



**SPECIAL OPEN MEETING  
UNITED LAGUNA WOODS MUTUAL LANDSCAPE COMMITTEE**

**Monday, January 15, 2024 – 9:30 a.m.  
BOARD ROOM/VIRTUAL  
Laguna Woods Village  
24351 El Toro Road, Laguna Woods, CA**

*Laguna Woods Village owners/residents are welcome to participate in all open committee meetings and submit comments or questions for virtual meetings using one of three options:*

1. *Join in-person in the Community Center Board Room*
2. *Join the Zoom meeting at <https://zoom.us/j/93131082872>. Please raise your “Virtual Hand” during the agenda item you wish to speak to.*
  - *If you have a comment regarding a topic that is **not** on the agenda, please raise your “Virtual Hand” during the “Member Comments” agenda item.*
3. *Via email to [meeting@vmsinc.org](mailto:meeting@vmsinc.org) any time before the meeting is scheduled and before the agenda item you wish to speak to during the meeting. Please use the name United Mutual Landscape Committee in the subject line of the email. Name and unit number must be included.*

*FYI: All landscaping rules and regulations may be found in the United Landscape Manual on the Village website: <https://www.lagunawoodsvillage.com/documents/view/United-Landscape-Maintenance-Manual-Updated-June-2020.pdf?v=1597776227>*

**AGENDA**

1. Call Meeting to Order
2. Acknowledgment of Media
3. Approval of the Agenda
4. Approval of the Meeting Report for December 11, 2023
5. Remarks of the Chair
6. Department Head Update
7. Member Comments (Items Not on the Agenda)
8. Response to Member Comments

Items for Discussion and Consideration

9. Urban Forest Management Plan

Concluding Business

10. Committee Member Comments

11. Date of Next Meeting – January 22, 2024 at 1:30 p.m.

12. Adjournment

Sue Quam, Chair  
Kurt Wiemann, Staff Officer  
Megan Feliz, Department Administrative Assistant  
Telephone: 949-268-2565

\*A quorum of the United Board, or more, may also be present at the meeting.





**OPEN MEETING**

**REGULAR MEETING OF THE UNITED LAGUNA WOODS MUTUAL  
LANDSCAPE COMMITTEE**

**Monday, December 11, 2023 9:30 a.m.  
BOARD ROOM/VIRTUAL MEETING  
Laguna Woods Village Community Center Board Room  
24351 El Toro Road**

**REPORT**

**COMMITTEE MEMBERS PRESENT:** Chair- Sue Quam, Anthony Liberatore,  
Georgiana Willis

**COMMITTEE MEMBERS ABSENT:** None.

**OTHERS PRESENT:** Ellen Leonard, Maggie Blackwell

**ADVISORS PRESENT:** Mary Sinclair, Ann Beltran

**STAFF PRESENT:** Kurt Wiemann, Megan Feliz

**1. Call to Order**

Director Quam called the meeting to order at 9:30 a.m.

**2. Acknowledgment of Media**

No media was present.

**3. Approval of the Agenda**

Director Liberatore motioned to approve the agenda. Director Quam seconded. The agenda was approved unanimously.

**4. Approval of the Meeting Report for August 28, 2023.**

Director Liberatore made a motion to approve the report. Director Willis seconded. The previous agenda passed unanimously.

## **5. Chair's Remarks**

Chair Quam thanked everyone for being present. The Landscape Committee introduced themselves.

## **6. Department Head Update**

Mr. Wiemann went over AB1572. Committee asked questions.

### **6a. Project Log**

Mr. Wiemann discussed the provided project log in detail. Directors made comments and asked questions.

### **6b. Water Use Comparison Graph**

Mr. Wiemann discussed the water use graph in detail. Directors made comments and asked questions.

### **6c. Tree Work Status Report**

Mr. Wiemann stated that the provided list of tree work was detail for Committee member use.

## **7. Member Comments (Items not on the agenda)**

One-member comment was made, commending the clean-up work that was completed at Aliso Creek.

## **8. Response to Member Comments**

None

## **Items for Discussion and Consideration**

## **9. Tree Removal Request - 52-B**

Director Liberatore made a motion to accept staff recommendation. Director Willis seconded the motion. The motion passed unanimously.

## **10. Tree Removal Request – 385-C**

Discussion ensued amongst the Committee. Mr. Wiemann requested that the item be tabled, as new information was presented. Director Willis made a motion to table the item until next meeting. Director Liberatore seconded the motion. The motion passed unanimously.

## **11. Landscape Request for Groundcover Removal – 2066-B**

Director Liberatore made a motion to accept staff recommendation. Director Quam seconded the motion. The motion passed unanimously.

## **12. Bench Request – 60Q**

Residents comments were made. Committee asked questions and discussion ensued.

Director Quam made a motion to direct staff on developing a bench policy. Director Liberatore seconded the motion. Director Quam made a motion to place the item on hold, until the bench policy is created. Director Willis seconded the motion.

### **13. Friendship Walk**

Director Liberatore made a motion to accept staff recommendation. Director Willis seconded the motion. The motion passed unanimously.

### **Concluding Business**

### **14. Committee Member Comments**

Various comments were made.

### **15. Date of Next Meeting – January 22, 2024 at 1:30 p.m.**

### **16. Adjourned at 10:48 a.m.**



Sue Quam (Dec 12, 2023 15:21 PST)

---

Sue Quam, Chair





## STAFF REPORT

---

**DATE:** January 15, 2024  
**FOR:** Landscape Committee  
**SUBJECT:** Urban Forest Management Plan

---

### **RECOMMENDATION**

Approve the Urban Forest Management Plan for United Laguna Woods.

### **BACKGROUND**

On April 12, 2022, The United Board of Directors approved a supplemental appropriation of \$184,760 for tree maintenance services, with approximately \$50,000 to be used for engaging the services of an outside arborist.

### **DISCUSSION**

United Mutual is responsible for the maintenance of 18,585 trees, with 236 different species. On January 14, 2020, United Mutual Board of Directors approved a species-based tree trimming policy, following years of an unsystematic approach to tree trimming, which has led to inefficiencies, an increased amount of service requests, and storm damage to mutual owned trees. Tree trimming is now performed based on the specific growth rate of each species, ensuring financially efficient methodologies to reduce risk and enhance the beauty of the urban forest.

Tree trimming is just one piece of an efficient, long-term maintenance plan of the mutual tree inventory. Most of the trees in United's urban forest are mature trees, with many of them planted in the late 1960s. The sheer number and variety of trees in United are unique in the region and will require a long-term plan to maintain and manage the trees in the years to come. Taking into consideration the age and condition of the inventory, developing an efficient replanting plan to maintain the inventory, as well as adapting to changes in the environment and the forecasted long-term drought conditions. Creating an Urban Forest Management Plan (UFMP) would accomplish these goals.

The final draft of the United UFMP (Attachment 1) developed a management tool that incorporated residence and committee input toward developing a long-term management plan. Community involvement and education is an important component of a successful UFMP program. Through the eighteen-month process, an ad-hoc committee was created. Four rounds of Committee and community meetings were held along with consultations with staff regarding existing protocol and policies, and a review the existing inventory database was conducted. Several draft iterations of the report were reviewed by the landscape and ad-hoc committees, the comments compiled and integrated into the final report.

**FINANCIAL ANALYSIS**

There is no financial impact in approving the UFMP.

**Prepared By:** Kurt Wiemann, Director of Landscape Services

**Reviewed By:** Megan Feliz, Landscape Administrative Assistant

**ATTACHMENT(S)**

**Attachment 1:** Urban Forest Management Plan





UNITED LAGUNA WOODS  
MUTUAL

# Urban Forest Management Plan





---

# Urban Forest Management Plan

# United Laguna Woods Mutual

---

**NOVEMBER 2023**

*Prepared for:*

**LAGUNA WOODS VILLAGE**

24351 El Toro Road

Laguna Woods, California 92637

*Contact: Kurt Wiemann*

*Prepared by:*

**DUDEK**

38 North Marengo Avenue

Pasadena, California 91101

*Contact: Kanami Otani*



---

# Table of Contents

SECTIONS	PAGE
Acronyms and Abbreviations.....	v
1 Introduction .....	1
1.1 What is an Urban Forest Management Plan?.....	1
1.2 Historical Context .....	1
1.3 Key Findings .....	1
2 Analysis of Current Conditions .....	3
2.1 Tree Inventory.....	3
2.1.1 Environmental Services and Economic Benefits .....	3
2.1.2 Species Diversity.....	7
2.1.3 Climate Preparedness .....	9
2.1.4 Diameter at Standard Height Distribution.....	12
2.1.5 Importance Value.....	14
2.2 Estimated Canopy Cover .....	15
3 Management Practices and Recommendations.....	17
3.1 Tree Planting.....	17
3.1.1 Tree Planting Recommendations.....	17
3.2 Tree Maintenance .....	19
3.2.1 Establishment Care .....	19
3.2.2 Tree Pruning.....	20
3.3 Tree Preservation and Removal .....	22
3.3.1 Parameters for Tree Removal .....	22
3.3.2 Recommendations for the Parameters for Tree Removal.....	23
3.3.3 Infrastructure Conflicts.....	23
3.3.4 Tree Removals and Replanting.....	26
3.3.5 Tree Protection during Construction Recommendations .....	29
3.3.6 Tree Risk Program Recommendations.....	30
3.4 Urban Wood Reuse and Recommendations.....	32
4 Community Engagement .....	35
4.1 Summary of Key Interested Party Input .....	35
4.2 Landscape Community Meetings .....	36
4.3 Laguna Woods Tree Survey .....	40
5 Standards and Details .....	45
6 References .....	49

**TABLES**

1	Environmental Services Provided by United Mutual's Tree Inventory .....	4
2	Financial Value of United Mutual's Tree Inventory .....	4
3	Urban Forest General Recommendations .....	16
4	Tree Planting Recommendations.....	19
5	Tree Maintenance Recommendations .....	22
6.	Infrastructure Conflict Action Menu .....	25
7	Infrastructure Conflict Matrix .....	25
8	Comparison and Analysis of Tree Replacement Ratios.....	27
9	Tree Replacement Ratio .....	28
10	International Society of Arboriculture Risk Assessment Levels .....	31
11	Tree Preservation Recommendations .....	31
12	Urban Wood Recommendations .....	34
13	Staff Interview Participants .....	35
14	Summary of Staff Interview Responses.....	36
15	Landscape Community Meeting Responses .....	39
16	Summary of Online Survey Responses.....	40
17	Strategies and Recommendations for United Mutual .....	45

**EXHIBITS**

1	Benefits of trees in an urban environment. ....	5
2	Urban heat island effect. ....	6
3	Top 10 genus in the inventory.....	8
4	Top 10 species in the inventory. ....	9
5	Distribution of Water Use Classification of Landscape Species water-use rating for all trees in the inventory.....	11
6	Top 20 species in inventory predicted to be unsuitable for future climates.....	12
7	Distribution of diameter at standard height for all trees in the inventory. ....	14
8	Top 10 species based on importance value. ....	15
9	Shade benefits of various stature trees. ....	29
10	On-site mulch storage facility of Laguna Woods Village. ....	33
11	United Laguna Woods Mutual landscape committee meeting flyer. ....	37
12	United Laguna Woods Mutual fast facts. ....	38
13	Laguna Woods tree survey graphic.....	40

14      Laguna Woods tree survey results..... 42

15      Laguna Woods tree survey results..... 43

**APPENDICES**

A      Recommended Tree Species Palette

B      Tree Removal Guidelines

C      Expanding Canopy Cover Ratio

D      Tree Planting and Mulching

E      Establishment Care Guidelines

F      Watering Guidelines

G      Tree Spacing Recommendations

H      Root Correction

I      Nursery Stock Selection

J      Young Tree Pruning

K      Guidelines for Pruning Specifications

L      Mature Tree Pruning

M      Infrastructure Conflicts Chart

N      Root Pruning Detail

O      Root Pruning Guidelines

P      Tree Protection Guidelines

Q      Mature Tree Protection Guidelines

R      Urban Wood

INTENTIONALLY LEFT BLANK

---

# Acronyms and Abbreviations

Acronym/Abbreviation	Definition
DSH	diameter at standard height
ISA	International Society of Arboriculture
Third Mutual	Third Laguna Hills Mutual
TPZ	Tree Protection Zone
TRAQ	Tree Risk Assessment Qualified
UFMP	urban forest management plan
UHI	urban heat island
United Mutual	United Laguna Woods Mutual
WUCOLS	Water Use Classification of Landscape Species

INTENTIONALLY LEFT BLANK



# 1 Introduction

## 1.1 What is an Urban Forest Management Plan?

An urban forest management plan (UFMP) is a long-term strategy aimed at bringing to life a shared vision for the ideal state of the urban forest. The UFMP identifies the current state of tree care practices and urban forest benefits a community receives; measures them against industry best management practices and ideal vision of the urban forest; and creates short-, medium-, and long-term actions to measure progress towards identified and measurable urban forestry goals.

A successful UFMP integrates community input throughout the plan to encourage buy-in and provides a framework for tree managers to implement industry-based, research-backed urban forestry principles and management practices to further their efforts toward a sustainably managed urban forest.

Laguna Woods Village is the tree owner and manager for all trees within the two separate communities, United Laguna Woods Mutual (United Mutual) and Third Laguna Hills Mutual (Third Mutual) (hereafter collectively referred to as the “Mutuals”). For both Mutuals, datasets such as canopy cover, current management practices, and the community tree survey were shared for this project. For analysis pertaining to tree inventory, tree inventory data was separated for United Mutual and Third Mutual as geographic information system locations identify which Mutual an individual tree belongs to, informing recommendations for each Mutual.

## 1.2 Historical Context

Laguna Woods Village is a community in Southern California known for its mild climate, abundance of trees, and proximity to the Laguna Beach coastline. The area was originally inhabited by the Tongva and Acjachemen people, who occupied the coastline, valleys, and mountains of Los Angeles and Orange Counties (City of Laguna Hills 2023). The tribes had access to an abundance of natural resources that the land provided, including staple foods and medicine from a variety of native plants and trees such as oak (*Quercus*), elderberry (*Sambucus canadensis*), and toyon (*Heteromeles arbutifolia*) (Orange County Department of Education 2022). Spanish missionaries arrived in the 1770s when they settled the nearby San Juan Capistrano mission, and where most of the land was organized into land grants, or “Ranchos” (Hallan-Gibson et al. 2005). Vast areas of the land grants became suitable for cattle grazing and sheep herding, which changed the natural ecology and introduced new plant and tree species.

In 1895, Louis Moulton purchased Niguel Ranch, also known as Moulton Ranch, which shortly after developed into the community of Laguna Woods where dry farming and cattle grazing dominated the hillsides (Zimmerman 1981). In 1962, a developer named Ross Cortese purchased 3,500 acres of Moulton Ranch with the goal to create an active senior living community, which is known today as Laguna Woods Village.

## 1.3 Key Findings

**Large and Diverse Urban Forest:** United Mutual has a diverse urban forest with over 258 species present in the inventory. The urban forest covers an estimated 31% of United Mutual and provides important environmental

benefits and economic services to residents. Choosing species for planting based on the recommended species palette in Appendix A will support the continuation of a healthy and climate-resilient urban forest into the future.

**Strong Policies to Preserve Trees:** United Mutual has clearly defined reasons for why it preserves trees and when tree removal is allowed, as referenced in Section 3.3.1, Parameters for Tree Removal. It was evident during community meetings that the landscape maintenance staff have set a precedent, supported by United Mutual board members, to deny resident tree removal requests unless a compelling reason stated in the United Mutual Tree Removal Guidelines found in Appendix B is met. Consistency in the application of parameters for tree removal maintains the high level of canopy cover in United Mutual and the benefits that community members receive from its trees.

**Infrastructure Conflicts Play a Central Role:** Despite the United Mutual Tree Removal Guidelines (Appendix B) presenting clear guidelines for when trees are considered for removal, the fourth guideline, “trees which are damaging or will damage a structure, pose a hazard, in failing health or interfere with neighboring trees, will be considered for removal,” leaves room for interpretation for when trees cause infrastructure conflicts. To remove potential bias from the removal evaluation process, a clear definition of infrastructure conflicts and a systematic evaluation system will provide United Mutual with a clear and justifiable decision-making framework for managing infrastructure conflicts. This is addressed further in Section 3.3, Tree Preservation and Removal.

**Urban Forest Advocacy:** United Mutual’s tree planting, tree maintenance, and tree care practices inherently support the goals of maintaining urban forest benefits for the community. However, community support is a large driver. Without urban forest practices such as replacement ratios for removing a tree being codified in United Mutual’s policies, tree canopy and urban forest benefits may be lost as both staff and residents change over time.

**Community Support of the Urban Forest:** Based on community input received throughout the UFMP engagement process, many residents of United Mutual would find value in opportunities that promote awareness, education, and involvement in United Mutual’s urban forest efforts. By providing regular updates and transparent information through “The Village Breeze” or “What’s Up in the Village” and other news outlets provided by the Community Center, United Mutual can take an initial step towards cultivating long-term community support. Additionally, educational materials such as signage, pamphlets, and tree plaques placed throughout United Mutual will provide a passive educational opportunity for residents as they learn about trees in their community. Guided group activities, such as tree care volunteer days and native tree walk tours promoted at the Community Center or by the Garden Club, were highly requested to garner a deeper connection to trees and build relationships with other residents who enjoy learning about the natural environment.

---

## 2 Analysis of Current Conditions

### 2.1 Tree Inventory

An urban forest consists of all trees in an urban area that are typically located on streets, parks, and public and private property. Community members that live and work in areas surrounded by trees receive ongoing benefits.

Well-known urban forest benefits include cleaner air through sequestration and storage of greenhouse gas emissions, improved water quality through stormwater capture and runoff reduction, and the creation of wildlife habitat (McPherson et al. 2017). Tangible benefits of a healthy urban forest include aesthetically pleasing neighborhoods and cooling effects provided by tree canopies, which can reduce energy use and associated cost by as much as 25% (Energy.gov n.d.).

The following assessment of United Mutual's urban forest provides an understanding of the benefits United Mutual is currently receiving from its trees. The analysis provides a baseline condition for United Mutual's health, species diversity, and canopy cover of the urban forest. The analysis will be utilized to develop long-term goals and standards, focused on maintaining a healthy canopy cover throughout United Mutual and providing a maximum level of resident enjoyment of environmental services.

An assessment of the existing urban forest was conducted through data and spatial analysis in addition to discussions and interviews with United Mutual staff and residents. The following sections describe the current status of United Mutual's urban forest, and Section 5, Standards and Details, provides recommendations that can help advance United Mutual toward a sustainable urban forest.

#### 2.1.1 Environmental Services and Economic Benefits

United Mutual's urban forest provides numerous environmental benefits and services to residents' quality of life and the surrounding environment. The United States Forest Service developed the i-Tree Eco software (USFS 2020) to estimate the economic and environmental value of urban and rural forests. The software uses tree inventory data such as tree species, diameter at standard height (DSH), health condition, and height to determine the quantity and estimated economic value of environmental benefits provided by United Mutual's tree inventory, including carbon storage, carbon sequestration, pollution reduction, stormwater diversion, oxygen production, and others. The following estimated environmental services and economic benefits are provided to the community and the surrounding environment. Exhibit 1 details benefits of trees in an urban environment.

United Mutual's inventory includes 18,308 total trees, with 18,291 containing all data needed for inclusion in the i-Tree Eco model. The estimated environmental services provided by the modeled trees is presented in Table 1. Annually, the trees sequester 236.9 tons of carbon, divert 1,432,519 gallons of water from stormwater systems, and remove 8.36 tons of air pollution. Table 2 details the overall financial value of the modeled trees. The structural value, or the cost to replace all trees with trees of equivalent ages, sizes, and conditions, is \$71.1 million (\$3.89 thousand per tree). The functional value, or the annual value of the environmental services provided by the trees, is \$123,200 (\$6.74 per tree). Each year, the trees store 6,371 tons of carbon with an associated economic value of \$1.09 million (\$59.59 per tree).

**Table 1. Environmental Services Provided by United Mutual's Tree Inventory**

Services Provided by Tree Inventory	Annual Environmental Benefit	Annual Environmental Impact	Annual Economic Value
<b>Carbon Sequestration</b> (carbon dioxide removed from air by trees)	236.9 tons	Removes the equivalent of the carbon dioxide emissions that 170 cars produce in 1 year	\$40,400
<b>Avoided Runoff</b> (stormwater redirected into ground by trees)	1,432,519 gallons	Diverts 13 times the amount of water the average American home uses in 1 year	\$12,800
<b>Pollution Removal</b> (ozone, sulfur dioxide, nitrogen, PM <sub>2.5</sub> )	8.36 tons	Removes the equivalent of emissions created by burning 38,158 pounds of coal	\$70,000
<b>Total</b>			<b>\$123,200</b>

**Sources:** Laguna Woods Tree Inventory (ArborPro 2016); i-Tree Eco (USFS 2020).

**Notes:** PM<sub>2.5</sub> = particulate matter less than or equal to 2.5 microns in diameter.

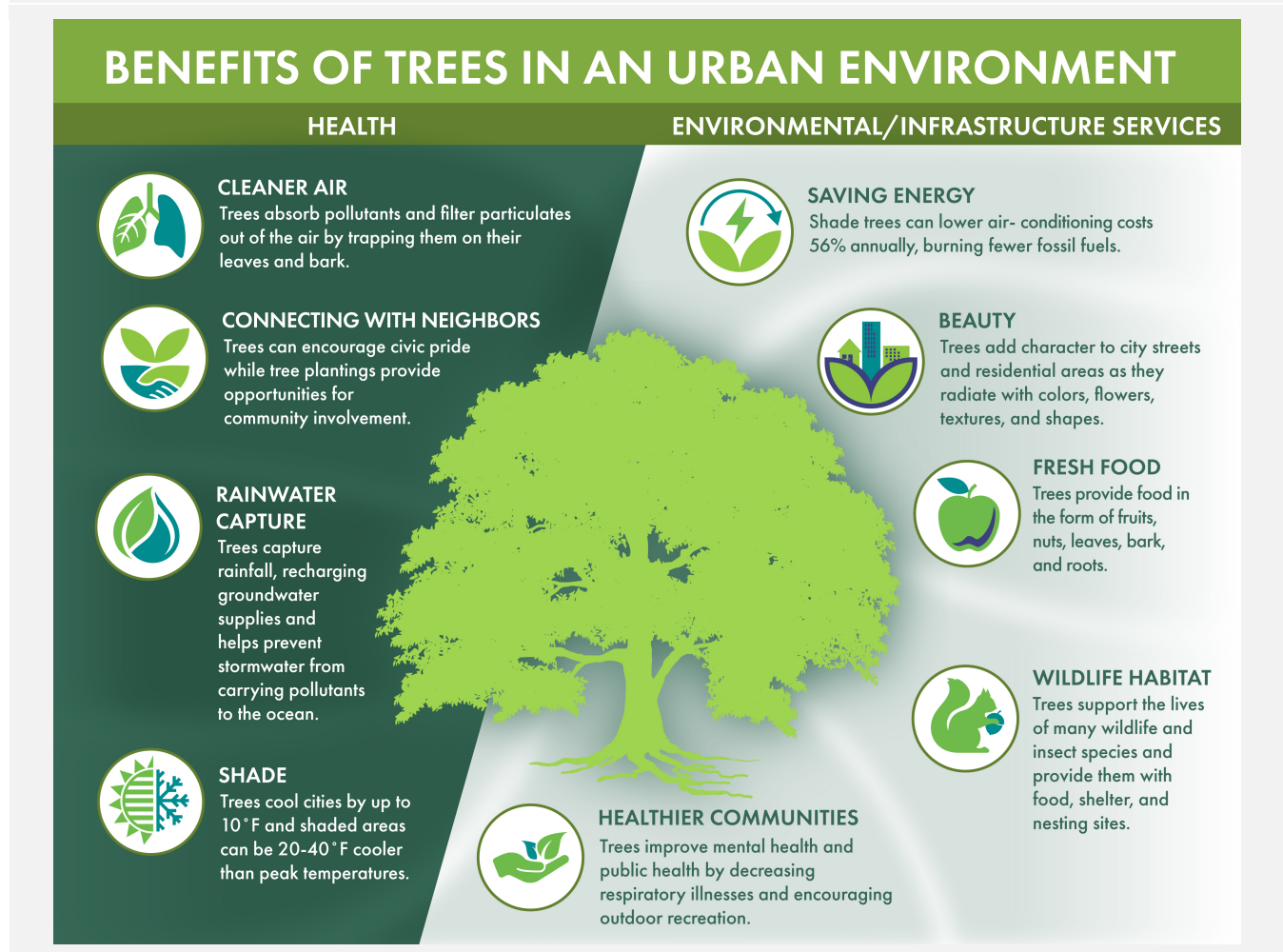
tons = 2,000 pounds. Monetary values are reported in U.S. dollars.

**Table 2. Financial Value of United Mutual's Tree Inventory**

Value	Description	Asset Amount	Per-Tree Value
<b>Number of existing trees in United Mutual included in i-Tree Eco model</b>			<b>18,291</b>
Structural	Tree replacement cost	\$71,100,000	\$3,887.16
Functional	Value based on the services trees perform	\$123,200	\$6.74
Carbon Storage	Value of carbon storage of United Mutual's trees; 6,371 tons of carbon currently held in trees	\$1,090,000	\$59.59

**Sources:** Laguna Woods Tree Inventory (ArborPro 2016); i-Tree Eco (USFS 2020).

**Note:** tons = 2,000 pounds. Monetary values are reported in U.S. dollars.

**Exhibit 1.** Benefits of trees in an urban environment.

In addition to the environmental services and economic values highlighted, United Mutual's tree inventory provides additional benefits such as oxygen, shade, heat reduction, habitat for wildlife, and stress relief for residents.

United Mutual's urban forest not only sequesters carbon but, as a byproduct of photosynthesis, also provides oxygen to living beings (USDA 2015). Urban green areas indirectly provide health benefits to the community members of United Mutual by providing shaded areas for walking and physical activity near their residence.

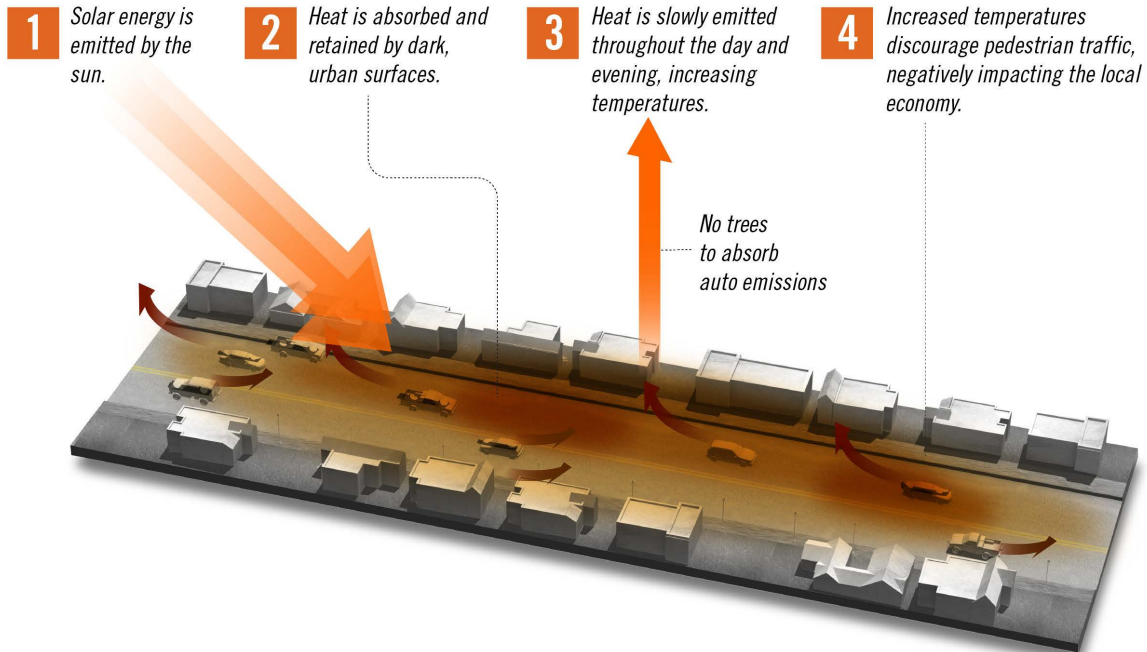
Urban infrastructure such as buildings and roads absorb and re-emit the sun's heat, creating "islands" or pockets of heat in a phenomenon called the urban heat island (UHI) effect. In dense urban areas, the UHI effect increases urban daytime temperatures by 1° F–7° F and nighttime temperatures by about 2° F–5° F (EPA 2022a). Areas with trees, vegetation, and green space lower surface and air temperatures by providing shade and cooling through evapotranspiration, reducing the UHI (EPA 2022b). Reduction of UHI in turn can decrease usage of air conditioning, lowering emissions to the environment and costs to residents. Exhibit 2 is a visual explanation of the urban heat island effect.



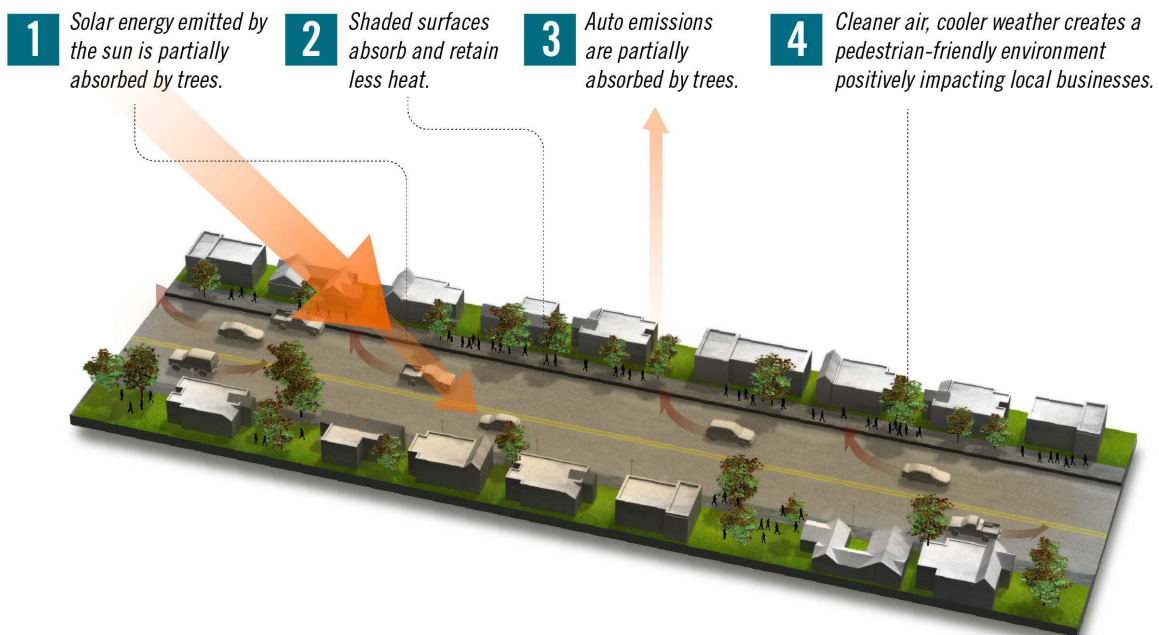
## Exhibit 2. Urban heat island effect.

## HOW TREES HELP NEGATE THE URBAN HEAT ISLAND EFFECT

### NO TREES OR GREENERY



### WITH TREES AND GREENERY



Residents enjoy the opportunity for living environment interaction with birds and other wildlife that utilize the urban forest as a habitat near their home. Residential areas with trees and urban forests not only provide habitat and nesting areas for birds but also provide stopover habitat for migrating birds, supporting the regional ecosystem (Buron et al. 2022).

The physiological and psychological effects of viewing and interacting with urban forests continue to be documented. Even short-term viewing of forests have relaxing effects such as significantly lower diastolic blood pressure, significantly lower heart rate, and less occurrence of induced negative and vigorous moods (Tsunetsugu et al. 2013). United Mutual's integration and preservation of trees in their community provides residents with shaded areas, which promote physical activity throughout their neighborhood.

Implementation of tree protection and preservation practices within United Mutual preserves intangible and quantifiable environmental services and economic values, increasing the quality of life for residents provided by United Mutuals' tree inventory.

## 2.1.2 Species Diversity

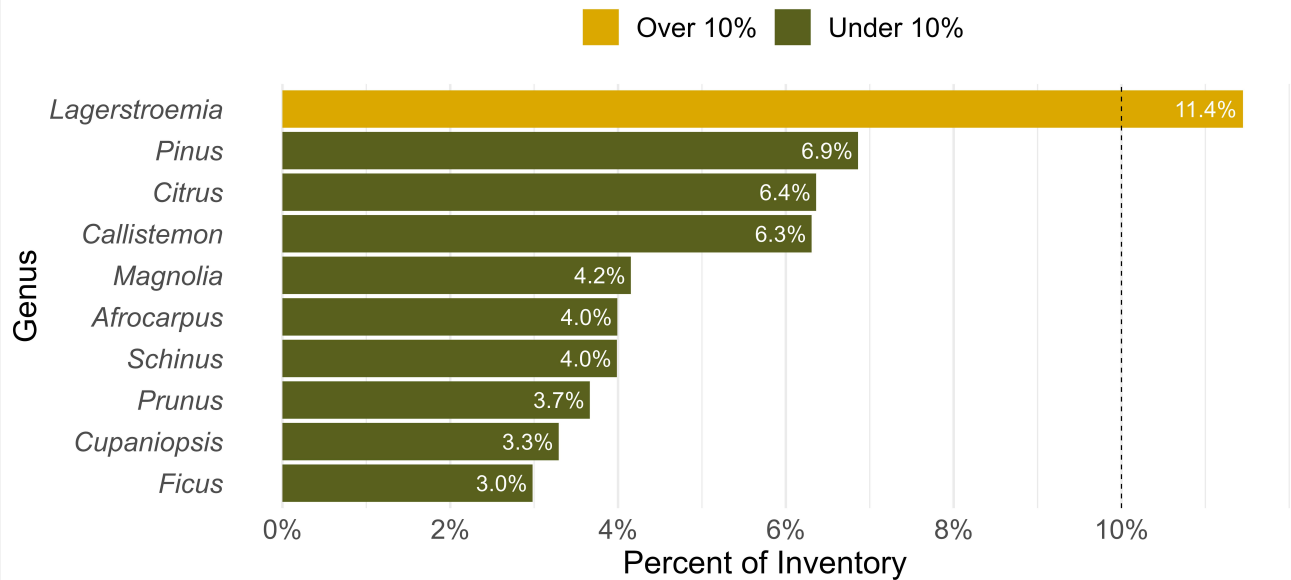
Species diversity of an urban forest is a key factor in determining its overall resilience to threats. Because biological diversity is often regarded as the basis for ecological stability (Tilman and Downing 1994), urban forests with uniform tree species are more likely to suffer from catastrophic loss when invasive pests and pathogens enter a landscape or when significant weather events impact a community. California acquires a new invasive pest or pathogen approximately every 40 days (UC Riverside 2023). While not all introduced invasive pests and pathogens result in a destructive loss to urban forests, fostering a diverse urban forest is a proactive strategy to lessen the damage caused by the next introduced pest or pathogen.

Historical best practices for species diversity standards in street tree inventories include a representation of no more than 10% of any one species, 20% of any one genus, or 30% of any one family (Miller and Miller 1991; Richards 1983). With anticipated increased threats from invasive pests and pathogens, using a more stringent metric is critical in planning for a more resilient urban forest. For this analysis, limitations of 10% of any one genus and 5% of any one species are used to provide additional protection of the tree inventory (Ball et al. 2007).

United Mutual's inventory includes 18,308 trees, consisting of 152 genera and 258 species. Additionally, 300 vacant sites and 6 stumps were identified. The top 10 tree genera make up 53% of the inventory (Exhibit 3). While nine of the top genera fall within the 10% recommendation, *Lagerstroemia* make up 11.4% of the United Mutual inventory. The top 10 species found in United Mutual make up 44.7% of the inventory (Exhibit 4). Three species exceed the 5% recommendation, with crape myrtle (*Lagerstroemia indica*) more than double the recommendation at 11.4% and bottlebrush species (*Callistemon* spp.) and Canary Island pines (*Pinus canariensis*) slightly above the recommendation at 6.3% and 5.6%, respectively. As United Mutual continues to plan for tree removals and replacements, planting trees outside of the genera and species that are currently overrepresented in the inventory will strengthen the resiliency of the overall urban forest. Sections 3.1.1.2, Recommended Species Palette, and 2.1.3, Climate Preparedness, provide more information for United Mutual to consider when selecting species.

**Exhibit 3.** Top 10 genus in the inventory.**United Laguna Woods Mutual Inventory - Genus Diversity**

Sustainability goal: No genus represents more than 10% of the inventory



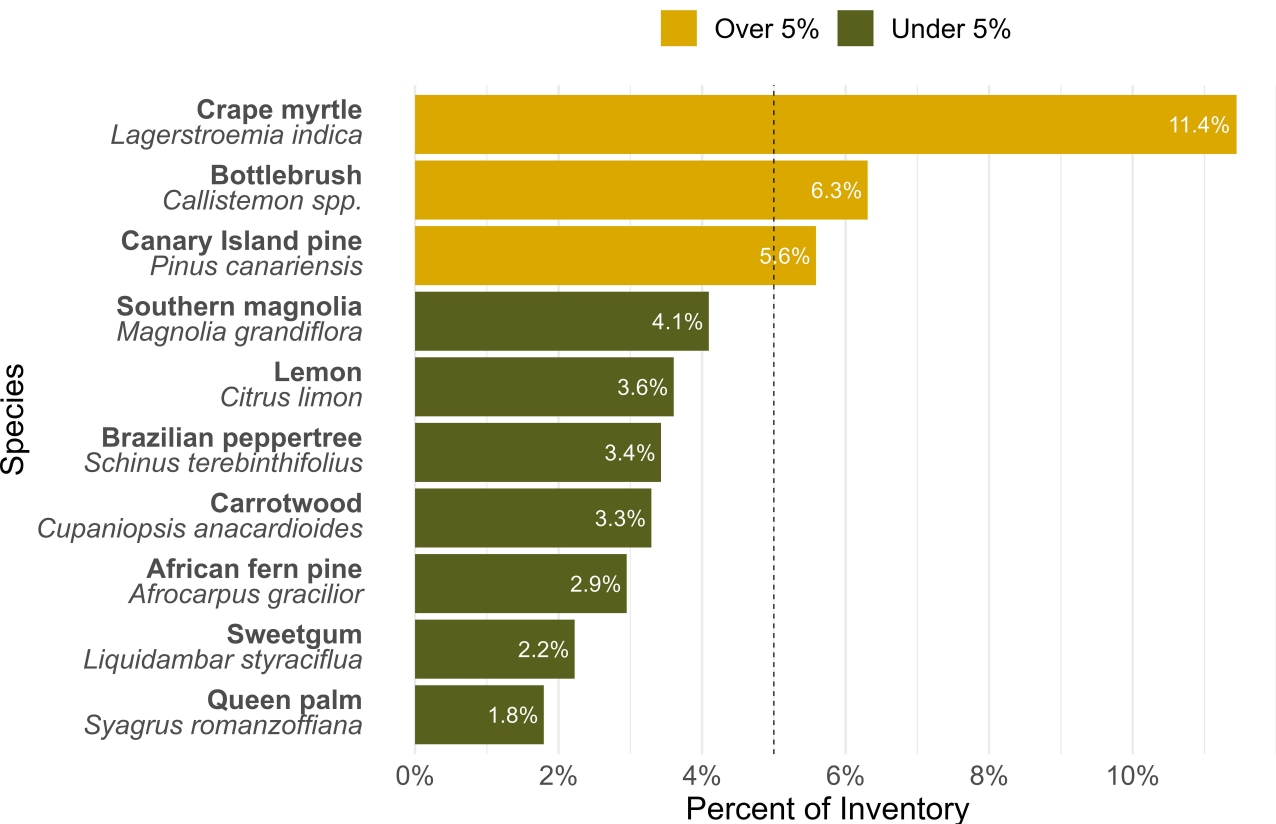
The top 10 genus make up 53.0% (9,874 trees) of United Mutual's inventory.

**Source:** Laguna Woods Tree Inventory (ArborPro 2016).



**Exhibit 4.** Top 10 species in the inventory.

**United Laguna Woods Mutual Inventory - Species Diversity**  
 Sustainability goal: No species represents more than 5% of the inventory



The top 10 species make up 44.7% (8,326 trees) of United Mutual's inventory.

**Source:** Laguna Woods Tree Inventory (ArborPro 2016).

### 2.1.3 Climate Preparedness

Over the past century, average maximum temperatures in California have increased between 1.6°F and 2.5°F, and these temperatures are expected to continue to rise over the coming years (McBride and Lacan 2018). Longer, more intense periods of drought and more variable periods of precipitation with increased flooding (Swain et al. 2018) will make finding additional irrigation water a challenge (McBride and Lacan 2018). Interviews with staff revealed plans in place to ensure United Mutual’s trees continue to receive the water they need through irrigation when turf reduction and transitions to low-water-use landscaping occur. By selecting and planting species that are predicted to perform well in future climate conditions, United Mutual can further prepare for these expected climate and water-use changes. There are many considerations when looking at the climate appropriateness of urban tree species. This analysis considers tree species’ water needs using Water Use Classification of Landscape Species (WUCOLS) and future climate suitability based on research conducted by McBride and Lacan (2018).

Exhibit 5 shows the distribution of trees based on WUCOLS water-use categories. WUCOLS classifies plants as very low, low, moderate, or high water users. WUCOLS water ratings are often part of the guidelines for selecting tree species palettes throughout California. Of United Mutual's trees, 1.4% are very low water users, 29% are low water users, 68% are moderate water users, and 0.63% are high water users. Approximately 1.4% of trees do not have a WUCOLS water-use rating. Species rated as high or moderate water users will require more water resources than species with low or very low ratings.

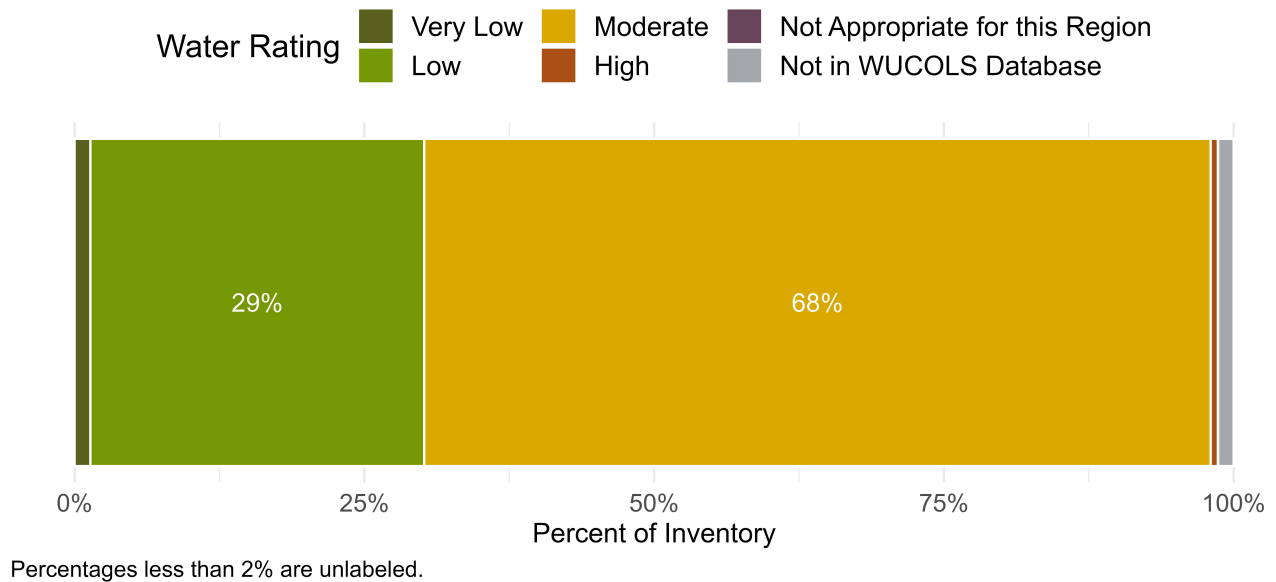
In 2018, a climate suitability study was conducted for street trees in California. One California city was chosen to represent each of the 16 hardiness zones present in California. Common tree species in these representative cities were then compared to common tree species in cities with current temperatures equal to the predicted temperatures of the representative cities in 2099. A list of species that are predicted to be unsuitable for future climates was created based on their absence from warmer cities, professional opinions, and WUCOLS ratings of unsuitable or high.

Comparing United Mutual's inventory to results from McBride and Lacan's research shows 29 species that are predicted to fare poorly in the potential future climate of Laguna Woods. These species make up 29%(5,248 trees) of the inventory. Exhibit 6 shows the top 20 most commonly occurring of these species. The top 3 species include crape myrtle making up 11.4% of the inventory, southern magnolia (*Magnolia grandiflora*) making up 4.1%, and sweetgum (*Liquidambar styraciflua*) making up 2.2% of the inventory.

When planting new or replacement trees, choosing species with low or very low WUCOLS water-use ratings will give newly planted trees a better chance of survival in future climates and water restrictions. By avoiding species predicted to be unsuitable for future climates, especially those already highly represented in the inventory, United Mutual will plant an urban forest that is best suited to the changing climate, therefore requiring less water while promoting tree longevity. These considerations are included in Section 3.1.1.2.

**Exhibit 5.** Distribution of Water Use Classification of Landscape Species water-use rating for all trees in the inventory.

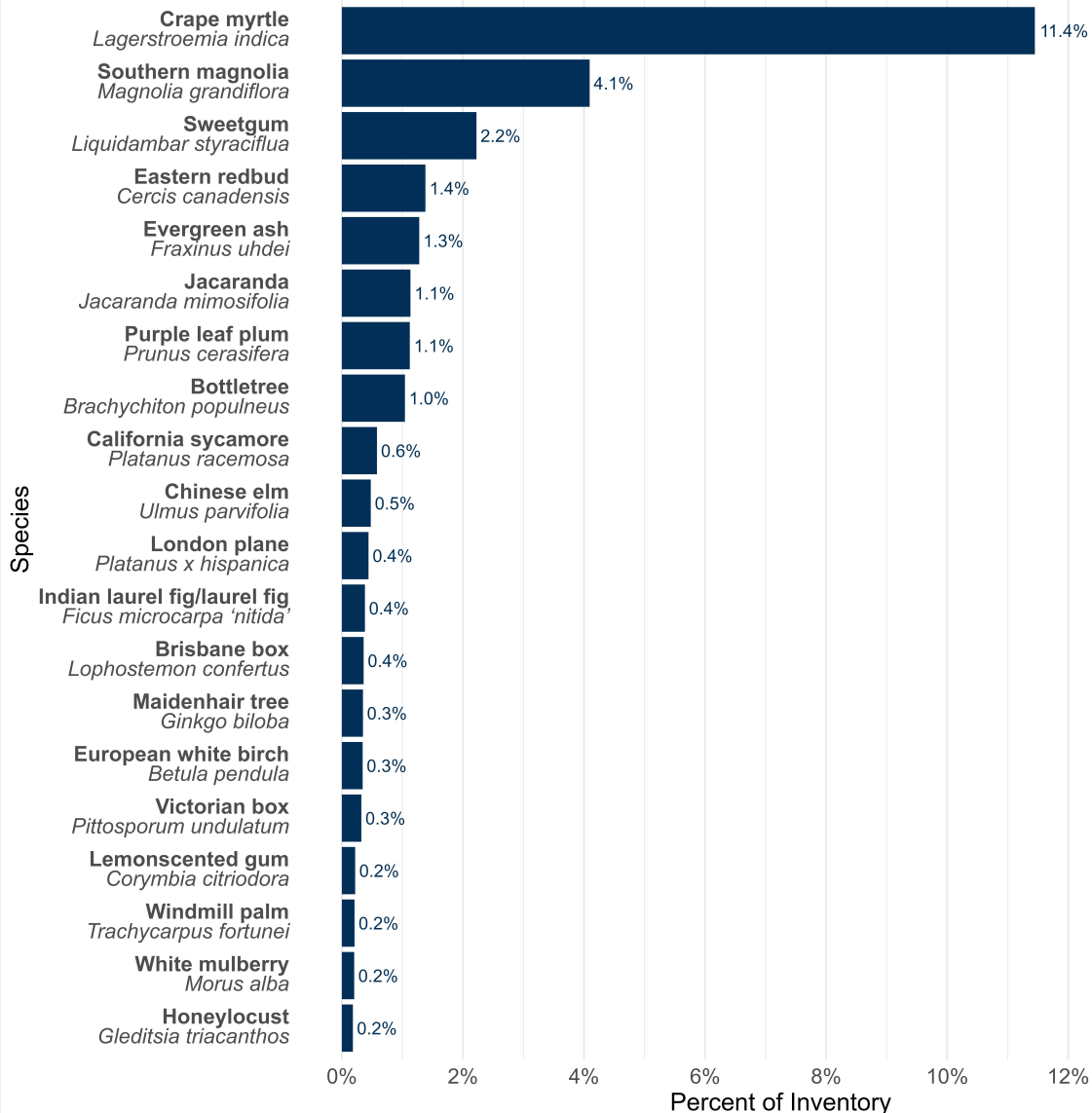
United Laguna Woods Mutual Inventory - Water Rating Diversity



**Source:** Laguna Woods Tree Inventory (ArborPro 2016); WUCOLS (Costello and Jones 2014).

**Exhibit 6. Top 20 species in inventory predicted to be unsuitable for future climates.**

**United Laguna Woods Mutual Inventory - Climate Resiliency**  
**Top 20 Species in Inventory Unsuitable for Future California Climates**



A total of 29 species in United Mutual's inventory are predicted to be unsuitable for future climates. These species (5,248 trees) make up 28.2% of United Mutual's inventory.  
Note: Research excluded palm species.

**Source:** Laguna Woods Tree Inventory (ArborPro 2016); McBride and Lacan 2018.

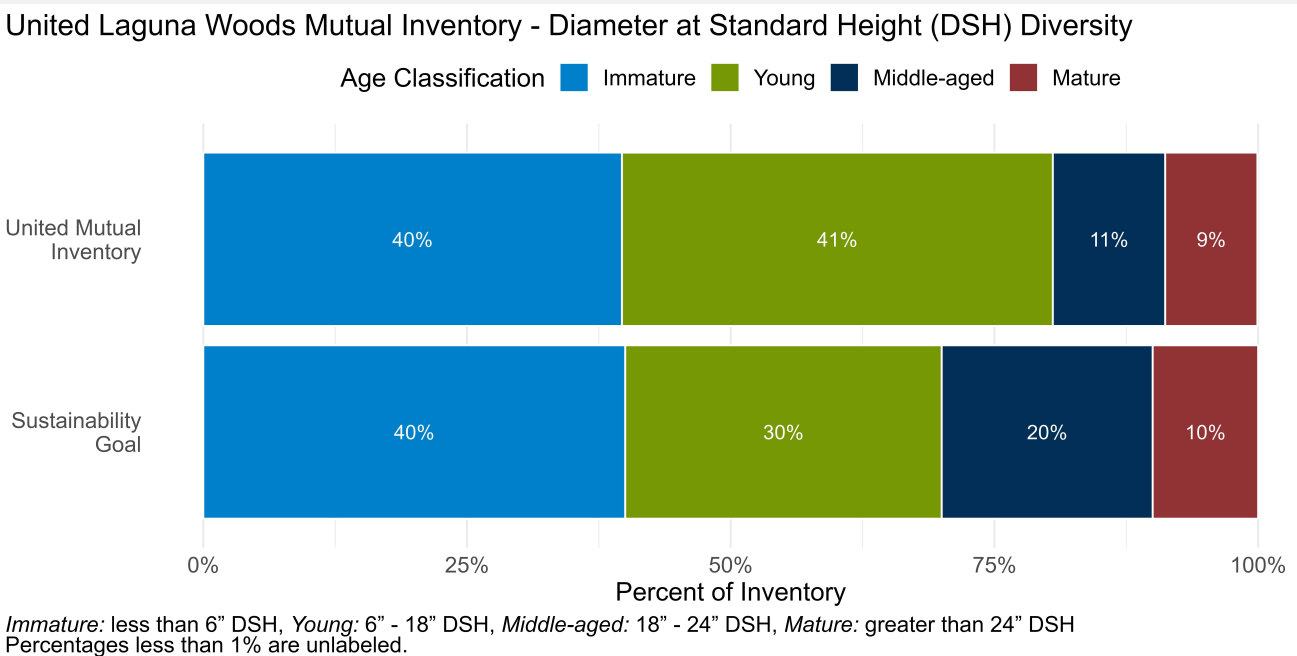
## 2.1.4 Diameter at Standard Height Distribution

Trees are living organisms with a finite life span. While many species live from 50 to over 100 years in natural settings, urban trees tend to have shorter lives with an estimated average life span of 19–28 years (Roman et al.

2016). The most common and least invasive method to approximate the age of a living tree is to measure the trunk diameter at 4.5 feet above the ground (DSH). Since trees vary in maximum stature and growth patterns, using DSH to determine age can only be considered an estimate. General age recommendations suggest an urban forest have a distribution of 40% immature trees to replace failing or aging ones, 30% young and 20% middle-aged trees to provide the bulk of economic and environmental benefits, and 10% mature trees that have most of their life behind them but provide significant environmental benefits (Morgenroth et al. 2020; Richards 1983). This analysis identifies if an urban forest has sufficient trees at different DSH measurements to replace mature trees as they experience senescence and are removed and to provide expected levels of economic and environmental benefits to the community.

Exhibit 7 shows the DSH distribution of all trees in United Mutual's inventory compared to the recommended DSH distributions. United Mutual's population of mature trees (9%) is slightly below the recommended percentage, and the population of middle-aged trees (11%) is below the recommended percentage, meaning a healthy population of immature and young trees is needed to ensure replacement as older trees experience senescence and are removed. United Mutual's population of young trees (41%) is above the recommended percentage, and the population of immature trees (40%) is in line with recommendations, meaning there are sufficient trees in these categories to provide replacement for older trees. These estimates may reflect higher tree-planting efforts in the last 10 to 20 years or an urban forest with high rates of small-stature trees (Section 2.1.2, Species Diversity). By continuing to plant trees at current rates or higher, the environmental services and economic benefits of United Mutual's urban forest will be maintained as the tree population ages and requires tree removals. If maintaining current planting proves difficult due to United Mutual's high stocking rate (98%), United Mutual should consider strategically identifying and planting new tree sites to install young trees in areas where their canopy will replace that of mature trees as removal is required. The stocking rate refers to the percentage of all identified tree sites within an urban forest that are currently planted. Additionally, large-stature trees should be prioritized over small-stature trees whenever possible. Appendix C, Expanding Canopy Cover, shows benefits of small-, medium-, and large-stature trees for consideration when selecting a species to replant.

**Exhibit 7.** Distribution of diameter at standard height for all trees in the inventory.



**Source:** Laguna Woods Tree Inventory (ArborPro 2016).

### 2.1.5 Importance Value

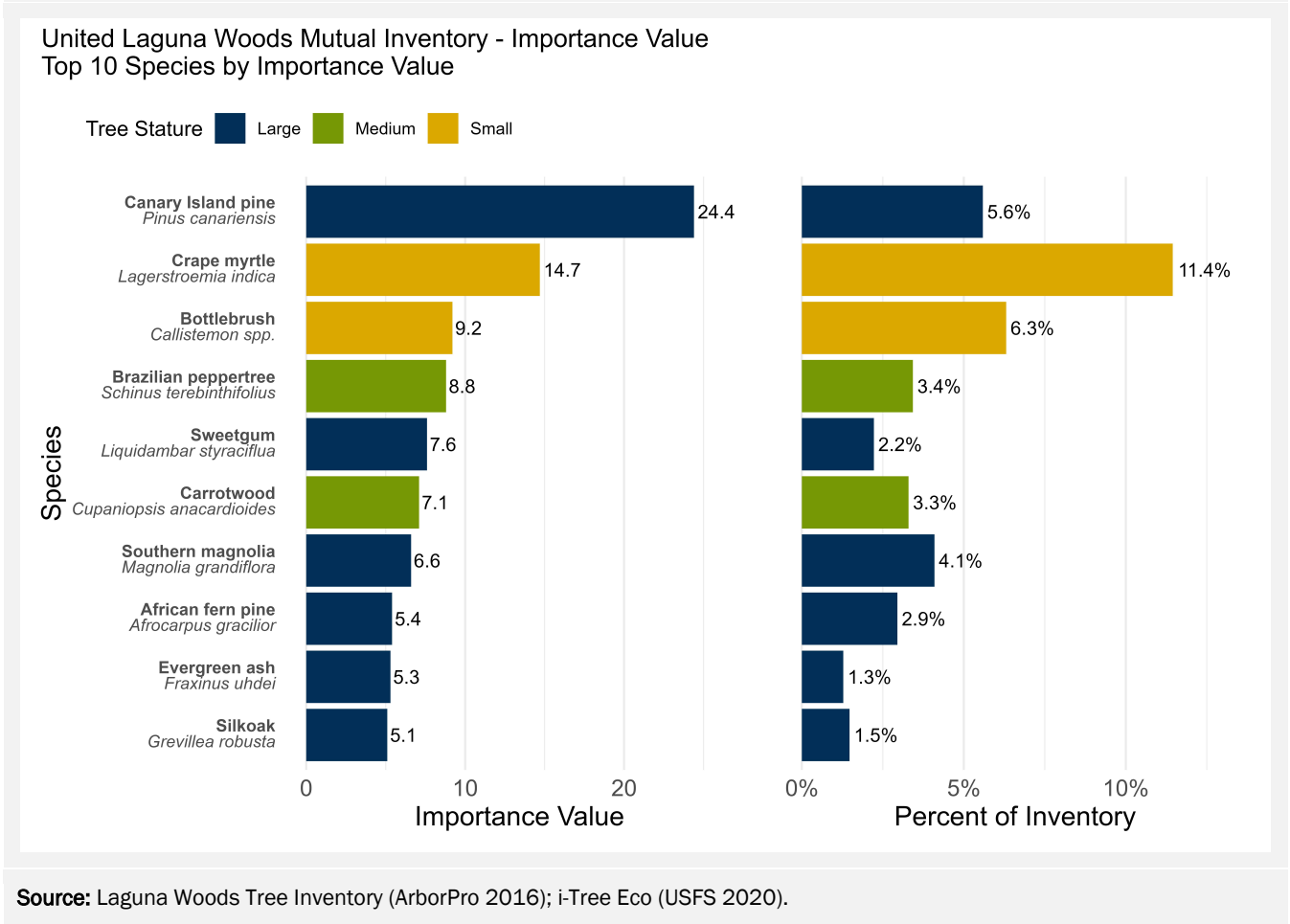
The importance value of a species is calculated in i-Tree Eco (USFS 2020) by combining the percentage a species represents in the inventory with its corresponding percentage of leaf area. The two percentages are added together to determine the importance value shown in Exhibit 8. This metric is another way to measure a species' total value to the urban forest and can be helpful in making tree protection and planting decisions.

Within United Mutual, evergreen ash (*Fraxinus uhdei*), and silkoak (*Grevillea robusta*) species have high importance values despite making up lower percentages of the inventory. These species are not included in the top 10 most commonly occurring species list; however, these large-stature trees provide a higher portion of the urban forest's environmental services and economic benefits on a per tree basis in comparison to small-stature trees. Even without a high quantity of these species, their large stature accounts for a higher percentage of leaf area, increasing their importance value. Conversely, small-stature trees like crape myrtle and bottlebrush have high importance values because they represent a high percentage of the United Mutual inventory but provide a lower environmental benefit per tree due to less leaf area.

Analyzing species' importance values helps determine which species provides a greater amount of urban forest benefits to United Mutual per individual tree. Large-stature trees provide more benefits per tree to the community (USDA 2005) and should be prioritized for preservation, when possible, to maintain environmental services provided by the tree inventory in United Mutual. As large trees planted in insufficient spaces mature, potential safety issues may arise that will qualify a tree for consideration of removal. One option to offset the loss of environmental

benefits if large trees need removal is to proactively plant new trees within the understory of large mature trees. The newly planted trees will have time to grow and replace the benefits of the removed tree prior to removal.

**Exhibit 8.** Top 10 species based on importance value.



Tree inventory analysis and visualizations were created using R (v4.2.1; R Core Team 2022) in RStudio (v6.0.421; Posit Team 2023) using the packages tidyverse (v1.3.1; Wickham et al. 2019), ggplot2 (v3.3.6; Wickham 2016), patchwork (v1.1.1; Pedersen 2020), ggtext (v0.1.2; Wilke and Wiernik 2022), scales (v1.2.0; Wickham and Seidel 2022), and units (v0.8-0; Pebesma et al. 2016).

## 2.2 Estimated Canopy Cover

Tree canopy cover refers to the layer of leaves, branches, and stems that provide coverage of the ground when viewed from above. Canopy cover of an area is calculated by dividing the combined acreage of tree canopy by the total acreage of the area, resulting in a percentage.

United Mutual does not update each tree's canopy width during normal operations, and therefore this analysis is an estimate of canopy cover. United Mutual's canopy cover is estimated using the "crown" attribute in the tree inventory. This attribute is an estimated range of each tree's crown width in feet. The estimated acreage of each tree's canopy cover is calculated by taking the mid-point of the range (for example, 7.5 feet is used for the 0-to-15-foot range). Estimated acreages for all trees are then summed and divided by the total acreage of United Mutual. Based on estimated ranges and mid-point of crown width, United Mutual's estimated canopy cover is 31.4%, which is considered a high level of canopy cover for a community in Southern California. This high level of canopy cover is also reflective of protective parameters for tree removal and effective urban forest management policies.

If United Mutual wanted to use canopy cover as a metric to track progress in tree planting or protection over time, a temporal comparison of canopy could be made with updated canopy width data or full canopy cover analysis, which entails using satellite imagery and lidar to detect tree canopies. Canopy cover analysis is often used by entities to determine tree-planting goals and priority planting locations to maintain canopy cover benefits such as shade and decreasing the UHI effect. A temporal canopy change analysis can be used to assess the effectiveness of planting and preservation efforts. Table 3 highlights general recommendations for urban forest canopy metrics.

**Table 3. Urban Forest General Recommendations**

Management Practice	Recommendation
<b>Environmental Services and Economic Benefits</b>	United Mutual's urban forest currently removes 236.9 tons of carbon dioxide, avoids 1,432,519 gallons of runoff, and removes 8.36 tons of pollution per year, valued cumulatively at \$123,200. Additionally, the urban forest currently provides carbon storage valued at \$1,090,000. Continue funding levels of tree maintenance to ensure healthy trees that will retain and increase the dollar value of their environmental services in United Mutual.
<b>Species Diversity</b>	United Mutual has overrepresented trees within their inventory in comparison to best practices. Planting trees outside of the species that are currently overrepresented in the inventory will increase diversity and resilience of the urban forest. Refer to Appendix A, Recommended Species Palette.
<b>Climate Preparedness</b>	When United Mutual plans for tree removals and replacements, planting species with low or very low WUCOLS water-use ratings will lower water needs in the future. Avoiding species predicted to be unsuitable for future climates, especially those already highly represented in the inventory, will increase urban forest resilience.
<b>Diameter at Standard Height Distribution</b>	If trees continue to be planted at or higher than existing rates, United Mutual can expect the urban forest's environmental services and economic benefits to remain steady as the population ages and requires tree removals.
<b>Importance Value</b>	If trees with high importance values are determined to meet resolution requirements to be removed, long-term planting and removal strategies will be important. This may include actively planting trees within the understory of large mature trees identified for removal, to allow for tree growth before removals occur.
<b>Estimated Canopy Cover</b>	The canopy cover data used in this analysis is an estimate. A more accurate record of canopy width or a full canopy cover analysis using satellite imagery and lidar to detect tree canopies is recommended to track the effectiveness of planting and preservation efforts.

**Note:** United Mutual = United Laguna Woods Mutual; WUCOLS = Water Use Classification of Landscape Species.



---

## 3 Management Practices and Recommendations

The Mutuals share a landscape department of 148 staff members. Staff includes a 7-person tree crew, approximately 16 irrigation personnel, and a 6-person pest and pathogen control department with a certified pest and pathogen professional. The in-house tree crew responds to resident tree planting and care requests. Small engine tools including tree care tools are owned and maintained by the Mutuals. The Mutuals split an annual 1-million-dollar tree maintenance contract performed by Great Scott Tree Care. Staff desire more funding to contractors to enable better maintenance for trees with higher pruning frequency rates.

### 3.1 Tree Planting

Replenishing trees throughout United Mutual's urban forest occurs either through resident requests or as replacement trees for removed trees. Throughout the Mutuals, roughly 100 trees are planted each year through these avenues. United Mutual does not currently have an official replacement ratio or policy in place but decides on a case-by-case basis whether the space is suitable for tree replacement.

United Mutual has planted a wide variety of species, and Section 2.1.2 reflects that, overall, the tree inventory is sufficiently diverse to be resilient to an emerging threat. Continuing to plant a wide diversity of tree species will provide further protection and resiliency against a pest or pathogen that could result in losing a significant portion of the tree population.

#### 3.1.1 Tree Planting Recommendations

Tree planting recommendations were developed through an analysis of the Mutuals' current tree planting practices, urban forest sustainability, and industry standards.

Planting trees to industry standards ensures trees are receiving the best chance for long-term survival. Trees need to be planted at the correct depth to allow respiration. Trees planted too shallow or too deeply prohibit absorbing roots from establishing in the upper 12 inches of soil and often is detrimental to trees receiving proper water and nutrients to grow (Voyle 2015). Upon planting, trees need 15 gallons of water slowly applied to reduce transplant shock and help roots establish. Tree planting recommendations can be found in Table 4.

When planting trees, contractors should be held to industry standards highlighted in Appendix D, Tree Planting and Mulching. Trees that lean at the time of planting should be staked with one, two, or three stakes and flexible ties. A newly planted tree may need additional support from stakes and ties until it establishes a root system and develops trunk taper. Each stake and tie should allow movement of the tree trunk to develop trunk taper. Appendix E should be referenced for establishment care and staking guidelines. Appendix F should be referenced for watering guidelines of a new tree.

Appendix E should be referenced in the planning phase to ensure no infrastructure conflicts are present prior to choosing a planting location. The recommended species palette found in Appendix A is specific for the spacing, climate, resident concerns, and resources provided for United Mutual's urban forest.

### 3.1.1.1 Right Tree, Right Place

A planting plan must include environmental considerations, such as surrounding trees, current infrastructure, proposed development, and access to water and nutrients. Tree planting plans must account for the potential height, trunk, canopy spread, and root zone that each tree will potentially achieve when it reaches maturity, ensuring there is sufficient space in the air and in the ground to avoid conflicts with surrounding structures, infrastructure, or other trees. This practice of selecting locations and species for tree planting is generally referred to as “right tree, right place.” Appendix A outlines the recommended species list with spacing recommendations for each tree species, and Appendix G, Tree Spacing Recommendations, shows proper planting distances for small, medium, and large trees.

Roots are often the cause of infrastructure conflicts belowground and must be considered when selecting a species to plant. Although variable due to species, tree age, and site conditions, the ratio of a root system to trunk diameter is estimated to be roughly 38:1 (Day et al. 2010). Official policies to ensure newly planted trees are following the “right tree, right place” guidelines will benefit United Mutual in the long-term plan in avoiding infrastructure conflicts.

### 3.1.1.2 Recommended Species Palette

The recommended species palette for United Mutual was created accounting for the WUCOLS tool. This tool addresses if the species is suitable in a hotter climate, and if the species is overly represented in the current inventory. Although the Mutuals’ tree inventories were analyzed as separate data sets for the purpose of this analysis, tree populations from both Mutuals were considered when looking at overly represented species to create an encompassing picture of which species are recommended for continued diversity. The recommended palette embodies the concept of “right tree, right place,” which avoids future infrastructure issues caused by mature trees today. The recommended species palette, with minimum distances to infrastructure, is outlined in Appendix A.

### 3.1.1.3 Nursery Stock Selection

Selecting a proper tree from the nursery is imperative to the tree’s establishment and longevity. Expensive tree services can be avoided simply by choosing the right individual specimen. Circumstances such as girdling roots, abnormal growth habits, and disease can be detected early on and avoided through careful examination of nursery stock prior to purchase. Inspecting nursery stock prior to purchasing will ensure an optimal chance of tree survivability.

Nursery stock accepted for planting should have the root ball and branching structure examined before acceptance. A container-grown tree should not have roots that are twisted or circling. Remove the root ball from the container for inspection. If the root ball has a girdling root growing horizontally across the trunk, fine roots can be cut away at planting, and large roots should attempt to be straightened. If the girdling root is unable to be mitigated, reject the nursery stock. The basal trunk flare should be exposed for a container tree. If the flare is buried, gently remove the substrate to observe structural root growth. Structural roots should be horizontal and reach the root ball periphery (AmericanHort 2014). Refer to Appendix H for nursery stock selection regarding root structure.

When examining branching structure, look for a strong, central leader and a branch aspect ratio less than a third of the trunk for each primary branch. Branches should be evenly distributed radially and vertically. Nursery stock should be inspected prior to planting. Should stock be mechanically injured, have defects that are not correctable prior to planting such as codominant branches or girdling roots, or show signs of drought stress, nursery stock

should be rejected (AmericanHort 2014). Appendix I should be referenced for the aspect ratio concept and nursery stock standards.

**Table 4. Tree Planting Recommendations**

Management Practice	Recommendation
Tree Planting	<p>Continue to plant a wide variety of trees from approved species palette with species diversity in mind.</p> <p>Refer to Appendices A and G for recommended species and tree spacing recommendations.</p> <p>Refer to Appendices D, E, and F for planting phase best practices.</p> <p>Continue to plant trees upon resident request. Refer to Appendix G and use it as a learning opportunity with the resident to talk about “right tree, right place.”</p>
Right Tree, Right Place	<p>Implement a “right tree, right place” guideline for selecting tree species to plant.</p> <p>Refer to Appendices A and G in the planning phase to select trees that fit in the proposed location at maturity.</p>
Recommended Species Palette	Refer to Appendix A in the species selection phase and choose trees appropriate for future climate, distance to infrastructure, and water needs.
Nursery Stock Selection	<p>Inspect both branching structure and root ball prior to accepting stock.</p> <p>Refer to Appendices H and I in the nursery stock selection phase.</p>

## 3.2 Tree Maintenance

### 3.2.1 Establishment Care

One of the main tenets of urban forest sustainability is that it requires human intervention (Clark et al. 1997). Since urban trees are planted and not naturally regenerating, they require ongoing care to ensure they successfully establish in the landscape. Establishment care is used to describe the 3-to-5-year period after a tree is planted. During this stage, the urban tree needs supplemental watering, resetting of stakes, removal of stakes, rebuilding of berms, mulching, weeding, and maintenance to establish roots and proper branching structure.

United Mutual irrigates their urban forest utilizing two main methods: trees planted in shrub areas are given bubblers, and trees planted in turf areas are watered by broadcast irrigation. Most trees are in turf areas.

The level of care and consistency of watering are two main factors in successful establishment of a newly planted tree. United Mutual’s current establishment practices were reviewed, and recommendations for improvement will follow in Section 3.2.1.1, Establishment Care Recommendations, and will be displayed in Table 5.

### 3.2.1.1 Establishment Care Recommendations

Current tree establishment care practices for United Mutual were analyzed, and recommendations based on industry standards were developed to encourage longevity of newly planted trees. United Mutual currently plants most trees by contractor or utilizes the in-house crew. Planting the tree at the correct depth and ensuring proper watering will aid in the tree's success. Refer planting crews to Appendix D for proper planting procedures.

Trees require watering that infiltrates the soil sufficiently enough to reach the entire root ball (2–3 feet below soil level) and at time intervals that allow soil moisture to dissipate before watering again. Conversely, turf requires frequent irrigation of the surface (top 6–8 inches) of soil. Most trees are planted in turf areas with broadcast irrigation and only receive frequent surface watering instead of periodic deep watering. United Mutual landscape staff are interested in weening away from broadcast irrigation to conserve water and better maintain tree health.

Watering newly planted trees at a rate of 15 gallons per week for 3 years after planting will help to establish the root system in the landscape. Additional watering is recommended during abnormal heat events to minimize stress to the trees from water loss. Bucket watering, hand watering, watering bags, or drip irrigation systems are ideal for slow, deep watering of trees.

Building a 4-to-6-inch berm 2 to 3 feet from the trunk of the newly planted tree helps direct water infiltration to the root ball. Reduce runoff by slowly filling the watering basin as water permeates into the root ball. Cover the berm and root ball with a 3-to-4-inch layer of mulch to encourage building a healthy soil profile as decomposition occurs and to reduce evaporation of moisture from the soil.

Appendix E shows proper establishment care practices, and Appendix F shows watering guidelines. Trees that lean at the time of planting should be staked with one, two, or three stakes and flexible ties. Each stake and tie should allow movement of the tree trunk to develop trunk taper. Trees are considered established when moving the trunk does not move the root ball. If tree roots are established, the stakes should be removed. Keeping stakes on trees past their establishment period can restrict growth and development of trunk taper.

Mature trees will benefit from supplemental watering during dry summer months, extended drought conditions, or extreme heat events. Mature trees should be watered slowly along the drip line once per month at a rate of 10–15 gallons per inch of trunk diameter per watering. Check the soil moisture before watering to confirm the soil is dry to prevent oversaturating the soil, which can induce the spread of pathogens within the soil.

Another aspect of tree maintenance is pest management, which is coordinated for both Mutuals by a six-person pest control crew, including a certified pest and pathogen professional. Continuing this capacity among the Mutuals will proactively prevent pest and pathogen outbreaks by having personnel with the ability to respond as soon as a pest or pathogen is identified. Diversity of new tree planting will also aid in decreasing pest vulnerability as an urban forest.

### 3.2.2 Tree Pruning

United Mutual currently divides tree pruning responsibilities between contractors and in-house staff. Contractors complete routine tree pruning cycles on a 6-year cycle for most trees in the inventory. Palms and fast-growing species such as *Cupaniopsis* spp. and *Ficus* spp. are on a 2-year pruning cycle. The in-house tree crews execute all trimming that happens outside of scheduled pruning, such as road clearance trimming and work requests from community members. Contractors are responsible for responding to tree emergencies. United Mutual is satisfied

with the contractor's performance, and United Mutual is on track with planned pruning cycles. United Mutual's current tree pruning practices were reviewed, and recommendations for improvement will follow in Section 3.2.2.1 and be displayed in Table 5.

### 3.2.2.1 Tree Pruning Recommendations

After establishing a baseline for United Mutual's current tree pruning practices, recommendations were created with United Mutual's resources and current practices in mind.

Trees under the maintenance plan for United Mutual should be on a pruning cycle of 2–6 years dependent on growth rate of species. This pruning cycle falls within the accepted industry standard for maintaining safe trees.

When trees are structurally pruned at a young age, the tree will mature into a more structurally sound tree. Young tree pruning can eliminate defects that could potentially lead to limb or branch failures or structural defects that have a higher cost to correct as trees mature. Defects such as codominant stems or competing leaders should be reduced during this process. Young tree structural pruning may be necessary to complete through two or three pruning cycles. Appendix J illustrates a few examples of the young tree structural pruning technique.

Pruning should occur annually for palms. To prevent trunk damage, palms should not be climbed with spikes. No live fronds should be taken above a 45-degree angle. All dead fronds should be removed or skinned. If there is a pathogen present within the palm population, proper disinfecting of tools prior to pruning the next palm is necessary to avoid spreading disease to the entire population.

Topping trees should be prohibited. Topping trees destabilizes tree structure and increases the need for maintenance to keep risk of failure low. In some cases, trees may be topped to mitigate storm damage. A topped tree should be evaluated for removal. If the tree is seen as valuable for wildlife and is not planned for removal, the tree should be reduced to a height with improbable likelihood of failure with negligible consequences of failure, evaluated by a Tree Risk Assessment Qualified (TRAQ) arborist. Topped trees that are not reduced in stature to minimize risk will need annual maintenance for sucker growth control.

Mature tree pruning should be performed by the tree maintenance contractor. Pruning should occur on a pruning cycle, with pre-determined specifications. Specifications should include style of pruning, amount to remove, types of cuts to use, and sizes of branch to be removed. Reasons for pruning should include improving structure, mitigating risk, providing clearance, maintaining health, reducing density, or restoration pruning after storm damage. Proper pruning practices should include a natural pruning system utilizing either a reduction cut or branch removal cut. Pruning practices should not include topping, lion tailing, making flush cuts, unnecessarily leaving stubs, or removing an excessive number of live branches. Guidelines for pruning specifications are found in Appendix K, and proper mature tree pruning practices can be found in Appendix L.

Recommendations for establishment care and tree pruning practices are summarized in Table 5.

**Table 5. Tree Maintenance Recommendations**

Management Practice	Recommendation
<b>Establishment Care</b>	<p>Irrigate trees with deep watering methods and move away from broadcast watering. Utilize hand watering, bucket watering, and drip irrigation.</p> <p>Funding for water may be taken away if unused. If funding is available, utilize funding for the added cost of trenching from water source to tree to have irrigation lines run below surface.</p> <p>Build a 4-to-6-inch berm around the tree and add organic mulch to improve moisture retention, enrich soil with nutrients, and suppress weeds.</p> <p>Trees that lean at the time of planting should be staked with one, two, or three stakes and flexible ties. Refer to Appendix E.</p> <p>Provide additional watering in times of drought for both young and mature trees.</p> <p>Ensure contractors and in-house crew are planting trees to standard. Refer to Appendix E for proper establishment care practices.</p>
<b>Tree Pruning</b>	<p>Young tree structural pruning should be considered to establish structurally sound trees. Refer to Appendix J.</p> <p>Tree pruning should occur to specifications assigned by tree owner prior to work being performed. Refer to Appendix K.</p>

### 3.3 Tree Preservation and Removal

United Mutual's community members commonly submit tree removal requests for evaluation. Such requests are reviewed by the board of directors and staff, who aim to optimize tree preservation and community safety. These factors, along with diverse community member preferences, can be challenging to balance. Due to tree and site variability, tree removal requests are evaluated on a case-by-case basis. As such, this facet of urban forest management can often be time intensive and demand complex decision-making. The following section outlays solutions that United Mutual has practiced, as well as recommendations for tree preservation and removal processes to further the protection of their urban forest.

#### 3.3.1 Parameters for Tree Removal

Tree removals are only warranted when all other management options have been exhausted. United Mutual receives many inquiries to remove trees for view obstruction or messy debris. United Mutual denies these requests, utilizing their adopted resolution for tree removal parameters. The parameters are listed below, and the full resolution can be found in Appendix B.

United Mutual has established the following tree removal guidelines (Appendix B):

- Unless there is a purposeful reason, trees should not be removed merely because they are messy, or because of residents' personal preferences concerning shape, color, size, or fragrance.

- Trees should not be removed because of view obstruction.
- Trees on slopes should not be removed if the removal will contribute to the destabilization of that slope.
- Trees which are damaging or will damage a structure, pose a hazard, in failing health or interfere with neighboring trees, will be considered for removal.

United Mutual faces unique challenges when managing tree preservation and removal. Although current arborist, landscape team, and community members are enthusiastic about maintaining and retaining trees, this may change with time and employee turnover; therefore, there is value in establishing standards for tree removal, tree preservation, and replanting.

### 3.3.2 Recommendations for the Parameters for Tree Removal

The term “should” used in the tree removal resolution implies some degree of discretion in decision-making. Likewise, the term “shall” has been widely interpreted in legal courts to have similar discretionary flexibility. It is recommended that the term “should” is replaced by “will” (Wex 2021).

The fourth parameter of the tree removal guidelines has been difficult to interpret and implement with consistency. United Mutual has recognized that a framework needs to be in place to interpret and respond to conflicts between trees and infrastructure. Analysis and recommendations for infrastructure conflicts can be found in Section 3.3.3.

### 3.3.3 Infrastructure Conflicts

An infrastructure conflict exists when a tree canopy, root structure, or trunk is directly causing damage or imminent damage to buildings, roofs, walkways, roads, pipes, or other structures. California cities spend approximately 30% of their tree budget on infrastructure conflicts, including mitigative tree work, prevention, and litigation (McPherson 2000). Proper planning and management of conflicts between trees and infrastructure is an essential facet of urban forest management. In most cases, mitigation efforts such as pruning and, as a last resort, removal must take place to fix the infrastructure conflict.

United Mutual indicated mitigating infrastructure conflicts as a focal point for improvement of their urban forest management program. In particular, landscape staff noted that large, mature trees planted close to buildings have resulted in building damage from roots and branches. Finding a balance between environmental benefits received from mature trees, costs of removal and conflicts, and timing of removal and appropriate replacement must be considered when managing an urban forest.

The following section was developed to decrease potential subjectivity associated with infrastructure conflicts and tree management decisions. Additionally, the Infrastructure Conflicts Chart found in Appendix M can be used by a qualified professional as a step-by-step resource when evaluating infrastructure conflicts in the field.

By creating a systematic process of evaluation for tree removals, the Mutuals can ensure only trees that necessitate removal will be approved, ensuring tree removals are consistent with the goals of United Mutual and its community.



### 3.3.3.1 Infrastructure Conflicts Considerations

When considering tree removal requests categorized under the fourth parameter, infrastructure conflicts, the following guidelines should be observed in sequence:

1. Evaluate conflict and potential mitigation solutions. Refer to the Infrastructure Conflict Action Menu (Table 6) to consider all possible mitigation actions prior to considering tree removal.
2. Consult a qualified professional. Due to potential complications to tree health, liability, and public safety, it is recommended that the decision-making individual for such instances has the following qualifications:
  - a. International Society of Arboriculture (ISA) Certified Arborist
  - b. ISA TRAQ
  - c. Experience with root pruning
3. Minimize impact and monitor. When impacts to trees and tree roots cannot be avoided, careful consideration must be given to determine if root pruning and tree preservation is feasible. For assessing and monitoring tree risk, refer to Section 3.3.6, Tree Risk Program Recommendations.
4. Tree removals should be considered only when all feasible preventative and mitigative procedures (found in Table 6) have been thoroughly considered and are insufficient for the level of mitigation necessary. After Table 6 is considered, refer to the Infrastructure Conflict Matrix (Table 7) to evaluate if the tree is a candidate for removal. Tree removals are recommended when infrastructure conflict mitigation would likely lead to tree death or intolerable tree risk situations.

Tree health must be considered when evaluating if a tree will survive mitigation efforts without jeopardizing structural stability or level of risk. Table 7 outlines when current tree health conditions may impact tree recovery from mitigation efforts and urges United Mutual to consult a qualified professional.

Although root pruning is often a preferred mitigation method to preserve trees, the following actions may detrimentally threaten the health or structural integrity of a tree,<sup>1</sup> and only when each of the following actions are answered with a “no,” should root pruning be considered. Appendix M can be used to determine if mitigation efforts are feasible for each tree.

- Pruning 30% or more of the tree’s root system
- Removing 30% or more of the tree’s canopy
- Root pruning at a distance less than three times the trunk diameter or on three or more sides of the tree

A tree stores energy reserves in branches, stems, trunk, and roots (Gilman and Lily 2008). As such, there is a limit to the amount of pruning and root suppression a tree can receive before causing detrimental changes to tree health and risk of failure (Smiley et al. 2014). When root pruning is necessary, tree managers should take care to minimize overall root pruning and maximize the distance from the tree’s trunk that roots are cut. Appendix N, Root Pruning Detail, and Appendix O, Root Pruning Guidelines, provide further details and specifications for root pruning. Pruning more than 30% of a tree’s canopy or root system should be avoided when possible (Smiley et al. 2014) but may be permissible in certain circumstances.

---

<sup>1</sup> Parameters are based on ISA Best Management Practices for Root Management (ISA 2008).



**Table 6. Infrastructure Conflict Action Menu**

Solution Category	Solution	Description
Conflict Prevention	Right tree, right place	The urban forest environment includes surrounding trees, irrigation schedule, and current and proposed development. When planting, available soil volume and presence of existing infrastructure should be deciding factors for species and site selection.
Infrastructure Adaptations	Expand tree well space	Large trees require large growth areas—above, below, and at ground level. Sidewalk infrastructure conflicts can be avoided by allocating larger tree wells to trees.
	Alternative sidewalk materials	Technological advancements for sidewalks, such as rebar concrete reinforcement, pervious pavement, and flexible joints, continue to be developed.
	Meandering sidewalks	Rebuild sidewalks to meander around planting areas, allowing the trees more grow space
	Bridging	A bridged surface that does not require compacted subgrade can replace damaged sidewalk.
	Root control devices	Root control devices have historically been suggested to guide roots underground and away from surface-level infrastructure. However, it has been found that root barriers are least effective in poorly aerated soils, which are commonplace in the built environment (Randrup et al. 2001; Gilman 1996).
Tree Work	Root pruning	Tree work such as root pruning should be considered when infrastructure mitigation is not possible. When pruning roots, avoid removing roots greater than 3 inches in diameter. Pruning roots within a distance five times the tree's trunk diameter should be avoided.
	Crown pruning	It has been found that moderate to aggressive crown pruning can lead to decreased root growth (Randrup et al. 2001; Coder 1997; Jones et al. 1998).
	Removal	Removals should only be considered when all other feasible options have been considered. Consult Table 7.

Table 7 summarizes infrastructure conflicts and tree risk recommendations.

**Table 7. Infrastructure Conflict Matrix**

Impact to Tree	Tree Health Condition before Infrastructure Conflict Mitigation			
	Dead	Poor	Fair	Good
Conflict can be resolved with little impact to tree or alternative site design is feasible	Tree is a candidate for removal	Employ all feasible infrastructure adaptations and monitor before considering tree for removal	Removal is strongly discouraged	Removal is strongly discouraged

**Table 7. Infrastructure Conflict Matrix**

Impact to Tree	Tree Health Condition before Infrastructure Conflict Mitigation			
	Dead	Poor	Fair	Good
<b>Tree can retain structural integrity with proposed tree work</b>	Tree is a candidate for removal	Employ all feasible infrastructure adaptations and monitor before considering tree for removal	Employ all feasible infrastructure adaptations and monitor before considering tree for removal	Employ all feasible infrastructure adaptations and monitor before considering tree for removal
<b>Proposed tree work will threaten structural integrity of tree</b>	Tree is candidate for removal	Tree is a candidate for removal	Employ all feasible infrastructure adaptations and monitor before considering tree for removal	Employ all feasible infrastructure adaptations and monitor before considering tree for removal
<b>Pruning of canopy will likely cause detrimental harm to tree health or structural stability</b>	Tree is a candidate for removal	Tree is a candidate for removal	Tree is a candidate for removal	Employ all feasible infrastructure adaptations and monitor before considering tree for removal

**Note:** This table has been designed to assist with tree management decision-making ONLY when an unavoidable infrastructure conflict exists and mitigation options in Table 6 have been considered and are deemed insufficient to decrease level of risk. Only trees justified for removal, according to the matrix, will be removed. When evaluating tree health, a qualified professional should be consulted.

### 3.3.4 Tree Removals and Replanting

If a tree removal request is approved, Appendix A, the recommended species palette, should be referenced to plant a tree species that can maximize the available growing space. Native or climate-appropriate species to Southern California are preferred as a replanting species due to their natural adaptation to soils and climate of the geographical area. When possible, new trees should be planted near old and declining trees for hyper-local mitigation of canopy loss.

Historically, fruit trees are prohibited in United Mutual. Past resident advocates planted fruit trees, which remain in the tree inventory. When homes went into escrow, fruit trees were removed prior to new ownership, decreasing maintenance needs provided by Laguna Woods Village. Through the UFMP process, community members expressed continued value in having fruit trees as part of their urban forest. Therefore, Laguna Woods Village has modified the fruit tree allowance to accommodate for this desire. Dwarf fruit trees within United Mutual are allowed only with prior approval from the Landscape Committee. Residents are required to maintain the fruit tree at a required level of maintenance, guided by United Mutual. Should residents be unable to provide the required maintenance and debris clean up, the Laguna Woods Village Landscape Department will remove the tree at no cost to the resident.

#### 3.3.4.1 Tree Replacement Ratio Comparison

United Mutual plants replacement trees for removed trees, but it does not have an official replacement ratio or policy in place. Codifying a replacement ratio will set a policy that cannot be easily changed if there is a shift in the

value the United Mutual residents or board members hold for trees. By adopting an official replacement policy, United Mutual ensures maintenance of urban forest benefits are preserved for current and future residents.

Removal of aging or hazardous trees is an essential aspect of tree management to maintain safety in the urban landscape. Tree managers that implement systematic replacement ratios that apply for all tree removals are securing urban forest benefits for the future community. Table 8 highlights how several municipalities approach tree replacement, which can be used as a basis for a United Mutual tree replacement ratio. An important caveat to the table below is that most municipal tree replacement ratios have varying standards for trees managed by the municipality and trees on private property. However, all trees within United Mutual are directly managed by Laguna Woods Village, allowing for a broader approach to tree replacement that can account for broader urban forestry goals and site development, as opposed to site-specific remedies.

**Table 8. Comparison and Analysis of Tree Replacement Ratios**

Municipality	Mitigation Description	Analysis
County of San Mateo, California	Unless inappropriate due to existing tree canopy or site restrictions, a tree removal shall require the planting of one or more replacement trees of a species and size designated by the Community Development Director (County of San Mateo Ordinance No. 3229).	Allows for case-by-case discretion and flexibility. Strategy does not offer clarity or consistency provided by a systematic approach.
City of Renton, Washington	Trees are categorized into three priority classifications. <ul style="list-style-type: none"> <li>▪ Landmark trees (trees above 24 inches DSH).</li> <li>▪ Trees in continuous woodlands and sediment-stabilizing trees on slopes are top priority.</li> <li>▪ Lowest priority trees include invasive species.</li> </ul> Replacement ratio varies between 1:1 and 6:1 depending on the removed tree's size and priority classification. In-lieu fees are accepted on a case-by-case basis (City of Renton Municipal Code Chapter 13, Section 9).	Number of replacement trees required depends on (1) species and geotechnical importance, and (2) size of the tree removed.
Town of Mount Pleasant, South Carolina	Trees are classified by species and health rating. Highly valued species in good condition are valued highest, followed by the same species in fair, then poor condition. There are 12 total categories (4 species-based x 3 health-rating-based). Classifications dictate the replacement is based on DSH of tree removed. Replaces fraction of DSH removed (i.e., if a 40-inch DSH live oak in good health is removed, 20 inches total DSH of replacement trees must be planted) (Town of Mount Pleasant Municipal Code Section 156.220).	Takes several factors into account and provides a replacement that closely resembles what has been removed.
County of Los Angeles, California	Heritage trees (trees above 36 inches DSH) and specific native species require specific permits. Oak tree replacement ratios range from 2:1 to 12:1, depending on size of tree removed. All other trees must be replaced on site at a 2:1 ratio. When mitigation on site is not available, in-lieu fees can be paid to the County's Protected Tree Fund (County of Los Angeles Municipal Code Section 22.56).	Provides specific measures for high-value trees. Simple 2:1 replacement ratio for all other trees.

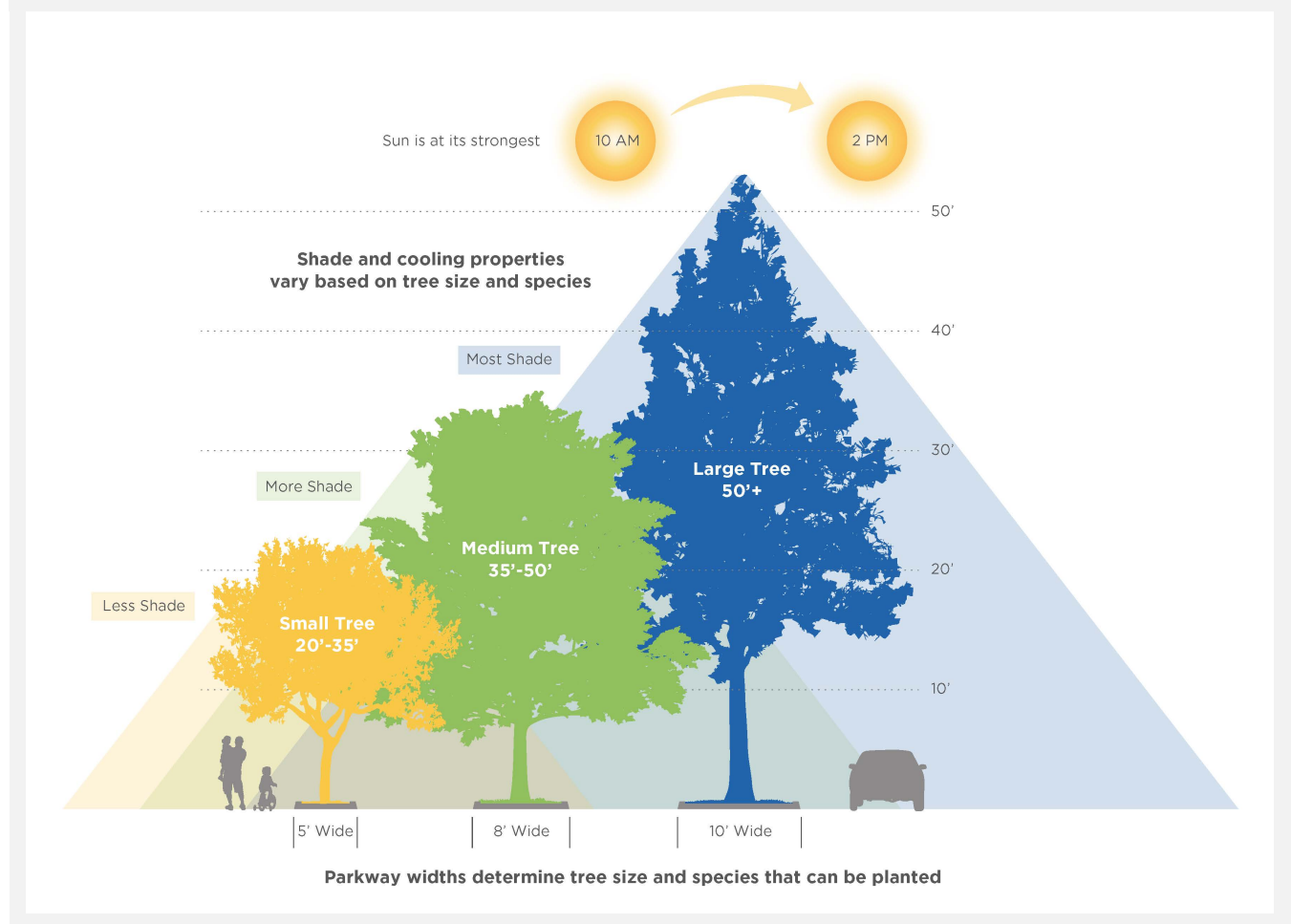
**Notes:** DSH = diameter at standard height.

### 3.3.4.2 Tree Replacement Ratio Recommendations

Although United Mutual has a high percentage of canopy cover at 31.4%, increasing canopy cover will benefit the community by providing shade to further avoid UHI effects and providing environmental services and economic value to the larger environment. United Mutual has a unique opportunity to continue increasing canopy cover to increase urban forest benefits beyond typical Southern California communities. Table 9 is the recommended tree replacement guideline for United Mutual. Appendix C, Expanding Canopy Cover Ratio, shows further benefits received when replanting ratios target expansion of the urban forest. Appendix C also highlights example species that may be utilized for replacement. Exhibit 9 visually illustrates shade benefits received from small-, medium-, and large-stature trees.

**Table 9. Tree Replacement Ratio**

Size of Removed Tree	Replacement Ratio		
	Small tree	Medium tree	Large tree
Small tree	3:1	2:1	1:1
Medium tree	4:1	3:1	2:1
Large tree	6:1	4:1	2:1

**Exhibit 9. Shade benefits of various stature trees.**

### 3.3.5 Tree Protection during Construction Recommendations

Construction for development, maintenance, and renovation can pose threats to tree survivability in numerous ways. Threats include injury to roots, trunks, and branches; soil compaction; soil contamination; and improper pruning. Soil compaction, often a result of placing heavy equipment or driving heavy machinery over a tree's root zone, decreases the soil pore space available for water and oxygen to reach tree roots. This process can be detrimental to tree health. It is essential that an arborist is included early in the planning process to avoid damage when trees intersect with the built environment. Arborists have the role of identifying which trees will be retained or removed, creating site-specific tree protection protocols, and establishing areas where replacement trees will be planted. The following guidelines should be followed to protect trees during the planning and construction phase:

1. **Tree Protection Zones:** A Tree Protection Zone (TPZ) is an area surrounding a tree and its critical root zone where no grading, excavation, construction activity, equipment storing, or vehicle parking is to occur. The purpose of the TPZ is to protect all parts of the tree, both above and below ground. It is common for tree owners to include a standard minimum TPZ for all construction projects within a tree ordinance. The size

of TPZ ranges between tree owners; however, research suggests that a TPZ should be at least 1.5 inches wide per every inch DSH (Day et al. 2010). A successful TPZ is surrounded by signed fencing that reads “Keep Out: Tree Protection Zone.”

2. **Reducing Compaction:** When soil is compacted, the flow of water and oxygen to tree roots is limited, which can lead to detrimental issues for a tree. In construction areas, compaction occurs purposefully through mechanical compaction or incidentally through the passage of vehicles and construction equipment over soil containing a tree’s roots. To dampen the impact of incidental compaction, it is recommended that a 6-to-12-inch layer of mulch be spread around the tree during construction activities. Once construction activities have concluded, the mulch layer should be decreased to the normal 2-to-3-inch depth (ISA 2008).
3. **Minimizing Effects of Grade Changes:** The optimal zone for root growth is within the first 12 inches of soil depth. Therefore, any change in grade within a tree’s rooting zone will likely cause negative impacts for tree health. The degree to which these impacts affect the tree depends on the age of the tree, species, prior stressors, and environmental factors. If significant grade changes are planned, an arborist should be consulted to help create a plan to minimize impacts.
4. **Inspection:** Trees impacted during construction, maintenance, or renovations, should be monitored for decline annually by an ISA Certified Arborist for the first 5 years after construction. Monitoring should include photographs, annual reports, and mitigation techniques if necessary.

Refer to Appendix P and Appendix Q for guidelines for protecting trees during construction.

### 3.3.6 Tree Risk Program Recommendations

The urban forest is interwoven with people, homes, cars, and other components of infrastructure that may be impacted by tree failures. To minimize risk and liability, a routine tree risk program evaluating trees with a potential safety concern is recommended. Trees should be evaluated by an ISA TRAQ arborist utilizing a systematic process with consideration for alternative mitigation methods prior to tree removal, mitigating risk while preserving benefits of large-stature trees.

Tree risk management begins with the tree manager establishing an acceptable level of risk and determining the type of assessment they are requiring for a tree (ISA 2017). There are three levels of risk assessment that vary in detail and equipment used to complete the assessment: level 1 limited visual assessment, level 2 basic assessment, and level 3 advanced assessment (Table 10).

A level 2 assessment by an ISA TRAQ arborist is recommended to assess the risk and mitigation potential of individual trees. To determine the overall risk associated, a TRAQ arborist systematically assesses tree health, structural integrity, likelihood of tree failure, time frame in which failure may occur, likelihood of impact to target (e.g., people, homes, cars), and severity of impact that may occur. ISA recommends qualitative tree risk assessments at regular intervals for trees with potentially elevated risk or in highly populated areas.

Although different situations require different response times, United Mutual should establish a maximum period in which an identified tree risk must be mitigated once it is deemed to have a risk level beyond the established threshold.

**Table 10. International Society of Arboriculture Risk Assessment Levels**

Risk Assessment Level	Description
Level 1	“Windshield” survey to identify high-risk trees while driving, walking, and commuting through neighborhoods. Only major defects or concerns are observed and recorded.
Level 2	360-degree observation of the crown, limbs, and trunk.  Determination of targets (homes, people, cars) that may be impacted by tree or limb failure.  Level of damage to the target should impact occur.
Level 3	Advanced assessments of the roots, stem, or crown.  Analysis of internal aspects of trees using sophisticated tools and technology.

### 3.3.6.1 Tree Risk Assessments before Removal

Implementing a tree risk program with level 2 or 3 assessments before tree removal is recommended. Trees evaluated by an ISA TRAQ arborist and process have alternative mitigation methods besides tree removal, to reduce the risk associated with a tree. These options can help a tree risk manager make decisions to mitigate risk while preserving trees. This process will strengthen the protection for existing trees in the event of staff changeover or resident preferences for supporting their urban forest. Table 11 presents recommendations for tree preservation.

**Table 11. Tree Preservation Recommendations**

Management Practice	Recommendation
Parameters for Tree Removal	Update language in resolution to replace “should” with “will.”  Use Table 6, Infrastructure Conflict Action Menu, and Table 7, Infrastructure Conflict Matrix, for increased consistency when considering trees for removal.
Infrastructure Conflicts	Utilize Table 6 to determine if mitigation is possible for infrastructure conflict prior to considering tree removal.  Refer to Appendix M, which is a decision-making flow chart on whether a tree should be considered for removal or infrastructure conflicts can be mitigated.  If unavoidable infrastructure conflicts exist, refer to Table 7 to systematically determine if a tree is a candidate for removal.
Tree Replacement Ratio	Codifying a replacement ratio will set a policy that cannot be easily changed if there is a shift in the values of United Mutual.
Tree Protection during Construction	If construction, maintenance, or renovation is to occur at United Mutual, the tree protection recommendations in Section 3.3.5 should be followed. Refer to Appendices P and Q.
Tree Risk	United Mutual will benefit from a tree risk management program by justifying removals that do get approved, saving trees from removal by ways of mitigation, and establishing a program to protect the urban forest from a change in priorities.



**Table 11. Tree Preservation Recommendations**

Management Practice	Recommendation
	Create a tree risk program if trees are identified as potentially having a high likelihood of failure or the consequences of failure are above the acceptable level of risk.
	Tree risk management programs should be developed with an ISA TRAQ qualified arborist.

**Note:** United Mutual = United Laguna Woods Mutual; ISA = International Society of Arboriculture; TRAQ = Tree Risk Assessment Qualified.

### 3.4 Urban Wood Reuse and Recommendations

The United States urban forest offsets roughly 2% of carbon emitted from vehicles by absorbing carbon dioxide during photosynthesis, storing it in tree tissues, and processing it into sugars that promote tree growth. When a tree reaches the end of its life cycle and dies, wood begins to decay, releasing stored carbon back into the atmosphere. The rate of decay determines the rate at which carbon re-enters the atmosphere (Berghorn 2021; Urban Wood Network 2020; Tinus and LaMana 2013; WCA 2023).

In a typical urban forestry program, wood from removed trees is hauled from the site by the tree maintenance contractor. The contractor determines the best method of disposal, which include landfill, mulch chippings, firewood, or urban wood products.

The landscape department at Laguna Woods Village manages and maintains an on-site mulch storage facility used by the Mutuals and residents for landscaping projects. Building a mulch ring around tree drip lines helps retain soil moisture and build the soil profile as mulch decays, providing water for trees and environmental regeneration services to the Mutuals. By reusing a removed tree as mulch, the Mutuals save costs by avoiding landfill tipping fees and avoid emissions from transportation of materials and disposal of green waste in the landfill. Exhibit 10 shows a photo of the mulch storage facility utilized for tree recycling at Laguna Woods Village.



**Exhibit 10.** On-site mulch storage facility of Laguna Woods Village.



**Source:** Laguna Woods Village 2022a.

Laguna Woods Village hosts a resident woodworking program for its residents. The Mutuals provide wood to this program, diverting waste from landfills and continuing to store carbon captured in an end-use product. This program enjoyed by community members can further their efforts by creating end-use wood products, such as educational plaques for tree information, benches within the native gardens, or as a wood source for projects such as garden fences.

Laguna Woods Village utilizes tree maintenance debris in an effort towards sustainable urban forest management. Urban wood reuse recommendations are summarized in Table 12. Appendix R shows various methods of utilizing tree maintenance debris as an urban wood product.

**Table 12. Urban Wood Recommendations**

Management Practice	Recommendation
Urban Wood Reuse	<p>Continue mulching program for landscaping needs and residential needs. Utilize mulch for tree maintenance by creating a mulch ring around the tree to build soil profile and retain soil moisture.</p> <p>Continue providing wood for the urban wood program within United Mutual. Removed trees can be used to create urban wood end-use products such as benches for native gardens, fencing, or educational plaques for tree species. This use of urban wood in its second life helps store carbon for a longer period of time, further increasing the sustainable forest practices of United Mutual as a community and its larger regional and global contribution to greenhouse gases, climate change, and increased heat and drought events.</p>

**Note:** United Mutual = United Laguna Woods Mutual.

# 4 Community Engagement

Meaningful community engagement is essential in developing a UFMP that reflects the goals, needs, and priorities of the community. During the UFMP development process, staff and the consulting team conducted community engagement activities to better understand the views community members hold about trees in United Mutual and to ensure those that interact and live amongst the urban forest have a voice in how trees are managed. The engagement process was guided by the International Association of Public Participation principles (IAP2 2018):

**Inform:** To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, and/or solutions.

**Consult:** To obtain public feedback on analysis, alternatives, and/or decisions.

**Involve:** To work directly with the public throughout the process to verify that public concerns and aspirations are consistently understood and considered.

**Collaborate:** To partner with the public in each aspect of the decision, including the development of alternatives and the identification of the preferred solution.

**Empower:** To place final decision making in the hands of the public.

This section details the approach, process, and results of United Mutual’s UFMP community engagement.

## 4.1 Summary of Key Interested Party Input

In fall 2022, Dudek conducted interviews with various staff to understand the effectiveness of tree management and practices within United Mutual. Four staff members with extensive experience in tree management were invited to a virtual Zoom meeting to provide key input, helping to prioritize the greatest needs to be addressed in the UFMP. Participants in the interviews are included below in Table 13. The interviews explored the role of each staff member in influencing tree management, clarified internal procedures, and informed areas where United Mutual could improve management of the urban forest. Major themes shared during the interviews are presented below (Table 14).

**Table 13. Staff Interview Participants**

Interviewee	Position
Clemente Sanchez	Foreman
Leonardo Lopez	Foreman
Robert Merget	Landscape Manager
Kurt Wiemann	Landscape Director

**Table 14. Summary of Staff Interview Responses**

Theme	Staff Responses
Staffing	<ul style="list-style-type: none"> <li>▪ Landscape department: 148 staff members</li> </ul>
Contractors	<ul style="list-style-type: none"> <li>▪ Great Scott Tree Care</li> </ul>
Tree Planting	<ul style="list-style-type: none"> <li>▪ The Mutuals try to replace every tree removed with at least a 1:1 ratio, but there is no formal replacement ratio</li> </ul>
Irrigation	<ul style="list-style-type: none"> <li>▪ Most trees are watered through broadcast irrigation method, with few trees on a drip irrigation system</li> <li>▪ The irrigation crew has 16 employees.</li> </ul>
Pruning	<ul style="list-style-type: none"> <li>▪ Contractors perform pruning work following the Mutuals' master pruning cycle list based on tree species. Biannual pruning cycle for select species and 6-year pruning cycle for all other trees.</li> </ul>
Mature Trees and Infrastructure	<ul style="list-style-type: none"> <li>▪ Mentioned in all interviews that many large, mature trees were planted too close to buildings and currently cause infrastructure damage</li> </ul>
Emergency Response	<ul style="list-style-type: none"> <li>▪ System is in place: in-house security contacts contractor; contractor responds to tree-related emergency after hours</li> </ul>
Pest/Pathogen Control Department	<ul style="list-style-type: none"> <li>▪ 6 employees on in-house crew</li> </ul>
Desired Update to Tree Regulation	<ul style="list-style-type: none"> <li>▪ Address large trees that have been planted in the wrong location</li> </ul>
Urban Wood Reuse	<ul style="list-style-type: none"> <li>▪ In-house mulching facility: over 2,000 cubic feet of mulch</li> </ul>
Vision for the Future	<ul style="list-style-type: none"> <li>▪ Further understanding of soil characteristics within the Mutuals and knowledge of trees that thrive in these conditions</li> </ul>
Desired Tree Palette Update	<ul style="list-style-type: none"> <li>▪ Right tree, right place</li> </ul>

**Note:** Mutuals = United Laguna Woods Mutual and Third Laguna Hills Mutual.

## 4.2 Landscape Community Meetings

The first in-person event to gather community input for the UFMP was during the Landscape Meeting held at the Laguna Woods Village Community Center Board Room on January 23, 2023. The Landscape Meeting introduced community members to the UFMP process through a presentation and created a space where community members can voice their opinions and suggestions for what to consider in the development of the UFMP. Exhibit 11 shows the flyer for the Landscape Committee meeting.



**Exhibit 11.** United Laguna Woods Mutual landscape committee meeting flyer.

## UNITED MUTUAL IS CREATING AN URBAN FOREST MANAGEMENT PLAN!

The plan will set the long-term vision and actions the staff at Laguna Woods will take so that all can enjoy the maximum benefits of trees. Join us at the United Landscape Committee meeting to ensure the plan reflects the ideas and priorities of Laguna Woods' community members!



**January 23, 2022**

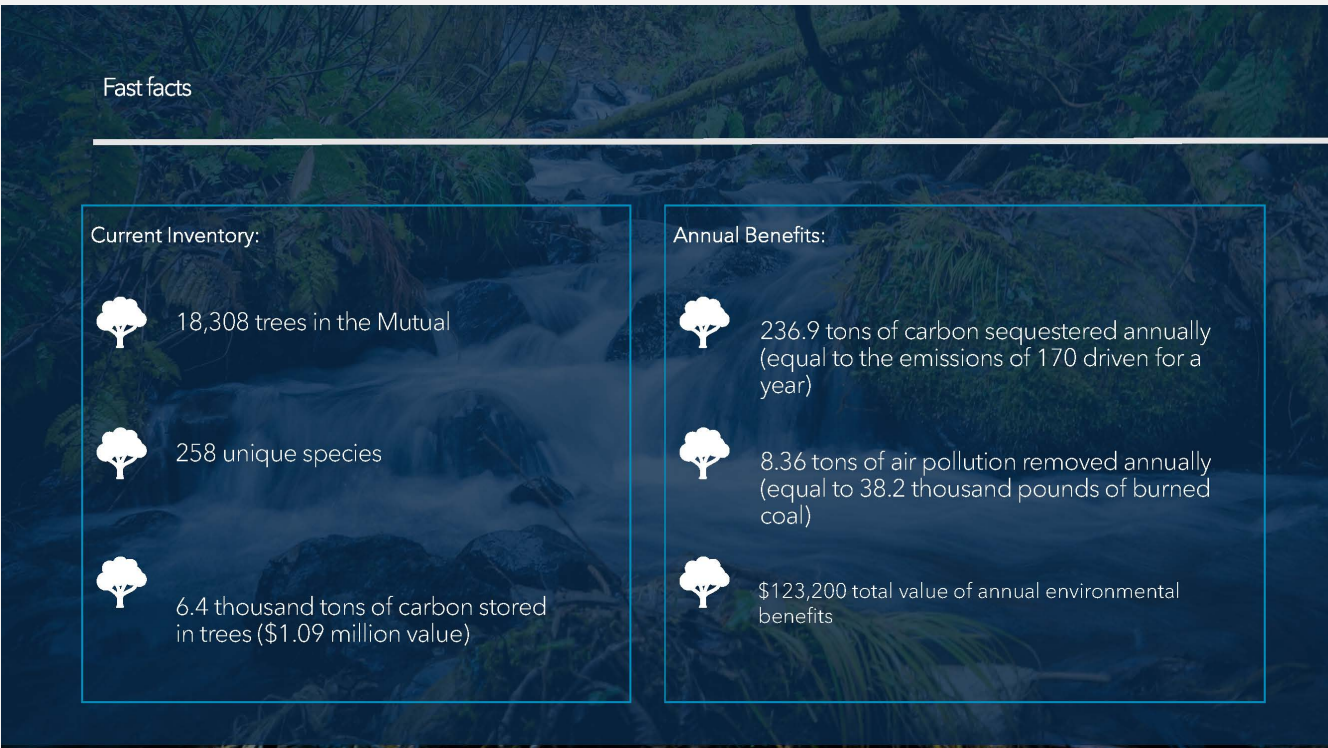
**1:30 PM in the Community  
Center Board Room**

  
Laguna Woods Village®

**Source:** Laguna Woods Village 2022b.

Preliminary data and information shared during the presentation included tree inventory findings, such as tree count, top species, unique species, and water-use ratings, and annual environmental and economic benefits provided by trees in United Mutual. Exhibit 12 shows a slide of fast facts presented at the Landscape Committee meeting.

**Exhibit 12.** United Laguna Woods Mutual fast facts.



**Source:** Dudek 2023a.

Attendees were asked to provide input through guided questions to ensure the values of community members were reflected in the development of the UFMP. Responses were recorded on a large flip chart paper. Below are specific questions and topics posed to the meeting participants:

1. Keywords and phrases that describe the ideal Laguna Woods urban forest.
2. What are the current challenges facing the Laguna Woods urban forest that should be considered in the UFMP?
3. What are the opportunities for improving the Laguna Woods urban forest?

Volunteers provided their input in an open discussion forum. Responses were organized afterwards by the consulting team. Responses are detailed in Table 15 below.

**Table 15. Landscape Community Meeting Responses**

Keywords and Phrases that Describe the Ideal Laguna Woods Urban Forest	What are the current challenges facing the Laguna Woods urban forest that should be considered in the UFMP?	What are the opportunities for improving the Laguna Woods urban forest?
<p>A community that is dense with trees</p> <p>Native tree species and native plants that complement the landscape</p> <p>A variety of tree species</p> <p>The beauty that trees provide a community</p> <p>Trees bring calmness and peace</p>	<p>Consider planting trees with minimal litter, needles, and fruit drop to avoid conflict with walkers, canes, etc.</p> <p>Consider root/utility-friendly tree species and spacing</p> <p>Plant trees that act as noise control buffer for loud noise from nearby highways</p> <p>Do not plant trees that are fire hazards</p> <p>Consider having a mix of evergreen and deciduous trees—homes can get too much shade in the winter</p> <p>Consider planting larger container-sized trees</p> <p>Explicitly state that trees are a part of purchase decision for new owners to avoid consideration of tree removal (i.e., trees blocking a view)</p>	<p>Increase awareness and education about trees through the Community Center</p> <p>Educate about the cultural significance of native tree species</p> <p>Include more information and news about trees and the UFMP process in The Globe</p> <p>Start having tree tours and guided nature walks</p> <p>Label trees with species information on plaques</p> <p>Encourage clubs within United Mutual to start tree-related volunteer groups such as gardening, tree care, native tree learning</p>

**Note:** UFMP = urban forest management plan; United Mutual = United Laguna Woods Mutual.

The second in-person meeting to discuss the UFMP was held on June 22, 2023, in the Laguna Woods Village Community Center Board Room. This meeting was held after an 80% draft of the UFMP was written and sent to staff and the board to review prior to this meeting. The project manager of the consulting team attended the meeting as a representative to discuss the draft document. Comments were captured by the landscape administrative assistant and implemented throughout the document in collaboration with staff. Recommendations captured during the meeting included the following:

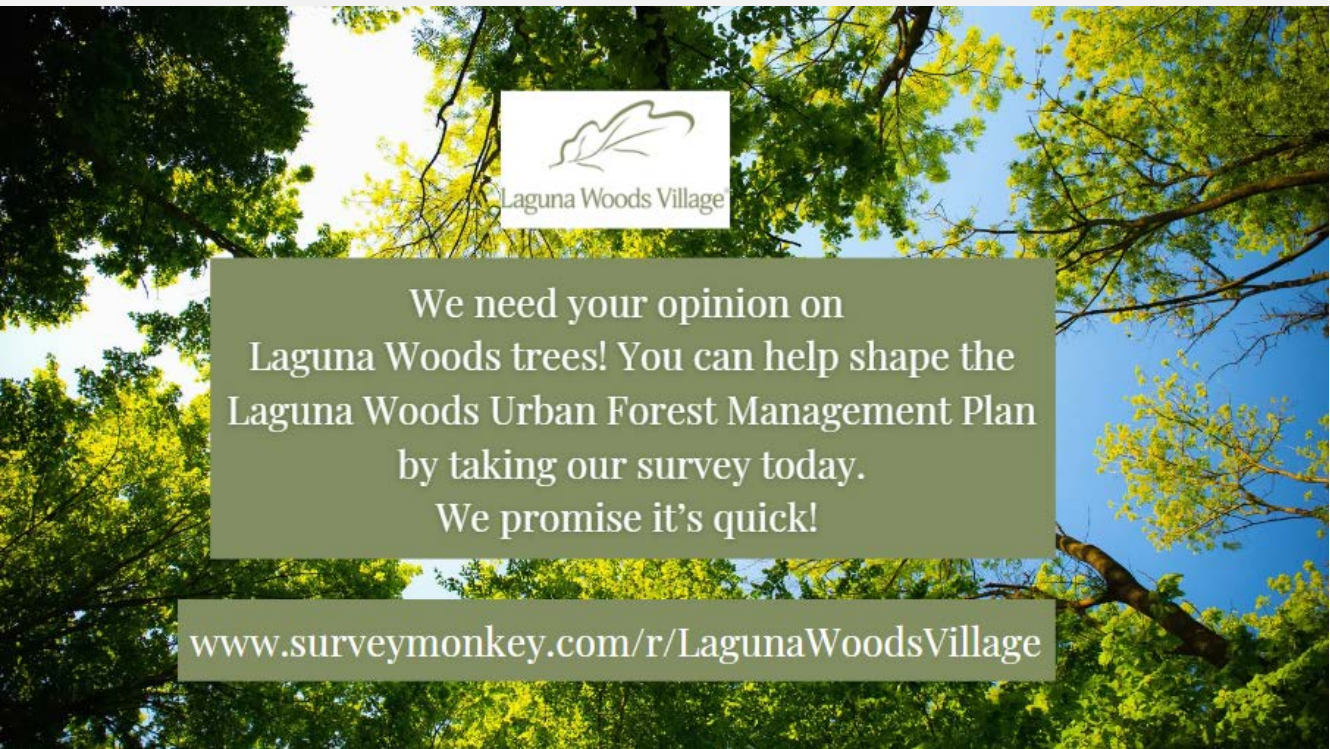
- Add intangible benefits of the urban forest to introduction
- Modify language throughout to protective language regarding trees
- Omit singular species when discussing any maintenance recommendations
- Focus on structural value of trees, not just monetary value
- Current tree removal request process needs to be added
- Attach full resolution as appendix
- Provide arboriculture background to construction damage portion to include importance of root zones
- Urban Wood section is not feasible for United Mutual at this time; remove as recommendation



### 4.3 Laguna Woods Tree Survey

The Laguna Woods Village Public Tree Survey was created to understand resident’s values and opinions of United Mutual’s trees and to offer an open forum for feedback as United Mutual developed its UFMP. The six-question survey was open between February 2023 and the end of March 2023 and was disseminated through United Mutual’s outreach outlets. In total, 964 survey responses were recorded. The results of the survey are summarized in Table 16 below. Exhibit 13 shows visual aid material developed for the community tree survey.

**Exhibit 13.** Laguna Woods tree survey graphic.



**Source:** Dudek 2023b.

**Table 16. Summary of Online Survey Responses**

Question	Response
What’s your favorite tree?	<ul style="list-style-type: none"> <li>8.32% mentioned pines as their favorite tree</li> <li>6.13% mentioned southern magnolias as their favorite tree</li> <li>5.25% mentioned jacarandas as their favorite tree</li> </ul>
What should be the top goals of the Laguna Woods Urban Forest Management Plan?	<ul style="list-style-type: none"> <li>31% believe that removing dead, dying, or hazardous trees is the top priority for the Laguna Woods Urban Forest Management Plan</li> </ul>



**Table 16. Summary of Online Survey Responses**

Question	Response
	<ul style="list-style-type: none"> <li>26% believe that maintaining the existing trees better is the top priority for the Laguna Woods Urban Forest Management Plan</li> </ul>
What do you value most about trees?	<ul style="list-style-type: none"> <li>79% value trees for improving the environment (i.e., human health, improving air quality, and storing greenhouse gas emissions)</li> <li>71% value trees for their beauty and aesthetics</li> </ul>
What key words and phrases describe the ideal Laguna Woods Urban Forest?	<ul style="list-style-type: none"> <li>Beautiful/Beauty: 24%</li> <li>Diverse/Diversity: 10%</li> <li>Maintained/Well-Maintained: 9%</li> <li>Healthy: 7%</li> <li>Variety: 6%</li> <li>Shade: 5%</li> <li>Lush: 5%</li> </ul>
What key priorities and concerns would you like the Urban Forest Management Plan to consider?	<ul style="list-style-type: none"> <li>10% of respondents believe better maintenance of existing trees to keep them healthy and safe is a key consideration when it comes to tree management in Laguna Woods</li> <li>8% of respondents believe proper and consistent tree trimming is important when it comes to tree management in Laguna Woods</li> </ul>

Word clouds displayed below in Exhibits 14 and 15 show the most common responses to questions “What key words and phrases describe the ideal Laguna Woods Urban Forest?” and “What key priorities and concerns would you like the Urban Forest Management Plan to consider?” Responses were gathered into word clouds to show visually what words within survey results appeared most frequently based on the size of the text in the word clouds.

**Exhibit 14.** Laguna Woods tree survey results.

Q5 What keywords and phrases describe the ideal Laguna Woods Urban Forest?

create spaced varied much overgrown times large thriving many well cared calming  
 damage tall walk landscape relaxing area Balance Urban Forest quiet  
 community Climate Woods Lush diverse healthy trees many trees well Full  
 Unique make Laguna Woods enhance maintenance tranquil  
 Peaceful health Diversity Serenity environment leaves  
 green Well kept Lush safety Variety life diverse  
 mature trees Beautiful Low maintenance trees don't  
 beauty need healthy love shade Diverse healthy  
 maintained clean Well maintained friendly forest  
 oasis living shady mature canopy Safe managed Sustainable  
 natural beauty species Lush green residents hazard keep habitat natural Serene  
 plants care homes trimmed removed abundant birds beautiful environment nature  
 Green lush look cool appropriate native good neighborhood provide shade Less majestic  
 flowering

**Exhibit 15.** Laguna Woods tree survey results.

Q6 What key priorities and concerns would you like the Urban Forest team to consider when creating the Urban Forest Management Plan?

removal thinning large dangerous cause walk forest village damage provide see  
 issues hazards cut trees plants living will homes pine trees mature trees  
 time clean species without trees removed many healthy grow take  
 know one community replace urban forest good health area dying  
 removing trees reduce Safety well water create  
 maintenance branches trimming healthy trees  
 Maintain care trees trees healthy Keep falling  
 need views plants around plant trees roots  
 Remove continue residents big beauty tall  
 environment Leave shade work beautiful Consider cost avoid  
 plan place Please future buildings sidewalks pruning already landscape  
 native add diversity don't replacement look also green concern much rid  
 climate change Protect USE drought tolerant management wildlife

INTENTIONALLY LEFT BLANK

## 5 Standards and Details

Table 17 consolidates all recommendations that were discussed within this UFMP for ease of reference.

**Table 17. Strategies and Recommendations for United Mutual**

Management Practice	Recommendation
<b>Environmental Services and Economic Benefits</b>	United Mutual's urban forest currently removes 236.9 tons of carbon dioxide, avoids 1,432,519 gallons of runoff, and removes 8.36 tons of pollution per year, valued cumulatively at \$123,200. Additionally, the urban forest currently provides carbon storage valued at \$1,090,000. Continue funding levels of tree maintenance to ensure healthy trees that will retain and increase the dollar value of their environmental services in United Mutual.
<b>Species Diversity</b>	United Mutual has overrepresented trees within their inventory in comparison to best practices. Planting trees outside of the species that are currently overrepresented in the inventory will increase diversity and resilience of the urban forest. Refer to Appendix A.
<b>Climate Preparedness</b>	When United Mutual plans for tree removals and replacements, planting species with low or very low WUCOLS water-use ratings will lower water needs in the future. Avoiding species predicted to be unsuitable for future climates, especially those already highly represented in the inventory, will increase urban forest resilience.
<b>Diameter at Standard Height Distribution</b>	If trees continue to be planted at or higher than existing rates, United Mutual can expect the urban forest's environmental services and economic benefits to remain steady as the population ages and requires tree removals.
<b>Importance Value</b>	If trees with high importance values are determined to meet resolution requirements to be removed, long-term planting and removal strategies will be important. This includes actively planting trees within the understory of large mature trees identified for removal, to allow for tree growth before removals occur.
<b>Estimated Canopy Cover</b>	The canopy cover data used in this analysis is an estimate. A more accurate record of canopy width or a full canopy cover analysis using satellite imagery and lidar to detect tree canopies is recommended to track the effectiveness of planting and preservation efforts.
<b>Tree Planting</b>	Continue to plant a wide variety of trees from approved species palette with species diversity in mind.  Refer to Appendices A and G for recommended species and tree spacing recommendations.  Refer to Appendices D, E, and F for planting phase best practices.  Continue to plant trees upon resident request. Refer to Appendix G and use it as a learning opportunity with the resident to talk about "right tree, right place."
<b>Right Tree, Right Place</b>	Implement a "right tree, right place" guideline for selecting tree species to plant.

**Table 17. Strategies and Recommendations for United Mutual**

Management Practice	Recommendation
	Refer to Appendices A and G in the planning phase to select trees that fit in the proposed location at maturity.
<b>Recommended Species Palette</b>	Refer to Appendix A in the species selection phase and choose trees appropriate for future climate, distance to infrastructure, and water needs.
<b>Nursery Stock Selection</b>	Inspect both branching structure and root ball prior to accepting stock. Refer to Appendices H and I in the nursery stock selection phase.
<b>Establishment Care</b>	<p>Irrigate trees with deep watering methods and move away from broadcast watering. Utilize hand watering, bucket watering, or drip irrigation.</p> <p>Funding for water may be taken away if unused. If funding is available, utilize funding for the added cost of trenching from water source to trees to have irrigation lines run below surface.</p> <p>Build a 4-to-6-inch berm around the tree and add organic mulch to improve moisture retention, enrich soil with nutrients, and suppress weeds.</p> <p>Trees that lean at the time of planting should be staked with one, two, or three stakes and flexible ties. Refer to Appendix E.</p> <p>Provide additional watering in times of drought for both young and mature trees.</p> <p>Ensure contractors and in-house crew are planting trees to standard. Refer to Appendix E for proper establishment care practices.</p>
<b>Tree Pruning</b>	<p>Young tree structural pruning should be considered to establish structurally sound trees. Refer to Appendix J.</p> <p>Tree pruning should occur to specifications assigned by tree manager prior to work being performed. Refer to Appendix K.</p>
<b>Parameters for Tree Removal</b>	<p>Update language in resolution to replace “should” with “will.”</p> <p>Use Table 6, Infrastructure Conflict Action Menu, and Table 7, Infrastructure Conflict Matrix, for increased consistency when considering trees for removal.</p>
<b>Infrastructure Conflicts</b>	<p>Utilize Table 6 to determine if mitigation is possible for infrastructure conflict prior to considering tree removal.</p> <p>Refer to Appendix M, which is a decision-making flow chart on whether a tree should be considered for removal or infrastructure conflicts can be mitigated.</p> <p>If unavoidable infrastructure conflicts exist, refer to Table 7 to systematically determine if a tree is a candidate for removal.</p>
<b>Tree Replacement Ratio</b>	Codifying a replacement ratio will set a policy that cannot be easily changed if there is a shift in the values of United Mutual.
<b>Tree Protection during Construction</b>	If construction, maintenance, or renovation is to occur at United Mutual, the tree protection recommendations in Section 3.3.5 should be followed. Refer to Appendices P and Q.

**Table 17. Strategies and Recommendations for United Mutual**

Management Practice	Recommendation
<b>Tree Risk</b>	<p>United Mutual will benefit from a tree risk management program by justifying removals that do get approved, saving trees from removal by ways of mitigation, and establishing a program to protect the urban forest from staff and priority changeover.</p> <p>Create a tree risk program if trees are identified as potentially having a high likelihood of failure or the consequences of failure are above the acceptable level of risk.</p> <p>Tree risk management programs should be developed with an ISA TRAQ qualified arborist.</p>
<b>Urban Wood Reuse</b>	<p>Continue mulching program for landscaping needs and residential needs. Utilize mulch for tree maintenance by creating a mulch ring around the tree to build soil profile and retain soil moisture.</p> <p>Continue providing wood for the urban wood program within United Mutual. Removed trees can be used to create urban wood end-use products such as benches for native gardens, fencing, or educational plaques for tree species. This use of urban wood in its second life helps store carbon for a longer period of time, further increasing the sustainable forest practices of United Mutual as a community and its larger regional and global contribution to greenhouse gases, climate change, and increased heat and drought events.</p>

**Note:** United Mutual = United Laguna Woods Mutual; WUCOLS = Water Use Classification of Landscape Species; ISA = International Society of Arboriculture; TRAQ = Tree Risk Assessment Qualified.

INTENTIONALLY LEFT BLANK



---

## 6 References

- AmericanHort. 2014. *American Standard for Nursery Stock*. ANSI Z60.1-2014. American National Standards Institute. [https://cdn.ymaws.com/americanhort.site-ym.com/resource/collection/38ED7535-9C88-45E5-AF44-01C26838AD0C/ANSI\\_Nursery\\_Stock\\_Standards\\_AmericanHort\\_2014.pdf](https://cdn.ymaws.com/americanhort.site-ym.com/resource/collection/38ED7535-9C88-45E5-AF44-01C26838AD0C/ANSI_Nursery_Stock_Standards_AmericanHort_2014.pdf).
- ArborPro. 2016. "Laguna Woods Tree Inventory."
- Ball, J., S. Mason, A. Kiesz, D. McCormick, and C. Brown. 2007. "Assessing the Hazard of Emerald Ash Borer and Other Exotic Stressors to Community Forests." *Arboriculture & Urban Forestry* 33(5): 350–359.
- Berghorn, G. 2021. *How Urban Wood Utilization Positively Impacts Carbon & The Climate Crisis*. TEDxUrbanWoodNetwork. December 2, 2021. <https://urbanwoodnetwork.org/webinar-tedxurbanwoodnetwork/>.
- Buron, R., M.E. Hostetler, and M.G. Andreu. 2022. "Urban Forest Fragments vs Residential Neighborhoods: Urban Habitat Preference of Migratory Birds." *Landscape and Urban Planning* 227: 104538. <https://doi.org/10.1016/j.landurbplan.2022.104538>.
- City of Laguna Hills. 2023. "History of Laguna Hills." Accessed September 14, 2023. <https://www.ci.laguna-hills.ca.us/247/History-of-Laguna-Hills>.
- Clark, J.R., N.P. Matheny, G. Cross, and V. Wake. 1997. "A Model of Urban Forest Sustainability." *Journal of Arboriculture* 23: 17–30.
- Coder, K.D. 1997. "Crown Pruning Effects on Roots." In *Proceedings from the III. European Arboriculture Congress*, edited by F. Decembrini. Savoy, Illinois: International Society of Arboriculture.
- Costello, L.R., and K.S. Jones. 2014. *WUCOLS IV: Water Use Classification of Landscape Species*. California Center for Urban Horticulture, University of California, Davis. Accessed November 19, 2022. <https://ccuh.ucdavis.edu/wucols-db>.
- Day, S.D., E.P. Wiseman, S.B. Dickinson, and R.J. Harris. 2010. "Contemporary Concepts of Root System Architecture of Urban Trees." *Arboriculture & Urban Forestry* 36(4).
- Dudek. 2023a. *United Laguna Woods Mutual Urban Forest Management Plan*. Prepared for United Laguna Woods Mutual. January 23, 2023. PowerPoint slides.
- Dudek. 2023b. "Laguna Woods Village Tree Survey Graphic." Prepared for United Laguna Woods Village.
- Energy.gov. n.d. "Energy-Efficient Landscaping." Accessed September 14, 2023. [www.energy.gov/energysaver/energy-efficient-landscaping](http://www.energy.gov/energysaver/energy-efficient-landscaping).
- EPA (U.S. Environmental Protection Agency). 2022a. "Learn About Heat Islands." US EPA. September 2, 2022. <https://www.epa.gov/heat-islands/learn-about-heat-islands#heat-islands>.

- EPA. 2022b. "Heat Island Cooling Strategies." US EPA. September 16, 2022. <https://www.epa.gov/heatislands/heat-island-cooling-strategies>.
- Gilman, E.F. 1996. "Root Barriers Affect Root Distribution." *Journal of Arboriculture* 22(3): 151–154.
- Gilman, E.F., and S.J. Lily. 2008. *Best Management Practices: Pruning*. Companion to ANSI A300.
- Hallan-Gibson, P., D. Tryon, M.E. Tryon, and the San Juan Capistrano Historical Society. 2005. *Images of America, San Juan Capistrano*. Arcadia Publishing.
- IAP2 (International Association for Public Participation). 2018. "IAP2 Spectrum of Public Participation." International Association for Public Participation. [cdn.ymaws.com/www.iap2.org/resource/resmgr/pillars/Spectrum\\_8.5x11\\_Print.pdf](https://cdn.ymaws.com/www.iap2.org/resource/resmgr/pillars/Spectrum_8.5x11_Print.pdf).
- ISA (International Society of Arboriculture). 2008. *Best Management Practices – Managing Trees During Construction*.
- ISA. 2017. *Tree Risk Assessment Manual*. Atlanta: International Society of Arboriculture.
- Jones, M., F.L. Sinclair, and V.L. Grime. 1998. "Effect of Tree Species and Crown Pruning on Root Length and Soil Water Content in Semi-Arid Agroforestry." *Plant and Soil* 210: 197–207.
- Laguna Woods Village. 2022a. *On-site mulch storage facility of Laguna Woods Village*. Photograph.
- Laguna Woods Village. 2022b. "United Mutual is Creating an Urban Forest Management Plan!" Flyer.
- McBride, J.R., and I. Lacan. 2018. "The Impact of Climate-Change Induced Temperature Increases on the Suitability of Street Tree Species in California (USA) Cities." *Urban Forestry & Urban Greening* 34: 348–356.
- McPherson, E.G. 2000. "Expenditures Associated With Conflicts Between Street Tree Root Growth and Hardscape in California, United States." *Journal of Arboriculture* 26(6).
- McPherson, E.G, Q. Xiao, N.S. van Doorn, J. de Goede, J. Bjorkman, A. Hollander, R.M. Boynton, J.F. Quinn, and J.H. Thorne. 2017. "The Structure, Function and Value of Urban Forests in California Communities." *Urban Forestry & Urban Greening*. 28: 43–53. <https://doi.org/10.1016/j.ufug.2017.09.013>.
- Miller, R.H., and R.W. Miller. 1991. "Planting Survival of Selected Tree Taxa." *Journal of Arboriculture* 17(7): 185–191.
- Morgenroth, J., D.J. Nowak, and A.K. Koeser. 2020. "DBH Distributions in America's Urban Forests—An Overview of Structural Diversity." *Forests* 11(2): 135. <https://doi.org/10.3390/f11020135>.
- Orange County Department of Education. 2022. "Background Information for Inside the Outdoors Programs, Inside the Outdoors Programs, Native American People of Orange County." March 23, 2022. Accessed 14 Sept. 2023. [ocde.us/ito/Documents/NativeAmericanBackground.pdf](https://ocde.us/ito/Documents/NativeAmericanBackground.pdf).
- Pebesma, E., T. Mailund, and J. Hiebert. 2016. "Measurement Units in R." *R Journal* 8(2): 486–494. <https://doi.org/10.32614/RJ-2016-061>.

- Pedersen, T. 2020. "patchwork: The Composer of Plots." R package version 1.1.1, <https://CRAN.R-project.org/package=patchwork>.
- Posit Team. 2023. "RStudio: Integrated Development Environment for R." Posit Software, PBC, Boston, MA. <http://www.posit.co/>.
- R Core Team. 2022. "R: A Language and Environment for Statistical Computing." R Foundation for Statistical Computing, Vienna, Austria. <https://www.R-project.org/>.
- Randrup, T., E. Mcpherson, and L.R. Costello. 2001. "A Review of Tree Root Conflicts with Sidewalks, Curbs, and Roads." *Urban Ecosystems* 5: 209–225.
- Richards, N.A. 1983. "Diversity and Stability in a Street Tree Population." *Urban Ecology* 7(2): 159–171.
- Roman, L.A., J. Battles, and J. McBride. 2016. *Urban Tree Mortality: a Primer on Demographic Approaches*. United States Forest Service. March 2016. Accessed: January 6, 2023. [https://www.fs.usda.gov/nrs/pubs/gtr/gtr\\_nrs158.pdf](https://www.fs.usda.gov/nrs/pubs/gtr/gtr_nrs158.pdf).
- Smiley, E.T., L. Holmes, and B.R. Fraedrich. 2014. "Pruning of Buttress Roots and Stability Changes of Rade Maple (*Acer rubrum*)." *Arboriculture & Urban Forestry* 40(4).
- Swain, D.L., B. Langenbrunner, J. David Neelin, and A. Hall. 2018. "Increasing Precipitation Volatility in Twenty-First-Century California." *Nature Climate Change* 8(5): 427–33. <https://doi.org/10.1038/s41558-018-0140-y>.
- Tilman, D., and J.A. Downing. 1994. "Biodiversity and Stability in Grassland." *Nature* 367: 363–365.
- Tinus, C.A., and M. LaMana. 2013. "Conversion Efficiency and Economics of Urban Wood Utilization." *Arboriculture & Urban Forestry* 39(1).
- Tsunetsugu, Y., J. Lee, B. Park, L. Tyrväinen, T. Kagawa, and Y. Miyazaki. 2013. "Physiological and Psychological Effects of Viewing Urban Forest Landscapes Assessed by Multiple Measurements." *Landscape and Urban Planning* 113: 90–93. <https://doi.org/10.1016/j.landurbplan.2013.01.014>.
- UC Riverside (University of California, Riverside). 2023. "Frequently Asked Questions About Invasive Species." UCR Center for Invasive Species Research. [cizr.ucr.edu/resources/invasive-species-faqs#where-do-invasive-species-come](https://cizr.ucr.edu/resources/invasive-species-faqs#where-do-invasive-species-come).
- Urban Wood Network. 2020. "Establishing an Urban Wood Utilization Program." Urban Wood Network. <https://urbanwoodnetwork.org/wp-content/uploads/EstablishingUrbanWoodProgram.pdf>
- USDA (U.S. Department of Agriculture). 2005. "Urban Forests and Climate Change." U.S. Department of Agriculture. <https://www.fs.usda.gov/ccrc/topics/urban-forests-and-climate-change>.
- USDA. 2015. "The Power of One Tree - The Very Air We Breathe." U.S. Department of Agriculture. March 17, 2015. <https://www.usda.gov/media/blog/2015/03/17/power-one-tree-very-air-we-breathe>.
- USFS (United States Forest Service). 2020. i-Tree Eco [online software]. <https://www.itreetools.org/tools/i-tree-eco>.

- Voyle, G. 2015. "Planting a Tree Successfully Requires the Correct Planting Depth." Michigan State University Extension. September 23, 2015. [https://www.canr.msu.edu/news/planting\\_a\\_tree\\_successfully\\_requires\\_the\\_correct\\_planting\\_depth](https://www.canr.msu.edu/news/planting_a_tree_successfully_requires_the_correct_planting_depth).
- WCA (West Coast Arborists Inc.). 2023. "Street Tree Revival." West Coast Arborists. <https://www.streettreerevival.com/>.
- Wex. 2021. "Shall." Wex Definitions Team. Legal Information Institute, Cornell Law School. August 2021. <https://www.law.cornell.edu/wex/shall>.
- Wickham, H., M. Averick, J. Bryan, W. Chang, L.D. McGowan, R. Francois, G. Golemund, et al. 2019. "Welcome to the Tidyverse." *Journal of Open Source Software* 4(43): 1686. <https://doi.org/10.21105/joss.01686>.
- Wickham, H. 2016. "ggplot2: Elegant Graphics for Data Analysis." Springer-Verlag New York.
- Wickham, H., and D. Seidel. 2022. "scales: Scale Functions for Visualization." R package version 1.2.0. <https://CRAN.R-project.org/package=scales>.
- Wilke, C., and B. Wiernik. 2022. "ggtext: Improved Text Rendering Support for 'ggplot2'." R package version 0.1.2. <https://CRAN.R-project.org/package=ggtext>.
- Zimmerman, P. 1981. "All This Once Was a Working Ranch." Laguna Woods History Center. September 1981. <https://lagunawoodshistory.org/workingranch>.

---

# **Appendix A**

## Recommended Tree Species Palette



# Appendix A

## Recommended Tree Species Palette

### Recommended Species - Most Suitable

Scientific Name	Common Name	Size Classification	Maximum Height (ft)	Building & Infrastructure - Spacing Guideline (ft)	Minimum Planting Space (ft)	United Total Trees	Third Total Trees	WUCOLS Water Use Rating
<i>Agonis flexuosa</i>	Agonis - Peppermint	Medium	35	10	5	30	52	Low
<i>Albizia julibrissin</i>	Albizia - Mimosa	Medium	35	10	5	17	27	Low
<i>Arbutus unedo</i>	Arbutus - Strawberry Tree	Medium	35	10	5	19	14	Low
<i>Brachychiton acerifolius</i>	Brachychiton Acerifolius	Large	60	15	>10	43	2	Low
<i>Brachychiton discolor</i>	Brachychiton Discolor	Large	65	15	>10	40	58	Low
<i>Ceiba speciosa</i>	Silk Floss	Large	60	15	>10	32	18	Low
<i>Cercidium x parkinsonia desert museum</i>	Palo Verde - Desert Museum	Small	20	6	2	1	0	Very Low
<i>Cercis occidentalis</i>	Redbud - Western	Small	20	6	2	5	3	Low
<i>Chilopsis linearis</i>	Chilopsis - Desert Willow	Medium	30	10	2	1	1	Very Low
<i>Chitalpa tashkentensis</i>	Chitalpa	Medium	35	10	5	43	41	Low
<i>Eucalyptus polyanthemus</i>	Eucalyptus - Silver Dollar	Large	75	15	>10	101	288	Low
<i>Eucalyptus sideroxylon</i>	Eucalyptus - Red Ironbark	Large	90	15	>10	29	269	Low
<i>Geijera parviflora</i>	Willow - Australian	Medium	35	10	5	91	123	Low
<i>Juniperus chinensis torulosa</i>	Juniper - Twisted	Small	15	6	2	267	315	Low
<i>Melaleuca linariifolia</i>	Melaleuca - Linariifolia	Medium	30	10	5	169	279	Low
<i>Melaleuca quinquenervia</i>	Melaleuca	Medium	40	10	5	284	433	Low
<i>Pinus brutia</i>	Pine - Calabrian	Large	80	15	>10	7	7	Low

<i>Pinus halepensis</i>	Pine - Aleppo	Large	60	15	>10	136	250	Low
<i>Quercus agrifolia</i>	Oak - Coast Live	Large	70	15	>10	30	19	Very Low
<i>Quercus engelmannii</i>	Engelmann oak	Large	65	15	>10	0	0	Very Low
<i>Quercus ilex</i>	Oak - Holly	Large	60	15	>10	4	1	Low
<i>Quercus suber</i>	Oak - Cork	Large	70	15	>10	2	0	Low
<i>Rhus lancea</i>	Rhus - African Sumac	Medium	30	10	5	52	39	Low
<i>Tipuana tipu</i>	Tipu	Large	50	15	>10	3	11	Low
<i>Zelkova serrata</i>	Zelkova - Sawleaf	Large	65	15	>10	1	0	Low



## Recommended Species – Better Suited

Scientific Name	Common Name	Size Classification	Maximum Height (ft)	Building & Infrastructure - Spacing Guideline (ft)	Minimum Planting Space (ft)	United Total Trees	Third Total Trees	WUCOLS Water Use Rating
<i>Acacia decurrens</i>	Acacia Decurrens	Large	50	15	>10	0	1	Low
<i>Acacia saligna</i>	Acacia - Blue Leaf	Medium	30	10	5	0	2	Low
<i>Beaucarnea recurvata</i>	Palm - Ponytail	Small	20	6	2	3	1	Low
<i>Brachychiton rupestris</i>	Brachychiton - Queensland Bottle Tree	Medium	40	10	5	0	1	Low
<i>Brahea armata</i>	Palm - Mexican Blue	Large	50	15	5	0	1	Low
<i>Brahea edulis</i>	Palm - Guadalupe	Small	25	6	5	64	53	Low
<i>Butia capitata</i>	Palm - Pindo	Small	25	6	5	1	4	Low
<i>Casuarina cunninghamiana</i>	Casuarina - River She-Oak	Large	70	15	>10	2	1	Low
<i>Cedrus libani</i>	Cedar - Lebanon	Large	100	15	>10	0	1	Low
<i>Chamaerops humilis</i>	Palm - Mediterranean Fan	Small	15	6	2	31	20	Low
<i>Cordyline australis</i>	Palm - Dracaena	Small	25	6	5	4	0	Low
<i>Corymbia ficifolia</i>	Eucalyptus - Ficifolia	Medium	45	10	5	9	84	Low
<i>Corymbia maculata</i>	Eucalyptus - Maculata	Large	100	15	>10	11	63	Low
<i>Cotinus coggygria</i>	Smoke Tree	Small	15	6	2	6	17	Low
<i>Cupressus sempervirens</i>	Cypress - Italian	Large	70	15	>10	236	26	Low
<i>Dodonaea viscosa</i>	Dodonaea - Purple Hopseed	Small	15	6	2	53	23	Low
<i>Dracaena draco</i>	Palm - Dragon Tree	Small	20	6	2	4	1	Very Low
<i>Erythrina americana</i>	Coral - American	Medium	30	10	5	1	1	Low
<i>Erythrina caffra</i>	Coral - Kaffirboom	Medium	40	10	5	6	11	Low
<i>Erythrina coralloides</i>	Coral - Naked	Medium	30	10	5	3	0	Low
<i>Erythrina crista-galli</i>	Coral - Cockspur	Small	20	6	2	0	1	Low
<i>Eucalyptus cinerea</i>	Eucalyptus - Cinerea	Large	50	15	>10	1	0	Low
<i>Eucalyptus lehmannii</i>	Eucalyptus - Bushy Yate	Small	25	6	5	6	49	Low

<i>Eucalyptus leucoxylon</i>	Eucalyptus - White Ironbark	Large	90	15	>10	1	2	Low
<i>Eucalyptus nicholii</i>	Eucalyptus - Nicholi (Willow-Leafed)	Large	50	15	>10	0	22	Low
<i>Eucalyptus pulverulenta</i>	Eucalyptus - Silver Moutain	Medium	35	10	5	14	2	Low
<i>Eucalyptus rudis</i>	Eucalyptus - Desert Gum	Large	60	15	>10	37	31	Low
<i>Eucalyptus torquata</i>	Eucalyptus - Coral Gum	Medium	35	10	5	3	2	Low
<i>Eucalyptus viminalis</i>	Eucalyptus - Viminalis	Large	150	15	>10	2	42	Low
<i>Heteromeles arbutifolia</i>	Toyon	Small	25	6	5	0	3	Very Low
<i>Juniperus chinensis</i>	Juniper - Chinese	Large	60	15	>10	1	17	Low
<i>Juniperus virginiana</i>	Eastern Red Cedar	Large	50	15	>10	1	0	Low
<i>Lagunaria patersonii</i>	Primrose	Large	50	15	5	1	0	Low
<i>Laurus nobilis</i>	Laurus - Sweet Bay	Medium	40	10	5	2	0	Low
<i>Lyonothamnus floribundus</i>	Catalina Ironwood	Medium	40	10	5	0	1	Low (SelectTree rating)
<i>Melaleuca armillaris</i>	Melaleuca - Bracelet Honeymyrtle	Medium	30	10	5	1	1	Low
<i>Melaleuca ericifolia</i>	Melaleuca - Heath	Medium	40	10	5	0	1	Low
<i>Melaleuca nesophila</i>	Melaleuca - Pink	Medium	30	10	5	5	11	Low
<i>Melaleuca styphelioides</i>	Melaleuca - Prickly Paperbark	Medium	40	10	5	0	3	Low
<i>Melia azedarach</i>	Chinaberry	Large	50	15	>10	2	1	Very Low
<i>Nerium oleander</i>	Oleander	Small	20	6	2	1	1	Low

<i>Parkinsonia florida</i>	Parkinsonia - Blue Palo Verde	Small	25	6	5	1	0	Very Low
<i>Phoenix dactylifera</i>	Palm - Dactylifera	Large	100	15	>10	0	7	Low
<i>Pinus pinea</i>	Pine - Stone	Large	80	15	>10	39	114	Low
<i>Pithecellobium dulce</i>	Guamuchil	Medium	30	10	5	0	1	Low (SelectTree rating)
<i>Pittosporum viridiflorum</i>	Pittosporum - Cape	Small	20	6	2	23	8	Low (SelectTree rating)

<i>Prunus ilicifolia</i> ssp <i>lyonii</i>	Cherry - Catalina	Medium	35	10	5	106	152	Very Low
<i>Rhus typhina</i>	Sumac - Staghorn	Small	15	6	2	3	0	Low
<i>Robinia pseudoacacia</i> <i>purple robe</i>	Locust - Purple Robe	Medium	40	10	5	13	19	Low
<i>Senna splendida</i> <i>golden wonder</i>	Wonder Senna	Small	20	6	>10	1	0	Low
<i>Tecoma stans</i>	Tecoma - Yellow Bells	Small	25	6	5	1	0	Low
<i>Thevetia peruviana</i>	Beestill Tree	Medium	30	10	5	3	0	Low
<i>Xylosma congestum</i>	Xylosma	Small	25	6	3	95	52	Low
<i>Yucca gloriosa</i>	Spanish Dagger	Small	10	6	2	76	40	Low

## Recommended Species – Better Suited

Scientific Name	Common Name	Size Classification	Maximum Height (ft)	Building & Infrastructure - Spacing Guideline (ft)	Minimum Planting Space (ft)	United Total Trees	Third Total Trees	WUCOLS Water Use Rating
<i>Abies magnifica</i>	Red Fir	Large	120	15	>10	1	0	Moderate (SelectTree rating)
<i>Abies procera</i>	Fir - Noble	Large	150	15	>10	1	0	Moderate (SelectTree rating)
<i>Acer oblongum</i>	Maple Evergreen	Medium	30	10	5	2	0	Moderate
<i>Acer palmatum</i>	Maple - Japanese	Small	25	6	5	25	11	Moderate
<i>Afrocarpus gracilior</i>	Podocarpus - Gracilior	Large	65	15	>10	549	447	Moderate
<i>Afrocarpus henkelii</i>	Podocarpus - Henkelii	Medium	35	10	5	190	86	Moderate
<i>Afrocarpus macrophyllus</i>	Podocarpus - Macrophyllus	Medium	30	10	2	4	10	Moderate
<i>Alnus cordata</i>	Alder - Italian	Large	50	15	>10	2	0	Moderate
<i>Araucaria columnaris</i>	Pine - Star	Large	160	15	>10	100	124	Moderate
<i>Araucaria heterophylla</i>	Pine - Norfolk Island	Large	100	15	>10	18	16	Moderate
<i>Archontophoenix cunninghamiana</i>	Palm - King	Large	70	15	5	259	410	Moderate
<i>Auranticarpa rhombifolium</i>	Pittosporum - Queensland	Medium	35	10	5	5	15	Moderate
<i>Bauhinia blakeana</i>	Orchid - Hong Kong	Medium	40	10	5	0	2	Moderate
<i>Bauhinia galpinii</i>	Orchid Tree - Red	Small	15	6	2	1	0	Moderate
<i>Bauhinia variegata</i>	Orchid - Purple	Medium	35	10	5	81	67	Moderate
<i>Betula papyrifera</i>	Birch - Paper	Large	65	15	>10	1	0	Moderate (SelectTree rating)

<i>Calliandra haematocephala</i>	Pink Powder Puff	Small	20	6	2	7	2	Moderate
<i>Calocedrus decurrens</i>	Cedar - Incense	Large	90	15	>10	1	10	Moderate
<i>Calodendrum capense</i>	Cape Chestnut	Medium	40	10	5	1	1	Moderate
<i>Carya illinoensis</i>	Pecan	Large	100	15	>10	3	0	Moderate
<i>Cassia leptophylla</i>	Cassia - Gold Medallion Tree	Small	25	6	5	38	13	Moderate
<i>Catalpa bignonioides</i>	Catalpa - Common	Medium	40	10	5	1	1	Moderate
<i>Cedrus atlantica</i>	Cedar - Atlas	Large	65	15	>10	6	18	Moderate
<i>Chionanthus retusus</i>	Chinese Fringe	Small	20	6	2	14	3	Moderate
<i>Cinnamomum camphora</i>	Camphor	Large	65	15	>10	149	264	Moderate
<i>Cocculus laurifolius</i>	Cocculus - Snailseed	Small	25	6	5	4	9	Moderate
<i>Cunonia capensis</i>	African Red Alder	Large	60	15	>10	10	9	Moderate
<i>Cupaniopsis anacardioides</i>	Carrotwood	Medium	40	10	5	613	737	Moderate
<i>Cupressocypariss x leylandii</i>	Cypress - Leyland	Large	50	15	>10	180	20	Moderate
<i>Diospyros kaki</i>	Persimmon - Japanese	Medium	30	10	5	53	38	Moderate
<i>Duranta repens</i>	Sky Flower	Small	20	6	2	6	0	Moderate
<i>Dyopsis decaryi</i>	Palm - Triangle	Small	20	6	5	10	4	Moderate
<i>Eriobotrya deflexa</i>	Loquat - Bronze	Small	25	6	5	104	56	Moderate
<i>Ficus benjamina</i>	Ficus - Benjamina	Large	100	15	>10	174	173	Moderate
<i>Ficus drupacea</i>	Ficus - Mysorensis	Large	110	15	10	0	1	Moderate (SelectTree rating)
<i>Ficus elastica</i>	Ficus - Rubber Tree	Large	45	15	5	18	9	Moderate
<i>Ficus lyrata</i>	Ficus - Fiddle Leaf	Medium	40	10	5	0	2	Moderate
<i>Ficus microcarpa</i>	Indian Laurel Fig (Weeping)	Medium	35	10	5	3	1	Moderate
<i>Ficus rubiginosa</i>	Ficus - Rubiginosa	Large	50	15	>10	58	297	Moderate
<i>Fraxinus pennsylvanica</i> *	Ash - Green	Large	50	15	>10	17	7	Moderate (SelectTree rating)

<i>Fraxinus velutina modesto</i>	Ash - Modesto	Large	50	15	>10	3	5	Moderate
<i>Handroanthus avellanadae</i>	Tabebuia - Lavender Trumpet	Medium	30	10	5	1	0	Moderate
<i>Handroanthus chrysotricha</i>	Tabebuia - Golden Trumpet	Medium	30	10	2	3	2	Moderate (SelectTree rating)
<i>Handroanthus impetiginosus</i>	Tabebuia - Pink Trumpet	Medium	30	10	5	126	77	Moderate
<i>Harpephyllum caffrum</i>	Kaffir Plum	Large	50	15	5	13	14	Moderate
<i>Hibiscus rosa-sinensis</i>	Chinese Hibiscus	Small	15	6	2	2	0	Moderate
<i>Hibiscus syriacus</i>	Rose Of Sharon	Small	15	6	2	1	0	Moderate
<i>Howea belmoreana</i>	Palm - Sentry	Small	25	6	5	3	2	Moderate (SelectTree rating)
<i>Howea forsteriana</i>	Palm - Kentia	Small	25	6	5	0	1	Moderate
<i>Hymenosporum flavum</i>	Sweetshade	Medium	35	10	5	8	2	Moderate
<i>Ilex altaclarensis wilsonii</i>	Holly - Wilson	Small	25	6	5	264	118	Moderate
<i>Ilex aquifolium</i>	Holly - English	Medium	40	10	5	25	6	Moderate
<i>Ilex cornuta</i>	Chinese Holly	Small	20	6	2	5	2	Moderate
<i>Koelreuteria bipinnata leptospermum scoparium</i>	Koelreuteria - Bipinata Tea Tree - New Zealand	Medium	40	10	5	77	27	Moderate
<i>Ligustrum japonicum</i>	Privet - Japanese	Small	15	6	2	20	1	Moderate
<i>Livistona chinensis</i>	Palm - Chinese Fountain	Medium	40	10	5	63	17	Moderate
<i>Lycianthes rantonnei</i>	Blue Potato Bush	Small	25	6	5	1	0	Moderate
<i>Macadamia integrifolia</i>	Macadamia	Medium	40	10	5	23	3	Moderate
<i>Magnolia acuminata</i>	Magnolia - Cucumber	Large	80	15	>10	3	5	Moderate (SelectTree rating)

<i>Magnolia champaca</i>	Champaca	Small	25	6	5	5	1	Moderate
<i>Magnolia soulangiana</i>	Magnolia - Saucer	Small	25	6	5	5	4	Moderate
<i>Malus floribunda</i>	Japanese Flowering Crabapple	Small	25	6	5	1	0	Moderate (SelectTree rating)
<i>Metrosideros excelsa</i>	New Zealand Christmas Tree	Medium	35	10	5	238	195	Moderate
<i>Nyssa sylvatica</i>	Nyssa - Sour Gum	Large	50	15	>10	1	0	Moderate
<i>Persea indica</i>	Persea Indica	Small	20	6	2	2	0	Moderate (SelectTree rating)
<i>Phoenix roebelenii</i>	Palm - Roebelinii	Small	15	6	2	0	1	Moderate
<i>Phoenix rupicola</i>	Palm - Cliff Date	Small	25	6	5	8	1	Moderate
<i>Photinia serrulata</i>	Photinia - Chinese	Medium	40	10	5	5	3	Moderate
<i>Photinia x fraseri</i>	Photinia - Fraseri	Small	20	6	2	9	13	Moderate
<i>Pinus canariensis</i> *	Pine - Canary Island	Large	80	15	>10	1040	504	Low
<i>Pinus patula</i>	Pine - Jelecote	Large	70	15	>10	1	0	Moderate
<i>Pinus thunbergiana</i>	Pine - Japanese Black	Medium	30	10	5	40	50	Moderate
<i>Pistacia chinensis</i>	Pistache - Chinese	Medium	35	10	5	22	1	Moderate
<i>Pittosporum crassifolium</i>	Pittosporum - Karo	Medium	30	10	5	23	33	Moderate
<i>Pittosporum tenuifolium</i>	Pittosporum - Silver Sheen	Medium	30	10	5	12	15	Moderate
<i>Pittosporum tobira</i>	Pittosporum - Mock Orange	Small	25	6	5	42	34	Moderate
<i>Platanus occidentalis</i>	Sycamore - American	Large	90	15	>10	1	50	Moderate (SelectTree rating)
<i>Platycladus orientalis</i>	Oriental Arborvitae	Small	20	6	2	6	6	Moderate
<i>Plumeria rubra</i>	Plumeria	Small	20	6	5	6	1	Moderate (SelectTree rating)
<i>Populus deltoides</i>	Poplar - Cottonwood	Large	100	15	>10	0	2	Moderate (SelectTree rating)
<i>Prunus caroliniana</i>	Cherry - Carolina	Medium	30	10	5	197	70	Moderate





<i>Vitex lucens</i>	New Zealand Chaste Tree	Large	50	15	>10	1	0	Moderate (SelectTree rating)
<i>Washingtonia filifera</i>	Palm - California Fan	Large	70	15	5	1	0	Moderate
<i>Xrhaphiobotrya splendens coppertone</i>	Loquat Hybrids - Coppertone	Medium	30	10	10	1	0	Moderate
<i>Zizyphus jujuba</i>	Chinese Jujube	Medium	30	10	5	27	9	Moderate (SelectTree rating)



---

# **Appendix B**

## Tree Removal Guidelines





**RESOLUTION 01-13-17**

**WHEREAS**, the Board of Directors recognizes that many policies and services have been implemented by way of practice over the years but not formally documented;

**NOW THEREFORE BE IT RESOLVED**, February 12, 2013, that the Board of Directors hereby adopts the following tree removal guidelines:

- Unless there is a purposeful reason, trees should not be removed merely because they are messy, or because of residents' personal preferences concerning shape, color, size, or fragrance.
- Trees should not be removed because of view obstruction.
- Trees on slopes should not be removed if the removal will contribute to the destabilization of that slope.
- Trees which are damaging or will damage a structure, pose a hazard, in failing health or interfering with neighboring trees, will be considered for removal.

**RESOLVED FURTHER**, that the officers and agents of this Corporation are hereby authorized on behalf of the Corporation to carry out the purpose of this resolution.



---

## **Appendix C**

### Expanding Canopy Cover Ratio





# TREE REMOVAL AND REPLACEMENT TO EXPAND CANOPY COVER



## IF YOU REMOVE...

### 1x Large Tree

**Height:** 55'+

**Example Species:**

- Coast Live Oak (*Quercus agrifolia*)
- Aleppo Pine (*Pinus halpensis*)
- Engelmann Oak (*Quercus engelmannii*)

**Benefits:**

Large trees should be planted wherever space allows. A large tree provides six times more shade, stores seven times as much carbon, and captures five times more water than a small tree.

## ...REPLACE WITH:

2x

LARGE TREES

OR

4x

MEDIUM TREES

OR

6x

SMALL TREES



### 1x Medium Tree

**Height:** 35' to 55'

**Example Species:**

- Box Elder (*Acer negundo*)
- Jacaranda (*Jacaranda mimosifolia*)
- Australian Willow (*Geijera parviflora*)

**Benefits:**

Medium trees strike a balance between the benefits of larger trees and the spatial requirements of small trees. Medium trees are beneficial to have along parkways and in commercial space that may not allow large trees.

2x

LARGE TREES

OR

3x

MEDIUM TREES

OR

4x

SMALL TREES



### 1x Small Tree

**Height:** Under 35'

**Example Species:**

- Toyon (*Heteromeles arbutifolia*)
- Desert Willow (*Chilopsis linearis*)
- Western Redbud (*Cercis occidentalis*)

**Benefits:**

Small trees are best used when a larger tree may conflict with surrounding infrastructure such as powerlines or nearby buildings. Small trees are also used to fill in gaps in the landscape and create visual interest.

1x

LARGE TREE

OR

2x

MEDIUM TREES

OR

3x

SMALL TREES



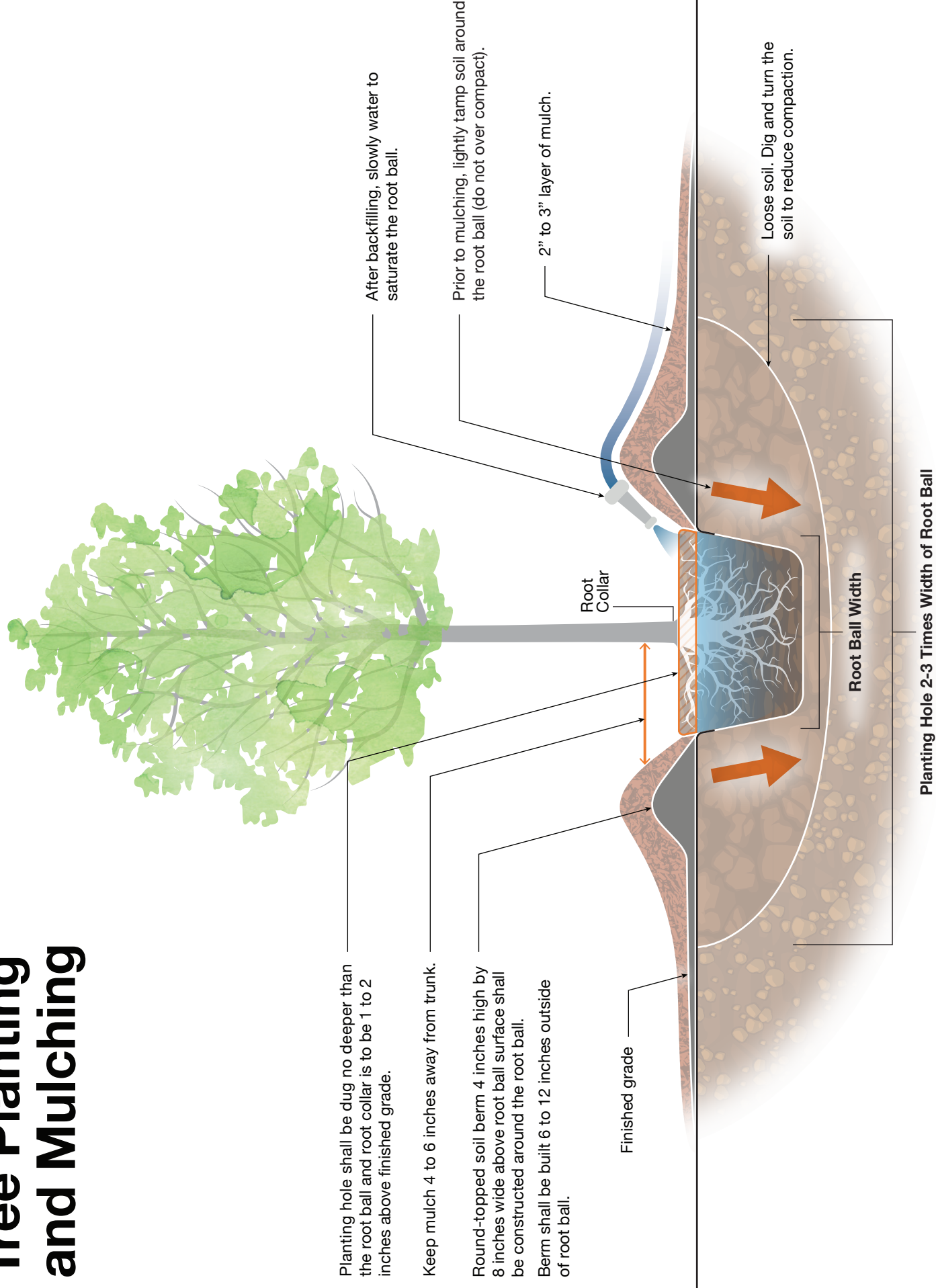
---

## **Appendix D**

### Tree Planting and Mulching



# Tree Planting and Mulching







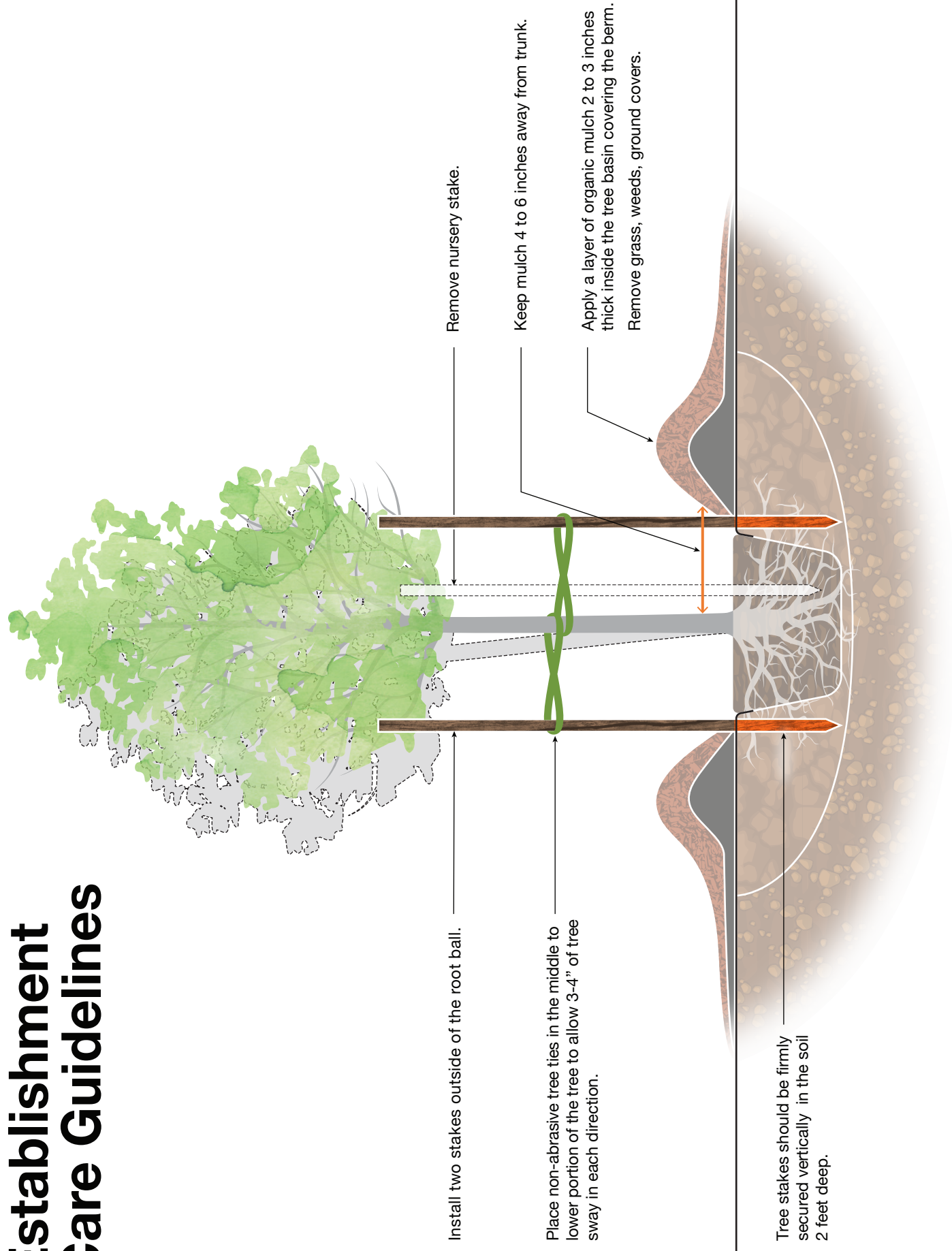
---

# **Appendix E**

## Establishment Care Guidelines



# Establishment Care Guidelines





---

# **Appendix F**

## Watering Guidelines



# Watering Guidelines

## Watering for Wet Seasons

- Prolonged saturated soil can lead to tree mortality.
- Turn off irrigation during rain events.
- To avoid over watering a newly planted tree, monitor soil moisture after rain events.
- If soil is saturated, stop watering. Resume watering when soil is dry.

## Watering Guidelines for Hot and Dry Seasons

- Prolonged and unexpected extreme heat waves can threaten a newly planted trees survivability by depleting the available water inside the tree and in the soil.
- During these periods trees may need additional watering once or twice a week to be sustained.
- It is critical to provide additional water as soon as possible during extreme heat events to maintain tree health and vigor.



Tree Age	Frequency	Quantity
First 3 months after planting	Deep water by filling basin twice a week	10-15 gallons per watering
4 -12 months following planting	Fill the water basin every week or every other week	10-15 gallons
Year 2 - 3	Every 2 - 4 weeks May through October	15-20 gallons
Year 4 - 7	Once a month May through October	deep watering





---

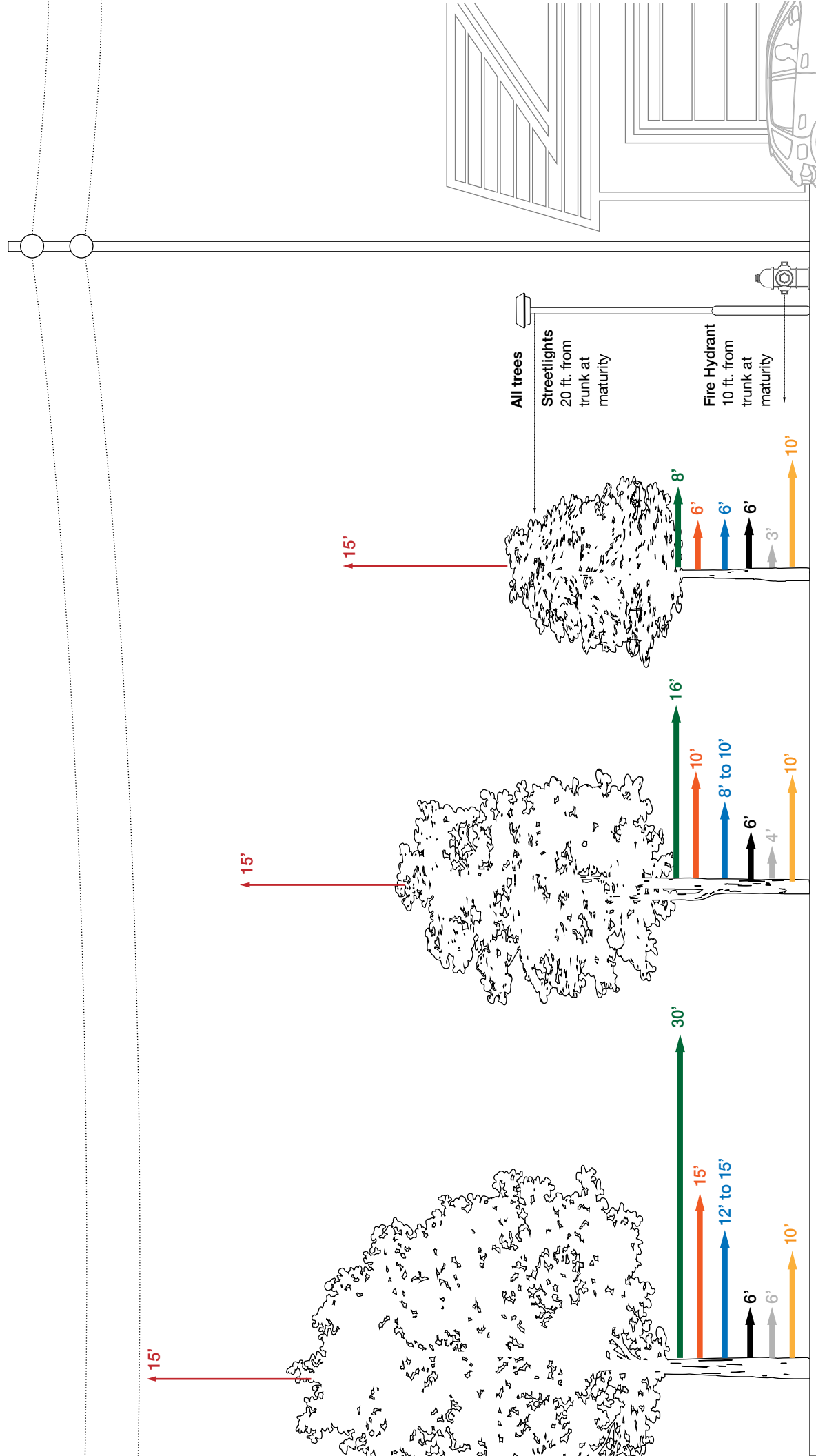
# **Appendix G**

## Tree Spacing Recommendations



# Spacing Guidelines Street Trees

- Spacing from other trees
- Spacing from sidewalks, curbs and driveways
- Spacing from building foundations
- Spacing from limbs to overhead wires
- Spacing from trunk at maturity to in-ground electrical lines
- Spacing from trunk at maturity to in-ground gas lines



**Large**  
46 ft. tall and higher

**Medium**  
26' to 45'

**Small**  
Up to 25'



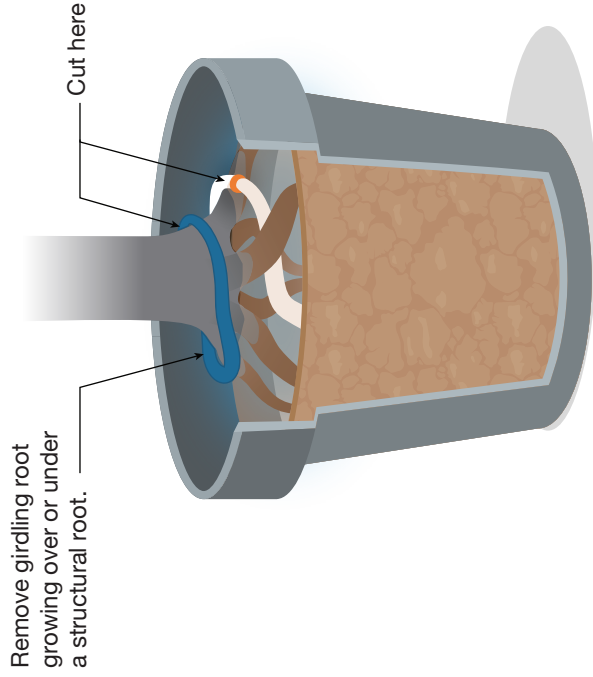
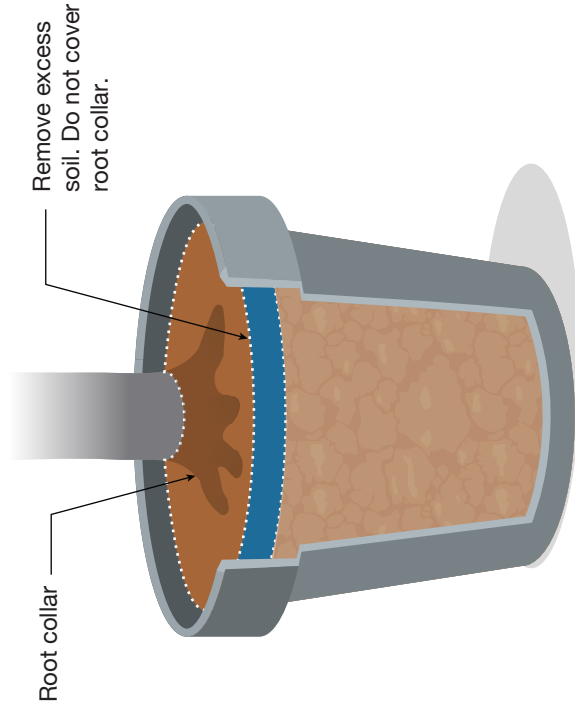
---

# **Appendix H**

## Root Correction

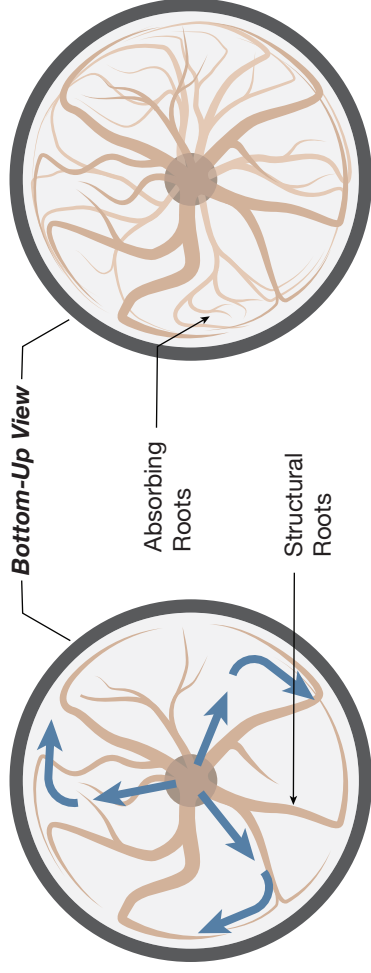


# Root Correction for Container Grown Trees



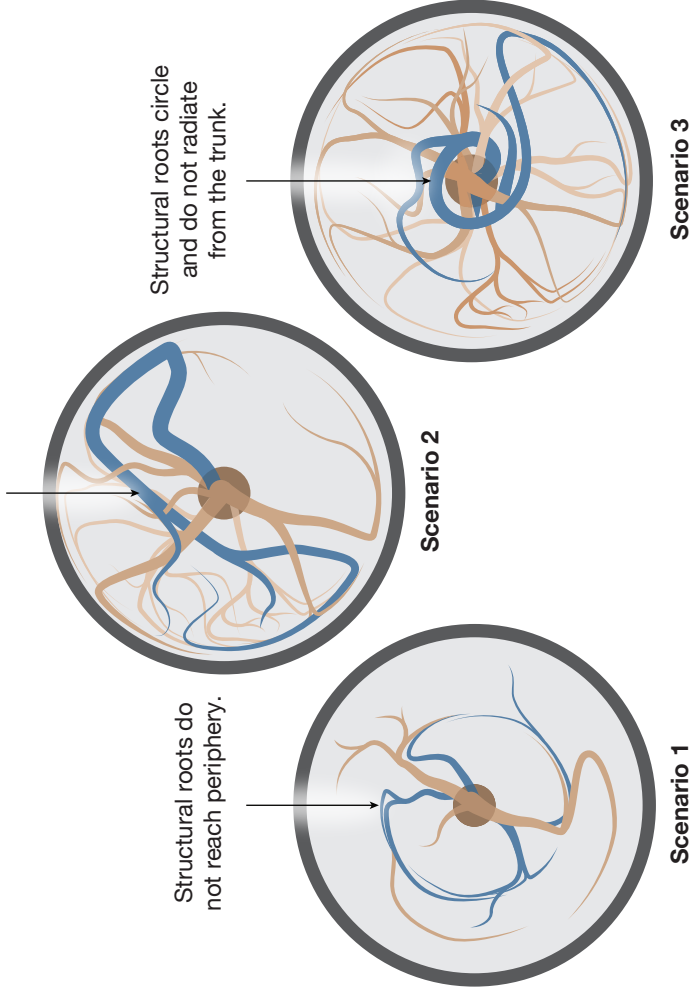
## Accept

Roots radiate from trunk and reach each side of root ball without deflecting down or around.



## Reject

Structural roots primarily grow to one side or tangent to trunk.







---

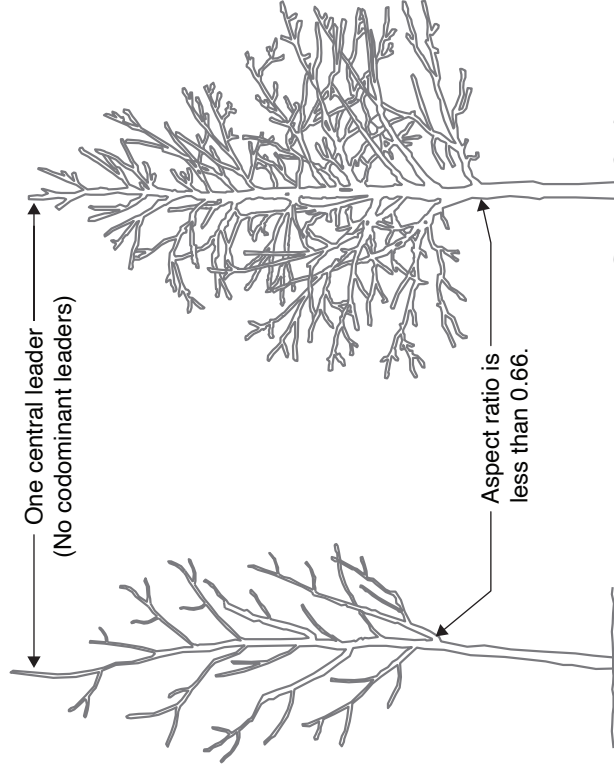
# **Appendix I**

## Nursery Stock Selection

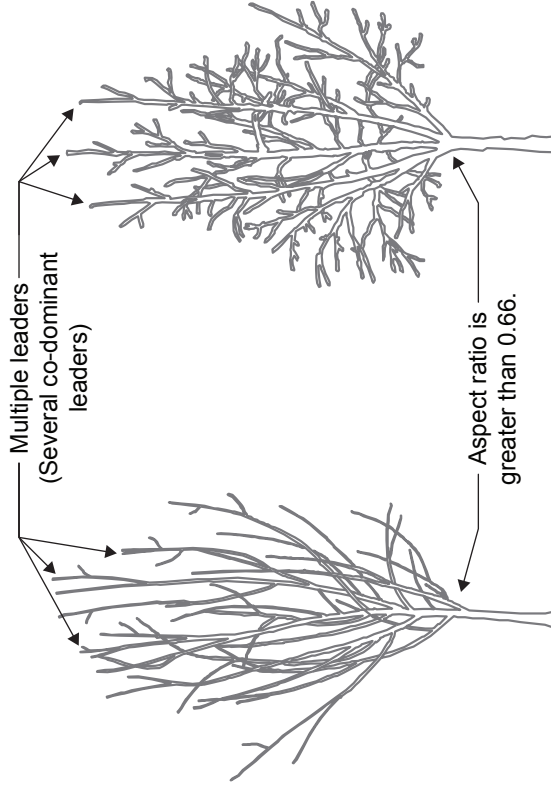


# Nursery Stock Selection

Accept



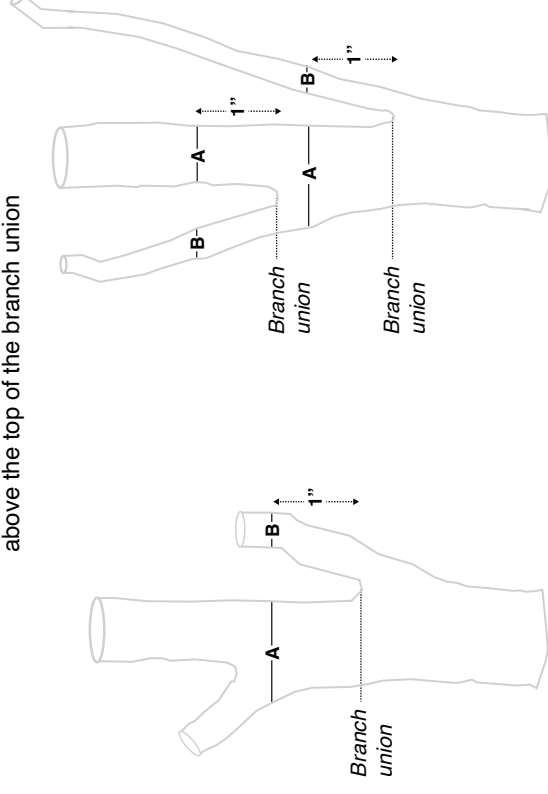
# Reject



**NOTE:** 1. Nursery stock with significant mechanical injury, serious root defects, and trees that show signs of dehydration are to be rejected. 2. Aspect ratio shall be less than 1.5. Aspect ratio is the diameter of branch (B) divided by the diameter of the trunk (A) as measured 1" above the top of the branch union. 3. Any tree not meeting the crown observations detail may be rejected.

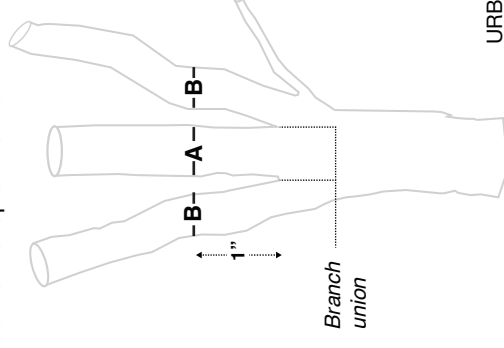
**Accept**

Aspect ratio of B:A less than 0.66 as measured 1" above the top of the branch union



# Reject

Aspect ratio of B:A greater than or equal to 0.66 as measured 1" above the top of the branch union.



URBAN TREE FOUNDATION  
ADAPTED BY DUDEK



---

# **Appendix J**

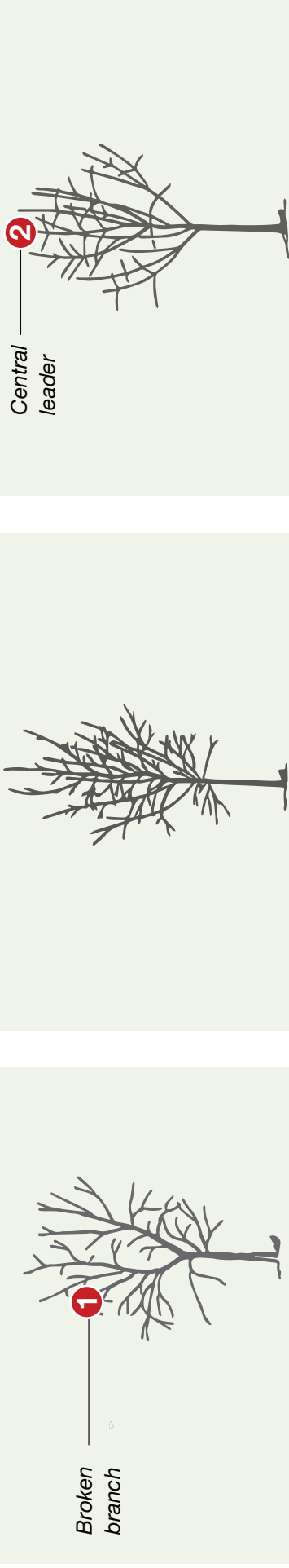
## Young Tree Pruning



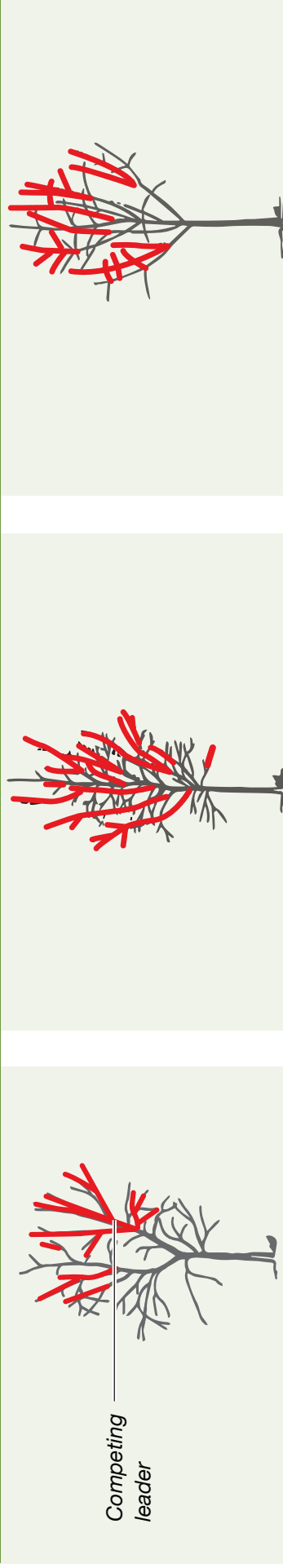
# Pruning to Improve Young Tree Structure

- 1** Remove broken branches.
- 2** Select central leader and remove competing leaders.
- 3** Select lowest permanent branch.
- 4** Select scaffold branches.
- 5** Select low temporary branches. Cut back and leave as temporary.

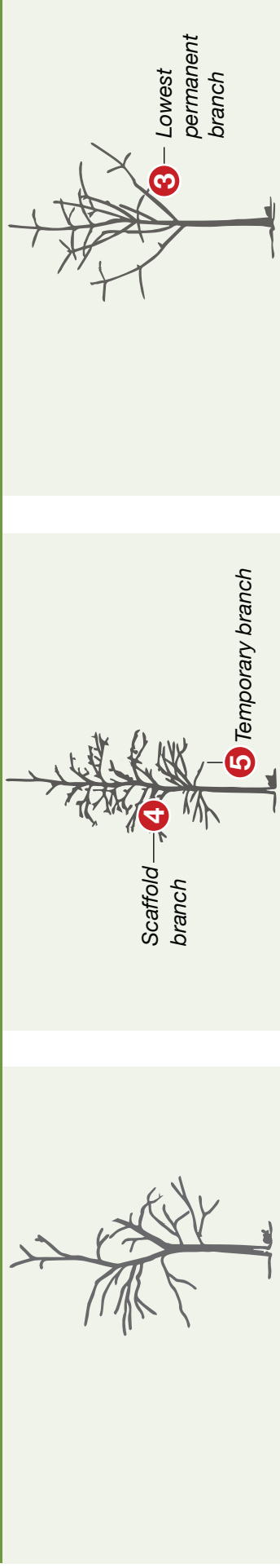
## BEFORE PRUNING



## WHAT TO PRUNE



## AFTER PRUNING



**NOTE: 1.** At the time of planting, limit pruning to removal of broken, dead, or diseased branches only.  
**2.** Young Tree Structural Pruning is to occur only after trees establish and resume normal growth rates following planting.





---

# **Appendix K**

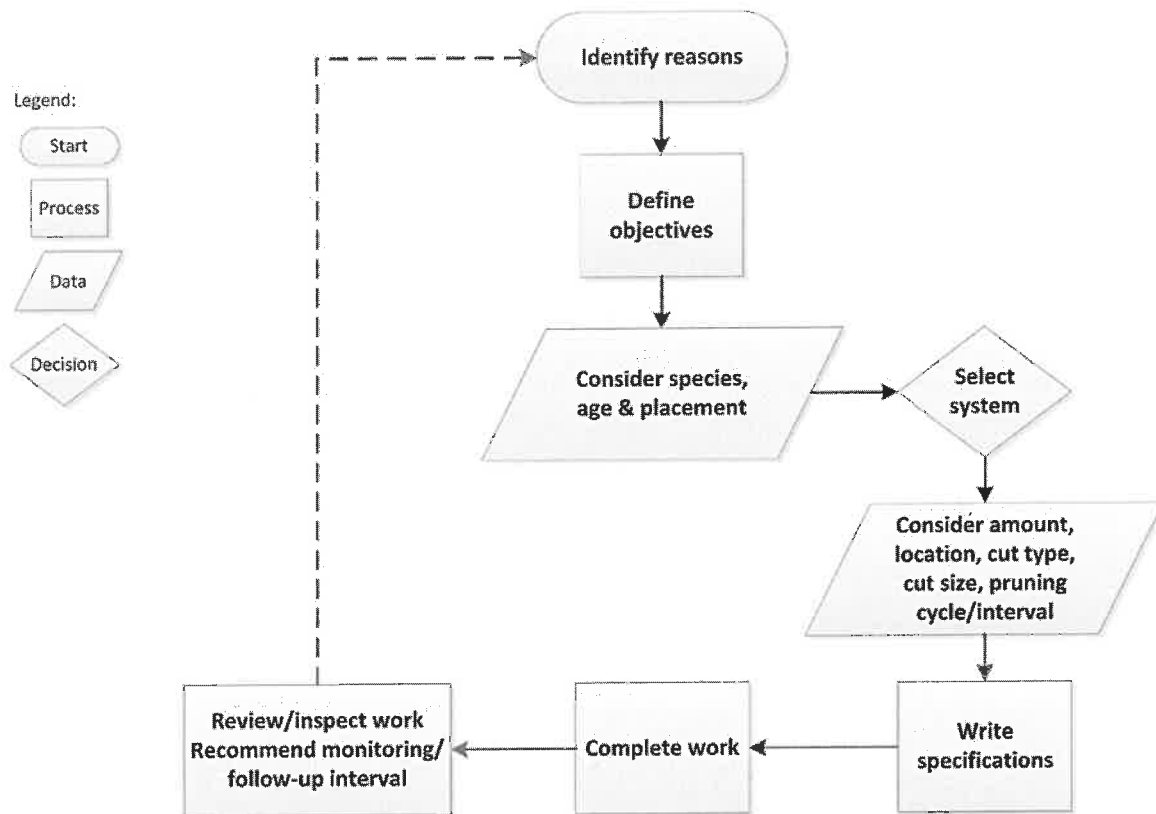
## Guidelines for Pruning Specifications



## Annex B – Specification writing guideline

This annex is not part of the ANSI A300 (Part 1)-2017 standard.

### Pruning Process Flowchart



Clearly written specifications ensure that objectives are communicated and understood. Pruning specifications must address individual plant, site and client requirements. Multiple objectives, or combinations of objectives, may be specified when pruning individual plants or groups of plants.

Once pruning objectives are established for a plant, a pruning system may be specified.

The examples below provide brief explanations of common pruning objectives, and guidance in writing specifications to achieve those objectives. While these examples cover many scenarios, they do not include all possible objectives, systems, combinations, or pruning solutions.

#### B-1 Mitigate risk

Prune to lower the likelihood of tree, branch, and/or other tree part failure and impact to targets (see ANSI A300 Part 9, *Tree Risk Assessment*).

##### Specification Guidelines

- Reduce or remove branches, leaders and/or other parts (living or dead) to lower or eliminate risk (*specify condition of concern, amount to be pruned, types, sizes and locations of pruning cuts, and monitoring interval*).
- In addition to pruning, consider supplemental support if appropriate (see ANSI A300 Part 3, *Supplemental Support Systems*).

## **B-2 Manage health**

Prune to improve or maintain plant health, or control pests (see ANSI A300 Part 2, *Soil Management* and ANSI A300 Part 10, *Integrated Pest Management*).

### **Specification Guidelines**

- Remove deleterious parts, e.g. branches that are dead or dying, diseased or infested, rubbing, weakened or broken, or parasitic plants, etc. (*specify condition of concern, types, sizes and locations of cuts, and monitoring interval*).
- Take appropriate precautions if necessary to prevent the spread of pests, e.g. seasonal timing, sterilization of tools, handling/disposal of debris/by-products.

## **B-3 Develop or improve structure**

Prune to improve plant architecture (i.e. optimum branch size, spacing, diameter and aspect ratios), ensure compatibility with site (e.g. conflict with traffic, line-of-sight or the built environment), or to restore damaged plants. Initiate structural pruning early to enhance benefits and value, and reduce long-term costs and potential for failure.

### **Specification Guidelines**

- Develop dominant leader(s) and desirable scaffold branches appropriate for the species and site (*specify leaders and branches to be retained and developed*).
- Subordinate or remove competing leaders, branches and shoots. If necessary, subordinate larger branches over multiple growing seasons to avoid making cuts with large aspect ratios and to avoid removing excessive amounts of material (*specify competing leaders and branches to be subordinated or removed, and appropriate maintenance interval*).

### **B-3.1 Restoration pruning**

Prune to redevelop or improve structure, form, and appearance following damage from storms, vandalism, lion tailing, topping or other substandard pruning, or other causes.

#### **Specification Guidelines**

- Assess trees for risk if necessary prior to beginning restoration pruning (see ANSI A300 Part 9, *Tree Risk Assessment*).
- Retain suitable leaders, branches and shoots to be developed (*specify parts to retain and develop*).
- Reduce, subordinate and/or remove competing or undesirable parts (*specify parts to be removed, and types, sizes number and locations of cuts*).
- Follow process outlined in B-3, pruning to develop or improve structure.

## **B-4 Provide clearance**

Prune to prevent interference with infrastructure, buildings, traffic, lines-of-sight, desired views, or other plants; also to ensure safe and reliable utility services, raise crowns, provide access to sites, and comply with regulatory and other requirements as necessary.

### **Specification Guidelines**

- Determine clearance amount according to intended site use, planned maintenance interval, and characteristic form of the plant, including shape, growth rate and likely growth response following pruning (*specify reason for clearance, clearance distance, and/or branches and leaders to be removed, and/or types, sizes and locations of cuts*).
- Use directional pruning to encourage growth away from the specified clearance area and to develop compatible and stable structure (*specify location of branches to be retained, and an appropriate maintenance interval*).

## **B-5 Manage size and/or shape**

Prune to reduce size or maintain desired shape.

### **Specification Guidelines**

- Consider species and typical form, ability to tolerate the amount of pruning required, location, current condition, and other characteristics such as cultivar, failure profile, growth rate and expected growth response following pruning.
- Selectively reduce, shear or remove branches, leaders or other parts to achieve or maintain a desired form, shape or size (e.g. topiary system) or to encourage regenerative growth from lower parts of the crown (*specify parts to be reduced or removed and/or types, sizes number and locations of cuts, and an appropriate maintenance interval*)

### **B-5.1 Retrenchment (Regenerative) Pruning**

**Retrenchment** is a natural process whereby older trees gradually shed overextended, decayed, damaged, or declining branches and leaders, and redirect energy into epicormic growth from interior and lower portions of the crown. Depending on species and site conditions, this process may occur over many years, decades or centuries.

Retrenchment pruning mimics the natural process of retrenchment by making prescriptive pruning cuts to remove declining branches, reduce risk of failure, stimulate new shoots on interior and lower branches, and restore tree vitality and appearance. Resulting new growth is subsequently managed to guide future structural development. Arborists should determine whether retrenchment pruning is appropriate, considering factors such as species, condition, placement, aesthetics, and expected response.

Perform retrenchment pruning to preserve and maintain trees in the landscape, especially those of high value or special heritage.

#### **Specification Guidelines**

- Selectively reduce, remove or head branches that are dead, senescing, damaged, or that pose unacceptable risk (*specify condition of concern, types, sizes and locations of cuts*).
- Minimize the size of cuts on living wood whenever possible (preferably less than 6-inches in diameter).
- Maintain and monitor branches or leaders that do not pose unacceptable risk (*specify branches and leaders to be retained, and monitoring interval*).
- After retrenchment pruning, follow process outlined in Restoration pruning, (B-3.1).

### **B-6 Improve aesthetics**

Prune to improve the visual appearance of plants and/or the surrounding site.

#### **Specification Guidelines**

- Selectively reduce or remove branches, leaders or other parts to achieve aesthetic objectives (*specify parts to be removed and/or types, number, sizes and locations of cuts, and an appropriate maintenance interval*).

### **B-7 Manage production**

Prune to optimize production or desired characteristics of fruit, floral, timber, canes or other products.

#### **Specification Guidelines**

- Selectively remove branches or other parts to achieve desired production levels (*specify parts to be removed and/or types, sizes, number and locations of cuts, and optimum maintenance interval*).
- Consider seasonal timing of pruning, as well as species and cultivar characteristics.

### **B-8 Rejuvenation of Shrubs**

Prune to stimulate new growth, restore desired form, and/or to remove dead, damaged, diseased or infested parts.

#### **Specification Guidelines**

- Consider species and typical form, current condition, seasonal timing, and ability to tolerate rejuvenation pruning
- Reduce or head branches or leaders at or near ground level (*specify location of cuts, branches/leaders*)

*to be removed).*

## **B-9 Manage Wildlife Habitat**

Pruning activities may affect wildlife, either directly through disturbance, or by manipulation of habitat such as food supplies, cover, nesting or roosting sites. Pruning activities may also violate certain regulations, including the federal Migratory Bird Treaty Act, the Endangered Species Act and other federal, state and local regulations. Arborists should be aware of regulations, and modify work procedures as appropriate to avoid disturbing, injuring or killing protected wildlife.

Pruning to improve, conserve or manipulate wildlife habitat may be part of an overall strategy across an entire property, park, right-of-way or other management area. The practice may involve multiple pruning objectives and/or various pruning systems, and may include other strategies beyond the scope of a pruning standard.

### **Specification Guidelines**

- Specify retention or enhancement of desired wildlife features that do not pose unacceptable risk, such as perches, cavities or other nesting sites (*specify features to retain or enhance, parts to be removed, and types, sizes and locations of cuts*).
- Prune to stimulate growth, cover, fruit or seed production (*specify branches to be pruned or retained, and seasonal timing appropriate for species*).

### **Annex C – Applicable ANSI A300 interpretations**

This annex is not part of the ANSI A300 (Part 1)-2017 standard.

The following interpretations apply to ANSI A300 (Part 1)-2017 *Pruning*:

#### **C-1 Interpretation of “should” in ANSI A300 standards**

“An advisory recommendation” is the common definition of “should” used in the standards development community and the common definition of “should” used in ANSI standards. An advisory notice is not a mandatory requirement. Advisory recommendations may not be followed when defensible reasons for non-compliance exist.

#### **C-2 Interpretation of “shall” in ANSI A300 standards**

“A mandatory requirement” is the common definition of “shall” used in the standards development community and the common definition of “shall” used in ANSI standards. A mandatory requirement is not optional and must be followed for ANSI A300 compliance.





---

# **Appendix L**

## Mature Tree Pruning



# Tree Pruning

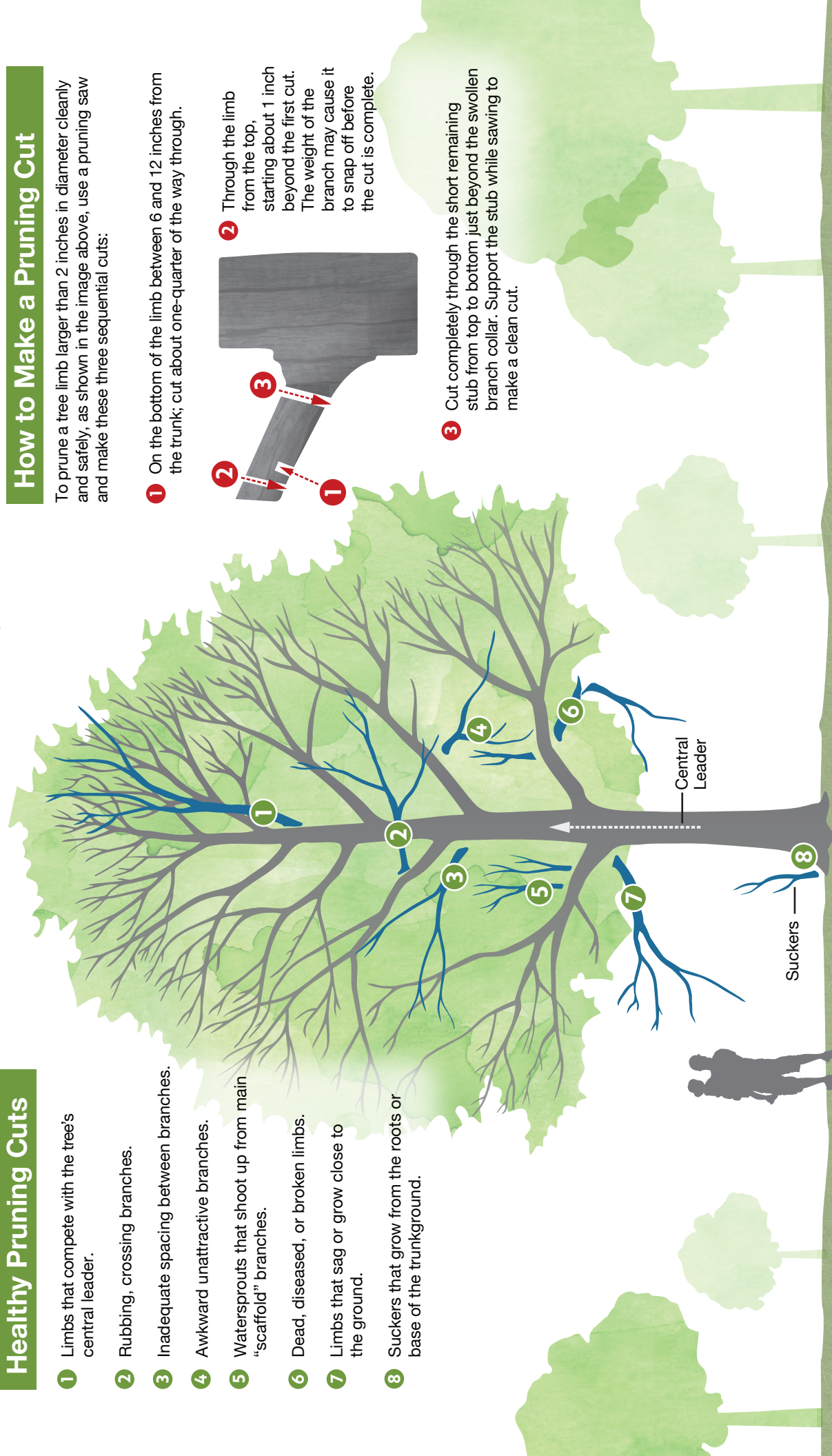
## Healthy Pruning Cuts

- 1 Limbs that compete with the tree's central leader.
- 2 Rubbing, crossing branches.
- 3 Inadequate spacing between branches.
- 4 Awkward unattractive branches.
- 5 Watersprouts that shoot up from main "scaffold" branches.
- 6 Dead, diseased, or broken limbs.
- 7 Limbs that sag or grow close to the ground.
- 8 Suckers that grow from the roots or base of the trunk/ground.

## How to Make a Pruning Cut

To prune a tree limb larger than 2 inches in diameter cleanly and safely, as shown in the image above, use a pruning saw and make these three sequential cuts:

- 1 On the bottom of the limb between 6 and 12 inches from the trunk; cut about one-quarter of the way through.





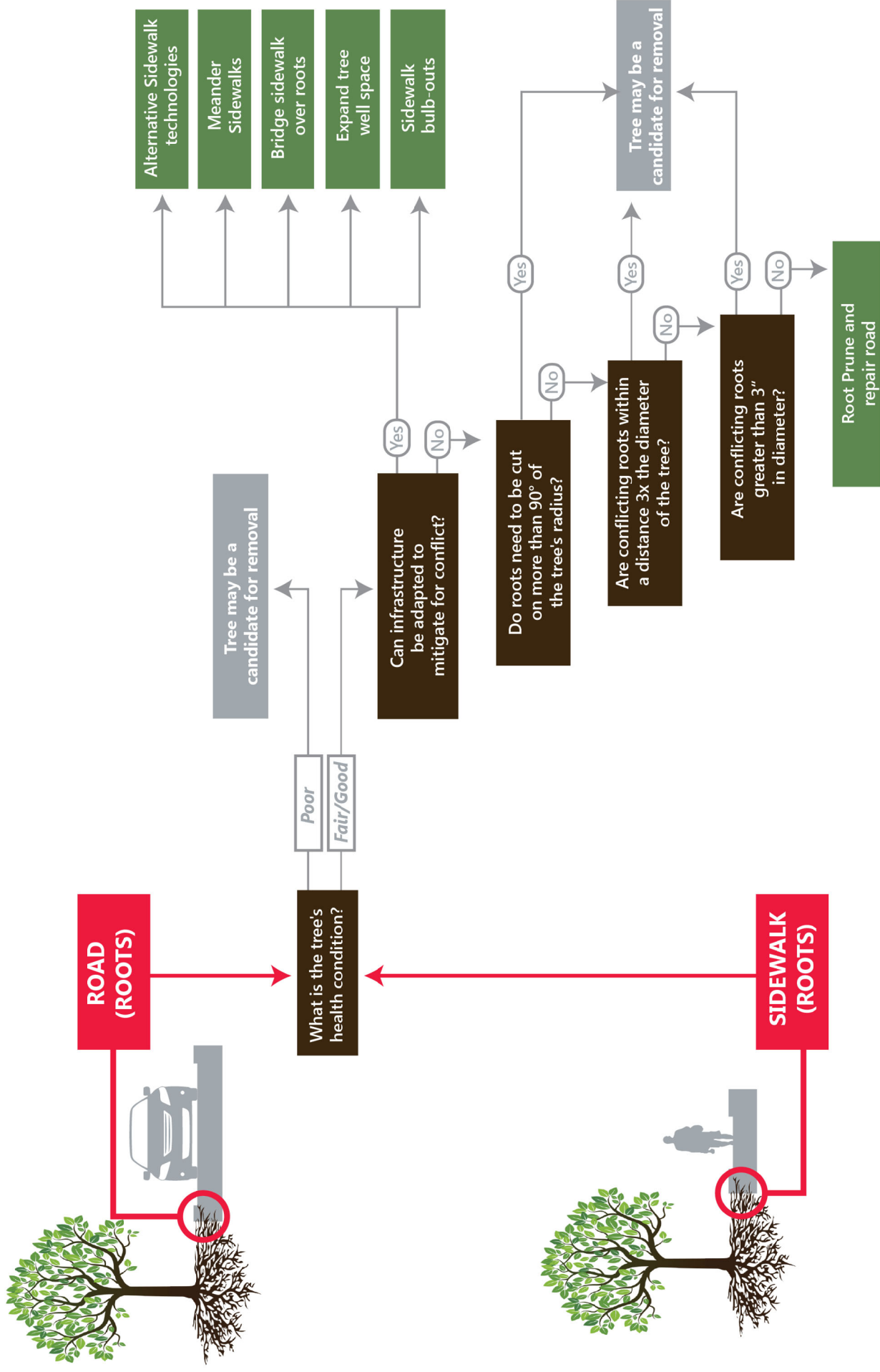
---

# **Appendix M**

## Infrastructure Conflicts Chart



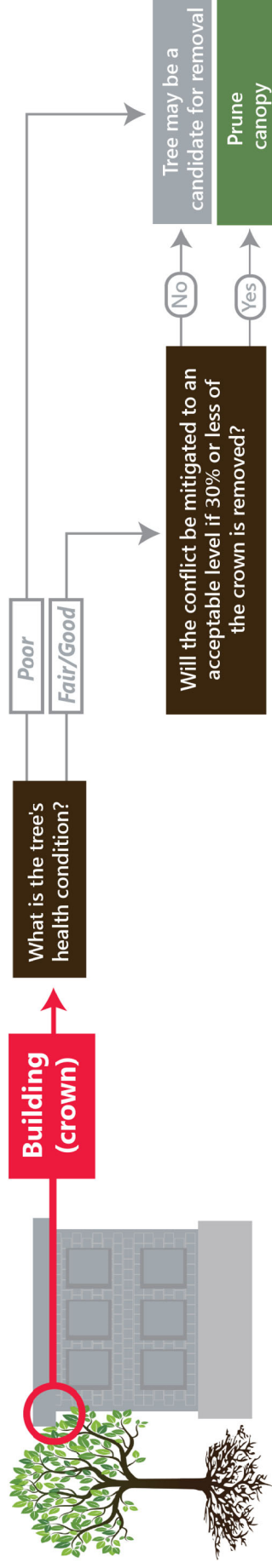
# What to do for tree **ROOT** conflicts with **ROADWAYS** and **SIDEWALKS**



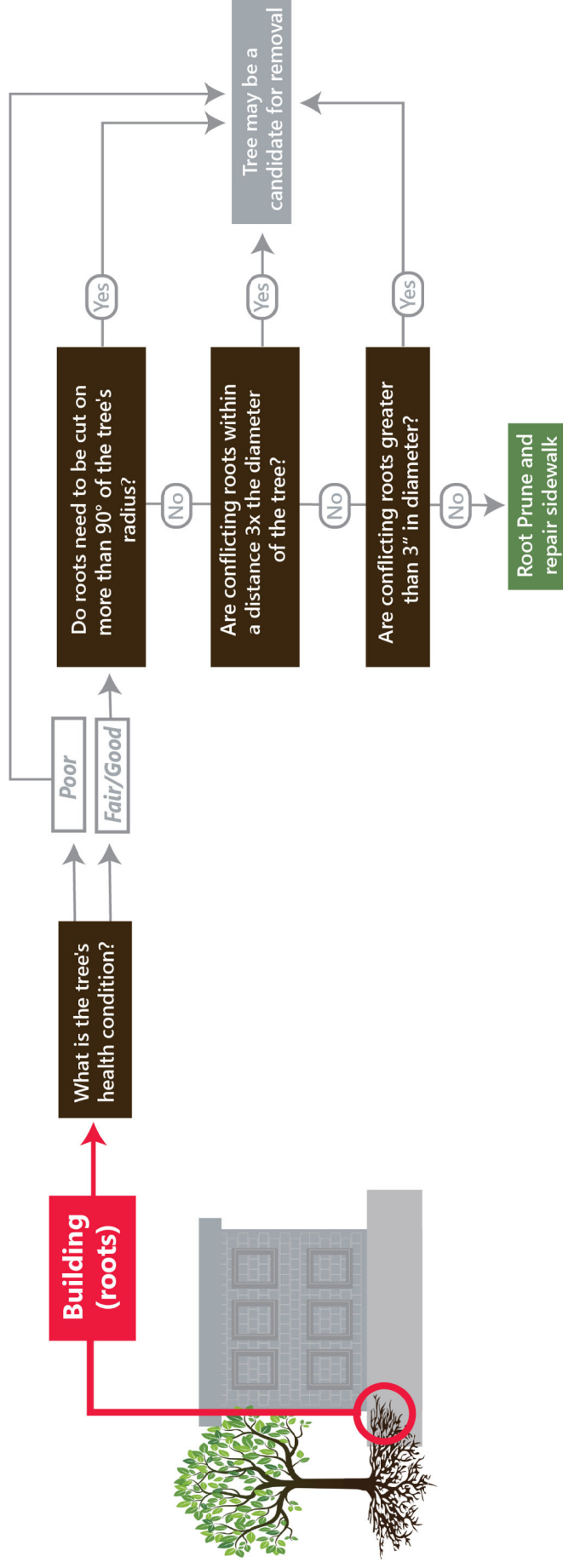




## What to do for tree **CROWN** and **BUILDING** conflicts



## What to do for tree **ROOT** and **BUILDING** conflicts



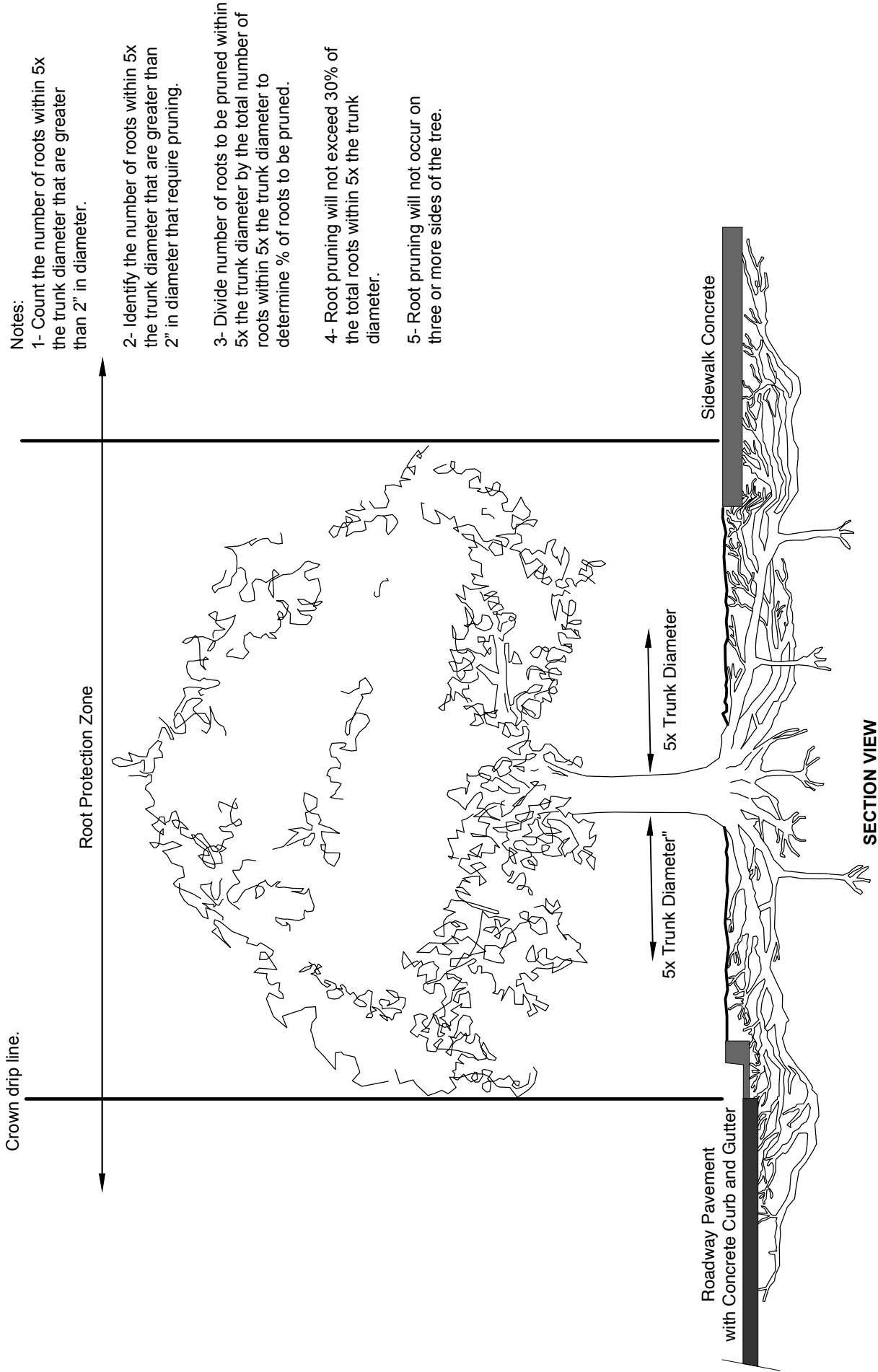


---

# **Appendix N**

## Root Pruning Detail





Notes:

- 1- Count the number of roots within 5x the trunk diameter that are greater than 2" in diameter.
- 2- Identify the number of roots within 5x the trunk diameter that are greater than 2" in diameter that require pruning.
- 3- Divide number of roots to be pruned within 5x the trunk diameter by the total number of roots within 5x the trunk diameter to determine % of roots to be pruned.
- 4- Root pruning will not exceed 30% of the total roots within 5x the trunk diameter.
- 5- Root pruning will not occur on three or more sides of the tree.

## ROOT PRUNING GUIDELINES



---

# **Appendix O**

## Root Pruning Guidelines





# Root Pruning Guidelines

Street trees planted in urban environments at times will come into conflict with adjacent sidewalks, tree wells, curbs, and other infrastructure that will need to be repaired to maintain the location in a safe condition. Every effort should be made to preserve trees when repairing damaged infrastructure. Prior to root pruning activities, alternative designs and materials that will minimize impacts to tree health and safety should be evaluated. When impacts to trees and tree roots cannot be avoided, careful consideration must be given to determine if root pruning and tree preservation is feasible.

Improper root pruning and unnecessary damage from construction-related activities can significantly damage trees, resulting in health decline and/or structural instability. If root pruning is necessary to preserve the tree(s), the following guidelines may be used to inform the decision-making process and decrease the likelihood of tree health decline and/or structural stability prior to and following root pruning.

Minimization of root damage is best accomplished by minimizing overall root pruning and maximizing the distance from the tree's trunk that roots are cut. Each tree and situation is unique and requires a decision-making process. As such, United Laguna Woods Mutual (United Mutual) requires the following qualifications of any individual who will make recommendations for trees that require root pruning:

- International Society of Arboriculture (ISA) Certified Arborist
- ISA Tree Risk Assessment Qualified
- Experience with root pruning

## Foundation for the Standards

United Mutual recognizes the most current editions of the following pruning standards:

1. American National Standards Institute (ANSI) A300 Pruning Standards
2. ANSI Z133.1 Safety Standards
3. ISA Best Management Practices: Tree Pruning

## Step 1: Tree and Site Assessment

To minimize root pruning impacts, a tree assessment will be conducted by a qualified arborist designated by United Mutual, prior to pruning. During the evaluation, the arborist will evaluate tree and site conditions to determine the potential for injury and loss of structural stability. Tables 1 and 2 provide guidelines to determine if the tree is a suitable candidate for root pruning. If the assessment finds the tree is a suitable candidate for root pruning, construction-related activities can commence under the supervision of a qualified arborist.

**Table 1. Tree Health and Safety Factors to Consider**

Factor	Description
Tree Species	Some species tolerate root pruning/damage better than others.
Tree Health	Trees in poor or declining health should not be root pruned.
Tree Age	Older trees are more likely to decline following root pruning and/or damage.

**Table 1. Tree Health and Safety Factors to Consider**

Factor	Description
Tree Lean	Leaning trees should not be root pruned.
Root Pruning Damage Proximity	The closer the root cut is to the tree, the greater the chance of tree decline and loss of stability.
Percentage of Anticipated Root Loss	More root loss increases the likelihood of decline.
Structural Root Damage	Structural damage increases the likelihood of structural failure and increases risk to the community.
Prior Root Pruning	Trees with a history of root pruning should be documented to minimize additional decline.
Soil Volume	Roots in shallow soils require additional distancing from the trunk of the tree to minimize the likelihood of root damage.

**Table 2. Long-Term Objectives to Consider**

Factor	Description
Future Site Development	The tree will require removal due to a pending project.
Sustainability	The tree species does not meet United Laguna Woods Mutual standards for water use, drought tolerance, and adaptability to changing climate conditions.
Increasing Canopy Cover	Consider an alternative species in the same location that would provide increased canopy coverage to meet the goals of United Laguna Woods Mutual.

## Step 2: Root Pruning

A qualified arborist will be on site during construction-related activities to monitor impacts to the tree and roots. If root pruning is required, root pruning will be minimized to the extent possible. The following guidelines are examples of potential root pruning approval conditions that will help guide the decision-making process prior to root pruning.

### Conditions to Determine Possible Tree Candidates

- The tree appears to be in good health and a safe condition as determined by a qualified arborist
- The tree species meets United Mutual's standards for water use, drought tolerance, and adaptability to changing climate conditions
- The tree species provides a maximum level of canopy cover for the growing space provided in the ground and air

### Suitable Conditions for Root Pruning

- The roots to be pruned are greater than or equal to 5 feet from the tree's drip line
- The root measures less than 2 inches and is a distance from the trunk of more than 5 times the diameter of the trunk, and pruning is less than 30% of the total root system

### Conditions that Require a Determination by a United Mutual Arborist Inspector

- Any disturbance within the drip line of the tree
- Any root cutting that occurs within a distance from the trunk of 5 times the diameter of the trunk

### Tree Removal

#### Candidates for Removal

- Root removal, as found by a qualified ISA Certified Arborist, will cause tree health decline and/or structural instability
- Root pruning is required at a distance less than 5 times the trunk diameter and will result in greater than 30% root damage, or is required on three or more sides of the tree

#### Removals of More than One Tree

- If tree removals are required for an entire block, removals will be staggered over a 5-year period to avoid a significant canopy cover loss
- Any plans created in the future will include consideration of streetscape alterations to ensure that hardscape is a minimum of 5 times the distance of the selected tree species expected trunk diameter at maturity

INTENTIONALLY LEFT BLANK

---

# **Appendix P**

## Tree Protection Guidelines



## Appendix K – Tree Protection Measures

*The following sections are included as general guidelines for tree protection from construction impacts. The measures presented should be monitored by arborists and enforced by contractors and developers for maximum benefit to the trees.*

### Tree Protection Measures Prior to Construction

**Fencing:** All remaining trees that will not be relocated or removed should be preserved and protected in place. Trees within approximately 15 feet of proposed construction activity should be temporarily fenced with chain link or other material satisfactory to United Mutual's planning staff throughout grading and construction activities. The fencing should be installed 3 feet outside of the dripline of each tree (or edge of canopy for cluster of trees), be 4 feet tall, and staked every 6 feet. The fenced area should be considered the tree protection zone (TPZ) unless proximate construction required temporary removal.

**Pre-Construction Meeting:** A pre-construction meeting should be held between all contractors (including grading, tree removal/pruning, builders, etc.) and the arborist. The arborist will instruct the contractors on tree protection practices and answer any questions. All equipment operators and spotters, assistants, or those directing operators from the ground, should provide written acknowledgement of their receiving tree protection training. This training should include information on the location and marking of protected trees, the necessity of preventing damage, and the discussion of work practices that will accomplish such.

### Protection and Maintenance During Construction

Once construction activities have begun the following measures should be adhered to:

**Equipment Operation and Storage:** Avoid heavy equipment operation around the trees. Operating heavy machinery around the root zones of trees will increase soil compaction, which decreases soil aeration and subsequently reduces water penetration in the soil. All heavy equipment and vehicles should, at minimum, stay out of the fenced TPZ, unless where specifically approved in writing and under the supervision of a Certified Arborist or as provided by the approved landscape plan.

**Storage and Disposal:** Do not store or discard any supply or material, including paint, lumber, concrete overflow, etc. within the protection zone. Remove all foreign debris within the protection zone; it is important to leave the duff, mulch, chips, and leaves around the retained trees for water retention and nutrients. Avoid draining or leakage of equipment fluids near retained trees. Fluids such as gasoline, diesel, oils, hydraulics, brake and transmission fluids, paint, paint thinners, and glycol (anti-freeze) should be disposed of properly. Keep equipment parked at least 50 feet away from retained trees to avoid the possibility of leakage of equipment fluids into the soil. The effect of toxic equipment fluids on the retained trees could lead to decline and death.

**Grade Changes:** Grade changes, including adding fill, are not permitted within the TPZ without special written authorization and under the supervision of a Certified Arborist or as provided by the approved landscape plan. Lowering the grade within this area will necessitate cutting main support and feeder roots, jeopardizing the health and structural integrity of the tree(s). Adding soil, even temporarily, on top of the existing grade will compact the soil further, and decrease both water and air availability to the trees' roots.



**Moving Construction Materials:** Care will be taken when moving equipment or supplies near the trees, especially overhead. Avoid damaging the tree(s) when transporting or moving construction materials and working around the tree (even outside of the fenced tree protection zone). Above ground tree parts that could be damaged (e.g., low limbs, trunks) should be flagged with red ribbon. If contact with the tree crown is unavoidable, prune the conflicting branch(es) using International Society of Arboriculture (ISA) standards.

**Root Pruning:** Except where specifically approved in writing or as provided in Attachment 3, all trenching should be outside of the fenced protection zone. Roots primarily extend in a horizontal direction forming a support base to the tree similar to the base of a wineglass. Where trenching is necessary in areas that contain tree roots, prune the roots using a Dosko root pruner or equivalent. All cuts should be clean and sharp, to minimize ripping, tearing, and fracturing of the root system. The trench should be made no deeper than necessary.

**Irrigation:** Trees that have been substantially root pruned (30% or more of their root zone) will require irrigation for the first 12 months. The first irrigation should be within 48 hours of root pruning. They should be deep watered every 2 to 4 weeks during the summer and once a month during the winter (adjust accordingly with rainfall). One irrigation cycle should thoroughly soak the root zones of the trees to a depth of 3 feet. The soil should dry out between watering; avoid keeping a consistently wet soil. Designate one person to be responsible for irrigating (deep watering) the trees. Check soil moisture with a soil probe before irrigating. Irrigation is best accomplished by installing a temporary above ground micro-spray system that will distribute water slowly (to avoid runoff) and evenly throughout the fenced protection zone *but never soaking the area located within 6 feet of the tree trunk, especially during warmer months.*

**Pruning:** Do not prune any of the trees until all construction is completed. This will help protect the tree canopies from damage. All pruning should be completed under the direction of an ISA Certified Arborist and using ISA guidelines. Only dead wood should be removed from tree canopies.

**Washing:** During construction in summer and autumn months, wash foliage of trees adjacent to the construction sites with a strong water stream every two weeks in early hours before 10:00 a.m. to control mite and insect populations.

**Inspection:** An ISA Certified Arborist should inspect the impacted preserved trees on a monthly basis during construction. A report comparing tree health and condition to the original, pre-construction baseline should be submitted following each inspection. Photographs of representative trees are to be included in the report on a minimum annual basis.

## **Maintenance After Construction**

Once construction is complete the fencing may be removed and the following measures performed to sustain and enhance the vigor of the preserved trees.

**Mulch:** Provide a 4-inch mulch layer under the canopy of trees. Mulch should include clean, organic mulch that will provide long-term soil conditioning, soil moisture retention, and soil temperature control.

**Pruning:** The trees will not require regular pruning. Pruning should *only* be done to maintain clearance and remove broken, dead or diseased branches. Pruning should only take place following a recommendation by an ISA Certified Arborist and performed under the supervision of an ISA Certified Arborist. No more than 20% of the canopy should be removed at any one time. All pruning should conform to ISA standards.

Watering: The natural trees that are not disturbed should not require regular irrigation, other than the 12 months following substantial root pruning. However, soil probing will be necessary to accurately monitor moisture levels. Especially in years with low winter rainfall, supplemental irrigation for the trees that sustained root pruning and any newly planted trees may be necessary. The trees should be irrigated *only* during the winter and spring months.

Watering Adjacent Plant Material: All plants near the trees should be compatible with water requirements of said trees. The surrounding plants should be watered infrequently with deep soaks and allowed to dry out in-between, rather than frequent light irrigation. The soil should not be allowed to become saturated or stay continually wet. Irrigation spray should not hit the trunk of any tree. A 60-inch dry-zone should be maintained around all tree trunks. An aboveground micro-spray irrigation system is recommended over typical underground pop-up sprays.

Washing: Periodic washing of the foliage is recommended during construction but no more than once every 2 weeks. Washing should include the upper and lower leaf surfaces and the tree bark. This should continue beyond the construction period at a less frequent rate with a high-powered hose only in the early morning hours. Washing will help control dirt/dust buildup that can lead to mite and insect infestations.

Spraying: If the trees are maintained in a healthy state, regular spraying for insect or disease control should not be necessary. If a problem does develop, an ISA Certified Arborist should be consulted; the trees may require application of insecticides to prevent the intrusion of bark-boring beetles and other invading pests. All chemical spraying should be performed by a licensed applicator under the direction of a licensed pest control advisor.

Inspection: All trees that were impacted during construction within the TPZ should be monitored by an ISA Certified Arborist for the first 5 years after construction completion. The Arborist should submit an annual report, photograph each tree and compare tree health and condition to the original, pre-construction baseline.



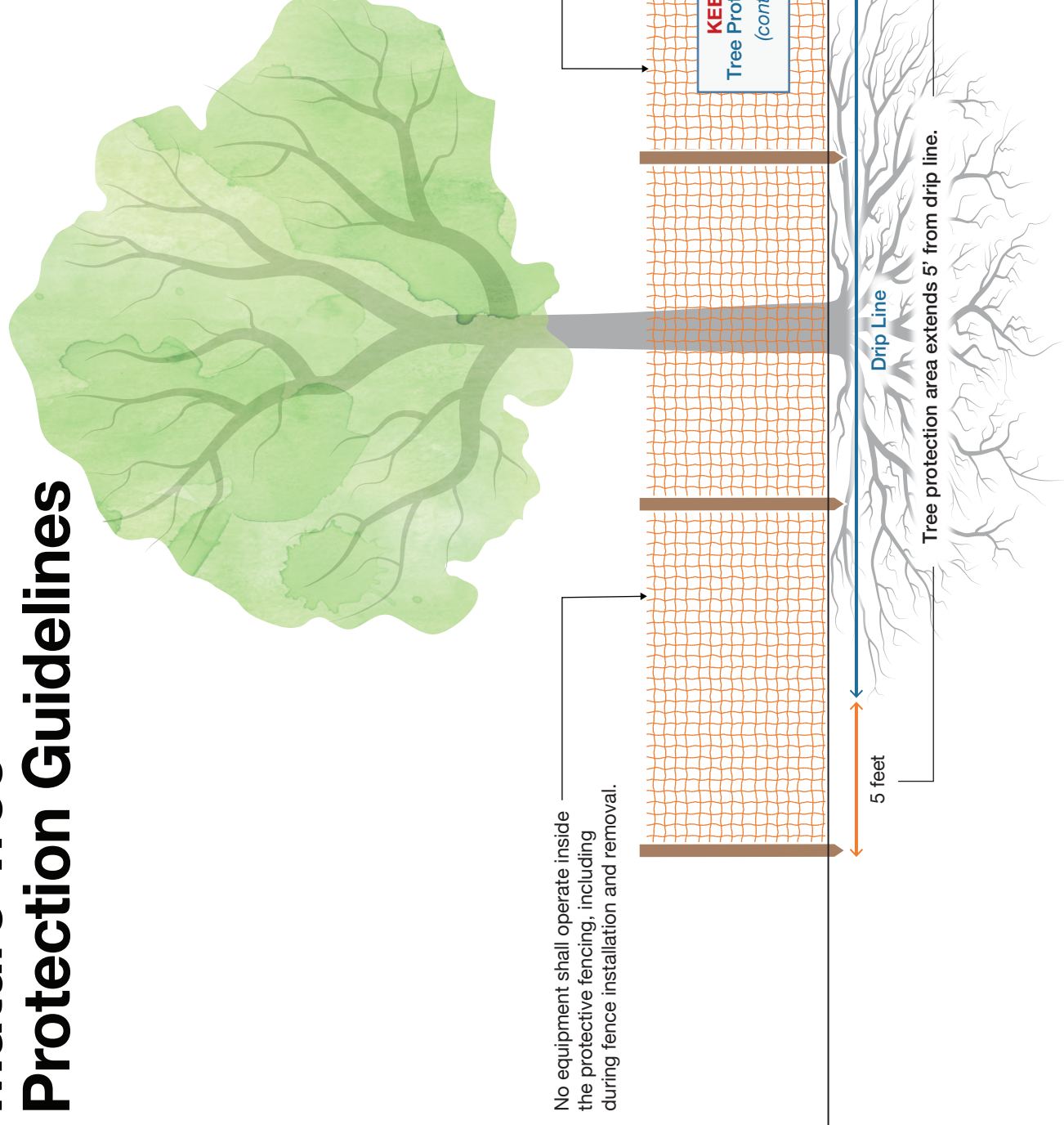
---

## **Appendix Q**

### Mature Tree Protection Guidelines



# Mature Tree Protection Guidelines





---

# **Appendix R**

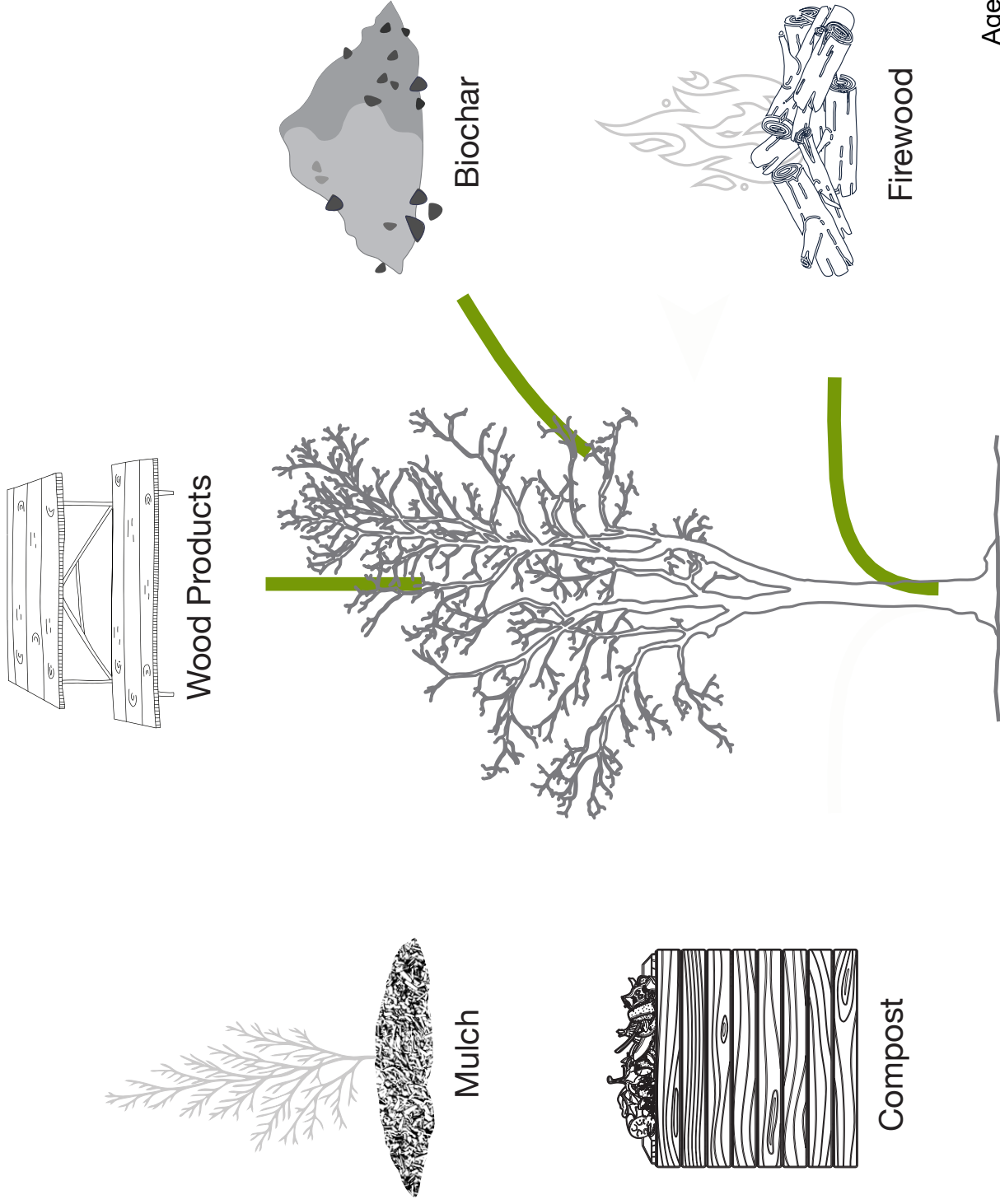
## Urban Wood





# Tree Recycling

When a tree requires removal, the second life of the tree as urban wood begins. A removed tree can be processed into firewood, mulch, compost, biochar, or end-use wood products like a bench or table.









UNITED LAGUNA WOODS  
— M U T U A L —