RESEARCH SUMMARY

A BASELINE ASSESSMENT TO SUPPORT THE FRAMEWORK OF COLORADO SPRINGS' URBAN FOREST MANAGEMENT PLAN

COLORADO SPRINGS, COLORADO

OCTOBER 2020

COLORADO SPRINGS
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PREPARED FOR
The City of Colorado Springs, Colorado

SAMPLE INVENTORIES PERFORMED
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INTRODUCTION

THE URBAN FOREST

The urban forest for many cities across the nation includes remnants from naturally forested areas, but Colorado Springs' urban forest was, with a few exceptions, planted as the City developed and expanded. The City's urban forest continues to be created, modified, and removed primarily by people, and sustaining it will require ongoing human intervention. The goal of this intervention is a sustainable urban forest— an urban forest that optimizes the benefits of trees while meeting established safety and economic goals. Achieving this requires robust and diverse funding, adequate staffing and levels of service, appropriate and effective policies, and management actions consistent with best practices.

A sustainable urban forest can be defined as "the naturally occurring and planted trees in cities which are managed to provide the inhabitants with a continuing level of economic, social, environmental and ecological benefits today and into the future" (Clark and Matheny et al. 1997).

Urban forests are increasingly important to urbanized areas and the people who live and work in these built landscapes. Trees offer many benefits, some of which are directly identifiable and quantifiable, and others that are experienced. Caring for Colorado Springs' urban forest is an important part of growing a sustainable, healthy, and vibrant city and can only be achieved with the input of its residents.

Urban forests and community health are inextricably linked; the better an urban forest, the greater a community's health. A community that is engaged with its urban forest will responsibly plant, care for, and nurture its trees, while inspiring others to do the same and supporting the City's urban forest management program. A thriving urban forest is only possible through a civic commitment and partnerships shared by all.

Similar to other city infrastructure like water mains, streets and sewers, tree benefits are increasingly being regarded as services. If properly managed, trees are assets that over time appreciate in value and in the services they provide as they mature.

Photo 1. | Colorado Springs Chamber of Commerce.

Photo 2. | The City of Colorado Springs.

It is estimated that there are more than 5.5 billion urban forest trees comprising 21 million acres of urban forest in American cities, with an environmental asset value of $18.3 billion (Nowak et al. 2018). The urban forest is a valuable asset that, if maintained and enhanced, will continue to add to the well-being of the community for generations.

A team of urban forestry planners was assembled to develop the City of Colorado Springs' Urban Forest Management Plan (the Plan) to direct City resources towards the mission of growing a better Colorado Springs for all. This Urban Forest Management Plan supported by the City and its residents advises growth as it relates to the protection and enhancement of trees and associated benefits along streets and trails, parks and open space, riparian areas, and, to an extent, the trees on private property throughout Colorado Springs. Through the planning process, a shared vision for a healthy and thriving urban forest was established and supported by the City, its partners, and constituents.

The strategic Urban Forest Management Plan is essential to the long-term sustainability of the City's valuable urban forest resources. The City's urban forest provides many beneficial services, but there also exist potential risks and challenges, such as: aging and declining tree canopy; uneven distribution of maintenance performed on trees; improperly maintained trees; inconsistent enforcement of tree policies; tree and sidewalk conflicts; tree pests and diseases; climate change and drought; high-density residential development plans; inconsistent and unsustained funding; resource management; staffing; and levels of service.

The urban forest provides many important ecological functions and economic benefits that contribute directly to the livability of the community. These benefits—estimated at nearly $1 billion—include enhanced property value, energy savings, stormwater infiltration and reduction, air pollution removal, tourism, recreational use, improved personal wellbeing, health care cost savings, economic development, wildlife habitat, and dynamic ecosystems. Ultimately an urban forest consists of people and trees. Broad participation in its stewardship is needed to ensure its sustainability.

Continuous delivery of those services depends on the long-term health and resilience of the tree population. To sustain desired levels of urban forest services, a multi-faceted approach provided by the Urban Forest Management Plan informs funding and staffing levels, tree maintenance and plantings, growth and preservation of existing trees, monitoring and adaptation techniques for a changing environment, and amplified community stewardship. Implementation of the Plan will ensure the City's urban forest continues to add to the health of the community.

SUMMARY OF BENEFITS PROVIDED BY TREES

The quality of life of the citizens in any community depends on the urban forest, as trees make a vital and affordable contribution to the sense of community, pedestrian-friendly neighborhoods, energy savings, and air quality. Colorado Springs' Forestry program is critical to meeting the City's commitment to climate change mitigation and adaptation, carbon sequestration, stormwater reduction, wildlife habitat enhancement, and water conservation. Trees are one of the few infrastructure investments that, if properly maintained, will grow in value over time.

Note: The following data was derived from the Alliance for Community Trees. A review of the specific benefits of Colorado Springs' urban forest based on the 2019 Tree Canopy Assessment is provided in the Data Analysis section.

Filter and Improve Air Quality

Shade trees reduce pollution and return oxygen to the atmosphere. In addition to carbon dioxide, trees' leaves or needles absorb pollutants, such as ozone, nitrogen dioxide, sulfur dioxide, and some particulate matter.

Calm Traffic and Make Neighborhoods Safer, Quieter

People drive more slowly and carefully through tree-lined streets, because trees create the illusion of narrower streets. One study found a 46% decrease in crash rates across urban arterial and highway sites after landscape improvements were installed. The presence of trees in a suburban landscape reduced the cruising speed of drivers by an average of three miles per hour. Faster drivers and slower drivers both drove at decreased speeds in the presence of trees. Trees reduce noise pollution, buffering as much as half of urban noise. By absorbing sounds, a belt of trees 100 feet wide and 50 feet tall can reduce highway noise by 6 to 10 decibels. Buffers composed of trees and shrubs can reduce 50% of noise.

Raise Property Values

Trees are sound investments, for campuses, businesses and residents alike, and their value increases as they grow. Sustainable landscapes can increase property values up to 37%. The value of trees appreciates over time, because the benefits grow as they do. For businesses, trees have added value, including higher revenues. Shoppers seek out leafy promenades that frame storefronts. Research shows that shoppers spend more—between 9 and 12% more—on products in tree-lined business districts.

Save Energy and Lower Energy Costs for Buildings

As natural screens, trees can insulate buildings from extreme temperatures, keep properties cool, and reduce air conditioning utility bills. A 20% canopy of deciduous trees over a house results in annual cooling savings of 8 to 18% and annual heating savings of 2 to 8%. By planting shade trees on sunny exposures, residents and businesses can save up to 50% on hot-day energy bills.

Reduce the Need for Street Maintenance

Shaded streets and parking lots last longer and require far less pavement maintenance, reducing long- term costs. Canopy diminishes pavement fatigue, cracking, rutting, and other damage. A study from University of California, Davis found that 20% shade cover on a street improves pavement condition by 11%, which is a 60% savings for resurfacing over 30 years.

Reduce Stress and Improve the Quality of Life

Neighborhoods and campuses with generous canopies of trees are good for public health. Greater contact with natural environments correlates with lower levels of stress, improving performance. Students' concentration levels go up when they are able to look out onto a green landscape. Studies show that children with attention deficit disorder function better after activities in green settings. A green environment impacts worker productivity. Workers without views of nature from their desks claimed 23% more sick days than workers with views of nature. Residents of areas with the highest levels of greenery were 3 times as likely to be physically active and 40% less likely to be overweight than residents living in the least green settings.

Build Safe Communities and Decrease Crime

Police and crime prevention experts agree that trees and landscaping cut the incidence of theft, vandalism, and violence by enhancing campus neighborhoods. Thriving trees on well-maintained streets indicate pride of ownership. Public housing residents with nearby trees and natural landscapes reported 25% fewer acts of domestic aggression and violence. Apartment buildings with high levels of greenery had 52% fewer crimes than those without any trees. Buildings with medium amounts of greenery had 42% fewer crimes.

Conserve Water and Soil

A tree's fibrous roots, extending into the soil, are premier pollution filtration and soil erosion prevention systems. Intensely urbanized areas are covered with a large number of impermeable surfaces. In contrast to an impervious hardscape, a healthy urban forest can reduce annual storm water runoff up to 7%. Highly efficient trees also utilize or absorb toxic substances such as lead, zinc, copper, and biological contaminants. One study estimated that eliminating the need for additional local stormwater filtration systems would result in savings exceeding $2 billion.

Cooler Pavement Diminishes Urban Heat Islands

Broad canopy trees lower temperatures by shading buildings, asphalt, and concrete. They deflect radiation from the sun and release moisture into the air. The urban heat island effect is the resulting higher temperature of areas dominated by buildings, roads, and sidewalks. Cities are often 5° to 10°F hotter than undeveloped areas, because hot pavement and buildings have replaced cool vegetated land. In addition, high temperatures increase the volatility of automobile oil and oil within the asphalt itself, releasing the fumes into the atmosphere. Shade trees can reduce asphalt temperatures by as much as 36°F, which diminishes the fumes and improves air quality.

Positively Influence Climate to Ensure Sustainability

Trees absorb carbon dioxide and store carbon in wood, which helps to reduce greenhouse gases. Carbon emissions from vehicles, industries, and power plants are a primary contributor to increased air temperatures in metropolitan areas. Trees in the United States store 700 million tons of carbon valued at $14 billion with an annual carbon sequestration rate of 22.8 million tons per year valued at $460 million annually.

Protect Wildlife and Restore Ecosystems

Planting and protecting trees can provide habitat for hundreds of birds and small animals. Urbanization and the destruction of valuable ecosystems have led to the decline of many of species. Adding trees, particularly native trees, provides valuable habitat for wildlife.

Figure 1. A healthy urban forest will provide the City of Colorado Springs with benefits such as shade, stormwater regulation, aesthetics and a sense of community as the community continues to develop.

COLORADO SPRINGS' URBAN FOREST

Founded in 1871, Colorado Springs was largely recognized as an area with an exceptional natural environment and an opportunity for prosperity through smart growth. As General William Jackson Palmer, founder of Colorado Springs, stated, "My theory for this place is that it should be made the most attractive place for homes in the west—a place for schools, colleges, literature, science, first-class newspapers and everything that the above imply". His vision was of a city with nearby parks, mountain driveways, woodland paths and trails to create places for healthful outdoor exercise and quiet restful enjoyment. Palmer believed in building a community with ample green space, tree-lined streets, and natural scenery.[1]

The first City park, Acacia Park (originally North Park), was included in the original town site plat of Colorado Springs in 1871. Large shade trees made Acacia Park a favorite destination for citizens. As the building of Colorado Springs began, Palmer's vision of tree-lined streets grew stronger and more urgent. He and other officers of the Colorado Springs Company constructed the 11.5-mile El Paso Canal which was used for over 80 years. In addition to street trees, residential lawns, and gardens, the Canal's waters fed the four ponds in Monument Valley Park and irrigated park sites, the Court House lawn, Evergreen Cemetery, all orchards, and parkways along streets. Once water was available in 1872, Palmer, in pursuit of accomplishing his vision, brought in 600 cottonwoods from the Arkansas Valley.[2]

Soon after this vision by Palmer, the Colorado Springs City Council created a Department of Forestry, a tree ordinance, and a City Forester position in 1910. It was the first such department west of the Mississippi River. The position of City Forester originated upon adoption of ordinance number 818 in August 1910 and in March 1911, Fred McKown became the first City Forester; a post he held for the next 47 years until his retirement in 1958.

In McKown's first annual report to the City government, he noted that he had inventoried 1,229 street trees, small in comparison to the more than 250,000 public trees that exist today. The original town site was covered with yucca and other perennial plants and grasses. McKown recalled that when he took office, the majority of trees in the City were either boxelder or cottonwood—native tree species to Colorado—and noted a trend in planting silver maple, American elm and green ash.

1. *Colorado Springs Park Commission, Report of the Park Commission (Colorado Springs, Colorado, 1908).*

2. *Colorado Springs Parks, Recreation and Cultural Services, Forestry Management Plan (2006).*

Photo 3. | The City of Colorado Springs.

Photo 4. | The City of Colorado Springs.

Thereafter, American linden and Norway maple gained popularity.[3] From the 1940's to the 1960's, there were no City street tree planting programs. During this time, the City's tradition of beautifying streets and new neighborhoods was the responsibility of the homeowners. Public concern for trees in the 1970's renewed interest in the urban forest. Budgets, staffing and the City's tree ordinance grew rapidly to meet citizen demands. A variety of new tree programs were initiated as incentives for homeowners to plant more trees. In 1977, the City achieved the designation of "Tree City USA", a title it has maintained every year since.

Nurturing the growth of trees in Colorado Springs has always been an ideal, but often a challenge. In the 1990's an epidemic of Dutch Elm Disease (*Ophiostoma ulmi*) swept through town, further diminishing the original urban forest and promoting a new focus on public education and involvement. Despite these setbacks, the position of City Forester and the Forestry Division exist to manage the urban forest for the citizens of Colorado Springs.

Much of the urban forest—especially the diversity seen in the City today—is a result of human effort. The City continues to plant suitable trees for the region, reaching astounding numbers given the region's climate and geography are less than conducive for broad-leaf trees. Located on an arid plateau, Colorado Springs was completely devoid of trees when first established. In all, Palmer's vision gave rise to more than 2,000 acres of parks, trails, and roadways planted with trees in Colorado Springs.

Today, the City continues to uphold the vision of Palmer by maintaining Colorado Springs' heritage, character, and image. This appreciation for and commitment to the natural environment is exemplified in the City's Comprehensive Plan, PlanCOS, stating "Colorado Springs will become a vibrant community that reflects our engaging outdoor setting as pioneers of health and recreation. Our city will be filled with unique places of culture and creative energy, sustainably designed around our natural environment. We will attract and retain residents of all generations with an innovative, diverse economy, and dynamic, well-connected neighborhoods that provide viable housing opportunities for all."

This Urban Forest Management Plan for Colorado Springs expands on the shared commitment to stewardship and enhancement of the natural environment by providing the road map for achieving improved levels of urban forest management, sustainability, and equity to benefit all residents and future generations.

3. *Wood, K. (2016). Urban & Community Forestry. Colorado State Forest Service, Colorado.*

COLORADO SPRINGS' URBAN FOREST PROGRAM

Colorado Springs has proven to be a national leader in parks and recreation by cultivating healthy communities through quality programs and dynamic public spaces. The Colorado Springs Parks, Recreation and Cultural Services Department (PRCS) currently manages over 200 parks encompassing 9,420 acres inside the City, another 4,950 acres of City parkland located just outside the City boundary, and nearly 150 miles of trails throughout. Within the Department, the City Forestry Division (Forestry) oversees a growing population of over 270,000 estimated trees found along and within City streets and medians, another 20,000 estimated trees in parks, plus additional trees found along trails and in open space and riparian areas. By providing park areas, a thriving urban forest, and access to an array of outdoor activities, Colorado Springs generates numerous environmental, social, and economic benefits within the community.

CITY FORESTRY TREE MANAGEMENT FUNDING HISTORY

The status of the Forestry Division has undergone various changes since its establishment as a department in 1910. Initially, it was under the authority of the Department of Public Works. A statement within the first City Forester's (Fred McKown) report described a change of street tree management responsibility from the Street Department to the Forestry Department. The Forestry Department maintained this responsibility and structure until 1950 when the Recreation Division became the authority over the Forestry Department. In 1956, when the Parks Division and Recreation Division merged, the Forestry Department gained Division standing.

The City limits have also changed and grown since 1911, as have the populations of people and trees. Records show that McKown's budgetary requirements for 1916 totaled $4,048.40 for Forestry. In 2006, a Division Budget in excess of $1.0 million funded the operations, maintenance and salaries for City Forestry consisting of 15 full-time staff. Records indicate that from 2005 through 2008, Forestry arborist crews spent between 15-17 percent of their time conducting scheduled preventative pruning on the public tree population consisting of between 118,500 and 129,000 trees, respectively, at that time. This equated to approximately 5,000 trees pruned per year on an approximate 20-year rotation (i.e. within 20 years, all public trees are pruned).

PARKS, RECREATION AND CULTURAL SERVICES CORE VALUES

Excellence

Consistently strives to deliver superior service and results with integrity;

maximizes potential through continuous improvement; and

sets, achieves, and maintains a high level of performance.

Passion

Motivated to provide remarkable service and dedication to the community and the Department.

Professionalism

Highly skilled and adaptable subject matter experts that embrace lifelong learning and improvement.

Innovation

Pursues creative ways to better deliver services both within the Department and with external partners, while anticipating future needs.

Collaboration

Inspires others to succeed and develop; thinks and acts beyond the scope of individual responsibilities;

puts department goals in front of division or individual objectives;

recognizes outstanding performance; and is accountable to each other.

Due to the 2008 U.S. economic recession, the budget for Forestry was significantly reduced for 2009 and 2010. Pruning contract funds for street tree maintenance were eliminated to reduce ongoing expenditures. With its removal, Forestry crews spent more time on priority "calls for service". By 2010, Forestry and the City as a whole were feeling the full effects of the recession.

According to the City's 2010 Budget, nearly 60% of Forestry Division funding was eliminated from the General Fund, no City-led tree plantings were to be funded, and maintenance pruning was eliminated. Instead of

scheduled preventative tree maintenance, funding was only available to address service requests for hazard trees. In addition, the New Home Tree Program was placed on hiatus. As a result of these reductions, the City's Tree City USA status held for 32 consecutive years was put in jeopardy. In total, the 2010 Budget reduced General Fund funding for Forestry by the amount of $567,501 (amended actual budget differs slightly) and eliminated seven full-time employees.[1]

The City is making strides in recovering from the recession in terms of Forestry staffing and funding. By 2011, the budget increased by $269,550 and by 2015 the budget raised above pre-recession amounts with a total of $1,480,016. In subsequent years, the budget incrementally increased, excluding 2018 where $600,000 from grant sources was not included as it was in 2017. The key takeaway from these budget summaries is that in 2019, the Forestry budget received an additional $385,000 in funding from the General Fund to support the hiring of three new Forestry Technicians. This long-time Forestry goal of creating a three-tiered organizational structure for arborist staff was achieved; Senior Forestry Technicians, Forestry Technician IIs, and Forestry Technician Is.

As of 2020, the Division budget stands at $2,166,801, of which $1,558,037 (72 percent) is budgeted for tree maintenance and the Division currently has 11 full-time staff specifically for urban forest management.[2] The 2020 Budget provides an increase of approximately $67,000 in the General Fund mainly to fund existing positions, decreased the Conservation Trust Fund by approximately $48,000 for adjustments to the existing position, decreased by $100,000 due to the lack of grant funding, and increased by $40,000 with Lodgers and Automobile Rental Tax-Capital Improvement Program (LART-CIP) funding for the Sesquicentennial Tree Planting (in celebration of the 150th anniversary).

UNFUNDED BUDGET REQUESTS

Essential needs of City Forestry to perform urban forest management cannot be addressed with the current budget for the Division. It is recommended to restructure the Division into four sections, each focused on a specific component of the urban forest, and the staffing level adjustments to support improved urban forest management. Funding is unavailable for the inventory of the public tree population which City Forestry manages. Furthermore, the budget for training, safety equipment, and contract tree removals is inadequate. To successfully implement actions in this 2020 Urban Forest Management Plan, funding for these requests needs to be acquired. Actions in this Plan are specific to the acquisition of these funds.

As the City expands and its populations of people and trees continue to grow, the Forestry budget must also grow proportionately. Benchmarking research was conducted to measure Colorado Springs' adjustments to the Forestry budget and staffing levels as these characteristics change over time. Additional information regarding the City's historical and current urban forestry program and staffing is available in the Urban Forest Benchmarking section of this Research Summary.

1. *City of Colorado Springs, CO Annual Budgets (2005 – 2020)*
2. *City of Colorado Springs, CO Annual Budgets (2005 – 2020)*

CITY FORESTRY TREE MANAGEMENT PROGRAM TODAY (2020)

This Plan primarily addresses the City Forestry Division and its role in managing and shaping the urban forest, though implementation requires a shared commitment among departments, partners, and the community. As part of the planning process, the operations, resources, and viewpoints from Forestry, departments, partners, and the community were extensively evaluated to inform the Plan. This research is detailed in the City Staff Interviews; key information about the Forestry Division is summarized below.

CITY FORESTRY

Mission

To manage our urban forest in a healthy, safe, and sustainable state, which maintains our original forest legacy, manages risk, and increases the canopy coverage for shade, stormwater retention and property value.

Services

- Conduct tree maintenance such as pruning to maintain and enhance the health, vigor and aesthetic value of each tree.
- Manage contracted services providing forest management and mitigation activities, urban tree and stump removals, and tree pruning and maintenance services.
- Remove diseased, dead and dying trees for the health of the urban forest.
- Provide for and enhance public safety by clearing traffic and school zone signs and visibility obstructions, and removal of hazard trees and large branches at risk of failure.
- Provide emergency response and coordinate efforts to address weather-related tree failures.
- Direct efforts to manage trees located in City rights-of-way and native medians.

Highlights

- Approximately 270,000 public trees and growing
- Service areas include streets, trails, parks, open space, riparian areas, wildland urban interface, and facilities
- 13 staff members total; 11 dedicated staff members for urban forest management (1 staff member for every ~24,500 trees)
- $2,166,801 Forestry budget; $1,558,037 dedicated budget for tree maintenance (2020)
- $5.77 funding per public tree

The summary statistics above highlight the resources allocated for the management of the City's ~270,000 public tree population. Forestry is responsible for the overall management of the urban forest and the native forest of the wildland-urban interface. Staff manages and maintains trees on the street rights-of-way and medians, urban parks, trail corridors, open spaces, and regional parks.

Currently, City Forestry has two Staff Foresters who are Certified Arborists that manage the City's street trees. The City Forester has four job responsibilities: management of public street trees, trees in open spaces, park trees, and riparian vegetation management. Each Staff Forester is responsible for tree inspections, contract administration, tree inventory, tree appraisals, code review and rewrite, working with 2C and PPRTA (Ballot item 2C increased sales tax for road improvements and Pikes Peak Rural Transportation Authority, PPRTA, roadway projects), reviewing development plans, coordinating planting projects, insect and disease diagnostics, coordination with other City entities, presentations, storm response, data entry, website content development, phone communication, and walk-ins, among many other services and tasks.

In 2019, a long-time Forestry goal of creating a three-tiered organizational structure for the arborist staff was achieved; Senior Forestry Technicians, Forestry Technician IIs, and Forestry Technician Is. Fortunately, the 2019 budget fulfilled the Senior Forestry Technician and Forestry Technician II positions with extremely competent staff. However, the Forestry Technician I positions remain unfilled. This new tiered staffing structure was created to strengthen a lineage of beginning level unskilled arborists to competent and Certified Arborists with long-term years of experience.

As a result of the October 2019 and the April 2020 weather events, tens of thousands of urban street trees have expired from freeze damage. As spring progressed, concerned citizens had inundated City Forestry with requests for tree removals. Presently (June 2020), the total tree contract budget for pruning and removals is $360,000, of which only $120,000 is designated strictly for removals. At a cost of nearly $1,000 per address, this will only remove an average of 120 trees per year through the contracted budget. Combined, City Forestry and contractors remove approximately 1,000 trees per year. Consequently dead trees will be evident throughout the community for the foreseeable future. Therefore it is essential for public safety and forest health that maintenance budgets are reflective of actual work loads.

As the City continues to grow exponentially, the demand-loads on three Forestry crews (as of 2020) are untenable. According to research, to properly manage an urban forest, each public tree should be "touched" approximately every seven years. For Colorado Springs, this means approximately 38,600 trees per year should have maintenance performed on them. In recent years, City staff have been able to maintain less than 1,700 trees per year with current staffing, and another 2,000 with contracted services. Additional staffing is critical to increase the care provided to the growing urban forest. With the addition of three entry level arborists, the crews would operate more efficiently, maintain safer work zones, reduce the potential tree hazards and risks, manage more trees per year, and nurture a healthy and thriving urban forest. Part-time, hourly staff are also essential to City Forestry's successful operation. Currently, Forestry employs one hourly for front desk administration, one hourly staff for Staff Forester support, and two hourly staff for operations.

Photo 5. | The City of Colorado Springs.

PARTNERSHIPS, PROGRAMS AND THE COMMUNITY

Partnerships with City Forestry include the Parks, Recreation and Cultural Services Advisory Board, the Trails, Open Space and Parks (TOPS) Working Committee, service organizations, volunteers, and advocates. In addition to managing the street trees and park trees., Forestry staff work closely with the Fire Department and Colorado Springs Utilities to complete critical forest health projects in the wildland-urban interface (WUI). The Mayor also launched the Tree Challenge as part of the sesquicentennial (150th anniversary) preparation and in honor of the City's founder, William Jackson Palmer. Citizens are encouraged to "Be Like Palmer" and help Colorado Springs achieve the goal of planting 18,071 trees by July 31, 2021. In addition to City projects and community events, the City has maintained Tree City USA status, accredited by the Arbor Day Foundation, for 43 years (as of 2020).

City Forestry exists to serve the citizens and the public trees. In 2019, the division received 2,460 service requests relating to urban forestry. City Forestry participates in the TreeCycle Program by chipping 1,583 Christmas trees in 2019. The program raised $23,000 to support Colorado Springs Youth Sports, Inc. Capital, Construction and Restoration Projects throughout the City limits are conducted every year by the City and its partners. For example, forest health management projects were completed for Blodgett Open Space and Ute Valley Park in 2019. Numerous trail improvements and facility landscape projects have been completed across the City in 2019.

URBAN FOREST MANAGEMENT PLAN FRAMEWORK

COMPONENTS OF THE TWO PLANNING PHASES

The development of the Colorado Springs, CO Urban Forest Management Plan (UFMP) involved two phases. Phase 1 consists of an evaluation of five unique planning elements, the results of which were applied to a systematic and industry-approved audit system. The research summary provides the outcomes of baseline assessments to inform the incremental strategies in Phase 2 that will advance Colorado Springs' urban forest through various implementation scenarios

The Urban Forest Management Plan (Phase 2) consists of four management scenarios based on available funding, staffing levels, tree maintenance responsibility, and outcomes from the research in Phase 1. The goal framework in Phase 2 provides short- and long-term objectives, the targets for measuring progress, the actions to implement the objectives, and the evaluation criteria to adapt management approaches for future planning horizons and changes in resources. The following provides an overview of the planning elements summarized in this report:

Figure 2. The five planning elements that were incorporated into the audit, which guided the research reported in this summary, and led to the primary framework of the UFMP.

PHASE 1: RESEARCH SUMMARY

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

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

Photo 6. | The City of Colorado Springs website.

COLORADO SPRINGS

RESEARCH SUMMARY:

A BASELINE ASSESSMENT TO SUPPORT THE FRAMEWORK OF THE **URBAN FOREST MANAGEMENT PLAN**

Based on the analysis of findings from the Phase 1 planning elements and audit, ***Colorado Springs scored a 67%*** in terms of urban forest sustainability, management, and access. These results are summarized in the Urban Forest Audit section of this Research Summary and fully reported in tabular form in the Appendix.

Figure 3. Following a thorough review of the urban forest management planning elements, the results were incorporated into the audit and used to inform the management plan.

PHASE 2 : URBAN FOREST MANAGEMENT PLAN FRAMEWORK

The audit rating and the information gathered during Phase 1 were applied to Phase 2 to develop the primary framework of the Urban Forest Management Plan. Results from the Urban Forest Audit System informed the Phase 2 **management scenarios** (representing four possible levels of resources), short- and long-term **objectives**, **targets** for measuring progress, implementation **actions**, and **evaluation** criteria to facilitate adaptive management approaches.

The five planning elements of the Phase 1 Research Summary were integrated into these Scenarios, Objectives, Targets, Actions, and Evaluation for the City of Colorado Springs which are presented in the separate Urban Forest Management Plan report document.

EXISTING POLICIES AND PLANS

RELATIONSHIP TO OTHER CITY EFFORTS

The purpose of Planning Element 1, Existing Policies and Plans, is to gauge the City's commitment and readiness for urban forest sustainability. Measuring alignment of existing policies and plans ensures a strong connection between the City Forestry Program's high-level strategic goals, and the projects and initiatives that support these goals. An Urban Forest Management Plan without proper alignment runs the risk of wasting resources and time and can jeopardize the success of key projects that support the City Forestry Program's mission. Plans cannot live in isolation, therefore, cross-examining various plans brings to light any projects or initiatives that are a misplacement of resources and time.

Table 1. | The urban forest management plan will support the City's existing planning efforts, detailed below.

Existing Plans, Policies, and Documents Reviewed	
PlanCOS	The City's Comprehensive Plan, adopted in January 2019 (additional details on next page)
Colorado Springs 2020-2024 Strategic Plan	The City's 5-year strategic budget plan, FY 2020-2024 (additional details on next page)
Colorado Springs 2020 Budget	The City's departmental budget, FY 2020
Colorado Springs City Code	The set of rules and standards for any new construction and redevelopment within the City of Colorado Springs
Colorado Springs Park System Master Plan	A master plan for Colorado Springs' parks
Colorado Springs Downtown Master Plan	A master plan for Colorado Springs' downtown neighborhood
Downtown Colorado Springs Form Based Code	The set of rules and standards for development in the downtown neighborhood
Colorado Springs Historic Preservation Code	The set of rules and standards for development in historic Colorado Springs
Mill Street Neighborhood Plan	A master plan for the Mill Street neighborhood
Colorado Springs Approved Street Tree List	The 2020 revised list of approved tree species that may be planted in City-owned Rights of Way
2006 Forestry Rules & Regulations	The set of rules and standards for trees (planting, spacing, removal, etc.) during new construction and redevelopment
2006 Forestry Management Plan	The City's most recent forestry plan
2006 Street Tree Planting Plan	A plan for planting new street trees in 2006
2004 Contract Tree Maintenance Summary	Tree work performed by contractors within Colorado Springs in 2004
2000 City Forestry Budget	The City's Forestry budget from FY 2000
1981 Forestry Per Capita	An academic article that reviewed the City's 1981 forestry budget

PLAN COS

PlanCOS is the City's Comprehensive Plan, adopted in January 2019. Key chapters pertaining to urban forestry include Chapter 2, "Vibrant Neighborhoods", Chapter 5, "Strong Connections", and Chapter 7, "Majestic Landscapes". Key policies identified in PlanCOS include:

Policy ML-1.A:

- Ensure adequate and sustainable funding for parks, recreation, urban forest, and open space assets.

Policy ML-2.C:

- Provide green infrastructure lands, facilities, and services that are tailored and aligned to meet the conditions and needs of all areas of the City.

Policy ML-3.A:

- Utilize, maintain, and expand upon open space and natural areas along creeks to convey stormwater while meeting recreation, education, and transportation needs consistent with the Complete Creeks Typology 4b.

Policy ML-3.B:

- Preserve and maintain the creek and waterway system as an essential component of stormwater infrastructure.

Policy ML-4.A:

- Emphasize preservation of undeveloped land and natural areas that result in the preservation of the most environmentally and culturally significant areas and incorporate low-impact recreation.

Policy ML-4.C:

- Implement standards, policies, and practices that support enhanced air and water quality.

Policy ML-4.D:

- Cultivate an ethic of environmental stewardship and landscape health through community education and engagement.

Policy ML-5.A:

- Recognize the vulnerability of both our natural and built landscapes to natural hazards, degradation, and overuse.

Policy ML-5.B:

- Focus on resilient landscapes in the face of drought, flood, and fire hazards.

2020-2024 STRATEGIC PLAN

The City of Colorado Springs' 2020-2024 Strategic Plan sets forth City priorities and commitments from 2020 to 2024. The plan was developed with broad community input and includes four main goals, all of which are pertinent to urban forest management:

Promoting Job Creation:

1. Attract the community, visitors, and businesses to drive the economy and image of Colorado Springs.

Investing in Infrastructure:

1. Enhance and expand an interconnected system of parks, recreation and cultural services through preservation, stewardship and innovative programs.
2. Cultivate the City's natural amenities to reflect its majestic landscapes for today and the future.

Building Community & Collaborative Relationships:

1. Build on existing relationships and partnerships with a diverse community of stakeholders to leverage resources.

Excelling in City Services:

1. Provide excellent and sustainable delivery of core services by making data driven investments and decisions.
2. Support continuous improvement and cross departmental collaboration to improve service delivery to residents and provide for public safety.

PARKS SYSTEM MASTER PLAN

The Colorado Springs Park System Master Plan, adopted in 2014, features recommendations for the stewardship, maintenance, operations and care of the City's parks. One of their recommendations pertained to the urban forest:

Increase focus on providing urban forestry tree care and replacement.

"Tree care and tree replacement standards are lacking with no annual tree replacement schedules currently in place. [...] A regular schedule of annual tasks including annual pruning, watering, and tree replacement is necessary to maintain a healthy urban forest."

CITY FORESTRY STAFF INTERVIEWS

The purpose of Planning Element 2, City Staff Interviews, was to garner interest in the Plan and solicit feedback from relevant parties within the City Forestry division, other City departments, and Colorado Springs Utilities. Information was gathered from City Forestry staff and partners for a better understanding of existing internal infrastructure and processes around tree management. Staff provided resource strengths, needs, and gaps during project consultations and as written summaries to inform the benchmarking research, Urban Forest Audit, and the goal framework in Phase 2 .

Table 2. | Stakeholders at the City of Colorado Springs who participated in the development of the UFMP.

City of Colorado Springs	
Dennis Will	City Forester
Jeff Cooper	Staff Forester
Alison Munroe	Staff Forester
Greg Eno	City Forestry Maintenance Supervisor
Julie Milstid	Forestry Assistant
Nadine Carlile	Forestry Administration
Karen Palus	Director, Parks, Recreation and Cultural Services
Kurt Schroeder	Program Manager, Parks, Recreation and Cultural Services
Jay Anderson	Citizen Engagement Administrator
Joshua Bartlett	Fire Captain
Eric Becker	Special Improvement Maintenance District Administrator
Timothy Biolchini	Stormwater Projects Coordinator
Daniel Gould	Landscape Architect
Mitchel Hammes	Neighborhood Services Manager
Dena Lozano	Deputy City Clerk
Victoria McColm	Risk Manager, ARM AICM AINS
Lisa O'Boyle	Attorney
Cole Platt	Program Supervisor, Public Works
Andy Richter	GIS Supervisor
Kate Roppel	Parks, Recreation and Cultural Services, Project Manager
David Scalfri	Operations Manager
Jeremy Taylor	Wildfire Mitigation Program Administrator
Vanessa Zink	Senior Public Communications Specialist
Colorado Springs Utilities	
Catherine Moravec	Water Conservation Specialist
Doug Lyons	Collection, Distribution Specialist
Eric Howell	Forest Program Manager

CITY FORESTRY ORGANIZATIONAL CHART

The following chart represents the organizational structure of Colorado Springs' City Forestry team, which is part of the Parks, Recreation, and Cultural Services (PRCS) Department overseen by the Mayor and Chief of Staff. This visualization was derived from the City of Colorado Springs 2020 budget and includes the number of full-time PRCS and Forestry employees.

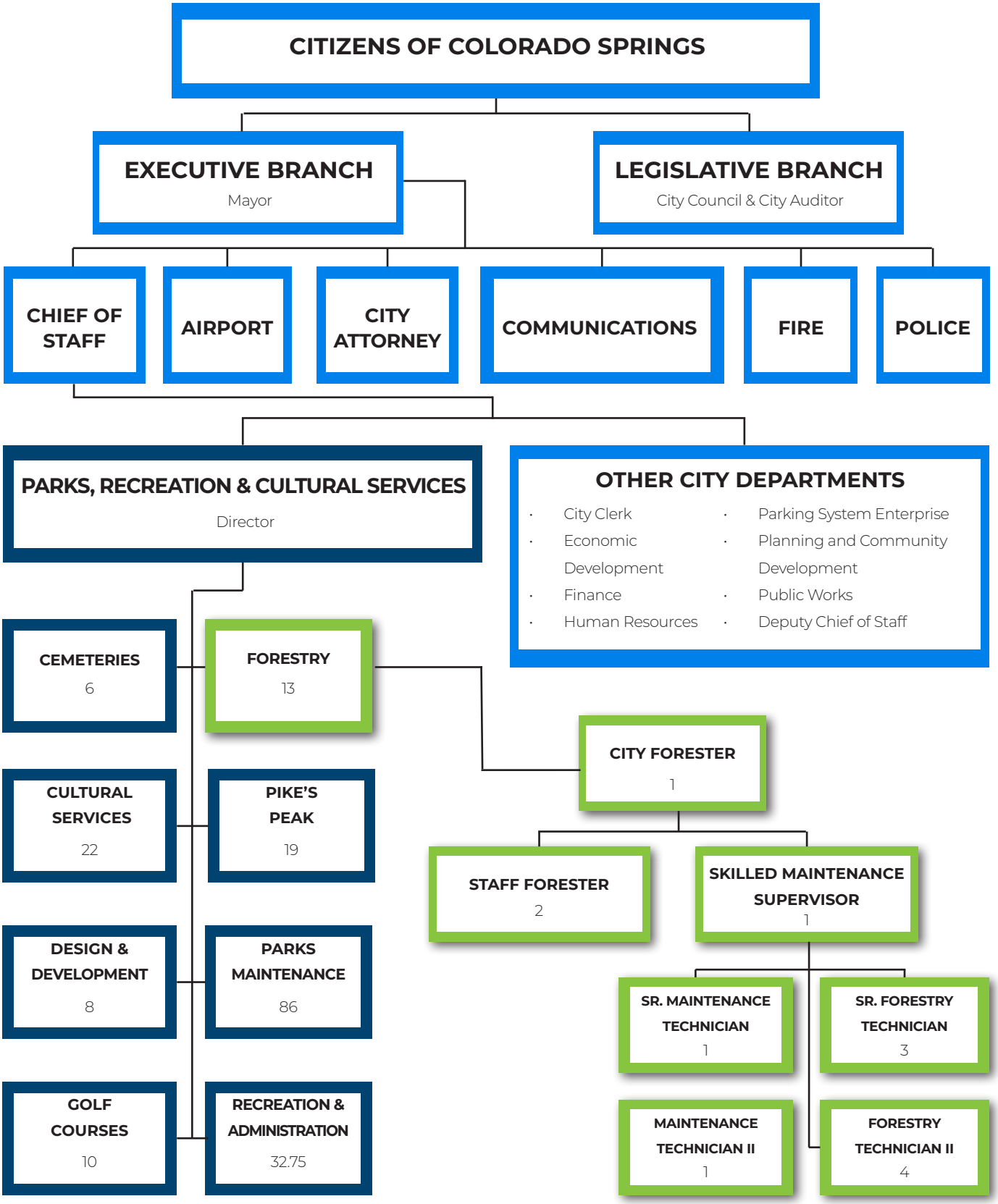


Figure 4. Organizational structure of the Colorado Springs City Forestry Division.

KEY ISSUES AND OPPORTUNITIES

The following themes were identified as common, or frequently recurring, throughout the City Staff interviews.

CITY CODE CHANGES

City Forestry does not have the policy support or authority to enforce weed tree maintenance or the prevention of volunteer sprouts/trees. This includes the growth of trees not deliberately planted or trees not suitable for the site because of growing restrictions, status as an invasive, or other reasons. In addition to concerns regarding naturally-sprouted trees, City Forestry does not have sufficient staffing to identify or respond to improper plantings in the City rights-of-way (ROW). This also extends to developers planting unsuitable trees within the public ROW with species such as cottonwoods *(Populus spp.*). As cottonwoods mature, they become costly for City Forestry to maintain, creating a conflict in which Forestry has to maintain a tree that wasn't suitable for the site but does not have the staffing or resources to address it.

City Forestry has established the 2006 Forestry Rules and Regulations ("Forestry Regulations") though the differences between this document and City Code is not clear, specifically in terms of enforcement. Furthermore, City Code does not reference the Forestry Rules and Regulations, for example, the mandate to contact City Forestry prior to major construction within 20ft of a city tree is only mentioned in the Forestry Regulations, not in City Code.

CODE ENFORCEMENT AND RESTITUTION

Repercussions or restitution for failing to adhere to City Code regarding unauthorized tree plantings in the public ROW do not exist. City Forestry lacks the policy to support a response to unauthorized planting, unpermitted tree removal and tree pruning, unpermitted hardscaping, or general use of herbicide in the ROW. City Code does not clearly define the authority or responsibility of this enforcement nor does it provide the proper procedures.

City Forestry is not an enforcing authority and must rely on City Clerk officers to enforce business licenses. Also, Forestry relies on Code Enforcement to follow through on noncompliance with private tree maintenance. Inconsistencies within City Code exist, creating confusion in respect to enforcement. For example, enforcement to address a hazard tree on private property exists in City Code (4.4.402E), but not in the Duty to Prune section of City Code (4.4.104). Due to staffing levels, City Forestry does not address these private tree situations.

INVASIVE TREE MANAGEMENT

City Forestry does not have the staffing or ability to enforce timely removal of sprout or "volunteer" trees or saplings. As a result, City Forestry is frequently tasked with inspecting locations for blocked streets or sidewalks, often caused by Siberian elm (*Ulmus pumila*) sprouts that are not being maintained. These unauthorized volunteer saplings, when allowed to grow large, often damage curbs and sidewalks, and become City Forestry 's responsibility to remove.

City Code does not reference trees that are not specifically planted or authorized but the language does make their maintenance the responsibility of Forestry. Updates to City Code should address the responsibility for managing these sprout or volunteer trees in public rights-of-way.

PUBLIC OUTREACH AND EDUCATION

An important aspect of urban forest management is the clear understanding of tree maintenance responsibility and authority within the public rights-of-way. Based on service requests and observations, it is assumed that a large portion of the public (especially away from the downtown core, or in areas with attached sidewalks and varying measurements of right of ways) may not know that City Forestry is responsible for maintaining right-of-way trees.

Information about the responsibility is available on the City website but Forestry does not have the staffing levels to respond to new requests for inspections, service, or educational presentations which would most likely occur with more media presence. With additional funding and resources, Forestry would have the opportunity to educate homeowners about appropriate tree species and proper pruning of young trees, providing the information to encourage advocacy and stewardship for the City's urban forest.

REACTIVE TREE MAINTENANCE

Reactive tree management, often guided by response to citizen requests, is the primary approach for City Forestry's public tree maintenance program. Tree work is generated almost exclusively by citizen requests with concern about the health of their trees. In 2019, there were a total of 2,460 service requests and inadequate staffing levels to address these, in addition to previous years' requests, resulting in backlogs and discontent. The priority or degree of concern vary among these requests, ranging from aesthetic pruning to a fallen tree. Adhering to City Forestry's responsibility to address citizen concerns leaves thousands of other trees unaddressed—many even on the same streets as the citizen requests—that are in worse condition or pose a more significant risk. City Forestry is too understaffed to promptly address or react to service requests, lacks the resources to prioritize these requests, and must disregard other trees—perhaps of higher priority—not staged in the service request system. Addressing this issue can only be accomplished with additional staffing, tree maintenance responsibility adjustments, and/or preventative maintenance pruning on a cyclical rotation.

TREE MAINTENANCE RESPONSIBILITY

Some street trees in Colorado Springs are the responsibility of other entities. Although City Forestry has the ultimate authority over all trees within the public right-of-way, the agency is not responsible for performing maintenance on all of these trees. Responsibility for a percentage of the trees falls to homeowners' associations and special improvement districts in multiple planned neighborhoods. As a result, achieving a standard and coordinated level of care is challenging. City Forestry has historically maintained trees planted by the City and those along major commercial streets or thoroughfares. However, City Forestry has also inherited maintenance of certain street trees planted by other agencies or entities, or through special state or federal funds. This has created an uneven patchwork where City Forestry maintains some trees but not others, making it difficult for property owners to know the maintenance responsibilities. It also creates a divided system whereby some property owners pay to maintain their street trees through special taxes while City Forestry assumes the cost and responsibility for others, and still others do maintenance without the guidance of City Forestry.

MAINTENANCE-DEFFERED TREES

In the neighborhoods to the north and east of downtown, thousands of trees between 8-16 inches in diameter, primarily 10-25 years old, have never been professionally pruned following industry standards and best practices. No pruning for improved structure or limb raising to reduce clearance issues has taken place. These trees are beginning to approach the age and size at which they can pose significant hazards. As seen in the images to the right, issues such as limb failure due to codominant trunks, poor branching attachment, and blocked roadway signs continue to rise, unaddressed, due to deferred tree maintenance. Solutions to this issue are also concerning, as most of these trees may be beyond Forestry's ability to correct structural issues. To attempt to maintain these trees would require time and resources beyond any normally maintained tree.

Figure 5. Examples of issues that can result from the deferred maintenance of trees. Photos by City Forestry.

Figure 6. Examples of some of the issues that can result from improper practices during new development. Photos by City Forestry.

NEW DEVELOPMENT

Rapid growth of new housing developments, especially in the north and east areas, pose a concern for Forestry's current resources. The division does not have staffing levels to review all development plans, nor does it have representation during the planning and design stages to clarify which trees are acceptable or the placement of trees. Many developers or homeowners' associations (HOAs) take ownership of these areas and impose their own regulations. As such, Forestry does not have an accurate understanding or control of the urban forest in these new development areas.

In addition, there is no accountability for tree survival or success. Some trees are inappropriate for the location; others are planted in the sight triangle at intersections, or directly in front of stop signs; others are planted in areas of no irrigation. As these trees mature, City Forestry is responsible for these maintenance, removal, and hazard mitigation issues. These issues are shown on the left with willows or cottonwoods being planted and inappropriate trees in the rights-of-way for the given space.

DOWNTOWN PARTNERSHIPS

City Forestry is currently responsible for tree maintenance on downtown trees, although the Downtown Business Improvement District is responsible for watering those trees. As new development projects are created downtown, the planting design and partnerships need to be evaluated for efficiency and a healthy downtown street tree population. Planting design and specifications should consider the effectiveness of tree grates given the limited space for tree root development and use of roadway salts that damage trees and tree grates which City Forestry is responsible to replace. Design and specifications should also consider trees in raised beds that provide greater root zones and have shown higher success rates in similar applications.

LIABILITY CONCERNS

Because City Forestry's tree maintenance program is citizen request-based, preventative tree care is not conducted, thus increasing the potential for tree risk. Generally, Forestry addresses tree hazards and mitigates risk by receiving a service request or tree crews notice the hazard while in the area. Due to staffing limitations, Forestry is unable to respond promptly to reduce hazards, with a backlog of one to three years, almost entirely from citizen requests. The trees that are not receiving attention are at increased risk for failure as they age which can only be addressed with additional staffing, tree maintenance responsibility adjustments, and/or preventative maintenance pruning on a cyclical rotation.

SPECIAL IMPROVEMENT DISTRICTS

City Forestry is tasked with assisting the Special Improvement Maintenance District (SIMD) areas with large tree care or removal. This adds miles of rights-of-way and private property that are irrigated and over-planted with trees. While SIMD does provide more routine care to their ability levels (pruning over sidewalks, and removing downed trees), they are also in need of larger forestry equipment and expertise for removals along busy roadways. There is also a higher demand based on visibility of trees along the roadways, which generate many requests to that department. In addition, budgets have been reduced for the replacement of trees and the maintenance staff have been reduced in recent years further complicating the responsibility of tree maintenance in these districts.

TREE MAINTENANCE AND UTILITIES

There is confusion among citizens regarding the responsible entity for tree maintenance in proximity to utility lines. Confusion among citizens arises due to the trees and utilities being in the rights-of-way where typically, it is City Forestry's responsibility. In alleyways, this is a more straightforward process because City Forestry does not plant trees in this right-of-way and therefore, does not conduct tree maintenance in these areas. As stated in City Code (9.6.302), homeowners are responsible for maintaining weeds up to the centerline of the alley.

An agreement with the City states Colorado Springs Utilities is responsible for tree maintenance under utility lines for the purpose of line clearance. However, City trees planted in the right-of-way along main or residential streets will also be pruned to utility standards if they are under lines though, City Forestry is not permitted to work within ten feet of high voltage electrical lines. Currently, the authority to maintain trees near utilities is unclear and the responsibility for tree failure due to aggressively pruned trees for utility clearance is undefined.

TREE PLANTING AND WATERING NEEDS

A healthy and growing urban forest that provides benefits and services to all citizens is accomplished, in part, with a "no net loss" strategy. This implies that every public tree that is removed, for any reason, is replaced either at the location or alternate location. With City Forestry understaffed and underfunded, a question of tree watering responsibility arises for the tree replacements.

Formerly, the division had the New Home Tree Program— a method to develop City Forestry presence in newer neighborhoods and ensure compliance with planting and tree care ordinances—but the division does not currently have the budget to continue this program. There is also no guarantee that the homeowners will water these trees. For the last several years, City Forestry has only replanted in parks or medians, where there is irrigation. These trees also receive supplemental watering, but City Forestry's capacity for hand watering is maximized at about 300 trees.

OPEN SPACE RESPONSIBILITIES

Trees in open spaces, along trail corridors, or in drainage canals within City property often become the responsibility of City Forestry if a citizen requests aid. There is no designated maintenance staff to care for weed plants or trees in some of these areas. City Forestry is often contacted to manage volunteer trees obstructing the adjacent homeowner's property. These "weed trees" grow because natural areas, referred to as "open spaces" are not maintained with mowers.

Additionally, larger trees outside of the trail corridor that suffer storm damage raise concerns from citizens who may request a response from City Forestry. Current staffing levels mandate that Forestry does not address these issues unless there is a hazard over a trail, building, or private property. This results in hanging broken branches and piles of down limbs in open spaces that will persist as shown in the images on the right.

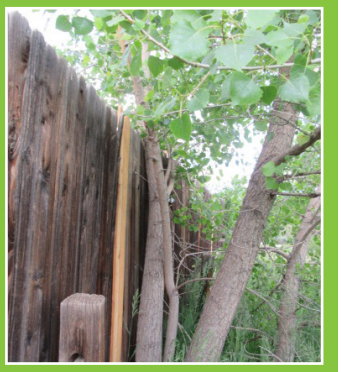


Figure 7. Examples of some of the issues that can result from a lack of defined open space responsibilities and/ or the resources and capacity to enforce them. Photos by City Forestry.

PLANTING AND DESIGN SPECIFICATIONS

Addressed in various degrees in previous sections, the planting specifications within City Code and the Forestry Rules and Regulations needs to be updated. Often times, trees are planted in rights-of-way with a width of four feet or less. For most street trees, this is inadequate growing space or soil volume for the health of the tree and longevity of infrastructure. City Forestry is currently experiencing many conflicts between sidewalks, curbs, gutters, and trees (as shown in the images below). With increased pressure to restore public infrastructure to Americans with Disabilities Act (ADA) standards and improve road conditions, many trees are being significantly impacted. Research and technology have advanced for alternative solutions to tree removal when they are in conflict with sidewalks and curbs (such as curb extensions, structural soils, and soil cells) but have not been adopted by the City for implementing.

In future development plans, alternative solutions such as attached sidewalks or significantly wider rights-of-way for adequate growing space for trees should be considered. Another option to consider is reducing the plantable space to two feet in some locations, which would preclude trees from being planted in these rights-of-way. In these cases, it would be ideal for new trees to be planted within private property where the trees may receive more care, cause fewer conflicts with adjacent hardscape, and instill a better sense of ownership by the individual citizens.

Another concern in the rights-of-way relates to irrigation. Many areas are being converted to rock and irrigation is removed due to increased water costs. This practice may increase in the future with the changing climate and should be appropriately addressed in the Forestry Rules and Regulations and other planning documents.

Figure 8. Examples of some of the issues that can result from improper planting and design specifications. Photos by City Forestry.

WILDFIRE MITIGATION

Management of the urban forest is essential to reducing wildfire risk. The removal and disposal of dead trees and limbs and the planting and placement of appropriate tree species reduces the potential impact of a wildfire. Understanding the extent of the urban forest using tree canopy assessments and tree inventories as described here provide urban forest and wildfire managers with the data to properly plan, respond, and recover from wildfires. As the population continues to rise in Colorado and within the City, more homes are being built in what is known as the wildland-urban interface (WUI)—near forests, rural areas or in remote mountain sites. The warm, dry climate of Colorado is appealing to residents and tourists alike, but it also brings the potential for wildfires year-round. In 2012, drought and extreme weather fueled the Waldo Canyon Fire, which burned nearly 18,000 acres, destroyed 347 homes, and was one of Colorado's most expensive wildfire with insurance costs totaling $453.7 million. The City operates a successful wildfire mitigation program to significantly reduce wildfire risk and greatly improve the community's resilience to wildfire. Through education and resources, a strong partnership between neighborhoods at risk and the Colorado Springs Fire Department has been established.

INSECT AND DISEASE RESPONSE

City Forestry's typical response to tree pests and diseases is to remove the tree once it has declined and prior to the point of it becoming a potential risk. Forestry does not have the budget for tree pest and disease prevention, treatment, or mitigation. Nor does it have the staffing to monitor infestations to properly time treatments. With the threat of emerald ash borer, referred to as EAB (*Agrilus planipennis*), to the City's ash trees, Forestry has identified ash trees with poor structure or vigor and preemptively assigned these trees a removal task rather than pruning. Additional resources and proper planning for threats such as EAB are crucial needs need for City Forestry.

2C/PPRTA CONSTRUCTION CONFLICTS

With increased funding for sidewalk, curb, and gutter repair or replacement projects, more trees are being impacted. Staff is required to inspect tree roots that are cut or need to be cut, and many of these locations have a four-foot right-of-way with a large street tree, typically greater than 20 inches in diameter. With inflexible specifications for concrete construction standards, many of these trees will be significantly damaged, or will have to be removed.

Currently, there are no tree protection standards or replacement specifications within the 2C contracts. 2C refers to the Ballot item passed by voters in 2015 allowing the City to impose a 0.62 percent sales tax for exclusive use on road improvements within the City. An extension to this was passed in 2019, extending this service through the year 2025 at a reduced tax rate of 0.57 percent. These 2C revenues complement road maintenance already funded through the Pikes Peak Rural Transportation Authority (PPRTA) and the City's General Fund budget. About 50 percent of the budget is dedicated to sidewalks, curb, and gutter repair and replacement.

The machines utilized to set forms and pour concrete for these projects provide more consistency and efficiency but requires tree roots and earth to be removed up to 18 inches beyond the existing curb, which, on smaller rights-of-way, may be within six inches of the trunk of larger trees (as shown in the images on the right). Trees and the root systems are greatly impacted by this construction, making it essential for the City to develop tree protection standards for these projects in order to maintain a healthy and growing urban forest.

Figure 9. Examples of some of the issues that can result from 2C/PPRTA construction project conflicts with trees. Photos by City Forestry.

Photo 7. | Asphalt milling in progress. Photo from The City of Colorado Springs' website.

URBAN FOREST BENCHMARKING

The purpose of Planning Element 3, Urban Forest Benchmarking, is to understand the level of effort and capacity necessary to satisfy the City's adopted goals, to identify industry trends and best practices, and to ensure urban forest sustainability. Benchmarks help to gauge the City's investment in community tree management compared to other communities facing similar issues in urban forest management.

BENCHMARKING DATA SOURCES

Several data sources were reviewed and compiled to paint a picture of how Colorado Springs measures up against communities of a similar size or geographic location and how its own operations have changed over time.

- **Urban & Community Forestry Census**
  To benchmark the City of Colorado Springs with other similar U.S. cities, the *Municipal Tree Care and Management in the United States: A 2014 Urban & Community Forestry Census of Tree Activities* by Hauer and Peterson was reviewed. The census (**UCFC**) reviewed over 660 communities with populations ranging from 2,500 to 1 million and their urban forestry management activities. In this analysis, Colorado Springs is compared with generalized averages of cities of a similar size (**250,000-500,000 population**) and geographic location (**Western**).

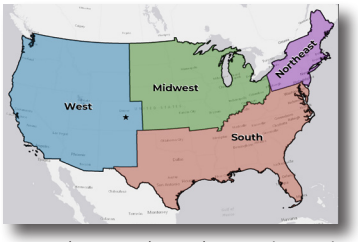
- **Tree City USA Database**
  To compare Colorado Springs with other Colorado cities, Tree City USA (**TCUSA**) data was reviewed. TCUSA is a program of the Arbor Day Foundation that maintains a database of over 3,400 U.S. cities that self-report their urban forestry metrics. Communities meeting a certain list of criteria can receive a "Tree City USA" designation. Colorado Springs is compared with nearby and similarly-sized/managed communities in Colorado and elsewhere. (Note: for additional demographic information about the benchmarking communities reviewed here, refer to the Appendix.)

- **Colorado Springs Historical Tree Activities**
  In addition to benchmarking the City of Colorado Springs against other cities, it was also pertinent to compare the City's own urban forest management and data over time. Using the City of Colorado Springs' self-reported Tree City USA data for Colorado cities with a population of over 100,000 (">100k population"), as well as the City's own internal budget documents, urban forestry activities from the ten-year period of **2008 through 2017** were assessed. Documents from **1981** and **2000** were also available and assessed to glean a much longer-term picture of Colorado Springs' urban forestry program.

Figure 10. Data sources used in the research summary.

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

REGIONAL AND NATIONWIDE URBAN FOREST BENCHMARKS

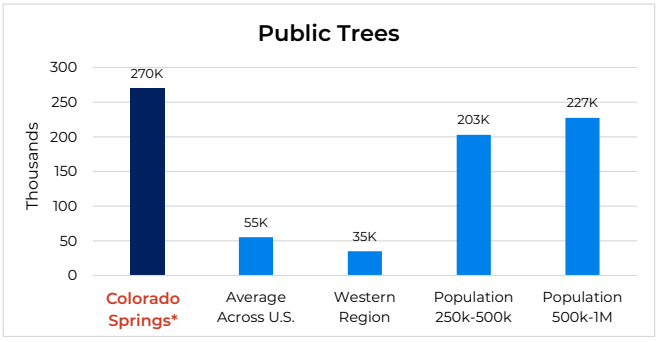


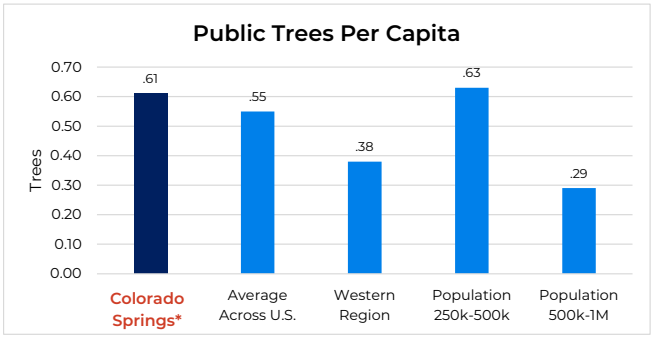
This assessment utilized data compiled in the 2014 Urban and Community Forestry Census, or UCFC, (Hauer and Peterson) to compare Colorado Springs' urban forest in terms of amount of trees with communities in the Western Region (right) and communities with a similarly-sized population. Summary statistics for two population groups are included: 250k-500k, or the group which Colorado Springs belonged to at the time of the census (with 439,886 residents in 2014), and 500k-1M, or the group that Colorado Springs is projected to soon reach (with an estimated 485,946 residents in 2020). Additionally, note that 270,000 public trees is the City's best approximation, used throughout this report with an (*). The actual number of City-owned trees, as well as their dollar value, is currently unknown and cannot be assessed until a complete inventory is performed.

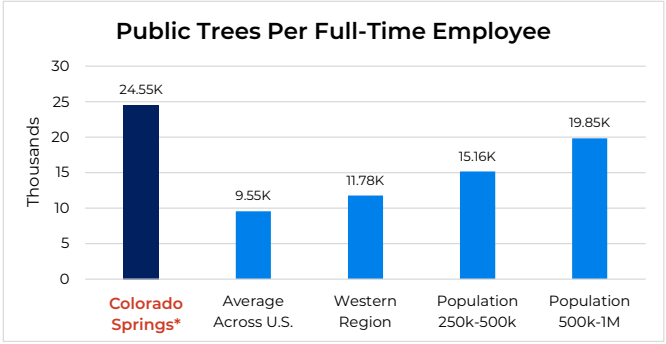
Table 3. | Comparison of Colorado Springs' urban forest structure with US cities based on 2014 UCFC data.

Category	Colorado Springs	Average Across U.S.	Western Region	Population 250k - 500k	Population 500k-1M
General					
Number of public trees	~270,000*	55,332	34,939	203,044	227,278
Public trees per capita	~0.61*	0.55	0.38	0.63	0.29
Public trees per full-time tree care employee	~24,545*	9,552	11,781	15,162	19,846
Does the City have a canopy goal?	No	44% Yes	N/A	38% Yes	55% Yes
Parks, Open & Green Space					
Acres of City-managed parks and open space	15,000	1,010	637	4,315	6,842
Tree Benefits					
Total value of publicly owned trees	N/A*	$68,665,110	$74,841,722	$100,559,126	$418,503,101

Regional and Nationwide Urban Forest Benchmarks of Colorado Springs with US Cities







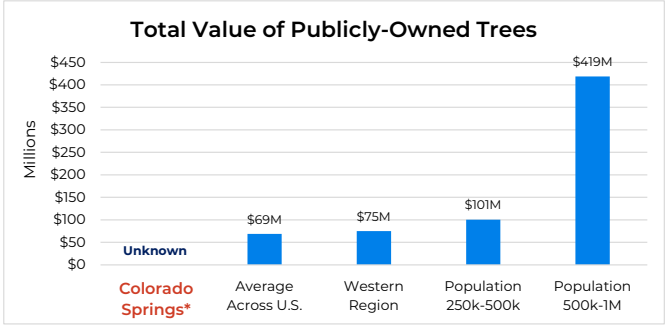


*Figure 11. Regional and nationwide urban forest benchmarking results for Colorado Springs based on 2014 UCFC data. *Note: 270,000 public trees is an estimation; the precise count cannot be known until an inventory is performed.*

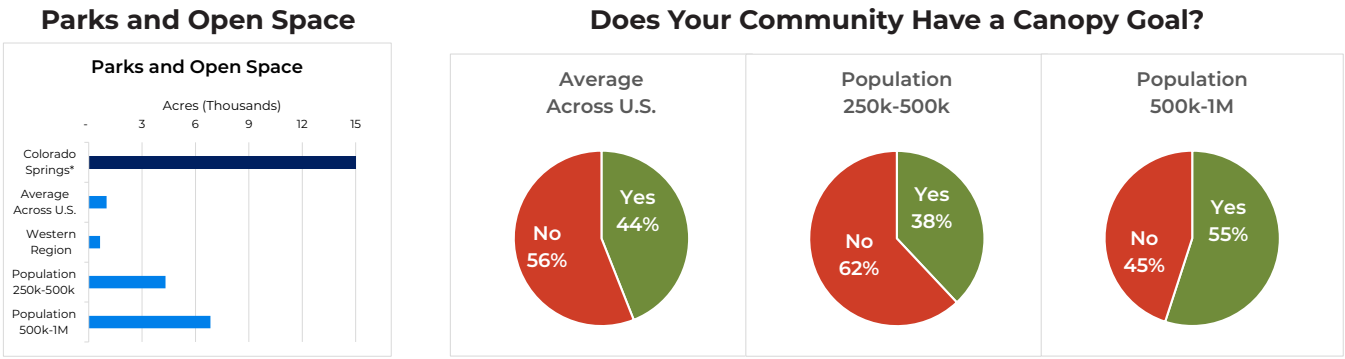


Figure 12. Regional and nationwide urban forest benchmarking results based on 2014 UCFC data.

Results indicated that Colorado Springs has a relatively high number of public trees when compared to the Western Region and cities with a similar human population. The City also manages significantly more acres of parks and open space than comparable U.S. cities. An assessment of the City's urban forestry staffing levels is provided in subsequent sections demonstrating the limited and insufficient resources currently available for a public tree population of this size.

REGIONAL AND NATIONWIDE URBAN FORESTRY PROGRAM BENCHMARKS

This analysis incorporated data from the 2014 Urban and Community Forestry Census (Hauer and Peterson) and Colorado Springs' self-reported 2019 Tree City USA (TCUSA) data obtained from the Arbor Day Foundation to benchmark the City's urban forestry program with communities with a similarly-sized population and with communities in the Western Region.

Table 4. | Comparison of Colorado Springs' urban forestry program with US cities based on 2014 UCFC data (continued on next page).

Category	Colorado Springs	Average Across U.S.	Western Region	Population 250k - 500k	Population 500k-1M
Program Management					
State License or Credential on staff	Y	23%	50%	36%	36%
ISA Certified Arborist on staff	Y	61%	95%	91%	91%
ISA Advanced Credential on staff	Y	11%	23%	36%	36%
ISA Municipal Specialist on staff	Y	15%	41%	45%	45%
City has a public electric utility?	Y	17%	N/A	N/A	N/A
City has an emergency management plan related to trees?	N	59%	N/A	N/A	N/A
Municipal Code and Policy					
City has tree protection ordinances?	Y	89%	100%	91%	91%
City has active enforcement of code?	N	64%	N/A	N/A	N/A
Community and Stakeholders					
Tree City USA	Y	73%	N/A	95%	82%
Volunteers taking part in tree activities	Y	65%	N/A	91%	82%
Volunteers involved in tree planting	Y	85%	N/A	N/A	N/A
Tree Operations & Maintenance					
Systematic tree care?*	N	55%	62%	47%	27%

Table 4. (Continued) | Comparison of Colorado Springs' urban forestry program with US cities based on 2014 UCFC data.

Category	Colorado Springs	Average Across U.S.	Western Region	Population 250k - 500k	Population 500k-1M
Tree Operations & Maintenance					
Percent of cities with systematic tree care?*	(Reactive Only)	55%	62%	47%	27%
Number of trees planted annually	73	629	356	2,386	2,008
Number of trees pruned annually	1,011	2,108	2,813	4,336	4,553
Number of trees removed annually	482	467	226	2,416	1,305
Number of trees treated for pests annually	0	265	245	784	905
Rotational pruning goals**	8 years	4.8 years	N/A	5.2 years	23.3 years

** "Systematic tree care" refers to tree maintenance that is scheduled ahead of time on a rotational basis. This is in contrast with "relative tree care" or reactionary maintenance which is not planned systematically but occurs based on need.*

*** 8 years is the rotational pruning goal for Colorado Springs; other values in that row refer to actual pruning rotations as reported in the 2014 UCFC.*

The City has the foundational components of urban forest management with certified staff, tree policies, and community engagement, though improved levels of service are essential to the health and growth of the urban forest. Actions to improve urban forest management are provided in the Phase 2 Urban Forest Management Plan.

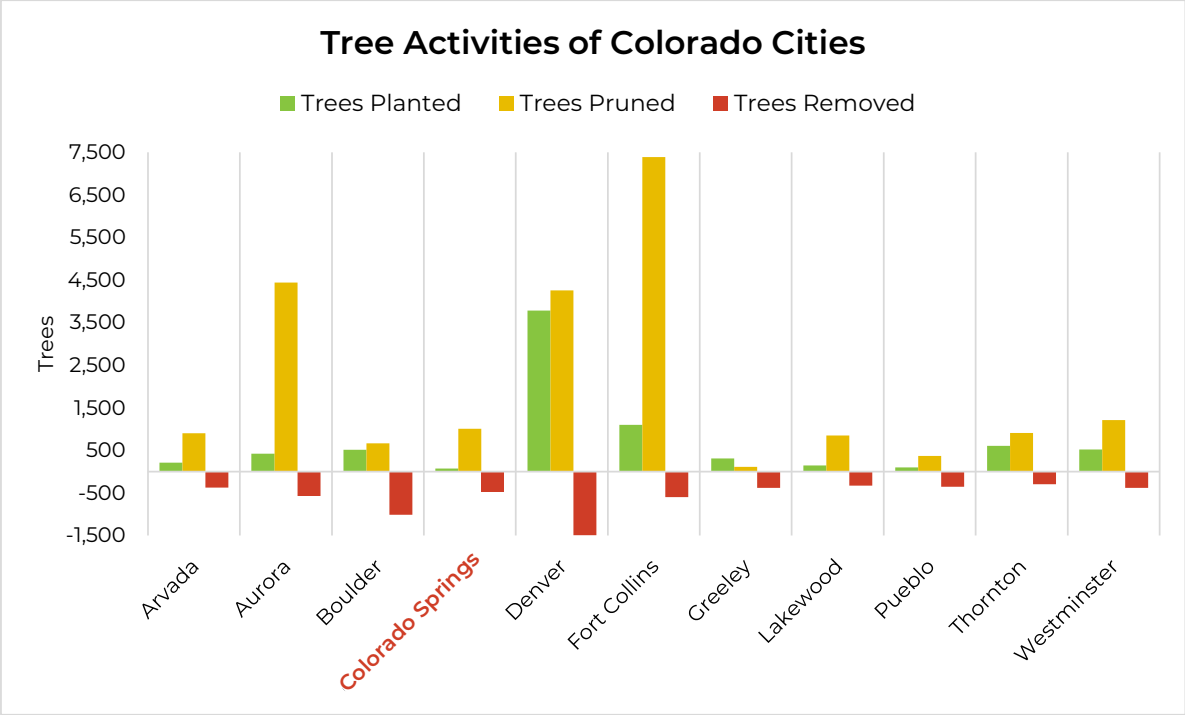


Figure 13. Comparison of tree planting, pruning, and removal counts for Colorado cities based on 2019 TCUSA data.

The City's tree planting and maintenance program is performing significantly less activities compared to other communities within the Western Region and those with a similar human population. Though trees are being planted as a requirement during new development, the City's Forestry program plants a fraction of the amount of trees compared to other communities. Tree maintenance in public areas is the responsibility of City Forestry but with a reduced arborist crew since 2009, performs relative (reactive) management of trees currently by responding to service requests, high risks, and storm damage. The charts on the previous page demonstrate the City's inadequate resources to manage and grow the public tree population.

REGIONAL, NATIONWIDE AND STATEWIDE URBAN FORESTRY BUDGET BENCHMARKS

First, using data from the 2014 Urban and Community Forestry Census (Hauer and Peterson), Colorado Springs' 2020 urban forestry budget (provided by the City) was compared with communities with a similarly-sized population and with communities in the Western Region. Then, 2019 TCUSA data provided by the Arbor Day Foundation was used to compare Colorado Springs with other Colorado cities with a population greater than 100,000 in terms of their total urban forestry expenditures and urban forestry budgets by section.

Table 5. | Comparison of Colorado Springs' 2020 urban forestry budget with other U.S. cities' 2014 UCFC data.

Category	Colorado Springs	Average Across U.S.	Western Region	Population 250k - 500k	Population 500k-1M
Funding					
Total municipal budget, excluding schools	$331,053,989	$200,316,126	$205,786,179	$780,007,436	$1,546,248,452
Average annual tree care and program budget	$2,166,801*	$801,595	$675,314	$3,074,165	$2,221,708
Average budget per public tree	$5.77	$37.50	$33.72	$24.58	$68.14
Average budget per street tree	$6.23	$42.59	$38.77	$29.91	$24.23
Average annual budget per capita	$3.54	$8.76	$7.75	$9.76	$3.32
Tree program percent of total municipal budget	0.47%	0.52%	0.40%	0.44%	0.15%

**Note: the 2020 budget specifically for tree maintenance is $1,558,037; the additional budget for the Division is for ROW mowing.*

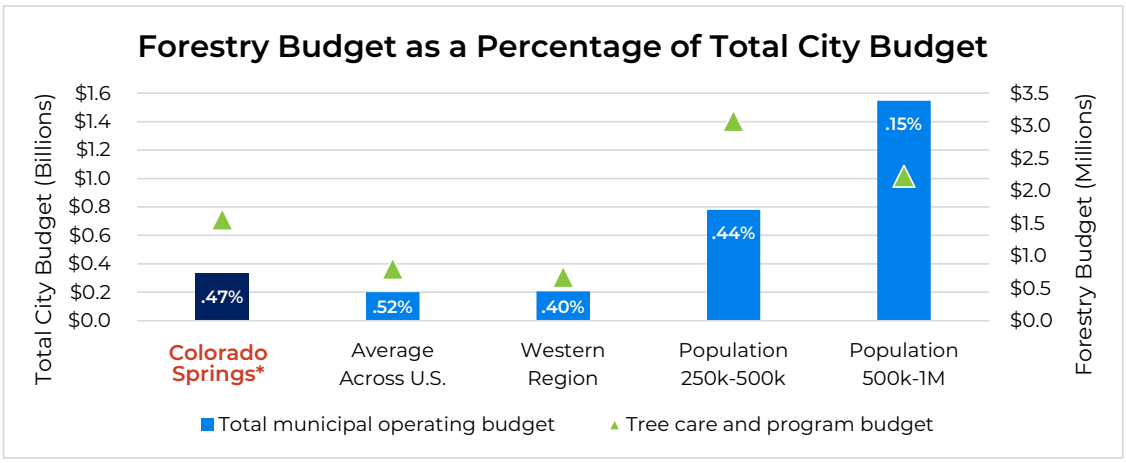


Figure 14. Comparison of Forestry Division funding and municipal budgets for Colorado Springs and similar US cities.

Colorado Springs has a total municipal operating budget of approximately $331 million in 2020, of which approximately $1.6 million is dedicated to tree maintenance. Although these figures are greater than the national and Western Region averages, they are significantly smaller than the averages for communities of a similar size. In fact, Colorado Springs' total municipal operating budget in 2020 was 136% less than the average operating budgets of all U.S. cities sized 250-500k, and 367% less than cities sized 500k-1M, in 2014.

When comparing forestry budgets in particular, the disparity between Colorado Springs and similarly-sized cities was less extreme, though still present: Colorado Springs' Forestry budget of approximately $1.6 million in 2020 was 43% smaller than cities sized 500k-1M and nearly half the size of other cities sized 250-500k. For this reason, the percentage of Colorado Springs' Forestry budget as a proportion of its total municipal operating budget appears relatively high (exceeding regional, and size-based averages at 0.47%), when in reality, the actual dollar amount budgeted for forestry activities in Colorado Springs is still dramatically lower than all comparable figures.

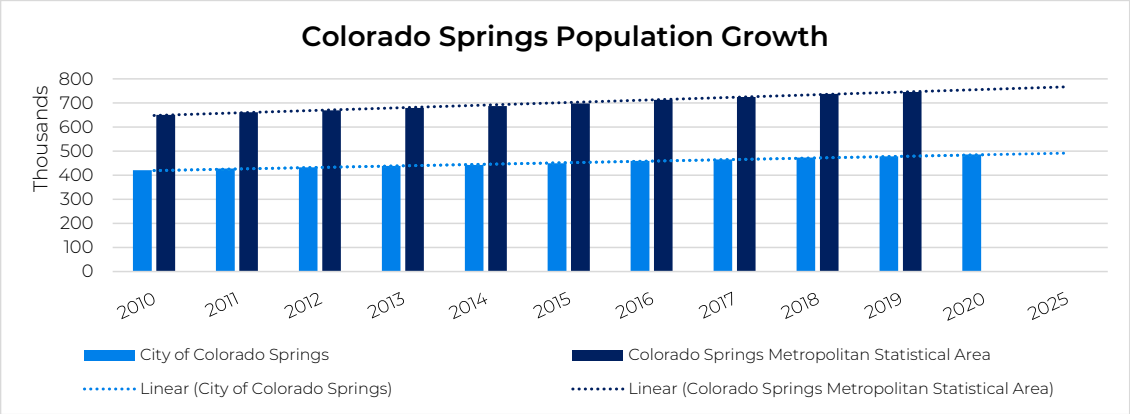


Figure 15. Population estimates for Colorado Springs, within City limits and the metropolitan statistical area.

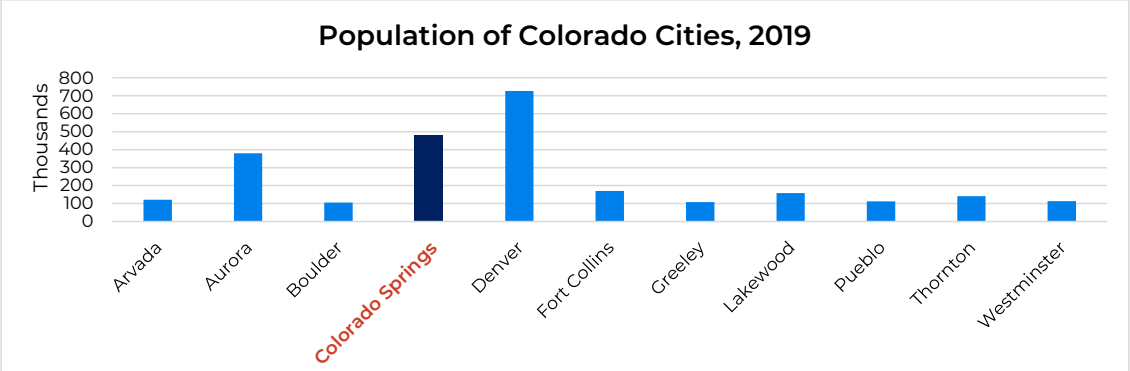


Figure 16. Population estimates for Colorado communities with a size greater than 100,000 residents.

Colorado Springs has experienced a steady growth rate over the last ten year period, adding 1-2% or an average of nearly 7,000 residents to its population each year. Currently, it is home to an estimated population of 485,946 within City limits and 745,791 in the broader Colorado Springs metropolitan statistical area (2020 U.S. Census estimates). When compared with other Colorado communities, Colorado Springs comes in second only to Denver in terms of its population. Furthermore, Colorado Springs is projected to exceed 500,000 residents within the next five years and to surpass Denver in population size by 2050 (University of Colorado at Colorado Springs Economic Forum, 2016).

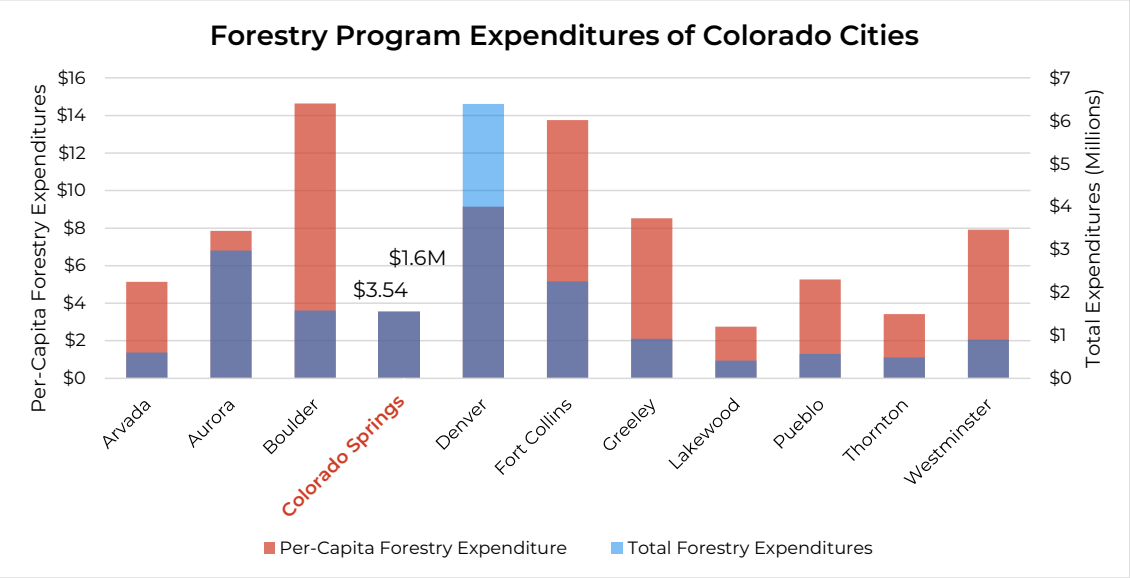


Figure 17. Benchmarking results of 2019 Forestry program expenditures and forestry expenditures per capita for Colorado communities with a size greater than 100,000 residents.

**Note: In Denver, total forestry expenditures proportionally exceed per-capita expenditures, which is why it appears a different color.*

When evaluated in total and by City resident, Colorado Springs' Forestry program budget was significantly lower than other Colorado communities, with a value per capita of $3.54 based on the City's 2020 budget and population estimate. Furthermore, it should be noted that Colorado Springs currently maintains sole maintenance responsibility for its street trees, whereas other communities such as Denver place that responsibility on the adjacent property owner.

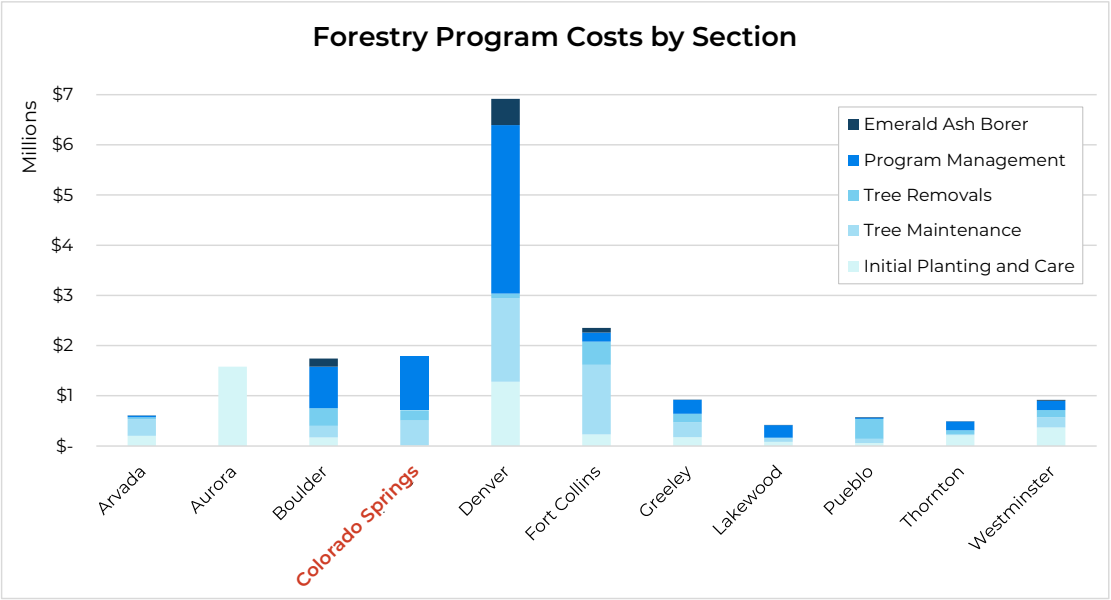


Figure 18. Urban forestry expenditures of Colorado cities by section.

When assessed by category, Colorado Springs' Forestry budget was smaller than other Colorado communities in nearly every field. The City's initial tree planting and care budget of $11,051 as reported to TCUSA in 2019 was the lowest of any community in the state. Colorado Springs' maintenance budget of $495,522 from the same TCUSA dataset was less than one-quarter that of Denver, which is the closest to Colorado Springs in population size, and one-third that of Fort Collins, which is much smaller in population. The greatest portion of Colorado Springs' forestry budget is management costs, which include staff salaries and community programs and education and comprises 59% of the City's total forestry expenditures. Fortunately, the City has not yet needed to invest any of its limited budget on EAB (Emerald Ash Borer, an invasive pest that is currently wiping out ash species in many Colorado cities) since it has not yet been identified within the City, but this cannot be counted on in the upcoming years.

COLORADO SPRINGS HISTORICAL TREE ACTIVITIES AND BUDGET BENCHMARKS

This assessment relied upon data provided by the City of Colorado Springs. Municipal operating budgets dating back to 2008 were analyzed to extract relevant forestry budget information, which was then analyzed over time.

Table 6. | Comparison of Colorado Springs' 2008-2020 urban forestry budgets based on the City's budget reports.

Year	City Population	Total Forestry Expenditures	Per Captita Expenditure	Total Trees (estimated)	Per Tree Expenditure
2008	407,902	$1,342,157	$3.29	125,000	$10.74
2009	414,658	$956,304	$2.31	129,000	$7.41
2010	420,685	$400,478	$0.95	129,000	$3.10
2011	427,434	$670,028	$1.57	141,333	$4.74
2012	432,782	$728,692	$1.68	153,667	$4.74
2013	438,146	$993,020	$2.27	166,000	$5.98
2014	442,361	$1,252,313	$2.83	178,333	$7.02
2015	449,572	$1,480,016	$3.29	190,667	$7.76
2016	458,714	$2,034,758	$4.44	203,000	$10.02
2017	465,167	$2,362,859	$5.08	215,333	$10.97
2018	472,567	$1,760,991	$3.73	227,667	$7.73
2019	478,221	$2,208,577	$4.62	240,000	$9.20
2020	485,946	$2,166,801	$4.46	270,000	$8.02

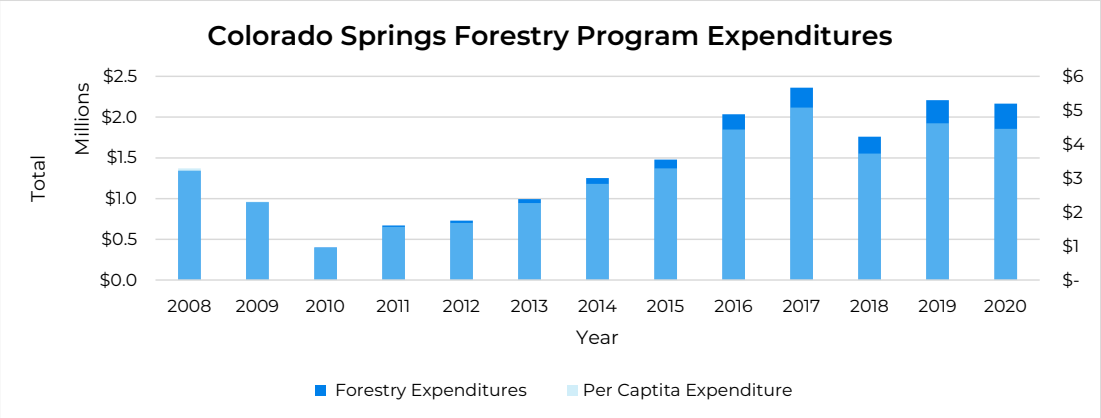


Figure 19. Forestry program expenditures in Colorado Springs since 2008, according to City budgets.

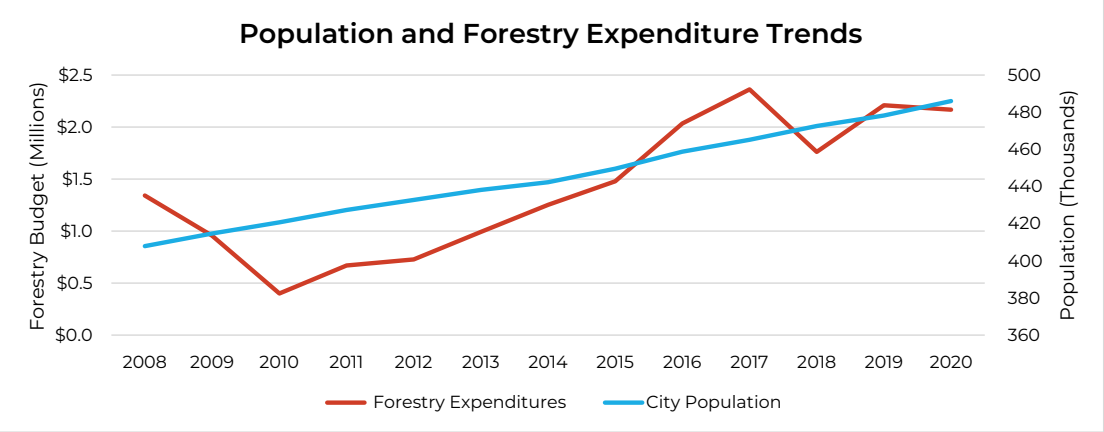


Figure 20. Forestry program expenditures in Colorado Springs since 2008, according to City budgets.

Although the City's populations of both humans and trees have been steadily growing every year, its Forestry expenditures have not been able to keep up. The Great Recession in 2009 took a heavy toll on the City's entire 2010 operational budget, and the City's trees have felt the effects ever since. That year, the Forestry budget was more than halved and several full-time positions were lost, and although City Forestry has been able to steadily grow its budget since then, as the previous benchmarking results with other U.S. and Colorado cities indicated, the total amounts are still much lower than other comparable communities, as well as the Division's need. This has also led to a decline in all tree-related activities (plantings, prunings, and removals) as illustrated in the chart below.

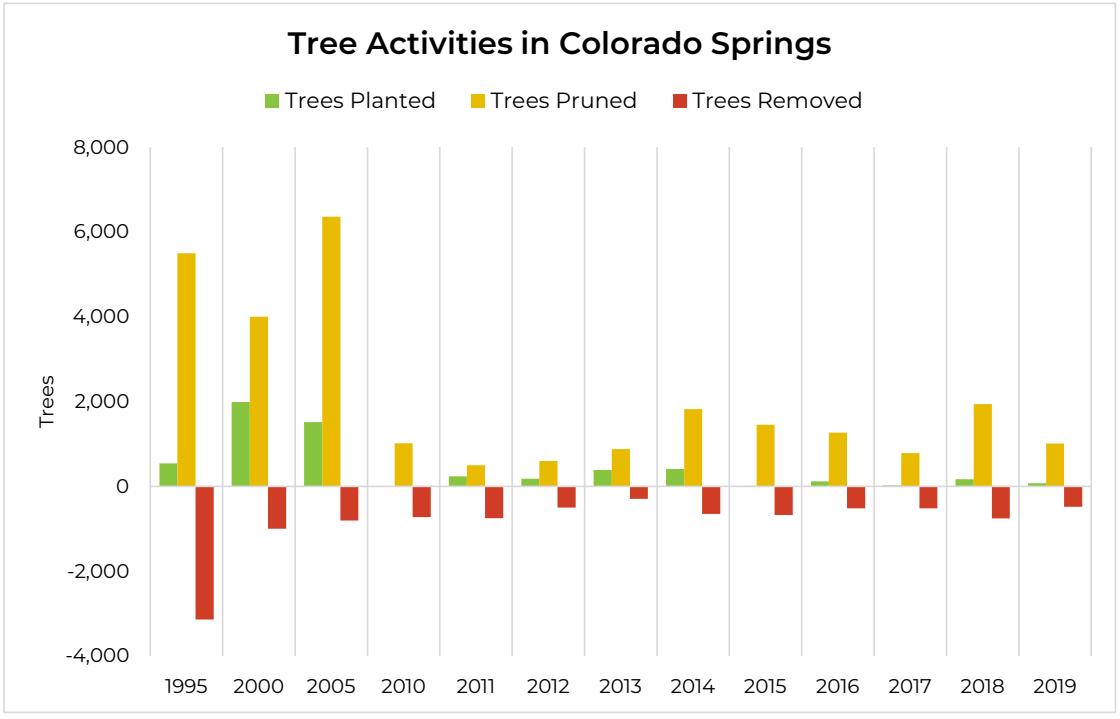


Figure 21. Comparison of tree planting, pruning, and removal counts for Colorado cities based on 2019 TCUSA data.

HIGH-LEVEL AND IN-DEPTH DATA ANALYSIS

Planning element 4, high-level and in-depth data analysis, compiled the City's existing urban tree canopy and sample inventory datasets. This element examines the extent and structure of the City's urban forest in order to make informed, science-based recommendations in the final UFMP.

Table 7. | Data sources analyzed for the Urban Forest Management Plan.

Source	Use in Urban Forest Management Plan
2018 Urban Tree Canopy Assessment	A complete geospatial assessment of Colorado Springs' urban tree canopy, analyzed by multiple geographies at 3 time periods
2018 & 2020 Public Surveys	Public opinion surveys that went into the creation of the canopy assessment and management plan
2018 Sample Street Tree Inventory	Updated inventories of two focus areas, the Old North End and Southeast Colorado Springs neighborhoods
2015 Park Tree Inventory	An inventory of park trees completed by the City in 2015
2014 Village 7 Inventory Tree Inventory	An inventory of trees in the Village 7 neighborhood completed by the City in 2014
2005 Street Tree Inventory (Retired)	The most complete street tree inventory, though still only a small sample of trees, which was performed in-house and last updated in 2005
2003 Balance Circle Inventory	Inventory summary results of one residential street completed by the City in 2019, featuring a neighborhood developed in 2003

URBAN TREE CANOPY ASSESSMENT

In 2018, Colorado Springs' Citywide urban tree canopy (UTC) was assessed for a better understanding of the extent of trees and available planting space, not just within City-maintained areas, but in all land uses. Using 2018 high resolution aerial imagery from the USDA's National Aerial Imagery Program (NAIP) for Colorado, remote sensing and GIS techniques were used to map and measure land cover types across several geographic scales. The intent of this assessment was to analyze canopy and other land cover metrics in developing an Urban Forest Management Plan for the City of Colorado Springs.

An initial land cover dataset was created prior to mapping tree canopy. This land cover dataset is the most fundamental component of an urban tree canopy assessment. A remote sensing process used the NAIP imagery to derive five initial land cover classes. These classes are shown below. The tree canopy land cover class was also separated into two subcategories, trees over 10' and shrub/scrub (such as Gambel oak). Of the 21,331 total acres identified as tree canopy, 18,932 acres were trees (89%) and 2,400 acres were shrub/scrub (11%).

Figure 22. Land cover classes identified in the 2018 Colorado Springs, CO urban tree canopy assessment.

Table 8. | Land cover classes for the City of Colorado Springs, 2018.

Colorado Springs Land Cover	Total Area	Tree Canopy	Non-Canopy Vegetation	Impervious Surfaces	Soil and Dry Vegetation	Water
Acres	124,949	21,331	37,445	39,896	25,690	587
% of Total	100%	17%	30%	32%	21%	<1%

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

2018 Tree Canopy Assessment Results by Neighborhood:

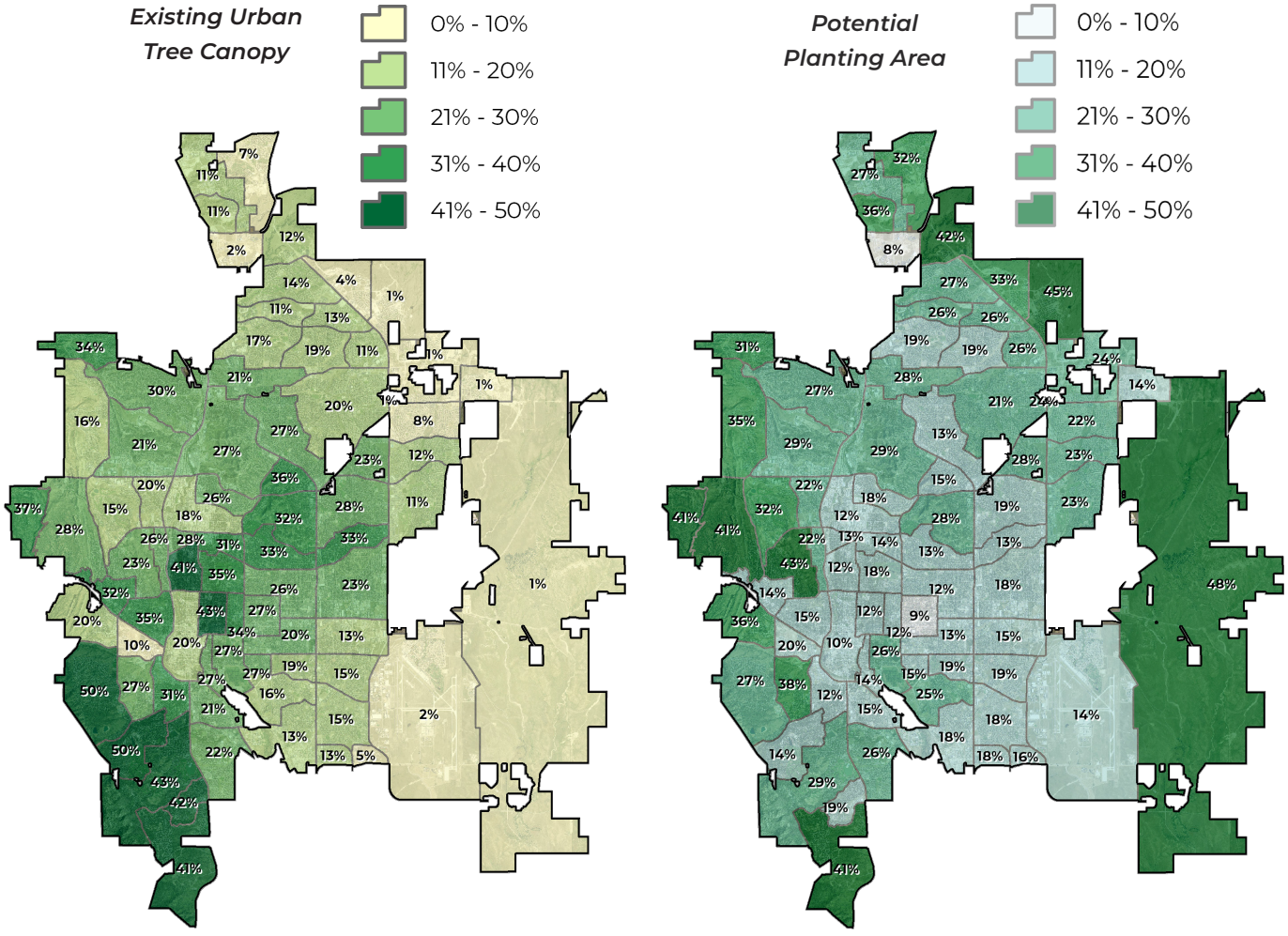


Figure 23. Existing urban tree canopy (left) and urban tree canopy potential for the City of Colorado Springs (right).

TREE CANOPY CHANGE ANALYSIS

Since this assessment was the first time the City had formally assessed its Citywide tree canopy, a change analysis of several historical time periods was also performed. Random points were created within the City boundary and identified as either a "tree" or "not a tree." This process was repeated until a standard error of 1% was achieved. Contrary to what was expected, the change analysis determined that Colorado Springs has been steadily increasing its canopy over the last three decades, as new trees are planted alongside new building developments (shown in the images below, which are screen captures of the same location in each of the three imagery sources used).

Table 9. | Tree canopy change since 1999.

	UTC 1999	UTC 2009	UTC 2015	Change (1999-2009)	Change (2009-2015)	Change (1999-2015)
Citywide	14%	16%	17%	2%	1%	3%
Old North End	18%	21%	25%	3%	4%	8%

Figure 24. An example of the same location in Colorado Springs, displayed in each of the three imagery sources used. Screen captures from the 2019 Colorado Springs Urban Tree Canopy Assessment.

For the complete results of the canopy assessment and change analysis, including existing and potential tree canopy by census blocks, census block groups, land use, and watershed, refer to the Colorado Springs Tree Canopy Assessment report.

INVENTORIES

Urban forest inventories describe the tree population in Colorado Springs in terms of its species composition, number of trees, age classes, and tree distribution. Whereas the urban tree canopy assessment provided a high-level picture of the City's total canopy distribution, tree inventories offer an on-the-ground look at the trees themselves. Although the City has not had a complete street tree inventory performed since 2005, several sub-boundaries have been assessed more recently, including the City's parks and the Old North End, southeast, and Village 7 neighborhoods.

Summaries are presented for the available attributes of each respective inventory. These summaries assist tree managers in proper tree management, planting, budget planning, and resource allocation to ensure long-lasting canopy and benefits distributed equally throughout the City of Colorado Springs.

Table 10. | Inventories performed in Colorado Springs.

Tree Inventories	Year	# of Sites	%
Old North End	2018	3,300	2%
Southeast	2018	1,740	1%
Village 7	2014	963	1%
Park Trees	2013	11,017	8%
Street Trees	2005	120,743	88%
Grand Total		**137,763**	**100%**

TREE DIVERSITY AND COMPOSITION

Tree species composition data are essential since the types of trees present in neighborhoods and commercial centers greatly affect the tree maintenance activities, required budgets, and amount of benefits provided.

2018 Sample Neighborhood Inventories

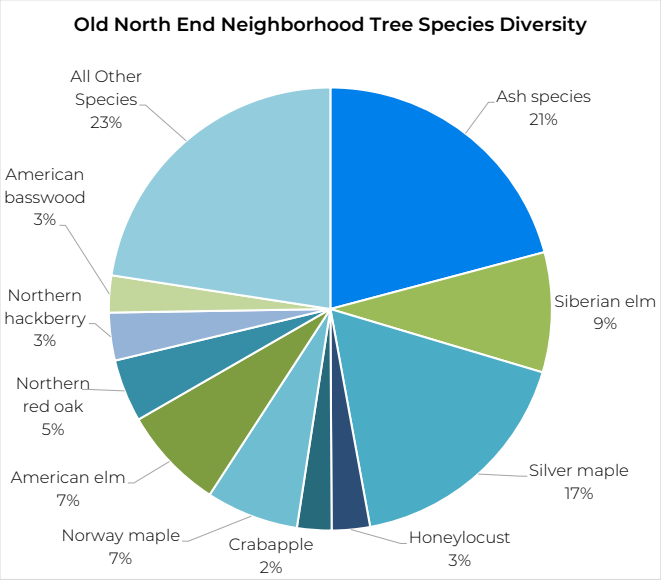


Figure 25. Species composition in the Old North End neighborhood (2018).

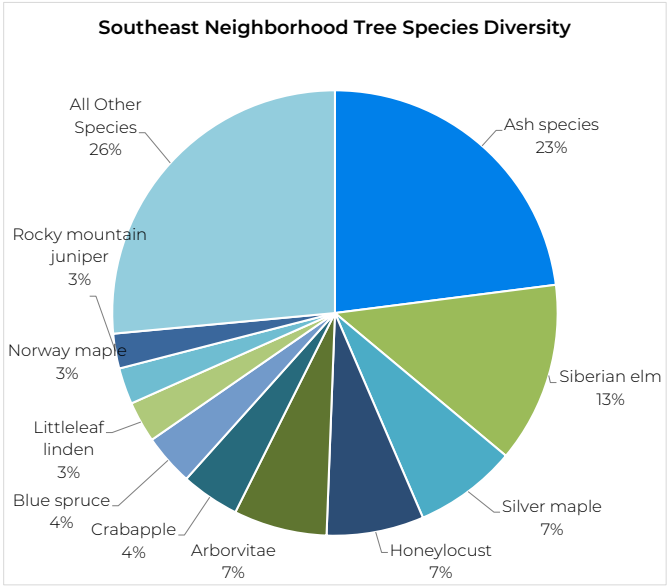


Figure 26. Species composition in the Southeast neighborhood (2018).

Table 11. | Species composition in the Old North End neighborhood (2018).

2018 Old North End Tree Species Diversity	# of Trees	% of Top 10	% of All Species
Ash species	639	25%	19%
Silver maple	578	23%	18%
Siberian elm	289	12%	9%
American elm	248	10%	8%
Norway maple	223	9%	7%
Northern red oak	151	6%	5%
Northern hackberry	115	5%	3%
Honeylocust	92	4%	3%
American basswood	89	4%	3%
Crabapple	83	3%	3%
All Other Species	**793**	--	**24%**
Total	**3,300**	**76%**	**100%**

Table 12. | Species composition in the Southeast neighborhood (2018).

2018 Southeast Tree Species Diversity	# of Trees	% of Top 10	% of All Species
Ash species	390	31%	22%
Siberian elm	228	18%	13%
Silver maple	130	10%	7%
Honeylocust	123	10%	7%
Arborvitae	118	9%	7%
Crabapple	74	6%	4%
Blue spruce	65	5%	4%
Littleleaf linden	52	4%	3%
Norway maple	46	4%	3%
Rocky mountain juniper	44	3%	3%
All Other Species	**470**	--	**27%**
Total	**1,740**	**73%**	**100%**

The inventory results indicated that these two neighborhoods do not have a diverse urban forest species composition. Five species composed 55% of all trees inventoried in the sample neighborhoods: green ash, silver maple, Siberian elm, Norway maple, and American elm. These numbers are concerning given these species' susceptibility to branch failure and mortality from pests and diseases.. For example, the emerald ash borer (EAB) has recently been confirmed in several cities in the Colorado Front Range including Longmont, Lafayette, Lyons, and Boulder (USFS 2018). For a more in-depth discussion of the 2018 neighborhood sample inventories, refer to the 2019 Colorado Springs Tree Canopy Assessment report (pages 36-37).

2013 Park Tree and 2014 Neighborhood Sample Inventories

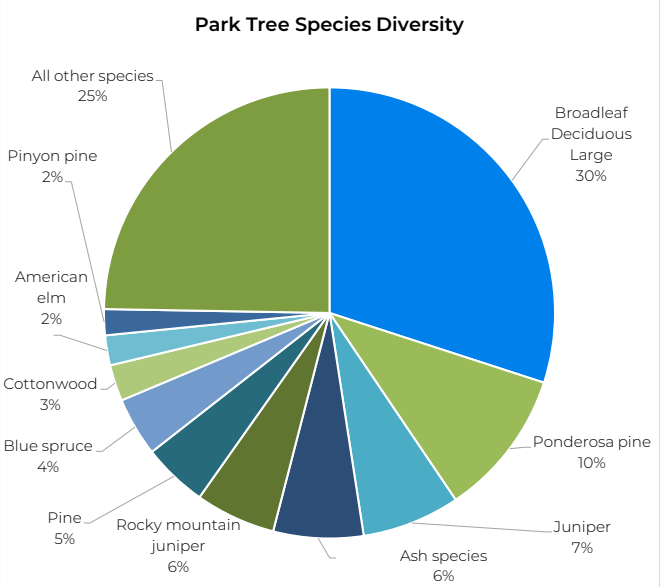


Figure 27. Species compositionof park trees (2013).

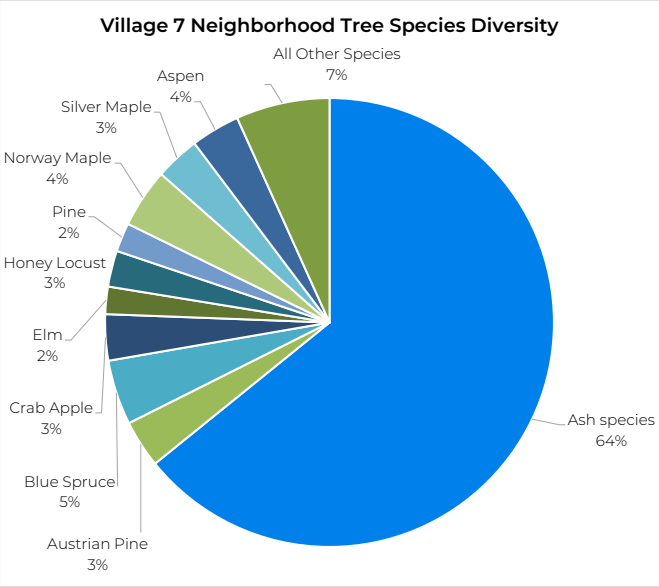


Figure 28. Species composition in Village 7 (2014).

Table 13. | Species compositionof park trees (2013).

2013 Park Trees	# of Trees	% of Top 10	% of All Species
Broadleaf Deciduous Large	5,816	40%	30%
Ponderosa pine	2,044	14%	11%
Juniper	1,362	9%	7%
Ash species	1,251	9%	6%
Rocky mountain juniper	1,116	8%	5%
Pine	903	6%	4%
Blue spruce	820	6%	4%
Cottonwood	504	3%	3%
American elm	416	3%	2%
Pinyon pine	361	2%	2%
All other species	**4793**	**--**	**25%**
Total	**19,386**	**75%**	**100%**

Table 14. | Species composition in Village 7 (2014).

2014 Village 7	# of Trees	% of Top 10	% of All Species
Ash species	618	69%	64%
Blue spruce	45	5%	5%
Norway maple	41	5%	4%
Aspen	34	4%	4%
Austrian pine	33	4%	3%
Crabapple	32	4%	3%
Silver maple	31	3%	3%
Honeylocust	25	3%	3%
Pine species	20	2%	2%
Elm species	19	2%	2%
All Other Species	**65**	**--**	**7%**
Total	**963**	**93%**	**100%**

Colorado Springs' park system has a relatively diverse urban forest compared with the other inventoried parts of the City. The only species exceeding 10% of the total park tree population is ponderosa pine, a sturdy and regionally-appropriate conifer, and many of the other most prevalent species are also conifers which provide year-round canopy. On the other hand, the Village 7 neighborhood, which was established in the early 2000's and inventoried in 2014, contains more than 60% ash trees, which are problematic in the region due to their susceptibility to emerald ash borer (EAB), a pest for which the City has not yet had capacity to develop a preventative approach.

2005 Street Tree Sample Inventory

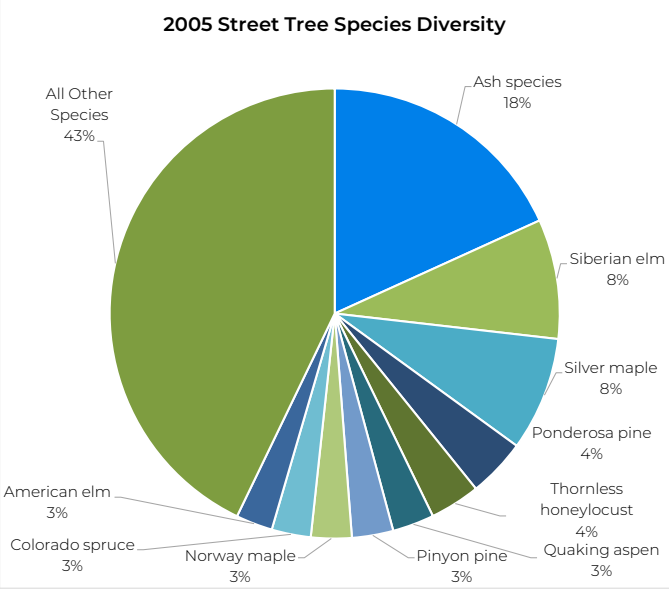


Figure 29. Species composition of street trees (2005).

Table 15. | Species composition of street trees (2005).

2005 Street Tree Species Diversity	# of Trees	% of Top 10	% of All Species
Ash species	14,533	32%	11%
Siberian elm	6,860	15%	9%
Silver maple	6,538	14%	8%
Ponderosa pine	3,348	7%	5%
Thornless honeylocust	2,885	6%	4%
Quaking aspen	2,388	5%	4%
Pinyon pine	2,370	5%	3%
Norway maple	2,332	5%	3%
Colorado spruce	2,245	5%	3%
American elm	2,101	5%	3%
All Other Species	**34,190**	**--**	**43%**
Total	**79,790**	**57%**	**100%**

SIZE AND AGE DISTRIBUTION

The distribution of tree ages influences the structure of the urban forest as well as the present and future costs. An uneven-aged urban forest offers continued flow of ecological benefits and a more uniform workflow allowing managers to more accurately allocate annual maintenance schedules and budgets. To optimize the value and benefits of the trees across the City, the urban forest in Colorado Springs should have a high percentage of large canopy trees which provide greater ecosystem benefits. On the other hand, there must be a suitable number of younger, smaller trees in the urban forest to account for the loss of large and mature trees in decline. Having a healthy percentage of young trees in the urban forest will ensure a sustainable tree population as well as age distribution in future years.

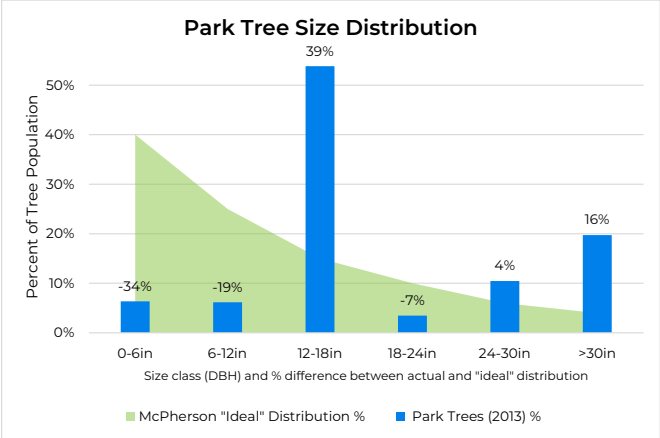


Figure 30. Size distribution of park trees in 2013.

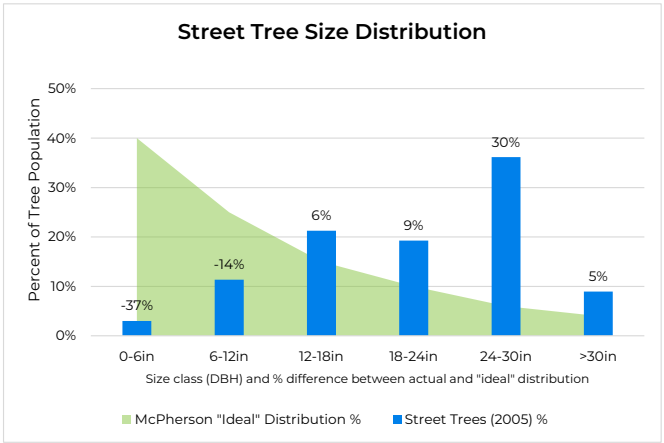


Figure 31. Size distribution of street trees in 2005.

When size was assessed in Colorado Springs' parks in 2013 and street trees in 2005, neither population aligned closely with the industry standard. As described in McPherson et. al, 2011, an "ideal" distribution of size/age structure would contain the greatest number of trees in the smallest size class to replace trees in larger size classes that are lost due to mortality or removal. However, the park tree population had its greatest proportion of trees in the 12-18" size class (young), which can lead to costly pruning needs as the trees grow larger. For street trees, most were in the 24-30" size class (mature), which could require removal as they decline. Neither parks nor street trees had a single size class in the ideal range.

2018 Neighborhood Inventories Size Distribution

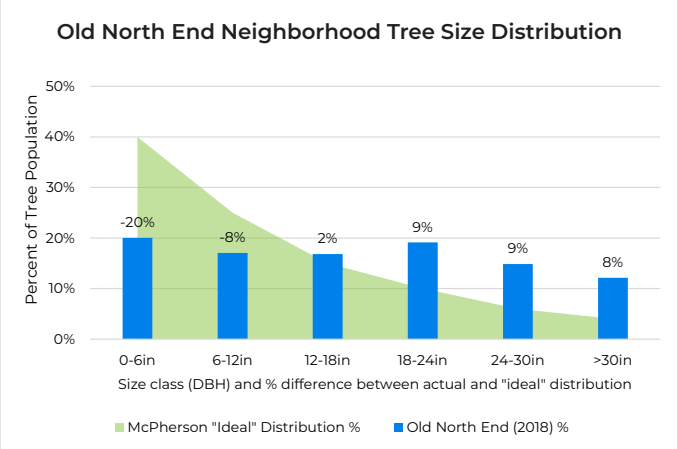


Figure 32. Old North End neighborhood tree sizes (2018).

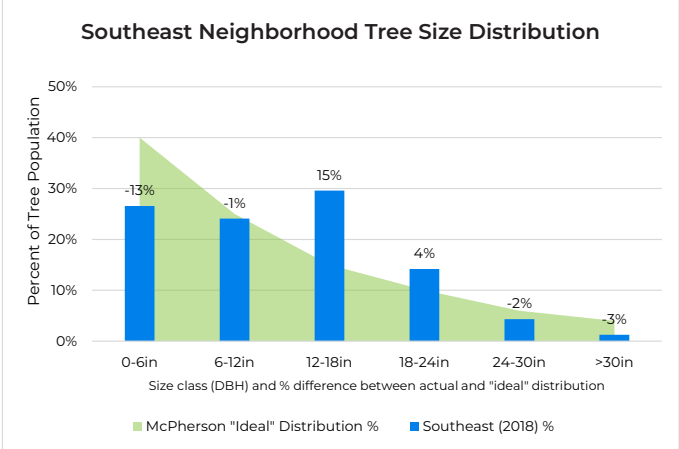


Figure 33. Southeast neighborhood tree sizes (2018).

In the two residential neighborhoods where street trees were inventoried in 2018, size classes more closely reflected the "ideal" distribution. The table below includes the percent of trees within each size class in an ideal distribution and the actual distribution in each of the four inventories mentioned.

Table 16. | Size distributions of Colorado Springs tree inventories, compared to the McPherson "Ideal Distribution" (McPherson, Soares et al 2011). Size ranges are listed in DBH (the tree's "diameter at breast height" or at ~4.5 ft).

DBH Range (inches)	"Ideal"	Street Trees (2005)		Park Trees (2013)		Old North End (2018)		Southeast (2018)	
	%	Trees	%	Trees	%	Trees	%	Trees	%
0-6in	40%	1,003	3%	1,232	6%	661	20%	462	27%
6-12in	25%	3,792	11%	1,195	6%	563	17%	419	24%
12-18in	15%	7,107	21%	10,434	54%	555	17%	515	30%
18-24in	10%	6,436	19%	675	3%	631	19%	247	14%
24-30in	6%	12,074	36%	2,025	10%	490	15%	75	4%
>30in	4%	2,989	9%	3,825	20%	400	12%	22	1%
Total	**100%**	**33,401**	**100%**	**19,386**	**100%**	**3,300**	**100%**	**1,740**	**100%**

URBAN FOREST CONDITION

Tree characteristics and outside forces affect the management needs for urban trees. An analysis of the condition and maintenance requirements assists managers in planning the Colorado Springs urban forest. Tree condition indicates how well trees are managed and how well they perform given site-specific conditions. Tree maintenance needs are assigned for public safety reasons and for the health and longevity of the trees. Understanding the maintenance needs assists tree managers in establishing daily work plans and maintaining public safety. The inventory data were analyzed to identify potential trends in tree condition and management needs. Information on the condition of trees plays an important role in the City's planning, budgeting, and use of resources. Each inventoried tree's health was evaluated by International Society of Arboriculture (ISA) Certified Arborists based on the condition of the wood and the foliage.

OBSERVATIONS

Tree observations were recorded during the 2018 inventories to further describe a tree's health, structure, or location when more detail was needed. Note that trees may have more than one observation (or none). These observations can be used in combination with the condition and maintenance data to assist in the management of Colorado Springs' urban forest.

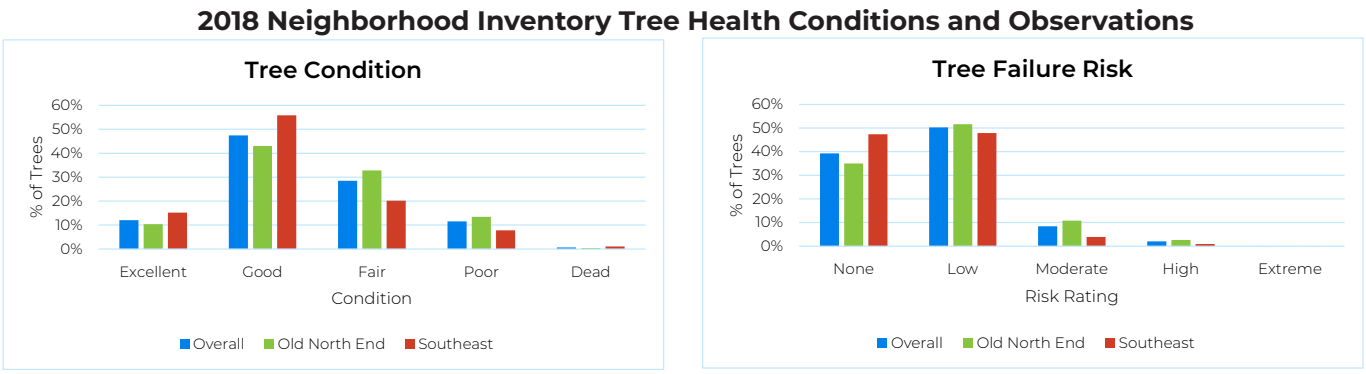


Figure 34. Condition of 2018 sample inventory trees.

Figure 35. Failure risk of 2018 sample inventory trees.

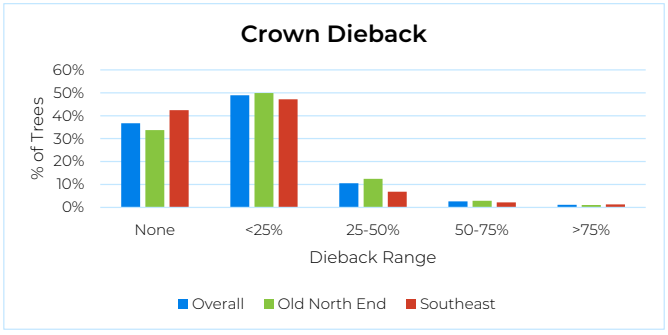


Figure 36. Crown dieback of 2018 sample inventory trees.

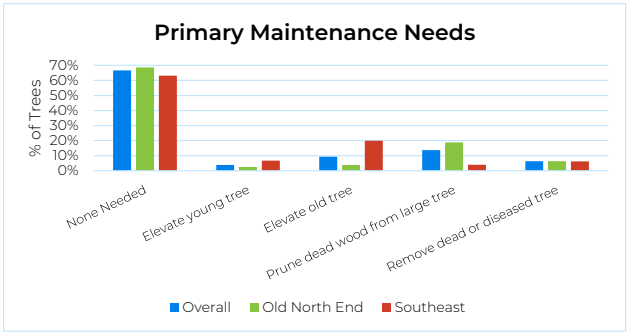


Figure 37. Maintenance needs of 2018 sample inventory trees.

MAINTENANCE NEEDS

Results of the 2018 neighborhood inventories indicated that most trees were in "good" condition or better, most had a failure risk of "low" or "none," and most did not have a primary maintenance need, although most had some (up to 25%) crown dieback. Crown cleaning and pruning (both clearance and structural) were the most common tree work needs. The most common observations noted were cavity decay, crown dieback, and poor structure, which could have resulted from multiple causes and possibly have been prevented with more a proactive maintenance schedule. The majority of these citizen service requests come from Colorado Springs' downtown core, where residents have the a greater awareness of City Forestry's services. It is also important to note this assessment is only one snapshot in time. Several storms or disturbance events have since occurred and the City has been actively managing tree risks with the resources they have available, so actual counts may differ.

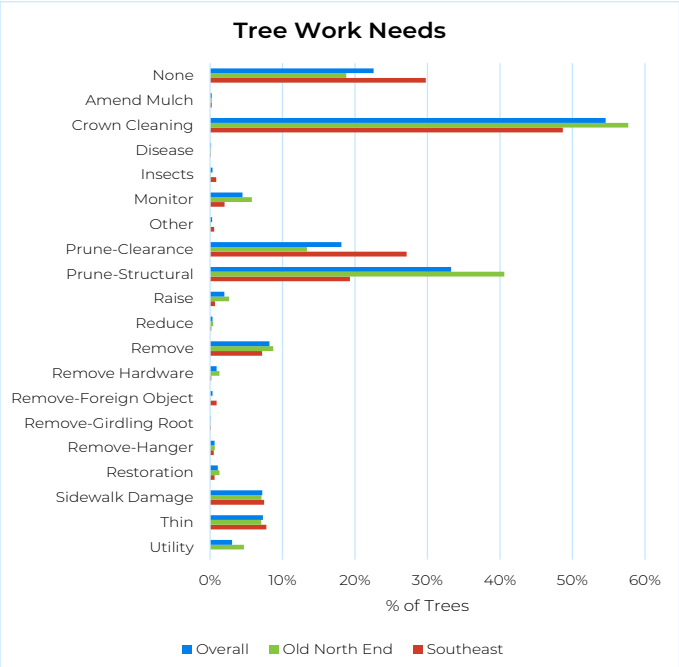


Figure 38. Tree work needs of 2018 sample inventory trees.

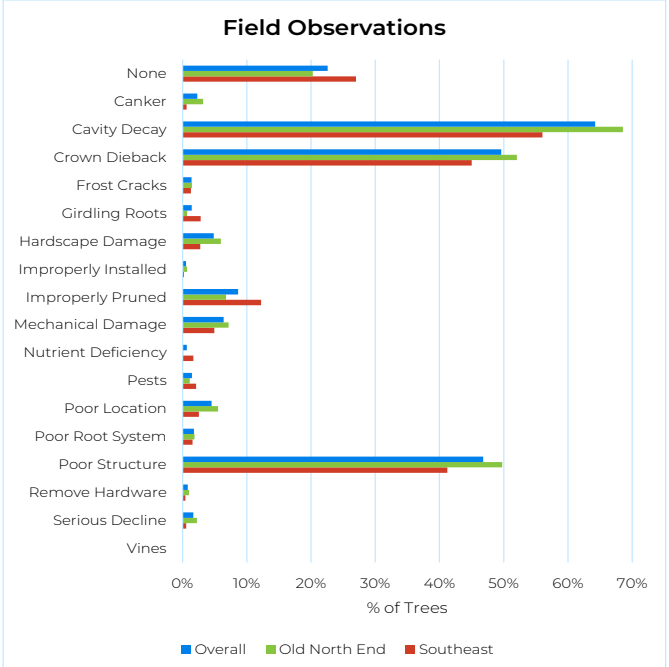
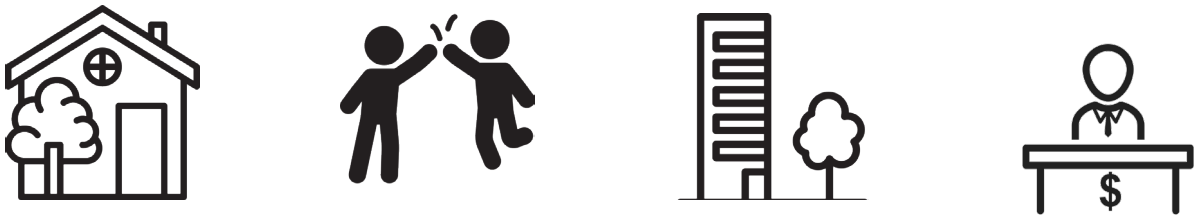


Figure 39. Observations of 2018 sample inventory trees.

INTERESTS AND INPUT FROM THE COMMUNITY



The purpose of Planning Element 5, Community Interests and Input, was to engage the citizens of Colorado Springs in planning the future of their City's urban forest. Much like the City Staff Interviews element, this planning element exists to gauge perceptions of the City's existing operations and assess its level of readiness for new programs.

2020 PUBLIC SURVEY

A survey was drafted and shared online via the City's communications channels and over 400 City residents responded. Following the web survey, a public meeting was conducted (also conducted online due to the COVID-19 Pandemic) to share the UFMP process, framework, and next steps. Their feedback was incorporated into the four planning scenarios in the UFMP, which were based on different levels of service the City could provide. One of the scenarios included relinquishment of street tree maintenance responsibilities to residents, so the feedback of residents on this matter was of particular importance.

Do you think the overall health and quality of Colorado Springs' public trees has improved, declined or stayed the same in the last 10 years?

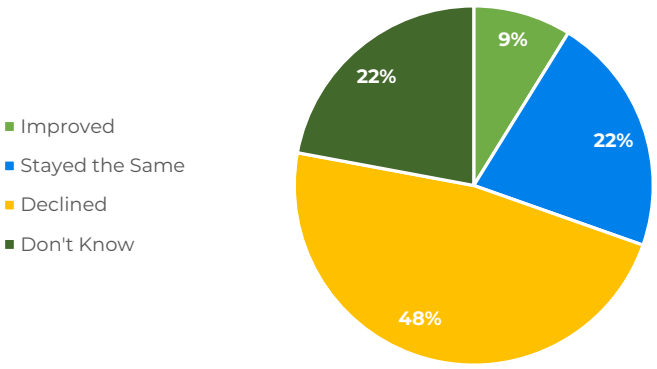


Figure 40. Answers to the 2020 public survey, question 1.

How would you rate the overall care and management of Colorado Springs' public street and park trees?

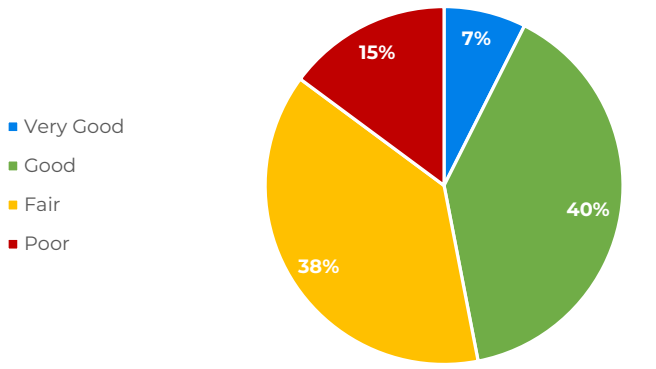


Figure 41. Answers to the 2020 public survey, question 2.

When asked about the current health of the City's urban forest, most residents (85%) agreed that it was in Fair condition or better, with nearly half (47%) stating it was Good or Very Good. However, when asked if it had improved or declined over the past decade, most (48%) said that it had declined while 22% thought it remained the same and only 9% thought it had improved. This indicates that, of the ~400 respondents, most residents do have an awareness of the issues facing the urban forest and has been witnessing its health decline.

Table 17. | Answers to the 2020 public survey, question 3.

Please rate your level of agreement with each of the following statements	Agree Strongly	Agree Somewhat	Neither Agree Nor Disagree	Disagree Somewhat	Disagree Strongly
Large public street trees properly planted and cared for improve the appearance of a community	92%	6%	1%	1%	1%
Public street trees are important for maintaining a healthy community environment	89%	7%	2%	1%	1%
Trees properly planted and maintained in business districts help to attract customers to the area	78%	15%	5%	1%	1%
Public street trees properly planted and cared for enhance the overall quality of life in a community	92%	6%	1%	1%	1%

When asked about the benefits of the urban forest, most residents strongly agreed that trees are beneficial to a community's appearance (92%), environment (89%), economy (78%), and overall quality of life (92%).

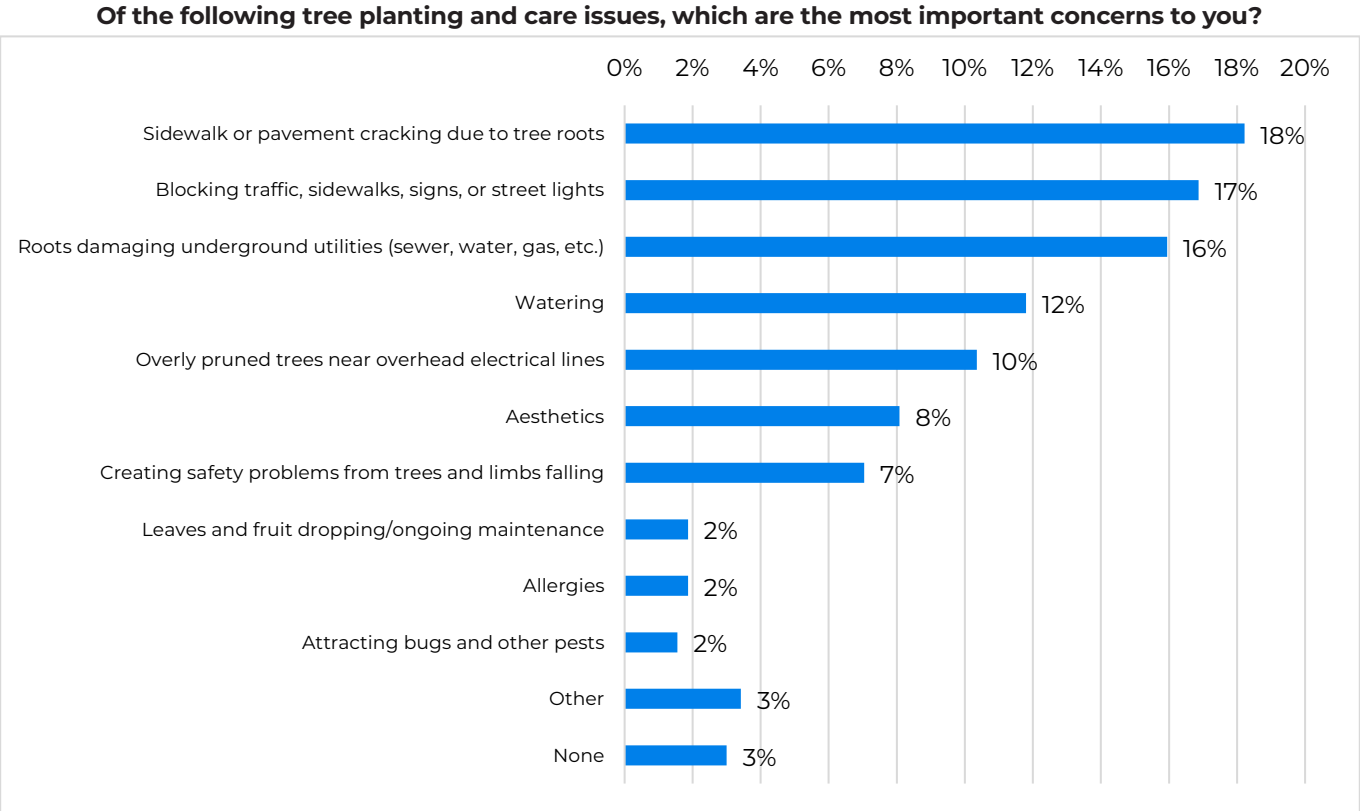


Figure 42. Answers to the 2020 public survey, question 4.

When asked about the downsides of the urban forest, the most commonly listed issue was sidewalk or pavement cracking due to tree roots (18%), followed by branches blocking traffic lights or signs (17%) and roots damaging underground utilities (16%). Some of the top issues, such as blocking signage, watering, and limbs falling could be addressed with a more frequent pruning and maintenance system.

The survey also asked residents about their own trees (if applicable) and sociodemographic information. The complete responses to these questions can be found in the **Appendix**. A few other highlights from the survey included:

- Most respondents noted that the **most urgent tree care issue** in their neighborhood was either **maintenance** of existing trees (36%) or **planting** new trees (35%).
- 40% of residents who have trees in the right-of-way **adjacent to their property** knew that the tree is **owned by the City,** but 32% were unsure of who owned the tree.
- When it comes to **pruning** and maintaining these right-of-way trees, 28% stated that they care for it **themselves**, 20% stated that **the City** performs such tasks, 25% were not applicable since they didn't have trees in the right-of-way.
- Most also agreed that **the City should increase its Forestry staffing** (78%) **and funding** (81%) to support a new or enhanced forestry program that handles the maintenance of street trees, as shown in the figures below..

Which statement most closely reflects your views on the City's Forestry staffing levels?

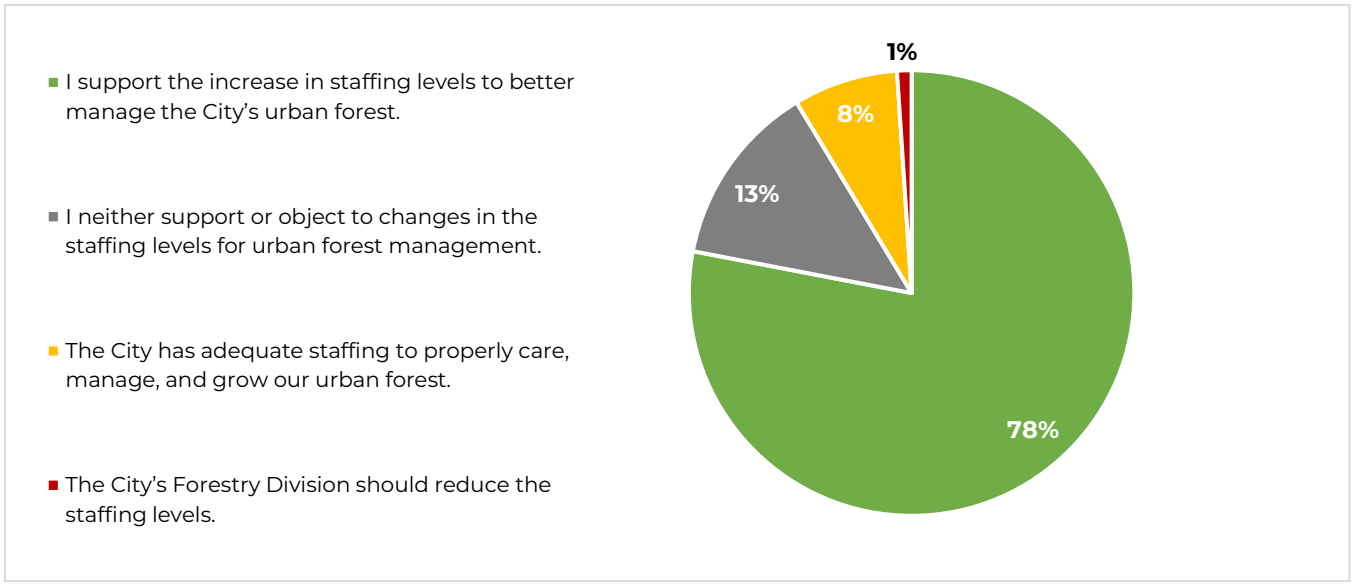


Figure 43. Answers to the 2020 public survey, question 9.

Which statement most closely reflects your views on the City's forestry funding levels?

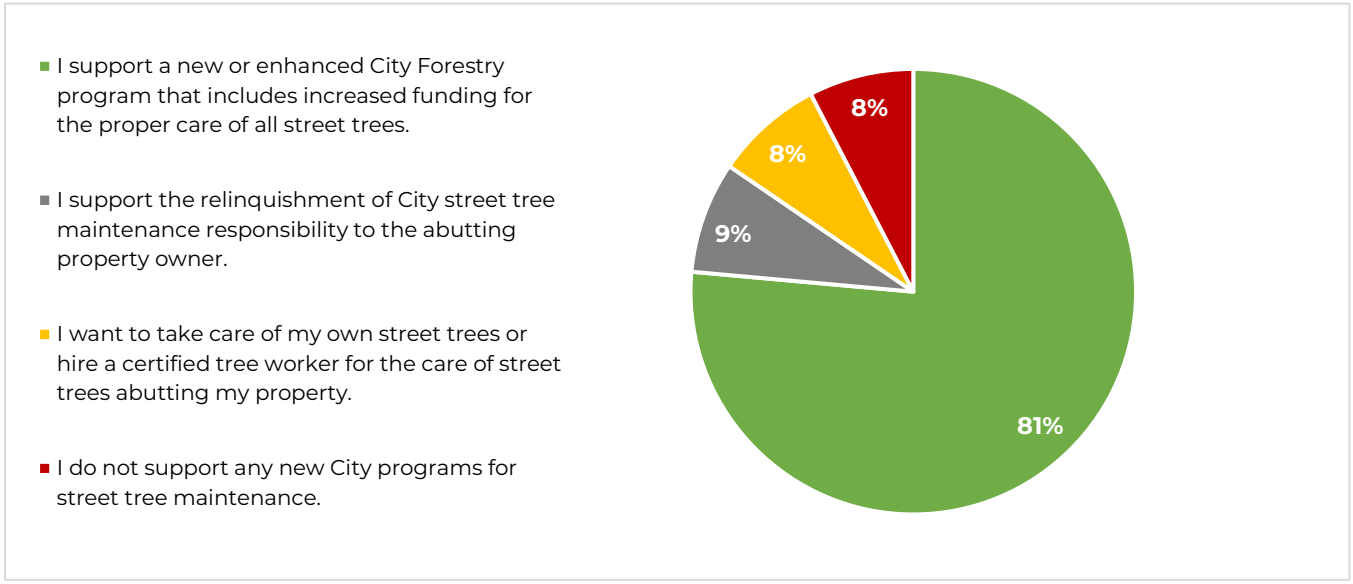


Figure 44. Answers to the 2020 public survey, question 10.

Additional comments

In addition to the listed responses for each question which are reported in the charts and graphs in this section, many questions also offered an “Other” or free response option. A total of 268 comments were received. Some common themes echoed throughout the various comments included the need for increased funding and staffing capacity, frustrations with the current maintenance schedule (or lack thereof), concerns about drought, selecting appropriate native and/or food bearing species, and preventing the spread of invasive sprouting or “volunteer” trees, All of the open-ended responses were compiled into a word cloud, below.

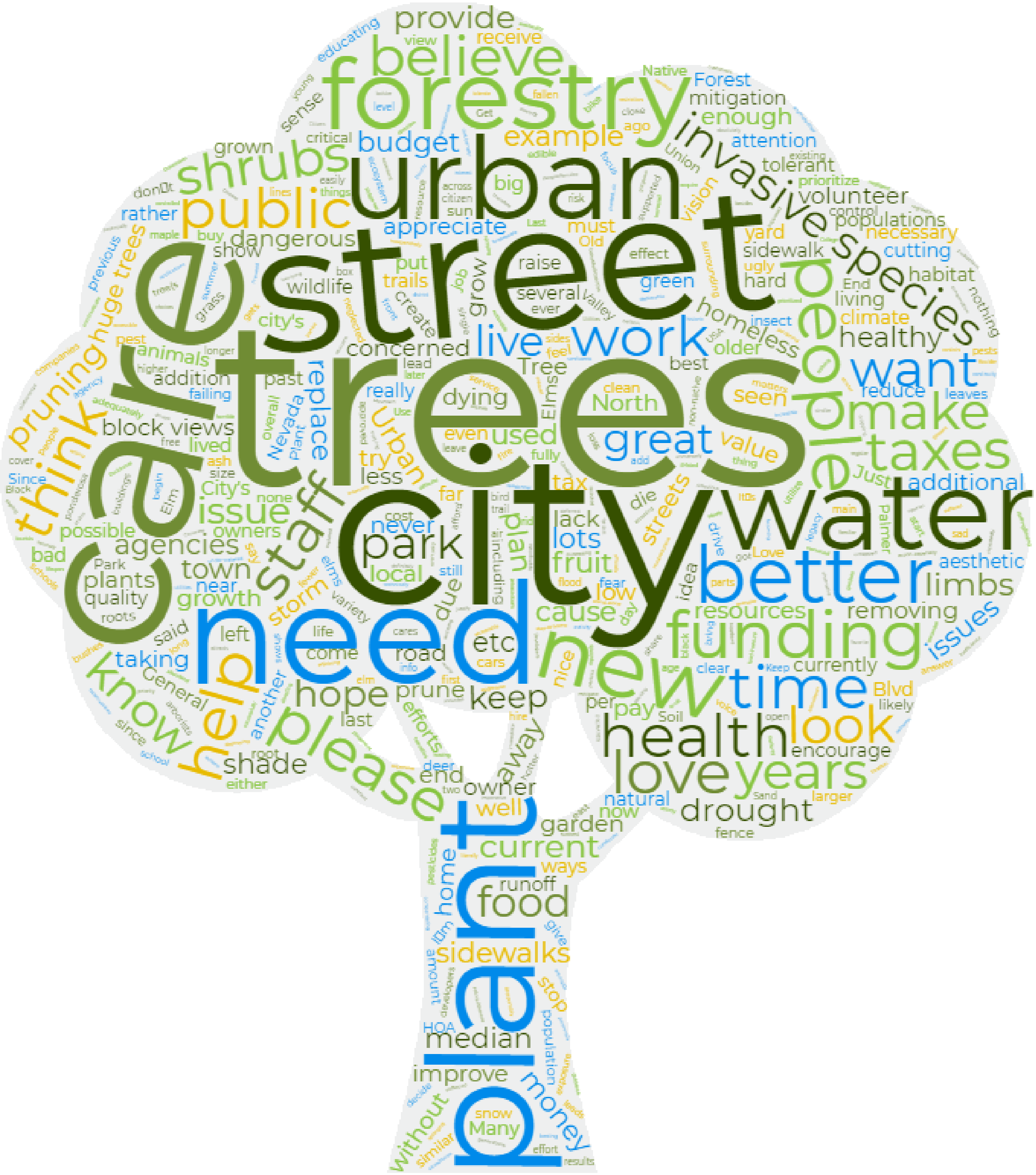


Figure 45. Word cloud composed of frequently used words in the 2020 public survey comments.

USDA FOREST SERVICE

URBAN FOREST AUDIT

USFS URBAN FOREST AUDIT SYSTEM

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

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

Developing this Plan was a systematic process where the results of each step informed the next, leading to development of the goals, objectives, targets, actions and adaptive management measures. Careful evaluation of Colorado Springs' urban forest was conducted by using a combination of information obtained through the five planning elements evaluated in this Phase 1 Research Summary

Information from these elements—such as existing legislation and planning documents (Element #1); current operations and workflows (Element #2); urban forest benchmarking (Element #3); data analysis of urban forest conditions and trends (Element #4); and community viewpoints (Element #5)—was documented and then systematically evaluated following the U.S. Forest Service's Urban Forest Sustainability and Management Audit (UFSMA) system .

Note: The following section provides an overview of the approach. For a comprehensive summary of the process, see Appendix for the full results. The chart below includes Colorado Springs' current rating and goal rating in each category of the audit, which are explained more on the next page. The first step in the planning process involved an extensive review of existing plans, policies, ordinances, practices, data, and initiatives to establish a baseline using the UFSMA (see Appendix).

This audit is an industry-accepted process and region-specific evaluation of 11 categories of urban forest sustainability and management as they relate to the City of Colorado Springs. 126 documents and resources were identified, reviewed, and indexed as part of the information discovery process. This auditing system is designed to provide a framework for comprehensively evaluating urban forest management programs.

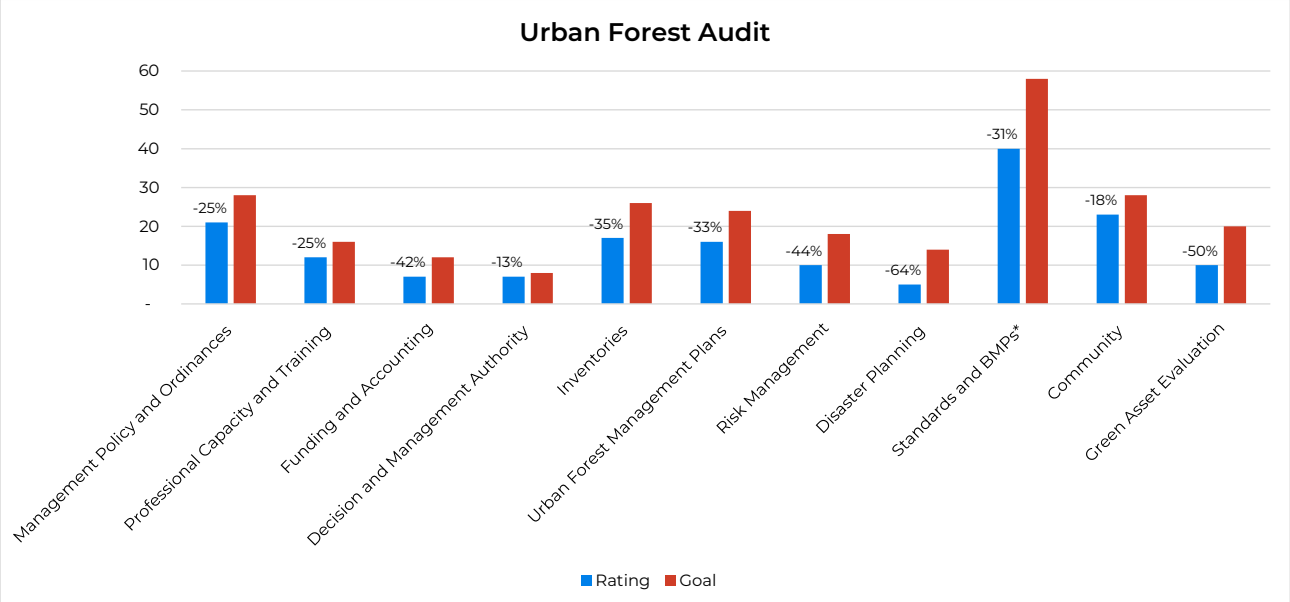


*Figure 46. Urban forest audit ratings for Colorado Springs out of possible scores, including the percent difference between the actual and goal ratings. *Note: BMPs refer to "best management practices."*

Table 18. | Results of the USDA Forest Service Urban Forest Audit. SOC refers to "standard of care," or the recommended levels of service as determined by USFS researchers during the development of the Audit.

Description	SOC* (% Achieved)	Base (% Achieved)	Overall Rating	Overall (% Achieved)	Goal Rating
Management Policy and Ordinances	100%	50%	21	75%	28
Professional Capacity and Training	100%	NA	12	75%	16
Funding and Accounting	50%	NA	7	58%	12
Decision and Management Authority	100%	50%	7	88%	8
Inventories	NA	50%	17	65%	26
Urban Forest Management Plans	NA	50%	16	67%	24
Risk Management	58%	50%	10	56%	18
Disaster Planning	NA	50%	5	36%	14
Standards and BMPs	75%	69%	40	69%	58
Community	100%	NA	23	82%	28
Green Asset Evaluation	NA	NA	10	50%	20
Total	**83%**	**53%**	**168**	**67%**	**252**

The primary objectives of the audit are defined by the UFSMA authors and adapted by the City's urban forestry consulting team to engage the full spectrum of the organizations' management team, provide program direction that increases the level of professionalism in management, conduct a gap analysis of management practices and the health of urban forests, provide strategic direction to improve the health of the urban forest, and optimize management for environmental justice and equitable distribution of resources.

The process of analyzing the urban forest involved extensive information and document gathering and research to identify policies, practices, programs, and standards pertaining to 11 categories of urban forest sustainability and management as defined by Clark et al. (1997), Kenney et al. (2011), and the Forest Service. The 11 categories are listed in the table above. Each category has a series of subcategories pertaining to the specific category. As an example, the following subcategories are in the **Management Policy and Ordinances** category:

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

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

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

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

RESEARCH SUMMARY

CONCLUSION

Colorado Springs is known for its majestic landscapes, proximity to abundant outdoor activities, and historical charm. Located at the base of the Rocky Mountains and Pikes Peak, Colorado Springs has thus far remained the second-most populous metropolitan area in the state, but that is projected to change within the next 30 years as Denver is limited by its geographical capacity and Colorado Springs continues to expand.

Photo 8. | The City of Colorado Springs.

FORESTRY IN COLORADO SPRINGS

At the same time that the City has exploded in population, its urban tree canopy has steadily increased, with trees being planted as new residential developments were built. Meanwhile, shrinking city budgets and a range of conflicting priorities to balance have left the City Forestry division with inadequate resources, funding, and staff to maintain established and newly-planted trees. This problem was exacerbated in 2010 when the Great Recession led to significant decreases in the Parks, Recreation, and Cultural Services budget that resulted in a loss of several full-time City Forestry positions.

Consequently, the urban forestry program in Colorado Springs has gradually devolved from one of planned, rotational maintenance to a reactionary system where trees are only visited when they have an urgent maintenance need, primarily driven by citizen service requests. Public safety is becoming a concern, mature trees are being lost due to lack of care, and City Forestry staff worry that the very things that make Colorado Springs great — like its beautiful natural landscape, and trees — are at risk. Fortunately, the City is taking action to address these issues and create an urban forest that is sustainable in terms of both its physical structure and management practices. This research summary integrates the results of several recent assessments, the City's archival data, and new surveys and interviews conducted as a part of the planning process.

Since the City had never previously conducted a formal assessment of its urban forest prior to these efforts, the first step was to assess citywide tree canopy. A few questions central to urban forest management guided this assessment, including how much canopy the City currently had, where it was located, and how it has changed over time.

TREE CANOPY ASSESSMENT

A full geospatial analysis of the most recently available source imagery, as well as statistical analyses of source imagery from several historical time periods, were performed. Results indicated that, contrary to a decline in the urban forest that had been expected, Colorado Springs' urban forest had steadily increased over the past 30 years. At first glance, it appeared that the City was losing its trees to mortality from drought, pests, and lack of care… and while these were all true, in fact, new trees were being planted at a higher rate which resulted in an overall increase in canopy. The surge of tree plantings is a result of tree plantings required for new development.

SAMPLE FIELD INVENTORIES

These results signaled the importance of assessing your urban forest from both the "top-down" through the 2019 tree canopy assessment and "bottom-up" through inventories. Ideally, the City would be able to perform a complete, updated "bottom-up" inventory to visit the growing populations of street, park, and public trees in its care, but this has not been possible yet, so as a part of the Phase 1 assessment, two neighborhoods were selected for sample inventories. A crew of ISA certified arborists surveyed every tree in the Old North End and Southeast neighborhoods for species, size/age, and maintenance needs, and documented what the City already knew: that regionally problematic species such as ash (*Fraxinus* spp.) and elm (*Ulmus* spp.) comprised large portions of the urban forest, the size and age structure of tree populations were not optimal, and many trees were in need of care.

URBAN FOREST MANAGEMENT PLAN

Colorado Springs' urban forest needed a vision and some long-range planning, and with the results from the Tree Canopy Assessment and inventories, City Forestry was able to communicate this need and initiate the process. The next step along Colorado Springs' journey to creating a sustainable urban forestry program was to develop an urban forest management plan (UFMP). Whereas the canopy assessment and sample inventories asked what conditions already existed, the UFMP looks to the future, asking what kind of urban forest the City would like to see and envisioning steps to get there. One key function of a UFMP is to "mainstream" urban forestry in the City, or compile all relevant parties and sources of information that relate to trees into one cohesive effort, leading to the development of a plan for the urban forest.

PLANNING ELEMENTS

First, the City's **existing policies and plans (planning element 1)** that related to urban forestry were reviewed to extract any mention of trees or the urban forest to ensure that the UFMP aligned with broader city planning efforts and gauge the City's readiness for improvements. Next, **city staff interviews (planning element 2)** were conducted with staff members from City Forestry, other City departments and Colorado Springs Utilities to establish a baseline of the City's urban forestry practices. Additionally, extensive **urban forest benchmarking research (planning element 3)** was conducted to measure the City's urban forest and forestry program against other similar cities and industry standards. This benchmarking data was then combined with other **high-level and in-depth data analyses (planning element 4)** including the City's tree canopy assessment and inventories just mentioned, as well as the results of a public survey designed to garner **community interests and input (planning element 5)**. Ultimately, the results of these various sources of information were incorporated into the **USDA-Forest Service Urban Forest Sustainability and Management Audit System** to identify strengths, weaknesses, and gaps in the City's urban forestry practices.

Once these results were gathered and compiled into this Research Summary, they became the foundation upon which the main UFMP framework was built. In an innovative approach designed just for Colorado Springs, four unique **scenarios** were developed representing different levels of management that City Forestry might implement, ranging from keeping the status quo to increasing funding by a small or optimal amount, to relinquishing street tree care duties from the City to the citizens owning the adjacent property. Within the framework of these four scenarios, **goals, objectives, actions**, and **targets** were identified to help the City move from their existing urban forestry operations to the type of program they'd like to achieve, over a 20-year planning horizon and under a range of budget scenarios. As time progresses, the UFMP can and should be **evaluated** intermittently to assess the City's progress in meeting its original goals and targets, and can be continually updated to reflect changes. This Plan will help transform City Forestry operations from a reactive regimen where staff struggles to keep up with its existing trees' maintenance needs to a proactive program that routinely monitors and maintains existing trees, plants new trees in the optimal locations, and engages the community to care for and about them.

RESEARCH SUMMARY

APPENDIX

INVENTORY TREE WORK DEFINITIONS

Prune-Clearance: The pruning of tree branches for appropriate clearance from sidewalks, roadways, signs, and utilities using best practices.

Prune-Routine: The regularly-scheduled pruning of established trees to preserve existing mature canopy and reduce potential risk..

Prune-Training: The pruning of newly-planted and young trees to help "train" their growth for optimal structure.

Remove: The removal of a tree due to a decline in tree health or a irreparable tree issue posing a potential or existing risk.

Monitor: Tree may need continued assessments to determine the maintenance need.

Utility: Tree maintenance typically including the trimming of branches or limbs for clearance of utilities i.e. Service wires.

Not Specified: Tree was not given a tree work task.

Sidewalk Damage: The upheaval and/or cracking of sidewalks due to tree roots and/or tree trunk and not due to other causes. Remediation is based on a case-by-case, tree-by-tree basis.

Crown Cleaning: The pruning of established and mature trees to remove dead, diseased, decayed, dying, or poorly structured branches while adhering to industry standards and best practices.

Remove-Stake: Newly planted trees often receive stakes for stability that need to be removed once established or stake is impeding growth or health.

Remove Hardware: Hardware may include ties for the tree stakes that need removed to not impede growth or health.

Remove-Girdling Root: Roots may encircle the trunk of a tree due to poor soils, excessive watering, poor mulching practices, and/or poor nursery quality and the girdling root needs to be severed and/or removed if it will not affect the health of the tree. This will prevent the tree from "choking" itself as it grows into the root, cutting of nutrient and water uptake.

TREE CANOPY ASSESSMENT DEFINITIONS

Total Acres: Total area, in acres, of the assessment boundary. Total acres are used to calculate all land cover metrics (e.g. tree canopy, other vegetation, impervious, soil, and water).

Land Acres: Total land area, in acres, of the assessment boundary (excludes water). Land acres are used to calculate all urban tree canopy metrics (e.g. existing canopy, possible planting area, and unsuitable areas).

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

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

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

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

Impervious Surfaces: Paved areas such as roads, sidewalks, buildings, parking lots, trails, and swimming pools.

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

Possible Planting Area: Areas of other vegetation (such as grass and open space) or impervious surfaces (paved areas, excluding buildings and roads) where tree canopy does not exist and it is biophysically possible to establish new trees.

Note: PPA does not include areas of soil, dry vegetation, or heavy clay considered unsuitable for tree planting since irrigation and other modifiers may be required to keep a tree alive in these areas.

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

ADDITIONAL URBAN FOREST BENCHMARKING CONTENT

The following table includes the complete 2019 Tree City USA dataset referenced in Planning Element 3 of this report.

Table A-1. | 2019 Tree City USA urban forestry program data for Colorado communities with a population size >100k. (Continued below.)

Community Name	Colorado Springs	Arvada	Aurora	Boulder	Denver
County	El Paso	Jefferson	Arapahoe	Boulder	Denver
City Population	478,221	121,272	379,289	105,673	727,211
Per Capita Expenditure	$3.54	$5.14	$7.85	$14.64	$9.14
Initial Planting Costs	$11,051	$200,000	$0	$168,078	$1,280,000
Maintenance Costs	$495,522	$332,271	$0	$229,797	$1,660,000
Removal Costs	$204,598	$40,000	$0	$353,127	$95,600
Management Costs	$1,070,303	$30,000	$0	$827,082	$3,359,400
EAB Management	$0	$5,000	$0	$162,635	$520,211
Volunteer Hours	175	325	1,088	180	422
Forestry Expenditures	$1,558,037	$602,271	$0	$1,578,084	$6,395,000
Trees Planted	74	213	425	515	3,785
Trees Pruned	991	903	4,443	666	4,257
Trees Removed	-618	-372	-571	-1,012	-1,492
Net Trees	-544	-159	-146	-497	2,293

(Table A-1. (Continued from above.) 2019 Tree City USA urban forestry program data for Colorado communities with a population size >100k.

Community Name	Fort Collins	Greeley	Lakewood	Pueblo	Thornton	Westminster
County	Larimer	Weld	Jefferson	Pueblo	Adams	Jefferson
City Population	170,243	108,649	157,935	112,361	141,464	113,166
Per Capita Expenditure	$13.76	$8.53	$2.75	$5.26	$3.42	$7.92
Initial Planting Costs	$230,917	$171,600	$80,000	$55,967	$217,312	$369,654
Maintenance Costs	$1,385,499	$300,114	$75,000	$87,276	$21,671	$199,628
Removal Costs	$461,833	$169,650	$10,000	$395,918	$73,797	$145,138
Management Costs	$180,917	$278,637	$250,000	$28,161	$173,500	$183,925
EAB Management	$93,000	$670	$3,500	$7,500	$5,750	$20,450
Volunteer Hours	0	105	224	800	0	135
Forestry Expenditures	$2,259,165	$920,001	$415,000	$567,322	$486,280	$898,345
Trees Planted	1,102	312	150	102	606	522
Trees Pruned	7,393	112	850	370	907	1,215
Trees Removed	-599	-377	-325	-356	-292	-382
Net Trees	503	-65	-175	-254	314	140

ADDITIONAL COMMUNITY INTERESTS AND INPUT CONTENT

The following charts contain responses to the additional 2020 public survey in referenced Planning Element 5 of this report.

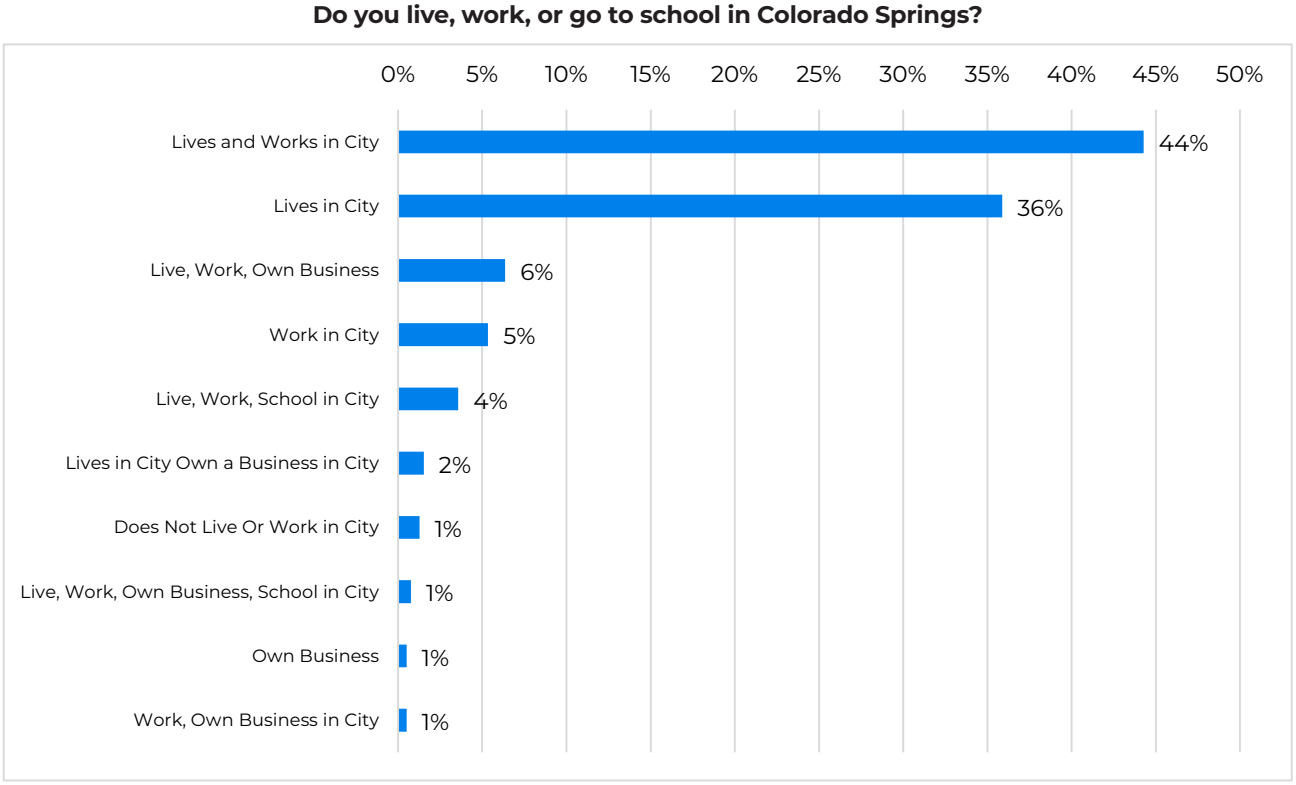
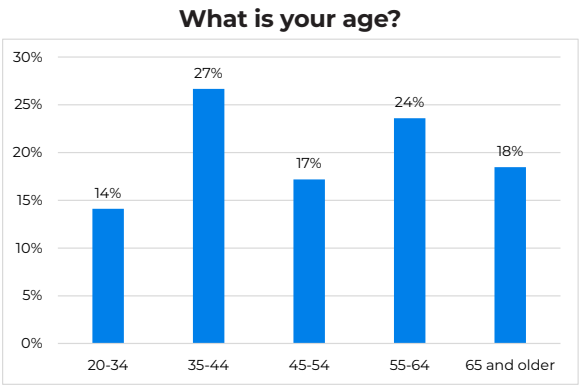
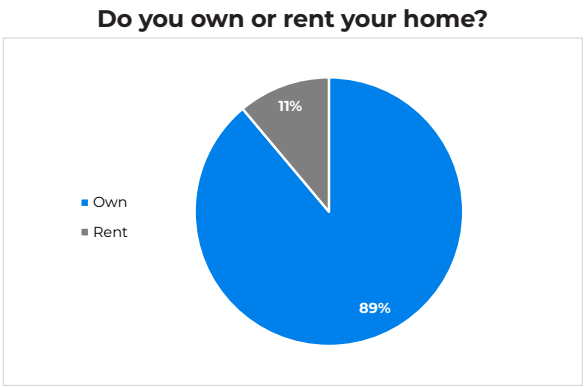


Figure A-1. | Answers to the 2020 public survey residency or affiliation question.





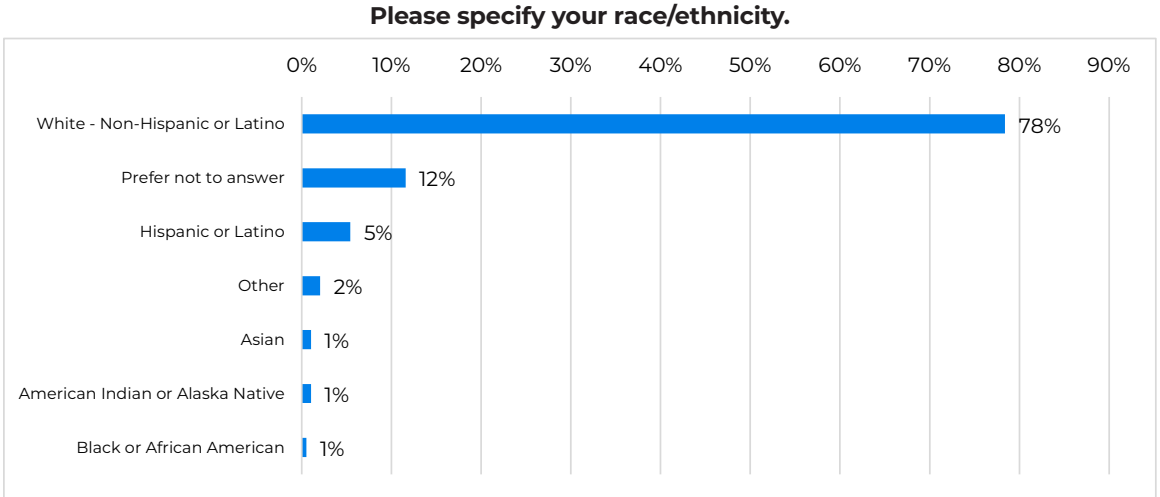


Figure A-2. | Answers to the 2020 public survey demographic questions (age, ethnicity, and home ownership).

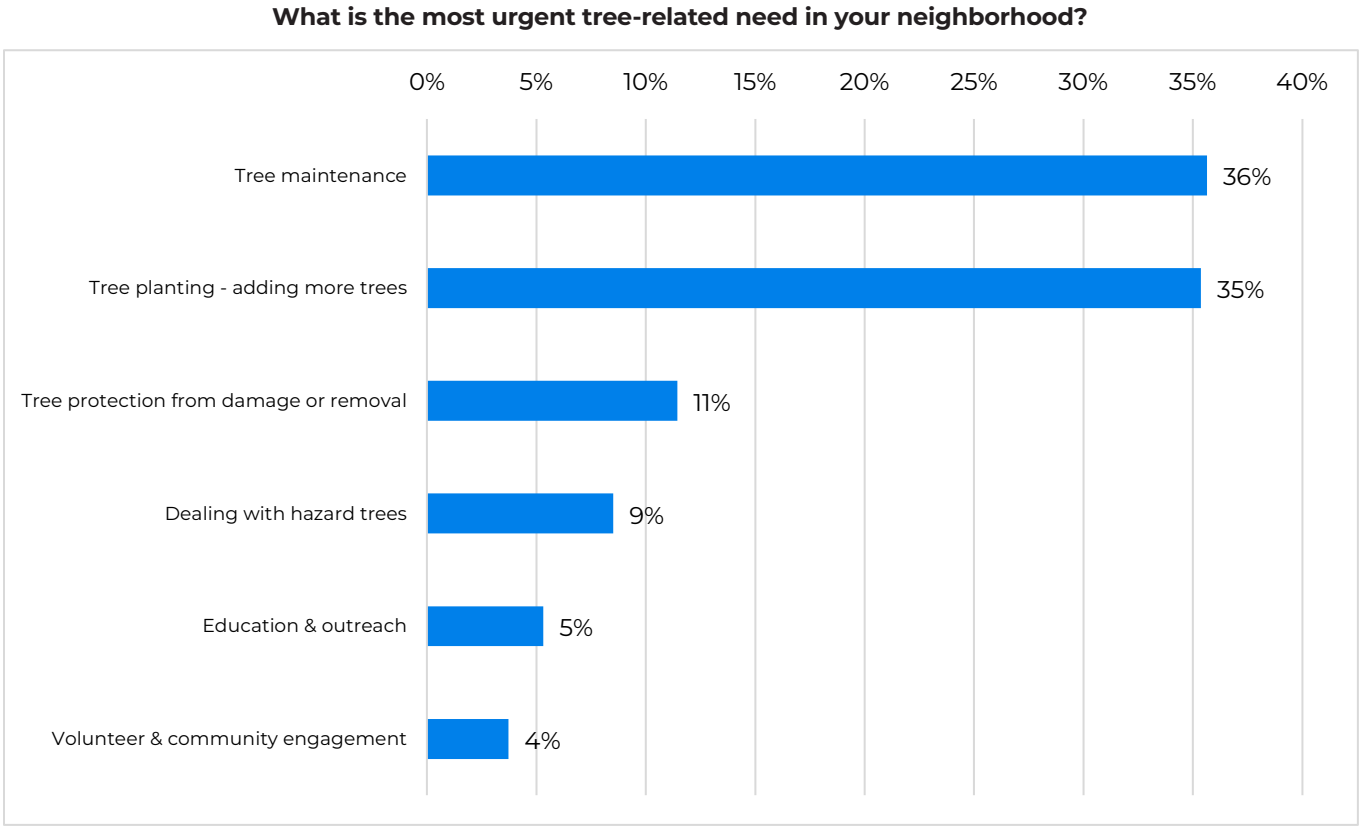


Figure A-3. | Answers to the 2020 public survey, question 5.

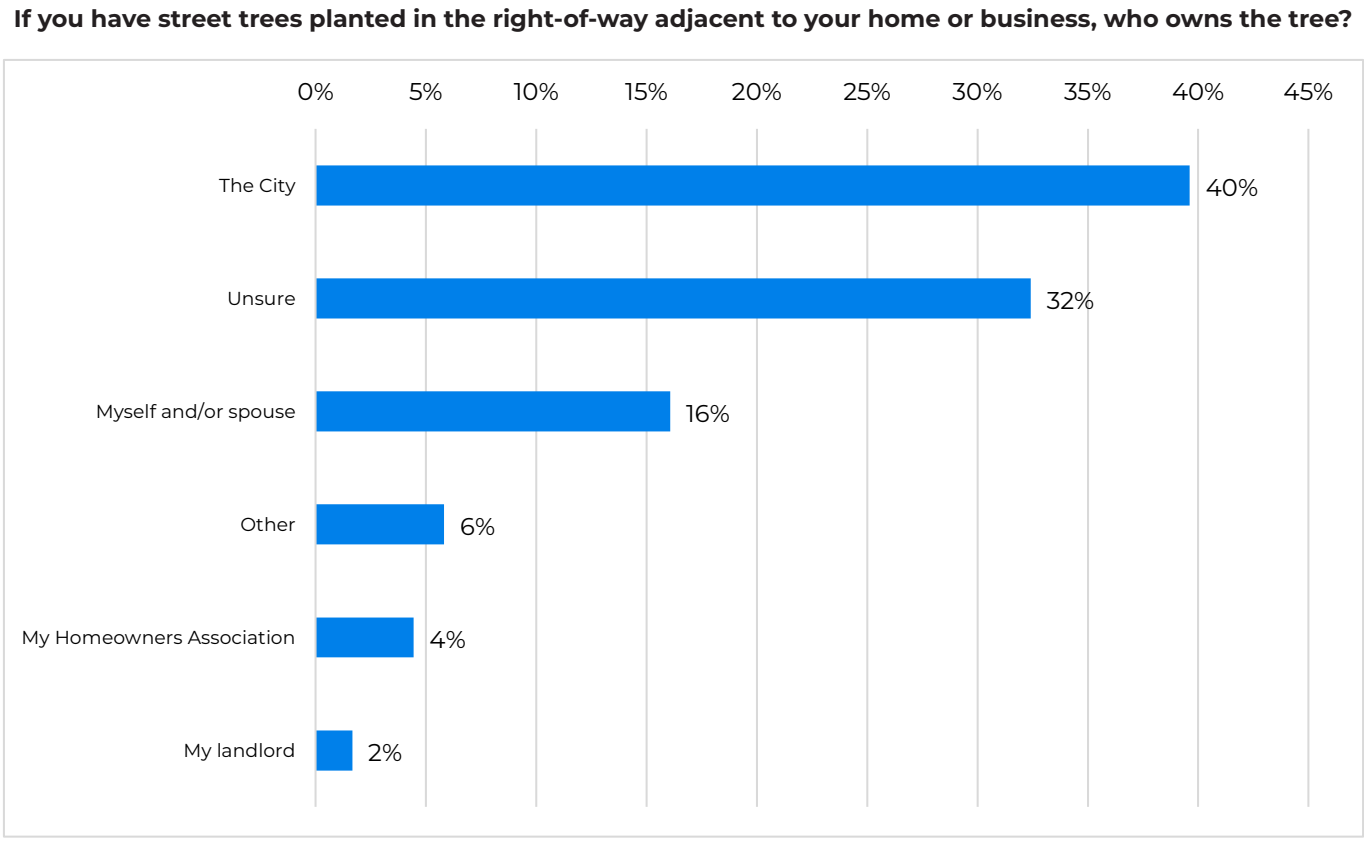


Figure A-4. | Answers to the 2020 public survey, question 6.

If you have street trees planted adjacent to your home or business, who prunes and performs other maintenance on your street tree(s)?

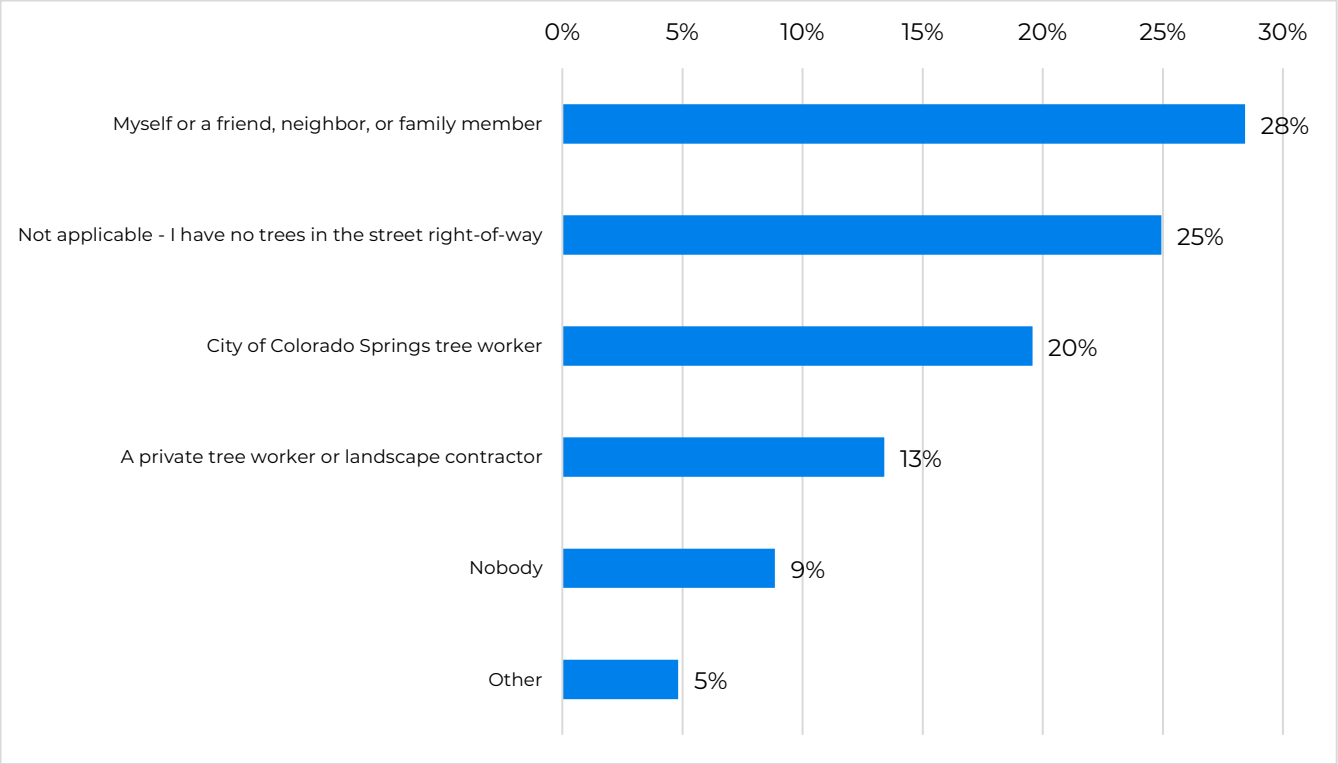


Figure A-5. | Answers to the 2020 public survey, question 7.

If you do not have street trees adjacent to your home or business, which factors affect your decision?

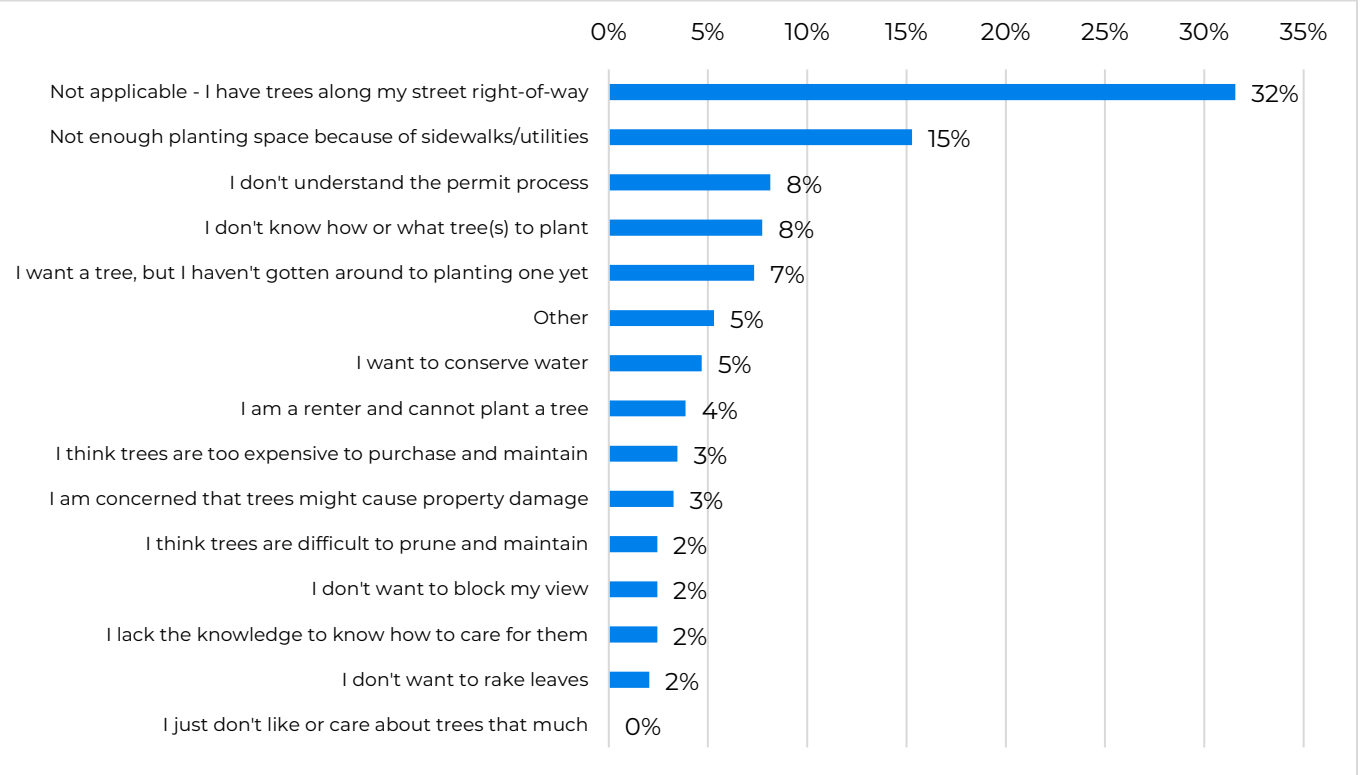


Figure A-6. | Answers to the 2020 public survey, question 8.

ADDITIONAL URBAN FOREST AUDIT SYSTEM CONTENT

The following table includes the complete results of the USDA Forest Service Urban Forest Sustainability and Management Audit. In each category, the City received a "ranked" score of 0-3 based on their current levels of service in that category. (Note: none of the categories received a score of 3, "Exceeds Common Practice," so it is not included in the key.)

Key:	Points:
Adopted common practice	2
In development	1
Not practiced	0

Table A-2. | Complete results of the USDA Urban Forest Sustainability and Management Audit for Colorado Springs.

	Component Evaluated	Description or Criteria for Evaluation
1	**Approved Policy Statements**	**Written policy statements approved by a governing body.**
1.01	**Climate Change (Sustainability)**	Also referred to as Sustainability. With reference to urban trees. Addresses the long-term health and productivity of the natural resource.
1.02	**No Net Loss**	Can refer to trees, basal area, or canopy.
1.03	**Risk Management**	Should reference: ANSI A300 Part 9, ISA BMP, and prioritization funding mechanisms.
1.04	**Tree Canopy Goals**	Overall community/campus goal, or by designated "zone".
1.05	**Tree Protection**	Construction and/or landscape maintenance.
1.06	**Utility**	Utility pruning, planting, and installation policy (e.g. boring vs. trenching).
1.07	**Human Health – Physical & Psychological**	Recognizes and addresses the human health benefits of the natural resource (e.g. exercise, air quality, stress management, shade). Could also include Urban Heat Island (UHI) policies.
1.08	**Wildlife Diversity/Habitat/ Protection**	Mammals, birds, or reptiles.
1.09	**Performance Monitoring**	Recognizes the annual or biennial calculation of metrics (e.g. some component of ecosystem services) for the purpose of tracking management performance.
1.10	**Ordinance (Private) V**	Tree protection and management for trees on private property.
1.11	**Ordinance (Public)**	Tree protection and management for public trees.
1.12	**Development Standards**	US Green Building Council's LEED® rating systems (or similar internationally); LEED v4 BD+C (Sustainable Sites); LEED 4 ND (Neighborhood Pattern & Design, Green Infrastructure); ASLA's SITES® Rating System
1.13	**High-Conservation Value Forests**	Programs or policies for identification, acquisition, and/or protection of groups of trees or forests that provide unique public benefits.
1.14	**Urban Interface (WUI)**	Programs or policies that improve management of the urban interface for fire and/or invasive species.
	Component Evaluated	**Description or Criteria for Evaluation**
2	**Professional Management**	**Provision for professional consultation.**
2.01	**Certified Arborist**	(STAFF)
2.02	**Certified Arborist**	(CONTRACTED)
2.03	**Certified Arborist**	(OTHER RESOURCE)
2.04	**Other Professional - Advising/ directing UF management**	This could be a professional in an allied field, like landscape architecture.
2.05	**Municipal Forestry Institute**	Graduate of Society of Municipal Arborists MFI program.

(Table A-2. continued from previous page)

2.06	**Urban Forestry Institute or Similar Training**	Attendance at regional urban forestry training held by the U.S. Forest Service.
2.07	**Outreach & Education Coordinator**	Urban forest specific, full-time.
2.08	**In-House Arborist Crew**	1) Response crew or multi-person crew in development 2) Staffing levels and resources enable maintenance of all City-maintained trees within 10 years
2.09	**Organizational Communications**	Process, procedures, and protocol for cross-professional communications within the organization (all departments "touching" trees).
	Component Evaluated	**Description or Criteria for Evaluation**
3	**Urban Forestry Budget**	
3.01	**Budgeted Annually**	Budget authorized/required for tree board, tree maintenance, and/or tree planting.
3.02	**Contingency Budget Process**	A protocol is in place to prioritize urban forestry management activities during budget shortfalls; e.g. during times of limited funding for: 1) risk management, 2) young tree care, 3) mulching.
3.03	**Funding Calculated from Community Attribute**	Budget in terms of per capita, per tree, or for performance (e.g. per tree weighted by size class or age.
3.04	**Funding Based on Performance Monitoring**	Budget connected with/based on ecosystem service (ES) monitoring and performance.
3.05	**Urban Forestry Line Item**	Is the budget specific to urban forest management?
3.06	**Green Asset Accounting**	Maintain green infrastructure data in the "unaudited supplementary disclosure of an entity's comprehensive annual financial report (CAFR)". GASB 34 implementation for municipalities.
	Component Evaluated	**Description or Criteria for Evaluation**
4	**Authority**	
4.01	**Urban Forest Manager**	Professional urban forest manager with authority over the program and day-to-day activity. Including designated budget line item.
4.02	**Staff Authority**	Designated staff with authority over the program and day-to-day activity. Including designated line item.
4.03	**Communication Protocol**	Established protocol and mechanism(s) for communication among all members of the urban forest management "community" in your municipality or organization (e.g. manager, department under control, advisory board, finance, field operations, public, NGOs, business community, developers).
4.04	**Tree Board, Commission, or Advisory Council**	Establishes a board for public participation (advisory or with authority).
	Component Evaluated	**Description or Criteria for Evaluation**
5	**Inventories and Assessments**	
5.01	**Canopy Inventory (UTC)**	Periodic (≤5 year) canopy inventory and assessment. Public & private.
5.02	**Ecosystem Services**	Is there a recent (≤5 year) ecosystem services (ES) inventory & assessment. Public: 100% or street trees; Public & Private: Sample; or Campus. Or, are ES calculated annually or biennially based on partial re-inventory and projected growth as a monitoring tool.
5.03	**Public Trees V**	The publicly controlled urban forest.
5.04	**Street Trees**	Is there a recent (5 year) inventory?

(Table A-2. continued from previous page)

5.05	**Parks/Riparian Areas**	Is there a recent (5 year) inventory?
5.06	**Other Public Trees**	Public facility landscaped areas, Industrial parks, green space.
5.07	**Continuous inventory on a cycle (≤5 years; i.e. panel)**	Partial re-inventory to support continuous forest inventory, growth projections, and the calculation of ecosystem services for the purpose of long-term monitoring of urban forest management performance (e.g. carbon or leaf surface).
5.08	**Private Trees**	
5.09	**Campus (Educational)**	Is there a recent (5 year) inventory?
5.1	**Corporate**	Is there a recent (5 year) inventory?
5.11	**Other Private Property**	Is there a recent (5 year) inventory?
5.12	**Continuous inventory on a cycle (≤5 years; i.e. panel)**	Partial re-inventory to support continuous forest inventory, growth projections, and the calculation of ecosystem services for the purpose of long-term monitoring of urban forest management performance (e.g. carbon or leaf surface).
5.13	**Green Stormwater Infrastructure (GSI)**	BMP stormwater mitigation practices and locations (e.g. Washington, D.C.).
5.14	**Spatial**	Inventory data includes Lat/Long (i.e. GIS). Should address the spatial relationship between the natural resource and people (i.e. residents, visitors, activities) that would help manage the resource for benefits associated with proximity (air quality, recreation, stress mitigation, improved educational opportunity).
5.15	**Maintenance and Planting Records Maintained**	Planting details (nursery, species, size, cost, contractor, etc.) maintained with inventory or as separate database or recordkeeping system. Also pruning and removal histories.
	Component Evaluated	**Description or Criteria for Evaluation**
6	**Management Planning Activities**	
6.01	**Annual Maintenance Calendar**	An annual calendar that defines typical activity by season. To support scheduling.
6.02	**Public Trees V**	*(Any one of the following sub-elements.)*
6.03	**Street Tree Management**	Is there a recent (5 year) plan for street trees?
6.04	**Parks/Riparian Area Management**	Is there a recent (5 year) plan?
6.05	**Other Public Trees**	Public facility landscaped areas, Industrial parks, green space.
6.06	**Private Trees**	*(Any one of the following sub-elements.)*
6.07	**Campus (Educational)**	Is there a recent (5 year) plan for Campus trees?
6.08	**Corporate**	Is there a recent (5 year) plan?
6.09	**Other Private Property**	Is there a recent (5 year) plan?
6.1	**Green Infrastructure**	Is there a plan for green infrastructure (i.e. nodes & linkages)? Large-scale projects.
6.11	**Other Written Plans**	Other natural resource plans (e.g. tree canopy). May be a component of another plan.
6.12	**Tree Planting**	Is there a recent (3 year) tree planting plan?). May be a component of another plan.

(Table A-2. continued from previous page)

6.13	**UF as Part of a Comprehensive Plan**	Is any UF management plan referenced in the comprehensive plan (i.e. county or municipality) or master plan (i.e. Campus)?
6.14	**Urban Forest Planning and Management Criteria and Performance Indicators**	Criteria and indicators based on A Model of Urban Forest Sustainability (Clark, J.R., Matheny, N.P., Cross, G., and Wake, V. 1997 Journal of Arboriculture.) or on work of W.A. Kenney, P.J.E. van Wassenaer, and A.L. Satel in Criteria and indicators for strategic urban forest planning and management. (2011)
	Component Evaluated	**Description or Criteria for Evaluation**
7	**Risk Management Activities**	
7.01	**TRAQ Attained**	At least one staff or consultant is TRAQ (Tree Risk Assessment Qualified).
7.02	**Annual Level 1 (ANSI A300 Part 9 & ISA BMP)**	All trees in high occupancy areas visited annually.
7.03	**Mitigation Prioritization**	A protocol for prioritizing mitigation following Level 1 and Level 2 assessments. Reflects the controlling agency's threshold for risk.
7.04	**Occupancy Areas Mapped**	Has TRAQ staff/consultant discussed/mapped occupancy levels with controlling authority?
7.05	**Recordkeeping, Reporting, and Communications**	A process has been put in place to maintain records on requests, inspections, evaluations, and mitigation of risk; and on the communications among the managers related to those risk assessments.
7.06	**Standard of Care Adopted**	Controlling authority has adopted a Standard of Care (SOC) or risk management policy.
7.07	**Tree Risk Specification**	Is there a written specification that meets requirements of ANSI A300 (Part 9)? And, has it been discussed with the controlling authority with relevance to the controlling authority's threshold for acceptable risk?
7.08	**Urban Tree Risk Management**	The community has prepared and follows a comprehensive program for urban tree risk management.
7.09	**Invasive Management**	Plan to address and manage invasive: plants, insects, and disease.
	Component Evaluated	**Description or Criteria for Evaluation**
8	**Disaster Planning Activities**	
8.01	**Response/Recovery Mechanism V**	Staff knowledge of the municipality's protocol for requesting disaster resources through the county or state with access to mutual aid and EMAC.
8.02	**Urban Forestry as part of the County Disaster Plan V**	The UF plan (8.3) is incorporated into the county/municipal disaster plan; specifically in reference to debris management and risk mitigation.
8.03	**Urban Forestry Disaster Plan**	A separate/specific plan within the urban forestry management program (i.e. who to call, priorities).
8.04	**Pre-disaster Contracts**	Contracts are in place for critical needs.
8.05	**Mitigation Plan**	A mitigation plan has been developed for pre-disaster, recovery, and post-disaster.
8.06	**EMAC Mission Ready Packages (MRP) V**	Municipality has published disaster resources with state EM and participates in inter-state Mutual Aid to support Urban Forest Strike Teams (UFST).
8.07	**Urban Forest Strike Team**	Participation in the UFST project.
	Component Evaluated	**Description or Criteria for Evaluation**
9	**ANSI Standard & BMP Activities**	
9.01	**ANSI Standards**	Reference and adherence to ANSI Standards for arboricultural practices (A300), safety (Z133), or Nursery Stock (ANSI Z60.1) (any or all).

(Table A-2. continued from previous page)

9.02	**Ages/Diameter Distribution**	Specific management for the development of an age-diverse tree population.
9.03	**Arborist Standards**	Standards of practice for arborists (i.e. Certification).
9.04	**Best Management Practices (BMPs)**	Establishes or references tree maintenance BMPs (i.e. written comprehensive standard).
9.05	**Fertilization and Mulching**	Fertilization or mulching standards required for conserved & planted trees.
9.06	**Lightning Protection Systems**	BMP written to the ANSI A300 Standard.
9.07	**Planting**	Planting and transplanting standards required/specified.
9.08	**Pruning**	Pruning standards required for conserved & planted trees.
9.09	**Removal**	Infrastructure damage, stump grinding, etc.
9.1	**Support Systems (Guying and Bracing)**	BMP written to the ANSI A300 Standard.
9.11	**Tree Risk**	Tree risk assessment procedures; ISA BMP or equivalent.
9.12	**Construction Management Standards**	Written standards for: tree protection, trenching/boring in CRZs, pre-construction mulching, root or limb pruning, watering (any or all).
9.13	**Design Standards**	Standards for design that specifically require trees; standards for tree placement (i.e. location), soil treatment, and/or drainage.
9.14	**Genus/Species Diversity**	Suggests or requires diversity of plant material.
9.15	**Green Stormwater Infrastructure (GSI)**	BMPs for site level GI practices like rain gardens and swales. Small-scale projects.
9.16	**Inventory Data Collection**	Community has adopted or developed applicable (written) standards for local urban tree inventory data collection to support QA/QC. Currently, there is no identified national standard. But, the following have components and elements worth noting.
9.17	**Minimum Planting Volume**	Minimum required root zone volume.
9.18	**Minimum Tree Size**	Minimum caliper for tree replacements, and/or minimum size of existing trees to receive tree density or canopy credit.
9.19	**Root Protection Zone (CRZ)**	Defines adequate root protection zone; Critical Root Zone (CRZ).
9.2	**Safety**	
9.21	**Topping**	Prohibits topping or other internodal cuts (public & private).
9.22	**Tree Species List**	Identifies and publishes a list of the most desirable, recommended, and/or preferred species (may include native and non-native species); alternatively, a list of species prohibited.
9.23	**Tree Quality Standards**	Written standards for tree selection at nursery in addition to Z60.1.
9.24	**Utility Right-of-Way (ROW) Management**	Requirements for planting, pruning, and/or removal of trees within a utility ROW.
9.25	**Urban Agriculture**	Enabled urban food forestry practices.
9.26	**Wood Utilization**	Larger diameter material is processed for wood products.
9.27	**Third-party forest products certification compliance**	Adoption of one of the international standards for production of wood products (for example): American Tree Farm System (ATFS); Forest Stewardship Council™ (FSC®); Programme for the Endorsement of Forest Certification (PEFC); Sustainable Forestry Initiative (SFI) Sustainable Forest Management Standard (Canada).Standards can apply to any/all publicly owned and managed trees; parks, street trees, and/or community forests.
9.28	**Energy generation**	Local or regional use of chips or other woody debris for co-generation facilities.
9.29	**Composting of Leaf and/or Other Woody Debris**	Leaves and small woody debris are captured and used on-site or processed by someone by composting for reuse.

(Table A-2. continued from previous page)

	Component Evaluated	Description or Criteria for Evaluation
10	**Activities That Build Community**	
10.01	**American Grove or Other Social Media**	Does your community/campus use American Grove to document and publicize your urban forestry program, activity, or events?
10.02	**Education**	The urban forest is used as an educational laboratory for class activity; Kids in the Woods, PLT, high school, or college level.
10.03	**Community Tree Steward Program**	Does your community sponsor this program locally?
10.04	**Tree Inventory Management Software**	Public access to the community tree resource via an on-line mapping program (i.e. any Web Map Service; WMS).
10.05	**Public Perception**	Is public management consistent with private property requirements for tree protections and care? Does the Campus/public tree management reflect neighborhood norms?
10.06	**Recognition Programs**	Programs that raise awareness of trees or that use trees to connect the community to significant events or activities.
10.07	**Arbor Day Celebration**	Whether or not associated with Tree City USA.
10.08	**Arboretum designation**	Internal or third party arboretum designation.
10.09	**Significant trees**	For example: size, history.
10.1	**Memorial/Honorarium**	Tree planting or tree care programs than honor/memorialize individuals, organizations, or events.
10.11	**Social Media**	Does your community/campus make use of Twitter, Facebook, Blogs for internal or external outreach?
10.12	**Active Communications**	Press releases, regular news articles (print), "State of the Urban Forest" reports, periodic analysis of threats and opportunities.
10.13	**Tree Care**	Are volunteers trained and used for basic tree care (e.g. mulching, pruning, planting).
10.14	**Tree Campus USA®, Tree City USA®, Tree Line USA®**	Community/campus meets current qualifications for any of these programs.
10.15	**Volunteer Opportunities**	Ad hoc or scheduled. Any/all age groups. Tree Campus USA student activities.
	Component Evaluated	**Description or Criteria for Evaluation**
11	**Observed Outcomes (Activity, Health)**	
11.01	**Deadwood**	Look for evidence of periodic or ad-hoc deadwood removal (i.e. lack of dead limbs ≥ 2" in the trees or on the ground).
11.02	**Genus Diversity**	No genera exceed 20% of population; make specific observations for *Acer, Fraxinus, Quercus, and Ulmus.*
11.03	**Mature Tree Care**	Mature trees are retained in the landscape, and are of acceptable risk; i.e. veteran tree management.
11.04	**Mulching**	Evidence of adequate (i.e. spatial extent, depth, and material) roots zone mulching for all age classes.
11.05	**Planting Site Volume Optimization**	Are species & sites matched for optimization of above ground canopy; right tree in the right spot concept.
11.06	**Rooting Volume Optimization**	Are species & sites matched for optimization for below ground rooting volume; right tree in the right spot concept.
11.07	**Species Diversity**	No species/cultivars exceed 10% of population; make specific observations for ***Acer, Quercus,*** and ***Ulmus*** genera. Also evaluate the role of regionally local native species.
11.08	**Soil Compaction**	Observe evidence of soil compaction by users or staff during maintenance. Include "desire" lines and construction activity at time of evaluation.
11.09	**Tree Health**	Rate the overall tree health in all size (age) classes; look for crown dieback, decay, foliage density & color.
11.1	**Young Tree Pruning**	Look for evidence of periodic (e.g. every 3 years to year 9) structural pruning (e.g. subordination cuts, dominant central leader, co-dominant stems lower that 20').

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OCTOBER 2020

RESEARCH SUMMARY

A BASELINE ASSESSMENT TO SUPPORT THE FRAMEWORK OF COLORADO SPRINGS' URBAN FOREST MANAGEMENT PLAN

PLANIT GEO™
mapping a greener future

COLORADO SPRINGS
OLYMPIC CITY USA