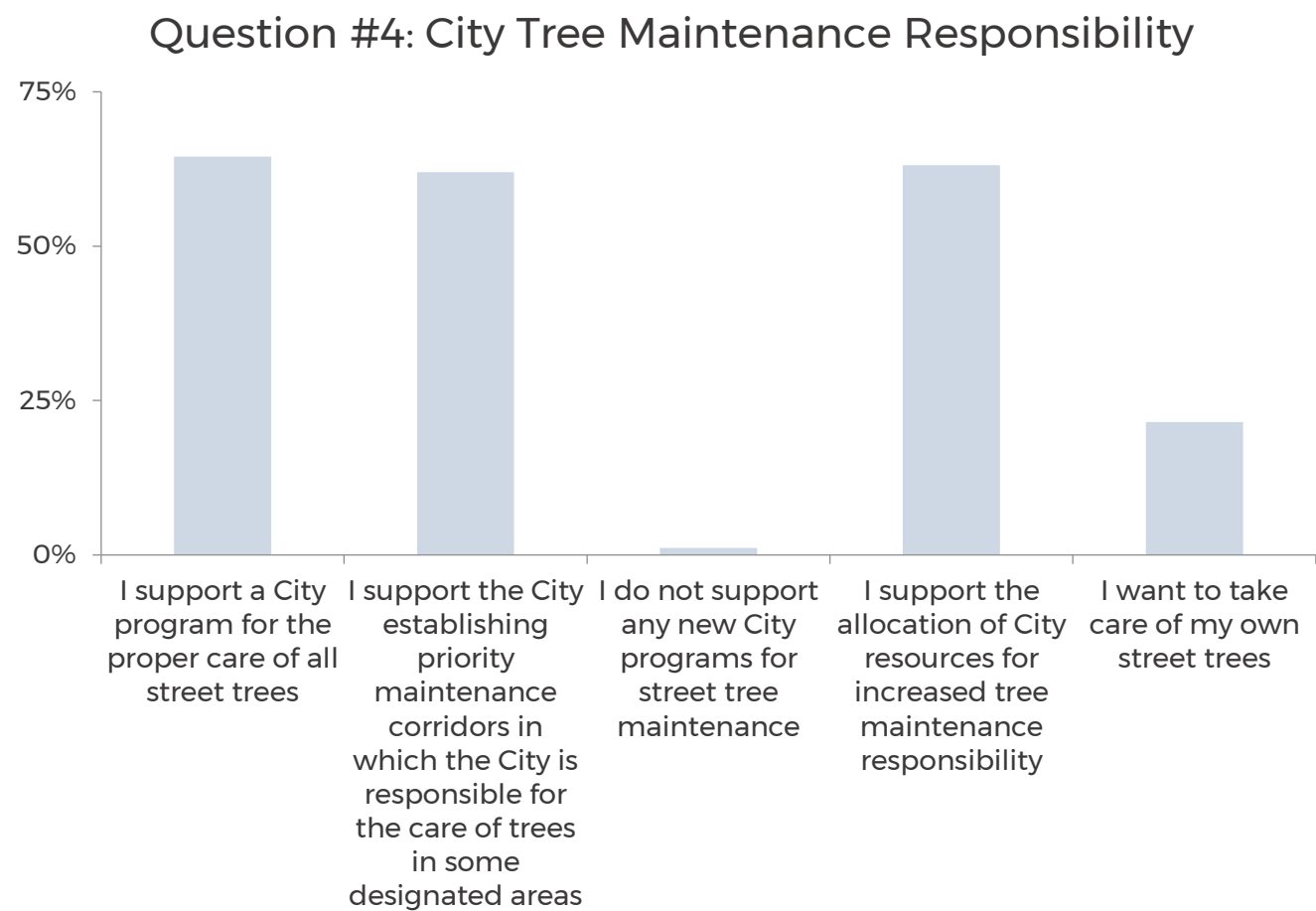
Question #3 Heritage Tree Program Options		
I support reasonable and appropriate tree protection of heritage street trees	94%	339
I do not support the designation of heritage street trees	2%	9
I support reasonable and appropriate tree protection of heritage private property trees	68%	247
I do not support 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
Answered		362
Skipped		13

Question #3: Heritage Tree Program



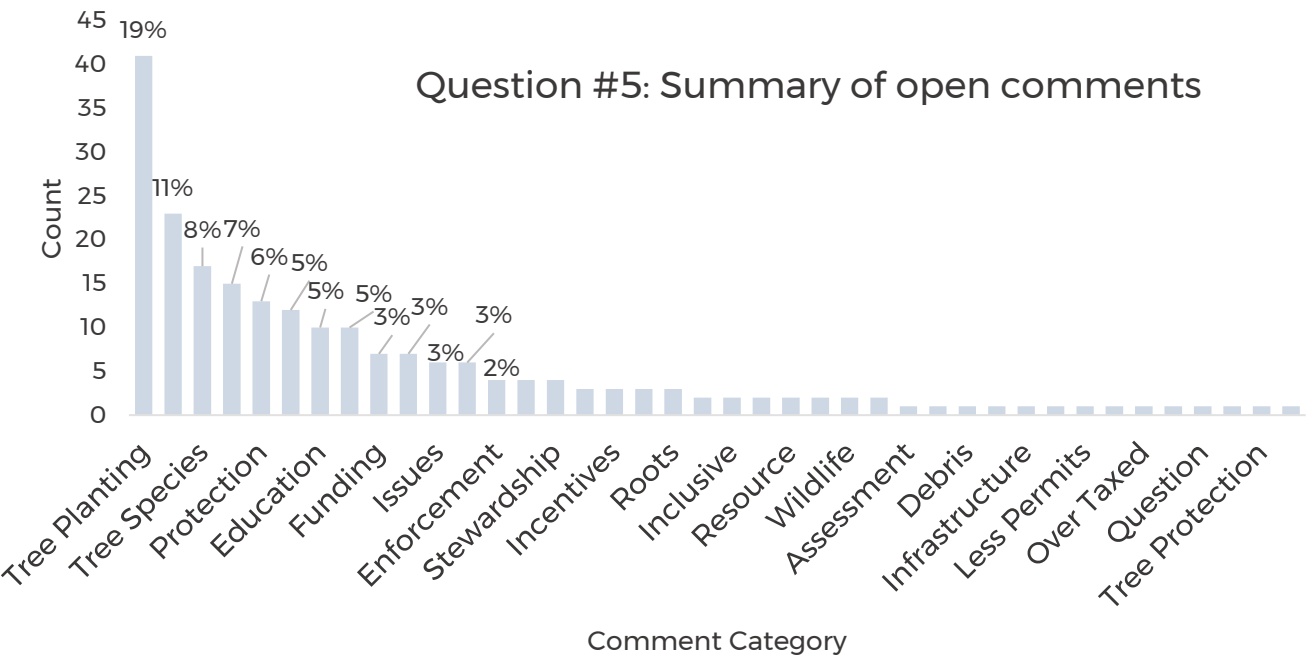
**Question #4:** In general, the City of Tacoma does not maintain street trees that are not abutting City-owned property (this includes pruning and removal); exceptions may occasionally be made due to easement stipulations, construction, abatement, and other specific reasons. Please review the following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

Question #4 City Tree Maintenance Responsibility Options		
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
Answered		358
Skipped		17

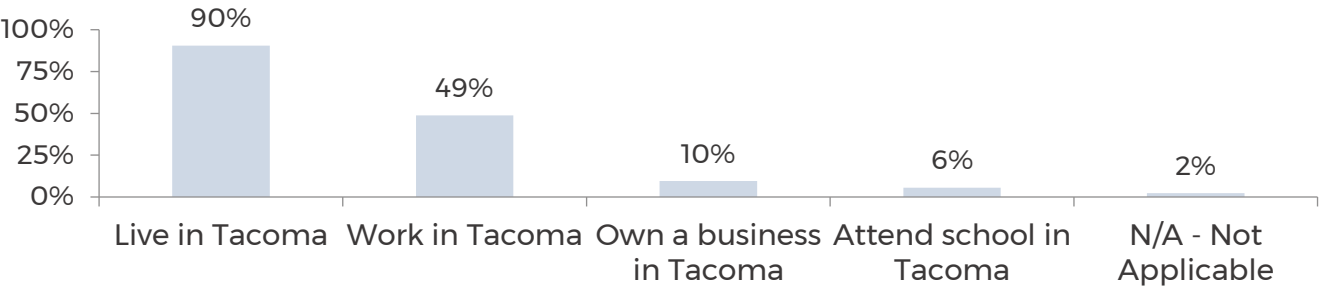




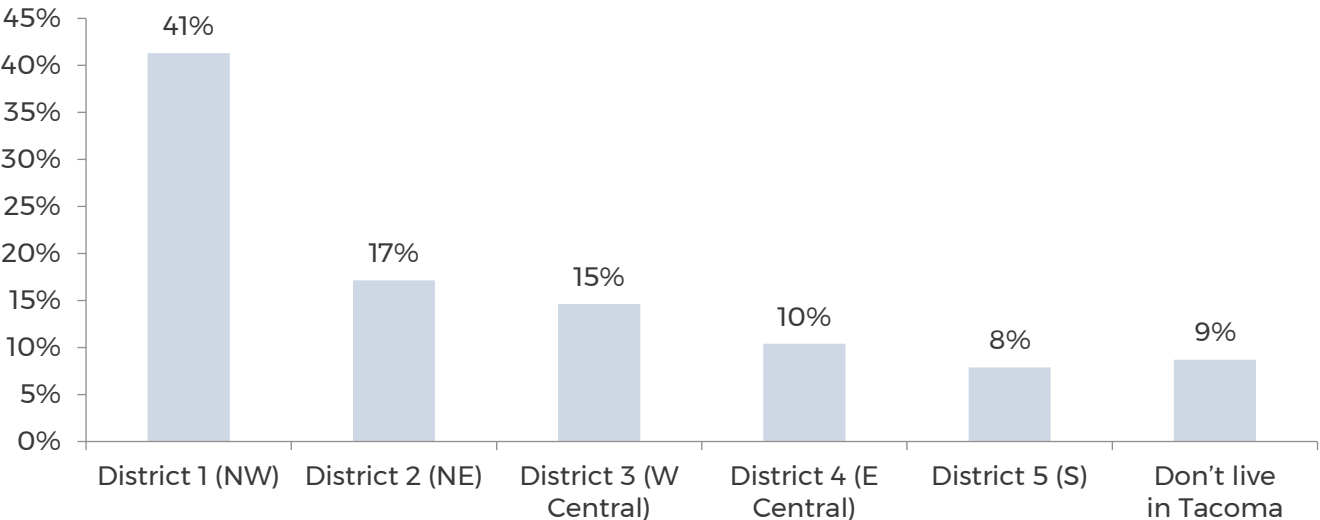
**Question #5:** Please share any other comments and suggestions for the City of Tacoma regarding tree planting and/or maintenance in urban areas? **(185 comments, 190 skipped)**



**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**

		<b>Sum of Evaluations</b>			
Category	Description	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

Management Policy and Ordinances			
Category & Element	Element Description	Item(s) Provided (Title or ID)*	Count
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
Total Count			105



## Professional Capacity and Training

Category & Element	Element Description	Item(s) Provided (Title or ID)*	Count
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>

## Funding and Accounting

Category & Element	Element Description	Item(s) Provided (Title or ID)*	Count
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>

Decision and Management Authority			
Category & Element	Element Description	Item(s) Provided (Title or ID)*	Count
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>

Inventories			
Category & Element	Element Description	Item(s) Provided (Title or ID)*	Count
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>

Risk Management			
Category & Element	Element Description	Item(s) Provided (Title or ID)*	Count
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
Total Count			15

Disaster Planning			
Category & Element	Element Description	Item(s) Provided (Title or ID)*	Count
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
Total Count			1



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
<b>Total Count</b>			<b>98</b>

<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 (≤5 year) canopy inventory and assessment. Public & private.	2) Adopted Practice
5.02	Ecosystem Services	Is there a recent (≤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 (≤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 (≤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 Wassenae, 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

9) Standards and Best Management Practices			
Category	Component Evaluated	Description or Criteria for Evaluation	Status
9.00	ANSI Standard & BMP Activities		
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	Community Building		
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	Observed Outcomes		
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, CO2 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  
Plan Section: Conclusion, page 87.

<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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