



RON GALPERIN
CONTROLLER

February 21, 2019

Honorable Eric Garcetti, Mayor
Honorable Michael Feuer, City Attorney
Honorable Members of the Los Angeles City Council

Re: Turning Over a New Leaf: L.A.'s Tree Trimming and Maintenance Program

Los Angeles is a living metropolis that spans 503 square miles. When viewed from above, it offers a swirling vision of freeways, streets and sidewalks, along with buildings, green hillsides, parks and millions of trees that make up our urban forest. Although they come in many shapes, sizes and species, trees provide myriad benefits to the City and the people who live here.

The Department of Public Works, Bureau of Street Services, Urban Forestry Division (UFD), has the primary responsibility for maintaining L.A.'s hundreds of thousands of street trees - those located in parkways between the curb and sidewalk, and in medians. The Division's mission is to proactively maintain trees to keep them healthy, and also to remove dead trees, clear obstructions and respond to emergencies caused by trees.

While there has been a concerted effort to improve street tree maintenance in recent years, the City must do more to care for its living street trees. L.A. lacks a citywide tree inventory and the right technology to better manage staff and track employees' work. Modernizing the management of the City's street tree preservation operations is the subject of my latest report.

Urban Forest at Risk

- Arborists and experts estimate that 30 percent of the region's trees could die within a decade due to drought, disease and pests. Just three years ago, the City gave itself a "D" when grading the health of L.A.'s street trees

- The City proactively trims trees far too infrequently - on a 14 to 18 year cycle as of today. Urban forestry experts recommend trimming every five years.
- Last year, the City spent \$49 million on street tree maintenance, with \$25 million going to the LADWP, \$4 million to the Dept. of Recreation and Parks and \$20 million dedicated to the UFD. This amount allowed UFD employees and contractors to trim 43,391 street trees and log 11,392 emergency responses. Although proactive trimming has increased in recent years, emergency response work still drains a disproportionate amount of the tree maintenance budget as it costs 2.5 times more per tree than proactive trimming.
- A greater emphasis on proactive maintenance can also help mitigate liabilities. Over the past three years, the City has paid an average of \$2.5 million a year on tree-related legal settlements.

To adopt a more proactive approach, the City must upgrade its tree maintenance technology. The City does not have an up-to-date inventory of its street tree population - its last inventory was conducted in 1996 - and critical information about day-to-day maintenance activities is still recorded using paper logs and decentralized tracking systems.

Recommendations

Having the right tools and flexibility to overhaul the City's street tree maintenance operations is of paramount importance. My report makes the following recommendations to get there:

- Conduct a technology-driven street tree inventory that is public facing and based on dynamic, current data;
- Implement a centralized electronic management system that helps prioritize the UFD's day-to-day work, including tracking future maintenance priorities and jobs already completed; and
- If alternative service models are explored in the future, consider a more flexible and accountable employment approach to supplement City tree trimming crews so that L.A. can meet its tree maintenance goals as expeditiously as possible.

I urge the City Council and Mayor to consider these recommendations. As stewards of our urban forest, we should all view maintaining safe, healthy and well-trimmed street trees as a necessity, not a luxury, for a greener and cleaner Los Angeles.

Respectfully submitted,



RON GALPERIN
L.A. Controller

Turning Over a New Leaf

L.A.'s Tree Trimming
and Maintenance
Program



RON  **GALPERIN**
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Executive Summary



A vibrant and well-maintained urban forest provides significant environmental, social, and economic benefits that improve quality of life for residents. Multiple City departments are responsible for maintaining trees under the care and control of the City: Board of Public Works Bureau of Street Services/Urban Forestry Division (Public Works); Department of Water and Power (DWP); and Department of Recreation and Parks (RAP). **Collectively, these departments spent approximately \$49 million on tree maintenance activities in FY2017-18.**

“Street trees” are located in parkways (i.e., landscaped areas between the curb and sidewalk) and median islands. Overgrown or damaged street trees present a public safety risk because they can: (1) impede the public right-of-way; (2) cause harm to pedestrians or property as a result of fallen trees/branches or sidewalks buckled by tree roots; or (3) interfere with power lines.

Although many of these trees are considered to be “owned” by the adjacent property owner, the City is responsible for caring for street trees and ensuring the public right-of-way is clear of tree-related hazards.

The City is falling short on caring for the trees that line our streets.

- In 2015, the City rated the health of the street tree population with a “D” letter grade.
- Approximately 30% of trees in the region are at risk of dying in the coming years due to factors such as drought, disease, and pests.
- Street trees in the City were proactively trimmed on a 14- to 18-year cycle in FY2017-18, urban forestry experts typically recommend a 5-year cycle.
- Public Works proactively trimmed only 43,000 of the City’s 600,000 - 700,000 street trees in FY2017-18.
- On average, the City paid approximately \$2.5 million per year in tree-related settlements during the three-year period ending June 30, 2018.
- The City has not conducted a comprehensive street tree inventory since 1996.

Because street trees are such a valuable and visible public infrastructure asset, we reviewed Public Works’ tree maintenance operations. The information and recommendations in this report are intended to assist the City in three critical areas: (1) conducting a citywide street tree inventory; (2) using data to improve street tree maintenance; and (3) potential contracting strategies to meet future needs.

Public Works arborists are responsible for protecting the health of the City’s street tree population and provide a broad range of maintenance services including, but not limited to, tree

trimming, removal, emergency response, and clearance of obstructions. In contrast, DWP's mission is narrow and focused on preventing power disruptions caused by trees near power lines and other equipment.

Many of the same management principles that apply to public infrastructure, such as streets, can be applied to trees. **Generally, regular preventive maintenance is more efficient and maximizes the overall value of the urban forest. A tree that is trimmed or inspected annually requires less time and effort than a tree that is trimmed once every decade. Prolonged periods of deferred maintenance increase the likelihood of tree failure or other conditions that require emergency response, which is often more expensive.**

Public Works' ability to effectively maintain street trees has been challenged during the previous decade. **Over the course of a four-year period beginning in 2009, Public Works' street tree maintenance budget was reduced by almost 40% and nearly all proactive street tree trimming was suspended. Between 2010 and 2012, Public Works' proactive trim cycle exceeded 50 years, which was more than 10 times greater than what is recommended by urban forestry experts.** As the City's financial outlook improved, funding for street tree maintenance has slowly recovered and Public Works has worked to rebuild the City's proactive tree trimming capacity.

These factors, along with environmental factors beyond the City's control, are contributing to the continued deterioration of the City's street tree population. **City Policymakers and Public Works have recently taken important steps to overcome these challenges, however, much work remains.**

KEY ISSUES

We found that Public Works needs to revamp its approach to managing street tree maintenance operations. The lack of basic inventory data and outdated management tools prevented our ability to determine whether the program was operating efficiently and effectively. These issues require urgent action so that the City can make informed decisions to reverse ongoing urban forestry trends.

During the FY2018-19 budget cycle, the City Council approved a proposal to eliminate the use of contractors and hire new in-house crews for proactive tree trimming activities. When fully implemented, Public Works projects the five in-house crews will proactively trim approximately the same number of trees as FY2017-18.¹

Maintaining the current service level (14- to 18-year trim cycle) is not enough. Moving forward, the City should prioritize proactive trimming as much as possible; it will cost the City less in the long term and allows Public Works arborists and tree surgeons to take actions that prevent emergency situations from occurring. Shifting to an in-house model also provides Public Works

¹ Public Works' projection includes trees trimmed using overtime funds authorized by the Council.

managers with increased control and flexibility; different approaches (e.g., prioritizing specific tree species) should be considered and tested to determine whether they increase efficiency.

An urban forestry consultant engaged by City Plants recently completed an assessment of the City's need for a comprehensive management plan.² The consultant estimated that overall urban forestry funding (which includes maintenance of street trees) for Public Works and RAP needs to be increased by \$40 to \$50 million in order to make significant improvements.

As City Policymakers make funding decisions, it should prioritize investment in a citywide street tree inventory and centralized management system so that each additional dollar allocated to the program provides the greatest possible value to Angelenos.

I. Conducting a Citywide Inventory of Street Trees

Street trees, like roadways and sidewalks, are an element of the City's public works infrastructure and require ongoing planning, maintenance, and improvement. To accomplish this, the U.S. Forest Service and American Public Works Association recommend maintaining an inventory of the street tree population.

Public Works gradually stopped maintaining data collected during the 1996 inventory due to staffing constraints, concerns about data reliability, and the burdensome process of manually inputting information from paper records into an obsolete management system.

To ensure that Public Works can develop appropriate maintenance plans and priorities, it urgently needs up-to-date information about its street tree population such as:

- tree location (GIS-based), species, diameter and height, current condition, maintenance needs and priority level, proximity to other infrastructure; and
- impacts of drought, pests, diseases, and the rates at which dead trees are replaced.

Public Works will need to evaluate inventory development opportunities to determine which approach is best suited for collecting data about the City's street tree population. First and foremost, Public Works has opportunities to collect important information each time it dispatches in-house crews or outside contractors to perform street tree maintenance activities. **There are opportunities to supplement these data collection efforts by using technology-based and collaborative strategies.**

- Advanced remote sensing technologies provide an opportunity to collect data that can be used to develop a street tree inventory. LA County officials are exploring the possibility of a pilot study for a hyperspectral & LiDAR-equipped flight to collect and analyze tree-related information in a limited geographic area. **If the project is successful, the City**

² City Plants is a public-private partnership between the City, local non-profit organizations, community groups, residents, and businesses.

should consider initiating its own flight or partnering with the County, other governments in the region, and non-governmental stakeholders.

- New York City has a street tree population that is similar in size to Los Angeles and its Department of Recreation and Parks (NYC Parks) developed its most recent tree census using a combination of in-house staff and volunteers. **Volunteers received training and used mobile applications, online mapping tools, tape measures, and species guides to collect tree data.** In total, more than 2,200 citizens donated 12,000 hours to the effort.
- Each year, DWP and Public Works crews inspect and maintain tens of thousands of street trees. The departments carry out their tree-related missions independently from one another, and street tree inventory/maintenance data remains in departmental silos. **As Public Works develops its plan for an updated inventory of street trees, it should consider partnering with DWP to compile and share street tree data.**

Whichever approach is selected, the City needs to engage in careful planning, execution, and monitoring of the effort.

To address these inventory issues, Public Works should:

Develop a plan to implement a comprehensive street tree inventory system that will support future tree maintenance, planting, removal, and pest and disease mitigation activities.

- a. **Consider using existing software packages** that can provide a cost-effective solution for the necessary data platform, and can leverage mobile technology to support field-based input; and updates and support time/labor input and activity tracking to help identify resources spent on various maintenance activities.
- b. **Present the implementation plan**, recommended platform, and anticipated costs to policymakers and stakeholders to help garner support for its success.

Assess the feasibility of:

- a. **Implementing technology-based strategies** (i.e., hyperspectral imaging and LiDAR) to collect street tree inventory data;
- b. **Partnering with volunteers/other stakeholders** and using mobile technology to develop a street tree inventory program; and
- c. **Improving coordination** with DWP to share street tree data.

Conduct an updated inventory of street trees to account for changes that have occurred since the last citywide inventory was performed in 1996.

Improve processes related to the ongoing collection, monitoring, and management of street tree data to ensure the comprehensive inventory system remains a dynamic, up-to-date resource for Public Works to make informed decisions.

II. Using Data to Improve Street Tree Maintenance

Public Works managers indicated that staff used an in-house system for inventory and work order management until approximately 2011. However, the system was obsolete because it did not integrate with mobile devices and allow crews to update inventory and maintenance records while working in the field. **Currently, Public Works staff use a combination of paper logs and decentralized tracking systems.**

Using a centralized, electronic management system would allow Public Works to improve its operational efficiency and make it easier to track critical information about street tree health and maintenance activities. RAP has made significant progress on this issue and Public Works should consider a similar approach.

An integrated forestry management system becomes increasingly important when resources are limited. Given that the City's street tree maintenance program has been generally reactive in nature, monitoring data would provide current information about conditions in the field and improve Public Works' ability to prioritize specific tree species or locations.

To address these data management issues, Public Works should:

Develop and implement a centralized system to manage its street tree maintenance operations. At minimum, the system should perform the following functions.

- a. **Integrate work order and inventory management** functions in order to streamline tree maintenance and inventory data collection.
- b. **Provide dynamic inventory and maintenance reporting** capabilities, so that managers can use tree data to prioritize maintenance and other urban forestry improvement projects.

III. Potential Contracting Strategies to Meet Future Needs

Public Works is in the process of shifting to an in-house model for proactive tree trimming, however, future needs may compel the City to consider a hybrid approach using some contractors. **Should this scenario emerge, the City should leverage inventory and maintenance data to consider a different contracting approach than it has used in the past.**

The City's contracts for proactive street tree trimming paid contractors a flat rate, whereas some municipalities use a tiered pricing structure that is designed to align unit prices with the specific service being performed (e.g., trimming a palm tree). Setting stipulated prices based on the type

or level of service, as well as having a group of pre-qualified contractors ready to perform on-demand or specialized services, may benefit the City.

To address these contracting issues, Public Works should:

Consider different contracting strategies if City crews need to be supplemented by outside contractors in the future.

- a. **Develop a pool of pre-qualified contractors** that can supplement City crews for on-demand services with stipulated pricing for specific types of trimming services.
- b. **Determine whether a service-specific, multi-tiered pricing structure** would be more beneficial to its overall strategy to maximize proactive trimming services citywide.

CONCLUSION

The health and sustainability of the City's street trees are threatened, and resource constraints have limited the ability to perform proactive maintenance activities within recommended timeframes. These factors place increased importance on how Public Works makes decisions about which trees are prioritized for trimming, removal, planting, and health mitigation activities.

The City should prioritize completion of the first comprehensive inventory of street trees since 1996 and implement a centralized management system to guide Public Works' day-to-day operations. Successful implementation of these core elements will improve the City's ability to develop effective long-term strategies that ensure Angelenos will enjoy the benefits of a vibrant and well-maintained population of street trees.

We would like to thank the Board of Public Works and staff from other City departments for their time and expertise during this review.³

³ A draft of this report was provided to Public Works on October 29, 2018 and we met with Public Works management at an exit conference on November 15, 2018. We considered their comments as we finalized this report for issuance. Public Works' formal response and action plan are included as an appendix to this report.

Background



All publicly and privately owned trees within an urban environment comprise what is typically referred to as an urban forest. A vibrant and well-maintained urban forest can provide significant environmental, social, and economic benefits that improve quality of life for Angelenos.

Figure 1: Benefits of the Urban Forest



A previous tree canopy assessment performed by the U.S. Forest Service estimated there were more than 10 million trees in the City's urban forest.

The entire community – from individuals to businesses to governmental entities – plays an important role in protecting the urban forest. Depending on location, trees can create scenarios that challenge the public and private property ownership framework.

According to the City Attorney, property lines typically extend into the center of the street, meaning trees located in the

public right-of-way are considered to be “owned” by the adjacent property owner. However, the Los Angeles Municipal Code (LAMC) requires the Board of Public Works (Public Works) to take general care of street trees and ensure that the public right-of-way is clear of tree-related obstructions and other hazards.

Trees under the control and care of the City are especially important due to their close proximity to residents, businesses, and property. Many of the same management principles that apply to public infrastructure/assets, such as streets, can be applied to trees. Generally, preventive maintenance results in better outcomes and maximizes the overall value of the urban forest.


City Departments with Tree Maintenance Responsibilities

There are multiple City departments responsible for maintaining trees whether those trees are on public or private property. Those include: (1) trees in the public right-of-way (known as “street trees”); (2) trees in parks; and (3) trees that may impact power lines or other utility infrastructure.

The City dedicates a significant amount of resources to the ongoing maintenance of trees under its care; departments spent approximately \$49 million in FY2017-18. City departments generally carry out tree-related maintenance responsibilities independently from one another. Each department has its own tree-related mission, policies, procedures, equipment, and data.

Figure 2: City Departments with Tree Maintenance Responsibilities



 How to notify City departments of tree emergencies and other maintenance needs



 Tree maintenance staffing and related accomplishments in FY2017 - 18



According to the Public Works, residents or business-owners seeking to have trees in the public right-of-way trimmed for aesthetic or other non-emergency reasons should not submit a request through MyLA311 or the other portals/telephone numbers listed in Figure 2.

Instead, Public Works advises residents or business-owners to: (1) trim the tree at their own expense using a qualified contractor; or (2) wait for the work to be completed by Public Works' proactive tree trimming program.

STREET TREES

Trees located in the public right-of-way, typically referred to as street trees, are a highly visible component of Los Angeles' urban forest. Generally, street trees are those growing in parkways (i.e., landscaped areas between the curb and sidewalk) and median islands.

Figure 3: MyLA311 App

The screenshot shows the 'Tree Emergency' form in the MyLA311 app. The form has a blue header with a back arrow and the title 'Tree Emergency'. Below the header are several input fields: 'Location' with a location pin icon, 'Details' with a list icon, 'Contact Info' with an envelope icon, 'Photo (optional)' with a camera icon, and 'Comments (optional)' with a speech bubble icon. Each field has an 'add' link to its right. At the bottom of the form is a large white text area for a description, also with an 'optional' label. Below the text area are two buttons: a prominent orange 'SUBMIT' button and a blue 'CANCEL' button.

Figure 4: Street Trees in Parkway (left) and Median Island (right)



Source: City of Los Angeles Complete Streets Design Guide

The City's street tree population is both vast and diverse. **An inventory conducted in 1996 estimated that there were approximately 700,000 trees along 6,500 centerline street miles and more than 900 different species, each with its own characteristics and benefits.**

Figure 5 lists the City's most common street trees (based on the 1996 inventory), and some of their key characteristics.

Figure 5: Most Common Street Trees in the City



Crape Myrtle
Grows up to 25 ft.
Lives up to 150 years
Medium branch strength



Mexican Fan Palm
Grows up to 100 ft.
Lives up to 150 years
Medium branch strength



American Sweetgum
Grows up to 80 ft.
Can live more than 150 years
Medium branch strength



Southern Magnolia
Grows up to 80 ft.
Can live more than 150 years
Medium branch strength



Indian Laurel Fig
Grows up to 35 ft.
Lives up to 150 years
Weak branch strength



Jacaranda
Grows up to 50 ft.
Lives up to 150 years
Weak branch strength

However, this data may no longer be accurate because City has undergone significant changes such as continued residential and commercial development, increasing population density, and climate change. Given these factors and the health issues described below, the current street tree population may be closer to 600,000.

Threats to the Urban Forest and Street Trees

Unfortunately, the health and sustainability of the City's urban forest and street trees are threatened. **Experts from the U.S. Forest Service and City arborists estimate that approximately 30% of trees in the region are at risk of dying in the coming years.** Several years of drought conditions have weakened the City's trees, making them more susceptible to diseases and pests.

For example, a bacteria known as Xylella, which affects host plants by invading their water conducting system, is increasingly affecting City trees. The Shot Hole Borer, a type of beetle, is also causing widespread harm to Los Angeles' trees. This beetle drills into trees and spreads a pathogenic fungus, which grows and spreads throughout the susceptible tree.

Figure 6: Tree Damage Caused by Xylella (left) and Shot Hole Borer (right)



Source: L.A. County Agricultural Commission



Source: University of California Cooperative Extension

In its **2015 State of the Street Trees** report, the City rated the health of the street tree population with a **“D” letter grade.**⁴ Data provided by the City shows that [as of July 2018] there were nearly 5,200 pending dead street tree removal cases, with some including more than one tree. Reductions in the number of street trees will reduce the level of community, health, and economic benefits. Data from an outdated inventory indicates that there are more than 120,000 vacant tree planting sites or vacant tree wells along City streets.⁵

⁴ To reach this conclusion, Public Works arborists performed random tree inspections and assessed factors such as canopy volume, foliar color, amount of dry wood, presence of pests, structural deficits, and trunk condition. In addition, Public Works consulted arboriculture experts.

⁵ Tree wells are defined tree planting sites in the public right-of-way.

Figure 7: Dying Street Tree (left), Dead Street Tree (center), and Vacant Tree Wells (right)



THE CITY'S STREET TREE MAINTENANCE PROGRAM

Overgrown or damaged street trees can impede the public right-of-way. The City's practice is to provide various tree maintenance services, including emergency response for hazardous trees, tree trimming, and tree removal.

The Public Works Bureau of Street Services/Urban Forestry Division is responsible for providing street tree maintenance services to mitigate tree-related risks. **This includes clearing trees that are obstructing vehicle traffic or pedestrians and addressing tree hazards that could injure a member of the public or cause property damage.**⁶

Caring for street trees is complex, as trees are living infrastructure which present a variety of maintenance challenges. To properly care for street trees, and the urban forest as a whole, the City must consider several resource and operational factors. Key components of a comprehensive urban forestry maintenance program for public trees include:

- an up-to-date tree inventory which provides information about tree locations, species, size, health, maintenance needs, and other conditions;
- a strategy for determining the desired level of maintenance, and the funding needed to achieve that level of service;
- a management plan that establishes clear priorities, and addresses tree care and community needs; and

⁶ According to data provided by the City Attorney, the City paid approximately \$7.7 million in tree-related settlements during a 3-year period ending 6/30/2018.

- ongoing maintenance to ensure trees are healthy, and to mitigate any risks posed to persons and property.

Generally, tree trimming activities can be categorized as either emergency trimming, crown thinning, crown raising, or crown reduction.⁷ The figure below describes these techniques and objectives.

Figure 8: Examples of Tree Trimming Techniques



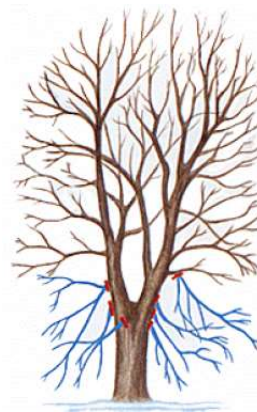
Emergency Trimming

Objective: Remove branches at risk of falling and causing harm to persons or property



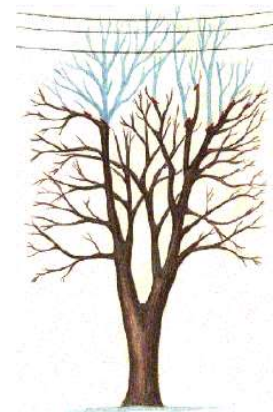
Crown Thinning

Objective: Remove a limited number of branches throughout the crown to allow for increased light penetration and air movement



Crown Raising

Objective: Remove branches from the bottom of the tree crown to provide clearance for pedestrians and vehicles



Crown Reduction

Objective: Remove branches on a tree that has grown too large for the surrounding space, resulting in an overall reduction in tree size

Source: U.S. Forest Service

Public Works takes a risk management approach to street tree trimming, and the primary objective is public safety. At minimum, Public Works seeks to ensure that street trees meet the sidewalk and street clearance requirements outlined in the LAMC. Those clearance requirements are:

- 13 feet, 6 inches over portions of State highways and major streets improved, designed, or ordinarily used for vehicle traffic;
- 11 feet over portions of local streets improved, designed, or ordinarily used for vehicular traffic; and
- 9 feet over the sidewalk and parkway area of all streets.

⁷ The crown includes the branches and leaves above the trunk which make up the tree's foliage.

However, the type of tree maintenance performed by Public Works varies based on the situation. For example, a crew responding to a tree-related emergency will have different objectives than a crew that is performing scheduled, planned trimming activities.

Proactive and Reactive Street Tree Trimming

Urban forestry managers often consider the economic costs and benefits of maintaining a street tree as it matures through different phases of its lifecycle. **Like other infrastructure or asset management activities (e.g., street paving), prolonged periods of deferred maintenance increase the likelihood of tree failure or other conditions that require emergency response.**

Proactive Street Tree Trimming

One of the most essential urban forest maintenance activities is proactive street tree trimming. Proactive trimming can generally be characterized as planned, scheduled preventive maintenance. **Forestry experts with the International Society of Arboriculture (ISA) advise that proactive tree trimming leads to more efficient tree management activities and greater overall value of the tree population.⁸**

When designing a maintenance program, decision makers must consider available resources and determine the following: which trees to trim; how much to trim; when to trim; and how long to trim for. **Generally, trees that are trimmed frequently will require less time and maintenance than trees that are rarely trimmed.**

Public Works performs proactive street tree maintenance using a zone-based approach; crews trim all or most of the trees within a designated geographic area. An advantage of zone trimming is that the work is planned, and equipment and staff are mobilized to trim the entire zone, allowing for increased productivity compared to an emergency response for individual incidents.

If properly executed, proactive street tree trimming provides benefits such as:

- lower maintenance costs;
- reduced risk of falling trees and branches;
- increased clearance over pedestrian and vehicle paths;
- improved tree structure and aesthetics; and
- general improvement that extends the life of a tree.

Specific trimming frequency may vary based on species and age; however, a best management practice is to trim street trees on a 5-year cycle. The ability to adhere to this cycle is contingent on the availability of adequate funding and resources.

⁸ The ISA is an international association dedicated to arboriculture research, technology, and education.

Reactive Tree Trimming

Reactive tree trimming generally consists of crews responding to reported tree hazards and right of way obstructions. **Reactively responding to tree hazards, while necessary to ensure public safety and a passable right-of-way, is less efficient because crews must respond to tree hazards one-by-one throughout the City.**

In-House and Contracted Street Tree Trimming

In FY2017-18, Public Works maintained street trees using a combination of in-house crews and outside contractors. **In-house crews typically performed reactive tree maintenance and primarily responded to customer service requests (via MyLA311) which notify the City of tree hazards that pose some form of risk to persons or property.** In-house crews provided coverage to a specific geographic area and responded to the scenarios as described below.

Tree Emergencies: A tree's condition is an imminent danger to the public, e.g., a tree limb may be broken and at risk of falling onto a person or property.

Tree Obstructions: A tree is obstructing traffic or pedestrian safety signs or signals, representing a danger to the public.

Tree Inspections: A customer request to evaluate the safety or condition of a street tree. Public Works staff will determine an appropriate course of action.

Proactive tree trimming was primarily performed by outside contractors. Public Works selected contractors using a competitive procurement process and assigned work through the zone trimming process described above. During the last three fiscal years, five contractors (with a total of nine contracts) held exclusive operating agreements for defined geographic areas spread across 15 City Council Districts.⁹ Public Works staff were assigned to monitor the work of outside contractors, and ensure the work was performed in accordance with contractual requirements.

Public Works crews performed some proactive tree trimming on weekends using overtime funds, as allocated by City Council. This program, referred to as "On Demand" trimming, allows Council offices to select specific areas or trees within their respective district for tree trimming. The program's resources were distributed equally across Council Districts. The table below provides additional details about in-house Public Works crews.

⁹ The following contractors performed proactive street tree trimming during this period: Mariposa Landscapes, Inc.; Thrifty Tree Service, Inc.; Trimming Land Co., Inc.; United Pacific Services, Inc.; and West Coast Arborists, Inc.

Figure 9: Public Works Tree Trimming Crews and Responsibilities (FY2017-18)

<p>Yard (5 City Crews)</p>	<ul style="list-style-type: none"> • Respond to tree-related emergencies • Inspect street trees to determine maintenance and removal needs • Based in one of five field locations throughout the City
<p>Program (2 City Crews)</p>	<ul style="list-style-type: none"> • Mechanized crews with specialized, heavy equipment • Respond to larger and more difficult tree maintenance projects • One crew stationed in the north region, and one in the south region
<p>Inspection/Claims (1 City Crew)</p>	<ul style="list-style-type: none"> • Oversees and approves the work of Public Works' tree trimming contractors • Investigates trees associated with liability claims against the City
<p>Proactive Tree Trimming (1 City Crew)</p>	<ul style="list-style-type: none"> • Dedicated to proactive, non-emergency tree trimming • Crew became fully operational in September 2018 • Prior to September 2018 staff in this crew were assigned to existing yard and program crews due to a lack of equipment

Work performed by in-house crews and outside contractors must adhere to industry standards for tree care established by ISA and the American National Standards Institute (ANSI).¹⁰ **These standards include technical tree trimming guidance to ensure work performed promotes tree health and results in safe, structurally sound trees, contributing to the overall health of the urban forest.**

Public Works Street Tree Maintenance Productivity

Based on the annual rate at which Public Works proactively trims street trees, a tree would be trimmed once every 14 to 18 years, significantly longer than the best management practice of five years.¹¹ In FY2017-18, Public Works proactively trimmed approximately 43,000 street trees at a cost of approximately \$215 per tree.¹² During the same period, Public Works responded to approximately 11,400 tree emergencies at a cost of \$540 per incident.

¹⁰ ANSI is a not-for-profit institute which develops and accredits industry standards.

¹¹ This range was calculated to account for the possibility that the actual street tree population is closer to 600,000.

¹² This cost estimate includes proactive street tree trimming activities performed by both City crews and outside contractors. The average unit price for trees proactively trimmed through General Fund contracts was \$177.

Figure 10: Snapshot of Public Works Street Tree Trimming Activities (FY2017-18)¹³

In contrast, DWP spent approximately \$114 to trim each tree during FY2017-18.¹⁶ Although DWP's tree-related mission is different than Public Works, the lower per-tree cost demonstrates an important concept. **Trees maintained by DWP will inherently require less maintenance because the trees near power lines are inspected or trimmed on an annual basis, compared to a street tree that Public Works may not have trimmed in more than a decade.**

Public Works also performs other maintenance activities beyond those listed in Figure 10. These include maintaining vegetation in median islands, removing dead trees, supporting the City's sidewalk repair program, and managing a green waste center which recycles plant waste generated by tree-related operations.

Funding for Street Tree Trimming Activities

Beginning in 2008, budget constraints reduced Public Works' ability to care for street trees. **Like many of the City's infrastructure maintenance programs, funding for proactive street tree trimming was significantly reduced.** During that time, Public Works primarily focused on emergency response, the removal of dead, dying, or hazardous trees, and the pruning of foliage obstructing traffic control devices.

The figure below provides historical context about how the financial downturn impacted Public Works' overall street tree maintenance budget (green bars) and proactive trim cycle (blue line). **Between 2010 and 2012, the proactive trim cycle exceeded 50 years, which was more than 10 times greater than what is recommended by urban forestry experts.**

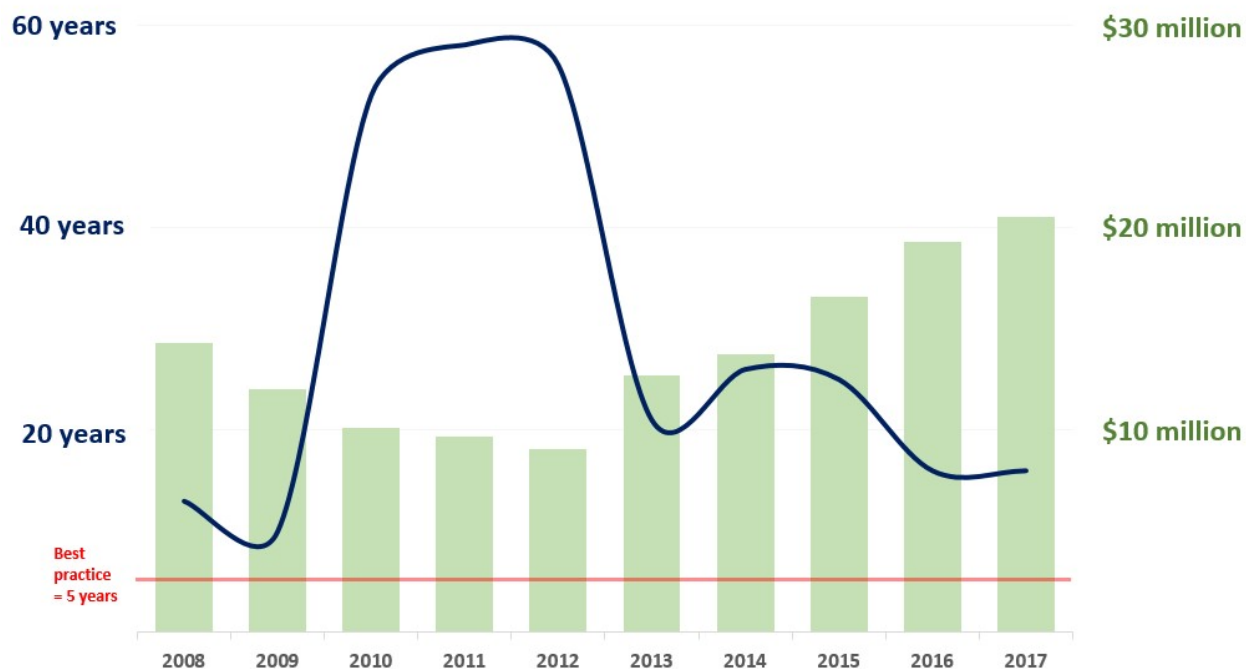
¹³ Business Improvement Districts, which are geographically defined districts throughout the City, can also provide tree trimming services within their business district. Business Improvement District activities are funded through special assessments paid by district members.

¹⁴ Trees trimmed by City crews include clearing tree obstruction, On Demand tree trimming, and some discretionary trimming by City crews.

¹⁵ This amount includes 5,497 trees trimmed by contractors using revenues from SLMAF. Public Works manages tree trimming contracts funded by SLMAF.

¹⁶ This amount includes a limited amount of non-trimming activities, such as tree and stump removal.

Figure 11: Public Works Street Tree Maintenance Budget and Proactive Trim Cycle

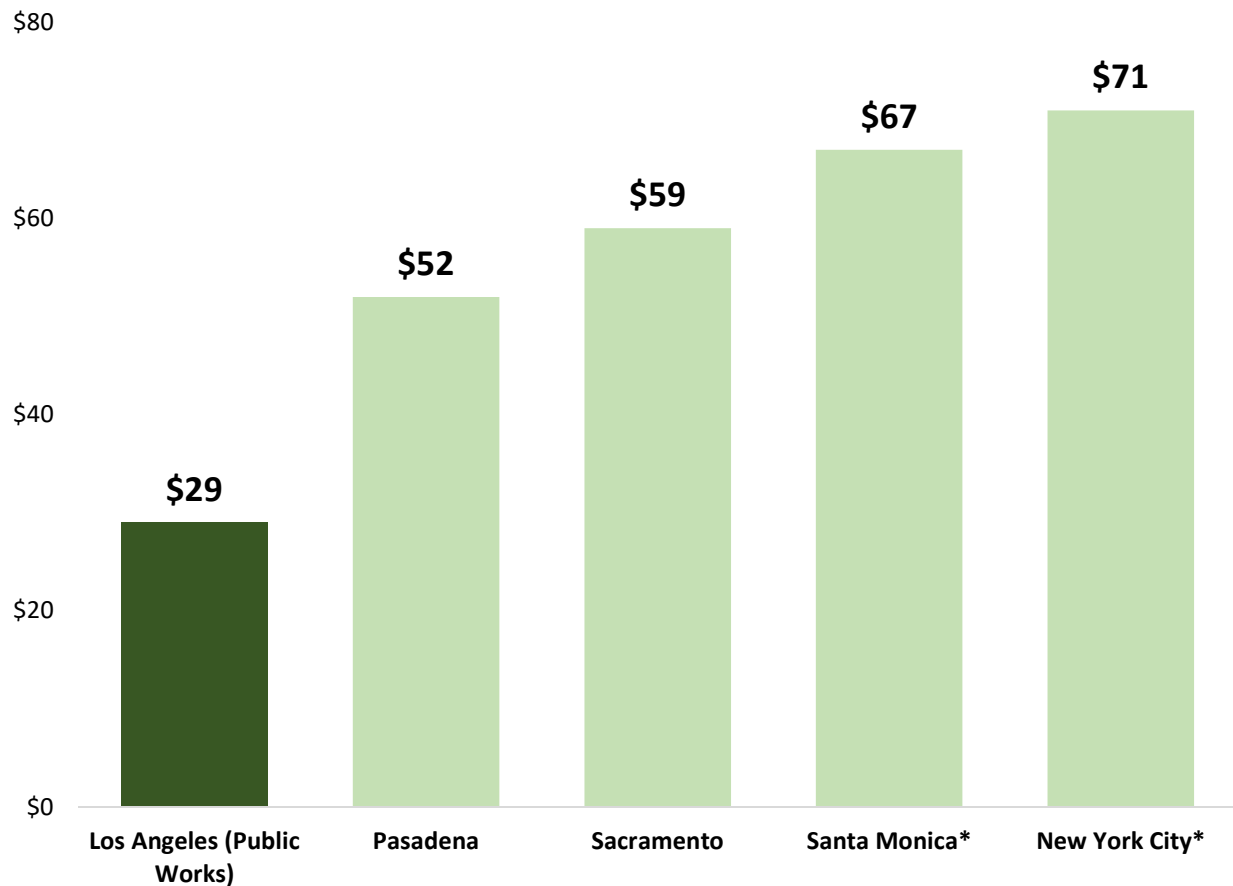


Source: Based on Adopted City Budgets (direct costs from FY2008-09 to FY2017-18) and Public Works Tree Trimming Data

As the City's financial outlook improved, funding for tree trimming activities has slowly recovered and Public Works has worked to rebuild the City's proactive tree trimming capacity. However, this prolonged period of deferred maintenance, combined with environmental factors beyond the City's control, are contributing to the continued deterioration of the City's street tree population.

In FY2017-18, the City spent approximately \$20 million on street tree maintenance activities, with approximately \$9 million spent on proactive street tree trimming; and \$11 million on reactive tree maintenance work.¹⁷ However, when considering the size of the jurisdiction, the City spent significantly less on tree maintenance on a per-tree basis than other cities such as New York, Santa Monica, Pasadena, and Sacramento.

¹⁷ The overall amount spent includes indirect overhead costs such as fringe benefits and departmental administration and support costs. The cost of proactive tree trimming services was calculated using contractor payment data and Public Works employee labor costs, as activities charged to defined work orders. The average annual amount of contract payments, based on the last three fiscal years, was \$4.8 million, while \$3.5 million was incurred by internal crews. An additional \$1 million of contracted tree trimming was performed using SLMAF revenues.

Figure 12: Los Angeles (Public Works) Per Street Tree Spending vs. Other Cities¹⁸

* The urban forestry programs in these cities maintain both street and park trees. The estimate for Santa Monica includes 34,500 trees, of which 5,000 are in parks. The estimate for New York includes 806,000 trees, of which 140,000 are park trees.

A Program in Transition

During the FY2018-19 budget cycle, the City Council approved a proposal to eliminate the use of contractors and hire new in-house crews for proactive tree trimming activities. The Public Works plan includes hiring four new crews and activating the existing in-house crew for proactive street tree trimming services. When fully implemented, Public Works projects the five in-house crews will proactively trim approximately the same number of trees as FY2017-18.¹⁹

Maintaining the current service level (14- to 18-year trim cycle) is not enough. **Moving forward, the City should prioritize proactive trimming as much as possible; it costs less and allows Public Works arborists and tree surgeons to take actions that prevent emergency situations from**

¹⁸ Per-tree funding estimates are based on interviews with other cities and publicly available reports about urban forestry programs.

¹⁹ Public Works' projection includes trees trimmed using overtime funds authorized by the Council.

occurring. Shifting to an in-house model also provides Public Works managers with increased control and flexibility to develop new strategies that may reduce the current trim cycle. Alternatives to the zone trimming approach (e.g., prioritizing specific tree species or age groups) should be considered and tested to determine whether they increase efficiency.

Other ongoing developments may also impact how the City approaches urban forestry management. For example, a consultant engaged by City Plants recently completed an assessment of the City's need for a comprehensive urban forestry management plan.²⁰ The assessment included a review of the City's urban forest-related governance structure, benchmarking analysis, and identification of current successes and challenges.

The consultant estimated that overall urban forestry funding (which includes maintenance of street trees) for Public Works and RAP needs to be increased by \$40 to \$50 million in order to make significant improvements. **As City Policymakers make funding decisions, they should prioritize investment in completion of a citywide street tree inventory and centralized management system so that each additional dollar allocated to the program provides the greatest possible value to Angelenos.**

In addition, the City is planning to hire a citywide urban forestry coordinator within the Board of Public Works. **This position is intended to be a professional with policy and technical expertise to potentially improve coordination across City departments and provide decision makers with advice on how to improve the delivery of urban forestry services.**

This report and its related recommendations are intended to assist the City as it moves forward in reorganizing its approach to street tree maintenance.

²⁰ City Plants is a public-private partnership between the City, local non-profit organizations, community groups, residents, and businesses.

I. Conducting a Citywide Inventory of Street Trees



Street trees, like roadways and sidewalks, are an element of the City’s public works infrastructure, and require ongoing planning, maintenance, and improvements. **To effectively carry out these tasks, Public Works needs reliable data to make strategic decisions about the street tree population.**

Organizations such as the U.S. Forest Service, the American Public Works Association, and the California Department of Forestry and Fire Protection (CAL FIRE) recommend developing and maintaining an inventory of street trees. Without data, it is difficult to develop action or resource plans to address maintenance needs.

The City Needs to Develop and Maintain an Inventory of Street Trees

Public Works completed its last comprehensive street tree inventory more than two decades ago (1996). They previously managed the inventory through the Urban Forestry Management System (UFMS), which was an internally-developed inventory and work management system. However, updating data in UFMS required Public Works staff to input information based on paper records generated in the field by tree maintenance crews.

Public Works management indicated that the division gradually stopped updating UFMS in approximately 2011 due to staffing reductions and the burdensome process of manually inputting data from paper records into the obsolete system.²¹ Management also had concerns about the quality and consistency of street tree inventory updates even prior to 2011.²²

In its 2015 *State of the Street Trees* report, Public Works highlighted this, noting that “an up-to-date and accurate street tree inventory is critical for street tree management” and “technology improvements allow for more efficient data collection and management.” **Public Works requested \$400,000 in funding during the FY2018-19 budget cycle to begin preliminary development of a modern, cloud-based, public-facing street tree inventory, but the request was not approved.**

Analyzing street tree data and other trends can assist forestry managers in determining where to focus limited resources and which trees should be removed, treated, or planted. Given the unique drought, pest, and disease factors impacting the City’s street tree population, the use of inventory data would be also be critical in supporting the development of both a comprehensive forestry management plan, and neighborhood-specific forestry management strategies.

²¹ Between FY2009-10 and FY2010-11, budgeted positions for Public Works’ Urban Forestry Division dropped from 207 to 109.

²² Some of the street tree inventory data was eventually migrated to the Navigate LA platform managed by the Bureau of Engineering. Navigate LA is a web-based mapping application that provides maps/reports based on data provided by various City departments, Los Angeles County, and other organizations.

Beyond conducting the inventory, Public Works needs to ensure that it has appropriate technology and processes in place to ensure that the inventory is dynamic and reflects the ongoing changes to the urban forest.

Potential Strategies for Developing an Updated Street Tree Inventory

The 1996 street tree inventory was performed by a contractor using a conventional field survey approach. Public Works estimated that the one-time cost of developing an updated using a similar strategy would be \$3 million. Different solutions will carry different price points.

Whichever approach is selected, the City should consider seeking funding from external sources that emphasize the importance of up-to-date tree inventories. For example, the City's Recreation and Parks Department (RAP) obtained a grant from CAL FIRE to develop an inventory of park trees.

Beyond developing an inventory, Public Works will need to implement a system to manage the data. Today, several urban forestry consulting firms offer off-the-shelf tree inventory systems at low price points to assist government clients with the collection and management of tree data. RAP uses such a system, as described in Section II of this report.

Conducting a street tree inventory requires careful planning, execution, and monitoring by qualified staff. This is especially true for the City of Los Angeles given the size and diversity of its street tree population. A street tree inventory should collect, at minimum, the following data points and information:

- location (using geographic information [GIS] systems data);
- species;
- diameter and height;
- condition;
- insect and disease concerns;
- maintenance needs and priority level;
- proximity to assets which could be impacted by the tree, such as utility lines, traffic signs, or traffic control devices; and
- potential tree planting sites.

Public Works will need to evaluate inventory development opportunities to determine which approach is best suited for collecting data about the City's street tree population. First and foremost, Public Works has opportunities to collect important information each time it dispatches in-house crews or outside contractors to perform street tree maintenance activities.

These efforts should be supplemented by technology-based solutions or other tree survey strategies that have been successfully implemented in other jurisdictions. In addition, there may be opportunities for Public Works to improve its operations by sharing data with DWP.

1. Technology-based solutions

Because large-scale field surveys can be time-consuming, urban forestry professionals often use aerial photographs or satellite images to collect tree-related data. This “top-down” approach has historically been used to collect information about tree quantity and canopy coverage. However, standard aerial imaging lacks the precision needed to accurately identify characteristics such as tree species, height, and condition; **most healthy trees simply appear as green spots when viewed from the sky.**

Advanced remote sensing technologies provide an opportunity to efficiently collect data that can be used to identify street trees and develop an inventory. Trees and vegetation emit energy/radiation cannot be seen along the visible spectrum. Characteristics unique to each species, such as chlorophyll content, carries its own spectral value. Hyperspectral imaging uses high-resolution sensors to map data along the full spectrum of reflected light, both visible and invisible to the human eye. Topography and characteristics such as tree height, shape, and structure can be detected through LiDAR (Light Detection and Ranging), which uses a laser to measure variable distance to the Earth.

Beyond collecting data to develop an updated a street tree inventory, the technology-based solutions described above can be used to: (1) address larger urban forestry issues (e.g., trees affected by disease or pests); or (2) collect vast amounts of other data (e.g., location of permeable surfaces) that fall within the City’s larger policy and planning goals.

LA County officials are exploring the possibility of a pilot study for a hyperspectral & LiDAR-equipped flight to collect tree-related information in a limited geographic area. The study would include processing and analysis of the collected imagery. **If the project is successful, the City should consider partnering with the County, other governments in the region, and non-government stakeholders to initiate a hyperspectral & LiDAR flight.**

It may be possible to initiate a shared approach to this project through the Los Angeles Region Imagery Acquisition Consortium (LAR-IAC) Program. LAR-IAC is a collaborative acquisition program for digital aerial imagery data which includes multiple municipalities, County departments, and public agencies. However, LA County officials stated that the plan for the next LAR-IAC flyover (scheduled for 2020) does not currently include hyperspectral sensors.

2. Partnerships with volunteers and other stakeholders

A “bottom-up” approach to developing an inventory typically uses urban forestry staff, contractors, or volunteers (or combination thereof) to collect field data by assessing individual trees within a defined geographic area. Thanks to advancements in technology and the growing use of mobile applications, local governments have opportunities to partner with citizen groups and non-profit organizations.

New York City has a street tree population that is similar in size to Los Angeles and its Department of Recreation and Parks (NYC Parks) developed the “TreesCount! 2015” census using a combination of in-house staff and volunteers.

Volunteers received training and used online mapping tools, tape measures, and species guides to collect tree data. **In total, more than 2,200 citizens supplemented NYC Parks staff in collecting tree data, donating 12,000 hours to the effort.** Listed below are important steps NYC Parks took in developing their most recent street tree inventory.

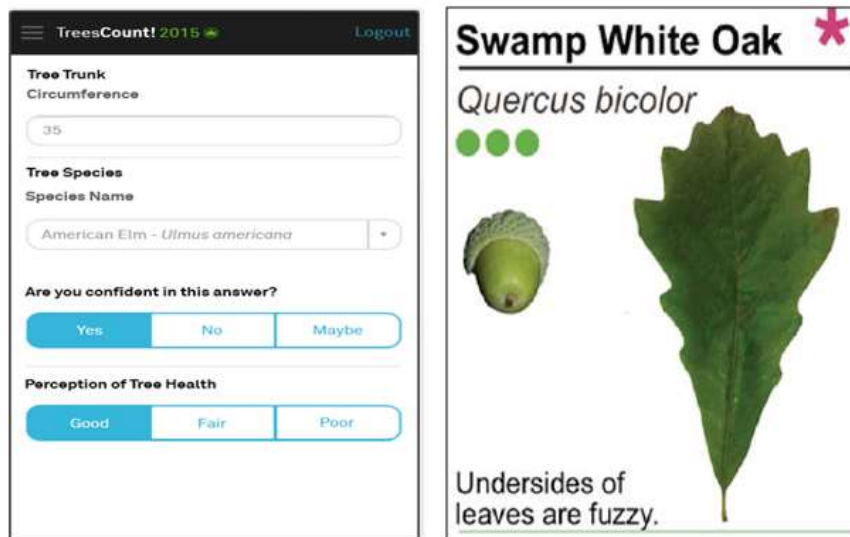
Mobile Application Development: Partnered with a local non-profit and a software company to develop a web-based mapping and data collection tool. The application was designed to collect standardized, consistent data from non-technical volunteers. The total cost to develop this application was approximately \$410,000.

Volunteer Training: Volunteers received extensive training on how to use the mapping and data collection features of the mobile application, identify tree species, measure tree dimensions, and what to look for when evaluating tree health.

Data Quality Management: Developed a data vetting process to ensure the quality of volunteer-collected information. Tree location and characteristics were reviewed for reasonableness. Some errors were fixed in real time, and the department’s analysis of quality assurance data helped staff refine its training programs.

Corporate Sponsorships: Recruited corporate sponsors and other organizations to provide support for the effort, including businesses such as BMW and Whole Foods. For example, BMW donated 20 electric vehicles to provide transportation for staff/volunteers.

Figure 14: Data Collection Tool and Volunteer Training Material



NYC Parks reported that, in total, more than 90% of the data collected for the tree census was collected using a mobile device.

Tree census data was used to launch the [New York City Street Tree Map](#), an interactive map which allows citizens to learn about the city’s street trees.

More importantly, the inventory data now serves as the baseline for NYC Parks’ forestry management database, and informs short- and long-term operational decision making.

3. Improved Data Sharing and Collaboration by City Departments

Each year, DWP and Public Works crews inspect and maintain tens of thousands of street trees. The departments carry out their tree-related missions independently from one another, and street tree inventory/maintenance data remains in departmental silos.

DWP currently maintains a Microsoft Access database with basic information such as tree location and the electric infrastructure adjacent to the tree. Because each tree is inspected or trimmed annually to ensure adequate clearance from power lines, DWP does not capture details about maintenance activities in its centralized database.

As Public Works develops its plan for an updated inventory of street trees, it should consider partnering with DWP to compile and share street tree data. Even though the roles of the departments differ, the sharing of tree inventory and maintenance data could reduce duplicative efforts. For example, DWP's annual assessment of street trees could inform tree data maintained by Public Works, and vice versa. This would allow both departments to repurpose information which has already been generated.

In addition, the sharing of any tree health, maintenance, and inventory data by the departments could provide a wealth of valuable information that the City's arborists can use to tailor future urban forestry management strategies. Given the amount of effort that the City's tree experts put in each year to monitor and evaluate the health of trees in Los Angeles, every effort should be made to use the information in order to develop the most complete picture possible of Los Angeles' urban forest needs.

Recommendations

To address these inventory issues, Public Works should:

1. **Develop a plan to implement a comprehensive street tree inventory system** that will support future tree maintenance, planting, removal, and pest and disease mitigation activities.
 - a. **Consider using existing software packages** that can provide a cost-effective solution for the necessary data platform, and can leverage mobile technology to support field-based input; and updates and support time/labor input and activity tracking to help identify resources spent on various maintenance activities.
 - b. **Present the implementation plan**, recommended platform, and anticipated costs to policymakers and stakeholders to help garner support for its success.
2. **Assess the feasibility of:**
 - a. **Implementing technology-based strategies** (i.e., hyperspectral imaging and LiDAR) to collect street tree inventory data;

- b. **Partnering with volunteers/other stakeholders** and using mobile technology to develop a street tree inventory program; and
 - c. **Improving coordination with DWP** to share street tree data.
3. **Conduct an updated inventory of street trees** to account for changes that have occurred since the last citywide inventory was performed in 1996.
4. **Improve processes** related to the ongoing collection, monitoring, and management of street tree data to ensure the comprehensive inventory system remains a dynamic, up-to-date resource for Public Works to make informed decisions.

II. Using Data to Improve Street Tree Maintenance



Maintenance of street trees, like other public infrastructure assets which require ongoing maintenance and monitoring, benefits from centralized tools to effectively manage how work is assigned, performed, and monitored. Reliance on paper records and fragmented processes related to data collection prevent the ability to take a comprehensive, data-driven approach to caring for street trees.

An electronic management system can facilitate the efficient allocation of work, develop a record of a tree's maintenance history, and allow for ongoing analysis of crew costs and operations. The importance of these tools are magnified when there are limited resources and extended trim-cycles. For example, strategic decisions should be made about which trees to trim *before* they pose a threat to public safety and require emergency response.

Public Works Needs to Improve Management of Tree Maintenance Data

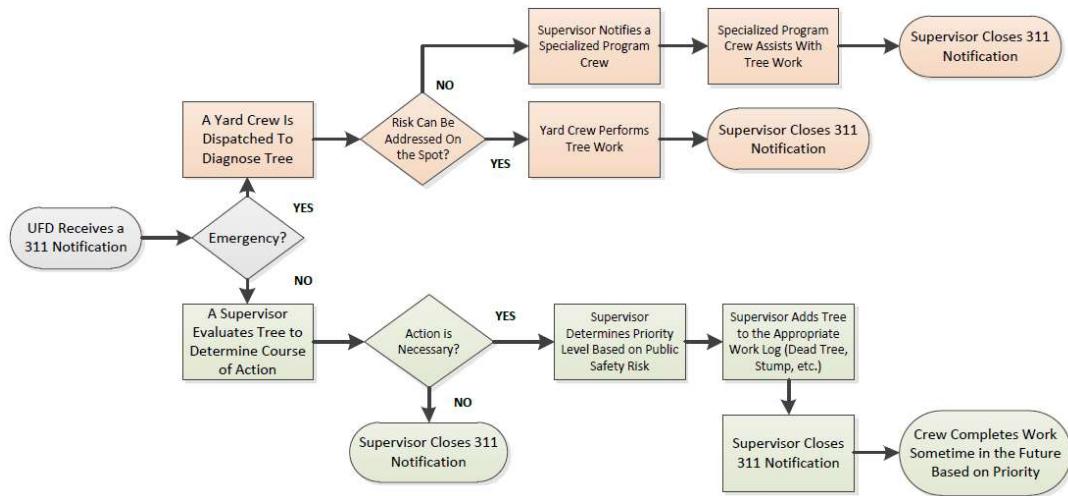
Public Works does not currently have a centralized work order management system to receive, assign, and track street tree trimming activities. Bureau management explained that prior to approximately 2011, in-house staff used the UFMS system for work order management. UFMS was also used by Public Works staff to manage the street tree inventory, last updated in 1996. However, tracking UFMS work order data required staff to manually input information at the end of a shift, as staff did not have the ability to update information in real time with web-based tablets or other mobile devices.

Currently, Public Works' primary tool for service notification management is MyLA311, the City's centralized customer relations management system. MyLA311 provides a single portal for residents to report and view all of their service requests, and functions as the notification intake tool for services ranging from parks maintenance to sidewalk repair. For street tree maintenance, residents can report a tree emergency, report an obstruction, or request an inspection.

Public Works' primary goal is to ensure street trees do not pose a threat to public safety. Service requests related to tree emergencies are the division's top priority; liability risk increases when the City is notified of a high risk tree, but does not take action to address a public safety issue. The Bureau's Yard Crews and more specialized Program Crews, which are based in maintenance yards throughout the City, usually respond to tree emergencies within one day.

Public Works also receives requests or independently identifies the need for non-emergency tree maintenance needs such as tree inspections, dead tree removals, and stump removals. See Figure 14 for an overview of how Public Works crews typically respond to service requests.

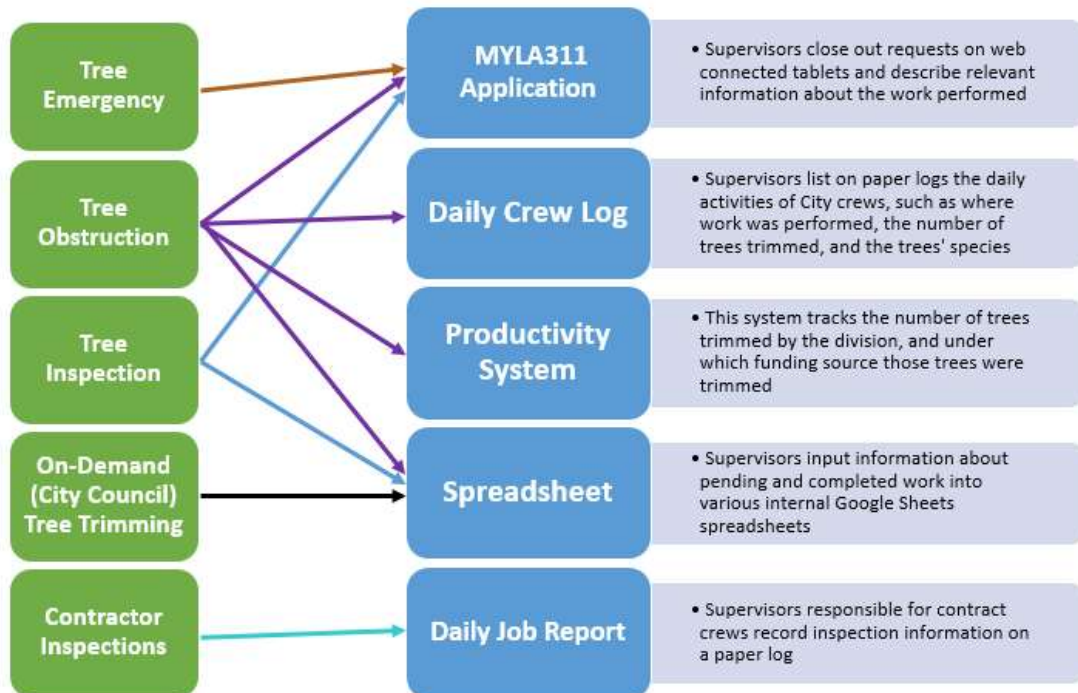
Figure 14: Summary Public Works Crew Response Process



Since MyLA311 is a service notification system, and not a work order management system designed for urban forestry management, Public Works must track tree trimming activities using multiple logs and systems. Non-emergency tree trimming activities like On Demand (City Council requests), dead tree removals, stump removals, and oversight of contract tree trimmers, are tracked outside of the MyLA311 system.

The figure below describes the systems and logs used to track the various tree trimming and maintenance activities performed by Public Works and its contractors.

Figure 15: Tracking Mechanisms for Public Works Tree Maintenance Activities



The ability to use a centralized, electronic forestry management system to assign and monitor tree maintenance projects could improve the Bureau’s efficiency, and make it easier to analyze data. Importantly, none of Public Works’ tracking mechanisms connect to an up-to-date and reliable street tree inventory. This contributes to reliance on paper records to track tree trimming activities. It also means valuable data collected by Public Works staff is not contributing to a central, computerized maintenance record, which could track the maintenance history of individual street trees.

Public Works’ lack of an integrated forestry management system also creates missed opportunities to collect data about the condition of the street tree population. Each year, Public Works staff evaluate the condition of thousands of trees. **While Public Works keeps a record of these evaluations, employees’ observations about tree health, other tree characteristics, whether new trees have been planted, or whether trees have been removed, do not contribute toward a current tree inventory.**

A Roadmap for Implementing a New Forestry Management System

Public Works management indicated that they would like to conduct a new street tree inventory, and implement a new inventory management system which would allow staff in the field to update inventory records without cumbersome paperwork and administrative processes. **Ideally, Public Works should have a forestry management system that streamlines workload management and the collection of tree maintenance and inventory data.** The system should also have the ability to generate reports about inventory condition or maintenance trends.

UFMS, the system previously used for inventory and work order management, was developed in house by Public Works staff. However, multiple off-the-shelf forestry management systems are available to government entities and some municipal urban forestry divisions use their citywide infrastructure asset management system for street tree management.

In 2013, RAP’s Forestry Division purchased an off-the-shelf forestry management system, at a cost of approximately \$10,500 for five years, and included 10 hours of technical support per year. RAP staff worked with the vendor to customize certain features to better suit the needs of a park tree maintenance program.

RAP’s Forestry Division managers stated that the system has been an effective management tool. **RAP’s system integrates work order and inventory management, and staff can access the system in the field with internet connected tablets and smartphones, reducing RAP’s reliance on paper-based processes.**²³ This allows RAP’s tree maintenance staff to continuously update the inventory while they conduct maintenance on park trees. While RAP does not currently have

²³ RAP’s system does not integrate MyLA311 customer request data. RAP staff must manually input 311 request data into its work order system upon receipt.

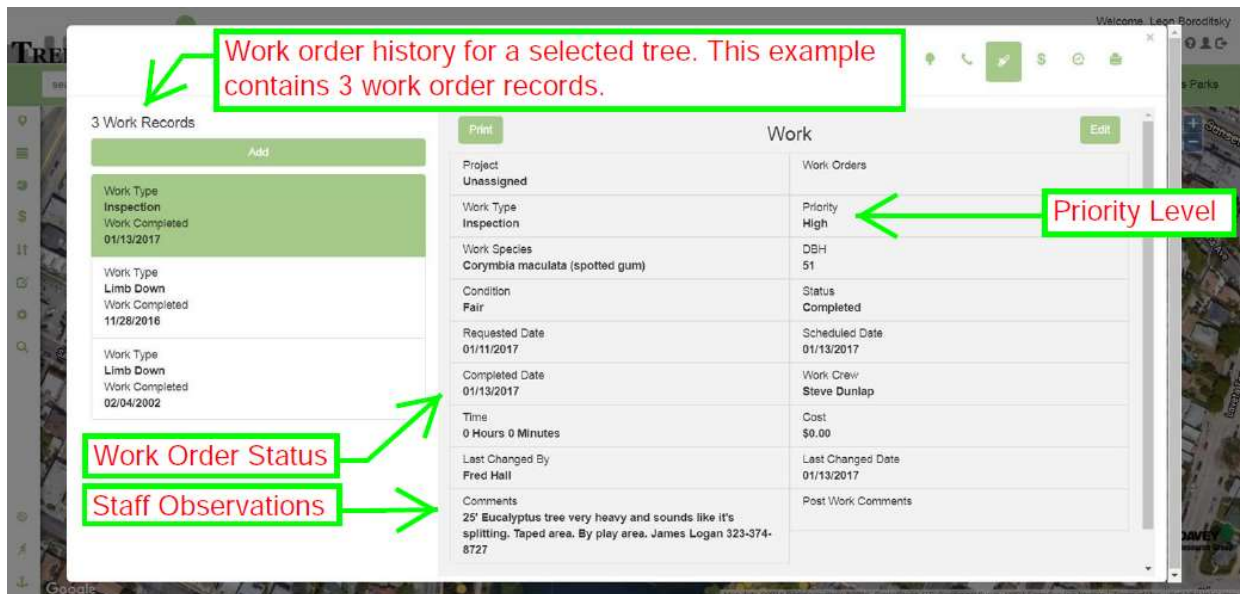
active tree trimming contracts, department representatives indicated they will be able to use the system to also track any work performed by contractors.

The figures below show selected inventory and work order management capabilities of the RAP forestry management system.

Figure 16: RAP's Interactive Tree Map for Echo Park



Figure 17: RAP's Work Order Management Screen



RAP's implementation of a forestry management system complements its ongoing inventory initiative that began in 2014. RAP estimates that there are 350,000 trees in developed community parks, which do not include larger regional parks such as Griffith Park. RAP was awarded a CAL FIRE grant in 2018 to complete a comprehensive inventory of all trees in the City's parks. This effort will build on the more than 60,000 park trees which have already been

inventoried. RAP expects to complete its inventory project by 2022. **In order to develop a modernized approach to street tree management, Public Works should consider a similar approach to RAP.**

Recommendations

To address these data management issues, Public Works should (in conjunction with Recommendation #1):

5. **Develop and implement a centralized system** to manage its street tree maintenance operations. At minimum, the system should perform the following functions.
 - a. **Integrate work order and inventory management functions** in order to streamline tree maintenance and inventory data collection.
 - b. **Provide dynamic inventory and maintenance reporting capabilities**, so that managers can use tree data to prioritize maintenance and other urban forestry improvement projects.

III. Potential Contracting Strategies to Meet Future Needs



Over the last three years, the City primarily used contractors for proactive street tree trimming services. Although Public Works is shifting to an in-house approach, future conditions may require a temporary or targeted surge in contracted services to strategically supplement the work performed by in-house crews.

Alternatively, the City may decide to shift to a hybrid model (i.e., mix of in-house crews and contractors). **Should any of these scenarios emerge, the City should consider a different contracting approach than it has used in the past.**

Tiered Pricing for Street Tree Trimming Contracts

Public Works' contracts for proactive street tree trimming services used a flat, per-tree cost mechanism. **This pricing structure means the City paid the same flat rate whether a tree required minimal pruning, a full reduction of the tree crown, or lifting of the tree crown to ensure adequate clearance for vehicle and pedestrian traffic.**

Public Works acknowledged that different trees require varying degrees of maintenance. However, they believe that their contracting approach accounts for these differences because potential contractors were provided an opportunity to evaluate the requested quantity, species, and trimming specifications before submitting a bid price.

In contrast to the City's approach, other municipalities in California and Pacific Northwest use a tiered pricing structure that is designed to align unit prices with the specific services being performed by contractors. The table below shows how the City of Santa Monica pays contractors different rates based on factors such as the type of service (e.g., crown reduction or safety trimming), tree height, and tree species (i.e., palm or non-palm).

Figure 18: Santa Monica Proactive Street Tree Trimming Cost Structure

Trimming Type	Service	City of Santa Monica
Crown Reduction ²⁴	Full Trim/Crown 0-6 DSH ²⁵	\$51.60
	Full Trim/Crown 7-12 DSH	\$154.90
	Full Trim/Crown 13-18 DSH	\$232.35
	Full Trim/Crown 19-24 DSH	\$284.00
	Full Trim/Crown 25-30 DSH	\$387.25
	Full Trim/Crown 31-36 DSH	\$464.70
	Full Trim/Crown 36+ DSH	\$516.35
Safety Trimming	Safety Trim 0-6 DSH	\$25.80
	Safety Trim 7-24 DSH	\$67.10
	Safety Trim 25-30 DSH	\$98.10
	Safety Trim 31-36 DSH	\$149.75
	Safety Trim 36+ DSH	\$201.35
Palm Trees	Date Palm Trim	\$180.70
	Date Palm Clean Trunk	\$180.70
	Fan Palm Trim	\$77.45
	Fan Palm Clean Trunk	\$180.70
	All Other Palms Trim	\$51.60

The City paid its contractors an average of \$177 per street tree in FY2017-18, which was less expensive than many of the costs shown in Figure 18. Moreover, Santa Monica’s street trees may require less work because they are trimmed more frequently.

However, the City’s lack of reliable inventory and work order data prevents the ability to determine *exactly* which types of trees were trimmed and the level of effort that was required by the contractor. Given this uncertainty, the City should leverage future improvements to its data and determine whether a tiered pricing approach would be appropriate.

In conjunction with a tiered pricing model, having a group of pre-qualified contractors ready to perform on-demand or specialized services, may benefit the City. This combination can allow Public Works to take a more tailored approach to street tree maintenance. For example, the City may identify an unplanned or unique tree maintenance need that hinders the operational efficiency of in-house crews. A bench of available contractors and task-based contracts would allow the City to quickly resolve the issue rather than initiating a lengthy procurement process.

²⁴ Crown reduction reduces the overall size of the tree. The ISA recommends that no more than 25% of a tree’s foliage be removed during crown reduction.

²⁵ DSH is an acronym for “diameter at shoulder height.” The tree diameter is an indicator of the tree’s overall size.

Recommendations

To address these contracting issues, Public Works should:

6. **Consider different contracting strategies** if City crews need to be supplemented by outside contractors in the future.
 - a. **Develop a pool of pre-qualified contractors** that can supplement City crews for on-demand services with stipulated pricing for specific types of trimming services.
 - b. **Determine whether a service-specific, multi-tiered pricing structure** would be more beneficial to its overall strategy to maximize proactive trimming services citywide.

SCOPE & METHODOLOGY



The objective of our review was to identify areas of opportunity where the City can improve its street tree maintenance activities.

We planned and performed the review to obtain sufficient, appropriate evidence to provide a reasonable basis for our observations and conclusions based on our objectives. Fieldwork was primarily conducted from June 2018 to July 2018.

Interviews and Walk-Throughs

We conducted multiple interviews with Public Works and representatives from other City Departments to assess current roles and responsibilities and to document the quality and extent of interdepartmental and interagency collaboration, and to gain perspective on areas of potential improvement.

Data Analysis and Documents Reviewed

We gathered and reviewed documentation on the activities Public Works and other City Departments tasked with tree-related responsibilities. In addition, we reviewed Public Works contracts and City budget documents to better understand the previous, current, and future structure of Public Works operations.

Benchmarking

We interviewed urban forestry professionals and researched policies and processes in other cities to identify model practices the City should consider as it seeks to improve maintenance activities related to street trees, particularly in the areas of: (1) developing an inventory; (2) using data to improve operations; and (3) contracting strategies.

SUMMARY OF RECOMMENDATIONS



#	Recommendation	Responsible Entity
Section I: Conducting a Citywide Inventory of Street Trees		
1	<p>Develop a plan to implement a comprehensive street tree inventory system that will support future tree maintenance, planting, removal, and pest and disease mitigation activities.</p> <ul style="list-style-type: none"> a. Consider using existing software packages that can provide a cost-effective solution for the necessary data platform, and can leverage mobile technology to support field-based input; and updates and support time/labor input and activity tracking to help identify resources spent on various maintenance activities. b. Present the implementation plan, recommended platform, and anticipated costs to policymakers and stakeholders to help garner support for its success. 	Board of Public Works, Bureau of Street Services/ Urban Forestry Division
2	<p>Assess the feasibility of:</p> <ul style="list-style-type: none"> a. Implementing technology-based strategies (i.e., hyperspectral imaging and LiDAR) to collect street tree inventory data; b. Partnering with volunteers/other stakeholders and using mobile technology to develop a street tree inventory program; and c. Improving coordination with DWP to share street tree data. 	Board of Public Works, Bureau of Street Services/ Urban Forestry Division
3	<p>Conduct an updated inventory of street trees to account for changes that have occurred since the last citywide inventory was performed in 1996.</p>	Board of Public Works, Bureau of Street Services/ Urban Forestry Division
4	<p>Improve processes related to the ongoing collection, monitoring, and management of street tree data to ensure the comprehensive inventory system remains a dynamic, up-to-date resource for Public Works to make informed decisions.</p>	Board of Public Works, Bureau of Street Services/ Urban Forestry Division

Section II: Using Data to Improve Street Tree Maintenance		
5	<p style="text-align: center;"><i>(In conjunction with Recommendation #1)</i></p> <p>Develop and implement a centralized system to manage its street tree maintenance operations. At minimum, the system should perform the following functions.</p> <ul style="list-style-type: none"> a. Integrate work order and inventory management functions in order to streamline tree maintenance and inventory data collection. b. Provide dynamic inventory and maintenance reporting capabilities, so that managers can use tree data to prioritize maintenance and other urban forestry improvement projects. 	<p>Board of Public Works, Bureau of Street Services/ Urban Forestry Division</p>
Section III: Potential Contracting Strategies to Meet Future Needs		
6	<p>Consider different contracting strategies if City crews need to be supplemented by outside contractors in the future.</p> <ul style="list-style-type: none"> a. Develop a pool of pre-qualified contractors that can supplement City crews for on-demand services with stipulated pricing for specific types of trimming services. b. Determine whether a service-specific, multi-tiered pricing structure would be more beneficial to its overall strategy to maximize proactive trimming services citywide. 	<p>Board of Public Works, Bureau of Street Services/ Urban Forestry Division</p>

CITY OF LOS ANGELES
INTER-DEPARTMENTAL CORRESPONDENCE

DATE: December 3, 2018

TO: Ron Galperin, City Controller
Office of the Controller

FROM: FOR Adel H. Hagekhalil, P.E.
General Manager and Executive Director
Bureau of Street Services

SUBJECT: CONTROLLER REPORT: MODERNIZING MANAGEMENT OF STREET TREE MAINTENANCE OPERATIONS

The Bureau of Street Services (BSS) appreciates the Controller's efforts to enhance the City of Los Angeles (City)'s service. BSS reviewed the October 29, 2018 draft of the subject report and submits this comment letter for inclusion in the final version of the report.

BSS concurs with the majority of the recommendations in the report, and in fact has been pursuing similar initiatives over the past few years to improve the strategic, data-driven management of the street tree population in Los Angeles. Examples of existing efforts by BSS Urban Forestry Division (UFD) that are aligned with the recommendations in the report include the following:

1. Pursuing a modernized, cloud-based street tree inventory:
 - Submitted FY 19 budget request for Phase 1 of cloud-based tree inventory (unfunded)
 - Submitted a CalFire grant proposal for cloud-based tree inventory in November 2018
2. Pursuing development of a citywide Urban Forestry Management Plan:
 - Supported successful effort to establish citywide tree policy coordinator position
 - Served on steering committee for CityPlants-sponsored consultant study producing a roadmap towards an Urban Forestry Management Plan for LA (Dudek Study)
 - BSS has submitted a budget request in the 2019-2020 proposed budget for funding to implement and launch an Urban Forestry Management Plan
3. Rebuilding UFD's proactive tree maintenance capacity:
 - Secured funding and position authority for 5 proactive tree trimming crews
 - Secured funding and position authority for 2 proactive tree removal crews
 - Secured funding and position authorities for tree planting, watering, and root pruning

There are a few points of clarification BSS wishes to make as enumerated below:

1. As noted on page 2 of the draft report, BSS is one of several City departments with tree maintenance and/or oversight responsibilities. However, it should be noted BSS/UFD oversees the maintenance of only the *street tree* portion of the urban forest which comprises approximately 10% of the total City urban forest population.
2. On page 14 regarding a description of recommended street tree inventory data points, BSS believes these recommendations will need to be reconciled with the recommendations in the upcoming Dudek Study to be issued in December of 2018.
3. BSS does not agree with the statement that UFD's current street tree maintenance efforts are primarily reactive (stated in several places within the draft report.) This statement may have been true in the first few years immediately following position eliminations during the budget crisis. However, over the past 5 fiscal years, UFD has been successful in steadily increasing capacity for proactive tree maintenance, initially obtaining funding for contracted tree trimming, then obtaining additional funding for city forces tree trimming on an overtime basis, and finally obtaining funding and position authority for in-house crews to perform the variety of tree maintenance tasks mentioned in item 3 above. Additionally, BSS does not concur with the statement on page 7 of the draft report that UFD primarily uses emergency trimming and crown raising techniques. UFD's in-house crews follow industry arborical standards which incorporate all aspects of tree health. Finally, the table on page 9 of the draft report incorrectly describes the status of UFD's current proactive tree trimming crews: since the July 1, 2018 start of FY 18-19, UFD has been operating three proactive tree trimming crews on weekdays (to date, these crews have proactively trimmed more than 6,000 trees.)
4. BSS does not concur with the statement that shifting from contracted tree trimming to in-house crews will reduce the number of trees trimmed annually. Fiscal year 18-19 is a transitional year in that only 6 months of funding was provided for the new trimming crews. Once UFD has the benefit of a full year of production of these new crews in FY 19-20, total annual trees trimmed will attain a similar level to recent years when much of the trimming was contracted.
5. BSS appreciates the analysis and recommendations pertaining to contracting structure and strategy; however, at this time BSS intends to pursue the stated wishes of the City Council to build in-house tree maintenance capacity and limit contracted tree trimming to street light clearance activities.

If you have any questions, please contact Mr. Chi Ming Gong at (213) 847-3022.

LIST OF OUTSTANDING AUDIT/REVIEW RECOMMENDATION(S)

Report Title: Modernizing Management of Street Tree Maintenance Operations
 Report Issuance Date:
 Department responsible for Implementation: Bureau of Street Services
 Reported Status Date:

Section	Summary Description of Finding	Rec. No.	Recommendation	DEPARTMENT REPORTED INFORMATION			
				Current Status	Basis for Status	% of Implementation	Target Date for Implementation
			Bureau of Street Services should:				
1	BSS does not have an up-to-date, accurate inventory of street trees, which is necessary in order to effectively develop action plans and make informed forest management decisions.	1	Develop a plan to implement a comprehensive street tree inventory system that will support BSS/UFD's future tree maintenance, planting, removal, and pest and disease mitigation activities. Consider existing software packages developed for this purpose that could provide a cost-effective solution and: (1) leverage mobile technology to support field-based updates; and (2) support time/labor input and activity tracking, to identify resources spent on various maintenance activities.	PI	BSS PROPOSES THE FOLLOWING ACTION PLAN TO ADDRESS THIS ITEM: 1. APPLY FOR CALFIRE GRANT 2. EXPLORE RETAINING CONSULTANT TO STUDY EXISTING UFD DATASETS AND RECOMMEND BEST APPROACH TO IMPLEMENT STREET TREE INVENTORY SYSTEM AND/OR WORK ORDER MANAGEMENT SYSTEM 3. SEEK FUNDING NEEDED TO IMPLEMENT BOTH SYSTEMS 4a. EXPLORE POSSIBILITY OF COLLABORATIVE CROWD-SOURCING STREET TREE DATA 4b. MIGRATE ALL UFMS DATA INTO NEW INVENTORY 5. DEVELOP PUBLIC-FACING DASHBOARD	1. 10% COMPLETED	1. GRANT PROPOSAL SUBMITTED TO CALFIRE 11/27/2018 2. PROGRESS ON REMAINING ITEMS DEPENDENT ON WHETHER FUNDING IS PROVIDED IN FY 19-20 BUDGET CYCLE
		2	Assess the feasibility of leveraging mobile technology, and relationships with relevant community organizations, to develop a street tree inventory program.	NYI	SEE SECTION 1, REC 1, ITEM 4a		TO BE DETERMINED AFTER SUCCESSFUL IMPLEMENTATION OF ITEM 3 IN SECTION 1, REC 1.
		3	Conduct an inventory of street trees to account for changes that have occurred since the last citywide inventory was performed in 1996.	NYI	SEE SECTION 1, REC 1, ITEM 4b		TO BE DETERMINED AFTER SUCCESSFUL IMPLEMENTATION OF ITEM 3 IN SECTION 1, REC 1.
		4	Improve processes related to the ongoing collection, monitoring, and management of street tree data to ensure the comprehensive inventory system remains a dynamic, up-to-date resource for BSS/UFD to make informed decisions.	NYI	SEE SECTION 1, REC 1, ITEM 4a		TO BE DETERMINED AFTER SUCCESSFUL IMPLEMENTATION OF ITEM 3 IN SECTION 1, REC 1.
2	BSS does not have a centralized system to manage inventory and maintenance information, leading to fragmented processes related to data collection and work order management.	5	Develop and implement a centralized system to manage its street tree maintenance operations. This system should facilitate: (1) the integration of work order and inventory management functions in order to streamline tree maintenance and inventory data collection; and (2) dynamic inventory and maintenance reporting capabilities so that managers can use tree data to prioritize maintenance and other urban forestry improvement projects.	NYI	TO BE IMPLEMENTED AFTER COMPLETION OF ITEM 4 IN SECTION 1, REC 1; DEVELOP WORK ORDER MANAGEMENT SYSTEM WORKING IN CONCERT WITH INVENTORY TO EFFICIENTLY MANAGE BSS RESOURCES AND PRIORITIZE STREET TREE WORK (POTENTIALLY ONE COMMERCIALY-AVAILABLE SYSTEM PROVIDES BOTH FUNCTIONS)		TO BE DETERMINED AFTER SUCCESSFUL IMPLEMENTATION OF ITEM 3 IN SECTION 1, REC 1.
3	The City might benefit from a multi-tiered pricing structure for contract tree trimming services, instead of the flat unit price model currently used by the department.	6	For any future street tree trimming contracts, perform limited testing/analysis to determine if a multi-tiered pricing structure, and/or activities limited to specific or specialized trimming services, would be more cost-effective than paying a flat rate per tree for all proactive trimming services.	NYI	BSS WILL DEVELOP FUTURE PILOT CONTRACT STUDY TO GATHER COMPARISON DATA		

I - Implemented
 PI - Partially Implemented or In Progress
 NYI - Not Yet Implemented
 D - Disagree