

# DENVER'S URBAN FOREST

## Natural Resource Analysis, Assessment & Recommendations



City of Denver Parks & Recreation  
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# INTRODUCTION

# EXECUTIVE SUMMARY

As we move deeper into the 21st century, it is clear that climate change is having a direct effect on our cities and our lives. The consequences of climate change are being felt in Colorado and, if not thoughtfully addressed, will exacerbate socio-ecological challenges that are already present within urban areas. An example of this is the urban heat island effect, a phenomenon of extreme heat caused by large areas of impervious surfaces and the use of low albedo building materials (e.g., concrete and pavement). Urbanization is increasing greenhouse gas emissions and heat production from industrial processes, cooling systems and transportation. This, in turn, has cascading negative effects on the environment, public health, and the economy in U.S. cities.

A healthy urban forest is an effective, nature-based method for mitigating the effects of climate change while also providing numerous social, environmental, and economic benefits. Some of the myriad positive benefits of urban trees include slowing storm water runoff and providing shade, which helps cool the air and lowers energy costs. However, due to historic discriminatory land use and development practices in cities, many

low income and Black, Indigenous, and People of color (BIPOC) communities have been denied the benefits of trees and face greater vulnerability to the effects of climate change. Addressing inequities in our urban tree canopy, particularly in Denver's already harsh climate, is one of the great challenges facing urban foresters, planners, and politicians.

This report analyzes the current administrative structure for managing urban trees in Denver, studies better practices from several other U.S. cities with successful urban tree management approaches, and outlines recommendations and strategies to improve the urban canopy in the city. Based on findings from two University of Colorado student research teams, data analysis, and stakeholder interviews, this guide outlines strategies to (i) develop and support a citywide vision for an equitable and resilient urban forest, (ii) establish and nurture long-term partnerships with organizations and stakeholders to help support and implement the city vision and management plan, and (iii) establish and strengthen community engagement and stewardship opportunities.



# What is this guide?

This visionary document presents the findings, recommendations, and strategies developed by a team of consultants and University of Colorado students to help the City and County of Denver improve the urban forest. The guide is organized into the following sections:

- A historic timeline of the city's development and important dates relevant to the urban forest.
- An analysis of existing plans and documents related to the urban forest.
- A summary of the current administrative structure within the city to manage the urban forest.
- A summary of department interviews conducted by the consultant teams, and the two-day roundtable workshop held to discuss the challenges and next steps for managing the urban forest.
- An analysis and summary of better practices employed by four U.S. cities (Boise, Idaho; Pittsburgh, Pennsylvania; Cincinnati, Ohio; and Portland, Oregon).
- An outline of recommendations and strategies to address historic inequities and improve Denver's urban forest.

## DENVER'S URBAN TREE CANOPY COVERAGE IS

**11%** ONE OF THE  
LOWEST OF ALL CITIES  
NATIONWIDE



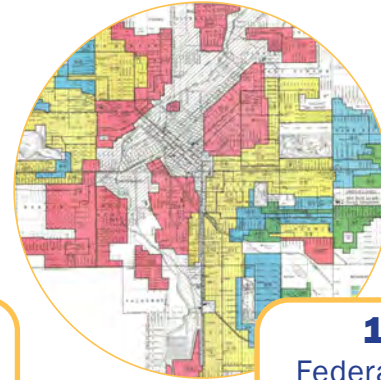
Source: <https://i.pinimg.com/736x/d5/ef/d9/d5efd9cc1de80735d613aae926ce9541.jpg> (2017)

## HISTORY OF DENVER'S URBAN TREE CANOPY

Denver's history and current urban form was heavily influenced by several factors. Begun as a mining camp in the mid-19th century at the confluence of the South Platte River and Cherry Creek, Denver grew rapidly with the arrival of a railroad spur from Cheyenne, WY in 1870. The city boomed, and with that growth came a desire to ameliorate the harsh, arid climate to attract newcomers from the eastern U.S. who were accustomed to lush landscapes of green grass and broad shade trees. An embrace of the City Beautiful movement at the turn of the 20th century, along with the vision of several ambitious leaders, led to the creation of a large network of public parks and parkways. However, as in all American cities, the impact of discriminatory lending and housing policies, urban renewal, and freeway construction greatly impacted the urban forest - creating a city of "haves" and "have nots" in the distribution of urban trees. In response to a rapidly changing climate, acknowledgement of historic and systemic inequities, and outdated urban forestry management policies, Denver is embarking on an effort to reimagine a "City of Trees".



**1906**  
Board of Public Works established



**1934**  
Federal Housing Administration (FHA) established and begins practice of "redlining"



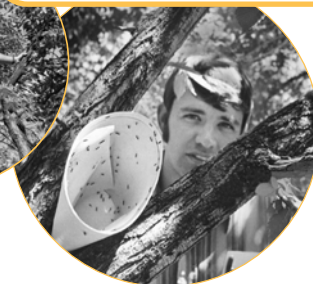
# 1900



**EARLY 1900S**  
"City Beautiful" Movement



**1928**  
Dutch Elm disease first reported in the U.S.





**1950**



**1958**  
Denver Urban  
Renewal Authority  
established



**1982**  
16th Street  
Mall opened



**1993**  
Streetscape  
Design Manual  
adopted



**2013**  
Emerald Ash Borer  
found in Boulder,  
CO

**2000**



**1974**  
Skyline Park  
designed



**1986**  
Denver's first  
Downtown Area  
Plan



**2006**  
Mile High  
Initiative

**2021**  
Denver's Urban  
Forest: Natural  
Resource Analysis,  
Assessment, and  
Recommendations







# EXISTING CONDITIONS & PROCESS

# OVERVIEW

Denver's urban forest was not created overnight but has been shaped throughout the past 150 years by countless decisions great and small. Federal and state policies and funding opportunities, transportation and land use decisions, a boom-and-bust cycle of growth and development, civic boosterism, and many other factors have all affected the proliferation and health, or lackthereof, of the urban forest. This guide is not intended as an exhaustive historical analysis of the city's tree canopy, but a look at where we are now and how the current administrative structure and policies could potentially be revised to better support urban forest development and health.

This section outlines the existing municipal plans and documents that relate to the urban forest, as well as the current structure of departments and agencies responsible for public and private trees. It includes a summary of departmental interviews, including key takeaways, conducted by the consultant team in 2021 and a review of the two-day roundtable workshop hosted by the Office of the City Forester in early 2022. Both resources provide insight to the challenges and next steps needed to improve Denver's urban forest.



# RELATED PLANS & DOCUMENTS



**GOVERNANCE**



**ROW / URBAN DESIGN STANDARDS**



**OPERATIONS / MAINTENANCE**



**PRIVATE PROPERTY**



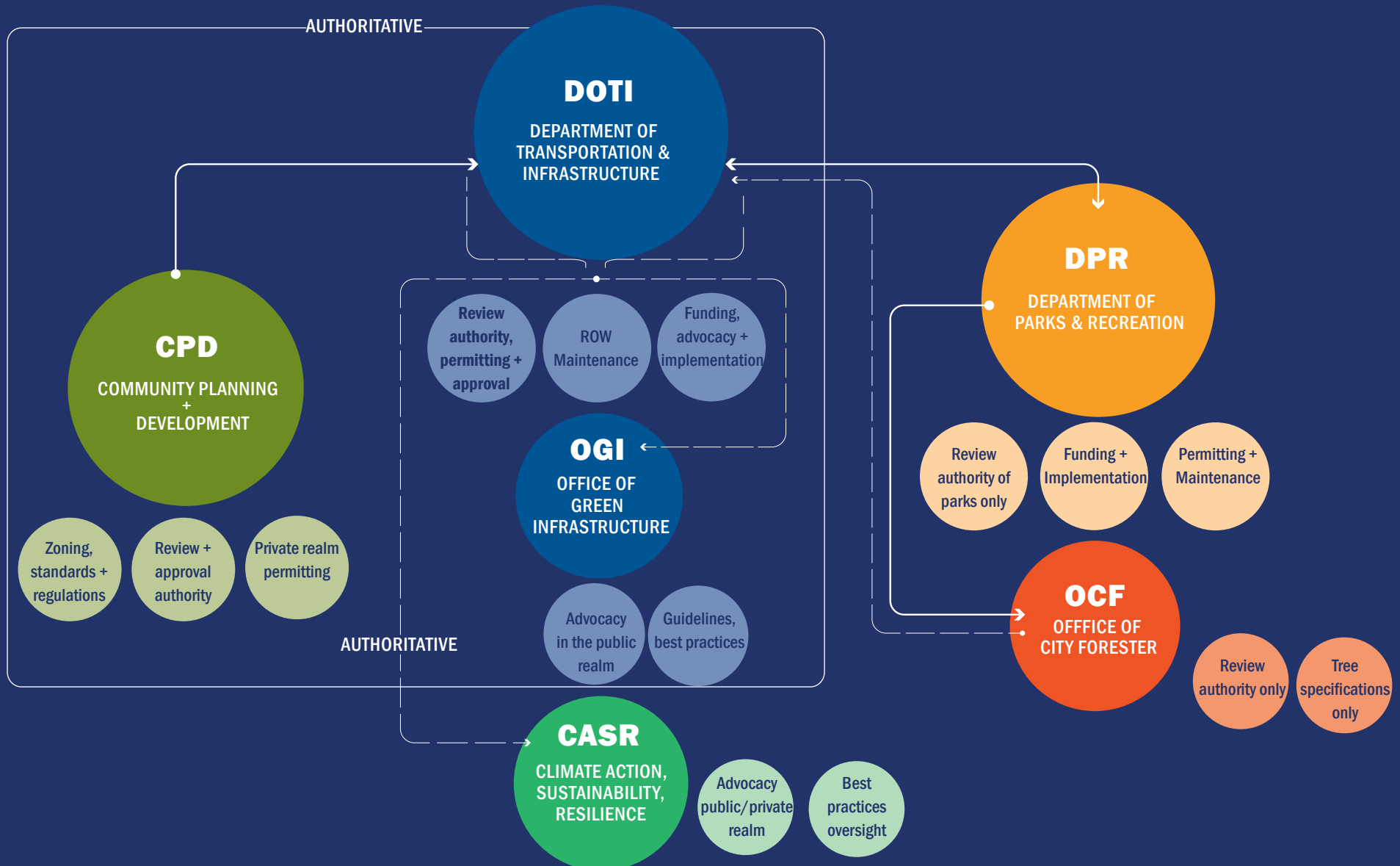
**FUNDING**



**PARTNERSHIPS**



# CURRENT DEPARTMENT STRUCTURE AND RESPONSIBILITIES





# CURRENT DEPARTMENT STRUCTURE AND RESPONSIBILITIES

## **Office of the City Forester (OCF)**

The Office of the City Forester is a division within Denver Parks & Recreation responsible for the direct maintenance of public trees within parks and designated parkways, as well as the regulation of street trees. Maintenance of street trees is the responsibility of adjacent property owners. OCF is also charged with oversight of privately maintained trees and taking actions to improve the overall quality of Denver's urban tree canopy.

## **Denver Parks & Recreation (DPR)**

Denver Parks & Recreation provides a broad range of programs, services, facilities and park amenities in the City & County of Denver. The City's park system encompasses more than 250 urban parks (6,000 acres), including 300 acres of parks along rivers and trails, and an additional 14,000 acres of spectacular mountain parks. OCF is a division within DPR.

## **Department of Transportation & Infrastructure (DOTI)**

Denver's Department of Transportation & Infrastructure (DOTI) is a modern agency focused on increasing mobility and safety while reducing congestion and mitigating climate change.

Source: City & County of Denver, 2022

### **Office of Green Infrastructure (OGI)**

The City & County of Denver is making green infrastructure a fundamental part of the City's long-term stormwater management strategy by looking at ways to incorporate large-scale green infrastructure and site-scale green infrastructure. Like Denver's urban forest, the benefits of green infrastructure, regardless of scale, include improved water quality as well as better air quality, reduced flooding risks, urban heat island effect mitigation, reduced energy demands, climate change resiliency, and enhanced community livability. OGI is a division within DOTI.

### **Community Planning & Development (CPD)**

Community Planning & Development works with Denver's communities to prepare plans – as well as regulations for land use and design – that guide the city's growth, enhancement and preservation. CPD staff also reviews, permits, and inspects development applications to ensure that future construction meets the community-led regulations laid out in Denver's zoning codes as well as meets the rigorous standards of the city's building, fire, and energy codes. This work helps to ensure life-safety and quality-of-life standards, now and in the future.

### **Climate Action, Sustainability & Resilience (CASR)**

The Office of Climate Action, Sustainability, and Resiliency was created to manage the City's ambitious emission reduction goals and sustainability programs in collaboration with fellow departments, other units of government, and community partners. The office ensures that the City's targets are aligned with current climate science, promotes the role that climate action and sustainability play in strengthening Denver's economic vitality and a prosperous future for all residents and businesses, and embraces equity as a value and practice in all of its work.



## THEMES



**MESSAGING**



**FUNDING  
SOURCES**



**MAINTENANCE**



**ROW  
CONFLICTS**



**PRIVATE  
PROPERTY**



**DEPARTMENTAL  
CONFLICTS**



**TREE  
REQUIREMENTS**

# INTERDEPARTMENTAL INTERVIEWS

Research began with a series of interviews across departments that deal with Denver's urban forest. These interviews were led by a consultant team of planners and landscape architects from Dig Studio and Design Workshop and included key representatives from each department or division. To encourage open dialogue and minimize debate, the interviews were conducted with one department or agency at a time. Following the interviews, a two-day roundtable workshop was held to bring all departments together for facilitated discussion and consensus on next steps to better collaborate on issues pertaining to the development and health of the urban forest. The interview questions are listed below and the following pages summarize key themes and takeaways from each departmental interview.

## INTERVIEW QUESTIONS

**What are this department's current goals or policies to enhance the urban forest?**

**Are there elements in your department's policies or regulations that stand in the way of a healthy and resilient urban forest?**

**Based on your understanding of national or international best practices, what opportunities can your department pursue to improve the health and resilience of the urban forest?**

**What discrepancies exist between your department and Forestry that may negatively impact the urban forest?**

# Interview Findings

## Denver Parks & Recreation

DPR has two primary work divisions within Planning, Design & construction responsible for the city's parks and parkways. The Planning group coordinates with OCF on park planning projects, particularly as they may impact existing trees, works to improve coordination on tree planting in new parks, and to improve policies to encourage urban development to preserve trees or create space for new trees. Design & Construction works closely with OCF to protect existing trees, particularly in areas of parks with mature canopies which are most desirable for new amenities.

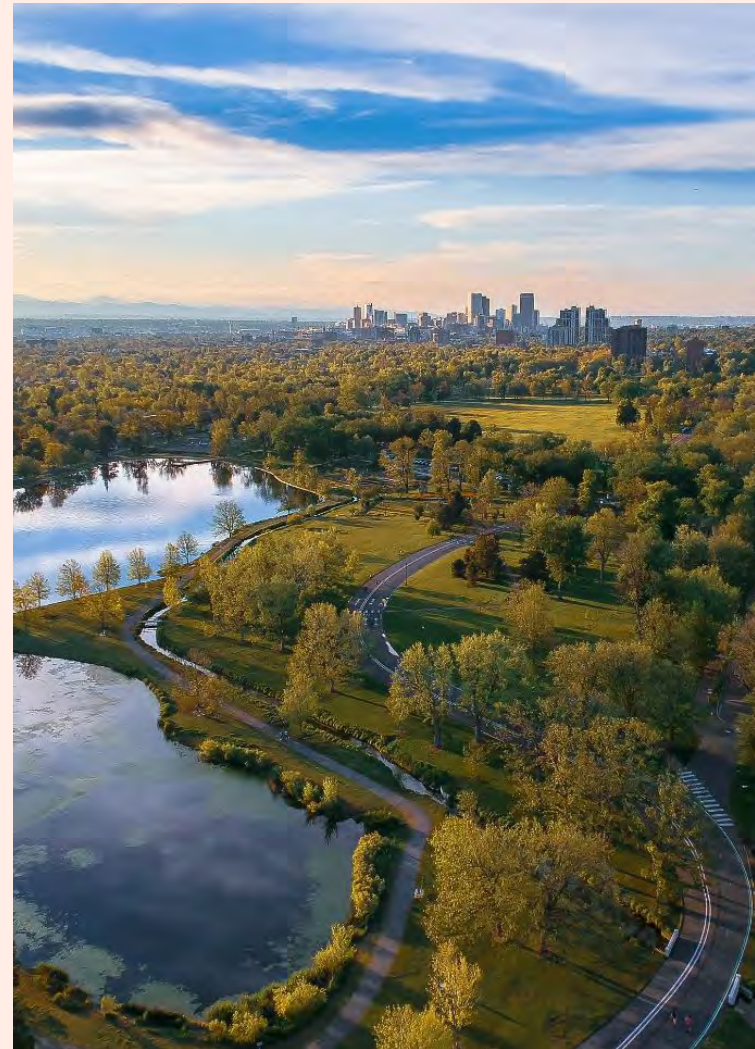
DPR believes there are opportunities to improve the health and resilience of the urban forest through strategies such as:

- requiring minimum soil volumes
- tree requirements and guidelines in targeted corridors
- employing new technologies
- prioritizing trees as an important piece of urban infrastructure
- utilizing public information and education campaigns
- developing parks system-wide tree strategies

DPR identified departmental challenges including narrowly-accepted tree species, inconsistent interpretation of existing ordinances and rules, and a confusing and expensive review processes. These rules often apply to DPR as well as private developers, leading to cost implications. DPR representatives also discussed discrepancies between departments that include:

- a lack of discussion about forest succession and hierarchy
- lack of regulation on private property
- inconsistent maintenance responsibilities within the public right-of-way
- utility conflicts
- misunderstanding of native landscapes
- communication challenges

DPR representatives were optimistic about the Denver Green Opportunity group, a new organization tasked with studying potential policy changes to address climate change and sustainability concerns.



[https://travel.hilton.com/en\\_us/guides/denver/neighborhoods/denver-washington-park/](https://travel.hilton.com/en_us/guides/denver/neighborhoods/denver-washington-park/)



# Interview Findings

## *Department of Transportation & Infrastructure*

DOTI has a broad goal of moving people safely from place to place whether they are walking, biking, using transit, or driving. They coordinate with OCF during the planning phase of projects. DOTI enforces transportation design standards for streets that includes a 5' - 8' sidewalk and 8' tree lawn/planting zone which was coordinated closely with OCF. The new Complete Streets Design Guidelines will be developed into new rules and regulations in the near future and there is the possibility for synergy between any updated forestry guidelines or recommendations during the process.

DOTI representatives understand that their standards often make achieving adequate soil volume for street trees challenging. The corridors and roadways that need trees the most often have the least amount of space and the most utility conflicts. There is opportunity for alignment between program needs including drainage, green infrastructure, and mobility. In many cases there is the most conflict between DOTI standards and Forestry goals because of limited space within the right-of-way. When the goal is to move people safely around the city, trees may take a back seat in terms of priority, but there are many other strategies for green infrastructure and buffering.

DOTI representatives stressed the need for a nuanced approach rather than blanket guidelines that apply citywide. A hierarchy of priorities, similar to content in the Complete Streets Design Guidelines, may be useful for Forestry goals, where the surrounding context is a factor in how design elements are prioritized. Regulatory tools could be the best way to align goals between agencies. Lastly, maintenance was a recurring theme in conversations with DOTI representatives who expressed concern that there is currently a lack of funding and staffing for OCF to perform the necessary tree care which often leads to fewer trees being planted.



<https://www.bicyclecolorado.org/advocacy-group/denver-bicycle-touring-club/>

# Interview Findings

## Office of Green Infrastructure

The OGI is a division within DOTI charged with implementing green streets, which are primarily focused on water quality, throughout Denver. The agency has constructed or designed 13 miles of green streets and has yet to reach their goal of 5 miles of green streets per year. In many cases, OGI coordinates with development projects to accomplish this goal.

Streets are targeted based on heat modeling, but in many cases the hottest streets lack an amenity zone within the right-of-way in which to add green infrastructure or street trees. OGI would like to look for opportunities to work across departments to research new technologies or better practices for tree preservation and construction/installation methods.

OGI representatives stressed the need to acknowledge and codify urban growing conditions that do not require unrealistic conditions that mimic a natural environment as this is difficult to achieve in the city. OGI also stressed that they maintain all of the infrastructure that they install. They are working to identify standards that are missing and can be updated, an approach that OCF should follow. OGI often looks to OCF for guidance on details such as soil volumes, but there is no formal standard. A more robust tree ordinance, standards, and details would be extremely beneficial for other city agencies. OGI would like to work with OCF to create an expanded acceptable tree species list that also includes trees that will thrive in water quality planters. Like other departments, OGI representatives stressed the need for maintenance programs and funding in order to support a robust canopy and urban forest.



photo credit: Dig Studio, 2019



# Interview Findings

## *Community Planning & Development*

CPD engages with the urban forest in several ways. Two recently completed neighborhood plans, the East and East Central Area Plans, were the first in Denver to call out the importance of tree canopy preservation and improvement. The plans list specific recommendations including:

- coordinating with OCF to identify areas to improve the tree canopy
- site specific recommendations for certain streets
- a community replacement program
- recommending climate-appropriate species
- developing educational programs for residents and property owners

While not regulatory, the area plans direct CPD to find ways to enhance their influence. CPD uses neighborhood planning as a guide for private development and zoning as a tool for minimum requirements. With no existing minimum tree requirements and few areas for improvement in the code (i.e. zoning requires zero setback, leaving little room for competing street elements) there are minimal opportunities to improve the urban forest through these tools.

From CPD's perspective, other municipalities are more active in establishing a robust urban forest through regulatory powers. Some require specific tree densities, maintenance, and inspection programs. Tree preservation is required in some communities on the east coast. CPD is working to improve the integration of OCF in residential site plan review, but chronic understaffing is a challenge for commercial review. Large development reviews require a minimum percentage of open space, but no requirements for trees. The greatest challenges are the lack of clear regulations or standards and the staff needed to support them. CPD is working with CASR to implement the Denver Green Code, which includes several provisions for tree preservation, but it is currently optional. There is also opportunity through the Denver Building Code to institute policy changes and interdepartmental coordination.



<https://secureservercdn.net/192.169.220.223/83c.7ab.myftpupload.com/wp-content/uploads/2017/02/Justin-39.jpg>



# Interview Findings

## *Climate Action, Sustainability & Resilience*

The Office of CASR is developing several tools with the potential to coordinate with OCF. Trees have worked their way to the top of the agenda for CASR, and the Denver Building Code and Denver Green Code both offer possibilities for further enhancement of the urban forest. CASR sees preserving existing, healthy trees as a top priority within these codes. CASR representatives stressed the importance of finding creative ways to secure better maintenance of the tree canopy (potentially through nonprofits) as well as developing innovative green workforce programs or urban wood recycling programs to create a circular local economy around city trees.

CASR representatives believe that greater coordination between agencies regarding management of the right-of-way is of particular importance in creating a healthy urban forest. It is crucial to work with DOTI, the Fire Department, and others with strict standards. There is a need for clarity and strong language in order to protect existing trees and build the urban forest. Additionally, clear requirements for installation and maintenance and regulations for developers of private property would have a tremendous impact on OCF goals. CASR believes revisiting the approved species list is important for our future climate and water implications. CASR would like to work more closely with OCF on messaging around trees as a means of carbon sequestration and pollution mitigation. These strategies can have an impact on the citywide conversation of the benefit of urban trees for adaptation and resilience.



[https://sustainableneighborhoodnetwork.org/lakewood-neighborhoods/eibergarden\\_nov2013](https://sustainableneighborhoodnetwork.org/lakewood-neighborhoods/eibergarden_nov2013)

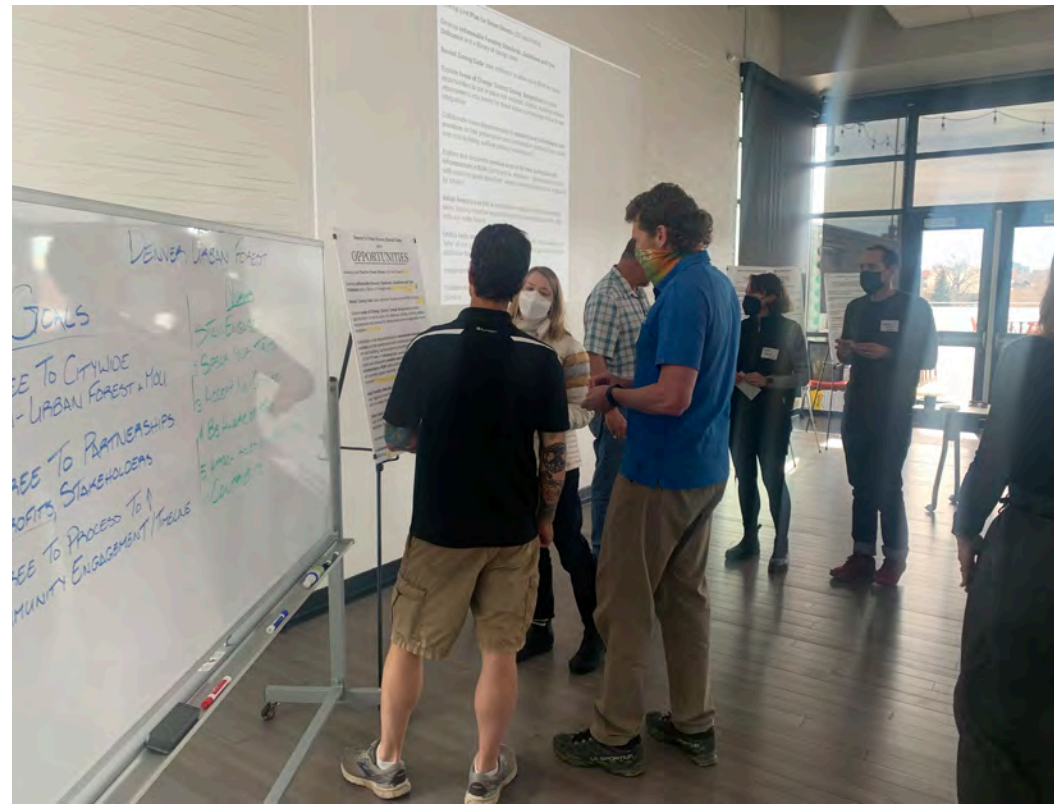
# ROUND TABLE & WORKSHOP

In early February 2022, OCF and the consultant team organized a two-day round table symposium and workshop for the city agencies that participated in the interviews. Attendees included representatives from OCF, DOTI, OGI, CPD, and CASR. The workshop was facilitated by the Watson Wenk group. Day one included an overview of better practices from cities identified by the project team - Boise, Idaho, Pittsburgh, Pennsylvania, Cincinnati, Ohio, and Portland, Oregon - as well as speakers from each. An overview of student research (see Appendix) and the non-profits and other organizations that do work in the arena of urban forestry was also included. Day two included an overview of where the City's Forestry rules and regulations currently stand, identified gaps and needs, an interactive SWOT analysis, and a group discussion of next steps and recommendations to improve the urban forest.

## OUTCOMES

Outcomes included a series of action items to be completed by the various city agencies, and led by the newly hired Urban Forestry Planner. These actions include:

1. Creation of a task force including representatives from all relevant agencies.
2. Establishing a time line of feasible action items.
3. Explore a Memorandum of Understanding (MOU) to outline how city agencies can collaborate on these goals.
4. Analyze departmental rules and regulations, standards, and guidelines to identify areas of improvement and revision.











# CASE STUDY & BETTER PRACTICES







# INTRODUCTION

Throughout the course of this project the consultant team and students from the University of Colorado looked to other cities across the country to better understand the challenges and successes in managing a healthy, resilient, and equitable urban forest.

Research by University of Colorado students indicated that there are a wide variety of approaches to managing urban forests in the U.S. The research team conducted an extensive literature review and qualitative interviews with city staff in each city. The data led the team to conclude that many large cities are working toward integrating an equity-focused approach to urban forest initiatives. While many cities are planning for equity, there are procedural barriers that limit the effectiveness of community engagement and the implementation of equitable urban forestry projects.

Many interviewees acknowledged that historic discriminatory land use practices have contributed to inequities in urban forest distribution and quality. Several representatives cited concerns regarding displacement associated with “green gentrification”. A significant portion of representatives discussed the importance of building trust and rapport within historically disadvantaged communities prior to executing programs such as tree giveaways. If intentional community engagement is not prioritized from the beginning of a planning process, it can result in greater distrust between communities and government agencies.

Additionally, this research identified challenges within urban forest management that include, but are not limited to, funding, tree maintenance, irrigation (with an emphasis on Western U.S. cities), interagency silos, balancing the pace of development with urban forestry goals, and tree protection.

The four U.S. cities highlighted on the following pages - Boise, Idaho, Pittsburgh, Pennsylvania, Cincinnati, Ohio, and Portland, Oregon - have all enjoyed some successes in their respective urban forestry programs, with measurable outcomes for urban forest health. The case studies and better practices identify key takeaways from each city that can be applied in Denver to develop programs and policies to improve the health of the urban forest.



# BOISE, ID

## **BUILDING A NETWORK OF DIVERSE PARTNERSHIPS**

The Treasure Valley Canopy Network (TVCN) located in Boise, Idaho is a strong example of collaborative partnerships that enhance urban forestry efforts and secure diverse funding sources. The TVCN is comprised of public, private, and nonprofit organizations with a shared goal of bolstering Boise's tree canopy through a variety of initiatives. A few of TVCN's projects include the City of Trees Challenge, Canopy Continuum, and the Urban Wood Network. The City of Trees Challenge integrates a multitude of industry partners such as nurseries, arborists, supply companies, landscape associations, and more to raise community awareness and strengthen regional urban forest initiatives. Canopy Continuum consists of a partnership between TVCN and Portland State University to monitor air quality, urban heat measurements, and examines the links between environment and public health to guide urban forestry strategies. Lastly, the Urban Wood Network is a program designed to maximize the value of the urban forest by developing a local urban timber industry through effective multi-sectoral partnerships.

## **EXPLORING PARTNERSHIPS THAT SUPPORT TREE PLANTING AND INNOVATIVE FUNDING OPPORTUNITIES**

The Shade Tree Project is a partnership between TVCN, Idaho Power Company, Idaho Department of Lands, and the Arbor Day Foundation's Energy Saving Trees program that is designed to encourage shade tree plantings for energy conservation. The program provides free shade trees to Idaho Power Company customers and includes a tool that estimates energy savings based on where the tree could be planted. To date, the program has given out more than 13,000 shade trees on residential properties throughout the Treasure Valley in Idaho (Treasure Valley Canopy Network, 2021).

## 2015 Community Forestry Strategic Management Plan



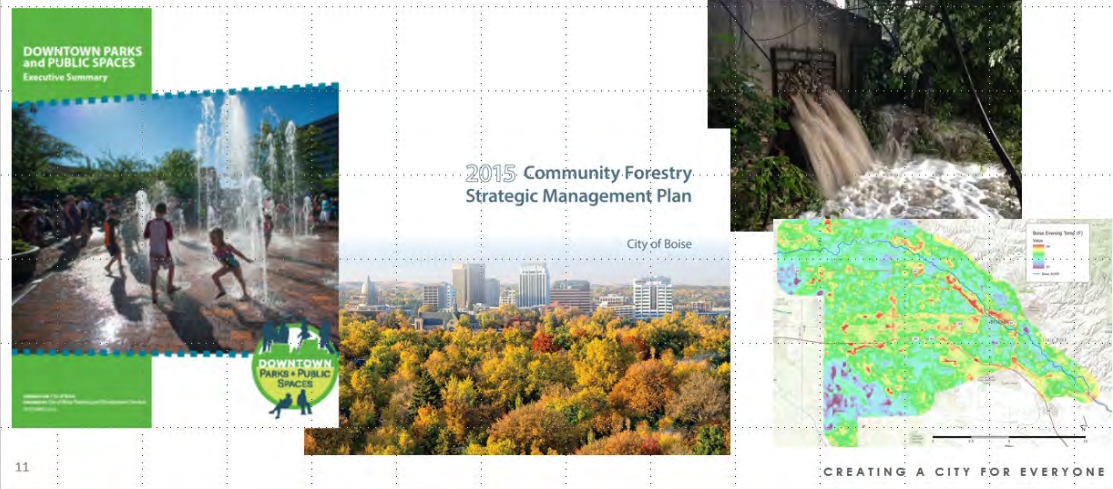
City of Boise

City of Boise, ID



City of Boise, ID

# TREES AS LIVING INFRASTRUCTURE

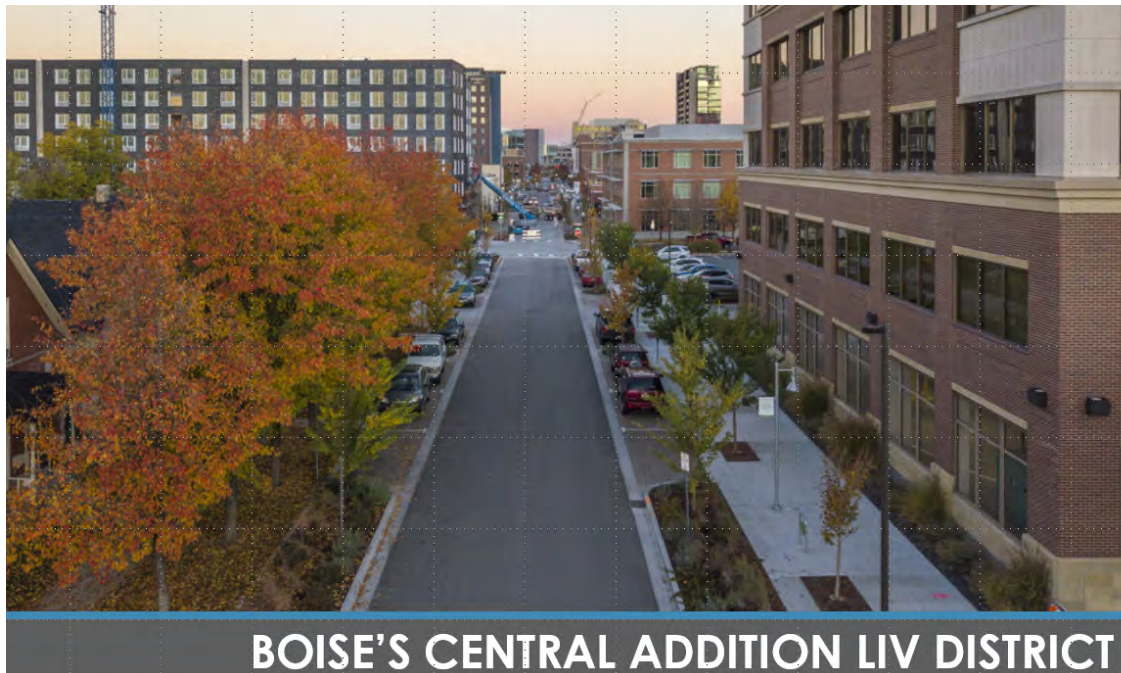


11

City of Boise, ID

## TAKEAWAY

Boise, ID emerged as a primary case study because of their successful implementation and management of a robust urban forest, as well as their climate, which is similar to Denver's. Boise's success stems from multi-agency coordination. For example, streets in the city are operated by the Ada County Highway District (ACHD), a separate entity from the City of Boise. However, the City assumes responsibility for suspended pavement systems and both entities share responsibility for storm water management. The Urban Renewal Agency implements streetscape projects and collaborates with private developers. This arrangement supports funding to implement design elements and pilot innovative projects. Most importantly, there is a high level of construction oversight within Boise and strong integration with locating utilities. The Parks department maintains trees and suspended pavement systems, which contribute to strong tree health. Public Works maintains stormwater management features, while the ACHD maintains typical drainage elements. Boise also employs a long-term replacement strategy for trees within the city.



## BOISE'S CENTRAL ADDITION LIV DISTRICT

City of Boise, ID



# PITTSBURGH, PA

## SHADE TREE COMMISSION

In 2012, Tree Pittsburgh, a non-profit organization dedicated to protecting the urban forest, spearheaded an urban forest master plan in collaboration with the City of Pittsburgh, relevant state agencies, environmental consultants, and community members. One of the plan's goals is to create "equitable urban forest benefits," aiming for initiatives that prioritize urban forestry efforts in neighborhoods that have been historically disinvested in. The plan outlines a shared vision for the future of Pittsburgh's urban forest as well as resources needed to effectively get there (Tree Pittsburgh, 2021).

The Shade Tree Commission is a quasi-governmental entity created by Pittsburgh ordinance and is funded through the Outdoor Advertising Excise Tax and developers in order to meet street tree requirements. Signature projects within the city include:

- **Tree Protection Task Force** works with City departments and authorities to prioritize tree protection. Trees are often a casualty of the City's own infrastructure projects.
- **Equitable Street Tree Investment Plan** focuses on 10 under-canopied neighborhoods annually to address deferred maintenance, new plantings, community engagement, and Shade Tree Commission funds.
- **Significant Tree Registry** to formally recognize significant trees on public or private property and encourage the proper maintenance, care, and protection of them. These are nominated by residents.

## Strategic Local Partnerships



City of Pittsburgh



City of Pittsburgh



# CINCINNATI, OH

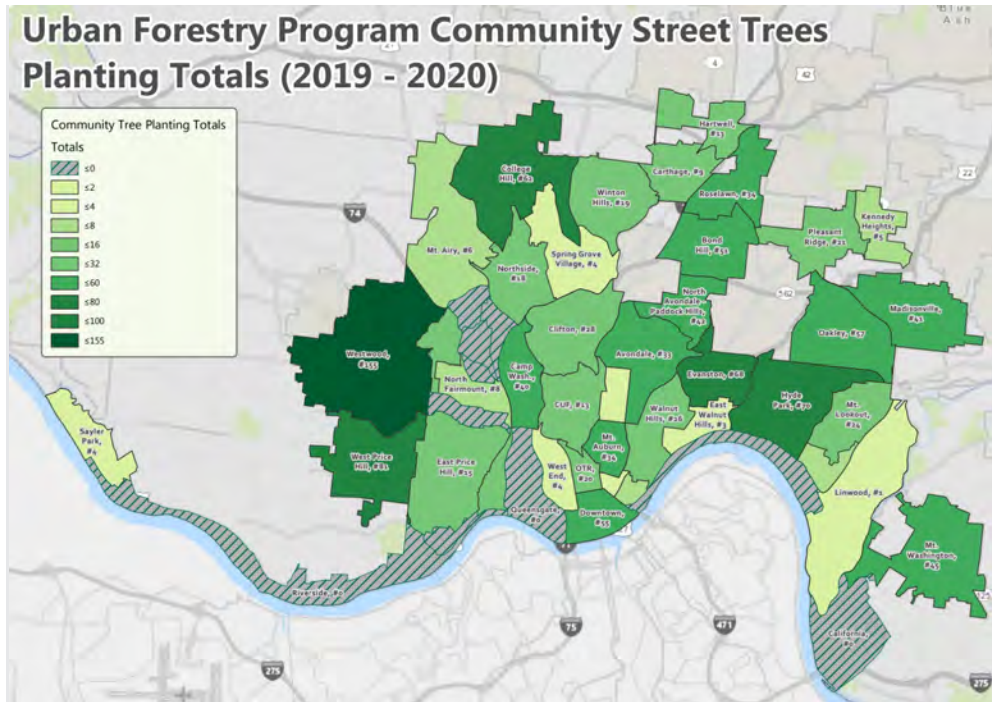
## CONCERNED CITIZENS AND REGULATORY POWER

In response to citizen concerns in the 1980s, a City task force created an Urban Forestry Assessment, Urban Forestry Regulations, and ultimately the beginning of the City's Urban Forestry Program (UFP). The program was eventually moved to the Parks Department where it resides today. There are 4 forestry districts with dedicated foresters who oversee hazard tree abatement, pruning cycle, tree planting, and community outreach within each of their 12 neighborhoods. The City Forester is responsible for oversight of the entire program and with the help of a dedicated GIS Analyst, directs the long-term canopy goals for the city.

There are 2 key regulations that guide the UFP:

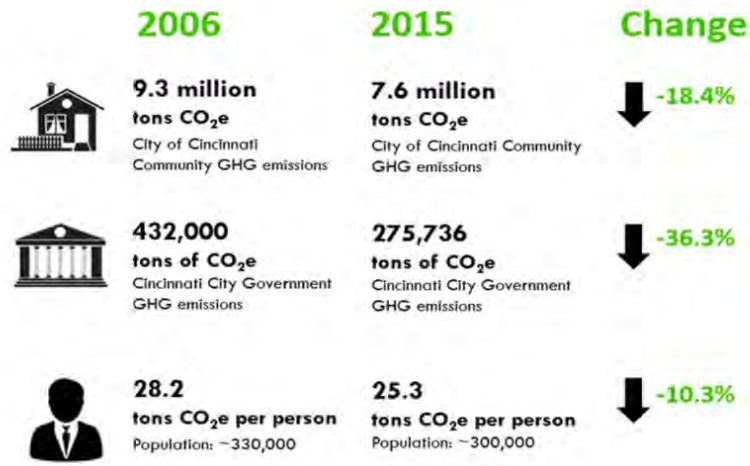
- **ORC 792** grants authority to the Cincinnati Parks Board to manage right-of-way trees, establishes the advisory board made up of residents and representatives of departments that directly intersect with right-of-way trees, and establishes protection and penalty for damage to public trees.
- **ORC 727** authorizes the creation of a dedicated funding stream for the operation of the UFP.

These regulations are unique within Ohio.



City of Cincinnati

## CHANGES IN CINCINNATI GREENHOUSE GAS EMISSIONS BY SECTOR FROM 2006 TO 2015



City of Cincinnati

# PORTLAND, OR

## A COMPREHENSIVE VISION AND STRATEGY

“Growing a more equitable urban forest: Portland’s citywide tree planting strategy” was developed after performing rigorous community outreach, “including feedback from Community Advisory Committee members and culturally-specific focus groups” (Portland Parks and Recreation, 2018). This strategic plan acknowledges that Portland’s distribution of trees is unequal and linked to socioeconomic factors. Portland Parks and Recreation also partnered with Portland State University (PSU) to identify barriers, opportunities, and recommendations to enhance inclusivity in procedural processes while bolstering tree equity (Portland Parks and Recreation, 2018).

## MAINTENANCE NEEDS AND FUNDING

The City of Portland tracks geographical location of street trees and overlays this data with racial and socioeconomic data using GIS software to identify priority areas. The city produces annual urban forest progress reports that highlight accomplishments and guide action plans for following years. Portland also updates their implementation strategies within the urban forest action plan on an annual basis based on progress, priorities, and community feedback. Since Portland has a strong community-driven volunteer program, the city is able to expand their tree surveying capacity. This allows the city to develop neighborhood-level canopy goals, especially for low canopy areas.



Growing a more equitable urban forest:  
Portland’s citywide tree planting strategy  
December 2018



## Urban Forest Action Plan

February 2007

PORTLAND PARKS & RECREATION



PORTLAND  
URBAN FORESTRY  
MANAGEMENT PLAN  
2004



# SUMMARY OF BEST PRACTICES

## **1. DEVELOP AND SUPPORT A CITYWIDE VISION FOR AN EQUITABLE AND RESILIENT URBAN FOREST.**

- Develop a comprehensive urban forest vision and management plan or strategy.
- Create a task force/coalition to support the development and implementation of an equitable and community-based vision.
- Create a comprehensive strategy to address and align tree maintenance needs and funding.
- Develop and manage urban forestry measures that support community-based equity and resilience goals.



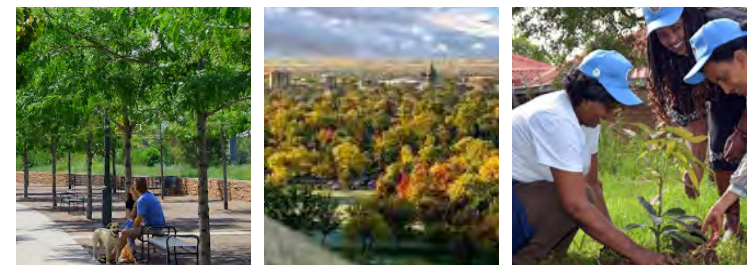
## **2. ESTABLISH AND NURTURE LONG-TERM PARTNERSHIPS WITH ORGANIZATIONS AND STAKEHOLDERS WHO CAN HELP SUPPORT AND IMPLEMENT THE CITY VISION.**

- Build a network of diverse partnerships to collaborate on common goals.
- Explore partnerships that support tree planting and innovative funding opportunities.



## **3. ESTABLISH AND STRENGTHEN COMMUNITY ENGAGEMENT AND STEWARDSHIP OPPORTUNITIES**

- Operationalize best practices for engaging communities from neighborhoods that have been historically disinvested in.
- Use a multi-pronged approach to community engagement in the development of an urban forest management plan.
- Continue to develop and support equitable pathways to green careers.
- Cultivate relationships with private property owners to promote planting and stewardship in under-resourced neighborhoods.











# RECOMMENDATIONS



# A HEALTHY URBAN FOREST

## **ACHIEVING A HEALTHIER, MORE RESILIENT, MORE EQUITABLE URBAN FOREST IN DENVER.**

The culmination of previous research, case studies, departmental interviews and the Forestry roundtable workshop leads to three high-level recommendations discussed on the following page. These recommendations offer a road map for OCF and other City departments to begin to change how Denver manages and plans for its urban forest. While challenges remain, these recommendations target manageable and achievable “next steps” for Denver to begin to create a healthier, more resilient and more equitable urban forest for current and future generations.





# RECOMMENDATIONS

## **PREPARE AN RFP TO DEVELOP 'URBAN FOREST MASTER PLAN'**

To ensure continuity and take advantage of the energy generated at the symposium in early 2022, the City should prepare and issue an RFP to develop an Urban Forest Master Plan. This plan would build on the research of Dig Studio, Design Workshop, and the student researchers to outline specific goals, objectives, and strategies for Denver to manage the urban forest.

## **CONVENE REGULAR MEETINGS OF FORESTRY TASK FORCE**

The symposium in early 2022 brought together leaders from across departments within the City & County of Denver to discuss the future of Denver's urban forest. Attendees agreed on creating an Urban Forestry Task Force to meet regularly and address cross-departmental issues and opportunities related to the urban forest, a potential forestry master plan, and updated departmental rules and regulations that align priorities with the urban forest in mind.

## **UPDATE RULES AND REGULATIONS WITH INTERDEPARTMENTAL ALIGNMENT**

One intended outcome of the Urban Forestry Task Force and an Urban Forest Master Plan is updating the Forestry rules and regulations. The current rules and regulations are outdated and require a concerted effort and budget to be updated. Representatives from the departments which oversee different aspects of the urban forest should have a role in the process.







# APPENDIX

**STUDENT WORK**

**UNIVERSITY OF COLORADO DENVER**



**DENVER'S URBAN FOREST:  
NATURAL RESOURCE  
ANALYSIS, ASSESSMENT, AND  
RECOMMENDATIONS**

**EXISTING INFORMATION & BEST PRACTICES PRESENTATION  
MAY 20, 2021**



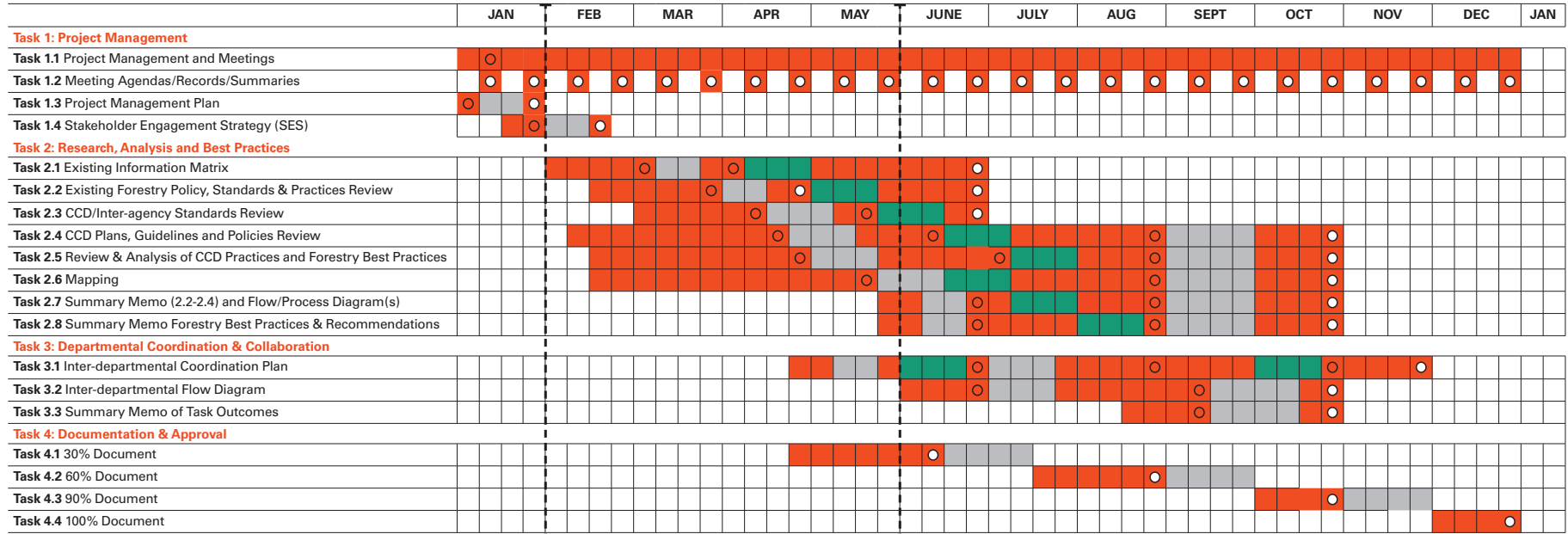
# AGENDA

- Project Overview
- Tree Analysis and Inventory - Denver
  - Denver's Tree Legacy
  - Internal Document Review
  - Priority Focus Areas
- Best Practice Cities
  - Overview
  - City Highlight: Portland
  - City Highlight: Cincinnati
- Priority Focus Areas Bibliography
- Next Steps



# PROJECT OVERVIEW

## OVERALL PROJECT SCHEDULE



Note: Subtasks are shown as "split" to illustrate a draft and final version of the deliverable, allowing for Client review and input

CAP Research Assistant Appointment Time frame

- Stakeholder and Technical Advisory Review Period
- City Review Period
- Draft Project Deliverable
- Final Project Deliverable

Source: Design Workshop



# PROJECT OVERVIEW

## CU DENVER RESEARCH ASSISTANT TIMELINE

FEBRUARY

MARCH

APRIL

MAY

**KICK OFF  
MEETING**

**EXISTING  
INFORMATION  
PRESENTATION**

**BEST  
PRACTICES  
RESEARCH**

Image Source: <https://kinserstudios.com/why-are-the-trees-in-denver-blue/>

# TREE ANALYSIS & INVENTORY - DENVER

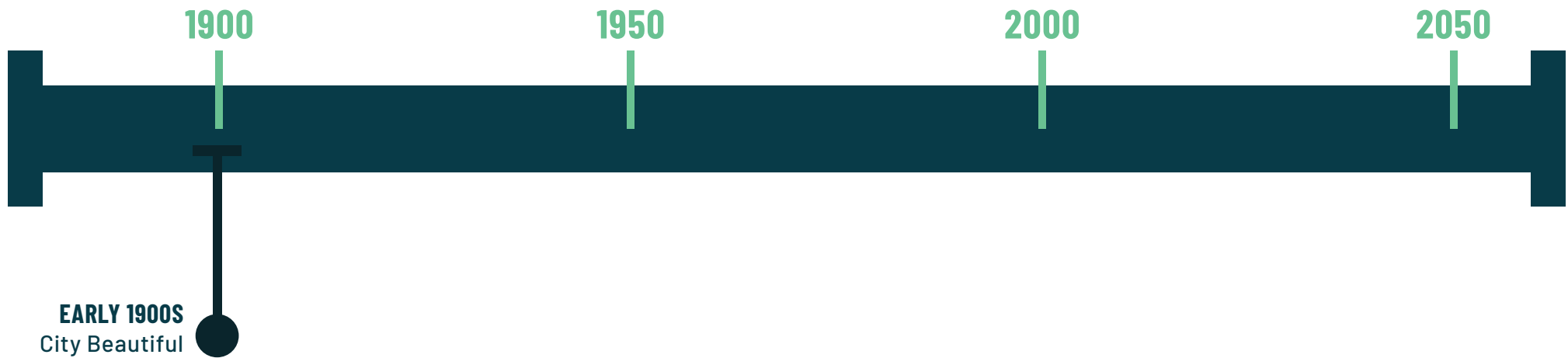




# DENVER'S TREE LEGACY



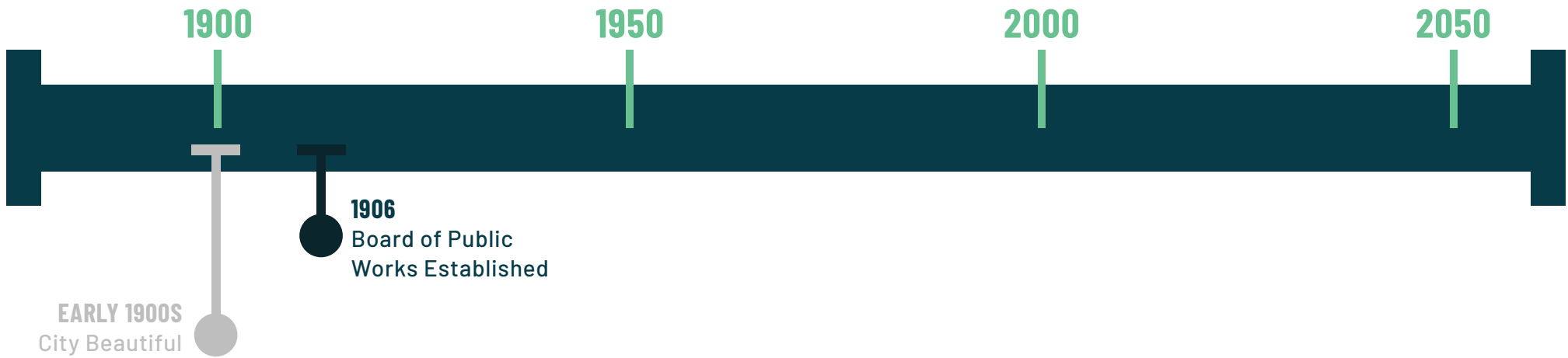
Mayor Speer during "Tree Day" April 22, 1911. Source: [https://www.denvergov.org/files/assets/public/doti/documents/standards/pwes-002.0-streetscape\\_design\\_manual.pdf](https://www.denvergov.org/files/assets/public/doti/documents/standards/pwes-002.0-streetscape_design_manual.pdf)



# DENVER'S TREE LEGACY



Planting trees in City Park. Source: Denver Public Library





# DENVER'S TREE LEGACY

## Trees and Tree Care, Adopted April 15, 1971

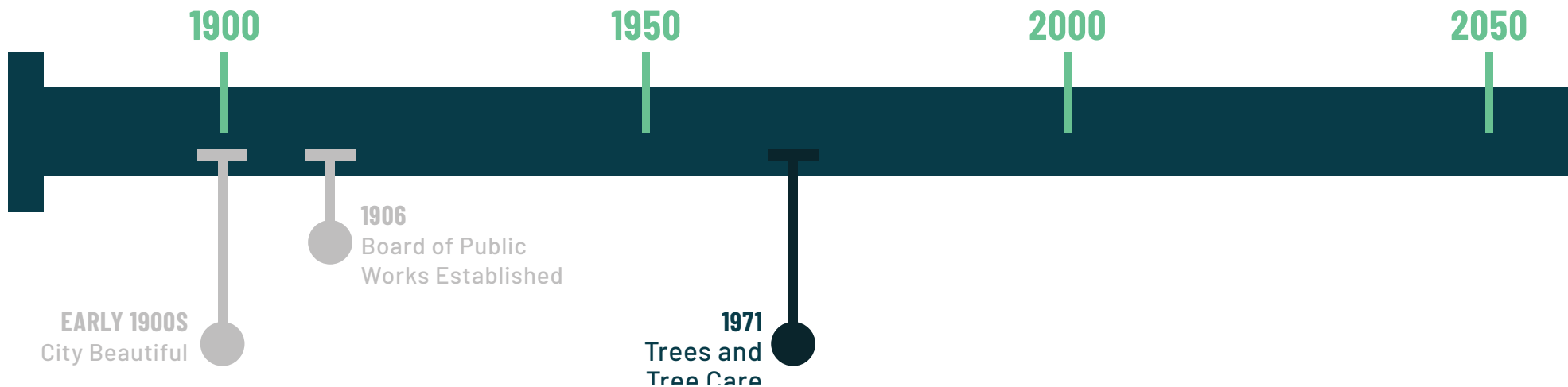
These regulations are intended to serve as a guide for arboricultural activities on public street right-of-way and otherwise defines required practices and treatments pertaining to same within the City and County of Denver, Colorado.

Any failure to comply with these regulations will be considered subject to prosecution or serve as a basis for a hearing conducted by the Manager of Parks and Recreation or both.

### CONTENTS

- I Planting and Maintenance of Tree and Plant Growth on Public Right-of-Way areas by Abutting Properties
- II Specific Requirements Pertaining to Tree Trimming Activities upon Tree Growing in Denver's Public Street Rights-of-Way
- III Authorized Types of Tree Trimming Applicable to Trees Growing Within Denver Public Street Rights-of-Way
- IV Regulations Pertaining to Species of Trees or Plants to be Planted
- V Regulations Pertaining to Spacing of Trees

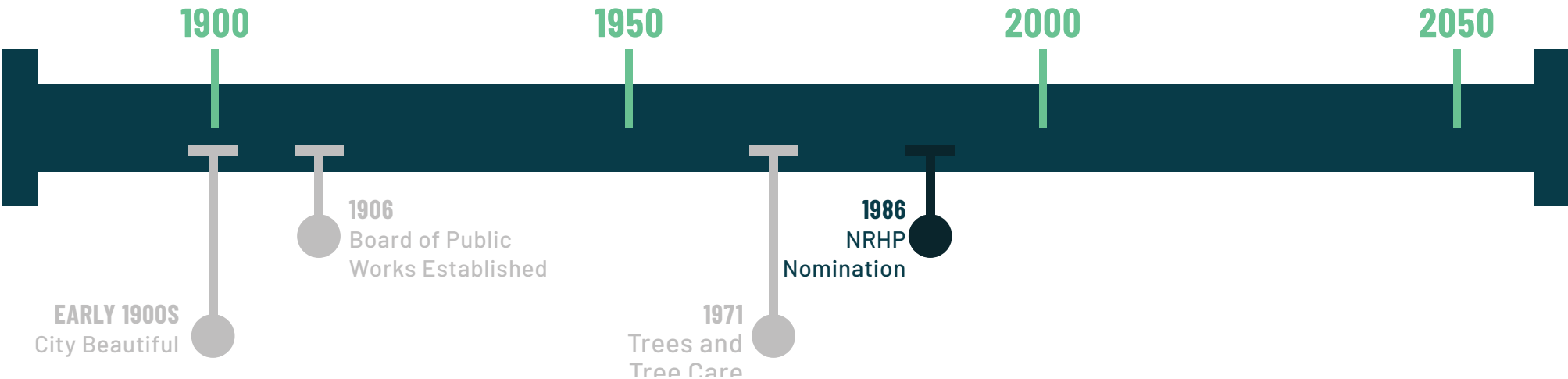
Source: [https://www.denvergov.org/files/assets/public/parks-and-recreation/documents/dpr\\_trees-tree-care-regulations.pdf](https://www.denvergov.org/files/assets/public/parks-and-recreation/documents/dpr_trees-tree-care-regulations.pdf)



# DENVER'S TREE LEGACY



Cheesman Park aerial photograph. Source: <https://www.historycolorado.org/denver-park-and-parkway-system-thematic-resource>

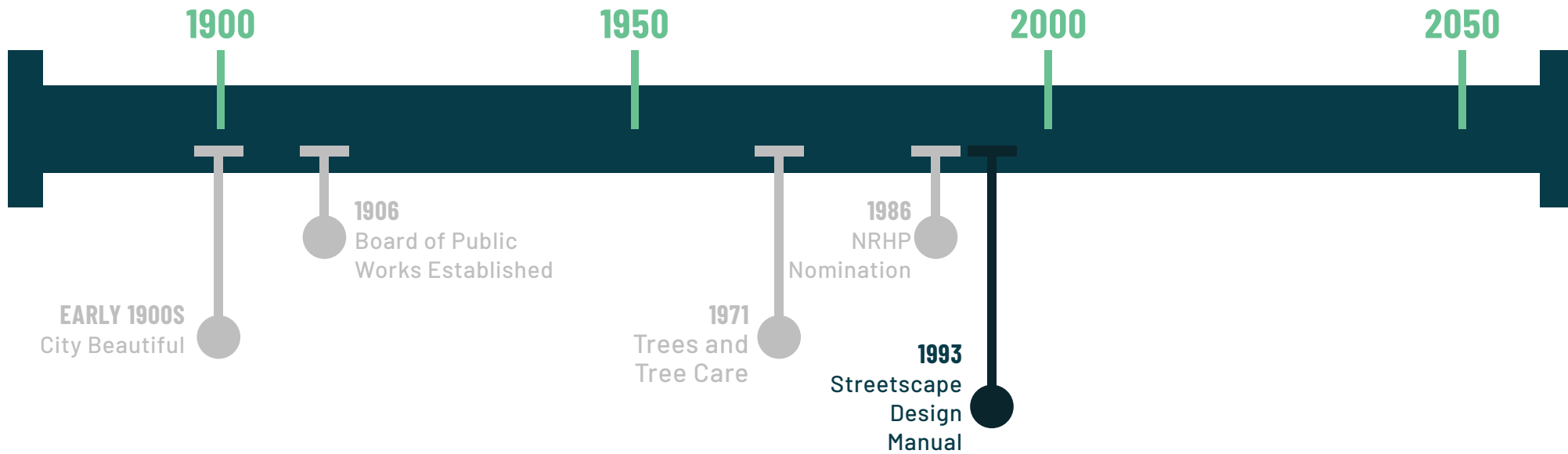




# DENVER'S TREE LEGACY



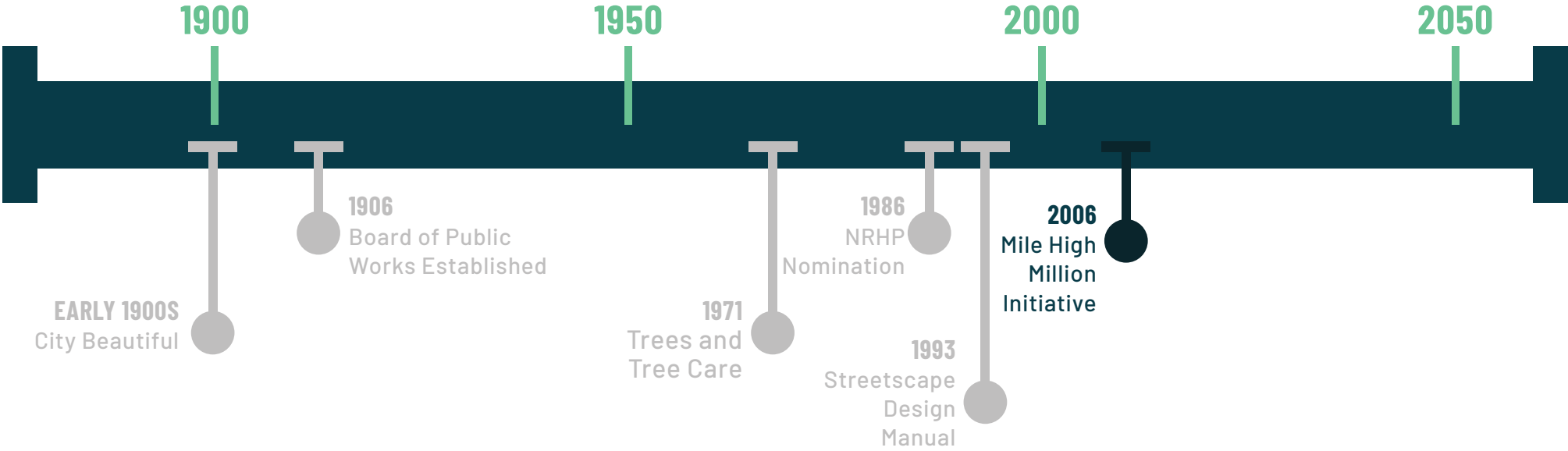
Source: [https://www.denvergov.org/files/assets/public/dot/documents/standards/pwes-002.0-streetscape\\_design\\_manual.pdf](https://www.denvergov.org/files/assets/public/dot/documents/standards/pwes-002.0-streetscape_design_manual.pdf)



# DENVER'S TREE LEGACY



Source: <http://actrees.org/files/Events/sdavis.pdf>

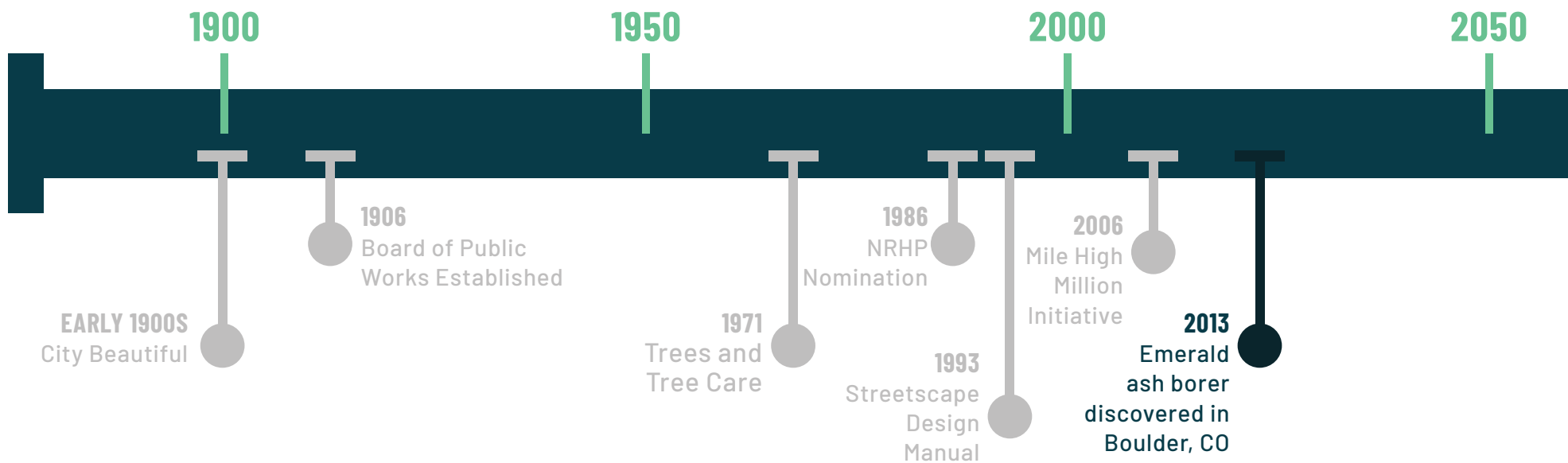




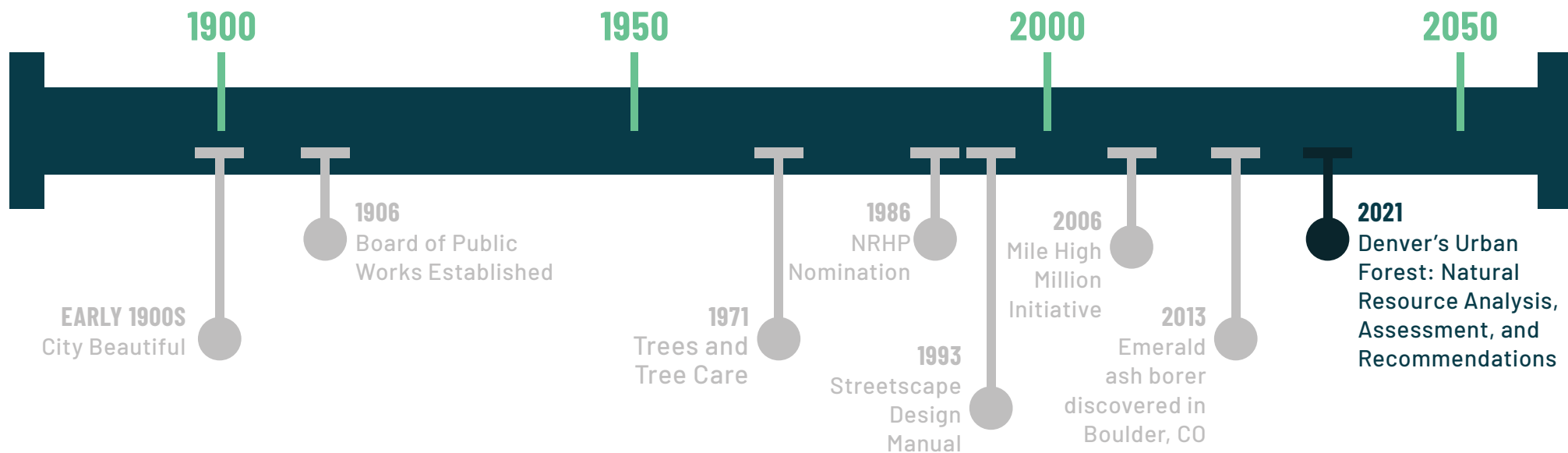
# DENVER'S TREE LEGACY



Emerald ash borer. Source: <https://coloradosun.com/2019/09/12/emerald-ash-borer-colorado-battle-ends/>



# DENVER'S TREE LEGACY





# DENVER'S TREE DILEMMA

- Denver's urban tree canopy is at 13%, among lowest in ranked cities nationwide
- Downtown urban tree canopy is at 3%
- Urban trees facing issues:
  - Raising Temperatures (Urban Heat Island Effect)
  - Diversity and Resiliency
  - Drought Concerns
  - Climate Change
  - Pollution
  - Adequate Soil Volumes
  - Pedestrian and Canine Stressors
  - Utilities above and below ground
  - Transit
  - Underground encroachments
  - Accessibility (access walks, on street parking)



Trees in downtown Denver, 2019

# EXISTING INFORMATION RESEARCH



## EXISTING INFORMATION MATRIX

This draft matrix will inform the research phase for the CAP students Task 2.1

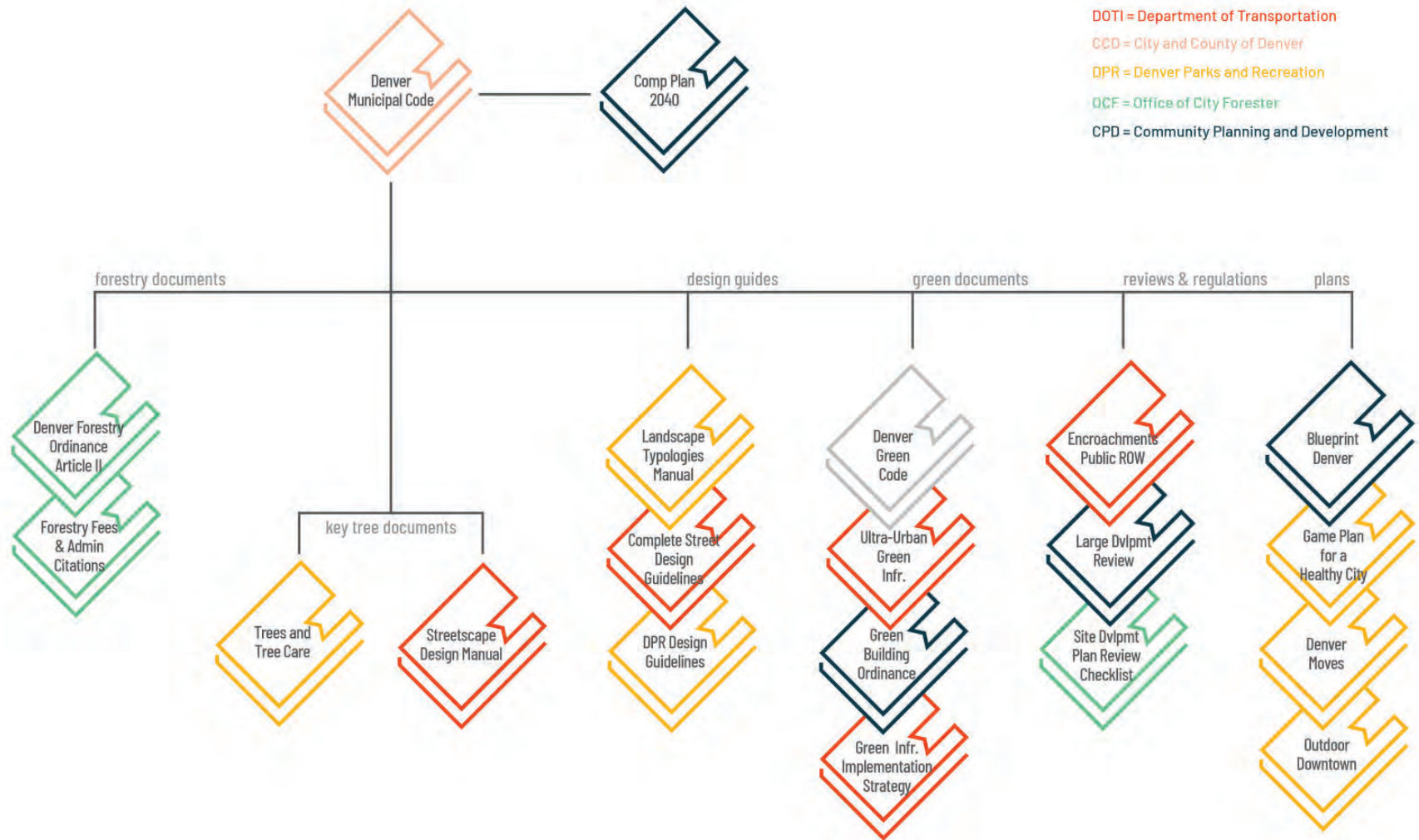
PLAN/STANDARD	OVERSEEING AGENCY RESPONSIBLE	NOTES
<b>Technical/Standards and Details</b>		
Tree Planting Detail – Public Right of Way, Park, Greenway OFC-PLNT 1	OCF	Available on OCF <a href="#">Website</a>
Tree Planter (Raised Curbed) DWG 13.0	DOTI	This detail only shows what is acceptable to DOTI at/above grade, not below.
Tree Planter (Grates) DWG 13.1	DOTI	This detail only shows what is acceptable to DOTI at/above grade, not below.
Tree Protection Zone Fencing Detail OCF-TPZ 1	OCF	
<b>Ordinances/Regulations</b>		
Denver Zoning Code	CCD	
Tree and Tree Care, 1971	DPR	
Denver Forestry Ordinance Article II – City Forester	CCD/OCF	
Site Development Plan Review Checklist	OCF	Being updated
Forestry Fees and Administrative Citations	OCF	
Green Building Ordinance	CPD	
Large Development Review	CPD	
Encroachments in the Public Right of Way	DOTI	
<b>City-wide Standards, Guidelines and Manuals</b>		
Streetscape Design Manual (1993)	DOTI	OCF states that current OCF Rules and Regulations are to be used and this manual is not to be used for tree items.
Complete Street Design Guidelines	DOTI	
DPR Design Guidelines - Planning, Design and Construction Standards	DPR	
Ultra-Urban Green Infrastructure Guidelines	DOTI	
Ultra-Urban Green Infrastructure Implementation Strategies	DOTI	
Landscape Typologies Manual	DPR	
Small Cell Infrastructure Design Guidelines	DOTI	
Aesthetically Enhanced Detention and Water Quality Ponds	DOTI	
Denver Green Code		A new internal group, OCF to provide update.



Plans		
Comp Plan 2040		
Blueprint Denver	CPD	
Game Plan for a Healthy City	DPR	
Mobility Action Plan	DOTI	Sidewalks/safe routes to schools
Vision Zero Action Plan		
Denver Moves	DPR	
Denver Comp. Plan	CPD	
CCD Climate Adaptation Plan	CASR	
5280 Trail Vision Plan	DDP	The trail will be installed within existing PRW and could impact current and proposed planting space.
Outdoor Downtown	DPR	
Green Infrastructure Implementation Strategy	DOTI	
Sidewalk Repairs		Potentially an Ordinance
Federal Allowance of utilities in ROW		
5G Repairs		
<b>Resources</b>		
Approved Street Tree List for Denver's Public Rights-of-Way	OCF	Acts as more than a resource, reviewed biennially
Parks Planning Construction Specifications	DPR	
Tree Report Card	DPR/OCF	Is a snapshot from captured data at that time, not current info. Needs to be connected to inventory for real time conditions.
Denver Tree Inventory/Tree Keeper	OCF	
District/Neighborhood Design Guidelines – the only key research component should be if the Guidelines/Standards are requiring above and beyond the City requirements from a planting, spacing or diversity standpoint (such as limiting tree species that are approved on the <a href="#">All Urban Design, Design Review, Design Standards and Guidelines</a> publish by CCD.		
All Higher Education campuses		25 different Design Standards/Guidelines? Review the specific chapter within the Denver Zoning Code



# EXISTING INFORMATION RESEARCH - POLICY DOCUMENTS



# EXISTING INFORMATION DIAGRAM: DESIGN STANDARDS

## TREE PLANTER GRATE

Dependent on permitted or approved design:  
If no on-street parking, setback not required

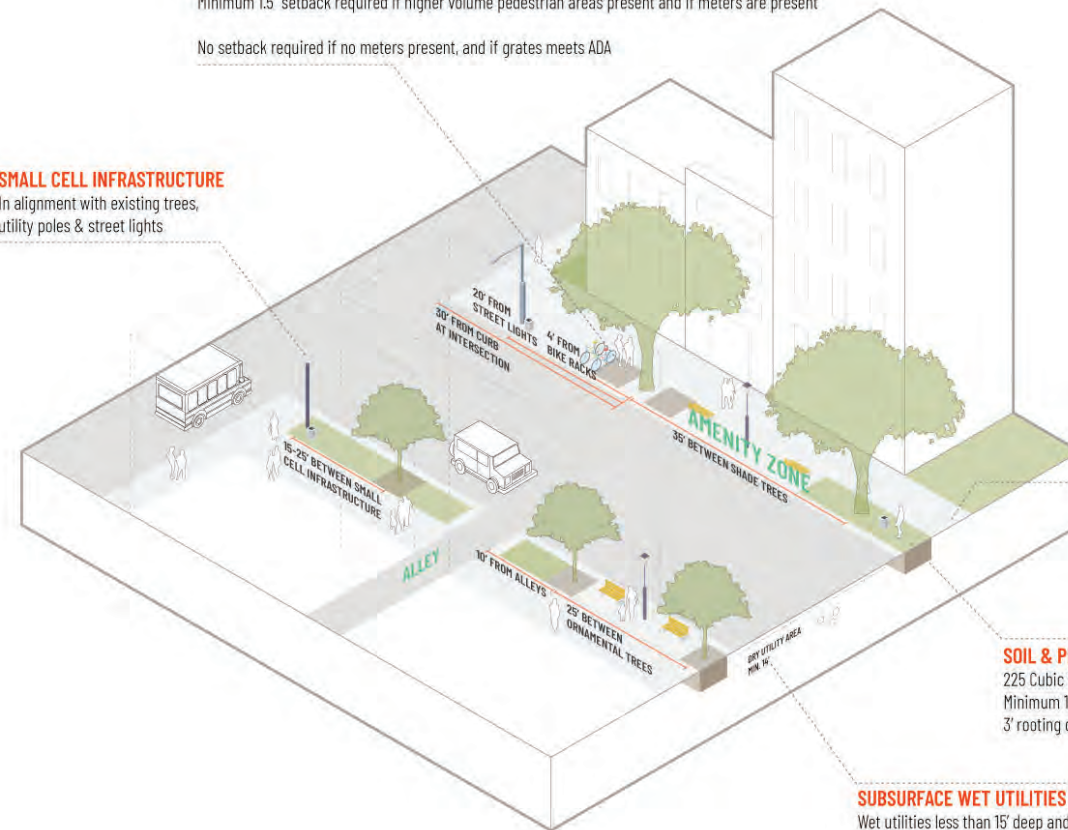
On-street parking with no meters or tree lawn, setback not required; however, can request if approved Office of City Forester and submitted design

Minimum 1.5" setback required if higher volume pedestrian areas present and if meters are present

No setback required if no meters present, and if grates meets ADA

## SMALL CELL INFRASTRUCTURE

In alignment with existing trees,  
utility poles & street lights



## PEDESTRIAN ZONE

5' minimum width based on  
60-68' R.O.W.  
8' minimum width based on  
110' R.O.W.

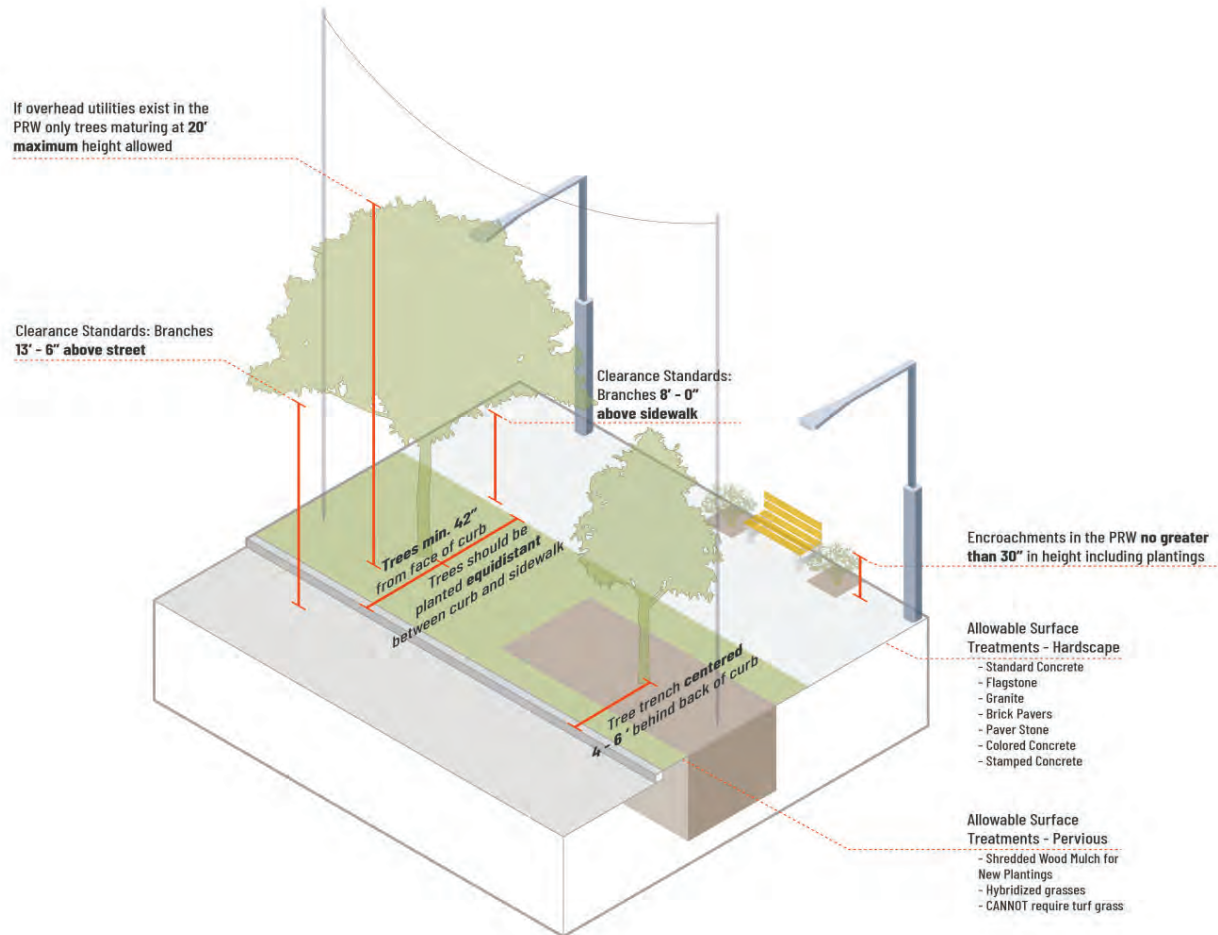
## SOIL & PLANTING

225 Cubic Ft. of uncompacted soil  
Minimum 15'X5' planter  
3' rooting depth

## SUBSURFACE WET UTILITIES

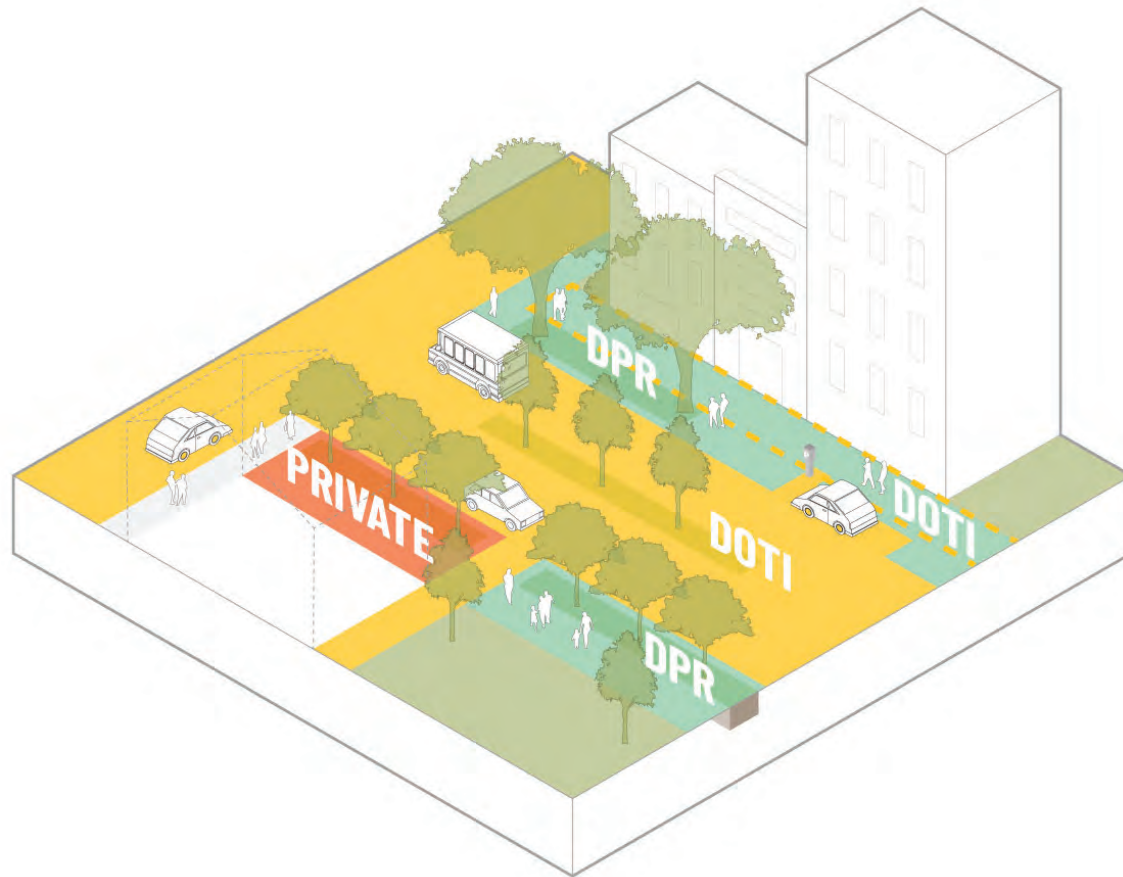
Wet utilities less than 15' deep and  
maximum pipe inside diameter of:  
STORM: 38"  
SANITARY: 12"  
WATER: 16"

# EXISTING INFORMATION DIAGRAM: DESIGN STANDARDS ENLARGEMENT





# EXISTING INFORMATION DIAGRAM: TREE MANAGEMENT



- Denver DOTI:** Responsible for upkeep of city-owned roadways, sidewalks, and streetscape elements including sewers, drainage structures, and parking meters
- Denver Parks & Recreation Department:** Responsible for the maintenance of City-owned trees and some vegetation zones adjacent to parks and in parkways
- Property Owners:** Responsible for maintenance of amenity zones and trees in the public right of way adjacent to their property

# PRIORITY FOCUS AREAS



## DESIGN STANDARDS

- Develop clear design standards consistency across city-wide documents
  - Spacing metrics
  - Volume metrics
  - Clearance standards
  - Surface treatments



## TREE PROTECTION

- Enhance definition for protected vs. heritage tree
- Create ordinances for protection of trees on private property



## ROLES & RESPONSIBILITIES

- Establish clear roles for responsibility and management of public and private trees



## CLIMATE ADAPTATION

- Integrate urban forest recommendations with green infrastructure
  - Tree trenches
  - Stormwater planters
  - Bioretention practices
  - Pervious surfaces



## EQUITY

- Prioritize enhancing tree canopy in historically disinvested in communities

# BEST PRACTICE CITIES



# BEST PRACTICE RESEARCH - OVERALL MATRIX

URBAN FORESTRY BEST PRACTICE CITIES										
CITY	DOCUMENTS REVIEWED	TAKEAWAYS	TREE CANOPY COVERAGE	CLIMATE	RELEVANT PRIORITY AREA					INTERVIEW RELEVANCE
					1- DESIGN STANDARDS	2- PRCTCN	3- R&R	4- C.A.	5- EQUITY	
Austin, TX	Austin's Urban Forest Master Plan Great Streets Standards Overview ROW Maintenance Web Page Environmental Criteria Manual Land Development Code	Great protection standards for "Protected" trees (19" or > DBH) and "Heritage" trees (24" or > DBH)  Development code requires more trees / landscaping to combat impervious surfaces  Spacing of trees 22'-0" O.C.	38%	Climatic transition between humid and semi-arid						
Palo Alto, CA	Sustaining the Legacy: Palo Alto Urban Forst Master Plan Tree Technical Manual Canopy website resources- Independent Non-Profit that supports City of Palo Alto and its residents in caring for urban trees City of Palo Alto Municipal Code: Chapter 8.10	Urban Forest Master Plan has a section detailing policies and protocols (page 121)  Very clear delineation of city-owned trees vs. privately owned trees (residents are not responsible for adjacent ROW trees)  Tree Technical Manual provides extensive criteria, procedures, and standards for implementing tree protection regulations.	38%	Mediterranean climate (mild, moderately wet winters and warm, dry summers).						Potential to interview the Canopy organization  Inquire about which document provides design standards. (The Tree Technical Manual provides information about protection & construction )
Salt Lake City, UT	Salt Lake City Municipal Code Tree Planting Requirements for Park Strip Trees Urban Forestry Plan Review Checklist Urban Forestry Web Page Salt Lake City Cemetery Master Plan	Cemetery Master Plan recognizes potential for cemetery to become arboretum  Design standards: municipal code includes very specific recommendations for surface treatment	13%	Dry-summer continental						Potential to discuss how urban forests will play into the "Reimagine Nature: SLC Public Lands Master Plan" (work in progress)
Boise, ID	Community Forestry Strategic Management Plan Boise Tree Ordinance Downtown Boise: Streetscape Standards & Specifications Manual Treasure Valley Tree Canopy Report	City Forester Department consists of 12 employees (including a city forester, forestry specialists, and an arborist crew).  Similar to Denver- private property owners are responsible for trees in adjacent right of way to their properties	16%	Semi-arid continental climate						Potential to ask city if they have considered shifting system of private property owners maintaining adjacent ROW trees or see if it works well for them.

# BEST PRACTICE RESEARCH - OVERALL MATRIX

Albuquerque, NM	Albuquerque & Bernalillo County Comprehensive Plan NeighborWoods Website Street Tree Ordinance City of Albuquerque Municipal Forest Resource Analysis	Street tree ordinance requires anyone who paves a parking lot to plant street trees	13%	Semi-arid desert						Potential to inquire about parking lot street tree requirements, are there a certain number of plantings required per square footage of new parking lots?
Portland, OR	Heritage Tree Nomination Form Urban Forestry Street Tree Planting Standards City of Portland Municipal Code Growing a more equitable urban forest: Portland's citywide tree planting strategy Urban Forest Action Plan Portland Urban Forestry Management Plan	Heritage tree nomination form is easy to find, encourages nomination Management structure for urban forest is very clearly delineated Equitable Urban Forest Plan lays out clear, actionable goals to enhance tree related equity	26%	Warm-summer Mediterranean						Potential to inquire about how the Urban Forest Management Plan and Urban Forest Action Plan work together to create a more robust urban forest
Seattle, WA	Urban Forest Management Plan (UFMP) Green Seattle Partnership Seattle Municipal Code - Tree Protection Street Tree Manual Seattle ROW Improvements Manual Seattle 2020 Standard Specifications	Development code refers to Green Factor measurements for trees; requires more tree / landscaping coverage Tree spacing O.C.: Large scale - 35-40+' Medium/Large - 30-35' Small/Medium - 25-30' Small - 20-25'	28%	Temperate; dry-summer subtropical						
Milwaukee, WI	Milwaukee City Ordinance City of Milwaukee Forestry Department of City Development Green Streets Stormwater Management Green Infrastructure Plan Greening Milwaukee	Green Infra Plan refers to green policies for trees; encourages more tree / landscaping coverage Greening Milwaukee partnership with City enhances preservation and protection of trees	22%	Humid continental climate						
Cincinnati, OH	Cincinnati Parks Urban Forestry Green Cincinnati Plan City Ordinance Stormwater Mgmt Utility Public ROW	Collaboration with forestry orgs to increase tree canopy by 40% in all residential neighborhoods, particularly low-income / clear visuals for canopy standards in City Ordinance / clear direction and responsibilities outlines in Green Cincinnati Plan	38% (as of 2010; close to reach 40% goal)	Humid; subtropical						Potential to interview the City on the success of their tree canopy goals + climate adaptation plans Inquire about Green Cincinnati Plan - specifically Recommendations approach and implementing a "Keys to Equity" approach

# BEST PRACTICE RESEARCH - OVERALL MATRIX

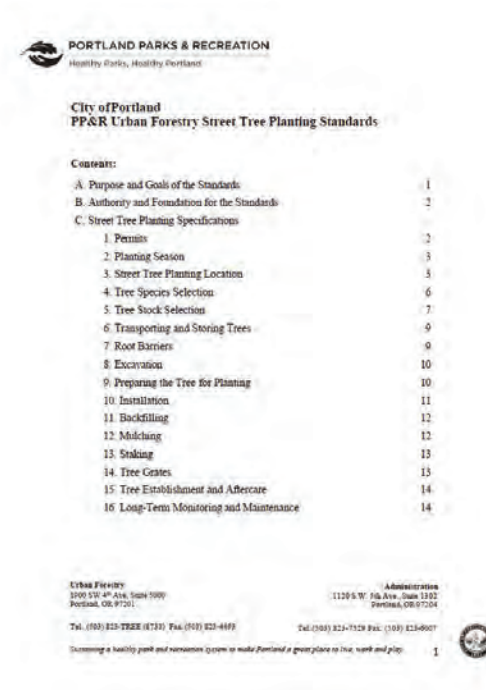
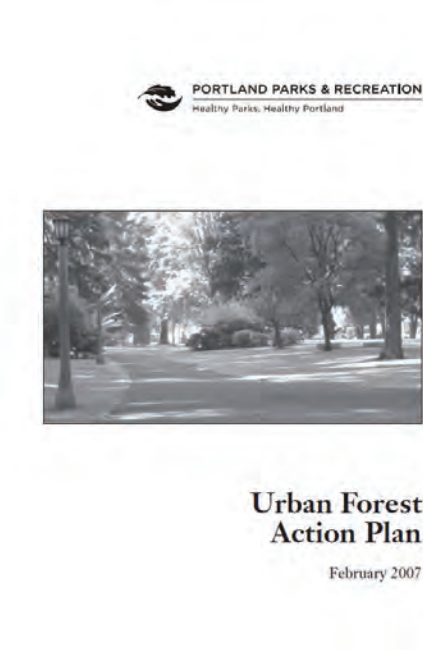
Toronto	<p>Strategic Forest Mgmt Plan</p> <p>Tree Protection Policy and Specs for Construction Near Trees</p> <p>Streetscape Manual User Guide</p>	<p>Tree Protection Policy details standards, barriers, and bylaws</p> <p>Strategic Mgmt Plan highlights other docs / strategies that helped structure the Plan</p> <p>Strategic Mgmt Plan references analysis showing where canopy coverage has expansion potential through land use types. Single family is highest in residential; speaks to inequities for multi-family dwellings.</p>	28.4 - 31% (as of 2018)	Humid continental						
Sacramento, CA	<p>City Tree Program</p> <p>City Ordinance</p> <p>Urban Forest Master Plan</p> <p>Parking Lot Tree Shading Design and Maintenance Guidelines</p>	<p>City Ordinance, Tree Program and Parking Lot Guidelines references design standards</p> <p>Tree Program and City Ordinance references roles and responsibilities</p>	19.12%	Hot-summer Mediterranean climate						Potential to inquire about Sacramento being hailed a "Sterling Tree City", but not meeting tree canopy coverage as high as other cities
Washington D.C.	<p>DDOT Urban Forestry</p> <p>Sustainable DC</p> <p>Climate Ready DC</p>	<p>Climate Ready Plans have chapters pertaining to potential risks</p> <p>DDOT Urban Forestry addresses chapter on equity impact assessments and training</p>	38% (down from 55% in 1950)	Humid subtropical						Potential to inquire about climate Adaptation strategies further
Atlanta, GA	<p>Trees Atlanta</p> <p>Georgia Forestry Commission</p> <p>Tree Conservation Commission</p> <p>Strategic Plan for Parks and Rec</p>	<p>City partnered with various agencies to address tree care and guidelines</p> <p>Difficult to locate full plans and documents pertaining to forestry and green initiatives</p>	48% (per 2014 study)	Humid subtropical						



# CITY HIGHLIGHT - PORTLAND

CITY	DOCUMENTS REVIEWED	TAKEAWAYS	TREE CANOPY COVERAGE	CLIMATE	RELEVANT PRIORITY AREA					INTERVIEW RELEVANCE
					1- DESIGN STANDARDS	2- PRCTCN	3- R&R	4- C.A.	5- EQUITY	
Portland, OR	Heritage Tree Nomination Form Urban Forestry Stree Tree Planting Standards City of Portland Municipal Code Growing a more equitable urban forest: Portland's citywide tree planting strategy Urban Forest Action Plan Portland Urban Forestry Management Plan	Heritage tree nomination form is easy to find, encourages nomination  Management structure for urban forest is very clearly delineated  Equitable Urban Forest Plan lays out clear, actionable goals to enhance tree related equity	26%	Warm-summer Mediterranean						Potential to inquire about how the Urban Forest Management Plan and Urban Forest Action Plan work together to create a more robust urban forest

# PORTLAND - KEY TREE DOCUMENTS



# PORTLAND - ROLES & RESPONSIBILITIES

- Chart in Urban Forestry Master Plan details who plans, reviews, and implements:
  - Public trees
  - Private trees

## MANDATES AND CURRENT URBAN FOREST MANAGEMENT

### RELATIONSHIPS CHARTS

The following charts provide:

1. A general summary of the current relationships among Portland's City bureaus regarding planning and regulating of the urban forest.
2. The relationship between the mandates listed in Chapter Two, the bureaus and agencies, their plans and projects, and the City's Framework Plan. The Framework Plan coordinates the City's responses to the ESA listing for salmonids and relates to many other city plans.

### ROLES OF VARIOUS CITY BUREAUS & ORGANIZATIONS IN URBAN FORESTRY

Note: These are broad and general definitions. There are many exceptions and refinements.

Public Trees – Parks & other City-owned property	Planned or Proposed by	Reviewed by	Implemented by	Regulated or Enforced by
Trees in Developed Parks and Open Spaces	UF / other PP&R unit	UF/BDS	UF / other PP&R unit/BDS	UF/BDS
Trees in Publicly-owned Natural Areas	NR (PP&R) Ecosystem MP/ BES/Metro/OSP	UF/BDS	NR/BDS	UF/BDS in e-zones, etc.
Private Trees in Public Rights-of-Way <sup>1)</sup>	Planned or Proposed by	Reviewed by	Implemented by	Regulated or Enforced by
Street Trees – Neighborhoods	FOT/ LIF/ BES	LIF	FOT, Neighbors, LIF	LIF – Title 20/BDS
Street Trees – Individual Lots	PPO/ BES	LIF	PPO	LIF – Title 20 <sup>2)</sup> /BDS
Street Trees – Transportation Improvements	PDOT Engineering	UF	PDOT	LIF – Title 20/BDS
Street Trees – Subdivisions (public or private streets)	PPO/ BES	UF/BDS	PO/BDS	LIF – Title 20/BDS
Private Trees – Developed Areas	Planned or Proposed by	Reviewed by	Implemented by	Regulated or Enforced by
Trees in Parking Lots	PO/ BES	BDS (BIS for SWMM)	PO	BDS – Title 33
Required Landscaping	PO	BDS	PO	BDS – Title 33
Emission Control	PO	BDS	PO	BDS – Title 10
Stormwater Management Facilities	PO/ BES	BES	PO	BES – Title 17
Heritage Trees	UF	UF	UF	LIF
Removal of trees over 12" in diameter (except on SF residential)	PO	UF/BDS	PO	LIF – Title 20.42/BDS
Other Trees on private property (generally)	PPO	BDS	PPO	BDS
Private Trees in Overlay Zones	Planned or Proposed by	Reviewed by	Implemented by	Regulated or Enforced by
Environmental zones	PO	BDS	PO	BDS
Willamette Greenway	PO	BDS	PO	BDS
Scenic Resources	PO	BDS	PO	BDS
Private Trees – Under or Undeveloped Areas	Planned or Proposed by	Reviewed by	Implemented by	Regulated or Enforced by
Trees on Divisible Lots – cutting <sup>3)</sup> & preservation	PO	UF/BDS	PO	LIF – Title 20/BDS
Cutting of regulated trees w/ clearing & grading <sup>4)</sup>	PO	BDS	PO	BDS
Subdivisions – tree preservation	PO	BDS	PO	BDS

BES = Bureau of Environmental Services  
 BDS = Bureau of Development Services  
 FOT = Friends of Trees  
 NR = PP&R Natural Resources Program  
 PDOT = Portland Office of Transportation  
 PO = Property Owner (public or private)

PPO = Private Property Owner  
 PP&R = Portland Parks & Recreation  
 SF = Single Family  
 SWMM = Stormwater Management Manual  
 UF = Urban Forestry Program

<sup>1)</sup>Property owners are required to maintain and care for street trees.



# PORTLAND - TREE PROTECTION

- Heritage tree nomination system, reviewed by Heritage Tree Committee
- **Tree Planting and Preservation Fund:**
  - Private trees: development must preserve and protect 1/3 of trees 12" or larger diameter, and ALL trees 20" or larger diameter OR pay into the tree planting and preservation fund
  - Public trees: development must replace removed trees OR pay into the tree planting and preservation fund



**PORTLAND PARKS & RECREATION**  
Healthy Parks, Healthy Portland

-For Official Use Only-

Accepted \_\_\_\_\_

Declined \_\_\_\_\_

**HERITAGE TREE NOMINATION FORM**

- Nominations are accepted year-round and reviewed after May 1 each year.
- Attachments may also be submitted, including photos and additional text.
- Nominations for trees on private property must include the consent and signature of the property owner(s).

<b>Tree Information</b>	
Date: _____	
Tree species (botanic or common name): _____	
Number of trees: _____	
Tree Address: _____	Neighborhood: _____
Portland, OR _____	
Tree is located:	
<input type="checkbox"/> Between the curb and sidewalk (right of way) <input type="checkbox"/> Park or other public property <input type="checkbox"/> Private property <input type="checkbox"/> Other	
Tree size:	
Height (approximate): _____	
Crown (measure from one edge to opposite edge): _____	
Circumference (distance around the trunk 4.5 ft. from ground): _____	
Approximate age: _____	
Condition: _____	
Historical facts: _____	
Noteworthy features:	
<input type="checkbox"/> Beauty <input type="checkbox"/> Shade <input type="checkbox"/> Size <input type="checkbox"/> Kind <input type="checkbox"/> Age <input type="checkbox"/> History <input type="checkbox"/> Horticultural interest	
<b>Nominator</b>	
Name: _____	
Address: _____	
City, State, Zip: _____	
Phone: _____	
Email: _____	
<b>Property Owner (this section not required for public trees)</b>	
Name (s): _____	
Address: _____	
City, State, Zip: _____	

# PORTLAND - EQUITY

- Growing a more equitable urban forest: Portland's citywide tree planting strategy (2018)
- Recognizes that current distribution of trees is uneven and directly linked to income

PORTLAND PARKS & RECREATION  
Healthy Parks. Healthy Portland.



Growing a more equitable urban forest:  
Portland's citywide tree planting strategy  
December 2018

Figure 1: Tree Canopy in Portland (Metro 2016). The citywide goal for tree canopy is 33.3%.

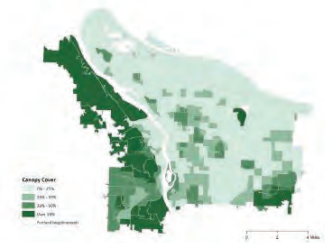


Figure 2: Populations of color in Portland (Office of Community and Civic Life 2010).

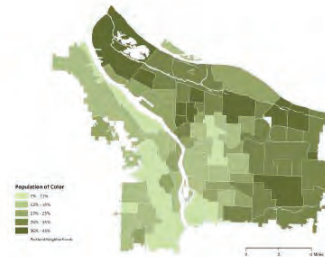


Figure 3: Limited English Proficiency (LEP) population in Portland (BPS 2014). Individuals with limited English proficiency are described as those whose primary language is not English and have a limited ability to read, write, speak, or understand the English language. This serves as a proxy for immigrant and refugee communities.

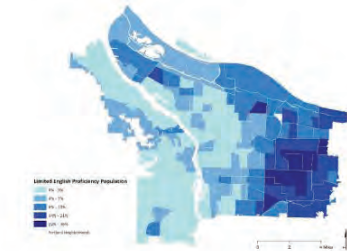
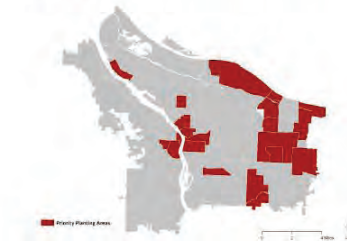


Figure 4: Priority planting areas. Portland Parks & Recreation prioritizes tree planting in neighborhoods where a high percentage of low-income residents live and where canopy is lowest. (PP&R 2018).



# CITY HIGHLIGHT - CINCINNATI

CITY	DOCUMENTS REVIEWED	TAKEAWAYS	TREE CANOPY COVERAGE	CLIMATE	RELEVANT PRIORITY AREA					INTERVIEW RELEVANCE
					1- DESIGN STANDARDS	2- PRCTN	3- R&R	4- C.A.	5- EQUITY	
Cincinnati, OH	<p>Cincinnati Parks Urban Forestry</p> <p>Green Cincinnati Plan</p> <p>City Ordinance</p> <p>Stormwater Mgmt Utility</p> <p>Public ROW</p>	<p>Collaboration with forestry orgs to increase tree canopy by 40% in all residential neighborhoods, particularly low-income / clear visuals for canopy standards in City Ordinance / clear direction and responsibilities outlines in Green Cincinnati Plan</p>	<p>38% (as of 2010; close to reach 40% goal)</p>	<p>Humid; subtropical</p>						<p>Potential to interview the City on the success of their tree canopy goals + climate adaptation plans</p> <p>Inquire about Green Cincinnati Plan - specifically Recommendations approach and implementing a "Keys to Equity" approach</p>



# CINCINNATI - KEY TREE DEPARTMENTS / DOCUMENTS



## 2018 Green Cincinnati Plan

Adopted May 2018



REGULATIONS / Chapter 743 - URBAN FORESTRY

## Chapter 743 - URBAN FORESTRY

### Sec. 743-1. - Definitions.

For the purpose of this chapter, the words and phrases defined in the sections hereu respectively ascribed to them, unless a different meaning is clearly indicated by the cont  
(Ordained by Ord. No. 248-1980, eff. June 30, 1985; repealed and reordained by 352-1981  
1990, eff. Oct. 3, 1990)

### Sec. 743-1-D. - Director.

"Director" shall mean the director of parks or person designated by the director.  
(Ordained by Ord. No. 352-1985, eff. Aug. 2, 1985; a. Ord. No. 412-1990, eff. Oct. 3, 1990)

### Sec. 743-1-P1. - Person.

"Person" shall mean an individual, corporation, the city of Cincinnati, or any of its dep  
estate, trust, partnership or association, two or more persons having a joint or common  
commercial entity.

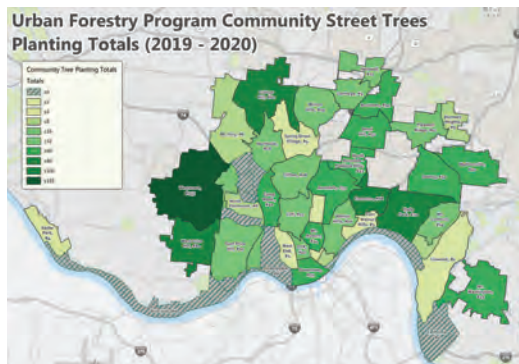
(Ordained by Ord. No. 248-1980, eff. June 30, 1981; repealed and reordained by Ord. No.  
No. 412-1990, eff. Oct. 3, 1990)

### Sec. 743-1-P2. - Public Tree.

"Public tree" shall mean a tree located on a public street within the city of Cincinnati.  
(Ordained by Ord. No. 248-1980, eff. June 30, 1981; repealed and reordained by Ord. No.

# CINCINNATI - DESIGN STANDARDS

- Fall ReLeaf program established in 1988 to provide shade trees, at no cost, to homeowners with narrow tree lawns or overhead utilities
- Distributed over 20,000 trees since their inception



## • City Ordinance tree regulations

**TABLE 4. PUBLIC FRONTAGE TYPES**

Public Frontage Type	A	B	C	D	E	F
Transect	1,2	1,2,3	3,4	3,4,5	4,5	4,5,6
<b>I. Assembly:</b> The principal variables are the type and dimension of curbs, sidewalks, planters and landscape.						
Total Width	14.24 feet	12.24 feet	12.18 feet	12.18 feet	14.24 feet	14.24 feet
<b>II. Curbcut:</b> The dressing of the edge of the vehicular way, incorporating drainage.						
Type	Open Swale Curb at 1:12 slope	Open Swale Ramp at 1:12 slope	Raised Curb Ramp at 1:12 slope	Raised Curb Ramp at 1:12 slope	Raised Curb Ramp at 1:12 slope	Raised Curb Ramp at 1:12 slope
<b>III. Walkway:</b> The portion of the thoroughfare dedicated exclusively to pedestrian activity.						
Type	Path (Optional) 10'-0"	Path 4'-6 feet	Sidewalk 4'-6 feet	Concrete 4'-6 feet	Network 6'-18 feet	Sidewalk 10'-24 feet
<b>IV. Planter:</b> The portion of the thoroughfare accommodating street trees and other landscape.						
Arrangement	Cluster	Cluster	Regular	Regular	Regular	Asymmetrical
Type	Cluster	Cluster	Regular	Regular	Regular	Asymmetrical
Spacing	Asymmetrical	Asymmetrical	Asymmetrical	Asymmetrical	Asymmetrical	Asymmetrical
Planter Type	Concrete/Shell 14'-24 feet	Concrete/Shell 8'-20 feet	Concrete/Shell 9'-12 feet	Concrete/Shell 8'-14 feet	Concrete/Shell 9'-16 feet	Concrete/Shell 8'-16 feet
Planter Width	14'-24 feet	8'-20 feet	9'-12 feet	8'-14 feet	9'-16 feet	8'-16 feet
Public Planting Type	Rounded, Curved, or Sawtooth View Pole	Rounded, Curved, or Sawtooth View Pole	Rounded, Curved, or Sawtooth View Pole	Rounded, Curved, or Sawtooth View Pole	Rounded, Curved, or Sawtooth View Pole	Rounded, Curved, or Sawtooth View Pole
<b>V. Verge:</b> Provides allowable locations for public infrastructure and public furniture outside of access ways.						
Verge Width	3 feet	3 feet	4 feet	4 feet	3 feet	3 feet
Verge Material	match curbs	match curbs	match curbs	match curbs	match curbs	match curbs
Lighting Type	Pole, Column, or 2.00 ft. head	Pole, Column, or 2.00 ft. head	Pole, Column, or 2.00 ft. head	Pole, Column, or 2.00 ft. head	Pole, Column, or 2.00 ft. head	Pole, Column, or 2.00 ft. head

\* Verge should begin within 2 feet of the curb or edge of pavement.

**TABLE 8. PUBLIC PLANTING - FOR REFERENCE ONLY. CONFIRM WITH MASTER TREE LIST.**

SARIS Tree Code	Tree Canopy Characteristics									
	Specific Name (Botanical Name)	Type	Size (height x spread)	Transect	Native	Planting Pattern	Product Code or Bloom	Special Indications		
1000	Hackberry (Celtis occidentalis)	Rounded	10' x 10'	T1, T2, T3, T4	Yes	Regular, Clustered	Drugs / N/A			
1001	White Ash (Fraxinus americana)	Oval	50' x 80'	T1, T2	Yes	Regular, Clustered	Sumac / N/A			
1002	Manhattan spruce ever green (Fir/Abies/Thuja)	Rounded	10' x 30'	T1, T2, T3, T4	Yes	Asym, Regular, Clustered	Sumac / N/A			
1003	Honeylocust (Gleditsia triacanthos)	Rounded	10' x 60'	T1, T2, T3, T4	Yes	Regular, Clustered	Post / N/A			
1004	Tulip Poplar (Liriodendron tulipifera)	Oval	10' x 60'	T1, T2, T3	Yes	Regular, Clustered	Sumac / N/A			
1005	Black Gum (Nyssa sylvatica)	Oval	10' x 40'	T1, T2, T3	Yes	Regular, Clustered	Drugs / N/A			
1006	Sycamore (Platanus occidentalis)	Rounded	10' x 60'	T1, T2	Yes	Regular, Clustered	Multiple Herb / N/A	Higher maintenance		

# CINCINNATI - ROLES & RESPONSIBILITIES



- **Urban Forestry Assessment** to collect an annual levy of control, planting, care, and maintenance of shade trees
- The assessment has increased 32% over 40 years, and that increase has covered the inflation costs of maintenance, additional tree plantings to address canopy loss caused by the tree-killing Emerald Ash Borer beetle, and achieving Cincinnati's increased urban canopy cover goals



# CINCINNATI - CLIMATE ADAPTATION

- **Climate Adaption plans** to address projections on heat statistics, potential storms, pests, health implications, agricultural disruptions, and in-migrations

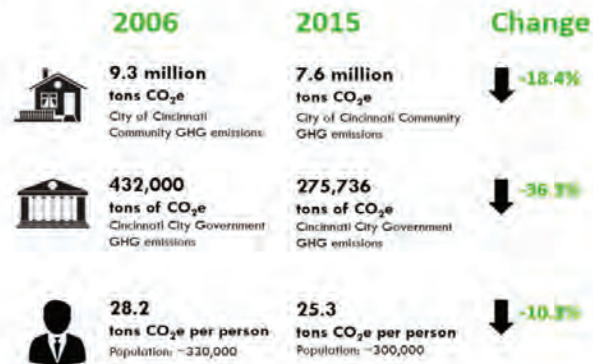


2018 Green Cincinnati Plan

Adopted May 2018



## CHANGES IN CINCINNATI GREENHOUSE GAS EMISSIONS BY SECTOR FROM 2006 TO 2015



- Since the Plan's adoption in 2008, Cincinnati has seen a decrease in greenhouse gas emissions

# CINCINNATI - EQUITY

## 2. Increase tree canopy and access to greenspace.

### What is it and why is it important to Cincinnati?

The City of Cincinnati will work with Taking Root and Cincinnati Parks to increase the tree canopy throughout the city, especially in low income neighborhoods and along the interstates. Increasing the City's tree canopy will help minimize the effects of urban heat islands, provide stability to land that is prone to landslides, reduce the cost of cooling for residents, reduce stormwater runoff and flooding during heavy rains, and reduce the concentrations of air pollutants. Planting efforts will align with the goals set forth in the Cincinnati Park Board's Natural Resource Management Section Management Plan. The City will explore funding options to restore the Park Board's ReLeaf program to provide trees that can be planted on public or private property.

One tool to improve tree canopy in deficient neighborhoods will be the creation of parks or other protected greenspaces in locations where residents lack walkable access to greenspace.

Taking Root is a coalition of organizations committed to planting 2 million trees in the Cincinnati region by 2020. Over the past 5 years, Taking Root's "Registree" has recorded the planting of nearly 300,000 trees. While planting an additional 1.7 million trees in the next 3 years seems unlikely, an increase in the current rate of tree plantings will provide tremendous benefits. Planting trees in areas that have inadequate tree canopy will provide more shade, less stress on air conditioners, and lower temperatures on hot days. Residents will experience less extreme temperatures and less of the adverse health effects that come along with it. Neighborhoods with high concentrations of disadvantaged residents often have inadequate tree canopies, so planting trees in these neighborhoods will help reduce inequity.

Planting trees in areas that contain a high percentage of impermeable surfaces will help absorb rainwater and reduce flooding. Trees can also be used to keep hills next to the interstate from sliding when rain comes. Trees are a carbon sink. They soak up carbon dioxide and convert it into organic carbon. As a tree matures, it can absorb up to 48 lbs. of CO<sub>2</sub> per year which can have a large impact over the lifetime of a tree. Trees also filter out pollutants from vehicles and other sources.

Recognizing climate and pest related stresses on our ecosystem, tree planting efforts should be mindful of increasing the species diversity that makes up the urban tree canopy. Tree planting efforts should also consider removal of invasive species which can prevent and inhibit the growth of beneficial species.

### Examples in Cincinnati and peer cities

- Taking Root in Cincinnati
  - A campaign that focuses on planting trees and better managing local forests
  - <http://www.takingroot.info/about/about-us/>

- Created to protect and restore urban forests and improve the City's tree canopy through tree planting and advocacy  
<http://www.northernhillsmonthly.com/2017/04/02/138277/tree-pittsburgh-planting-the-seeds-of-the-city-s-future>

### Who will be taking the leading roles on this project?

- Cincinnati Parks Board
- Taking Root
- Cincinnati Permaculture Institute

### Who is the target audience?

- Land Owners
- Landscapers and Tree Professionals
- City Parks Department
- Local Environmental organizations

### What is the City of Cincinnati's role in implementation?

- The City's role will be to provide aid to a team of organizations that campaigns and provides programs to help increase the number of trees planted throughout the city.

### Is it Feasible?

- Feasibility: Easy
  - It is highly feasible to increase the pace of tree plantings in Cincinnati. There are already campaigns and programs in place and this recommendation can be used to accelerate the process and create more initiatives.

### How much would it cost?

Cost (10 year, 100 trees)	Benefit (10 year, 100 trees)	Cost-Benefit Ratio
\$51,000 (To Cincinnati Parks)	\$510,000 (To Cincinnati Parks)	10

According to a Cost Benefit analysis provided by Xavier University, a rough cost estimate runs around \$31,000 for proper planting and initial care for every 100 trees and a rolling maintenance estimate of \$20 per tree per year. Savings related to stormwater retention, enhanced property value and reduced energy bills due to increased coverage were nearly ten times the monetary costs in ten years and more as trees age.

### Keys to Equity:

- Focus tree plantings in areas with the lowest tree canopies which tend to be the most disadvantaged areas

- Target areas that suffer from the Urban Heat Island effect
- Educate residents on how trees can lower surrounding temperatures as well as save on air conditioning cost
- Provide jobs to incarcerated individuals and members of work release programs to provide useful work skills

### Timeline for Implementation

Tree planting is already taking place in Cincinnati. Efforts to accelerate the planting of trees will begin as soon as locations are identified for trees to be planted and trees are available to plant. Trees will be planted in locations that will have the greatest impact both environmentally and economically.

### Greenhouse Gas Impact

#### Annual Carbon Reduction Potential

2018	2035	2050
0 mtCO <sub>2</sub>	1,770 mtCO <sub>2</sub>	3,333 mtCO <sub>2</sub>

We used a CO<sub>2</sub> sequestration rate for urban trees in Ohio of 0.248 kg C per m<sup>2</sup> per year (Nowak et al., 2013). An average sized tree's crown covers 28 square meters. The goal will be to plant 15,000 trees each year. In 2035, this would result in uptake of 1,770 mtCO<sub>2</sub>/year. By 2050, this would remove 3,333 mtCO<sub>2</sub>/year from the atmosphere.<sup>155</sup>





# **PRIORITY FOCUS AREAS**

# **BIBLIOGRAPHY**



# BIBLIOGRAPHY OVERVIEW

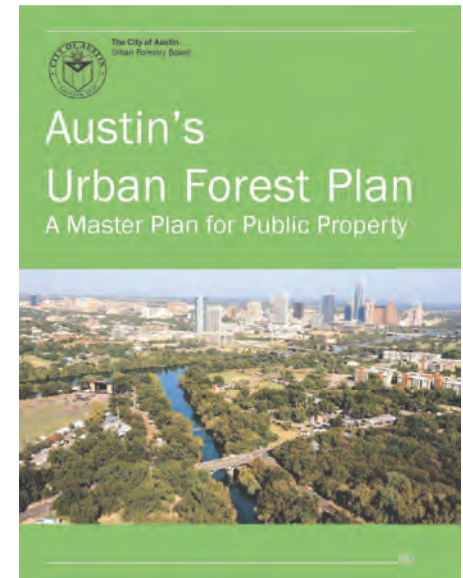
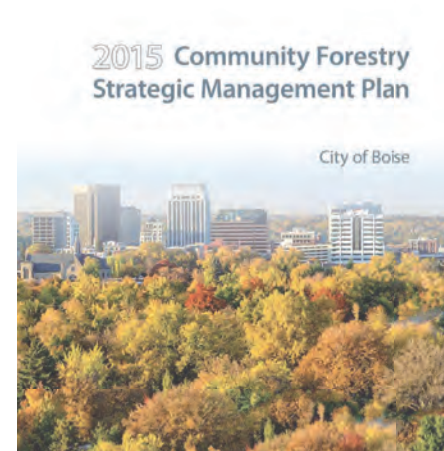
DESIGN STANDARDS	TREE PROTECTION	ROLES & RESPONSIBILITIES	CLIMATE ADAPTATION	EQUITY
<ul style="list-style-type: none"> <li>• Effects of varying establishment approaches on the growth of urban street trees</li> <li>• Specifying soil volume to meet the needs of mature urban trees and trees in containers</li> <li>• Soil volume restrictions and urban soil design for trees in confined planting sites</li> </ul>	<ul style="list-style-type: none"> <li>• Protecting heritage trees in urban and peri-urban environments.</li> <li>• Evaluating the efficacy of a local tree protection policy using LiDAR remote sensing data</li> </ul>	<ul style="list-style-type: none"> <li>• The role of partnership in urban forestry</li> <li>• Urban Forestry: Planning and Managing Urban Greenspaces</li> </ul>	<ul style="list-style-type: none"> <li>• Trees and Solar Power: Coexisting in an Urban Forest Near You</li> <li>• The Value of Green Infrastructure for Urban Climate Adaptation.</li> <li>• Analyzing the cost effectiveness of Santiago, Chile's policy of using urban forests to improve air quality</li> </ul>	<ul style="list-style-type: none"> <li>• The equity of urban forest ecosystem services and benefits in the Bronx, NY.</li> <li>• Street Trees and Equity: Evaluating the Spatial Distribution of an Urban Amenity. Environment and Planning A: Economy and Space</li> <li>• The relationship between urban forests and race: A meta-analysis</li> <li>• Is Planting Equitable? An Examination of the Spatial Distribution of Nonprofit Urban Tree-Planting Programs by Canopy Cover, Income, Race, and Ethnicity</li> </ul>

# NEXT STEPS



# PROJECT HAND OFF

- Pass off our research efforts to graduate students in the Master of the Environment Program at CU Boulder
- They plan to:
  - Conduct interviews with best practice cities
  - Continue research within priority focus areas





**STUDENT WORK**  
**UNIVERSITY OF COLORADO BOULDER**

**URBAN  
FORESTRY,  
EQUITY, AND  
CLIMATE  
RESILIENCE  
TOOLKIT**

MELISSA ENGLUND  
LORENA GONZALEZ  
KIANA SETO  
KAYLI SKINNER



**PLANNING TODAY FOR  
A GREENER TOMORROW**



Masters of the Environment  
UNIVERSITY OF COLORADO **BOULDER**

PREPARED FOR THE NATURE CONSERVANCY

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# EXECUTIVE SUMMARY

The consequences of climate change are being felt in Colorado. As warming intensifies, climate change will exacerbate socio-ecological vulnerabilities that are already present within urban areas. An example of this is demonstrated by urban heat island inequities. The urban heat island effect is a phenomenon caused by an increased use in impervious surfaces and low albedo building materials (e.g., concrete and pavement) that is progressively amplifying the adverse impacts of extreme heat. In addition, urbanization has increased greenhouse gas emissions and anthropogenic heat production from industrial processes and cooling systems. This, in turn, has cascading negative effects on the environment, public health, and the economy in U.S. cities, which become heightened by the impacts of climate change.

Urban trees are effective nature-based solutions that can mitigate the impacts of climate change while providing numerous social, environmental, and economic benefits. However, due to the inequitable distribution of urban tree canopy that can be attributed to historic discriminatory land use practices, low income and some Black, Indigenous, and People of Color (BIPOC) communities are denied the benefits of trees and face greater vulnerability to the effects of climate change.

To enhance equitable and sustainable outcomes in urban forestry management practices, our four-person, graduate student team researched and conducted qualitative interviews to develop this toolkit with guidance from The Nature Conservancy in Colorado.

This toolkit is designed for the City and County of Denver, however, the recommendations and strategies suggested have the potential to be applicable to cities nationwide. Based on our findings, data analyses, and stakeholder interviews, we outlined strategies to (i) develop and support a citywide vision for an equitable and resilient urban forest, (ii) establish and nurture long-term partnerships with organizations and stakeholders who can help support and implement the city vision and management plan, and (iii) establish and strengthen community engagement and stewardship opportunities.





## ***Acknowledgements***

We would like to thank our partners at The Nature Conservancy in Colorado, Chris Hawkins (Urban Conservation Program Manager) and Drew Rayburn (Director of Conservation Science and Planning) and our academic advisor, Gretel Follingstad, for all of their guidance and contributions throughout the development of this toolkit. Thank you to all the stakeholders across the country that dedicated the time to share their experiences and expertise with our team during the interview process.

## ***About the Team***

We are a team of Masters of the Environment (MENV) graduate students at the University of Colorado - Boulder (CU Boulder). As part of our graduate degrees, we worked in partnership with The Nature Conservancy in Colorado (TNC) over nine months to complete this capstone project to provide recommendations to the City and County of Denver regarding urban forestry in the context of equity and climate resilience. Our team worked closely with two TNC program leads and an academic advisor to complete this project. Meet our team:

- Melissa Englund is studying within the Urban Resilience and Sustainability specialization of MENV. She is aspiring to be an urban resilience and sustainability planner post-graduation.
- Lorena Gonzalez is specializing in environmental policy within the MENV program. She is committed to remedying historical wrongs within the environmental sector by advancing environmental and climate justice through policy that centers equity.
- Kiana Seto is a first year MENV student specializing in Urban Resilience and Sustainability. She hopes to pursue a career in sustainable urban planning post-graduation.
- Kayli Skinner is studying Urban Resilience and Sustainability within the MENV program. She is dedicated to building regenerative communities by integrating a holistic approach to climate resilience and urban planning.

## ***The Vision For This Toolkit***

The team hopes that the City and County of Denver can use these recommendations and strategies to co-create a vision for equitable and sustainable urban forest management. Our goal is to promote coordination and collaboration across agencies, sectors, and the communities of Denver to attain this vision. We highlight the importance of community-driven resilience planning and developing innovative strategies to strengthen stewardship opportunities. The team hopes that this toolkit may also assist other cities that are committed to enhancing equity and resilience within their own urban forest management practices.



# BACKGROUND

## URBAN HEAT ISLAND AND TREES

The urban heat island effect refers to the phenomenon where temperatures are higher in urban settings compared to rural environments due to the significant use of impervious surfaces and lack of vegetation. As solar radiation is absorbed by low albedo materials, heat becomes trapped and is slowly reemitted back into the surrounding environment, thereby raising local air temperatures. Urban tree canopy coverage can mitigate the impacts of UHIs through the process of evapotranspiration and by providing natural shading through morphological characteristics. Moreover, urban trees can improve carbon sequestration, air quality, water quality, energy efficiency, property values, stormwater management, wildlife habitats, and biodiversity. Numerous studies also have found correlations between urban trees and social, physical, and mental health benefits.

## CLIMATE CHANGE IN COLORADO

The effects of climate change are becoming increasingly prevalent in Colorado. The state has warmed an average of 2°F in the last 30 years and 2.5°F in the last 50 years (Colorado Energy Office, 2021). In 2021, Colorado experienced its fourth-hottest summer on record. Out-of-state wildfires sent plumes of toxic smoke across Colorado that mixed with local air pollution, which triggered record-high unhealthy air quality days. The state is also seeing an increase and intensity of flooding, extreme precipitation events, and associated debris flows that have resulted in costly impacts to infrastructure and livelihoods.

Furthermore, current climate models project an increase in drought conditions, reduced snowpack, and earlier snowmelt in the Rockies that will continue to threaten Colorado's water supply and growing season (Masson-Delmotte et al., 2021). All of these factors will continue to adversely impact the economy, public health, air quality, ecosystems, natural resources, and overall quality of life for all who inhabit the state. However, the gravest effects are felt by disproportionately impacted communities. Fortunately, the Colorado Legislature has made tackling climate change a state priority at the capitol. The Colorado Climate Action Plan, House Bill 19-1261, was made into law in 2019 that established statewide greenhouse gas reduction targets of 26% by 2025, 50% by 2030, and 90% by 2050 as compared to 2005 levels. In addition, House Bill 21-1266 was passed in 2021 that requires reductions of greenhouse gas emissions from the oil and gas, industrial, and electric sector. This bill also orders the Colorado Department of Public Health and Environment to prioritize near-term reductions of greenhouse gas and achieve reductions of greenhouse gas and co-pollutants in disproportionately impacted communities.



**INTEGRATING THE SOCIAL EQUITY IN URBAN RESILIENCE PLANNING FRAMEWORK**

To address the emerging issue of tree canopy disparity, a growing number of cities are incorporating equity into their plans and policies. However, our research and stakeholder interviews revealed that only a small quantity of cities use an equity framework to guide their equity analyses.

For this project, our team used the Social Equity in Urban Resilience Planning framework to assess issues of social equity in our analysis of nationwide urban forest efforts. Refer to **Figure 1** to review the Social Equity in Urban Resilience Planning framework. At the center of this framework are three dimensions of equity that shape the resilience of vulnerable communities and determine whether they are equipped to handle shocks and stressors related to climate disruptions. These dimensions include distributional, recognitional, and procedural equity and are further expanded upon below (Meerow et al., 2019).

**Distributional Equity:** Defined as equitable access to goods and infrastructure, environmental amenities, services, and economic opportunities (Meerow et al., 2019). This includes the equitable distribution of environmental goods, such as tree canopy, and the associated benefits that environmental services provide.

**Procedural Equity:** Defined as equitable participation in decision-making processes. This includes public participation in the development of the plan, efforts to increase ongoing public participation in city governance, and targeted outreach to marginalized groups who are often underrepresented in traditional public engagement processes (Meerow et al., 2019). In the context of urban forestry, an example of this could be the creation of neighborhood-level greening efforts that include community members in the processes, planning, and implementation of long-term tree canopy goals.

**Recognitional Equity:** By definition, this concept: (i) acknowledges the intersecting identities of different community members (e.g., race, gender, class, and age); (ii) recognizes that some of these identities are shaped by historical injustices and can influence individual vulnerability to shocks and stresses, and (iii) fosters respect for different groups (Meerow et al. 2019). In practice, recognitional equity can look like city officials acknowledging the history of redlining as one problem that has led to inequitable UTC and actively identifying pathways towards addressing it.

By using comprehensive and intentional approaches to community-driven resilience planning, practitioners can develop pathways towards achieving more equitable outcomes in the field of urban forestry.



Image source: Meerow et al., 2019

**Figure 1.** Social Equity in Urban Resilience Planning framework



# METHODOLOGY

## *Research Questions*

Our team identified two key questions that guided our literature review, interview process, and the development of this toolkit:

- (i) What promising practices are other cities using to support more equitable urban forestry programs?
- (ii) How can interagency and external collaboration strengthen and clarify the roles and responsibilities involved in urban forestry programs?

## *Approach*

In collaboration with our capstone partner, TNC of Colorado, our team of CU Boulder graduate students co-developed the scope of this research to focus on equity, climate resilience, and clear roles and responsibilities within urban forestry. Simultaneously, a team of CU Denver graduate students were partnered with Design Workshop, a landscape architecture consulting firm, to assist the City and County of Denver in updating their tree-related codes and regulations. Due to a mutual connection, our teams collaborated and shared resources. The CU Denver students and Design Workshop team developed a list of target cities based on their scope and research findings. Our team used this list as a primer to our literature review and added additional target cities that presented promising practices relevant to our scope.

## *Literature Review and Target City Selection*

To identify considerations for promising practices and target cities, our team produced a literature review that examined 178 government documents, journal articles, news articles, and reports. Based on our background research, we highlighted the following criteria for selecting target cities:

- (i) A comprehensive urban forestry strategy or plan, especially if it addresses UTC and establishes quantifiable targets
- (ii) Innovative urban forestry practices and programs
- (iii) Similar climate considerations to Colorado
- (iv) Demonstrates promise in equity, coordination, and/or collaboration within urban forestry

The team selected 15 cities and created a list of potential interviewees from each selected city. To integrate a wide range of perspectives, the team identified stakeholders from city governments, non-governmental organizations (NGOs), consulting agencies, academia, and other key stakeholders.

## *Outreach and Qualitative Interviews*

After identifying potential interviewees, the team initiated the stakeholder outreach phase. We partnered with The Nature Conservancy's "Cities" network, including programs in nearly 25 cities, to leverage existing partnerships in the target cities and reached out to additional stakeholders via email. The interviews were qualitative, virtual, and semi-structured. We prepared a list of questions based on the stakeholder and city interviewed. Generally, these questions examined the topics of equity, tree canopy, collaboration, and climate resilience. In total, we interviewed 53 stakeholders from regions across the United States. The distribution of stakeholder representation is demonstrated in **Figure 2**.

## DISCUSSION

Our research, literature review, and qualitative interviews findings demonstrate that many major U.S. cities are working towards integrating an equity-focused approach to urban forest initiatives. However, while many cities are planning for equity, there are procedural barriers that limit the effectiveness of community engagement and the implementation of equitable urban forestry projects.

Many of our interviewees acknowledged that historic discriminatory land use practices have contributed to inequities in UTC distribution. Additionally, several interviewees cited concerns regarding displacement associated with green gentrification. A significant portion of interviewees discussed the importance of building trust and rapport within historically disadvantaged communities prior to giving away free trees or addressing UTC inequities. If intentional community outreach and engagement is not prioritized from the start of planning processes, it can result in greater distrust between communities and government entities.

Moreover, our interviews identified additional challenges within urban forest management, which include, but are not limited to, funding, tree maintenance, irrigation (with an emphasis in Western U.S. cities), interagency silos, balancing the pace of development with UTC goals, and tree protections. To overcome these limitations, many U.S. cities are developing promising programs, practices, and policies for equitable and sustainable urban forest management. Based on the team's findings, we developed recommendations and strategies to promote equity and climate resilience within the City and County of Denver's urban forest program.

## RECOMMENDATIONS

We identified three overarching recommendations for the City and County of Denver:

- (i) develop and support a citywide vision for an equitable and resilient urban forest,
- (ii) establish and nurture long-term partnerships with organizations and stakeholders who can help support and implement the city vision and management plan, and
- (iii) establish and strengthen community engagement and stewardship opportunities.

Each overarching recommendation has associated strategies and actions suggested to best implement these recommendations. Additionally, examples from cities implementing these recommendations and strategies are also provided throughout.



### RECOMMENDATION 1: DEVELOP AND SUPPORT A CITYWIDE VISION FOR AN EQUITABLE AND RESILIENT URBAN FOREST

To initiate and/or strengthen the process of enhancing equity and climate resilience within urban forestry, a citywide vision should be established. Based on the findings from our research, we identified four pertinent areas within this recommendation: (i) developing a comprehensive urban forest vision and management plan or strategy, (ii) creating a task force / coalition to support the development and implementation of an equitable and community-based vision, (iii) create a comprehensive strategy to address and align tree maintenance needs and funding, and (iv) develop and manage urban forestry measures that support community-based equity and resilience.

#### **Strategy 1: Develop a comprehensive urban forest vision and management plan or strategy -**

Multiple cities interviewed vocalized how co-developing a comprehensive urban forest management plan significantly helped to align a collective vision and break down inter-agency silos. We recommend that Denver develops a citywide, comprehensive urban forest vision and management plan to enhance coordination and establish community-based tree canopy goals that put all neighborhoods on the path to tree canopy equity. We recommend that this plan and process include participation of diverse, community-based voices from across the city to reflect the broad range of urban forest challenges and opportunities specific to Denver. Hiring an external facilitator or consultant could be explored to better align the community and city vision. The role of a facilitator is especially

important when collaborating between agencies that encounter conflicting priorities. An outside facilitator can also bring a new and potentially neutral perspective to help work through existing problems or ones that may arise during the planning process.

#### ***Implementation in Practice: Pittsburgh, PA***

In 2012, Tree Pittsburgh, a non-profit organization dedicated to protecting the urban forest, spearheaded an **urban forest master plan** in collaboration with the City of Pittsburgh, relevant state agencies, environmental consultants, and community members. One of the plan's goals is to create "equitable urban forest benefits," aiming for initiatives such as giving priority of urban forestry efforts to underserved neighborhoods. This plan provides a shared vision for the future of Pittsburgh's urban forest as well as resources needed to effectively get there (Tree Pittsburgh, 2021).

#### **Strategy 2: Create a task force / coalition to support the development and implementation of an equitable and community-based vision -**

In support of the citywide vision and plan, convening an urban forest task force or coalition that has designated seats for community member representation should be explored. This task force can best align community urban forestry needs and wants with city goals while bringing inter-agency groups together. This can also help uncover potential gaps, blind spots, or conflicts early on by the community and inter-agency parties. Conflicting policies could also be addressed within this task force or committee. Additionally, it helps establish ownership and buy-in for the plan and associated efforts from all parties involved.



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***Implementation in Practice : New York, NY***

The Forest for All NYC coalition unites diverse sectors and organizations that are dedicated to enhancing the urban forest. It includes 43 members from the New York City Department of Parks and Recreation, the New York City Environmental Justice Alliance, the New York City Housing Authority, grassroots groups such as El Punte, and more. The coalition provides guidance to the city and helps ensure the actions outlined in the NYC Urban Forest Agenda are achieved, and get other relevant stakeholders to the decision making table. This dedicated coalition can remedy capacity concerns and ensure sustained progress on the agenda.

**Strategy 3: Create a comprehensive strategy to address and align tree maintenance needs and funding** - A beneficial step for Denver to take would be creating a comprehensive maintenance strategy that considers the maintenance of trees on all properties, those who might be able to maintain them, and associated barriers and opportunities. Our initial research repeatedly showed the burden and inequality within tree maintenance for low-income, underserved communities, especially when dealing with trees in the ROW where insufficient maintenance of trees can lead to fines. Removing the barrier of maintenance can increase equitable distribution of trees due to residents being more open to having the trees on or near their property (Seo, 2020). Another maintenance challenge was funding, with many urban foresters we interviewed expressing frustration and concern about the lack of funding for tree maintenance

due to it not being seen as appealing or “photo opp. friendly” compared to tree planting. A maintenance strategy could help address these issues. Denver’s potential (and needed) increased planting in underserved areas may create a higher need for maintenance funding in the future, which is why setting up a strategy now could help things run more smoothly in the future.

***Implementation in Practice : Pittsburgh, PA***

Pittsburgh’s Mayor William Peduto came out with a vision to plant 100,000 trees in the city over the next decade. This past March, Mayor Peduto and the Shade Tree Commission — a quasi-governmental entity that promotes the planting, protection, and preservation of trees within the city — came out with their **Equitable Street Tree Investment Strategy** which aims to apply an equity lens to that vision by annually identifying 10 low-income and low-canopy neighborhoods to target with tree plantings, cyclical maintenance, urban forest educational activities, and employment opportunities (City of Pittsburgh, 2021).



**Action: Explore implementing block pruning -**

Interviewees from Providence, RI and New York, NY shared the maintenance practice of block pruning. This practice involves maintaining public / ROW trees through a predetermined system of block-by-block routine maintenance instead of relying on 311 calls. Block pruning is considered a more equitable system compared to others, since relying on 311 calls requires individuals to directly contact the city with their concerns and those requests are responded to first. One interviewee further described the problem, saying individuals who already have ties with local government feel more comfortable calling the 311 line, therefore prioritizing tree maintenance concerns in an inequitable way.

**Implementation in Practice : Providence, RI**

*Funded partially by a \$50,000 grant, the City of Providence launched a pilot block pruning program in 2015. Six years in, the city's urban forester reflected that the process has been more equitable than the reactionary 311 process they had before. The city's urban forester said block pruning helps increase efficiency of their maintenance processes due to a decrease in emergency calls and the number of requests to prune trees in general. Providence did face challenges, however. One hurdle was working with unions who had a concern about workload, which they overcame by promising overtime. Another challenge was funding, which Providence overcame through securing grant funding which was matched by a city endowment.*

**Action: Strengthen and grow local tree**

**organization partnerships** - In multiple cities interviewed, the city partnered with their local tree organization to effectively leverage each other's resources. Local tree organizations often focus on tree plantings with the community — lightening the planting work for the city — while the city focuses mainly on tree maintenance and associated costs. In Pittsburgh, the local tree non-profit, Tree Pittsburgh, receives funds from the city to help with planting. This ensures the program is sustainable while allowing the city to handle maintenance issues. Similarly, in San Francisco, Friends of the Urban Forest (FUF) works closely with the city's Bureau of Urban Forestry to plant and care for public trees. FUF plants trees and maintains them for up to five years. After five years, maintenance is transitioned to the city's street tree maintenance program. The two complement each other's work since the city's maintenance program does not receive funding for tree planting. Both examples show how a city effectively leveraged the relationship and resources of a local tree organization.





**Action: Assess current maintenance funding streams and conduct a financial analysis based on the goals of a comprehensive management plan** - We encourage Denver to assess current funding streams and explore aligning funding sources with appropriate needs and opportunities, while exploring opportunities for innovation. This could include tapping into current pools of money for similar initiatives such as the Parks Legacy Fund (2018) and the Climate Protection Fund (2020).

*Implementation in Practice : San Francisco, CA*  
*San Francisco's 2015 Urban Forest Plan* focused on street trees and provided specific recommendations, goals, and actions aimed at exploring sustainable funding opportunities for the city's street tree maintenance. Part of the actions included a **Street Tree Financing Study** that looked into potential ways to fund long-term maintenance required to continue growing and caring for the urban forest. The results suggested that routine maintenance of street trees is a more effective and efficient approach compared to responding to hazardous tree maintenance upon request. The study showed this could potentially save the city costs in the long term (AECOM, 2013) and provide funding alternatives for the city to pursue.

**Strategy 4: Develop and manage urban forestry measures that support community-based equity and resilience** - Cities indicated that some tree canopy or urban forest goals established in their plans were not initiated or completed. Typically, these dropped initiatives were not conveyed to the general public. Some of the challenges

include capacity and funding, which is why large and seemingly unrealistic UTC and tree planting goals can face more hurdles than accomplishments. Instead, focusing on communities with the greatest UTC need and developing strategies to accomplish community-based tree canopy goals could be a more effective approach. We recommend that the City and County of Denver develop and manage accountability measures to increase transparency with the general public, show progress and room for improvement, and also to increase communication between interagency sectors and external stakeholders.

**Action: Establish neighborhood-level canopy goals, especially for low-canopy areas** - To complement the citywide urban vision and plan, the City and County of Denver should work with neighborhoods, especially low-canopy ones, to establish target canopy goals and action plans. The absence of place-based goals can exacerbate disparity because tree planting efforts may go to areas that already have ample tree canopy where it might be easier to plant or are not facing socioeconomic hardships (Garrison, 2019).

**Action: Use existing and/or develop tools to support community-based urban forestry** - Tracking and analyzing urban forestry efforts is vital to understanding what is working and what areas need improvement. Tools such as American Forests' Tree Equity Score Analyzer (TESA) are one option Denver can consider using to support their forestry efforts. TESA is an interactive planning tool that supports both policy and project-level interventions to achieve Tree Equity — a tool that could be helpful as Denver looks at best next steps for increasing their own tree equity. Denver could also develop and track their own metrics based on local needs.

**Action: Report on the progress of the urban forest plan’s actions and goals in a routine, transparent, and inclusive manner** - Once an urban forestry management plan is established, we recommend creating annual progress reports to showcase the year’s accomplishments. In Providence, the annual report produced for their Sustainability Plan also served as a way to break down communication silos with other governmental agencies and partners due to having to communicate on the status of progress. This can also help build trust with the local community by letting them know progress is being made.

**Implementation in Practice : Portland, OR**  
*The “Growing a more equitable urban forest: Portland’s citywide tree planting strategy” was developed after performing rigorous community outreach, “including feedback from **Community Advisory Committee members** and **culturally-specific focus groups**” (Portland Parks and Recreation, 2018). This strategic plan acknowledges that Portland’s distribution of trees is unequal and linked to socioeconomic factors. Portland Parks and Recreation also partnered with Portland State University (PSU) to identify barriers, opportunities, and recommendations to enhance inclusivity in procedural processes while bolstering tree equity (Portland Parks and Recreation, 2018). Additionally, the City of Portland tracks the geographical location of street trees and overlays this data with race and socioeconomic data using GIS software to identify priority areas. The city produces annual urban forest progress reports that highlight accomplishments and guide action*

plans for following years. Portland also updates their implementation strategies within the urban forest action plan on an annual basis based on progress, priorities, and community feedback. Since Portland has a strong community-driven volunteer program, the city is able to expand their tree surveying capacity. This allows the city to develop neighborhood-level canopy goals, especially for low canopy areas.



**RECOMMENDATION 2: ESTABLISH AND NURTURE LONG-TERM PARTNERSHIPS WITH NON-CITY ORGANIZATIONS AND STAKEHOLDERS WHO CAN HELP SUPPORT AND IMPLEMENT THE CITY VISION AND MANAGEMENT PLAN**

A 2013 study summarizes the importance of partnerships in achieving urban tree canopy goals well by stating, “Independent action is inadequate: no agency, organization, single landowner or business has sufficient funds or land to achieve a city’s [urban tree canopy] goal. Coordination and collaboration are needed and depend upon identifying common or complementary interests, categories of programs, or areas for action” (Locke et al., 2013). This also applies to achieving equity and climate resilience — no one sector can remedy and tackle these issues alone. Our team identified three pertinent areas within long-term partnerships that appear as promising practices: (i) build a network of diverse partnerships, (ii) consider non-traditional/innovative partnerships to collaborate towards common goals, and (iii) explore partnerships that support tree planting and innovative funding opportunities.

**Strategy 1: Build a network of diverse partnerships** - Achieving an equitable tree canopy in Denver will require a vast, diverse network of partnerships. This network should include various people and organizations, such as community members, non-profits, government agencies, and the private sector.

**Implementation in Practice: Boise, ID**  
The Treasure Valley Canopy Network (TVCN) located in Boise, Idaho is a strong example of collaborative partnerships that enhance urban forestry efforts and secure diverse funding sources. The TVCN is comprised of

*various public, private, and nonprofit organizations that look to bolster tree canopy through a variety of initiatives. A few of TVCN’s projects include the City of Trees Challenge, Canopy Continuum, and the Urban Wood Network. The City of Trees Challenge integrates a multitude of industry partners, such as nurseries, arborists, supply companies, landscape associations, and more to raise community awareness and strengthen regional urban forest initiatives. Canopy Continuum consists of a partnership between TVCN and Portland State University to monitor air quality, urban heat measurements, and examines the links between environment and public health to guide urban forestry strategies. Lastly, the Urban Wood Network is a program designed to maximize the value of the urban forest by developing a local urban timber industry through effective multi-sectoral partnerships.*





**Strategy 2: Consider non-traditional / innovative partnerships to collaborate towards common goals** - Increasing tree canopy necessitates a multifaceted approach. Both non-profit tree organizations and city governments shared promising partnerships they established with non-traditional partners, such as partnering with affordable housing and multi-family complexes to address the barrier to obtaining trees in high renterhip properties. The City and County could explore opportunities to align urban tree canopy goals with affordable housing developments to work towards more equitable canopy distribution and access to tree cover. Additionally, some cities spoke about partnering with local businesses who were interested in supporting tree planting efforts — such as the City of Cincinnati partnering with a local brewery to plant trees in their neighborhood. This not only provides additional funding, but also draws attention to the importance of trees within communities. In Denver, this could look like partnerships with culturally robust and community relevant businesses or nonprofits addressing environmental injustices.

**Implementation in Practice : Seattle, WA**

*The Seattle Housing Authority partners with the City of Seattle to encourage more trees within affordable housing developments. The partnership also helps facilitate conversations with the residents about the benefits of urban trees through tree walks and youth group activities. Through this partnership, both parties achieve their common goals of addressing urban tree inequity and bringing trees and their benefits to people who need it the most.*

**Strategy 3: Explore partnerships that support tree planting and innovative funding opportunities** - During our research and interviews with stakeholders, there were examples of partnerships across all sectors to increase tree plantings. In the City of Cincinnati, the local government partnered with the non-profit Groundwork around tree plantings to reach Groundwork’s main goal (addressing environmental injustice) while also addressing the city’s main goal (reaching their sustainability plan goals). Potential partnerships in Denver could take shape in various ways. One example of an optimized partnership could be with Xcel Energy. The City of Grand Junction has already received a \$4,000 grant from the Xcel Foundation for tree planting in 2021 (City of Grand Junction, 2021). The City and County of Denver could explore if a similar partnership is feasible, especially around increasing tree planting in the inverted L neighborhoods.

**Implementation in Practice : Boise , ID**

*The Shade Tree Project is a partnership between TVCN, Idaho Power Company, Idaho Department of Lands, and the Arbor Day Foundation’s Energy Saving Trees program that is designed to encourage shade tree plantings for energy conservation. This program provides free shade trees to Idaho Power Company customers and includes a tool that estimates energy savings based on where the tree could potentially be planted. To date, the program has given out over 13,000 shade trees on residential properties throughout the Treasure Valley in Idaho (Treasure Valley Canopy Network 2021).*

**RECOMMENDATION 3: ESTABLISH AND STRENGTHEN COMMUNITY ENGAGEMENT & STEWARDSHIP OPPORTUNITIES**

A major theme that emerged in stakeholder interviews is that much more must be done to adequately engage and include communities in the planning, design, and implementation of urban forest initiatives. This can help ensure that decision makers provide services and solutions that are better suited to people’s needs, which is critical among residents who lack political, economic, and social capital to engage in the same ways that others can. When given the opportunity to have input into decisions that affect their daily lives, community members are more committed and empowered to get involved in the difficult work of making their community better after the planning process ends (Lachapelle, 2008).

The following section outlines four key strategies within this area: (i) operationalize best practices for engaging communities from underserved neighborhoods, (ii) use a multi-pronged approach to community engagement in the development of an urban forest management plan, (iii) continue to develop and support equitable pathways to green careers, and (iv) cultivate relationships with private property owners to promote planting and stewardship in under-resourced neighborhoods. These recommendations heavily draw from stakeholder interviews and the recently passed legislation House Bill 21-1266 that codified best practices for engaging disproportionately impacted communities in Colorado.

**Strategy 1: Operationalize best practices for engaging communities from underserved neighborhoods** - The vast majority of stakeholders indicated that healthy, thriving, and equitable communities require engaged community members. But due to the uneven distribution of power, resources, and bandwidth,

not all communities have access to the same opportunities for public participation as others.

Charting a path towards effective community engagement means that decision makers must first work to overcome procedural barriers to engagement. For that reason, it is imperative that these best practices transcend barriers related to power, feelings of distrust, language, and competing demands for time and attention. These best practices include:

- Acknowledge the inequity of power and resources that underserved communities hold in Denver and commit to redress harmful government processes of the past.
- Establish strong working principles to help prevent uneven power conflicts when engaging with stakeholders, such as the Jemez Principles for Democratic Organizing (please refer to **Table 1**).

**Table 1:** Jemez Principles for Democratic Organizing

***Jemez Principles for Democratic Organizing***

*On December 6-8, 1996, six "Jemez Principles" for Democratic Organizing were adopted by participants of the "Working Group Meeting on Globalization and Trade" in Jemez, New Mexico. The meeting was hosted by the Southwest Network for Environmental and Economic Justice with the intention of establishing common*

- 1. Be Inclusive**
- 2. Emphasis on Bottom-up Organizing**
- 3. Let People Speak for Themselves**
- 4. Work Together in Solidarity and Mutuality**
- 5. Build Just Relationships Among Ourselves**
- 6. Commitment to Self-Transformation**

*understandings between participants from different cultures, politics and organizations. These principles are a pillar of environmental justice that lay the foundation for successful collaboration and movement-building.*

http://www.cinet.org/jemez.pdf

- Share power by co-creating solutions based on community needs.
- Engage with communities through open and transparent processes that clearly articulate how public input will inform decision making.
- Compensate community members for their time and participation in committees, the development of urban forest management plans or other large-scale local government urban forest plans.
- Use a variety of methods of outreach and ways to promote urban forestry action, including disseminating plain-language information in non-traditional places such as schools, clinics, local stores, civic groups, community-based groups, and other local services.
- Translate public-facing physical and digital outreach materials and provide interpretation during public meetings in the relevant language of the community.
- Schedule public engagement opportunities at various times of the day and days of the week, including one weekend time and one evening time. Provide several methods for communities to give input, such as in-person and virtual meetings, online comment portals or email.

#### ***Implementation in Practice: Austin , TX***

*The Austin Climate Equity Plan was developed in September 2021 with support from the City's Equity Office to ensure Austin meets the goals in the 2015 Climate Action Plan (CAP) in an equitable manner. The city piloted the **Community Climate Ambassador Program** as a way to reach the city's historically underrepresented groups whose voices were previously left out of citywide plans (City of Austin, 2020). The program sought out applicants from underrepresented communities who would be*

*paid to talk to their friends and neighbors about climate-related issues in order to identify challenges, barriers, and opportunities to engage in climate action work. To create a safe space where participants could feel comfortable openly expressing their opinions, meetings and interviews were facilitated by the ambassadors without city staff present. Through these meetings and interviews, the ambassadors identified key community priorities that are now **reflected in the goals and actions of the Equity Plan.***

**Strategy 2: Use a multi-pronged approach to community engagement in the development of an urban forest management plan** - Cities that are well underway with incorporating equity into their planning processes underscored the importance of employing new tools and strategies to engage community members who have been traditionally left out of planning decisions. During interviews, non-city stakeholders overwhelmingly reported that conventional approaches have been limited in their effectiveness at reaching broad and diverse community members.

**Action: Adopt creative engagement actions that are responsive to the diverse needs of the community** - This could include the following:

- Contract a third party cultural equity facilitator to build psychological safety and help communities engage openly and meaningfully.
- Advertise online surveys on print materials at public places and on social media in the relevant languages of the community.
- Partner with community artists to create creative placemaking spaces.



- Host pop-up events in different neighborhoods to meet communities where they are.
- Hold community focus groups to support a psychologically safe, smaller group setting that may enhance participation.



Image source: SLC Public Lands Master Plan Engagement Window #1 Summary Report

#### **Implementation in Practice: Salt Lake City, UT**

*Salt Lake City has foregrounded equity as a core value in its community-driven “Reimagine Nature” Public Lands Master Plan that includes its urban forest. Slated to be released at the end of 2021, the plan includes three community engagement windows in its development process. Over 7,000 “intercept interviews” were conducted by the city in the second community engagement window by way of ice cream and food truck pop-up events and snack bike trailers stationed along trail sides. The city also hosted focus groups with community councils that provide services to underserved populations. The city reported that intercept interviews were hugely successful at reaching more diverse respondents compared to an initial online survey that reached respondents who were overwhelmingly white.*

**Strategy 3: Continue to develop and support equitable pathways to green careers** - With the Denver Office of Climate Action, Sustainability and Resiliency’s recent [\\$2.1 million investment](#) in creating green careers in clean energy, there is an opportunity for the city to continue developing a green workforce that extends beyond the clean energy industry. Hiring local talent for tree maintenance and other urban forest work presents an opportunity to advance equity and create living-wage jobs for underserved communities who often face barriers to employment. It can also help diversify the urban forest workforce, since BIPOC are severely underrepresented in the field (American Forests, 2021). Research also shows that job training and mentorship in urban forestry bolster economies, improve health and wellbeing, and can create a new wave of environmental stewards who otherwise may not have had the exposure to this field (Vibrant Cities Task Force, 2011). During interviews, cities shared that workforce development programs can fill gaps in maintenance needs such as watering and, in some cases, pruning city trees. The City and County of Denver could continue to expand their investment and opportunities for equitable pathways to green careers, specifically related to urban forestry.

**Action: Support local organizations that already have workforce training or are in the process of developing new programs** - *We recommend that the City and County of Denver continue to support local organizations that already have workforce training or are in the process of developing new programs related to urban forestry. Denver could explore how to best collaborate with these organizations to maximize the partnership and determine what the partnership would look like in practice. Furthermore, the city could explore the feasibility of utilizing participants of these programs into city tree maintenance work.*

**Implementation in Practice: Detroit, MI**

*The Greening of Detroit has a certified Federal Apprenticeship Program through the U.S. Department of Labor. The nonprofit offers two training programs: Certified Landscape Technician and Certified Tree Artisan. The program welcomes individuals with barriers to entry into the workforce including felony convictions. The Greening of Detroit also has a Green Corps summer youth program that exposes urban youth to careers related to science and urban forestry. The youth corps is involved in watering trees planted by the organization as well as other enrichment activities such as standardized test preparation and financial literacy.*

**Strategy 4: Cultivate relationships with private property owners to promote planting and stewardship in under-resourced neighborhoods-**

Denver's local government manages between 13 to 15 percent of the city's canopy and the rest falls on the shoulders of private property owners (Sach, 2021). Since a substantial percentage of plantable space for urban trees is located on private property, promoting tree planting and stewardship among property owners is crucial to the future of the city's urban forest.

**Action: Partner with local community organizations to understand the challenges, values, needs, and opportunities related to the urban forest across Denver -**

Denver could deepen partnerships with local, community-based organizations as a first step to start building trust and rapport with private property owners. Partnering with local organizations with strong existing social ties can provide an "in" with the community and a basis for understanding community values and needs.

Various stakeholders noted in their interviews that an increase in time and resources for tree canopy education can help cultivate a sense of collective pride and ownership of neighborhood tree canopy. Furthermore, Denver is uniquely positioned to leverage the resources from the Climate Protection Fund to build climate resilience that is community-led and helps strengthen the economic foundation of those communities. Ultimately, this can help Denver build a new type of mutually beneficial relationship with the community and help alleviate possible concerns with participating in local government initiatives.

**Implementation in Practice: Tacoma, WA**

*The Tacoma Mall neighborhood in Tacoma, Washington has one of the lowest tree canopy densities in the city. The City of Tacoma, in partnership with The Nature Conservancy of Washington, is conducting a long-term monitoring project around the public health impacts of increased green infrastructure in the Mall neighborhood using a combination of air quality and temperature sensors and resident surveys. Additionally, the Urban Forestry Department partnered with the city's arts office to develop two public art installations in the Mall neighborhood as a way to engage the community in greening projects and tree planting in the area. A panel of community members will choose from local artists who will then create unique artwork for the initiative.*



Image source: Tacoma Murals Project

**Action: Enhance at-risk tree maintenance program and free tree giveaways by building trust with communities** - In 2021, the Office of the City Forester established the Denver Forestry Neighborhood Initiative for the purpose of pruning or removing trees that pose a risk to public safety. It also functions to plant trees in the public right-of-way, as space allows. Property owners who are eligible for a free tree or for tree maintenance receive mail correspondence from the Office of the City Forester that details the service they qualify for and how to claim them. But a recent article from a local news source shows that the office only gets a 40 percent response rate (Sachs, 2021). While we acknowledge that this is the first year of the program, we recommend that Denver prioritize trust-building initiatives to increase that response rate. By doing this, Denver can ensure that all community members can benefit from these programs, not just the well-resourced communities who may feel most comfortable interacting with the government.

#### *Moving at the Speed of Trust*

*Cities including Salt Lake City and Detroit cited instances of residents from underserved communities declining tree maintenance assistance and sometimes even refusing city-sponsored free trees. Some interviewees attributed this to a lack of education on the benefits of trees and the absence of established trust between local government and residents.*

Our research and interviews suggest that city initiatives that encompass maintenance for at-risk trees and free tree giveaways may only find success after decision makers establish trust with private property owners and have a positive presence in the community. While not an exhaustive list, the actions outlined in this section could help Denver build a strong foundation of trust with underserved communities.



Image source: Greening of Detroit



Our team set out to answer two questions that guided the creation of this toolkit: What promising practices are other cities using to support more equitable urban forestry programs? How can interagency and external collaboration strengthen and clarify the roles and responsibilities involved in urban forestry programs? Based on our extensive literature review and 53 stakeholder interviews, we developed these recommendations that are summarized below.

We foresee many positive outcomes from implementing the recommendations listed within this toolkit. First, urban forestry is complex and looks different in every city – there are a lot of organizations and agencies involved, which makes breaking down silos important. With improved collaboration between city agencies and external partners, we hope to see silos around urban forestry broken down through more effective communication and an increase in overall engagement from city agencies and the community at large. Second, Colorado just experienced its fourth hottest summer on record in 2021 and current climate models project higher frequencies of days over 95°F by the turn of the century (Sakas, 2021). If we hope to make streets safe and usable during these extreme heat events, we need to consider incorporating nature-based cooling that can reduce detrimental public health impacts. Ideally, urban trees would be prioritized and seen as valuable and important infrastructure that enhance the city's climate resilience, especially considering the roles of trees in extreme heat abatement, air quality, carbon sequestration, stormwater management, and energy conservation. Some of the promising initiatives we saw in other cities were increasing tree canopy along transit corridors,



utilizing urban trees in green infrastructure, and linking climate policies to urban forestry projects. Lastly, in the long-term we hope to see a strong network of diverse stakeholders that support sustainable and equitable urban forestry practices. Equitable urban forestry initiatives require sharing power with community members who lack it, dedicating adequate time and funding to community education and engagement, and allocating sufficient resources to properly care for trees.

Denver has an opportunity to set the bar high as a national model for community-based, equitable climate resilience. With Denver's recent planning efforts, the passage of the Parks Legacy Fund and the Climate Protection Fund, and the local and national renewed focus on the urban forest, the time is ripe for action. The planning Denver does today will lead to a greener, more equitable tomorrow.

Recommendations	Strategies	Actions
Develop and Support a Citywide Vision for an Equitable and Resilient Urban Forest	Develop a comprehensive urban forest vision and management plan or strategy	Explore the option to hire an external facilitator or consultant to align a collective vision between the community and the city.
	Create a task force / coalition to support the development and implementation of an equitable and community-based vision	Ensure community seats on task force / coalition.
	Create a comprehensive strategy to address tree maintenance needs and funding	Explore implementing block pruning.
		Strengthen and grow local tree organization partnerships.
		Assess current maintenance funding streams and conduct a financial analysis based on the goals of a comprehensive management plan.
	Develop and manage urban forestry measures that support community-based equity and resilience	Establish neighborhood-level canopy goals, especially for low-canopy areas.
		Use existing and/or develop tools to support community-based urban forestry.
Report on the progress of the urban forest plan's actions and goals in a regular, transparent, and inclusive manner.		
Establish and Nurture Long-Term Partnerships with Non-City Organizations and Stakeholders Who Can Help Support and Implement the City Vision and Management Plan	Build a network of diverse partnerships	Include various people and organizations, such as community members, non-profits, government agencies, and the private sector.
	Consider non-traditional / innovative partnerships to collaborate towards common goals	Partnering with local businesses, culturally robust organizations, affordable housing units, multifamily properties, etc.
	Explore partnerships that support tree planting and innovative funding opportunities	Consider partnership with Xcel Foundation / Energy, etc.
Establish and Strengthen Community Engagement &	Operationalize best practices for engaging communities from underserved neighborhoods	Acknowledge the inequity of power and resources that underserved communities hold in Denver and commit to redress harmful government processes of the past.
Stewardship Opportunities		Establish strong working principles to help prevent uneven power conflicts when engaging with stakeholders, such as the Jemez Principles for Democratic Organizing.
		Share power by co-creating solutions based on community needs.
		Engage with communities through open and transparent processes that clearly articulate how public input will inform decision making.
		Compensate community members for their time and participation in committees, the development of urban forest management plans or other large-scale local government urban forest plans.
		Use a variety of methods of outreach and ways to promote urban forestry action, including disseminating plain-language information in non-traditional places such as schools, clinics, local stores, civic groups, community-based groups, and other local services.
		Translate public-facing physical and digital outreach materials and provide interpretation during public meetings in the relevant language of the community.
		Schedule public engagement opportunities at various times of the day and days of the week, including one weekend time and one evening time. Provide several methods for communities to give input, such as in-person and virtual meetings, online comment portals or email.
	Use a multi-pronged approach to community engagement in the development of an urban forest management plan	Contract a third party cultural equity facilitator to build psychological safety and help communities engage openly and meaningfully.
		Advertise online surveys on print materials at public places and on social media in the relevant languages of the community.
		Partner with community artists to create creative placemaking spaces.
Continue to develop and support equitable pathways to green careers	Host pop-up events in different neighborhoods to meet communities where they are.	
	Hold community focus groups to support a psychologically safe, smaller group setting that may enhance participation.	
Cultivate relationships with private property owners to promote planting and stewardship in under-resourced neighborhoods	Support local organizations that already have workforce training or are in the process of developing new programs	
	Partner with local community organizations to understand the challenges, values, needs, and opportunities related to the urban forest across Denver.	
		Enhance at-risk tree maintenance programs and free tree giveaways by building trust with communities.

### ***Further Research and Emerging Innovations***

There are a number of gaps in our knowledge around urban forestry at the intersection of equity and climate resilience that would benefit from further research. We anticipate these gaps as potential barriers to reaching desired outcomes, and also important areas of research that we were unable to fully address within our work due to time constraints and limited literature on some research topics. Additionally, a number of promising innovations related to climate resilience and green infrastructure were identified throughout our research. Our team determined that they were not within the scope of our final recommendations, but some innovations are integrated into the list below. Further research topics and notable emerging innovations include:

#### ***Explore the Potential of Transitioning to Municipal Maintenance of Right-of-Way Tree***

In 2016, San Francisco passed [Proposition E](#) which allocated money from the city's general fund to create a street tree maintenance program. According to our research, this is one of the only recent examples of a city transitioning right-of-way tree maintenance. We were interested in learning more about San Francisco's process from initiation to completion, including a [Street Tree Financing Study](#) that helped assess the feasibility of this funded program. For the City and County of Denver, we believe this is a strategy worth exploring, especially considering tree maintenance is a large financial barrier for underserved communities. Since adjacent property owners are responsible for maintaining trees and sidewalks in the public right-of-way, private property owners may encounter significant costs related to tree root growth causing damage to sidewalks and other required tree maintenance. During this research, the city could also consider whether providing tree maintenance contracts for local, small businesses promotes economic activity and supports small businesses.

#### ***Green Gentrification***

Green gentrification was repeatedly brought up in our research and acknowledged as a major problem by many of our interviewees. No stakeholders interviewed had a specific solution and few were in the preliminary stages of developing policies and other initiatives to address the issue. A combination of anti-displacement tools and equitable green development practices, such as tenant protections and inclusionary zoning, are starting points for developing effective policies. Newly developed toolkits such as [Greening in Place](#) and [Policy and Planning Tools for Urban Green Justice](#) are also useful guides to strategy development (Gibbons et al., 2020; Oscilowicz et al., 2021). While literature around effectively mitigating gentrification is limited, some researchers note that the solution lies in involving community members in every stage of the planning and implementation of new green infrastructure projects (Hart et al., 2019). Even so, approaches to mitigating the effects of green gentrification vary depending on geographical context, and there is no one size fits all solution. Further research is needed to aid practitioners in the process of initiating green projects without resulting in the displacement of the very people they are trying to serve.

#### ***Complete Streets and Planting Along Transit Corridors***

Researchers suggest that tree planting initiatives should be concentrated along public transit corridors to provide cooling relief for transit users (Georgetown Climate Centers, 2021). Many individuals who rely on public transit also reside in neighborhoods that lack adequate tree canopy and are vulnerable to heat-related illnesses. To address this, trees can thoughtfully be integrated into the streetscape through Complete Streets designs. Complete streets are "streets designed and operated to enable safe use and support mobility for all users" (U.S. Department of Transportation, n.d.). This strategy can improve pedestrian safety by providing shade along pedestrian and biking corridors. This is critical in communities with high transit ridership to ensure people can safely travel to bus stops even during extreme heat events. Denver has recently updated their Complete Streets guidelines and could continue to build off these designs.



This makes it challenging to quantify true progress in achieving the procedural and recognitional dimensions of equity that are also critically important in advancing tree equity. Furthermore, our interviews and research suggest that empowering communities to shape metrics related to equity could be a way to encourage more engagement, give them the opportunity to define what success looks like, and ultimately get community-buy in for urban forest projects. We recommend that the city continue to explore the development of equity metrics and effective accountability measures to ensure they meet objectives related to equity.

#### *Carbon Credits*

Several interviewed stakeholders referred to carbon credit programs as an important tool to offset carbon emissions and finance urban tree efforts. A number of cities specifically spoke about City Forest Credits, a nonprofit carbon registry that manages carbon and impact standards for metropolitan areas in the U.S., although most were only in the beginning stages of integrating this strategy into their city's work. We recognize that carbon credits are a growing field, and if Denver is not already pursuing a similar approach, City Forest Credits could be a beneficial program to further explore, especially considering its focus on human health, social equity, and environmental impact standards. Moreover, a carbon credit program could secure diverse funding sources to support urban forest initiatives. Some cities that are using the City Forest Credits verification process include Boise, Austin, and King County in the Puget Sound region.

#### Stormwater Management

Street trees can play a significant role in stormwater management and may complement the city's strategy for green infrastructure. Some cities, such as the Puget Sound region, have invested in developing interdisciplinary handbooks that highlight the benefits of urban trees, strategies for linking UTC to stormwater management, and opportunities for interagency collaboration (Better Ground, 2021). For drought-struck areas, proper stormwater management can help communities meet their future water needs.

Moreover, stormwater management is linked to social inequities. Stormwater contamination and mismanagement disproportionately impacts underserved communities due to the high percentage of impervious surfaces and pollution in these areas. If stormwater cannot be captured or diverted, it results in flooding. If there is a lack of green space or adequate infrastructure, the stormwater is left contaminated and it may result in damage to electricity, property, restrict access to public services, and expose residents to harmful toxins and bacteria (Aboelata and Yañez, 2021). As such, we recommend exploring the potential for coupling urban trees with other understory vegetation and amended soil to reduce stormwater runoff and enhance water quality (Better Ground, 2021).

#### Suspended Pavement Systems

To enhance the health and growth of urban trees, Denver could explore the use of suspended pavement systems. Suspended pavement systems, such as Silva Cells, increase the amount of available soil volume by constructing underground bioretention systems within constricted urban spaces. The open interior design optimizes the spread of root systems and water infiltration. The greater the root system, the larger and healthier the tree can grow, thus enhancing interception and evapotranspiration as well. Some suspended pavement systems can further improve water quality by incorporating a biofiltration system (Hunter, 2021). While suspended pavement systems are costly, many cities have recognized the value in investing in this infrastructure.

#### Equity Performance Metrics/Indicators

Our research and stakeholder interviews revealed that equity metrics for urban forestry have yet to be fully understood and adopted in the field. While many cities already track the (in)equitable distribution of UTC, other metrics to assess community leadership opportunities or social and economic impacts related to urban forest efforts are lacking.

### ***Research Challenges and Limitations***

Our research process presented various challenges that included the project timeline, our team's capacity, and scheduling interviews. Reaching interview candidates and scheduling meetings during the summer months was challenging and this may have contributed to the difference in stakeholders interviewed in each city. Interviews ranged from 30 minutes to one hour. Due to this, interviewees were not always asked the same set of questions. In shorter interviews, for example, our team prioritized the stakeholder's focus area instead of covering the issues broadly. It should also be noted that each interview varied based on the stakeholder's role and the target city. Furthermore, some of our questions were intentionally designed to gain additional insights on best-in-class implementation techniques for specific programs, partnerships, and policies. As a result, the data presented in the findings and results section does not accurately represent all of the concerns or promising practices shared by interviewed participants. Instead, we note the frequency count of each referenced theme.

### ***Challenges and Barriers in Urban Forest Management***

To improve the outcomes of urban forest initiatives, the team identified common challenges and barriers in urban forest management. A few key themes are highlighted below.

#### ***Funding & Maintenance***

Budget cuts, changes in leadership, and shifting priorities may impact funding availability. City-wide tree maintenance requires substantial funding and changes in funding can negatively impact the overall health of the urban forest by reducing the funding available for routine maintenance such as hazardous tree removal.

Maintenance responsibilities for urban trees often vary by where the trees are located (e.g., public property, private property, etc.) as is the ability and expertise of people responsible for maintaining urban trees. In many municipalities, adjacent property owners are responsible for maintaining trees and sidewalks in the public right-of-way (ROW). However, this can pose barriers for urban residents due to the additional financial burden lower income property owners may face with expensive maintenance costs. The path forward must both alleviate these financial burdens as a matter of equity and ensure that trees still get the care they need for their survival.

#### ***Equity-Focused Efforts & Tracking Progress through Metrics***

Embedding equity into urban forestry practices is a relatively new principle in the field. While various cities are charting a path towards centering equity in urban forestry, many practices and initiatives are in the planning vs. implementation phase. Stakeholders indicated that achieving true equity goes beyond putting words on a paper and implementing the strategies and actions that have the potential to change the living conditions of those on the margins of society.

Additionally, standardized equity metrics that fully capture the impact of local urban forestry efforts are absent from the majority of cities. Metrics tracking the (in)equitable distribution of UTC are primarily used by cities, but other metrics to assess community leadership opportunities or social and economic impacts are lacking. This makes it challenging to quantify true progress in achieving the procedural and recognition dimensions of equity.

#### Enforcement & Accountability

Many cities have urban forest management plans and tree protection ordinances, but there are barriers to implementation and enforcement. This may include a lack of staff, funding for staff, conflicting interests within city agencies, or no accountability measures if UTC goals or projects are not achieved. There is also often a lack of enforcement on the regulations requiring tree care for private citizens and property owners. This lack of enforcement is often because of limited resources to help lower income property owners, potential political pushback, and other socio-ecological factors that can reduce the overall health of the urban forest.

#### Climate Change

Rising temperatures linked to climate change will impact urban forestry management strategies and how cities approach their current and future tree inventory. While many cities aim to increase biodiversity and resilience within their urban forests, they also must prepare for drought conditions, invasive pests, and extreme weather events.

#### Stewardship & Engagement

Stewardship and care for urban trees is a shared responsibility. Although cities and nonprofit organizations play an important role in urban forest management, community members and property owners are also pivotal in maintaining the health of the urban forest.

However, there is a lack of widespread educational awareness about the benefits of trees, risk factors (e.g., falling trees), and maintenance requirements among community members. Without having this foundation of understanding, community members may be less likely to be engaged or show support for urban forestry initiatives. There are also few models of (and rarely funding for) compensating community members to maintain the urban forest, especially in areas of public interest (e.g., the public right-of-way, not private property).

#### Silos & Lack of Collective Vision

Municipal governments and partners often face competing responsibilities and priorities for managing city infrastructure, which often leads to a lack of a shared vision and challenges coordinating resources to manage the urban forest.

#### Available Planting Space

Not all available land in cities is suitable for trees. For many U.S. cities, physical space available for trees and/or soil health may be a challenge. The available planting area may be concentrated on private property, which poses another challenge for government agencies around tree planting and maintenance strategies. The soil may not be suitable for growing trees. Both cases present challenges to increasing tree canopy in areas that need it most.

#### Green Gentrification

New research shows that greening projects in historically underserved communities can be associated with gentrification. The rising cost of living as a result of greening can displace long-time residents, despite initial intentions to improve the built environment for the benefit of current residents (Jelks et al. 2021).



### ***Promising Programs and Practices in Urban Forestry Management***

Based on the team's findings from the literature review, we designed a list of promising programs practices within urban forest management to guide the qualitative interviews. Key points are outlined below.

#### *Multi-Sectoral Partnerships*

Interagency coordination and external collaboration are essential components to effectively managing the urban forest. Developing partnerships between NGOs, community groups, and additional stakeholders can enhance urban forestry efforts through collaborative tree planting initiatives. Hosting regular meetings, seminars, workshops, and additional coordination techniques can reduce overlap between external entities. Planners, politicians, and relevant stakeholders should encourage knowledge sharing between departments and partake in collaborative training events to strengthen relationships between agencies. Urban forestry and climate equity should be integrated in cross-sectoral planning efforts to ensure longevity and resilience.

#### *Assess UTC Distribution & Spatial Connections*

A common promising practice for advancing equity within a city or town's urban forestry program is collecting data to identify: (i) if there is a need for increased tree canopy (e.g., identifying the disproportionate concentration of environmental burdens vs. amenities in communities), (ii) if so, where the need for increased tree canopy is, and (iii) the severity of the need (e.g., a neighborhood with 7% coverage would potentially be at a higher severity need of tree coverage than a neighborhood with 15%).

#### *Urban Forestry Commission/Task Force*

Establishing an Urban Forestry Committee or Advisory Council could help guide decision making, planning, advocacy, and outreach efforts. Numerous cities have developed Urban Forestry Councils composed of diverse knowledge experts, social justice groups, and community members that promote interdisciplinary approaches to urban forestry governance.

#### *Demonstrate Coordination for Roles & Responsibilities in Urban Forest Management*

Clearly identifying the various roles and responsibilities related to urban forest management improves coordination between agencies, NGOs, and other organizations to maximize efficiency and ensure that efforts are complementary rather than conflicting.

#### *Social Equity in Urban Resilience Planning Framework*

While cities are increasing their efforts to enhance resiliency, critics argue that the urban resilience agenda inadequately addresses social equity and benefits remain inequitable (Meera et. al., 2019). According to research, incorporating an equity framework into urban forest projects can be one way to improve equitable outcomes. An equity framework can be used to critically analyze the intended and unintended impacts of urban forest efforts and help departments create solutions that address present and future disparities. One of the frameworks that we used for the purpose of this project is the Social Equity in Urban Resilience Planning framework that was designed to assess urban resilience planning efforts and the inclusion of social equity considerations, namely the distributional, recognitional, and procedural dimensions of equity (Meerow et al., 2019). Urban forest departments can use frameworks like this one to ensure they are holistically addressing disparities and achieving equitable outcomes.

#### *Develop Equitable Pathways to Green Careers*

Maintaining and growing a city's urban forest is an ongoing process that requires a variety of skilled workers (urban forester(s), maintenance crews, etc.). Hiring local talent for tree maintenance and urban forestry work presents an opportunity for cities to involve local community members in the creation of sustainable green jobs related to urban forestry, from tree planting to routine maintenance.

#### *Interagency Collaboration Towards Common Goals*

Co-developing a collective vision for urban forest related plans and projects can enhance the outcomes of urban forest initiatives. When multi-sectoral government agencies collaborate towards common goals (e.g., co-creating solutions for tree related sidewalk damage or co-developing tree related codes and ordinances) urban forest efforts can become more coordinated, and conflicts can potentially be avoided.

#### *Comprehensive Climate Resilience Planning*

Integrating urban forest efforts into comprehensive climate resilience planning (e.g., stormwater management, heat abatement strategies) can help cities achieve UTC goals. Additionally, co-creating plans with multi-sectoral agencies can improve coordination and collaboration in urban forest management practices.

#### *Urban Forestry Policies & Ordinances*

Tree preservation ordinances can provide insight on how a municipality values the social, economic, and ecosystem services associated with the urban forest (Lavy and Hagelman, 2019). By integrating tree related ordinance regulations and standards into the city code, a municipality can balance the pace of development with UTC goals.

#### *Equity Performance Metrics/Indicators*

Establishing equity performance metrics and or indicators can help track the long-term success of projects. A promising practice is to link tree canopy goals to current equity goals in other community plans, such as utilizing tree canopy to assist in energy-related equity goals (Daley, 2020).



### *Promising Practices from Target Cities*

Our interviewees emphasized the importance of building and maintaining long-term partnerships with external stakeholders. Some cities are developing networks of partnerships that span across government agencies, non-profit organizations, and private sectors to strengthen urban forest initiatives. Additionally, cities are establishing urban forestry commissions, councils, or task forces to bolster coordination, collaboration, and advocacy for the urban forest. These groups can bring together relevant community stakeholders that can guide strategic design, inform policy, and raise awareness for funding purposes.

To balance the pace of development with UTC goals, many interviewees noted the significance of tree-related ordinances and protections. Some cities are co-creating ordinances with additional interagency groups, such as planning, sustainability, transportation, or utility bureaus. Several interviewed cities hire external consultants/facilitators to align equity and/or sustainability goals. This allows cities to balance power between different agencies when developing a citywide vision for the urban forest. Moreover, having an equity specialist can ensure that policies and strategies produce beneficial outcomes for historically disadvantaged communities.

Several interviewed cities have comprehensive urban forest management plans that establish quantifiable targets on a neighborhood scale. Some cities are producing annual reports that demonstrate community-level progress. In addition, cities are integrating urban forest initiatives within other city plans, especially in relation to climate resilience. Finally, a few cities are adopting formal social equity frameworks designed for policy and strategies. This practice allows city leaders to orient their plans around equity rather than having it be an afterthought. Refer to **Figure 3** to review the frequency distribution of referenced promising practices from interviewed cities.

### *Promising Programs from Target Cities*

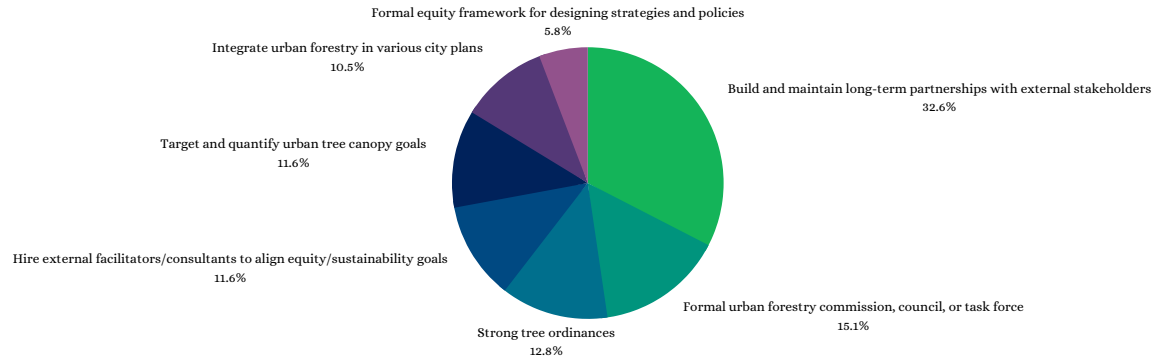
Nearly all of our interviewees cited the benefits of developing long-term partnerships with NGOs to enhance equity and city-wide UTC. Establishing partnerships with external entities allowed city leaders to broaden their impact and enhance relationship building within historically disadvantaged communities. Developing interagency collaborative projects promoted coordination and a breakdown of silos within urban forest management. Additionally, these projects allow different agencies to address conflicting interests and design strategies to overcome challenges, such as sidewalk management, planting along transit corridors, or co-creating ordinances.

Many cities are developing education programs that teach residents how to care for urban trees, such as pruning techniques. Interviewees cited that free tree giveaways allow the city to enhance the equitable distribution of UTC, especially if they target areas that lack adequate canopy. However, some cities noted that free tree giveaways should be coupled with educational materials to ensure the trees survive. Moreover, some interviewees recommended culturally-competent techniques to improve community engagement in low canopy areas.

Additionally, some interviewees noted the benefits of partnering with NGOs to increase the effectiveness of tree giveaways, particularly when trust and rapport is required. Other cities utilize their partnerships with NGOs to provide maintenance assistance for the first two to three years after the tree is planted. Many urban foresters stated the value of cities being responsible for the maintenance of street trees rather than placing the burden on adjacent property owners. Property owners may be unaware of the responsibility that comes with trees, or they may not know how to properly care for them. Furthermore, socioeconomically disadvantaged communities may not be inclined to plant trees if they have to cover the cost of removing at-risk trees or associated sidewalk damage. When the city maintains trees in the right-of-way, they can strategically create a cycle of pruning and watering to enhance the longevity of urban trees.

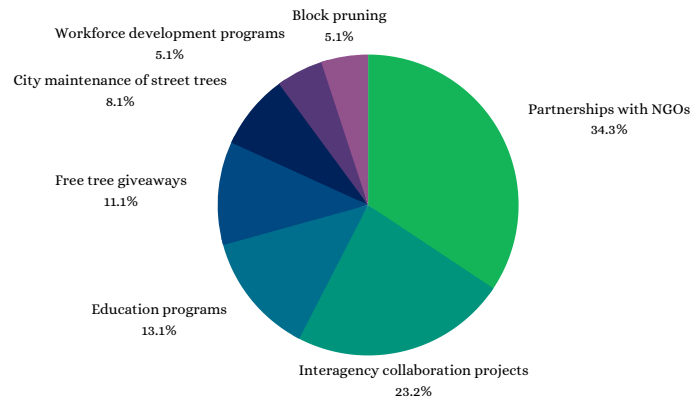


*Note: While we share the quantitative outcomes of the interviews, many of the interviews were limited by time. As a result, the highlighted promising practices are by no means representative of the only promising practices from interviewed cities.*



**Figure 3.** Frequency distribution of cited promising practices from interviews.

Finally, some cities are taking a holistic approach to increasing equity and UTC by creating workforce development programs. These programs allow residents to gain experience in green careers while promoting local economic activity. A few cities specifically target BIPOC or socioeconomically disadvantaged groups for workforce development programs. This strategy can create community leaders that advocate for urban forest initiatives in areas that lack adequate canopy and address barriers to employment that these communities often face. Refer to **Figure 4** to review the frequency distribution of cited promising programs from interviews.



**Figure 4.** Frequency distribution of cited promising programs from interviews.

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# AGENCY INTERVIEW NOTES

## DOTI, Office of Green Infrastructure

*Sarah Anderson, Colin Bell, Brian Wethington*

### **What are your division's current goals or policies to enhance the urban forest?**

- 5 miles of green streets goal per year
  - Haven't reached the goal yet
  - 13 miles constructed, under construction, or in design
  - What does a green mile equate to?
    - Average ROW (64')
    - SF impervious that equates to a mile (8 acres/mile)
  - About water quality treatment
  - Prioritize streets based on criteria from priority basins
    - Coordinate with other projects (OGI can't afford to do it alone)
- Doing heat modelling (for every 10% increase, 2% surface temperature reduction)
  - Prioritizing top 25% in underserved neighborhoods to increase to 10% canopy coverage
  - Green Continuum guidelines coming soon
    - 5 levels of green
    - No more 5 x 5 or 5 x 15 requirements
    - Intent is to use level of green 1 & 2 on hot streets
    - Agency coordination: going through ER currently
    - Part of the reason for doing this was that projects that couldn't do full WQCV didn't have any requirement
  - Question: many of the hottest streets don't have amenity zones; where does the green infrastructure go?
    - Will likely focus on streets that have room
- Codifying bare minimum of things that you have to do

### **Based on your understanding of national or international best practices, what opportunities can your department pursue to improve the health and resilience of the urban forest?**

- Look for opportunities to work cross-department to research new technologies/practices, particularly around tree preservation, constructability
- Don't: require unrealistic expectations for trees (i.e., require conditions that mimic natural growth environment)
- Acknowledge and codify urban growing conditions (quality or quantity?)

### **Does your department have funding available for any urban forestry or tree planting initiatives?**

- Capital budget from stormwater fee for 5 miles of green streets
- Spending has been matched (\$36M total in last 3 years)

### **Are there elements of your department's policies or regulations that stand in the way of a healthy and resilience urban forest?**

- Everything OGI puts in is maintained by OGI
- Old-school Inspectors may be blocking the intent of coordination in the field – how do we get innovations to trickle down? (inter-departmental flow chart)
- OGI trying to identify what standards are missing, and which can be updated
- When push comes to shove, who has the final say?

**What discrepancies exist between your department and Forestry that may negatively impact the urban forest?**

- Forestry and OGI don't always see eye to eye on trees in stormwater planters (forestry doesn't always support trees in planters)
  - Brighton trees are doing best
  - 1,300 trees currently in GI planters
  - Doing study with CSM to look at media in planters
  - Portland has done some interesting studies on trees in planters (found that they do very well in planters that out)
  - Forestry denies everything through ER
  - OGI wants to be in charge of their own tree species list to be able to measure over time
- Forestry's tree list (2016) doesn't factor in knowledge/experience that OGI has seen more recently
- OGI looks to Forestry for guidance (details) on things like soil volume, but there isn't anything formal there
  - Forestry should have a tree ordinance, standards and details
  - Forestry should have more research, input on heat
  - Be more aggressive on providing clear expectations for what they need
- Many policies are intended to support unrealistic expectations for tree coverage (climate)
- Lack of irrigation infrastructure; how to we grow trees on challenging streets without permanent irrigation
  - Understory requirements and water balance
- Denver needs a tree ordinance
- Maintenance on adjacent property owner doesn't support a robust canopy
- How does the city start to set up a maintenance program for trees in the ROW?
  - Begin with neighborhoods that are lower-income or underserved
  - Can more of the 2A funding go toward forestry?
  - Constructability guidelines around trees would also be helpful

## DOTI, Transportation

*Chris Baca, Emily Gloeckner, Jennifer Hillhouse, David Pulsipher, Nick Williams*

### **What are your division's current goals or policies to enhance the urban forest?**

- Our values are getting people safely from place to place whether walk, ride, transit or drive
  - We engage DPR/Forestry in the planning phase
- Our standards require 5'-8' sidewalks and up to 8' tree lawn
  - These were closely coordinated with forestry
  - If we want to update, it's a 1 reg update
  - We know there's an optimal soil volume and our standards don't always accommodate
    - Need minimum pedestrian access route of 5-8'
    - Utilities – increasingly challenged
    - Areas that need trees the most – least amount of space, most utilities
    - Need tree cells but forestry doesn't want to maintain them, property owners don't want to or don't know how, and require encroachment permit
- Complete streets design guidelines (CSDG) will move into rules & regs soon
  - Look for synergy with urban forest recommendations that could be timed well with CSDG

### **Based on your understanding of national or international best practices, what opportunities can your department pursue to improve the health and resilience of the urban forest?**

- Places with good canopies are very different climate
  - Look for places with alignment between program needs – drainage, green infrastructure, safe mobility
- Buckley Rd. in Aurora has very well-maintained medians
  - Maintenance is the biggest challenge we face
  - How do we tackle the maintenance problem in small spaces? Denver doesn't do this well and other cities do

### **Does your department have funding available for any urban forestry or tree planting initiatives?**

### **Are there elements of your department's policies or regulations that stand in the way of a healthy and resilient urban forest?**

- DOTI is focused on moving people, so trees and other things are "contentious" space within ROW
  - Understand the value we're just trying to squeeze 10 lbs. of need into a 5 lb. bag
  - Often in conflict with forestry

### **What discrepancies exist between your department and Forestry that may negatively impact the urban forest?**

- Maintenance
  - On W. Colfax, DPR staff adamant we could not plant the median due to maintenance
- Fewest property impacts along parks to create pedestrian infrastructure, but sometimes challenged because of the trees



- “You can replace a tree but not a person”
  - Would like a more nuanced conversation sometimes
- What are some other tools in the toolbox to meet the intent and buffer pedestrians?
  - If there’s not enough space for trees, what else can we do?
- *Question: When you coordinate well with forestry, what does it look like?*
  - So many different processes so it’s hard to nail down
  - From coordination standpoint we do pretty well, whether its private development or capital process
  - Tension starts to become elevated when we don’t have enough space to fit everything into ROW
    - Whose needs are more important?
- “Scale bars” and hierarchy of priorities (as illustrated in CSDG) might be useful for tree guidelines (similar to CSDG)
- DOTI wants trees on streets, but the problem is when we get stuck and don’t have the space to accommodate everything
- CSDG – context of area around each location is important and things will be a bit more nuanced
- *Question: If you were the city forester what would you do?*
  - Better tools for maintenance particularly for difficult areas (medians)
  - Not allowed to say “no trees” because of maintenance – we have enough challenges to implementation
  - Need more tools such as: softscape elements that don’t require as much space, innovations like building over the roots, seatwalls, creative things within surface parking lots, etc.
  - Policy suggestions: Why aren’t we requiring private development to plant trees?
- Messaging around “why” is going to be helpful to get inspectors on the same page
  - A quick video that could be shopped around the city (heat island effect, importance of tree canopy, etc.) and shared throughout the entire department
  - Learning that OGI used high priority basins allowed DOTI to incorporate it into their work because they understood the reasons
    - Should create something geospatially tangible
- Need regulatory specific tools, updating standard details, should be a detail for structural cells, looking into forestry taking over maintenance of structural cells, mitigation standards – when we have to take trees out what do we do?
- Note: leverage our electronic review process for updating rules & regs

## CPD

*Olga Mikhailova, Mikaela Firnhaber, Courtney Levingston, Jason Morrison, Chris Gleissner, Kristopher Johnson*

### **What are your division's current goals or policies to enhance the urban forest?**

- NPI East and East Central Plans, Quality of Life chapter
  - Importance of tree canopy preservation and improvement – first time for neighborhood specific level recommendations for canopy
  - Has recommendations that deal with increasing canopy within ROW
    - Coordinate with OCF to identify areas
    - Site specific (Colfax, other larger streets)
    - Community replacement program
    - Climate appropriate trees
    - Develop educational programs
  - Also preserving canopy in redevelopment (5 ac +)
  - Area Plans are not regulatory, but will direct CPD to find ways to increase the impact
- Private development
  - Try to use NPI plans as guides
  - Uses the Denver Zoning Code as a minimum requirement
    - The way it's written, there aren't many ways to improve - For instance, zero-setbacks, ROW is competing for so much infrastructure
    - Forestry has no requirements to street trees, so if developers don't propose street trees Forestry doesn't see plans
    - Few opportunities to request landscaping
    - In districts with setbacks, there is a requirement for 50% live landscape (not necessarily trees)
    - In parking lots, trees are required but minimum requirements often don't result in success
  - Zoning cannot require street trees because it only covers private property
  - Tree preservation only requires preservation with a permit for demo or construction
    - Only authority Forestry has
    - Trees can be removed if there is not a permit
  - Forestry is only added as a reviewer on new buildings or large additions to residential developments
  - Forestry could consider implementing dedications (like transportation does for sidewalks)

### **Based on your understanding of national or international best practices, what opportunities can your department pursue to improve the health and resilience of the urban forest?**

- Other municipalities are much more active in establishing a robust urban forest
  - Require specific tree densities
  - Maintenance and inspection programs
- Tree preservation in new developments on the east coast
- Street canopy regulations need to apply to both private streets and public ROW
  - Forestry cannot currently comment on private streets
- Fort Collins had the power of the code to require street trees, ability to enforce the code rested on the plan reviewer

- Boulder requires more from applicants
  - Must show all utilities in ROW, locations of trees, sidewalks, etc. to ensure there is no conflict

**Does your department have funding available for any urban forestry or tree planting initiatives?**

**Are there elements of your department’s policies or regulations that stand in the way of a healthy and resilient urban forest?**

- Residential:
  - Working with Forestry is good; the difficulty is actually having regulations that are enforceable
  - Working to improve integration of Forestry into plan review process
  - Help Forestry know when permits have been issued so that they can inspect tree protection fencing (add to preconstruction inspection requirements)
  - Potentially require Forestry to sign-off on CO
- Commercial development:
  - Staffing levels are chronically understaffed; more regulation or responsibility will require additional staff
- 1 and 2 family projects do not require a landscape plan
- LRPs require a percentage of open space, but no requirements for trees
  - Tend to use them for detention which limits the success of trees
- Landscape regulations for private property are very minimal
- DOTI challenges most structural cell proposals in ROW
  - More successful when they are cross-agency coordinated
- Do we have folks going out to make sure that projects are being constructed as approved?
  - Private property, inspectors will count but they’re not looking at how trees are planted
- DOTI will consider existing trees and will allow for the movement of sidewalks to accommodate

**What discrepancies exist between your department and Forestry that may negatively impact the urban forest?**

- Challenge we have in executing goals is the lack of proper regulations in proper places and the staffing to support them
- Working to identify conflicts or opposing forces within the City
- Good things happen when agencies are working together
  - “If we have room, we will plant them” – trees tend to be the first to go when fighting for space in ROW
- Idea: Institute a min. number of street trees; if there is a competing element, require that they locate it somewhere else on site
- **Denver Green Code:** optional code that is being pushed heavily by CASR and CPD
  - Several code provisions for tree preservations
  - Incentive available to use of code; looking at other ways to require the use of it
- Denver Building Code: trying to make it more of an interdepartmental opportunity to institute good policy
- Would be helpful for applicants to understand what volume requirements translate to dimensionally



## CASR

*Elizabeth Babcock, Bradley Paterson*

### **What are your division's current goals or policies to enhance the urban forest?**

- CASR works with CPD on building codes; Green Building Ordinance can have implications on trees
- Denver Green Code (starting in January) includes some elements that can be beneficial to urban forest
- Trees have worked their way to top of the agenda
- Top priority should be preserving large, existing, healthy trees
  - Won't see true value of new trees for a decade or more
  - What rules & regs need to be changed to make it much more difficult for developers to remove large, healthy trees?
  - Reluctance to meander sidewalks around existing trees

### **Based on your understanding of national or international best practices, what opportunities can your department pursue to improve the health and resilience of the urban forest?**

- Cities are needing help with planting and maintaining trees
  - Atlanta has a huge nonprofit that does all street tree watering
  - Make it easier to partner with other groups to collaborate and cooperate
- Just hired a green workforce liaison
  - What opportunities around trees?
- Urban wood – developing a circular economy
  - Trees that grow where we live (diseased trees, removals) used for reuse project (mulching is not the best use)
- Forestry requirements
  - Look at the data – analyze what do we need to do to prepare for our climate future? What trade-offs do we need to make for a more resilient future?
  - Mortality rates, water use, soil volumes, etc.
  - How trees are watered (one contractor is just dumping water on the trees, consider requiring deep watering or other approaches)

### **Does your department have funding available for any urban forestry or tree planting initiatives?**

- Working on Climate Protection fund for planting on private property
- Working with DPS for trees on school property
- Maintenance of existing trees
  - Not prepared to take on any commitment to maintain street trees with the CP fund
  - 50% of fund toward community-based projects with lens toward equity and resilience

### **Are there elements of your department's policies or regulations that stand in the way of a healthy and resilient urban forest?**

- ROW
  - Important to have a city-wide mentality shift as it relates to trees
  - DOTI is largely in charge

- Who are the right people to have that conversation?
    - Policy guidance from reviewers
  - Fire department pushes back on length of planting areas
  - Setbacks
    - Gas lines – forestry prefers 10'
    - From a climate standpoint, we need to move away from methane (biggest opportunity for next decade)
    - Could get rid of gas lines, which would create a lot more room for trees
- Regulatory: clarity and strong language around the things we need to do to protect trees

**What discrepancies exist between your department and Forestry that may negatively impact the urban forest?**

- DPS is having a lot of die-offs because no dedicated long-term maintenance
- Clear requirements for installation and maintenance
- Regulations for developers on private property
  - Irrigation is challenging in underserved communities
  - Rebates for those that adequately maintain for 3 years?
- Revisit tree species palette
  - Consider our water future
  - Consider understory, especially the use of shrubs
- Trees as carbon sequestration and pollution mitigation are problematic arguments
  - Sequestration is less than 1/10<sup>th</sup> of 1% in a Denver study
  - Pollution needs to be addressed at the source
  - Lead tree benefit conversation with adaptation and resilience
  - CASR would like to work more closely with Forestry on messaging

## DPR

*Kathy LeVeque, Craig Coronato, Jenna Harris*

### **What are your division's current goals or policies to enhance the urban forest?**

- Planning:
  - Coordinating with Forestry on park planning (impacts on trees)
  - Improve coordination on tree planting relative to future park development
  - Improve policies to encourage development to preserve trees or create new areas for trees to be planted
  - Strategic Acquisition Plan
- Design & Construction:
  - Works with OCF more than any other group
  - Work together to protect existing trees
    - Most desirable area for amenities are where mature trees
    - Conflicts with regulations around protection of root zones

### **Based on your understanding of national or international best practices, what opportunities can your department pursue to improve the health and resilience of the urban forest?**

- Phoenix
  - Minimum soil volumes
  - City identified corridors (areas of change) and put a district to put in place soil volumes, utilities, building setbacks all to encourage a healthy urban
- Parks has a great opportunity to work with OCF on the use of different technologies on the next generation of the urban forest
- No-setback development on properties adjacent to parks can be an issue on the quality of parks
- Hong Kong
  - Every tree tagged and monitored
  - Prioritize trees so that they are the most important piece of infrastructure in the city
- Reinforce the notion that trees are a critical piece of our infrastructure
  - Use a public information campaign to describe the impact of trees on our lives
  - Educate planners, designers, consultants, public
  - Appropriate trees in appropriate locations
  - Arborist techniques and managing growth (compensatory pruning)
- Continue to strengthen collaboration between Parks and Forestry rather than treating DPR as developers
  - Strategy for the entire parks system rather than focusing on an individual tree
- OCF doesn't trust designers to be able to select trees

### **Does your department have funding available for any urban forestry or tree planting initiatives?**

### **Are there elements of your department's policies or regulations that stand in the way of a healthy and resilient urban forest?**

- Challenges working with Forestry to protect trees
- Opportunity to be planters of trees
  - Can plant different species
  - Opportunity to use parks as a place to test different species



- Interpretation of ordinance during the design and construction process
  - Forestry isn't always consistent with their interpretation from beginning to end
  - Results in change orders, additional costs
  - Fines incurred by contractors that don't abide by specifications have been unnecessarily harsh with little to no warning
  - OCF doesn't inform the project manager to fix the problem
  - DPR faces mitigation fees when removing trees
- Overcome challenges and trust that parks is trying to create and enhanced forest/experience
- Resilience:
  - Restoration – compatibility with species
  - Balance low-water landscapes with need for trees

**What discrepancies exist between your department and Forestry that may negatively impact the urban forest?**

- Our low canopy coverage is probably higher than it was before urbanization
- We necessarily have to disturb some trees in order to do what we want
  - Don't talk about succession enough
  - Hierarchy to mature trees – gold-medal trees versus those that may not contribute or may be disease prone
- Denver lacks regulation on private property
  - Hard to get people to buy into (property rights)
- Who controls the public realm?
  - Many trees are within the ROW but adjacent to property owners who are responsible for maintenance
  - Can the city take control of maintenance and irrigation?
  - Maintenance of structural cells – city take on the maintenance
    - How do we get people to use them with the cost of maintenance?
  - Utilities – cable and fiber often get put in the tree lawn
    - Stronger policies to help preserve spaces for trees and encourage longevity
    - Prioritization: trees go first, work utilities around them
- Construction
  - Communication
  - Have to work around trees to get the work done as well
  - Native landscapes – consultants placing trees without thought to how a prairie landscape functions
- Don't lose the forest for the trees
- Denver Green Opportunity group just starting up
  - Looking at policies changes
  - Biggest loss to pervious areas is the construction of more dense housing – reducing the areas available for trees

# CASE STUDY AND BEST PRACTICE CITIES

CITY *of* BOISE

## BOISE'S URBAN FORESTRY AND CLIMATE INITIATIVES

DENVER URBAN FORESTRY ROUNDTABLE  
FEBRUARY 3, 2022

CREATING A CITY FOR EVERYONE



**STEVE HUBBLE**

- Climate Action Manager
- City of Boise, Department of Public Works



**LANCE DAVISSON**

- Owner / Principal Consultant, The Keystone Concept
- President & Director, Treasure Valley Canopy Network

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# TODAY'S DISCUSSION

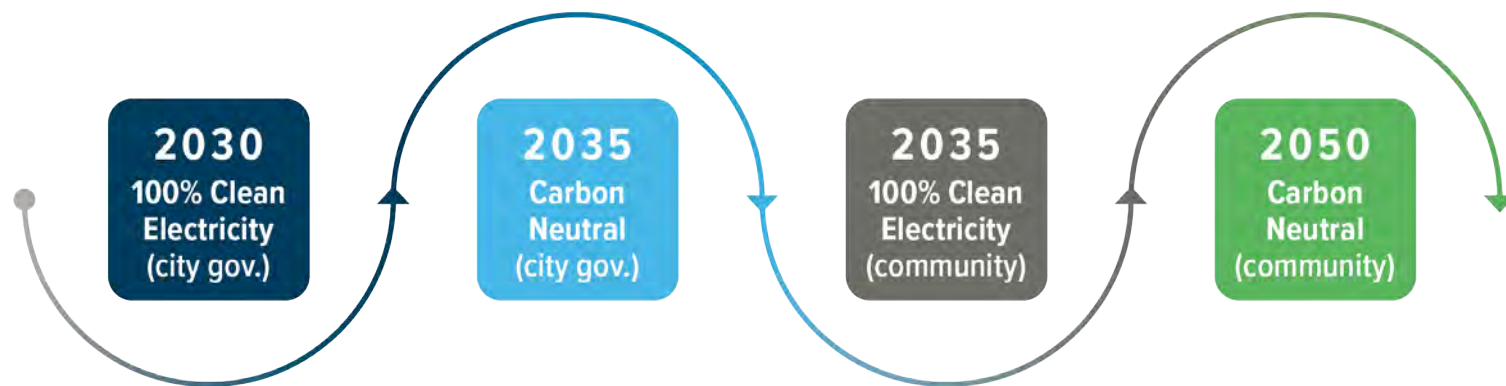
- Boise's Climate Action Agenda
- The role & value of collaboration with Treasure Valley Canopy Network
- Trees as living infrastructure
- Data & partnerships drive results
- Our ever-evolving path forward
- Discussion with the roundtable participants



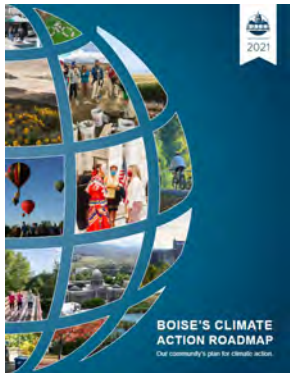
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# BOISE'S CLIMATE AND CLEAN ENERGY GOALS



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# CLIMATE ACTION ROADMAP PURPOSE

- Prioritize climate action, with a focus on implementation
- Organize initiatives in a technical document
- Identify climate action goals
- Prioritize opportunities and actions, leverage public involvement with implementation activities
- A living, evolving document that adjusts with new policy, technology and community needs

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# ROADMAP OUTLINE



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## NATURAL ENVIRONMENT

Urban Trees Planted

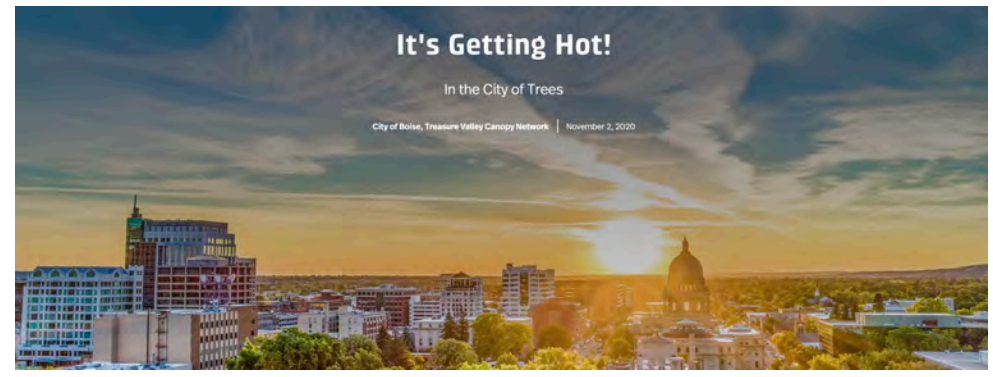
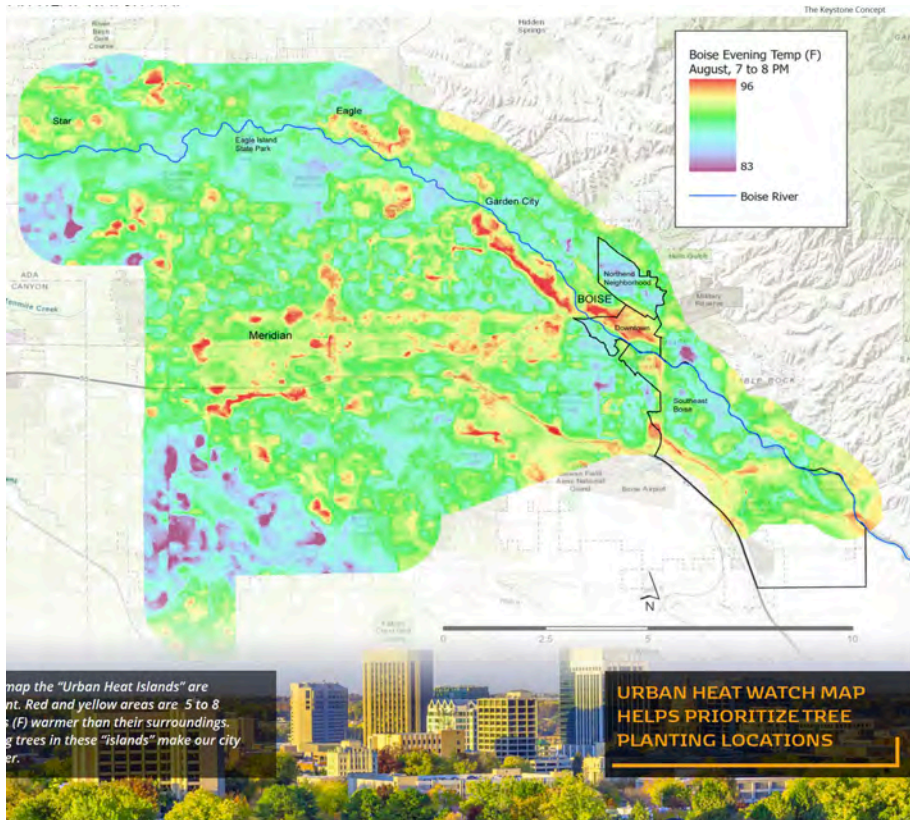
4,305

Forest Seedlings Planted

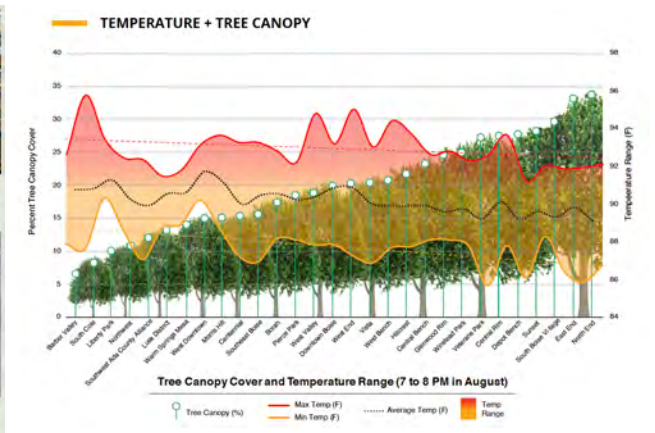
37,000







# URBAN HEAT







*Collaborate, Innovate, Sustain.*

# Healthy Trees Support Healthy Communities

[Learn More](#)

## TREASURE VALLEY CANOPY NETWORK

# TREASURE VALLEY CANOPY NETWORK

*COLLABORATE, INNOVATE, SUSTAIN*

- 2012-13 8<sup>th</sup> & Main revitalization
- 2013 Regional Urban Tree Canopy Assessment
- 2014** ***Boise City Council & CCDC prioritize streetscapes***  
***Healthy tree canopy & stormwater***  
***Boise Grove revitalization***
- 2015-16 Boise Community Forestry Management Plan
- 2016-20 Urban Heat; Carbon+ Credits; ID Power  
Shade Tree
- 2020-22 City of Trees Challenge; ID Urban Wood Network

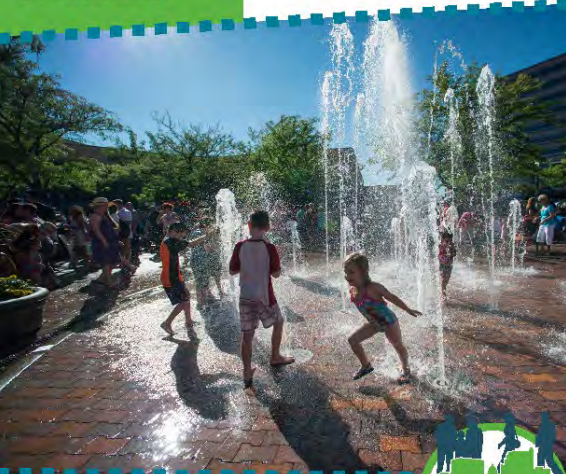


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# TREES AS LIVING INFRASTRUCTURE

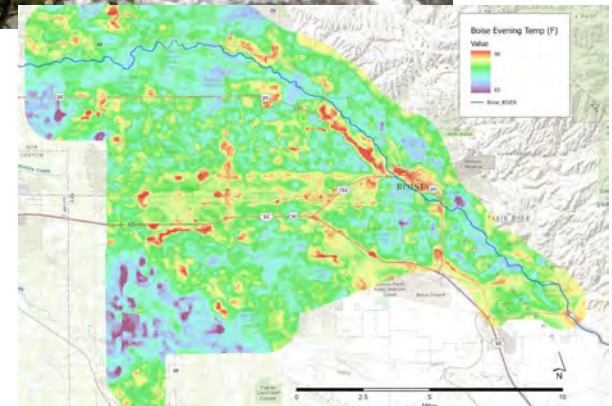
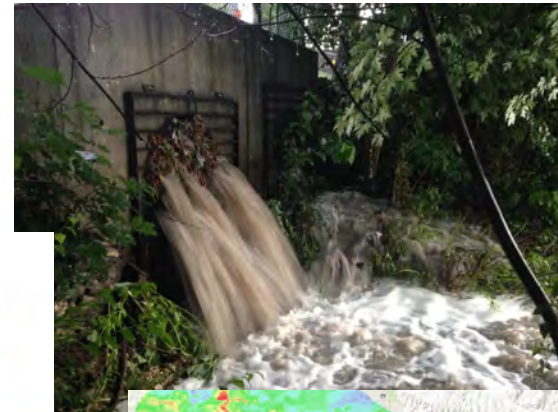
**DOWNTOWN PARKS  
and PUBLIC SPACES**  
Executive Summary



PREPARED FOR: City of Boise  
PREPARED BY: City of Boise Planning and Development Services  
SEPTEMBER 2016

**2015 Community Forestry  
Strategic Management Plan**

City of Boise



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**What's the dirt?**  
 We're installing SILVA CELLS!

Boise is the City of Trees - and to grow big and healthy, trees need soil!

That's why we're creating a special rooting environment with a product called the Silva Cell, created by a Deeproot, Inc. The Silva Cell is an open crate-like system designed to support a sidewalk, but is filled with soil to create more space for tree roots and a place to direct stormwater. A large, healthy tree canopy provides benefits such as cleaner air, stormwater interception, shade from the hot sun, energy savings, higher property values and a more vibrant, healthy downtown. It's another way we're making Boise the most livable city in the country!

WANT MORE INFO? Contact City Forester Brian Jorgensen by phone at (208) 608-7700 or email [forestryinfo@cityofboise.org](mailto:forestryinfo@cityofboise.org).



**Silva Cells:**

- make more space for tree roots
- absorb stormwater runoff
- create a healthier downtown

Parks & Recreation | [www.cityofboise.org](http://www.cityofboise.org) | deeproot

12 **INTEGRATING TREES INTO BOISE'S URBAN LANDSCAPE**

# ALPHABET SOUP

- **Ada County Highway District (AHCD)** – Operates and maintains public roadways in Boise
- **Capital City Development Corporation (CCDC)** – Boise’s Urban Renewal Agency
- **Green Stormwater Infrastructure (GSI)** – Innovative approach to stormwater management focused on infiltration
- **Suspended Pavement System** – Technology that supports the weight of paving to allow a void for soil underneath (Silva Cells – Proprietary Product)



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STREETSCAPE MAP TYPES

- 1 URBAN BRICK
- 2 URBAN CONCRETE W/ BRICK
- 3 URBAN CONCRETE
- 4 NEIGHBORHOOD
- 5 URBAN PARKWAY
- 6 CAPITOL BOULEVARD
- 7 FAIRVIEW-MAIN GREEN STREET
- SPECIAL
- PROPOSED STREET CONNECTIONS

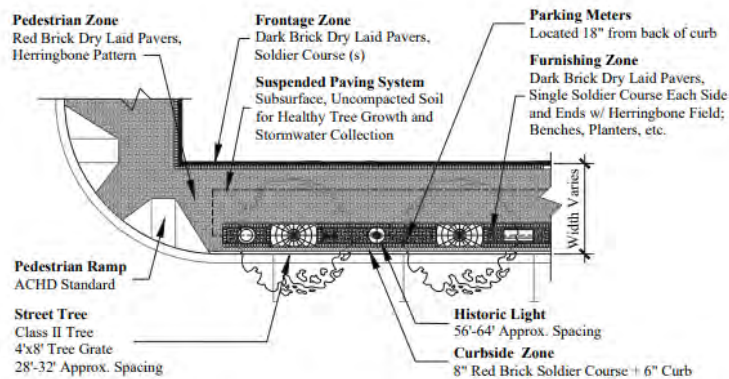


# STREETSCAPE STANDARDS



# STREET TREE REQUIREMENTS

- **Suspended Paving Systems** 26  
Suspended Paving Systems (SPS) are required under the hardscape surface. Design to be determined by site specific conditions.



**TYPE 1 - URBAN BRICK STREETScape DETAIL PLAN**  
JBA 2015

## DOWNTOWN BOISE STREETScape STANDARDS & SPECIFICATIONS MANUAL



ALL FOOTINGS AND CONCRETE ARE REQUIRED TO BE CONC. COLLAR OR BASE PLATE.

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# SUSPENDED PAVING SYSTEMS

- Support healthy trees and canopy
- Reduce soil compaction
- Allow stormwater infiltration and alignment with Green Stormwater Infrastructure requirements



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# MULTI-AGENCY COORDINATION

- Streets in Boise operated by Ada County Highway District (ACHD) – separate entity from the City of Boise
- Agreements required for activities within the Right-of-Way
  - City assumes responsibility for suspended pavement systems
  - ACHD and City share responsibility for stormwater
    - Property owner responsibility for private drainage

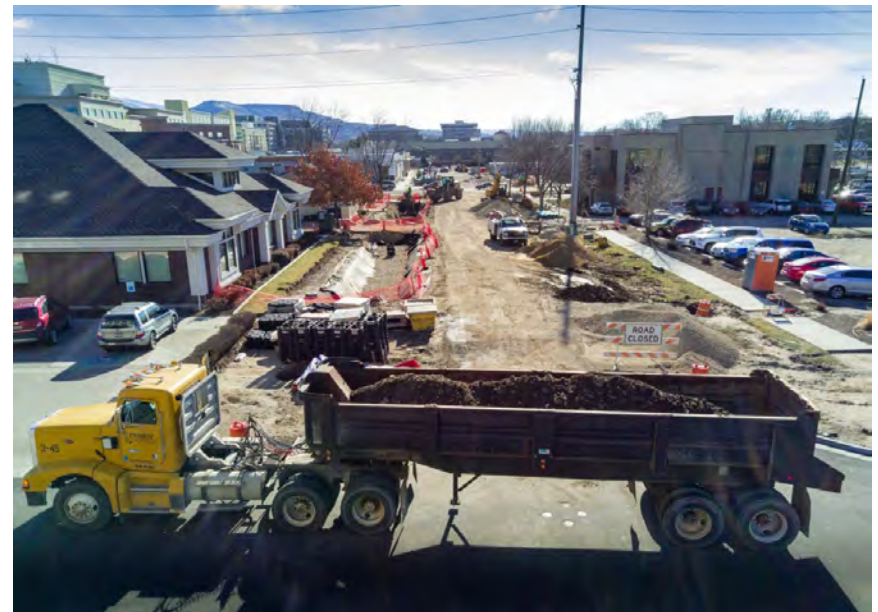




# MULTI AGENCY COORDINATION



- Urban Renewal Agency implements streetscape projects and collaborates with private development
- This arrangement supports funding to implement streetscape design elements and pilot innovative approaches



CREATING A CITY FOR EVERYONE

# CENTRAL ADDITION PILOT PROJECT

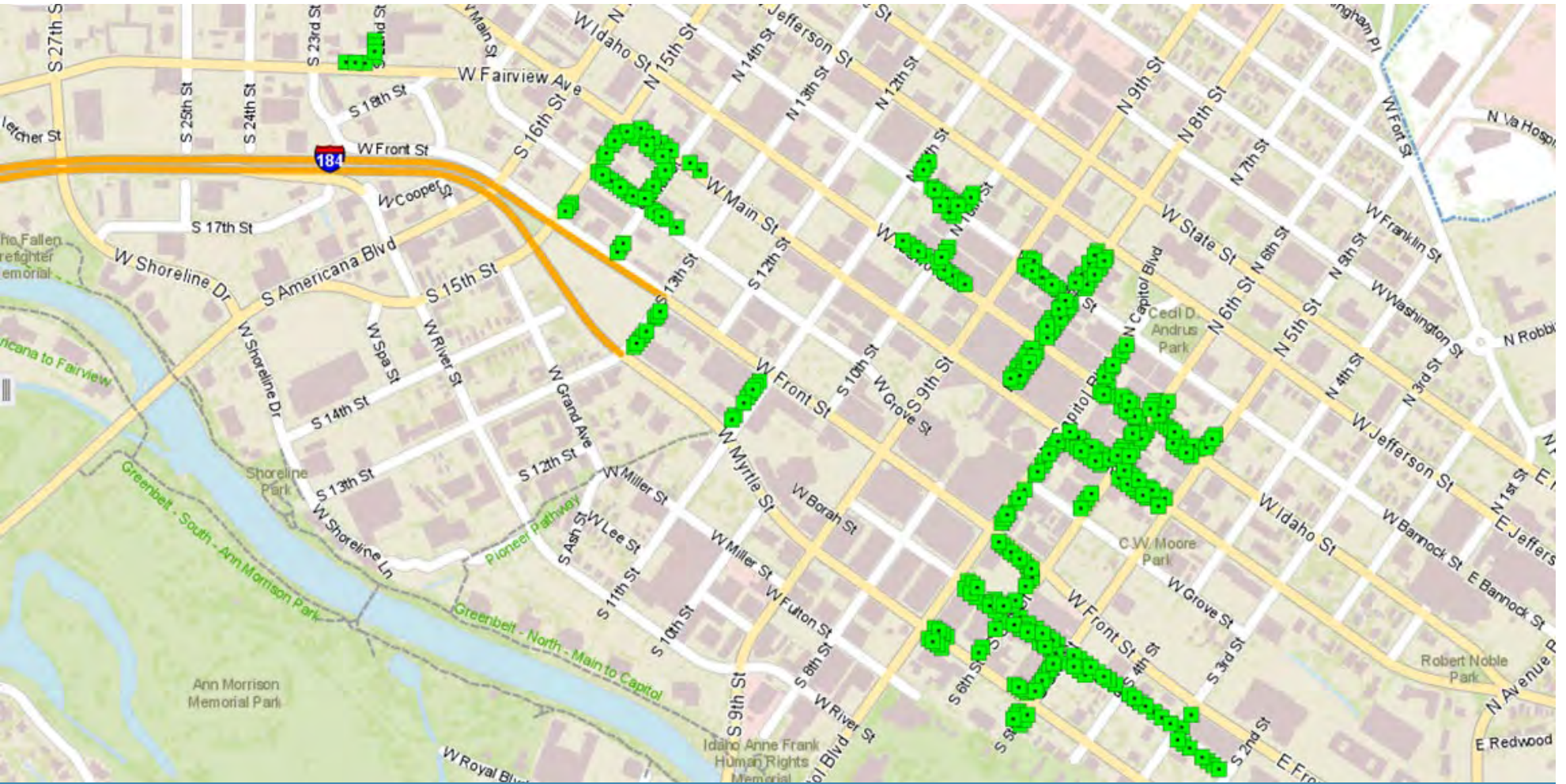






# BOISE'S CENTRAL ADDITION LIV DISTRICT

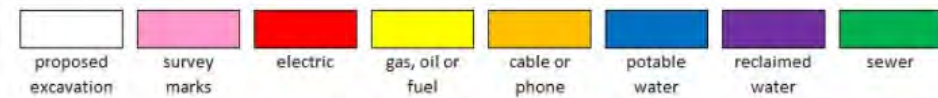




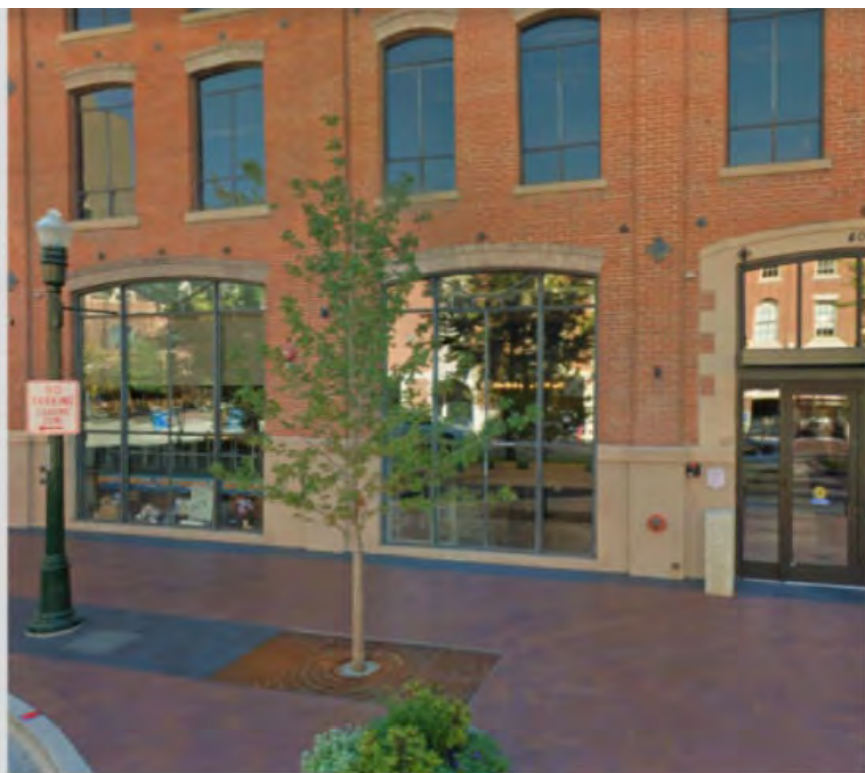
# MAINTENANCE CONSIDERATIONS

# MAINTENANCE CONSIDERATIONS


- Construction Oversight
- Integration with Utility Locating
- Maintenance Responsibility
  - Parks – Trees and Suspended Pavement Systems
  - Public Works – Stormwater Elements
  - ACHD – Typical Drainage Maintenance (Inlets, Curb/Gutter, etc.)
- Long Term Replacement







2017

 deeproot



2019

# TREE COMPARISON





24

# TREE COMPARISON – NO SUSPENDED PAVING SYSTEM

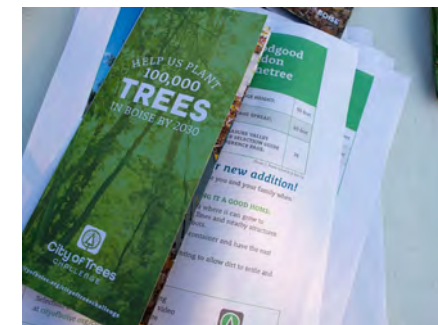


## TREE COMPARISON – SUSPENDED PAVING WITH STORMWATER





## City of Trees Challenge



CREATING A CITY FOR EVERYONE



# GRASSROOTS CLIMATE ACTION

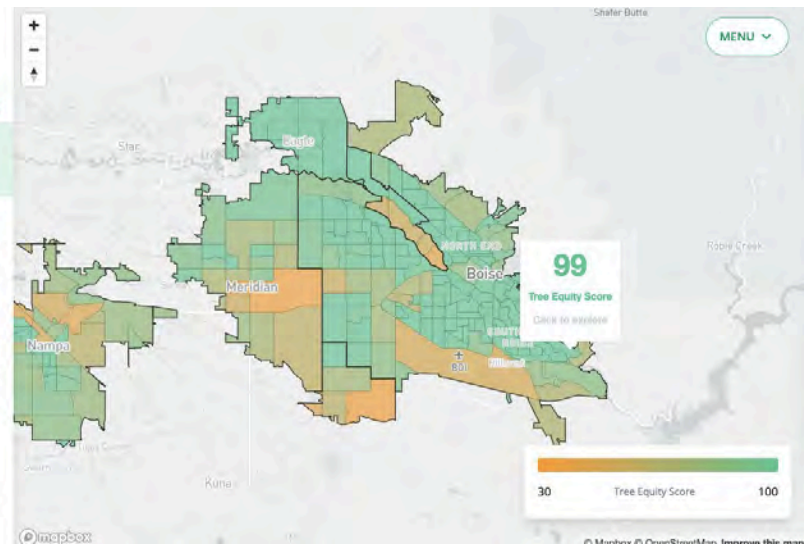
## DATA DRIVEN & PROVEN RESULTS



**TREE EQUITY SCORE** NATIONAL EXPLORER

Search for your town

Zoom in or search for a city or town to explore Tree Equity Scores.



CO2 Removal (lbs/yr)  
**5,935.2**



CO2 Removal Value (\$/yr)  
**138.03**



Pollutants Removed (lbs/yr)  
**20.38**



Pollutant Removal Value (\$/yr)  
**26.73**



Runoff Avoided (gal/yr)  
**13,262.86**



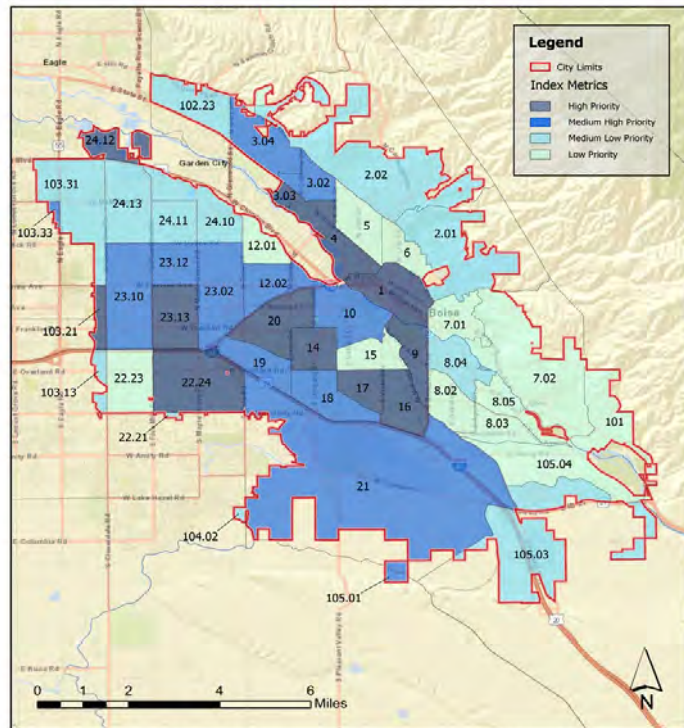
Runoff Avoided Value (\$/yr)  
**118.52**



In cities across America, trees have historically been planted along race and class lines. Ensuring equitable tree cover across every neighborhood can help address social inequities so that all people can thrive.

CREATING A CITY FOR EVERYONE

# BOISE'S CLEAN CITY INDEX



Boise Clean City Index

Quartile ranking for all metrics within the Clean City Index by census tract

Ecosystem Sciences, LLC  
 Science Design Planning  
Disclaimer: This map or data product is for illustration purposes only. It is not intended to be used for advertising, conveyance, notification, definition of legal boundary, or property line. This is not a survey product. Users are encouraged to examine the documentation or metadata associated with the data upon which this map is based for information related to its accuracy, currency, and limitations.

A Story Map

## Clean City Index

The Clean City Index serves as a guide to understand variation in environmental, health and equity metrics across Boise.

For details on the study see the [Technical Memorandum](#)

Environmental Indicators

- Air Quality
- Water Quality
- Land
- Waste
- Natural Hazards Vulnerability

Equity and Health Indicators

- Demographics
- Education
- Health
- Equity
- Housing
- Energy
- Transportation

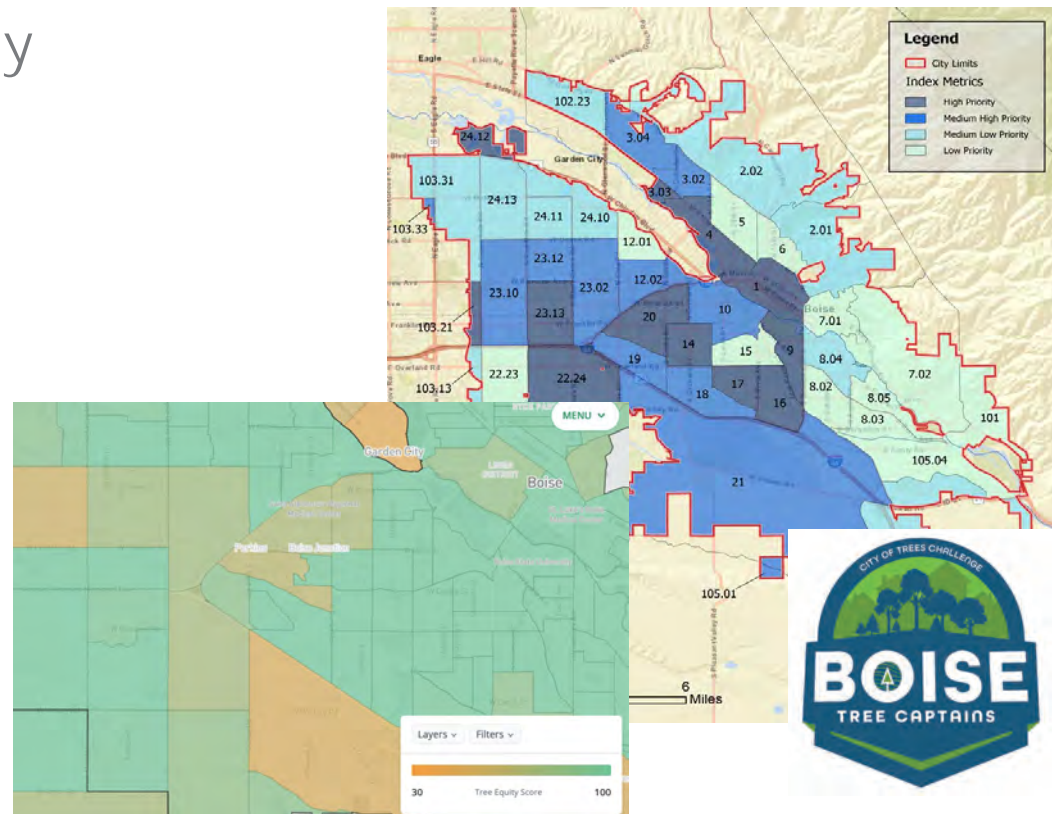
## A Clean City for Everyone

Protect our clean air and clean water, improve parks, open spaces and pathways that unite neighborhoods and connect us. Create opportunity through the transition to a clean energy economy.

CREATING A CITY FOR EVERYONE

# LONG-TERM SOLUTIONS FOR CLIMATE & EQUITY

- Targeted investments in 4 key Neighborhood Associations
  - Morris Hill
  - Central Bench
  - Borah
  - West Boise
- Execute Boise Tree Captains Program in 2022



CREATING A CITY FOR EVERYONE



# LESSONS LEARNED & OUR PATH FORWARD

## IN THE CITY OF TREES

What's Working	Challenges Ahead
Trusted relationships & partnerships	Maintenance coordination
Municipal, non-profit & industry collaboration	Be prepared to adapt & evolve (COVID-19; economic & political fluctuations; etc)
Diverse funding strategies	Sustainable public & private investment
Consistent and regular communications & common goals	Training & workforce development



# QUESTIONS AND DISCUSSION



# Cincinnati Urban Forestry

Division Mgr. of Natural Resources  
[crystal.courtney@cincinnati-oh.gov](mailto:crystal.courtney@cincinnati-oh.gov)



## Outline

---

Success over time: “A city within a park...”

---

Foundations of the Urban Forestry Program

---

Data driven decision making

---

What does success look like?

# Success over time...



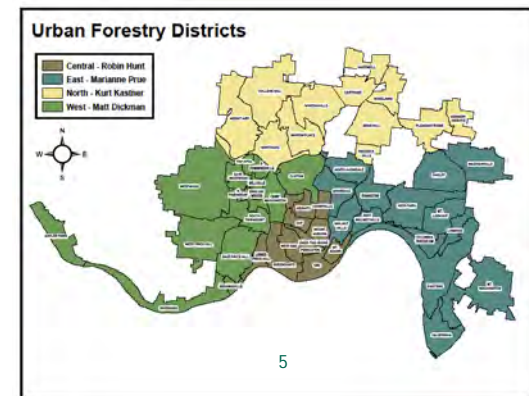
# Visionary Forefathers: Building a city within a park.





# How did we get here: Cincinnati Park Board Urban Forestry Program

- ▶ Responsible for planting, maintaining, and protecting over 85,000 street trees on 1,000 miles of public right-of-way within the City of Cincinnati.
- ▶ Team: (urban forestry supervisor, 4 district forester, 2 in house arborists, and GIS analysis)
  - ▶ *24-hour, 365-day emergency services to open streets blocked by downed trees*
  - ▶ *Spot tree planting*
  - ▶ *Perform 6-year preventive maintenance*
  - ▶ *Community outreach*
  - ▶ *Educational programs*
- ▶ *Majority of of the work is completed by contractors.*



\*Cincinnati Park Board

# What makes this program function?

- ▶ Municipal Code 792 - Urban Forestry Regulations:
  - ▶ Authority of UFP to manage public trees
  - ▶ Urban Forestry Advisory board
    - ▶ made up of 4 city residents, the City Engineer, Architect, Planner, and Forester
    - ▶ Cohesive planning and management of impacts and opportunities in the ROW
  - ▶ Protection of public trees
    - ▶ Permit required for any work w/in 15' of a public tree
    - ▶ Tree damage appraisal and fines
- ▶ Ohio Revised Code 727
  - ▶ Creates a dedicated funding stream for the program

# How We Fund The Program

- ▶ Ohio Revised Code 727.011

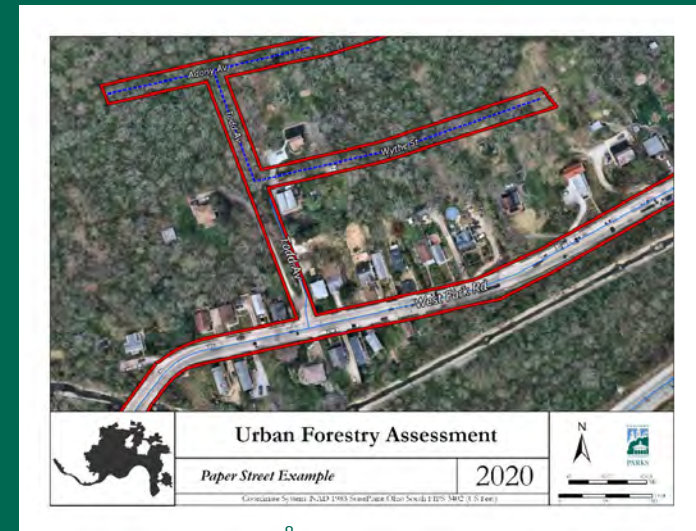
- ▶ *For the purpose of controlling the blight and disease of shade trees within **public rights-of-way**, and for planting, maintaining, trimming and removing shade trees in and along the streets of a municipality.*
- ▶ *ORC 727.011 allows granting power to levy collection from ANY abutting, adjacent, and contiguous parcels of land for the improvement of any street, dock, wharf, public road, parkway and in this case an urban forest.*

\*State of Ohio



# How we manage the ORC 727.011

- ▶ 3 annual Ordinances passed by City Council
  - ▶ *Determination of Need (\$/FF)*
  - ▶ *Opportunity to object*
  - ▶ *Determination to proceed*
  - ▶ *Approval to Levy*
- ▶ Charge €21 per linear foot to all property in Cincinnati (public, private, educational, and "nonprofit")
  - ▶ Which includes *paper streets*



\*Cincinnati Park Board, Ohio Revised Codes

# Conclusion

- ▶ Having a dedicated funding stream allows the city to:
  - ▶ Own and care for the public trees, including the maintenance and protection of existing trees and planting of new trees where they are needed most
    - ▶ Allows Equitable distribution of canopy, rather than only having canopy where property owners can afford to care for it
  - ▶ Build an expert team of forestry professionals to guide the BMPs of the Program as the industry continues to evolve
  - ▶ Have staff to focused on the needs of the community, the urban forest, and community outreach rather than the \$
  - ▶ All of the above build credibility in the program, as community members see a very visible utilization of their tax dollars



# City of Pittsburgh's Tree Canopy Denver Forestry Workshop

City of Pittsburgh, Department of City Planning  
Sustainability and Resilience Division

February, 2022



# Agenda

Pittsburgh Historical and Tree Canopy Context

Shade Tree Commission and Strategic Partnerships

Integration within Department of City Planning

Resources and technical assistance

Greenways Partnership Program and Invasive Species Management

# Pittsburgh Historical Context



Pittsburgh Population, 1950-2015

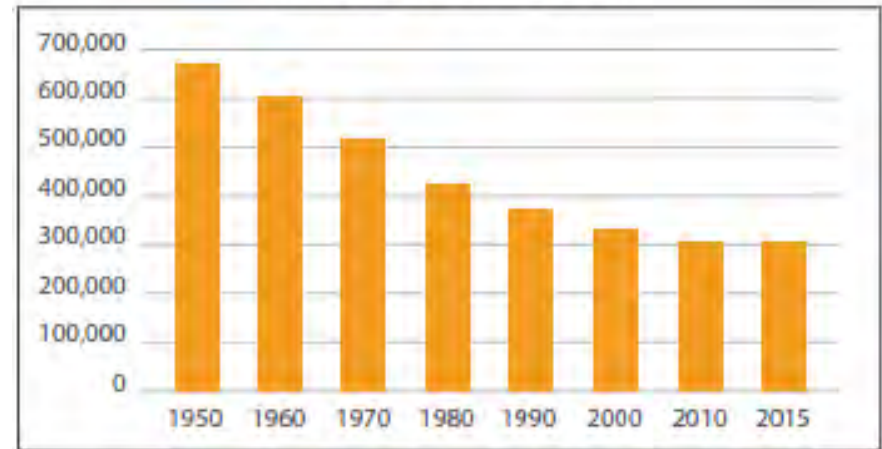
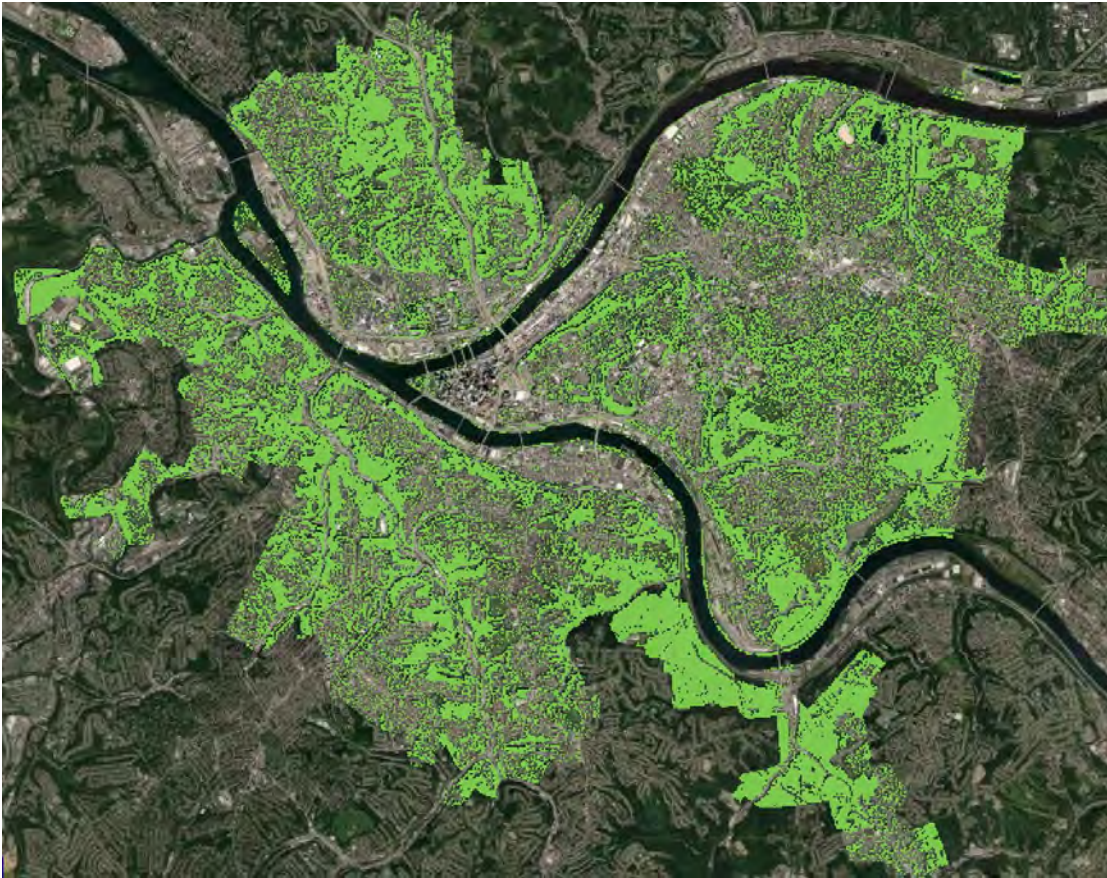


Figure notes: Historical population of Pittsburgh, 1950-2015, Source: U.S. Census Bureau

# Pittsburgh Boasts 41% Tree Canopy Coverage



## **Operations and Maintenance of Street Trees and Parks**

City Forestry Division

311 to report

Some contracts to nonprofit partners

## **Data**

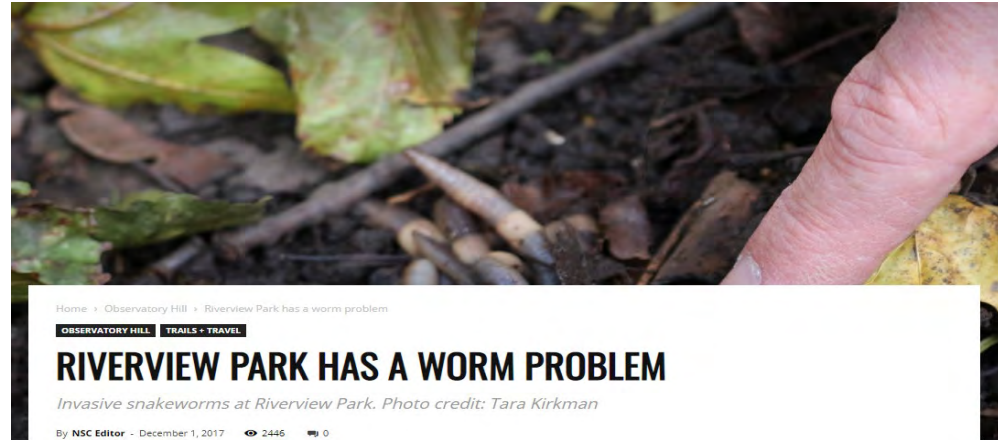
Department of Innovation and Performance

Cartegraph

Tree Pittsburgh Urban Tree Master Plan shows 5% canopy loss between 2010-2015

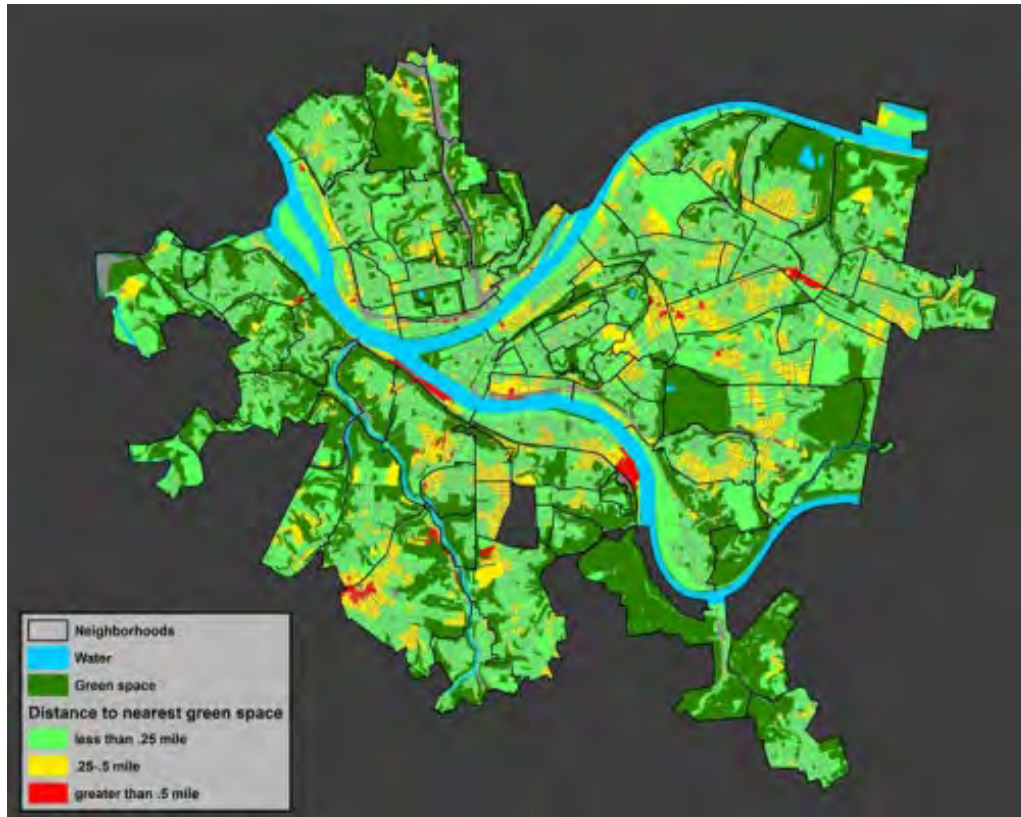


# Conditions: Not all natural spaces are functioning & maintained





# Access to green space scores generally good and equitable, but health outcomes do not align



Source: ONEPGH Resilience Strategy



### Indicator 59: Access to green space

2018 equality score: 100

Indicator definition	Ratio of the percentages of white and black residents living within one-quarter of a mile from a green space	
Reporting year results	<b>2017</b> White: 91.0% (178,824 people) Black: 93.5% (68,586 people)  <b>White-to-black ratio = 0.973, score 100</b>	<b>2018</b> White: 90.8% (184,621 people) Black: 94.5% (68,165 people)  <b>White-to-black ratio = 0.961, score 100</b>
Changes from reporting year 2017 to reporting year 2018	White: -0.2% Black: 1.0%  Change in equality score: 0	
Geography	City (census tract)	
Description of results and context	Access to green space (e.g., a park, wooded area, or greenway), based on a living within one-quarter of a mile from green space, is generally good in Pittsburgh. Access varied slightly between racial groups: black residents were slightly more likely to be living within one-quarter of a mile from green space (94.5 percent) than white residents (90.8 percent). These findings indicate that black residents may have better access to parks and urban forests than their white counterparts. Between 2017 and 2018, the percentage of black Pittsburghers living within one-quarter of a mile from a green space increased by 1.0 percent, while it decreased by 0.2 percent for white Pittsburghers. The small percentage change, and the maintenance of the flipped disparity between black and white Pittsburghers' access to green space, resulted in no change in the 2017 equality score of 100. There is no information available on the error associated with these data points, so we are unable to determine the statistical significance of changes in raw data or equality scores. Note that this analysis does not take into account the quality or specific amenities available at a given green space location.	

Source: ONEPGH Equity Indicators

# Pittsburgh Shade Tree Commission



The Shade Tree Commission is a quasi-governmental entity created by Pittsburgh ordinance [Title Four, Article XIII, Chapter 487](#) . Comprised of Mayor-appointed and City Council-approved volunteers, the Commission is funded through the **Outdoor Advertising Excise Tax** and funds from developers unable to meet street tree requirements (Alternative Compliance funds)

The Shade Tree Commission approves recommendations to the Mayor's office and City Council to expend funds from the Shade Tree Trust Fund to advance urban forestry initiatives.

## Signature Projects

[Tree Protection Task Force](#) works with City departments and authorities to prioritize tree protection. Trees are often a casualty of the City's own infrastructure projects

[Equitable Street Tree Investment Plan](#) focuses on 10 under-canopied neighborhoods annually to address deferred maintenance, new plantings, community engagement and STC funds

[Significant Tree Registry](#) to formally recognize significant trees on public or private property and encourage the proper maintenance, care and protection of them. Nominated by residents

## Members

Fifteen members comprise this Commission:

- All appointed by Mayor; confirmed by City Council
- 1 from Forestry Division of Public Works Department
- 1 from DPW with engineering/construction background
- 1 from Department of City Planning
- 1 from Mayor's Office
- 1 from Urban Redevelopment Authority
- 1 from an electric utility
- The rest from various "educational institutions, community-based organizations, business organizations, and environmental organizations"
- Majority of members must be City residents.



# Strategic Local Partnerships



501(c)3 born out of the Shade Tree Commission in 1996 to help care for and grow the City's tree canopy. Conducts an Urban Tree Canopy Study every 5 years, teaches a Tree Tenders Certification Course for resident stewardship, operates an annual tree pruning crew, conducts new plantings on public property, develops Releaf Neighborhood Plans in coordination with City Planning.

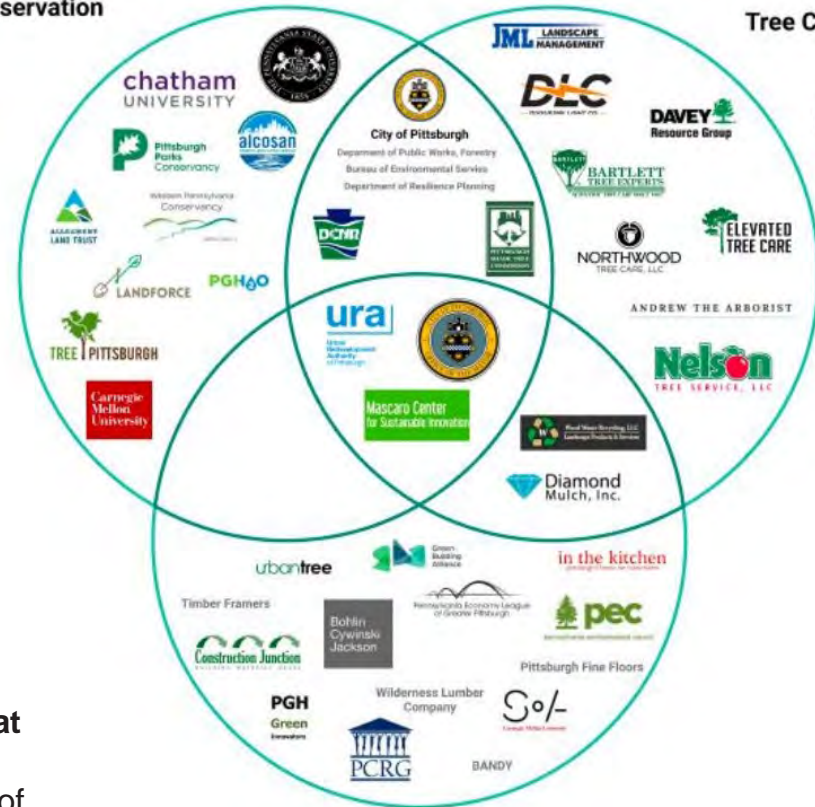


An application based, community tree planting program that has planted more than 34,000 trees since 2008. TreeVitalize Pittsburgh is a joint project of Allegheny County Parks, the City of Pittsburgh, Tree Pittsburgh, PA Department of Conservation and Natural Resources and the Western Pennsylvania Conservancy.

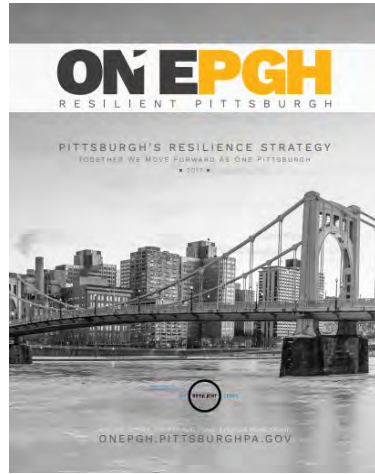
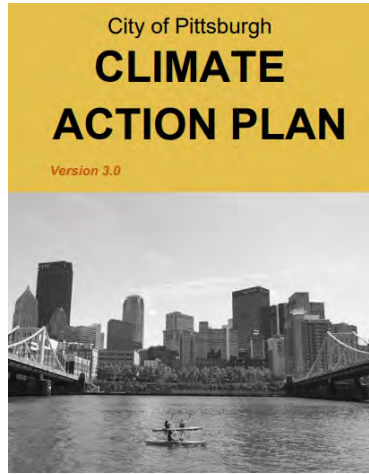
## Tree Planting and Preservation



## Tree Care and Removal



# Department of City Planning institutionalizes prioritization of tree canopy in planning documents



- Climate Action Plan includes an Urban Ecosystems Chapter and targets
- ONEPGH Resilience Strategy discusses natural infrastructure as a tool for climate resilience
- ONEPGH Investment Prospectus outlines a 100,000 trees by 2030 goal, Greenways Partnership Program, and Parks Investments
- All Neighborhood Plans are required to incorporate a tree canopy section
- Forthcoming Climate Adaptation Plan looks at tree canopy operational considerations

# Additional Funding and Technical Resources

2020 .5mill **Parks Tax**, new **Stormwater Fee** opportunity

**Tree Pittsburgh** developed the Urban Forest Master Plan

**Trust for Public Land** 10 Minute Walk supported a Greenways Pilot Program for ecosystem restoration

**National Recreation and Parks Association** support expanded Greenways Pilot into 2 year program

**Cambium Carbon** technical assistance explores new revenue streams from **urban wood reuse and carbon credits**

**100 Resilient Cities** support for ONEPGH plans and staffing capacity

Lamar **Advertising contract** goes towards the Shade Tree Trust Fund

City **leveraged vacant property** for Tree Pittsburgh campus and tree nursery, greenways and forest growth

**Participation in networks** like Vanguard Cities, American Forests, Cities 4 Forests, Biophilic Cities Network help advocate for resources



PITTSBURGH URBAN FOREST MASTER PLAN  
A Road Map for the Efficient Management of our Urban Forest



**1,362**

Number of tree removals conducted by the Division of Forestry in 2020

**937**

Estimated number of additional tree removals on private property in 2020

**\$27.49 / ton**

Disposal fee paid by the City for Wood Waste Recycling

**\$317,644.92**

Total contract amount paid to Wood Waste Recycling from 2017 to 2019

**\$660,000**

Estimated carbon revenues from a 200-acre preservation project at Hays Woods

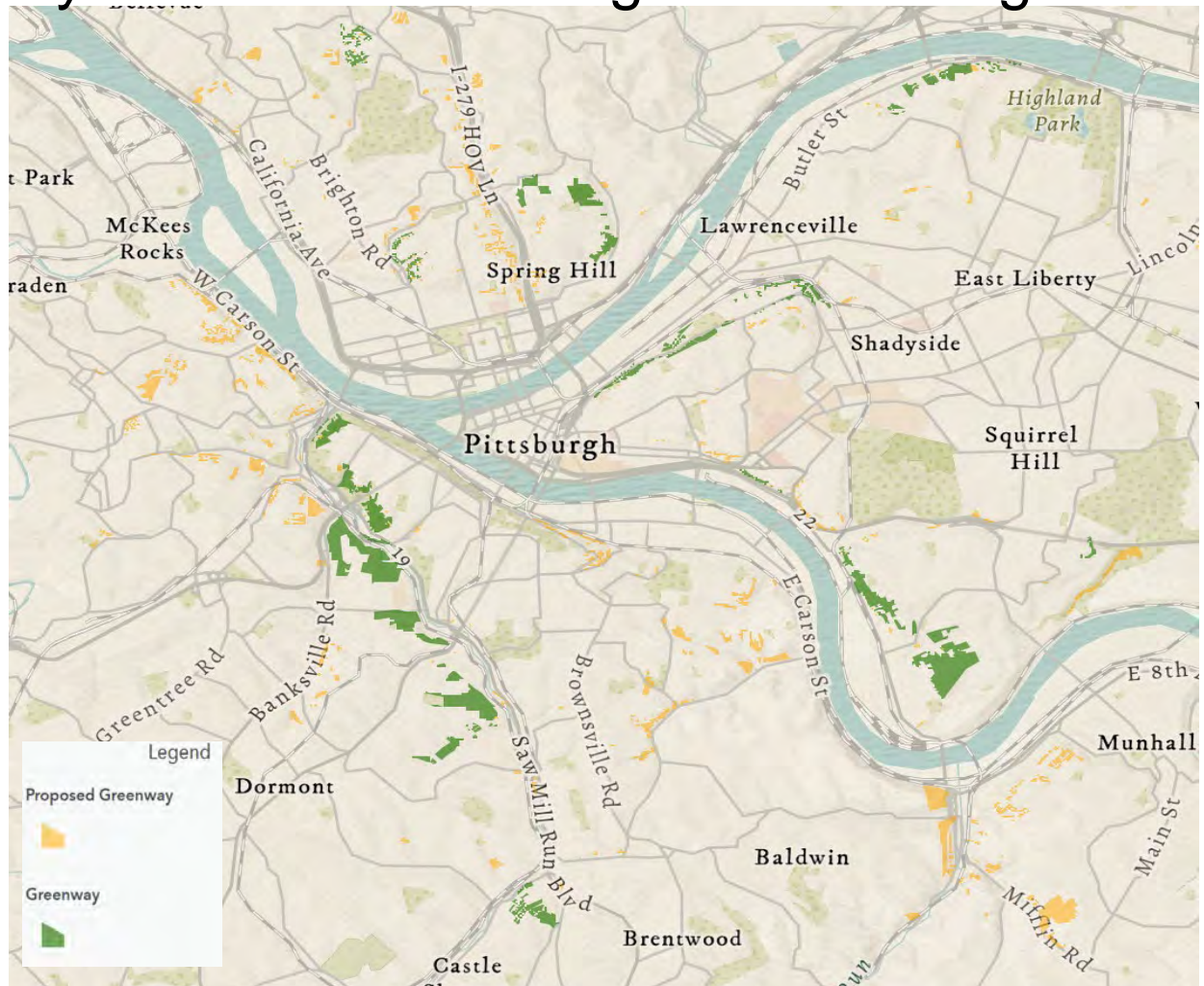






# 600 acres of Greenways are located throughout Pittsburgh

- Pittsburgh's Greenways were developed in 1980 as a means to systematically deal with abandoned properties that had come under City ownership after the collapse of the steel industry and loss of population.
- Greenway stewardship was left up to resident groups. The City of Pittsburgh does not fund work or maintenance in the greenways network.
- Greenways are essentially big vacant lots, and they need a lot of love and resources to address resilience issues of flooding, landslides, air quality, and ecological collapse.





# Hazelwood Greenway pilot project tackled a little over 2 acres

before:



mid-chomp



after



## Project Partners





Thank you!  
**Rebecca Kiernan**  
**Principal Resilience Planner**  
rebecca.kiernan@pittsburghpa.gov

## Where can you find us?



**Pittsburgh City Planning**



**@PLANPGH**



**@planpgh**

Online at [www.pittsburghpa.gov/dcp](http://www.pittsburghpa.gov/dcp)



# URBAN FOREST MANAGEMENT FUNDING: *CASE STUDY PORTLAND, OREGON*



[PORTLANDPARKS.ORG](http://PORTLANDPARKS.ORG) | Commissioner Carmen Rubio | Director Adena Long



**PORTLAND PARKS & RECREATION™**

Healthy Parks, Healthy Portland

## PORTLAND'S URBAN FOREST

- 30.7% Canopy Coverage
- 218,000 street trees
- 1.2 million park trees
- 2.9 million private trees
- \$5 billion structural value (2007)
  
- 52% Canopy Coverage Potential







**PORTLAND PARKS & RECREATION™**

Healthy Parks, Healthy Portland

# PORTLAND URBAN FORESTRY



PORTLANDPARKS.ORG | Commissioner Carmen Rubio | Director Adena Long



PORTLAND PARKS & RECREATION™

Healthy Parks, Healthy Portland

## THE STORY OF IMPROVED FUNDING

- Years of visible, painful budget cuts and service impacts
- Leadership: the need for a financially ***Sustainable Future***
- Analyses: funding needs, service trajectories, revenue potentials
- Community task force: political viability / pros and cons of various funding options
- City Council: conversation to outline the need and the funding options (most of which would require voter support)
- Community polling
- More community and City Council conversations about a potential specific ballot initiative
- 2020 ballot measure – ***Parks Local Option Levy***
- Spring 2021 – Levy implementation begins



## PP&R SUSTAINABLE FUTURE PROGRAM

- Commitment to establishing a more financially sustainable direction that aligns equitable service and funding levels
- **Near term = successful delivery of Parks Levy**
- Long term
  - Financial sustainability
  - Equitable parks and recreation system for all Portlanders







**PORTLAND PARKS & RECREATION™**

Healthy Parks, Healthy Portland

## PARKS LOCAL OPTION LEVY



### RECREATION FOR ALL

**Expanding and maintaining equitable recreation services.**



### PROTECT AND GROW NATURE

**Maintaining parks, improving the health of natural areas, and increasing tree planting and care.**



### COMMUNITY PARTNERSHIPS

**Building stronger community partnerships and increasing engagement with underserved communities.**

## FOREST-RELATED COMMITMENTS IN VOTER PAMPHLET



1. Enhance and preserve parks, rivers, wetlands, trees, and other important natural features in urban areas for the benefit of all Portlanders and wildlife.
3. Increase opportunities for communities of color and children experiencing poverty to connect with nature;
6. Protect water quality and wildlife habitat, control erosion, remove invasive species in 8,000 acres of natural area.
11. Plant new trees in communities where today canopy coverage is lower, to improve air and water quality, diminish the impacts of climate change, and provide wildlife habitat.
12. Protect Portland's 1.2 million park trees by performing proactive maintenance, safety checks, hazard removal, and replacement of damaged trees in parks and natural areas.
13. Modernize data systems to improve internal efficiency.
14. Prioritize services for communities of color and households experiencing poverty, including equity-centered engagement and outreach, community partnership grants, and increased engagement with volunteer and partner groups.



## BLENDING FUNDING MODEL

- “Blend” Parks Levy resources with other revenue (General Fund, etc.) so that little to no PP&R positions, expenses, etc. are fully supported by *only* the Parks Levy
- General Fund (GF) is the *first* money in and pays for all GF-only costs, then the remainder GF is split between levy-eligible costs
- Parks Levy then funds the gap of what the GF doesn’t cover on levy-eligible costs
- Results in a group of services across the Bureau that all have an equivalent blend of resources





## PARKS LEVY OVERSIGHT COMMITTEE

- 5-member Parks Levy Oversight Committee appointed in Summer 2021
- Committee advises PP&R Director and staff on:
  - Review of Levy expenditures and outcomes
  - Communicating Levy success to the public
  - An independent audit
  - Report to City Council annually
- Committee Members:
  - Alescia Blakely
  - Paul Agrimis
  - Judy Bluehorse Skelton
  - Maria Velez
  - Silas Sanderson



## WHY MAXIMIZING PARKS LEVY SUCCESS IS IMPORTANT



- Demonstrate success and deliver on promises made to voters in November 2020
- Spend funding responsibly and equitably
- Translation of success with Parks Levy to renewal or alternative sustainable funding option

# FUNDING GAPS



**Operating**  
(maintenance and programming)



**Voter approved  
5-Year operating  
levy**



**Capital  
maintenance**



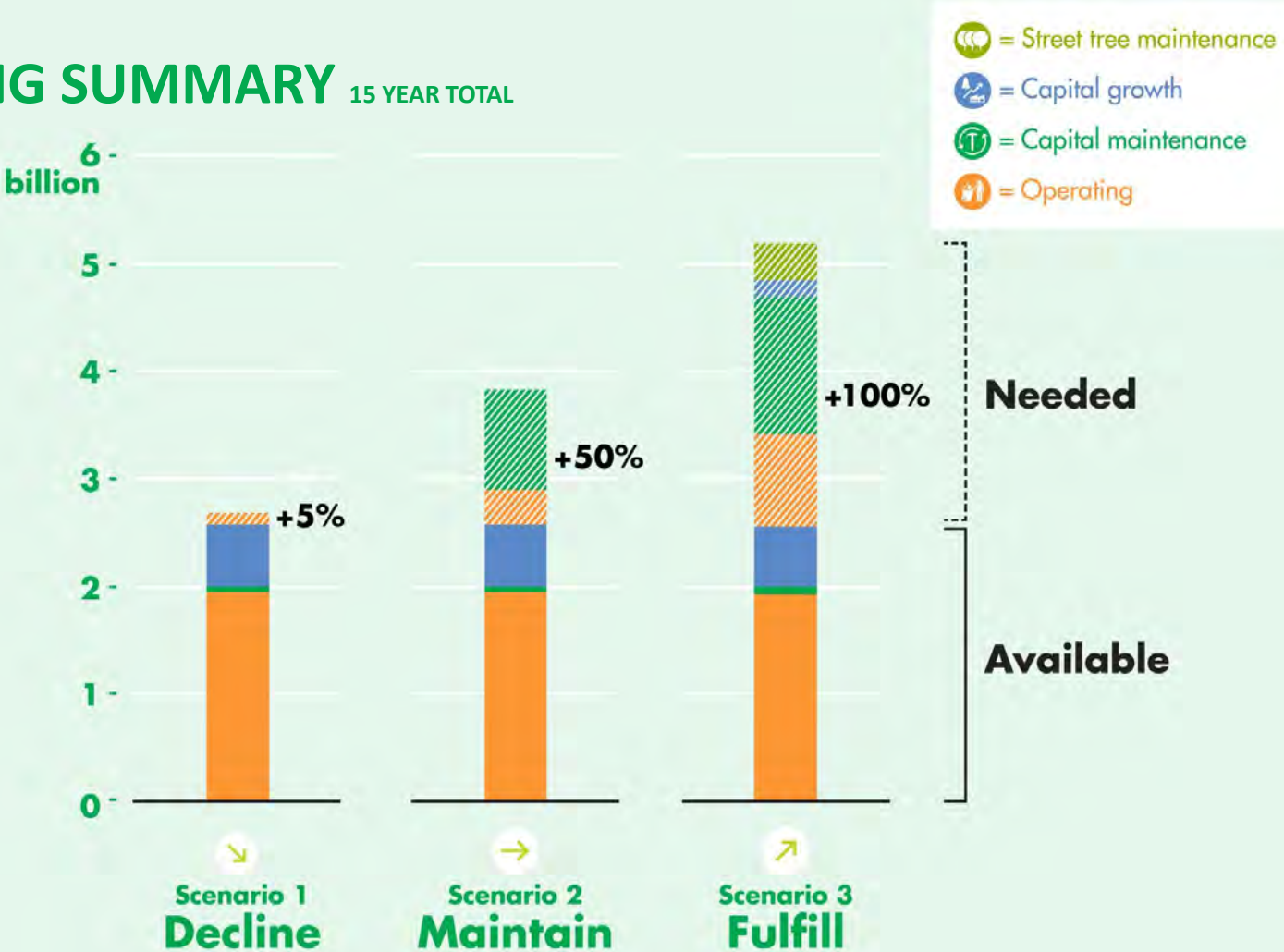
**Capital  
growth**



**System Development  
Charge Program  
(partial)**



# FUNDING SUMMARY 15 YEAR TOTAL



## ALTERNATIVE FUNDING OPTIONS\*

- General Obligation Bond
- Special District
- Local Option Levy
- Transient Lodging Tax
- Cell Phone Tax
- Prepared Food/Beverage Tax
- *Income Tax*

*\*Options considered have been implemented in Oregon; list is not ranked by PP&R or the Alternative Funding Task Force.*





**PORTLAND PARKS & RECREATION™**

Healthy Parks, Healthy Portland

## OTHER SOURCES OF INFORMATION

- Parks Levy Website  
<https://www.portland.gov/parks/parks-levy>
- Claire Flynn, Levy Coordinator  
Claire.Flynn@PortlandOregon.gov  
503.679.8008
- Future Information Sources
  - Annual Reports
  - Independent Audit
  - City Council Presentations





# REVISED APPROVED TREE SPECIES

## OFFICE OF THE CITY FORESTER



### Approved Street Tree List for Denver's Public Rights-of-way

Trees in the approved list are those which, given proper and consistent maintenance including supplemental irrigation, proper pruning, and avoidance of chemical contaminants, will be assets to Denver's urban canopy.

When possible, obtain trees that have been grown from a local seed source. Locally grown trees will be adapted to our area's highly variable, and often harsh, growing conditions. If locally grown trees cannot be obtained, source from locales that have similar growing conditions to our area (precipitation, soil pH, high/low temperatures, etc). Moisture requirements are based on observed species averages following root establishment. All trees require supplemental water for root establishment.

Per Forestry Rules and Regulations, the following trees may not be planted in the public right-of-way:

- Any of the poplar (*Populus*) species including cottonwoods and aspens
- Any of the willow (*Salix*) species
- Boxelder (*Acer negundo*)
- Siberian elm (*Ulmus pumila*)
- Weeping and pendulous trees
- Multi-stemmed trees

Other trees which, for various reasons, currently have a moratorium on planting in the public right-of-way include:


- Ash (*Fraxinus*) species
- Walnut (*Juglans*) species
- Silver maple (*Acer saccharinum*)
- Autumn Blaze / Freeman maple (*Acer x freemannii*)
- Sunburst honeylocust (*Gleditsia triacanthos inermis* 'Sunburst')
- Bradford pear (*Pyrus calleryana* 'Bradford')
- Mulberry (*Morus*) species
- Russian-olive (*Elaeagnus angustifolia*)
- Tree-of-heaven (*Ailanthus altissima*)

Trees not included on the approved street tree list may not be planted in the public right-of-way (as a street tree) without express permission from the Office of the City Forester. If a tree is excluded, it may be permitted on a case-by-case basis. Contact the Office of the City Forester (720-913-0651) for details, site inspections, and planting permits.

By Denver ordinance (§57-18), the adjoining property owner is responsible for all aspects of street tree care, including but not limited to: planting, pruning, vegetative litter clean-up, and removal. A free permit is required from the Office of the City Forester for tree planting and removal.

#### Minimum Spacing Requirements

- 35' between shade trees
- 25' between ornamental trees
- 30' from curb at intersections
- 20' from street lights
- 10' from alleys, driveways & fire hydrants
- 7' from attached sidewalks
- 5' from water meters

 Shading indicates species suitable for planting under overhead utilities. These varieties should only be planted in situations where overhead growth restrictions exist.

**Denver Office of the City Forester Approved Street Tree List**

Updated March 2017

Family	Botanical Name	Acceptable Cultivar	Common Name	Hardiness Zone	Moisture Level	Soil Salt Tolerance	Aerosol Salt Tolerance	Water Quality Area	Height @ Maturity	Canopy Spread @ Maturity	Canopy Area @ Maturity	Growth Form/Shape	Flowers	Fruits	Leaf Color - Spring/Fall		Additional Notes (includes compaction/tolerances/restrictions)			
															Spring	Fall				
															Aceraceae	<i>Acer buergerianum</i>		Streetwise	Trident Maple	5
Aceraceae	<i>Acer campestre</i>		Hedge Maple	5	Min	Tolerant	Tolerant		30	30	707	Oval to rounded, dense	Small green-yellow in spring, insignificant	Green samaras	Dark green	Yellow	Tolerates dry soil. Intolerant of soil compaction. Prune to develop strong branching structure and overhead clearance.			
Aceraceae	<i>Acer campestre</i>	Panacek	Metro Gold Hedge Maple	5b	Min	Tolerant	Tolerant		30	15	177	Upright to narrow oval	Small green-yellow in spring, insignificant	Green samaras	Dark green	Yellow	Upright, narrow form. Tolerates dry soil. Intolerant of soil compaction. Prune to develop strong branching structure and overhead clearance.			
Aceraceae	<i>Acer campestre</i>	JFS ShichtelZ	Streetside Maple	5	Min	Tolerant	Tolerant		32	15	177	Upright to narrow oval	Small green-yellow in spring, insignificant	Green samaras	Dark green	Yellow	Upright, narrow form. Tolerates dry soil. Intolerant of soil compaction. Prune to develop strong branching structure and overhead clearance. Availability may be limited.			
Aceraceae	<i>Acer glabrum</i>		Rocky Mountain Maple	5	Min to Mod	Sensitive	Sensitive		20	13	133	Oval	Small green-yellow in spring, insignificant	Green samaras	Green	Yellow-orange-red	Plant in protected site - heat tolerance may be a concern. Prune to develop strong branching structure and overhead clearance.			
Aceraceae	<i>Acer grandidentatum</i>		Bigtooth Maple	4	Xeric	Sensitive	Sensitive		25	25	491	Rounded to broad spreading	Small green-yellow in spring, insignificant	Green samaras	Green	Orange-red	Also known as Wasatch maple. Slow growing. Tolerant of alkaline soils. Typically multistem. Prune to develop central leader, strong branching structure and overhead clearance.			
Aceraceae	<i>Acer grandidentatum</i>	JFS-NuMex 3 P.A.F.	Mesa Glow Bigtooth Maple	4	Xeric	Sensitive	Sensitive		25	15	177	Upright oval	Small green-yellow in spring, insignificant	Green samaras	Dark green	Orange-red to red	Upright form of parent species. Slow growing. Tolerant of alkaline soils. NM State introduction - Availability may be limited. Prune to develop central leader, strong branching structure and overhead clearance.			
Aceraceae	<i>Acer grandidentatum</i>	Schmidt	Rocky Mountain Glow	4	Xeric	Sensitive	Sensitive		20	13	133	Oval	Small green-yellow in spring, insignificant	Green samaras	Green	Yellow-orange-red	Faster growing than species. Intolerant of soil compaction. Prune to develop strong branching structure and overhead clearance.			
Aceraceae	<i>Acer grandidentatum</i> x <i>saccharum</i>	Hipzam	Highland Park Maple	4	Min	Sensitive	Sensitive		35	22	380	Narrow upright to pyramidal	Small green-yellow in spring, insignificant	Green samaras	Dark green	Red	Faster growing & more upright than bigtooth maple. More heat & drought resistant than sugar maple. Prune to develop overhead clearance.			
Aceraceae	<i>Acer grandidentatum</i> x <i>saccharum</i>	Orbit	Canyon Treasure Bigtooth Maple	4	Min	Sensitive	Sensitive		35	22	380	Oval to rounded	Small green-yellow in spring, insignificant	Green samaras	Dark green	Red	Very cold hardy. NDSU introduced - Availability may be limited. Prune to develop overhead clearance.			
Aceraceae	<i>Acer griseum</i>		Paperbark maple	4	Mod	Intermediate	Intermediate		25	20	314	Oval to vase	Small green in spring, insignificant	Brown samaras	Dark green	Yellow-orange-red	Very slow growing. Attractive, exfoliating bark. Tolerant of slightly alkaline soils. Intolerant of extended drought. Not recommended for planting in or near hardscape. Availability may be limited. Prune to develop single stem form and overhead clearance.			
Aceraceae	<i>Acer griseum</i>	JFS KW8AGRI	Fireburst Paperbark Maple	5	Mod	Intermediate	Intermediate		22	15	177	Upright oval	Small green in spring, insignificant	Brown samaras	Dark green	Brilliant red	Faster growing variety of parent species. Attractive, exfoliating bark. Tolerant of slightly alkaline soils. Intolerant of extended drought. Not recommended for planting in or near hardscape. Availability may be limited. Improved branch structure over parent species. Prune to develop single stem form and overhead clearance.			
Aceraceae	<i>Acer miyabei</i>	Morton	State Street Maple	4	Mod	Intermediate	Intermediate	X	45	35	962	Upright pyramidal to rounded	Small green-yellow in spring, insignificant	Green samaras	Green	Yellow-orange	Cold hardy & drought tolerant, chlorosis resistant; pest free.			
Aceraceae	<i>Acer miyabei</i>	JFS-KW3AMI	Rugged Ridge Maple	4	Mod	Intermediate	Intermediate	X	50	35	962	Upright oval	Small green-yellow in spring, insignificant	Green samaras	Dark green	Yellow	Cold hardy & drought tolerant, chlorosis resistant; pest free; touted as most vigorous miyabe maple.			
Aceraceae	<i>Acer nigrum</i>		Black Maple	4	Mod	Sensitive	Sensitive		60	40	1257	Upright oval to rounded	Small green-yellow in spring, insignificant	Green samaras	Dark green	Yellow-orange-red	More drought & heat tolerant than sugar maple. Intolerant of poorly drained soils. Availability may be limited.			
Aceraceae	<i>Acer nigrum</i>	Greencolumn	Greencolumn Maple	4	Min to Mod	Unknown	Unknown		45	15	177	Narrow upright	Small green-yellow in spring, insignificant	Green samaras	Light green	Yellow-orange	Good heat and drought tolerance. May suffer some scorch in exposed sites.			
Aceraceae	<i>Acer platanoides</i>		Norway Maple	See comments regarding Norway maple													Tree is susceptible to sunscald, leaf scorch, frost cracks, and chlorosis. Does not tolerate planting in exposed sites or hardscape. Tree should only be planted in large areas with organic surface treatments.			
Aceraceae	<i>Acer pseudoplatanus</i>		Sycamore Maple	4	Mod	Tolerant	Tolerant		35	25	491	Upright spreading to rounded	Small green-yellow in spring, insignificant	Green samaras, turning red	Dark green	Yellow	Soil adaptable and salt tolerant. Intolerant of heavy clay soils. Plant in large tree lawn.			
Aceraceae	<i>Acer pseudosieboldianum</i>	KorDak	Northern Spotlight Korean Maple	4	Mod	Unknown	Unknown		15	20	314	Upright to broad spreading	Off-white in spring, insignificant	Brown-purple samaras	Green	Orange-deep red	Cold hardy cross between Korean & Japanese maple. Leaves resistant to scorch, persist through winter. Thin bark may be easily damaged. NDSU introduced - Availability may be limited.			
Aceraceae	<i>Acer pseudosieboldianum</i> x <i>palmatum</i>	Hasselkus	Northern Glow Maple	4	Mod	Unknown	Unknown		15	20	314	Upright to broad spreading	Off-white in spring, insignificant	Brown-purple samaras	Green	Orange-deep red	Cold hardy cross between Korean & Japanese maple. Leaves resistant to scorch. Thin bark may be easily damaged. NDSU introduced - Availability may be limited.			
Aceraceae	<i>Acer rubrum</i>	Minnesota	Fall Grandeur Red Maple	3	Insufficient Data at this time - if tree can be obtained, Forestry is open to permitting planting on trial basis													Green	Red	Alkaline soil tolerant variety. NDSU introduced - Availability may be limited.

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															Spring	Fall	
Aceraceae	Acer saccharum	Collins Caddo	Collins Caddo Maple	5	Insufficient Data at this time - If tree can be obtained, Forestry is open to permitting planting on trial basis												
Aceraceae	Acer saccharum	Green Mountain	Green Mountain Sugar Maple	3	Mod	Sensitive	Sensitive		45	35	962	Upright to broad oval	Small green-yellow in spring, insignificant	Green samaras	Dark green	Yellow-red-orange	Good scorch resistance. Leaves are tatter resistant. More drought tolerant than parent species.
Aceraceae	Acer saccharum	Legacy	Legacy Sugar Maple	4	Mod	Sensitive	Sensitive		45	30	707	Symmetrical oval to rounded	Small green-yellow in spring, insignificant	Green samaras	Dark green	Reddish orange-red	Good scorch resistance. Leaves are tatter resistant. More drought tolerant than parent species.
Aceraceae	Acer saccharum	John Pair	John Pair Caddo Maple	5	Min to Mod	Unknown	Unknown	X	27	27	573	Rounded, symmetrical	Small green-yellow in spring, insignificant	Green samaras	Glossy green	Red	Heat, drought, and alkaline soil tolerant cultivar.
Aceraceae	Acer saccharum	Autumn Splendor	Autumn Splendor Caddo Maple	5	Min to Mod	Unknown	Unknown	X	40	35	962	Broad oval to rounded	Small green-yellow in spring, insignificant	Green samaras	Glossy green	Orange-red	Heat, drought, and alkaline soil tolerant cultivar.
Aceraceae	Acer saccharum	JFS-Caddo2	Flashfire Caddo Maple	4	Min to Mod	Unknown	Unknown	X	40	35	962	Broad oval	Small green-yellow in spring, insignificant	Green samaras	Dark green	Bright red	Heat, drought, and alkaline soil tolerant cultivar. Brilliant, early fall color. Hardest of Caddo maples.
Aceraceae	Acer saccharum	JFS-Caddo3	Oregon Trail Maple	5		Unknown	Unknown		45	40	1257	Broadly oval to rounded	Small green-yellow in spring, insignificant	Green samaras	Dark green	Orange red-red	Drought & heat resistant; strong branch structure resists ice damage.
Aceraceae	Acer saccharum	Sisseton	Northern Flare Sugar Maple	3	Mod	Unknown	Unknown		40	35	962	Oval	Small green-yellow in spring, insignificant	Green samaras	Green	Orange-red	Slow-growing, cold hardy cultivar. Tolerant of alkaline soils, but intolerant of compaction. NDSU introduced - Availability may be limited.
Aceraceae	Acer saccharum	Sugar Cone	Sugar Cone Maple	4	Mod	Unknown	Unknown		22	11	95	Dwarf pyramid, compact	Small green-yellow in spring, insignificant	Green samaras	Dark green	Red-orange-yellow	Smallest cultivar of species. Slow growing. Drought tolerant. Unproven in Denver region.
Aceraceae	Acer tataricum	JFS-KW2	Rugged Charm Tatarian Maple	3	Xeric	Intermediate to Tolerant	Unknown	X	24	13	133	Upright oval, compact	White clusters in spring	Red samaras	Green	Yellow-orange-red	Form more narrow and symmetrical than parent species and Hot Wings. Rarely suckers. Showy, heavy seed crop.
Aceraceae	Acer tataricum	Gar-Ann	Hot Wings Tatarian Maple	3	Xeric	Intermediate to Tolerant	Unknown	X	20	20	314	Rounded, spreading	White clusters in spring	Bright red samaras	Green	Yellow-red	Broadly spreading cultivar. Rarely suckers. Showy, heavy seed crop. Prune to develop strong branching structure.
Aceraceae	Acer tataricum	Patdell	Pattern Perfect Tatarian Maple	3	Min	Intermediate to Tolerant	Unknown	X	23	18	254	Upright oval	White clusters in spring	Red Samaras	Green	Yellow-orange-red	Oval form more narrow than parent species and Hot Wings. Rarely suckers. Showy, heavy seed crop. Faster growing than other cultivars of species.
Aceraceae	Acer triflorum		Three Flower Maple	4	Mod	Intermediate	Intermediate		15	20	314	Rounded	Green in spring, insignificant	Green samaras	Light green	Bright orange	Slow growing. Intolerant of drought and alkaline soil. Shallow root system. Availability may be limited - Obtain from northern seed sources. Unproven in Denver region.
Aceraceae	Acer triflorum	Jack-O-Lantern	Orange Aglo Three Flower Maple	3b	Mod	Intermediate	Intermediate	Insufficient Data at this time - If tree can be obtained, Forestry is open to permitting planting on trial basis				Rounded	Unknown	Unknown	Green	Orange	Leaves persist through winter. Alkaline soil tolerant. NDSU introduced - Availability may be limited.
Aceraceae	Acer truncatum x platanoides	JFS-KW249	Ruby Sunset Maple	4b	Min	Unknown	Unknown		22	17	227	Broad oval to rounded	Unknown	Green samaras	Glossy dark green	Deep red	Availability may be limited. Unproven in Denver region.
Aceraceae	Acer truncatum x platanoides	JFS-KW187	Urban Sunset Maple	4b	Min	Unknown	Unknown		35	20	314	Narrow pyramidal to upright oval	Yellow flowers in spring, very short bloom time	Green samaras	Glossy dark green	Red	Minimal pruning is required. Produces few seeds.
Aceraceae	Acer truncatum x platanoides	JFS-KW202	Crimson Sunset Maple	4	Min	Unknown	Unknown		30	20	314	Upright oval	Yellow flowers in spring, very short bloom time	Green samaras	Deep purple	Reddish-bronze	More heat and drought tolerant than parent species. Thin bark may be easily damaged. Prune for street use to maintain shape and structure.
Aceraceae	Acer truncatum x platanoides	Keithsform	Norwegian Sunset Maple	4b	Min	Unknown	Unknown		30	20	314	Upright oval	Yellow flowers in spring, very short bloom time	Green samaras	Dark green	Yellow-orange-red	More heat and drought tolerant than parent species. Japanese beetle resistant. Thin bark may be easily damaged. Prune for street use to maintain shape and structure.
Aceraceae	Acer truncatum x platanoides	Warrenred	Pacific Sunset Maple	4b	Min	Unknown	Unknown		27	20	314	Upright spreading to rounded	Yellow flowers in spring, very short bloom time	Green samaras	Dark green	Yellow-orange-red	More heat and drought tolerant than parent species. Japanese beetle resistant. Thin bark may be easily damaged. Prune for street use to maintain shape and structure.
Hippocastanaceae	Aesculus flava		Yellow Buckeye	4	Mod	Intermediate	Intermediate		60	30	707	Upright oval to slightly spreading	Yellow-green flowers in spring, showy	Smooth, Pear-shaped capsule & nut	Dark green	Pumpkin-yellow	Greater leaf blotch resistance and less leaf drop than other Aesculus species. Leaf scorch may be an issue in windy, exposed sites.
Hippocastanaceae	Aesculus glabra		Ohio Buckeye	4	Mod	Intermediate	Sensitive		35	35	962	Rounded to oval, low branching	Yellow-green flowers in spring, showy	Spiny, oval-shaped capsule & nut	Bright green	Pumpkin-yellow	Intolerant of excess heat and drought. Powdery mildew, leaf scorch, and leaf drop may be issues. Prune to develop overhead clearance.
Hippocastanaceae	Aesculus x arnoldiana	Autumn Splendor	Autumn Splendor Buckeye	4	Mod	Intermediate	Unknown		30	25	491	Rounded, low branching	Off-white flowers in spring, showy	Spiny, oval-shaped capsule & nut	Dark green	Red-orange-purple	Resistant to leaf scorch. Intolerant of excess drought. Prune to develop overhead clearance.
Hippocastanaceae	Aesculus x 'Homestead'		Homestead Buckeye	4	Mod	Intermediate	Unknown		35	22	380	Broad oval to rounded, low branching	Yellow-red flowers in spring, showy	Spiny, oval-shaped capsule & nut	Dark green	Bright red-orange	Intolerant of excess heat and drought. Powdery mildew, leaf scorch, and leaf drop may be issues. Prune to develop overhead clearance.
Hippocastanaceae	Aesculus hippocastanum		Common Horsechestnut	4	Mod	Intermediate	Intermediate		60	40	1257	Dense oval	White flowers in spring, showy	Spiny, round-shaped capsule & nut	Dark green	Yellow	Tolerant of restricted growing areas. Intolerant of excess heat and drought. Powdery mildew, leaf scorch, and leaf drop may be issues. May be subject to storm breakage; avoid planting in high wind areas.



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															Spring	Fall	
Hippocastanaceae	Aesculus hippocastanum	Baumanni	Baumann Horsechestnut	4	Mod	Intermediate	Intermediate		45	36	1018	Broad oval	Double white flowers w/ red & yellow tints in spring, showy	Fruitless	Dark green	Yellow	Recommended over standard horsechestnut. Tolerant of restricted growing areas. Intolerant of excess heat and drought. Powdery mildew, leaf scorch, and leaf drop may be issues. May be subject to storm breakage; avoid planting in high wind areas.
Hippocastanaceae	Aesculus x Bergeson		Prairie Torch Buckeye	3	Mod	Intermediate	Intermediate		27	27	573	Slightly weeping, globose	Yellow-green in spring, showy	Spiny, round-shaped capsule & nut	Dark green	Orange-red	Excellent cold hardiness. Resistant to leaf scorch. Intolerant of drought.
Hippocastanaceae	Aesculus x carnea	Ft McNair	Ft McNair Horsechestnut	4	Mod	Intermediate	Intermediate		29	27	573	Rounded, low branching	Pink w/ yellow tints in spring, showy	Small, spiny, round-shaped capsule	Dark green	Yellow	More leaf blotch resistant than parent species and other cultivars. Leaf scorch in windy sites may be an issue. Less leaf drop than other Aesculus sp..
Hippocastanaceae	Aesculus x carnea	Briotti	Briotti Horsechestnut	4	Mod	Intermediate	Intermediate		27	32	804	Rounded, low branching	Bright red flowers in spring, showy	Nearly fruitless	Dark green	Yellow	Nearly fruitless cultivar. Intolerant of drought. Prefers moist, well-drained soil.
Rosaceae	Amelanchier arborea		Downy Serviceberry	4	Min to Mod	Intermediate	Sensitive	X	20	15	177	Rounded	White flowers in spring, showy	Small, purple-red fruit, edible	Dark green	Orange-red-yellow	Intolerant of pollution. Thin bark may be easily damaged. Prefers moist, well-drained soil.
Rosaceae	Amelanchier canadensis*		Shadblow Serviceberry	3	Xeric	Intermediate to Tolerant	Sensitive	X	20	15	177	Rounded to upright vase, typically multistemmed	White flowers in spring, showy	Small, purple-red fruit, edible	Dark green	Orange-red-yellow	Thin bark may be easily damaged. Prune to develop single stem form.
Rosaceae	Amelanchier x grandiflora	Autumn Brilliance, Princess Diana, Robin Hill	Apple Serviceberry	4	Xeric to Min	Intermediate to Tolerant	Sensitive	X	20	15	177	Upright to moderate spreading	White, light pink flowers in spring, showy (Robin Hill)	Small, purple-red fruit, edible	Dark green	Orange-red-yellow	Cold hardy. Thin bark may be easily damaged. Prune to develop single stem form. Robin Hill best cultivar for single stem form.
Rosaceae	Amelanchier laevis		Allenghery Serviceberry	4	Min to Mod	Intermediate to Tolerant	Sensitive	X	22	13	133	Upright oval, irregular	White flowers in spring, showy	Small, black-purple fruit, edible	Blue-green	Red-orange-yellow	Tolerant of full shade and confined planting spaces. Thin bark may be easily damaged. Taller and more upright than other Amelanchier species. Good selection for single stem form.
Rosaceae	Amelanchier laevis	JFS-Arb PP 15304	Spring Flurry Serviceberry	4	Min to Mod	Intermediate to Tolerant	Sensitive	X	25	15	177	Upright oval vase	White flowers in spring, showy	Small, black-purple fruit, edible	Green	Red-orange-yellow	Tolerant of full shade and confined planting spaces. Thin bark may be easily damaged. Taller and more upright than other Amelanchier species. Dominant central leader with upward scaffold branches. Good selection for single stem form.
Annonaceae	Asimina triloba		Pawpaw	5	Mod	Unknown	Unknown	X	23	12	113	Upright to rounded	Purple-maroon flowers in early spring	2"-4" elongated fruit, green maturing to brown, edible	Green	Yellow	Tolerant of full shade, medium-wet soils, and slightly alkaline pH. Fruit results from multiple tree cross-pollination. Plant in areas where fruit is not problematic. Prune to develop strong branching structure. Availability may be limited. Unproven in Denver region.
Betulaceae	Carpinus betulus	Frans Fontaine, Fastigiata	Columnar European Hornbeam	5	Mod	Sensitive	Sensitive		35	20	314	Upright, narrow	White flowers in spring, insignificant	Insignificant	Dark green	Yellow	Intolerant of excess & reflective heat, resulting in scorch and poor vigor. Plant in protected sites with large rooting space.
Betulaceae	Carpinus caroliniana		American Hornbeam	3	Mod	Sensitive	Sensitive		25	22	380	Columnar-oval to pyramidal, low branching	Orange-yellow catkins in early spring, insignificant	Insignificant	Green	Orange-red-yellow	Tolerant of periodic flooding. Intolerant of compacted soils. Prefers slightly acidic soils. May be difficult to transplant. Highly resistant to storm damage due to hard, dense wood. Availability may be limited.
Betulaceae	Carpinus caroliniana	Uxbridge	Rising Fire American Hornbeam	4	Mod	Sensitive	Sensitive		27	12	113	Upright, narrow	Orange-yellow catkins in early spring, insignificant	Insignificant	Green	Red-orange	Columnar form of parent species. Tolerant of periodic flooding. Intolerant of compacted soils. Prefers slightly acidic soils. May be difficult to transplant. Highly resistant to storm damage due to hard, dense wood. Availability may be limited.
Juglandaceae	Carya illinoensis		Pecan	5	Mod	Sensitive	Sensitive		60	40	1257	Oval to spreading	Yellow catkins in spring, insignificant	1"-2" Edible nut	Green	Yellow	Northern seed source is critical. May be difficult to transplant & establish due to taproot. Large root system requires large tree lawn. Prune to develop strong branching structure when young. Unproven in Denver region.
Juglandaceae	Carya glabra		Pignut Hickory	5	Min to Mod	Sensitive	Intermediate		50	30	707	Dense oval	Yellow-green catkins in spring, insignificant	1" Nut	Green	Yellow-copper	May be difficult to transplant & establish due to taproot. Unproven in Denver region.
Juglandaceae	Carya ovata		Shagbark Hickory	5	Mod	Intermediate	Sensitive		50	30	707	Oval	Yellow catkins in spring, insignificant	1" Nut	Deep yellow-green	Burnt yellow	May be difficult to transplant & establish due to taproot. Unproven in Denver region.
Bignoniaceae	Catalpa ovata		Chinese Catalpa	4	Xeric to Min	Tolerant	Intermediate		25	25	491	Spreading	Yellow-white flowers in spring to summer, showy	Long, brown bean pod	Green	Yellow	Smaller than Catalpa speciosa. Heat, drought, and alkaline soil tolerant. Decay when wounded or as tree ages may be an issue. Availability may be limited.
Bignoniaceae	Catalpa speciosa		Western Catalpa	5	Xeric to Min	Intermediate	Intermediate	X	50	35	962	Irregular pyramidal to rounded oval	Large, white flowers in spring to summer, showy	Long, brown bean pod	Green	Yellow	Heat, drought, and alkaline soil tolerant. Decay when wounded or as tree ages may be an issue.
Bignoniaceae	Catalpa speciosa	Hiawatha 2	Heartland Catalpa	5	Xeric to Min	Intermediate	Intermediate	X	45	23	415	Upright narrow oval	Large, white flowers in spring to summer, showy	Long, brown bean pod	Green	Yellow	Narrow, upright form of parent species. Uniform branching habit.

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															Spring	Fall	
Bignoniaceae	Catalpa x erubescens	Purplea	Purple Catalpa	5	Xeric to Min	Intermediate	Intermediate	X	40	35	962	Rounded	Large, yellow-purple-spotted white flowers in spring to summer; showy	Long, brown bean pod	Purple	Yellow	Purple leaved cultivar of parent species. Unproven in Denver region.
Ulmaceae	Celtis laevigata	All Seasons, Magnifica	Sugar Hackberry	5	Xeric to Min	Tolerant	Intermediate	X	45	40	1257	Rounded vase to broad oval	Green in spring, insignificant	Small berry, insignificant	Dark green	Yellow	Varieties are more hardy than parent species. Magnifica has similar growth habit to elm & improved insect resistance.
Ulmaceae	Celtis occidentalis	Prairie Pride	Common Hackberry	3	Xeric to Min	Tolerant	Intermediate to Sensitive	X	45	35	962	Rounded vase	Green in spring, insignificant	Small berry, insignificant	Green	Yellow	Tolerant of urban growing conditions. Nipple gall may be an aesthetic issue. Intolerant of mechanical damage. Transplant in spring (B&B)
Ulmaceae	Celtis occidentalis	Chicagoland	Common Hackberry	3	Xeric to Min	Tolerant	Intermediate to Sensitive	X	45	35	962	Rounded vase, strong central leader	Green in spring, insignificant	Orange-red to deep purple berry	Green	Yellow	Tolerant of urban growing conditions. Nipple gall may be an aesthetic issue. Intolerant of mechanical damage. Transplant in spring (B&B)
Ulmaceae	Celtis occidentalis	JFS-KSU1	Prairie Sentinel Hackberry	4	Xeric to Min	Tolerant	Intermediate to Sensitive	X	45	12	113	Columnar	Green in spring, insignificant	Orange-red to deep purple berry	Green	Yellow	Columnar cultivar of parent species. Tolerant of urban growing conditions, including confined planting spaces. Nipple gall may be an aesthetic issue. Intolerant of mechanical damage. Transplant in spring (B&B)
Ulmaceae	Celtis reticulata		Netleaf Hackberry	3	Xeric to Min	Unknown	Unknown		25	25	491	Rounded, spreading	Green in spring, insignificant	Small, orange-red berry	Green	Yellow	Slow growing. Nipple gall may be an aesthetic issue. Prune to develop strong branching structure and overhead clearance. Also known as western hackberry.
Cercidiphyllaceae	Cercidiphyllum japonicum		Katsuratree	5	Mod	Intermediate to Sensitive	Intermediate to Sensitive		35	35	962	Upright, pyramidal to rounded	Green in spring, insignificant	1/2"-1" elongated pod	Blue-green	Yellow-orange	Intolerant of soil compaction and confined planting spaces. Shallow surface roots; plant in a site with large rooting space.
Fabaceae	Cercis canadensis		Eastern Redbud	4	Min to Mod	Sensitive	Sensitive	X	25	30	707	Irregular, rounded vase	Lavendar/pink/ purple in spring (before leaves), showy	Small, brown pod 2-3" long	Green	Yellow	Tolerant of partial shade. Flowers emerge before leaves. Plant in protected area. Prune to develop strong branching structure and overhead clearance.
Fabaceae	Cercis canadensis	Forest Pansy	Forest Pansy Redbud	5	Min to Mod	Sensitive	Sensitive	X	15	20	314	Irregular, rounded vase	Magenta-rose in spring (before leaves), showy	Small, brown pod 2-3" long	Purple-bronze green	Yellow-orange	Tolerant of partial shade. Flowers emerge before leaves. Plant in protected area. Prune to develop strong branching structure.
Fabaceae	Cercis canadensis	Pink Trim	Northern Herald Redbud	4	Min to Mod	Sensitive	Sensitive	X	22	28	616	Spreading, rounded	Magenta-rose in spring (before leaves), showy	Small, brown pod 2-3" long	Burgundy to forest green	Yellow	Cold hardy variety of parent species. Tolerant of urban conditions. Prune to develop strong branching structure and overhead clearance.
Fabaceae	Cercis canadensis	JN2PP21451	Rising Sun Redbud	5	Min to Mod	Sensitive	Sensitive	X	13	18	254	Spreading, rounded	Magenta-rose in spring (before leaves), showy	Small, brown pod 2-3" long	Yellow w/ orange new growth	Yellow	Tolerant of partial shade. Flowers emerge before leaves. Plant in protected area. Prune to develop strong branching structure.
Oleaceae	Chionanthus virginicus		American Fringetree	4	Min to Mod	Sensitive	Sensitive		15	15	177	Spreading, oval	Green-white in spring, fragrant	1/2"-3/4" Blue-black fruit	Green	Yellow	Slow growing. Tolerant of urban conditions, including minor drought. Susceptible to emerald ash borer - increased risk of damage or death. Prune to develop strong branching structure and overhead clearance.
Oleaceae	Chionanthus retusus		Chinese Fringetree	5b	Mod	Sensitive	Sensitive		15	15	177	Broad oval	Large Green-white clusters in spring, fragrant	1/2"-1" Blue-purple fruit	Dark green	Yellow	Slow growing. Tolerant of urban conditions. Intolerant of drought. Species is not affected by emerald ash borer. Prune to develop strong branching structure and overhead clearance. Availability may be limited.
Oleaceae	Chionanthus retusus	Tokyo Tower	Tokyo Tower Fringetree	5b	Mod	Sensitive	Sensitive		15	8	50	Narrow upright vase	Large White clusters in spring, fragrant	1/2"-3/4" Blue-black fruit	Dark green	Yellow	Tolerant of confined planting spaces and urban conditions. Intolerant of drought. Species is not affected by emerald ash borer. Golden-tan exfoliating bark.
Fabaceae	Cladrastis kentukea		American Yellowwood	4	Mod	Intermediate to Sensitive	Intermediate to Sensitive		35	35	962	Rounded to oval	Creamy white-yellow clusters in spring, showy, fragrant	2"-4" Elongated pod	Bright green	Yellow	Flowers are significant source of nectar for bees. Thin, smooth bark may be easily damaged. Prune to develop strong branching structure and overhead clearance.
Fabaceae	Cladrastis kentukea	Perkins Pink	Perkins Pink Yellowwood	5	Mod	Intermediate to Sensitive	Intermediate to Sensitive		40	45	1590	Rounded to oval	Pink clusters in spring, showy, fragrant	2"-4" Elongated pod	Yellow-green	Yellow	Flowers are significant source of nectar for bees. Thin, smooth bark may be easily damaged. Prune to develop strong branching structure and overhead clearance.
Cornaceae	Cornus controversa	June Snow	June Snow Dogwood	5	Mod	Unknown	Unknown		25	35	962	Horizontally layered, spreading	White in early summer	1/4" Blue-black berry cluster	Dark green	Orange-red	Tolerant of partial shade, but prefers full sun. Tolerant of alkaline soils. Prune to develop overhead clearance. Availability may be limited. Unproven in Denver region.
Cornaceae	Cornus mas	Many - Consult with Forestry	Corneliancherry Dogwood	5	Mod	Unknown	Unknown		15	12	113	Rounded oval, commonly multistem	Yellow in early spring (before leaves)	Bright red fruit in mid-summer	Dark green	Purple-red	Flowers emerge before leaves. Highly resistant to storm damage due to hard, dense wood. Prune to develop strong branching structure and overhead clearance.

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															Spring	Fall	
Betulaceae	Corylus colurna		Turkish Filbert	4	Xeric	Sensitive	Sensitive		40	25	491	Pyramidal	Catkins in spring, insignificant	Oval nut	Green	Yellow	Plant in sites with large rooting space (tree lawns 8' and wider). Tree is slow to establish. Prune to develop strong branching structure.
Anacardiaceae	Cotinus obovatus		American Smoketree	4	Min to Mod	Intermediate to Sensitive	Intermediate to Sensitive	X	18	13	133	Rounded to broad spreading	Small pink/purple on long stem in late spring, showy	Small purple-brown fruit	Light green	Orange-red-yellow	Blooming flowers create smoke-like effect. Single stem form may be difficult to locate. Prune to develop strong branching structure.
Rosaceae	Crataegus ambigua		Russian Hawthorn	4	Xeric	Sensitive	Sensitive	X	15	15	177	Rounded to spreading	White in spring, showy	1/2" Dark red-purple berry, persistent	Green	Yellow	Tolerant of urban conditions, including alkaline soil and drought. Thorns are sparse and branches may be essentially thornless.
Rosaceae	Crataegus crus-galli	Inermis	Thornless Cockspur Hawthorn	4	Xeric	Tolerant	Tolerant	X	20	20	314	Rounded to spreading	White in spring, showy	1/2" Dull red berry, persistent	Deep green	Orange-bronze	Thornless variety of parent species. Extensive fruit litter may be an issue. Prune to develop strong branching structure and overhead clearance.
Rosaceae	Crataegus laevigata	Crimson Cloud	Crimson Cloud Hawthorn	4	Xeric to Min	Sensitive	Sensitive		20	15	177	Upright, spreading oval	Bright red w/ white centers in spring, showy	Max 1/2" Glossy red berry	Glossy green	No fall color change	Nearly thornless cultivar. More disease resistant than parent species. Prune to develop strong branching structure and overhead clearance.
Rosaceae	Crataegus laevigata	Pauli	Paul's Scarlet Hawthorn	4	Xeric to Min	Sensitive	Sensitive		20	15	177	Spreading to oval	Deep pink double flowers in spring, showy	Small pink-red berry, sparse	Glossy green	No fall color change	Tree slightly more susceptible to fireblight than cockspur hawthorn. Leaf spot and cedar apple rust may be an issue.
Rosaceae	Crataegus x mordensis	Snowbird, Toba	Snowbird/Toba Hawthorn	3	Xeric to Min	Unknown	Unknown		15	15	177	Upright oval to spreading	Double white in spring, fragrant	3/8" Red berry	Glossy green	No fall color change	Drought tolerant. Snowbird is hardier cultivar than Toba. Fireblight may be an issue.
Rosaceae	Crataegus submollis		Northern Downy Hawthorn	4	Min to Mod	Unknown	Unknown	X	20	20	314	Rounded to spreading	White in spring	3/4" Red-purple berry	Green	Yellow	Branches feature thorns up to 3" in length. Prune to develop strong branching structure. Also known as Quebec hawthorn. Availability may be limited. Unproven in Denver region.
Rosaceae	Crataegus viridis	Winter King	Winter King Hawthorn	4	Min to Mod	Unknown	Unknown	X	20	15	177	Upright to rounded	White in spring, showy	3/4" Bright red berry	Glossy dark green	Yellow	More disease resistant cultivar. Mostly spineless but occasional thorns up to 1.5" in length. Prune to develop strong branching structure. Also known as Green hawthorn.
Eucommiaceae	Eucommia ulmoides		Hardy Rubber-tree	5	Min	Intermediate	Intermediate		40	40	1257	Rounded	Brown in spring, insignificant	Fruitless	Dark green	Yellow	Prune to develop strong branching structure. Availability may be limited.
Eucommiaceae	Eucommia ulmoides	Empozam	Emerald Pointe Hardy Rubber-tree	5	Min	Intermediate	Intermediate		35	15	177	Upright, narrow	Brown in spring, insignificant	Fruitless	Dark green	Yellow	Availability may be limited.
Fagaceae	Fagus grandifolia		American Beech	3	Mod	Sensitive	Sensitive		65	60	2827	Pyramidal to oval	Yellow-green in spring	1/2"-1" spiny capsule & nut	Dark green	Golden bronze	Slow growing. May be difficult to transplant. Tolerant of heavy shade. Intolerant of wet, poorly drained soils and drought. Large root system requires large tree lawn. Thin bark may be easily damaged. Prune to develop overhead clearance. Availability may be limited.
Fagaceae	Fagus sylvatica		European Beech	4	Mod	Sensitive	Sensitive		50	40	1257	Pyramidal to oval	Yellow-green in spring	1/2"-1" spiny capsule & nut	Glossy dark green	Golden bronze	Slow growing. May be difficult to transplant. More tolerant of varying soil conditions than American beech. Intolerant of wet, poorly drained soils and extended drought. Prefers neutral to slightly acid soils. Large root system requires large tree lawn. Thin bark may be easily damaged. Prune to develop overhead clearance. Availability may be limited.
Fagaceae	Fagus sylvatica	Purpurea	Copper Beech	5	Mod	Sensitive	Sensitive		55	40	1257	Upright oval to rounded	Reddish in spring, insignificant	1/2"-1" spiny capsule & nut	Dark red to red-green	Red-orange	Slow growing. May be difficult to transplant. More tolerant of varying soil conditions than American beech. Intolerant of wet, poorly drained or compacted soils and extended drought. Prefers neutral to slightly acid soils. Large root system requires large tree lawn. Thin bark may be easily damaged. Prune to develop overhead clearance. Availability may be limited.
Fagaceae	Fagus sylvatica	Roseomarginata	Tricolor Beech	4	Mod	Sensitive	Sensitive		25	15	177	Oval	Yellow-green in spring	1/2"-1" spiny capsule & nut	Variegated purple, rose pink with cream margins	Light bronze	Slow growing. May be difficult to transplant. More tolerant of varying soil conditions than American beech. Intolerant of wet, poorly drained soils and extended drought. Thin bark may be easily damaged.
Ginkgoaceae	Ginkgo biloba	Autumn Gold	Autumn Gold Ginkgo	3	Mod	Intermediate	Intermediate	X	40	30	707	Broad pyramidal	Insignificant	Fruitless	Green	Golden yellow	Male (seedless) clone with slow growth rate.
Ginkgoaceae	Ginkgo biloba	JFS-LGA2	Golden Colonnade Ginkgo	4	Mod	Intermediate	Intermediate	X	40	20	314	Narrow oval	Insignificant	Fruitless	Green	Golden yellow	Male (seedless) clone with moderate growth rate.
Ginkgoaceae	Ginkgo biloba	Magyar	Magyar Ginkgo	4	Mod	Intermediate	Intermediate	X	45	20	314	Narrow to pyramidal	Insignificant	Fruitless	Green	Golden yellow	Male (seedless) clone with moderate growth rate (faster than Princeton Sentry).
Ginkgoaceae	Ginkgo biloba	The President	Presidential Gold Ginkgo	4	Mod	Intermediate	Intermediate	X	45	35	962	Broad pyramidal to oval	Insignificant	Fruitless	Green	Golden yellow	Male (seedless) clone with slow growth rate.
Ginkgoaceae	Ginkgo biloba	Princeton Sentry	Princeton Sentry Ginkgo	4	Mod	Intermediate	Intermediate	X	35	15	177	Narrow pyramidal	Insignificant	Fruitless	Green	Golden yellow	Male (seedless) clone with slow growth rate.



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Ginkgoaceae	Ginkgo biloba	Shangri-la	Ginkgo	4	Mod	Intermediate		X	45	30	707		Insignificant	Fruitless			Male clone, fruitless. Slow grower
Fabaceae	Gleditsia triacanthos inermis	Imperial	Thornless Honeylocust	4	Xeric	Tolerant	Tolerant	X	35	35	962	Rounded	Insignificant	Fruitless	Green	Yellow	Thornless and fruitless cultivar. Genus overplanted in Denver region.
Fabaceae	Gleditsia triacanthos inermis	Moraine	Moraine Honeylocust	4	Xeric	Tolerant	Tolerant	X	40	40	1257	Rounded	Insignificant	Fruitless	Dark green	Yellow	Thornless and fruitless cultivar. Genus overplanted in Denver region.
Fabaceae	Gleditsia triacanthos inermis	Harve	Northern Acclaim Honeylocust	3b	Xeric	Tolerant	Tolerant	X	40	30	707	Broad pyramidal	Insignificant	Fruitless	Green	Yellow	Thornless and fruitless cultivar. Genus overplanted in Denver region.
Fabaceae	Gleditsia triacanthos inermis	Shademaster	Shademaster Honeylocust	4	Xeric	Tolerant	Tolerant	X	40	30	707	Vase to rectangular	Insignificant	Fruitless	Green	Yellow	Thornless and fruitless cultivar. Central leader less present than Skyline. Genus overplanted in Denver region.
Fabaceae	Gleditsia triacanthos inermis	Skycole	Skyline Honeylocust	4	Xeric	Tolerant	Tolerant	X	40	30	707	Broad pyramidal	Insignificant	Fruitless	Green	Yellow	Thornless and fruitless cultivar. Tree features strong central leader. Form is more upright than Shademaster. Genus overplanted in Denver region.
Fabaceae	Gleditsia triacanthos inermis	Draves PP21698	Street Keeper Honeylocust	4b	Xeric	Tolerant	Tolerant	X	40	15	177	Upright, narrow pyramidal	Insignificant	Fruitless	Dark green	Yellow	Columnar cultivar of parent species. Thornless and fruitless. Genus overplanted in Denver region.
Fabaceae	Gleditsia triacanthos inermis	True Shade	True Shade Honeylocust	4	Xeric	Tolerant	Tolerant	X	40	30	707	Oval	Insignificant	Fruitless	Dark green	Yellow	Thornless and fruitless cultivar. Faster growth rate and better branch angles than other cultivars. Genus overplanted in Denver region.
Fabaceae	Gymnocladus dioicus	Espresso	Kentucky Coffeetree	4	Xeric	Tolerant	Tolerant	X	60	40	1257	Spreading vase	Greenish-white clusters in late spring	Fruitless	Blue-green	Yellow	Male (fruitless) cultivar. Tolerant of urban growing conditions. No known insect or disease issues. Leaves, seeds, and pulp reported to be poisonous if ingested.
Fabaceae	Gymnocladus dioicus	JC McDaniel	Prairie Titan Coffeetree	4	Xeric to min	Tolerant	Tolerant	X	55	35	962	Upright, spreading	Greenish-white clusters in late spring	Fruitless	Blue-green	Yellow	Male (fruitless) cultivar. Tolerant of urban growing conditions. No known insect or disease issues. Leaves, seeds, and pulp reported to be poisonous if ingested.
Fabaceae	Gymnocladus dioicus	Stately Manor	Stately Manor Coffeetree	4	Xeric to Min	Tolerant	Tolerant	X	45	20	314	Narrow, upright	Greenish-white clusters in late spring	Fruitless	Blue-green	Yellow	Male (fruitless) cultivar. Tolerant of urban growing conditions. No known insect or disease issues. Leaves, seeds, and pulp reported to be poisonous if ingested.
Sapindaceae	Koeleruteria paniculata		Goldenraintree	5	Xeric	Intermediate	Intermediate	X	30	30	707	Open, rounded vase	Yellow in summer, very showy	Small, black fruit in brown seed pod, resembles small lantern	Green	Yellow	Volunteer seedlings could be an issue in mulched areas.
Sapindaceae	Koeleruteria paniculata	JFS-Sunleaf	Summer Burst Goldenraintree	5	Xeric	Intermediate	Intermediate	X	30	30	707	Open, rounded vase	Yellow in summer, very showy	Small fruit in brown seed pod w/ pink highlights, pod resembles small lantern	Dark green	Yellow	Cultivar more heat resistant than parent species. Volunteer seedlings could be an issue in mulched areas.
Altingiaceae	Liquidambar styraciflua	Check with Office of the City Forester for acceptable cultivars	Sweetgum	5	Mod to Moist	Intermediate	Intermediate		60	40	1257	Pyramidal to rounded	Yellow-green in spring, insignificant	Spliny, round-shaped capsule & nut	Green	Red-orange-yellow	Shallow surface roots; plant in a site with large rooting space. Rotundiloba is a seedless cultivar. Fruit litter may be an issue for parent species and/or other cultivars.
Magnoliaceae	Liriodendron tulipifera		Tulip Tree	4	Mod to Moist	Sensitive	Sensitive		70	40	1257	Pyramidal to oval	Green-yellow in spring, showy	Insignificant	Green	Yellow	Large root system requires large tree lawn.
Magnoliaceae	Liriodendron tulipifera	JFS-Oz	Emerald City Tulip Tree	5	Mod to Moist	Sensitive	Sensitive		55	25	491	Upright oval	Green-yellow in spring, showy	Insignificant	Dark green	Yellow	Cold hardy cultivar. Form features strong, central leader and is more upright than parent species. Large root system requires large tree lawn. Unproven in Denver region.
Fabaceae	Maackia amurensis		Amur Maackia	3	Xeric	Intermediate	Intermediate		25	18	254	Rounded vase	White in summer	Insignificant	Green	Yellow	Tolerant of urban conditions, including drought. Prune to develop strong branching structure and overhead clearance.
Fabaceae	Maackia amurensis	MaackNificent	MaackNificent Amur Maackia	3	Xeric	Intermediate	Intermediate		28	20	314	Upright vase	White in summer	Insignificant	Silvery green	Yellow	Tolerant of urban conditions, including drought. Branching more upright than species. Prune to develop strong branching structure and overhead clearance.
Fabaceae	Maackia amurensis	Summertime	Summertime Amur Maackia	3	Xeric	Intermediate	Intermediate		18	16	201	Upright to rounded	White in summer	Insignificant	Silvery green	Yellow	Small cultivar of parent species. Tree displays low branching habit (starting at 48" above ground). Plant where overhead clearance is not an issue.
Fabaceae	Maackia amurensis	Starburst	Starburst Amur Maackia	3	Xeric	Intermediate	Intermediate		27	18	254	Upright to rounded	White in summer	Insignificant	Silvery green	Yellow	Tree displays low branching habit (starting at 48" above ground). Plant where overhead clearance is not an issue.
Moraceae	Maclura pomifera	White Shield	White Shield Osage Orange	5	Xeric	Unknown	Unknown		30	30	707	Upright spreading	Green in late spring, insignificant	Fruitless	Dark green	Yellow	Fruitless and thornless male cultivar. Tolerant of heat and drought. Highly resistant to storm damage due to hard, dense wood. Availability may be limited.

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Moraceae	Maclura pomifera	Wichita	Wichita Osage Orange	5	Xeric	Unknown	Unknown	X	30	30	707	Upright spreading, rounded	Green in late spring, insignificant	Fruitless	Glossy dark green	Yellow	Fruitless and thornless male cultivar. Tolerant of wet soils, dry soils, heat, and drought. Highly resistant to storm damage due to hard, dense wood. Young trees may have few thorns but become thornless with age. Availability may be limited.
Magnoliaceae	Magnolia acuminata		Cucumber-tree Magnolia	4	Mod	Intermediate	Intermediate		65	50	1963	Pyramidal to rounded	Yellow in spring, insignificant, fragrant	2"-3" red cucumber-shaped fruit, persistent	Dark green	Yellow-bronze	Fast growing species. Intolerant of compacted soils. Thin bark may be easily damaged. Large root system requires large tree lawn. Transplant in spring for best survivability. Availability may be limited.
Magnoliaceae	Magnolia	NCM1 P.A.F.	Mercury Magnolia	5	Mod	Unknown	Unknown		23	12	113	Upright pyramidal	Large lavender pink flowers, very late blooming	Unknown	Dark green	Yellow	Upright pyramidal form with strong, central leader & branching structure. Flowers emerge much later than other magnolias, reducing susceptibility to frosts & freezes. NC State introduced - Availability may be limited. Unproven in Denver region.
Rosaceae	Malus cv	Check with Office of the City Forester for acceptable cultivars	Crabapple	4	Varies with Cultivar	Varies with Cultivar	Varies with Cultivar	X	Varies with Cultivar	Varies with Cultivar	-	No multi-stemmed or pendulous forms permitted	Varies with Cultivar	Varies with Cultivar	Varies with Cultivar	Yellow	Check with Office of the City Forester for guidance on cultivars.
Betulaceae	Ostrya virginiana		American Hophornbeam	3	Min to Mod	Sensitive	Sensitive		30	30	707	Oval to rounded	Brown-green in summer, showy	1/4" Nut in hoplike sac, persistent	Dark green	Yellow	Tolerant of urban conditions. Tree is slow to establish, plant in early spring. Shallow root system. Prune to develop overhead clearance. Also known as Ironwood.
Betulaceae	Ostrya virginiana	JFS-KW5	Autumn Treasure Hophornbeam	4	Min to Mod	Sensitive	Sensitive		35	17	227	Upright pyramidal to oval	Brown-green in summer, showy	1/4" Nut in hoplike sac, persistent	Dark green	Golden yellow	Upright, narrow form of parent species. Tolerant of urban conditions. Tree is slow to establish, plant in early spring. Shallow root system. Leaves do not persist through winter - Leaf drop is complete in fall. Availability may be limited. Unproven in Denver region.
Betulaceae	Ostrya virginiana	Camdale	Sun Beam American Hophornbeam	3	Min to Mod	Sensitive	Sensitive		33	30	707	Oblong pyramidal to rounded	Brown-green in summer, showy	Nut in hoplike sac, persistent	Dark green	Yellow	Leaves may persist through winter. NDSU introduced - Availability may be limited.
Hamamelidaceae	Parrotia persica		Persian Ironwood	5	Min	Unknown	Unknown		30	30	707	Upright oval to rounded	Red in spring	Insignificant	Red-purple to dark green	Orange-red-yellow	Few issues once established. Prune to develop overhead clearance. Availability may be limited.
Hamamelidaceae	Parrotia persica	JLColumnar P.A.F.	Persian Spire Parrotia	5	Min	Unknown	Unknown		25	10	79	Columnar to Upright Oval	Red in spring	Insignificant	Red-purple to dark green	Orange-red-yellow	New introduction. Availability may be limited.
Hamamelidaceae	Parrotia persica	Vanessa	Vanessa Persian Spire Parrotia	5	Min	Unknown	Unknown		25	12	113	Upright vase	Red in spring	Insignificant	Dark green	Orange-red-yellow	New introduction. Availability may be limited.
Rutaceae	Phellodendron amurense		Amur Corktree	3	Min to Mod	Intermediate	Intermediate		38	45	1590	Open, rounded to spreading	Green-white in spring, insignificant	Small, black berry-like fruit cluster, only on females.	Green	Yellow	Easy to transplant. Large, shallow root system requires large tree lawn. Use only male cultivars, as fruit from females can be messy. Naturalization & seeding may be an issue.
Rutaceae	Phellodendron amurense	His Majesty	His Majesty Amur Corktree	3	Min to Mod	Intermediate	Intermediate		30	25	491	Broad vase	Green-white in spring, insignificant	Generally Fruitless	Green	Yellow	Generally fruitless, but use only male cultivars. Large, shallow root system requires large tree lawn. Naturalization & seeding may be an issue.
Rutaceae	Phellodendron amurense	Longneck	Eye Stopper Corktree	4	Min to Mod	Intermediate	Intermediate		30	25	491	Upright to rounded	Green-white in spring, insignificant	Generally Fruitless	Green	Yellow	Generally fruitless, but use only male cultivars. Large, shallow root system requires large tree lawn. Naturalization & seeding may be an issue.
Rutaceae	Phellodendron amurense	Macho	Macho Amur Corktree	4	Min to Mod	Intermediate	Intermediate		40	40	1257	Upright to rounded	Green-white in spring, insignificant	Fruitless	Green	Yellow	Male, seedless cultivar of parent species. Large, shallow root system requires large tree lawn.
Anacardiaceae	Pistacia chinensis		Chinese Pistache	6	Min to Mod	Sensitive	Sensitive		30	30	707	Rounded vase	Green-white in spring, showy	1/3" red to blue-purple fruit cluster, only on females	Dark green	Orange-red	Resistant to storm damage. Plant in protected site. Prune to develop strong branching structure and overhead clearance.
Anacardiaceae	Pistacia chinensis	Pair's Choice	Western Son Pistache	6	Min to Mod	Sensitive	Sensitive		27	27	573	Upright spreading to rounded	Unknown	Seedless	Dark green	Orange-red	Resistant to storm damage. Plant in protected site. Ascending branches minimize overhead clearance issues. Prune to develop strong branching structure.
Platanaceae	Platanus occidentalis		American Sycamore	4	Mod	Intermediate	Intermediate	X	75	60	2827	Pyramidal to rounded	Deep red in spring, insignificant	1" Round seed ball, persistent	Green	Yellow	Upper branches display showy bark. Large root system requires large tree lawn. Fruit litter may be an issue.
Platanaceae	Platanus occidentalis	Bismarck	Northern Advance American Sycamore	3	Mod	Intermediate	Intermediate	X	75	60	2827	Pyramidal to rounded	Insignificant	1" Round seed ball, persistent	Green	Yellow	Cold hardy cultivar of parent species. Large root system requires large tree lawn. NDSU introduced - Availability may be limited.
Platanaceae	Platanus occidentalis	Glabra	Texas Sycamore	Insufficient Data at this time - If tree can be obtained, Forestry is open to permitting planting on trial basis									Insignificant	1" Round seed ball, persistent	Green	Yellow	Alkaline soil tolerant cultivar. Faster growing than parent species. Anthracnose resistant. Large root system requires large tree lawn.
Platanaceae	Platanus x acerifolia	Bloodgood	Bloodgood London Planetree	5	Mod	Intermediate	Intermediate	X	40	35	962	Broad pyramidal	Insignificant	1" Round seed ball in cluster of 2-3, persistent	Green	Yellow	Upper branches display showy bark. Cultivar more resistant to anthracnose than parent species. Large root system requires large tree lawn.

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Platanaceae	Platanus x acerifolia	Morton Circle	Exclamation London Planetree	5	Mod	Intermediate	Intermediate	X	50	30	707	Pyramidal	Insignificant	1" Round seed ball in cluster of 2-3, persistent	Green	Yellow	Upper branches display showy bark. Cultivar more resistant to anthracnose than parent species. Large root system requires large tree lawn.
Rosaceae	Prunus sp.	Check with Office of the City Forester for acceptable cultivars	Plum/Cherry	5	Varies with Cultivar	Varies with Cultivar	Varies with Cultivar		Varies with Cultivar	Varies with Cultivar	-	Varies with Cultivar	Varies with Cultivar	Varies with Cultivar	Varies with Cultivar	Varies with Cultivar	Check with Office of the City Forester for guidance on cultivars.
Rosaceae	Prunus x virginiana	POD2s	Sucker Punch Chokecherry	2	Min to Mod	Intermediate	Intermediate		25	20	314	Rounded	White in spring, showy	1/4"-1/2" Dark purple berry	Green to deep purple	Purple-red	Non-suckering cultivar of parent species. Availability may be limited.
Rutaceae	Ptelea trifoliata		Common Hoptree	3	Xeric	Intermediate	Intermediate		15	15	177	Rounded to vase	White in summer, not showy but fragrant	3/4"-1" Round samara	Green	Yellow	Tolerant of urban conditions and full shade sites. Suckering may be an issue. Prune to develop strong branching structure and overhead clearance.
Juglandaceae	Pterocarya stenoptera		Chinese Wingnut	6	Min to Mod	Unknown	Unknown		60	60	2827	Rounded to vase	Light green catkins in spring, showy	3/4" Winged nut	Glossy dark green	Yellow-green	Suckering and cold hardiness may be an issue. Large root system requires large tree lawn. Prune to develop strong branching structure. Unproven in Denver region.
Rosaceae	Pyrus calleryana	Aristocrat	Aristocrat Pear	4b	Min to Mod	Intermediate	Intermediate	X	30	22	380	Pyramidal	White in spring, showy	Insignificant	Dark green	Deep red	Tolerant of urban conditions. Overplanting is a concern. Prune to develop strong branching structure.
Rosaceae	Pyrus calleryana	Autumn Blaze	Autumn Blaze Pear	4	Min to Mod	Intermediate	Intermediate	X	20	18	254	Rounded	White in spring, showy	Insignificant	Emerges with red tint to glossy green	Bright red	Most cold hardy cultivar of parent species. Tolerant of urban conditions. Overplanting is a concern. Prune to develop strong branching structure.
Rosaceae	Pyrus calleryana	Capital	Capital Pear	5	Min to Mod	Intermediate	Intermediate	X	30	10	79	Columnar	White in spring, showy	Insignificant	Glossy green	Red-purple	Availability may be limited.
Rosaceae	Pyrus calleryana	Glen's Form	Chanticleer Pear	4	Min to Mod	Intermediate	Intermediate	X	30	15	177	Upright pyramidal	White in spring, showy	Insignificant	Glossy green	Red	Greater fireblight resistance than other cultivars. Overplanting is a concern. Prune to develop strong branching structure.
Rosaceae	Pyrus calleryana	Jazzam	Jack Pear	4	Min to Mod	Intermediate	Intermediate	X	12	8	50	Compact oval	White in spring, showy	Insignificant	Dark green	Yellow	Dwarf cultivar of parent species.
Rosaceae	Pyrus fauriei	Westwood	Korean Sun Pear	4	Min to Mod	Intermediate	Intermediate	X	10	12	113	Compact round	White in spring, showy	Insignificant	Green	Red-purple	Fast growing dwarf. Cultivar is more cold hardy than parent species.
Rosaceae	Pyrus ussuriensis	Baillfrost	Mountain Frost Ussurian Pear	3b	Min to Mod	Intermediate	Intermediate	X	20	20	314	Narrow upright	White in spring, showy	Insignificant, sparse	Dark green	Yellow-red	Greatest cold hardiness among pear species. Fireblight resistant. Fruiting is typically sparse.
Rosaceae	Pyrus ussuriensis	MorDak	Prairie Gem Pear	3	Min to Mod	Intermediate	Intermediate	X	20	20	314	Rounded	White in spring, showy	Insignificant	Dark green	Yellow	Greatest cold hardiness among pear species. Fireblight resistant. Fruiting may be abundant if planted adjacent to other pear cultivar(s).
Fagaceae	Quercus accutissima		Sawtooth Oak	5	Min to Mod				50	50	1963	Broad pyramidal to rounded	3"-4" catkins	1" Acorn	Dark green	Yellow-brown	Tolerant of heat & humidity. Chlorosis may be an issue. Availability may be limited. Unproven in Denver region.
Fagaceae	Quercus alba		White Oak	3	Mod	Tolerant	Tolerant		60	60	2827	Oval to rounded	Insignificant	1/2"-1" Acorn	Green	Red	Relatively slow growing. May be intolerant of alkaline soils. Chlorosis may be an issue.
Fagaceae	Quercus bicolor		Swamp White Oak	4	Min to Mod	Intermediate	Intermediate	X	50	50	1963	Upright oval	Insignificant	1/2"-1" Acorn	Dark green	Copper-orange	Tolerant of urban conditions including periodic flooding, soil compaction, and drought. Depending on genetics, may be susceptible to bullet gall. Chlorosis may be an issue. Prune to develop central leader.
Fagaceae	Quercus bicolor	JFS-KW12 PP23632	American Dream Oak	4	Min to Mod	Intermediate	Intermediate	X	45	35	962	Broad pyramidal	Insignificant	1/2"-1" Acorn	Bright green	Yellow	Cultivar is faster growing than parent species. Tolerant of urban conditions including periodic flooding, soil compaction, and drought. Depending on genetics, may be susceptible to bullet gall. Chlorosis may be an issue. Prune to develop central leader.
Fagaceae	Quercus bicolor	Bonnie and Mike	Beacon Oak	4	Min to Mod	Intermediate	Intermediate	X	35	12	113	Narrow columnar	Insignificant	1/2"-1" Acorn	Glossy green	Yellow	Tolerant of urban conditions including periodic flooding, soil compaction, and drought. Depending on genetics, may be susceptible to bullet gall. Chlorosis may be an issue. Prune to develop central leader.
Fagaceae	Quercus x bimundorum	Midwest	Prairie Stature Oak	3	Min to Mod	Intermediate	Intermediate		45	35	962	Broad pyramidal	Insignificant	1/2"-1" Acorn	Dark green	Yellow-orange-red	Cold hardy hybrid of English and white oak. Tolerant of alkaline soils.
Fagaceae	Quercus buckleyi		Texas Red Oak	5b	Min	Tolerant	Unknown		35	35	962	Broad rounded	Insignificant	1/2"-3/4" Acorn	Glossy green	Orange-red	Native of Texas is closely related to shumard oak. Tolerant of alkaline soils and drought. Check seed source for hardiness and soil tolerance.
Fagaceae	Quercus gambelii		Gambel Oak	5	Xeric	Sensitive	Sensitive		20	20	314	Irregular rounded	Insignificant	1/2"-3/4" Acorn	Dark green	Yellow-red-brown	Root suckers may be an issue. Prune to develop single stem form. Kermes scale is an increasing issue.



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Fagaceae	Quercus glaucoides		Lacey Oak	6b	Xeric	Unknown	Unknown		30	25	491	Irregular rounded	Insignificant	1/2"-3/4" Acorn	Pink turning to blue-green	Yellow-brown	Native of south-central Texas. Tolerant of heat, drought, and alkaline soils. Cold hardness may be an issue. Prune to develop central leader. Unproven in Denver region.
Fagaceae	Quercus imbricaria		Shingle Oak	5	Mod	Unknown	Intermediate		50	50	1963	Pyramidal to oval-rounded	Insignificant	1/2" Acorn	Green	Yellow-red	May be intolerant of alkaline soils. Transplant in spring for best survivability. Large root system requires large tree lawn. Chlorosis may be an issue.
Fagaceae	Quercus x macdaniellii	Clemons PP11431	Heritage Oak	4	Min	Unknown	Unknown		45	35	962	Broad pyramidal to oval	Insignificant	1/2" Acorn	Dark glossy green	Yellow	Hybrid of English and bur oak. More cold hardy than English oak.
Fagaceae	Quercus macrocarpa		Bur Oak	3	Xeric	Intermediate	Intermediate	X	70	60	2827	Rounded	Insignificant	1" Acorn	Dark green	Copper-yellow	Tolerant of urban conditions. Depending on genetics, may be susceptible to bullet gall. Large root system requires large tree lawn.
Fagaceae	Quercus macrocarpa	Bullet Proof	Bullet Proof Bur Oak	4	Xeric	Intermediate	Intermediate	X	70	60	2827	Rounded to upright	Insignificant	1" Acorn	Dark green	Copper-yellow	Tolerant of urban conditions. High resistance to bullet gall. Large root system requires large tree lawn.
Fagaceae	Quercus macrocarpa	JFS-KW14	Cobblestone Oak	3	Xeric	Intermediate	Intermediate	X	50	40	1257	Broad oval	Insignificant	1" Acorn	Dark green	Yellow	Bark displays more cork-like features than parent species.
Fagaceae	Quercus macrocarpa	JFS-KW3PP22815	Urban Pinnacle Oak	3	Xeric	Intermediate	Intermediate	X	50	20	314	Narrow pyramidal to oval	Insignificant	1/2" Acorn	Glossy dark green	Yellow	Tree features strong central leader.
Fagaceae	Quercus muehlenbergii		Chinkapin Oak	3	Mod	Intermediate	Intermediate		45	50	1963	Upright oval to rounded	Insignificant	1" Acorn	Yellow-green	Yellow	Tolerant of alkaline soils. Transplant in spring for best survival. Prune to develop central leader.
Fagaceae	Quercus muehlenbergii	Red Autumn	Red Autumn Chinkapin Oak	Insufficient Data at this time - If tree can be obtained, Forestry is open to permitting planting on trial basis									Insignificant	1" Acorn	Unknown	Unknown	Variety displays fall color than parent species.
Fagaceae	Quercus prinoides	Fort Lincoln	Prairie Pioneer Dwarf Chinkapin Oak	4	Xeric to Min	Unknown	Unknown		20	15	177	Upright	Yellow catkins in spring, insignificant	1/2"-3/4" Acorn	Glossy green	Yellow-brown	Depending on genetics, may be susceptible to bullet gall. Prune to develop single stem form. May have limited availability. Unproven in Denver region.
Fagaceae	Quercus prinus		Chestnut Oak	4	Min to Mod	Unknown	Unknown		50	50	1963	Pyramidal to oval-rounded	Insignificant	1-1/4" Acorn	Dark green	Orange-yellow	Tolerant of dry, rocky sites. Prefers well-drained soils. Chlorosis may be an issue. Unproven in Denver region as tolerance to alkaline soils is yet to be fully tested.
Fagaceae	Quercus robur		English Oak	5	Xeric to Min	Intermediate	Tolerant	X	50	40	1257	Oval to rounded	Insignificant	1"-1-1/4" Acorn	Dark green	Copper	Tolerant of urban conditions. Proven in Denver region. Kermes scale is an increasing issue.
Fagaceae	Quercus robur x alba	Crimschmidt PP9103	Crimson Spire Oak	4	Xeric to Min	Intermediate	Tolerant	X	45	15	177	Narrow Columnar	Insignificant	1"-1-1/2" Acorn	Dark green-blue green	Rusty red	Columnar hybrid of English and white oak. Tolerant of urban conditions. Proven in Denver region. Kermes scale may be an issue.
Fagaceae	Quercus robur x alba	Tabor PP21382	Forest Knight Oak	4	Xeric to Min	Intermediate	Tolerant		45	35	962	Broad oval	Insignificant	1"-1-1/2" Acorn	Glossy dark green	Orange-red	Columnar hybrid of English and white oak. Tolerant of urban conditions. Kermes scale may be an issue.
Fagaceae	Quercus robur x alba	JFS-KW2QX P.A.F.	Skinny Genes Oak	4	Xeric to Min	Intermediate	Tolerant		45	10	79	Narrow Columnar	Insignificant	1"-1-1/2" Acorn	Glossy dark green	Yellow	Narrowest form of columnar English & white oak hybrids. Tolerant of urban conditions. Kermes scale may be an issue.
Fagaceae	Quercus robur x alba	JFS-KW1QX	Streetspire Oak	4	Xeric to Min	Intermediate	Tolerant		45	12	113	Narrow Columnar	Insignificant	1"-1-1/2" Acorn	Dark green	Rusty red	Columnar hybrid of English and white oak. Tolerant of urban conditions. Leaves are not persistent. Highly resistant to storm damage. Kermes scale may be an issue.
Fagaceae	Quercus robur x bicolor	Nadler PP17604	Kindred Spirit Oak	4	Xeric to Min	Intermediate	Tolerant		30	6	28	Narrow Columnar	Insignificant	1"-1-1/2" Acorn	Green	Yellow-brown	Columnar hybrid of English and swamp white oak. Tolerant of urban conditions. Kermes scale may be an issue.
Fagaceae	Quercus robur x macrocarpa x muehlenbergii	Taylor	Triple Crown Oak	4	Xeric to Min	Intermediate	Tolerant		60	35	962	Upright oval	Insignificant	1"-1-1/2" Acorn	Glossy dark green	Unknown	Hybrid of English, chinkapin, and bur oak. Tolerant of urban conditions. Availability may be limited. Kermes scale may be an issue.
Fagaceae	Quercus robur	Asjes	Rosehill Oak	4	Xeric to Min	Intermediate	Tolerant		40	20	314	Narrow oval	Insignificant	1"-1-1/2" Acorn	Glossy green	Yellow	Columnar hybrid of English oak. Tolerant of urban conditions. Kermes scale may be an issue.
Fagaceae	Quercus robur	Fastigiata	Skyrocket Oak	5	Xeric to Min	Intermediate	Tolerant		45	15	177	Narrow columnar	Insignificant	1"-1-1/2" Acorn	Dark green	Yellow-brown	Columnar cultivar of English oak. Tighter growth habit than species. Tolerant of urban conditions. Kermes scale may be an issue.
Fagaceae	Quercus robur	Pyramich	Skymaster Oak	5	Xeric to Min	Intermediate	Tolerant		50	25	491	Narrow to pyramidal	Insignificant	1"-1-1/2" Acorn	Dark green	Yellow-brown	Cultivar of English oak displays pyramidal form. Very strong central leader. Tolerant of urban conditions. Kermes scale may be an issue.
Fagaceae	Quercus shumardii		Shumard Oak	5	Mod	Intermediate	Intermediate		60	40	1257	Pyramidal to oval	Insignificant	1/2" Acorn	Green	Orange-red	Due to large growth range, source as locally as possible for pH, drought, and hardiness tolerance. Large root system requires large tree lawn. Prune to develop central leader.

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Fagaceae	Quercus shumardii	Fort Collins Select	Fort Collins Select Shumard Oak	Insufficient Data at this time - If tree can be obtained, Forestry is open to permitting planting on trial basis									Insignificant	1/2" Acorn	Unknown	Unknown	Due to large growth range, source as locally as possible for pH, drought, and hardiness tolerance. Large root system requires large tree lawn. Prune to develop central leader.
Fagaceae	Quercus shumardii	Osage County	Osage County Shumard Oak	Insufficient Data at this time - If tree can be obtained, Forestry is open to permitting planting on trial basis									Insignificant	1/2" Acorn	Green	Deep red	Due to large growth range, source as locally as possible for pH, drought, and hardiness tolerance. Large root system requires large tree lawn. Prune to develop central leader.
Fagaceae	Quercus velutina		Northern Black Oak	4	Min to Mod	Unknown	Unknown		50	45	1590	Oval to rounded	Insignificant	3/4" Acorn	Dark green	Rusty red	Tolerant of clay soils. Chlorosis may be an issue. Unproven in Denver region as tolerance to alkaline soils is yet to be fully tested.
Fagaceae	Quercus x mazei		Colorado Foothills Oak	5	Xeric	Unknown	Unknown		35	35	962	Irregular rounded	Insignificant	3/4" Acorn	Dark green	Yellow	Hybrid of Gambel and bur oak. Root suckers may be an issue. Prune to develop single stem form.
Fagaceae	Quercus robur x warei	Long	Regal Prince Oak	4	Xeric to Min	Intermediate	Tolerant		45	18	254	Columnar to narrow oval	Insignificant	1"-1.5" Acorn	Glossy green	Yellow	Columnar hybrid of English and swamp white oak. Tolerant of urban conditions.
Fagaceae	Quercus undulata		Wavy Leaf Oak	4	Xeric to Min	unknown	Unknown	x	20	16	201	Upright rounded	Insignificant	1/2"-3/4" Acorn	Glossy blue-green	Yellow	Natural hybrid of Q. gambelli x Q. turbinella. Small, slow growing oak with similar form as Gambel Oak.
Fabaceae	Styphnolobium japonica		Japanese Pagodatree	5	Min	Intermediate	Intermediate	x	50	50	1963	Oval to rounded	White-light yellow in summer, showy	Elongated green pod & seeds, persistent	Green-blue green	Dull yellow	Tolerant of urban conditions, including heat, drought, and compacted soils. Transplant in spring for best survivability. Storm damage, canker, and twig blight may be issues. Formerly known as Sophora japonica.
Fabaceae	Styphnolobium japonica	Regent	Regent Japanese Pagodatree	5	Min	Intermediate	Intermediate	x	40	35	962	Spreading to rounded	Creamy white in summer, showy	Elongated green pod & seeds, persistent	Dark green	Yellow	Tolerant of urban conditions, including heat, drought, and compacted soils. Faster growing, improved growth habit, and greater disease resistance than parent species. Transplant in spring for best survivability. Storm damage may be an issue.
Fabaceae	Styphnolobium japonica	Halka	Millstone Japanese Pagodatree	5	Min	Intermediate	Intermediate	x	40	30	707	Broad oval to rounded	Creamy white in summer, showy	Elongated green pod & seeds, persistent	Dark green	Yellow	Tolerant of urban conditions, including heat, drought, and compacted soils. More upright branching habit than parent species. Greatest canker resistance of pagodatree species.
Oleaceae	Syringa pekinensis	Zhang Zhiming	Beijing Gold Tree Lilac	5	Xeric to Min	Tolerant	Tolerant	x	15	15	177	Upright spreading	Yellow clusters in summer, showy	Small, brown capsule in cluster, insignificant	Dark green	Golden yellow	Tolerant of urban conditions, including alkaline soils. Intolerant of poorly drained soils. Growth habit is more upright than other cultivars. Shiny, cinnamon-colored bark. Prune to develop single stem form and overhead clearance.
Oleaceae	Syringa pekinensis	Morton	China Snow Lilac	5	Xeric to Min	Tolerant	Tolerant	x	15	15	177	Upright spreading to rounded	Creamy white clusters in summer, showy	Small, brown capsule in cluster, insignificant	Dark green	Yellow	Tolerant of urban conditions, including alkaline soils. Intolerant of poorly drained soils. Exfoliating, amber-colored bark. Prune to develop single stem form and overhead clearance. Availability may be limited.
Oleaceae	Syringa pekinensis	DTR 124 PP8951	Summer Charm Lilac	3	Xeric to Min	Tolerant	Tolerant	x	15	12	113	Upright spreading	Creamy white clusters in summer, showy	Small, brown capsule in cluster, insignificant	Dark glossy green	Yellow	Tolerant of urban conditions, including alkaline soils. Intolerant of poorly drained soils. Prune to develop single stem form and overhead clearance.
Oleaceae	Syringa pekinensis	WFH2 P.A.F.	Great Wall Tree Lilac	3	Xeric to Min	Tolerant	Tolerant	x	17	10	79	Upright oval	White flowers in late spring, showy	Small, brown capsule in cluster, insignificant	Dark glossy green	Golden yellow	Tolerant of urban conditions, including alkaline soils. Intolerant of poorly drained soils. Cherry-like exfoliating bark. Prune to develop single stem form and overhead clearance. Availability may be limited.
Oleaceae	Syringa reticulata	Ivory Silk	Ivory Silk Tree Lilac	3	Xeric to Min	Tolerant	Tolerant	x	25	20	314	Upright to oval	Creamy white clusters in early summer, showy	Small, brown capsule in cluster, insignificant	Dark green	Yellow	Tolerant of urban conditions, including alkaline and clay soils. Showy, reddish-brown bark. Prune to develop single stem form and overhead clearance.
Oleaceae	Syringa reticulata ssp pekinensis	SunDak	Copper Curfs Peking Tree Lilac	3	Xeric to Min	Tolerant	Tolerant	x	25	20	314	Upright to oval	Creamy white clusters in early summer, showy	Small, brown capsule in cluster, insignificant	Dark green	Yellow	Tolerant of urban conditions, including alkaline soils. Growth habit is more open than parent species. Exfoliating copper-colored bark. Prune to develop single stem form and overhead clearance. NDSU introduced - Availability may be limited.
Tiliaceae	Tilia americana	Boulevard	Boulevard Linden	3	Mod	Sensitive	Sensitive		45	20	314	Narrow pyramidal	Pale green in summer, fragrant	Insignificant	Green	Yellow	Flowers are significant source of nectar for bees. Intolerant of urban conditions, particularly heat. Not recommended for planting in or near hardscape. Prune to develop strong branching structure and overhead clearance.
Tiliaceae	Tilia americana	Continental Appeal	Continental Appeal Linden	4	Mod	Sensitive	Sensitive		45	23	415	Narrow oval to pyramidal	Pale green in summer, fragrant	Insignificant	Green w/ white underside	Yellow	Source and plant stock native to upper Midwest. Flowers are significant source of nectar for bees. Intolerant of heat. Not recommended for planting in or near hardscape. Prune to develop strong branching structure.

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Tiliaceae	Tilia americana	DTR 123	Legend Linden	4	Mod	Sensitive	Sensitive		35	25	491	Broad pyramidal	Pale green in summer, fragrant	Insignificant	Glossy green	Yellow	Flowers are significant source of nectar for bees. Intolerant of heat. Not recommended for planting in or near hardscape. Red buds & twigs provide winter interest. Cultivar is more resistant to rust than parent species. Prune to develop strong branching structure.
Tiliaceae	Tilia americana	McKSentry	American Sentry Linden	3	Mod	Sensitive	Sensitive		40	25	491	Pyramidal	Pale green in summer, fragrant	Insignificant	Green	Yellow	Flowers are significant source of nectar for bees. Intolerant of heat. Not recommended for planting in or near hardscape. Prune to develop strong branching structure and overhead clearance.
Tiliaceae	Tilia americana	Lincoln	Lincoln Linden	3	Mod	Sensitive	Sensitive		35	25	491	Compact pyramidal	Pale green in summer, fragrant	Insignificant	Dark green	Yellow	Flowers are significant source of nectar for bees. Intolerant of heat. Not recommended for planting in or near hardscape. Prune to develop strong branching structure and overhead clearance.
Tiliaceae	Tilia americana x euchlora	Redmond	Redmond Linden	3	Mod	Sensitive	Sensitive		40	30	707	Broad pyramidal	Pale green in summer, fragrant	Insignificant	Light green	Yellow	Flowers are significant source of nectar for bees. Intolerant of heat. Not recommended for planting in or near hardscape. Prune to develop strong branching structure and overhead clearance.
Tiliaceae	Tilia x euchlora		Crimean Linden	5	Mod	Sensitive	Sensitive		35	30	707	Broad pyramidal to oval	Pale green in summer, fragrant	Insignificant	Glossy green	Yellow-green to yellow	Flowers are significant source of nectar for bees. Intolerant of heat. Not recommended for planting in or near hardscape. Prune to develop strong branching structure and overhead clearance.
Tiliaceae	Tilia cordata	Bailey	Shamrock Linden	4	Mod	Sensitive	Sensitive		40	30	707	Pyramidal	Pale green in summer, fragrant	Insignificant	Dark green	Yellow	Faster growth rate and more stout branching habit than Greenspire. Flowers are significant source of nectar for bees. Intolerant of heat. Not recommended for planting in or near hardscape. Prune to develop strong branching structure and overhead clearance.
Tiliaceae	Tilia cordata	Chancole	Chancellor Linden	3	Mod	Sensitive	Sensitive		35	20	314	Narrow Pyramidal	Pale green in summer, fragrant	Insignificant	Dark green	Yellow	Flowers are significant source of nectar for bees. Intolerant of heat. Not recommended for planting in or near hardscape. Prune to develop strong branching structure. Availability may be limited.
Tiliaceae	Tilia cordata	Corzam	Corinthian Linden	3	Mod	Sensitive	Sensitive		40	15	177	Narrow Pyramidal	Pale green in summer, fragrant	Insignificant	Dark green	Yellow	Narrowest cultivar of species. Flowers are significant source of nectar for bees. Intolerant of heat. Not recommended for planting in or near hardscape. Prune to develop strong branching structure.
Tiliaceae	Tilia cordata	Greenspire	Greenspire Linden	4	Mod	Sensitive	Sensitive		40	30	707	Pyramidal	Pale green in summer, fragrant	Insignificant	Dark green	Yellow	Flowers are significant source of nectar for bees. Intolerant of heat. Not recommended for planting in or near hardscape. Prune to develop strong branching structure and overhead clearance.
Tiliaceae	Tilia cordata	Halka PP10589	Summer Sprite Linden	4	Mod	Sensitive	Sensitive		20	15	177	Rounded Pyramidal	Pale green in summer, fragrant	Insignificant	Green	Yellow	Dwarf cultivar of species. Flowers are significant source of nectar for bees. Intolerant of heat. Not recommended for planting in or near hardscape. Prune to develop strong branching structure and overhead clearance.
Tiliaceae	Tilia cordata	Golden Cascade	Golden Cascade Linden	3a	Mod	Sensitive	Sensitive		40	27	573	Rounded pyramidal to cascading oval	Yellow in early summer, fragrant	Insignificant	Dark green	Yellow	Unique branching habit features gracefully weeping branches. Flowers are significant source of nectar for bees. Resistant to sunscald, however avoid planting in or near hardscape. Prune to develop strong branching structure and overhead clearance.
Tiliaceae	Tilia cordata x mongolica	Harvest Gold PP12232	Harvest Gold Linden	3	Mod	Unknown	Unknown		35	25	491	Pyramidal	Pale green in summer, fragrant	Insignificant	Dark green	Bright yellow	Hybrid of Mongolian and littleleaf linden. Flowers are significant source of nectar for bees. Hardier and faster growing than parent species. Intolerant of heat, not recommended for planting in or near hardscape. Prune to develop strong branching structure.
Tiliaceae	Tilia x flavescens	Glenleven	Glenleven Linden	3	Mod	Sensitive	Sensitive		45	25	491	Pyramidal to oval	Pale green in summer, fragrant	Insignificant	Green	Yellow	Faster growing & more open growth habit than Greenspire. Flowers are significant source of nectar for bees. Intolerant of heat, not recommended for planting in or near hardscape. Prune to develop strong branching structure.
Tiliaceae	Tilia tomentosa	Sterling	Sterling Silver Linden	5	Mod	Intermediate	Intermediate		40	30	707	Broad pyramidal	Pale green in summer, fragrant	Insignificant	Green w/ silver-gray underside	Yellow	Flowers are significant source of nectar for bees. Intolerant of heat, not recommended for planting in or near hardscape. Large root system requires large tree lawn. Prune to develop strong branching structure.



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Tiliaceae	Tilia tomentosa	PNI 6051	Green Mountain Linden	5	Mod	Intermediate	Intermediate		40	30	707	Broad pyramidal to oval	Pale green in summer, fragrant	Insignificant	Dark green w/ silver-white underside	Yellow	Flowers are significant source of nectar for bees. Intolerant of heat, not recommended for planting in or near hardscape. Large root system requires large tree lawn. Prune to develop strong branching structure.
Ulmaceae	Ulmus americana	JFS-Prince II	Colonial Spirit Elm	4	Mod	Intermediate	Intermediate	X	60	45	1590	Upright vase with arching limbs	Insignificant	Round to ovate samara, insignificant	Dark green	Yellow	Growth rate unknown. Resistant to Dutch elm disease. Resistance to elm leaf beetle and scale unknown. Strong branching structure. Availability may be limited. Unproven in Denver region.
Ulmaceae	Ulmus americana	New Harmony	New Harmony American Elm	4b	Mod	Intermediate	Intermediate	X	60	55	2376	Upright vase with arching limbs	Insignificant	Round to ovate samara, insignificant	Dark green	Yellow	Fast growth rate. Shallow root system. Dutch elm disease resistance higher than parent species. Per CSU elm trials, tree may be moderately resistant to scale. Resistance to elm leaf beetle unknown. Prune to develop strong branching structure.
Ulmaceae	Ulmus americana	New Horizon PP8684	New Horizon Elm	4	Mod	Intermediate	Intermediate	X	50	35	962	Upright oval with arching limbs	Insignificant	Round to ovate samara, insignificant	Dark green	Yellow	Cold hardy, slower growing cultivar. Tolerant of urban conditions. Very high Dutch elm disease resistance. Per CSU elm trials, tree may be moderately resistant to scale. Resistance to elm leaf beetle unknown. Prune to develop strong branching structure.
Ulmaceae	Ulmus americana	Jefferson	Jefferson Elm	4	Mod	Intermediate	Intermediate	X	60	40	1257	Vase with arching limbs	Insignificant	Fruitless	Dark green	Yellow	Tolerant of urban conditions. High Dutch elm disease resistance. Resistance to scale & elm leaf beetle unknown. Leaves persist later than other elms. U-shaped branch unions, however prune to develop strong branching structure. Unproven in Denver region. Availability may be limited.
Ulmaceae	Ulmus americana	Lewis & Clark	Prairie Expedition American Elm	2b	Mod	Intermediate	Intermediate	X	55	50	1963	Broad rounded to vase with arching limbs	Insignificant	Round to ovate samara, insignificant	Dark green	Yellow	Cold hardy, fast growing cultivar. Tolerant of urban conditions. Resistant to Dutch elm disease. Susceptible to scale. Resistance to elm leaf beetle unknown. Prune to develop strong branching structure.
Ulmaceae	Ulmus americana	Princeton	Princeton American Elm	4	Mod	Intermediate	Intermediate	X	60	45	1590	Upright vase	Insignificant	Round to ovate samara, insignificant	Dark glossy green	Yellow	Fast growing cultivar. Resistant to Dutch elm disease and elm leaf beetle. Per CSU elm trials, tree may be susceptible to scale. Prune to develop strong branching structure.
Ulmaceae	Ulmus americana	Scale Buster	Scale Buster American Elm	Insufficient Data at this time - If tree can be obtained, Forestry is open to permitting planting on trial basis								Upright vase with arching limbs	Insignificant	Round to ovate samara, insignificant	Dark green	Yellow	Dutch elm disease and elm leaf beetle resistance is unknown. Resistant to scale. Prune to develop strong branching structure.
Ulmaceae	Ulmus americana	Valley Forge	Valley Forge American Elm	5	Mod	Intermediate	Intermediate	X	60	60	2827	Broad vase with arching limbs	Insignificant	Round to ovate samara, insignificant	Green	Yellow	Fast growing cultivar. Highest Dutch elm disease resistance of American elms. Per CSU elm trials, tree may be susceptible to scale. Resistance to elm leaf beetle unknown. Prune to develop strong branching structure.
Ulmaceae	Ulmus glabra x carpinifolia	Pioneer	Pioneer Elm	4	Mod	Tolerant	Tolerant	X	50	45	1590	Rounded	Insignificant	Round to ovate samara, insignificant	Dark green	Yellow	Resistant to Dutch elm disease. Highly susceptible to elm leaf beetle. Per CSU elm trials, tree may be susceptible to scale. Prune to develop strong branching structure.
Ulmaceae	Ulmus davidiana		David Elm	3	Mod	Unknown	Unknown		40	30	707	Upright vase	Insignificant	Round to ovate samara, insignificant	Green	Yellow	Cold hardy. Resistant to Dutch elm disease and elm leaf beetle. Resistance to scale unknown. Prune to develop strong branching structure. Unproven in Denver region.
Ulmaceae	Ulmus davidiana	JFS KW2UD	Greenstone Elm	4	Mod	Unknown	Unknown		55	35	962	Upright vase	Insignificant	Round to ovate samara, insignificant	Green	Yellow	Cold hardy. Resistant to Dutch elm disease. Resistance to elm leaf beetle and scale unknown. Branching structure features open branch angles. Pruning to develop strong branching structure may be necessary. Availability may be limited. Unproven in Denver region.
Ulmaceae	Ulmus davidiana var. japonica	Discovery	Discovery Elm	3	Mod	Tolerant	Tolerant		40	30	707	Upright oval to arching vase	Insignificant	Round to ovate samara, insignificant	Dark green	Yellow	Slow growing, cold hardy variety. Resistant to Dutch elm disease and elm leaf beetle. Resistance to scale unknown. Large root system requires large tree lawn. Growth habit requires consistent crown-thinning. Prune to develop strong branching structure.
Ulmaceae	Ulmus davidiana var. japonica	Freedom	Freedom Elm	3	Mod	Tolerant	Tolerant		36	27	573	Upright vase	Insignificant	Round to ovate samara, insignificant	Dark green	Yellow	Fast growing, cold hardy variety. Resistance to Dutch elm disease, scale, and elm leaf beetle unknown. Prune to develop strong branching structure. Availability may be limited.
Ulmaceae	Ulmus davidiana var. japonica	Burgundy Glow	Northern Empress Japanese Elm	3	Mod	Tolerant	Tolerant		28	24	452	Rounded, open	Insignificant	Round to ovate samara, insignificant	Green	Red	Medium growth rate. Resistant to Dutch elm disease and elm leaf beetle. Resistance to scale unknown. Prune to develop strong branching structure.

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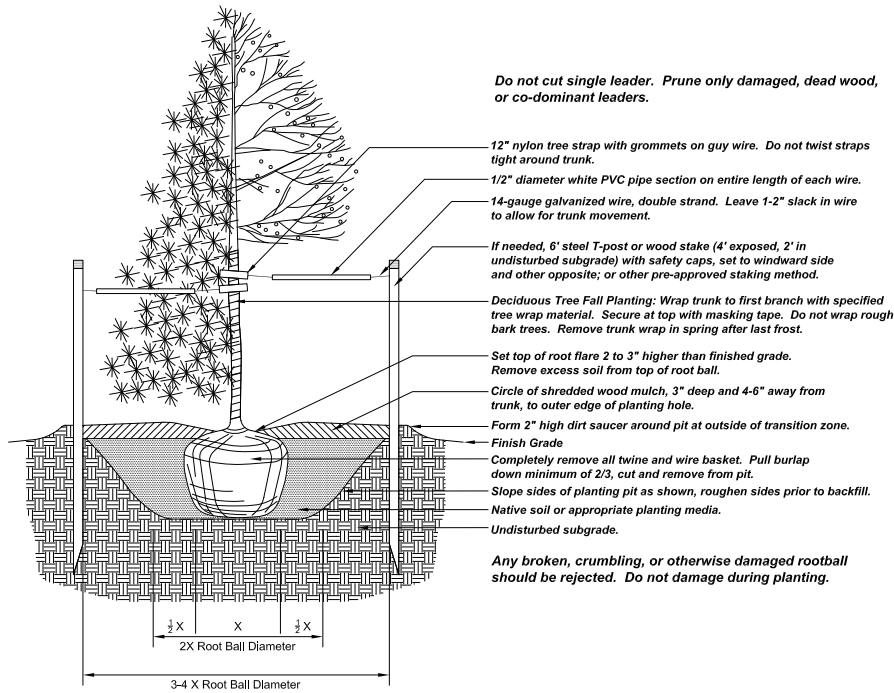
Updated March 2017

Family	Botanical Name	Acceptable Cultivar	Common Name	Hardiness Zone	Moisture Level	Soil Salt Tolerance	Aerosol Salt Tolerance	Water Quality Area	Height @ Maturity	Canopy Spread @ Maturity	Canopy Area @ Maturity	Growth Form/Shape	Flowers	Fruits	Leaf Color - Spring/Fall		Additional Notes (includes compaction/tolerances/restrictions)
															Spring	Fall	
Ulmaceae	Ulmus (japonica x wilsoniana Morton) x (pumila x carpinifolia)	Morton Stalwart	Commendation Elm	5	Min to Mod	Tolerant	Tolerant		50	40	1257	Upright oval	Insignificant	Round to ovate samara, insignificant	Dark green	Yellow	Fast growth rate, but easier to maintain good branching form than other hybrids. Resistant to Dutch elm disease. Susceptible to elm leaf beetle. Per CSU elm trials, tree shows high scale resistance. Tolerant of urban conditions. Large root system requires large tree lawn. Prune to develop strong branching structure.
Ulmaceae	Ulmus japonica x wilsoniana	Morton	Accolade elm	4	Min to Mod	Intermediate	Intermediate	X	60	50	1963	Vase with arching limbs	Insignificant	Round to ovate samara, insignificant	Dark glossy green	Yellow	Cold hardy. Resistant to Dutch elm disease and elm leaf beetle. Per CSU elm trials, tree shows high scale resistance. Prune to develop strong branching structure.
Ulmaceae	Ulmus japonica x wilsoniana	Morton Red Tip	Danada Charm elm	4	Min to Mod	Intermediate	Intermediate		60	50	1963	Upright vase with arching limbs	Insignificant	Round to ovate samara, insignificant	Emerges red-tinged turning dark green	Yellow	Resistant to Dutch elm disease. Susceptible to elm leaf beetle. Per CSU elm trials, tree may be moderately resistant to scale. Prune to develop strong branching structure.
Ulmaceae	Ulmus parvifolia	Emer II PP7552	Allee Lacebark Elm	5	Mod	Intermediate	Intermediate	X	45	30	707	Upright vase with arching limbs	Insignificant	Round to ovate samara, insignificant	Green	Orange-red	High resistance to Dutch elm disease and elm leaf beetle. Resistance to scale unknown. Thin, showy bark. Prune to develop strong branching structure.
Ulmaceae	Ulmus parvifolia	Emer I PP7551	Athena Lacebark Elm	5	Mod	Intermediate	Intermediate	X	28	30	707	Broad rounded, compact	Insignificant	Round to ovate samara, insignificant	Glossy green	Yellow	High resistance to Dutch elm disease and elm leaf beetle. Resistance to scale unknown. Thin, showy bark. Prune to develop strong branching structure. Unproven in Denver region.
Ulmaceae	Ulmus parvifolia	Dynasty	Dynasty Elm	5	Mod	Intermediate	Intermediate	X	35	35	962	Vase	Insignificant	Round to ovate samara, insignificant	Green	Yellow-orange	Fast growth rate. Resistance to Dutch elm disease, scale, and elm leaf beetle unknown. Prune to develop strong branching structure. Availability may be limited. Unproven in Denver region.
Ulmaceae	Ulmus parvifolia	A. Ross Central Park	Central Park Splendor Elm	5	Mod	Tolerant	Tolerant	X	35	30	707	Broad rounded vase	Insignificant	Round to ovate samara, insignificant	Green	Yellow to red-purple	Hardest cultivar of species. Excellent resistance to Dutch elm disease and elm leaf beetle. Resistance to scale unknown. Tolerant of urban conditions. Prune to develop strong branching structure.
Ulmaceae	Ulmus parvifolia	Will Rogers	Will Rogers Elm	Insufficient Data at this time - If tree can be obtained, Forestry is open to permitting planting on trial basis									Insignificant	Round to ovate samara, insignificant	Unknown	Unknown	Cold hardy. Resistance to Dutch elm disease, scale, and elm leaf beetle unknown. Prune to develop strong branching structure. Availability may be limited. Unproven in Denver region.
Ulmaceae	Ulmus parvifolia	Cortiosa	Cork Bark Elm	6	Mod	Intermediate	Intermediate	X	40	40	1257	Vase	Insignificant	Round to ovate samara, insignificant	Dark green	Orange	Resistance to Dutch elm disease, scale, and elm leaf beetle unknown. Prune to develop strong branching structure. Cold hardiness may be an issue. Availability may be limited. Unproven in Denver region.
Ulmaceae	Ulmus parvifolia	Emerald Prairie	Emerald Prairie Elm	5	Mod	Intermediate	Intermediate	X	35	27	573	Upright spreading, arching vase	Insignificant	Round to ovate samara, insignificant	Dark green	Yellow	Cold hardy. Drought & heat tolerant. Resistant to Dutch elm disease and elm leaf beetle. Resistance to scale unknown. Prune to develop strong branching structure. KSU introduced - Availability may be limited. Unproven in Denver region.
Ulmaceae	Ulmus propinqua	JFS-Bieberich	Emerald Sunshine Elm	5	Min to mod	Intermediate	Intermediate		30	20	314	Vase	Insignificant	Round to ovate samara, insignificant	Emerges copper bronze turning dark green	Yellow	Slow growth rate. Resistant to Dutch elm disease and elm leaf beetle. Resistance to scale unknown. Tolerant of urban conditions, including heat and drought. Prune to develop strong branching structure.
Ulmaceae	Ulmus pumila x japonica	Morton Plainsman	Vanguard Elm	4	Min to mod	Tolerant	Tolerant		45	40	1257	Rounded vase	Insignificant	Round to ovate samara, insignificant	Green	Yellow	Fast growth rate. Resistant to Dutch elm disease. Resistance to elm leaf beetle unknown. Per CSU elm trials, tree shows high scale resistance. Tolerant of urban conditions. Prune to develop strong branching structure.
Ulmaceae	Ulmus pumila x hollandica x carpinifolia	Homestead	Homestead Elm	5	Min to mod	Tolerant	Tolerant		50	30	707	Pyramidal to oval	Insignificant	Round to ovate samara, insignificant	Dark green	Yellow	Fast growth rate. Resistant to Dutch elm disease. Susceptible to elm leaf beetle. Per CSU elm trials, tree may be moderately resistant to scale. Prune to develop strong branching structure.
Ulmaceae	Ulmus pumila x japonica x wilsoniana	Morton Glossy	Triumph elm	4	Min to mod	Tolerant	Tolerant	X	50	40	1257	Upright oval to vase	Insignificant	Round to ovate samara, insignificant	Dark glossy green	Yellow	Cold hardy. Excellent resistance to Dutch elm disease. Resistant to elm leaf beetle. Per CSU elm trials, tree may be moderately resistant to scale. Prune to develop strong branching structure.
Ulmaceae	Ulmus wilsoniana Prospector	Prospector	Prospector Elm	4b	Mod	Tolerant	Tolerant	X	35	27	573	Dense vase	Insignificant	Round to ovate samara, insignificant	Emerges orange-red turning dark green	Yellow	Resistant to Dutch elm disease and elm leaf beetle. Per CSU elm trials, tree shows high scale resistance. Prune to develop strong branching structure.
Ulmaceae	Ulmus (wilsoniana x pumila Accolade) x carpinifolia x glabra	Patriot	Patriot Elm	4	Mod	Tolerant	Tolerant	X	45	35	962	Upright, narrow vase	Insignificant	Round to ovate samara, insignificant	Dark green	Yellow	Fast growth rate. Highly resistant to Dutch elm disease. Per CSU elm trials, tree may be susceptible to scale. Not as drought tolerant as other hybrids. Prune to develop strong branching structure.
Ulmaceae	Ulmus x 'Cathedral'	Cathedral	Cathedral Elm	4	Min to Mod	Intermediate	Intermediate		40	35	962	Vase	Insignificant	Round to ovate samara, insignificant	Med to light Green	Yellow-Orange-Brown	Moderate resistance to Dutch elm disease. Resistant to elm leaf beetle. Resistance to scale unknown. Prune to develop strong branching structure. Unproven in Denver region.

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Family	Botanical Name	Acceptable Cultivar	Common Name	Hardiness Zone	Moisture Level	Soil Salt Tolerance	Aerosol Salt Tolerance	Water Quality Area	Height @ Maturity	Canopy Spread @ Maturity	Canopy Area @ Maturity	Growth Form/Shape	Flowers	Fruits	Leaf Color - Spring/Fall		Additional Notes (includes compaction/tolerances/restrictions)
															Spring	Fall	
Sapindaceae	Xanthoxerces sorbifolium	Clear Creek	Golden Yellowhorn	5	Xeric to Mod	Unknown	Unknown	X	25	15	177	Rounded, often multistem	White with yellow/red blotch at base in late spring	1/2" black seeds in 2-3" round capsule	Dark green w/ lighter underside	Yellow	Tolerant of urban conditions including partial shade, damp soils, and drought. Edible plant, fruit, and seeds. Plant where overhead clearance is not an issue. Prune to develop strong branching structure.
Ulmaceae	Zelkova serrata	City Sprite	City Sprite Zelkova	5b	Xeric to Mod	Intermediate	Intermediate	X	20	15	177	Compact oval to vase, semi-dwarf	Insignificant	Insignificant	Dark green	Yellow	Dwarf cultivar of species. Tolerant of urban conditions. Susceptible to canker from mechanical injury. Plant in spring where overhead clearance is not an issue. Prune in fall to develop strong branching structure.
Ulmaceae	Zelkova serrata	Green Vase	Green Vase Zelkova	5b	Xeric to Mod	Intermediate	Intermediate	X	45	30	707	Vase, upright arching branches	Insignificant	Insignificant	Green	Orange	Faster growth rate, but less cold hardy than Village Green. Tolerant of urban conditions. Susceptible to canker from mechanical injury. Plant in spring. Prune in fall to develop strong branching structure.
Ulmaceae	Zelkova serrata	Halka	Halka Zelkova	5b	Xeric to Mod	Intermediate	Intermediate	X	50	35	962	Upright vase, open & loose form	Insignificant	Insignificant	Green	Yellow-orange	Growth rate is fastest of zelkova cultivars. Tolerant of urban conditions. Susceptible to canker from mechanical injury. Plant in spring. Prune in fall to develop strong branching structure.
Ulmaceae	Zelkova serrata	Musashino	Musashino Columnar Zelkova	5b	Xeric to Mod	Intermediate	Intermediate	X	45	15	177	Very narrow upright vase	Insignificant	Insignificant	Green	Yellow	Columnar form of parent species. Tolerant of urban conditions. Susceptible to canker from mechanical injury. Plant in spring. Prune in fall to develop strong branching structure. Unproven in Denver region for snowload.
Ulmaceae	Zelkova serrata	Village Green	Village Green Zelkova	5b	Xeric to Mod	Intermediate	Intermediate	X	40	40	1257	Vase, rounded	Insignificant	Insignificant	Dark Green	Rusty red	Most cold hardy Zelkova cultivar. Growth habit may develop more straight trunk than Green Vase. Susceptible to canker from mechanical injury. Plant in spring. Prune in fall to develop strong branching structure.
Ulmaceae	Zelkova sinica		Chinese Zelkova	5b	Xeric to Mod	Intermediate	Intermediate	X	35	35	962	Vase	Insignificant	Insignificant	Dark green	Yellow-orange	Resistant to elm leaf beetle. Exfoliating cinnamon-colored bark. Prune in fall to develop strong branching structure. Availability may be limited. Unproven in Denver region.
	Fits under power lines																



**Trees planted upon park land, public property, or within the Public Right of Way (PRW) are subject to the following restrictions:**

- An approved planting permit from the Office of the City Forester (OCF), regardless of approved plans, is required prior to planting.
- Administrative citations up to \$999 shall be issued for trees planted without an OCF issued permit.
- Only tree species approved by or listed on the OCF's approved street tree list shall be planted in the PRW.
- For a list of prohibited or suspended PRW trees, contact or visit the OCF website.
- If overhead utility wires exist in the PRW, only ornamental or trees maturing at 20 (twenty) feet maximum height shall be planted.
- Trees shall be centered in tree lawns and/or planting areas.
- Trees shall not be planted in tree lawns less than five feet wide unless authorized by the OCF.
- Where sidewalks are not present, trees shall be located as designated by Office of the City Forester.
- Planting in corner triangle formed by the first 30 (thirty) feet along the PRW in each direction from the corner is not permitted.
- Planting within 10 (ten) feet of alleys, driveways, or fire hydrants is not permitted.
- Planting within 20 (twenty) feet of stop signs is not permitted.
- Planting within 25 (twenty-five) feet of street lights is not permitted.
- Planting within five feet of water meters or pits is not permitted.
- Large shade trees shall be spaced 35 (thirty-five) feet o.c. and ornamental trees 25 (twenty-five) feet o.c. or as designated by OCF.
- Trees shall be pruned to maintain a clearance of 13'-6" over streets and alleys and 6'-6" over remaining portions of PRW, including sidewalk.

**Prior to digging, the Utility Notification Center of Colorado shall be contacted at 811 to locate underground utilities.**

REVISIONS	MARK	BULLETIN	DATE	PREPARED BY OFFICE OF THE CITY FORESTER, DENVER PARKS AND RECREATION DEPARTMENT	CITY AND COUNTY OF DENVER 201 W. COLFAX AVE. DENVER, COLORADO 80202	STANDARD RESIDENTIAL TREE PLANTING DETAIL FOR SOD AREA OR TREE LAWN	NOT TO SCALE
							DATE: 3/13/17 DIAGRAM P-1A