City of Chico

Urban Forest Master Plan

DECEMBER 2022

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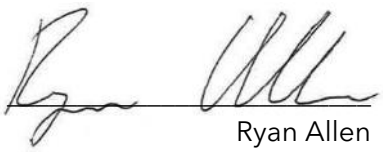

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Urban Forestry Management Lead

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Acknowledgments

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City Staff

Bidwell Park and Playground Commission

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CAL FIRE

Prepared By
Dudek – Urban Forestry Division

With Support From
Butte Environmental Council
Chico Urban Forest Master Plan Working Group

Bidwell Park and Playground Charter, Municipal Code Section 1006
The council shall be responsible for the propagation, planting, removing, pruning, and maintenance of all trees and shrubberies on the streets and along the sidewalks of the city. The council shall adopt such ordinances as may be necessary to exercise such responsibilities and may in such ordinances delegate the responsibility to any other board, commission, or department of the City as it determines.

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Vision

Our urban forest is a resilient network of trees that is sustainably managed by the City and residents, providing equitable social, economic, and ecosystem benefits to all residents and habitat for wildlife, and reflects Chico's identity and legacy as the City of Trees.

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Acronyms and Abbreviations

Acronym/Abbreviation	Definition
BEC	Butte Environmental Council
BPPC	Bidwell Park and Playground Commission
CAL FIRE	California Department of Forestry and Fire Protection
CARD	Chico Area Recreation and Park District
DSH	diameter at standard height
DSM	digital surface model
FTE	full-time equivalent
GHG	greenhouse gas
ISA	International Society of Arboriculture
nDSM	normalized digital surface model
RPI	relative performance index
SCN	South Campus Neighborhood
SWRP	Storm Water Resource Plan
TES	Tree Equity Score
TRAQ	Tree Risk Assessment Qualification
UFMP	urban forest management plan

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1 Introduction

1.1 Historical and Environmental Context

Prior to the founding of the City of Chico in 1860, the original inhabitants of the area were the Mechoopda Indians, a federally recognized tribe who were intrinsically connected to the land for centuries (Native Americans 2012). The rich riparian woodland habitat of the area was used by the Mechoopda and provided a myriad of resources, such as fresh water, shade, and staple food sources like salmon, acorns, waterfowl, and deer (White 2015). The Mechoopda were exceptional stewards of the land, strengthening the production and preservation of natural resources by routine selective burning and cultivating natural stands of flora for food and fiber (BCCER 2021).

In 1860, the City of Chico was founded by General John Bidwell and it was incorporated in 1872. Bidwell's vision and foresight led to the development of a thriving community that incorporated street trees and landscapes throughout the downtown area, in parks and along residential streets. As the town developed, some of the orchards planted by the Bidwell's became street trees, especially in the Avenues. These trees provide an important source of shade and beauty to the City. Most of Chico was initially developed under county jurisdiction and subsequently annexed. This has resulted in a patchwork of substandard rural improvements throughout the urban fabric. It has other planning ramifications such as a wide array of parkway widths and some neighborhoods that were developed in the 1950s having street trees behind the sidewalk. The urban forest is made up of trees, landscapes, and related vegetation within the City's parks, along the streets and creeks, and within private property. Chico's urban forest provides a defining characteristic to the City of Chico that includes environmental services and economic benefits to its citizens.

The elements of the urban forest exist throughout the community, although their care is under several jurisdictions. The first street tree ordinance was codified in March of 1897, delegating the responsibility for oversight to the Committee on Streets, Public Squares and Parks, and delegating the responsibility for maintenance to the abutting property owner. In April 1918, the Bidwell Park and Playground Commission (BPPC) first met in its role as the City's Tree Commission. Today the BPPC has authority over street trees and "shrubberies" provided through the Chico Municipal Code 14.40.

Chico is known as the "City of Trees" and is the most populous city in Butte County, with 102,000 residents. The residents of Chico take pride in maintaining a unique sense of small-town living, a safe environment, a thriving business community, and access to outdoor recreation.

1.2 UFMP Development Process

In 2017, the City of Chico was awarded $425,811 from the California Department of Forestry and Fire Protection (CAL FIRE) Urban and Community Forestry Program for its grant application "City of Chico Urban Forest Revitalization". The funding supported updating the City's tree inventory, planting and maintaining 700 trees in disadvantaged communities in collaboration with Butte Environmental Council (BEC), and completion of an Urban Forest Master Plan (UFMP). The City's Urban Forest Manager and Public Works Department are the main City entities that are responsible for overseeing the UFMP's development and implementation, and provided key insights into City practices, coordination with internal and external stakeholders, and co-hosted community engagement

events. The Urban Forest Manager provided City standard documents and other data sets for analysis. The following sections detail the analysis, community engagement activities, and processes involved in developing the UFMP.

1.2.1 Analysis of Plans, Policies, and Ordinances

In May 2021, the City began the process of developing the UFMP, in collaboration with BEC and Dudek. The project initiated with a thorough analysis of City management practices, policies, ordinances, and funding, to understand the strengths and deficiencies of its urban forest program. The analysis of current practices was initially informed by reviewing City planning documents, including the Bidwell Park Master Management Plan Update, Chico 2030 General Plan, Stormwater Resource Plan, Climate Action Plan, City of Chico Design Guidelines Manual, The Avenues Neighborhood Plan, and specific plans. It also included an analysis and/or review of City planning practices, tree ordinances, standard details, annual service data, urban forest program budget, and the 2012 draft UFMP which was not finalized or adopted.

1.2.2 Inventory and Canopy Cover Analysis

Using data from the City's 2021 inventory, the consultant team analyzed the information using sustainability metrics to determine the inventory's species diversity, age distribution, condition, relative performance index, environmental services, and economic benefits. This analysis informed what management practices will need to be improved to have the most meaningful impact on tree health and safety in the City.

Additionally, the City's entire urban forest (public and private property) was analyzed to determine the canopy cover extent, and the condition of trees using sustainability metrics. The City canopy cover and land use was derived from National Agriculture Imaging Program (NAIP) imagery, tree height information purchased from Nearmap, LiDAR, and other satellite spatial imagery by using an artificial intelligence learning model to classify and distinguish trees, other vegetation (e.g., shrubs, grasses), water, impervious surfaces (e.g., buildings, roads, and other infrastructure), and bare ground. The information was used to determine an overall canopy cover for the entire City, as well as a change detection to see how canopy cover has changed between over a 16-year period from 2005 and 2021.

1.2.3 Stakeholder Interviews

Understanding the effectiveness of the urban forest management program was further informed by interviews with City staff, elected officials, and external stakeholders. The interviews explored the role each stakeholder had in influencing City tree management, clarified internal City procedures, and informed areas where the City could improve management of the urban forest. The list of City Departments and stakeholders who participated in the UFMP interview process included the following:

- Public Works Department Operations and Maintenance
  - Urban Forestry
  - Facilities Maintenance
  - Landscapes
  - Parks and Natural Resources
- Public Works Department Engineering
  - Traffic Engineering

  - Construction Inspection
- **Community Development Department**
  - Building
  - Planning
  - Housing
  - Code Enforcement

1.2.4 Community Engagement

The community engagement process was based on the International Association of Public Participation to ensure those affected by City tree management have a voice in how City trees are managed. The engagement process was guided by these principles:

- **Inform**: To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, and/or solutions.
- **Consult**: To obtain public feedback on analysis, alternatives, and/or decisions.
- **Involve**: To work directly with the public throughout the process to verify that public concerns and aspirations are consistently understood and considered.
- **Collaborate**: To partner with the public in each aspect of the decision, including the development of alternatives and the identification of the preferred solution.
- **Empower:** To place final decision making in the hands of the public.

Input from Chico community members and stakeholders helped to inform the analysis of City management practices and the development of guiding principles, goals, and objectives of the UFMP. The following engagement activities were executed:

- Urban Forest Summit (59 attendees)
- Online survey (310 responses)
- Door knocking campaign (xxx households)
- Community tabling events
  - Farmer's market (4 events)
  - Chico Summer Fest (1 event)

1.3 Why the City Needs a UFMP

Adaptation to changing environmental conditions is becoming increasingly important in Chico. Ongoing drought conditions, increased days of extreme heat, and catastrophic wildfires reflect adverse impacts to the environment brought on by climate change. In response, the State of California has passed legislation like Senate Bill 32 mandating cities develop Climate Action Plans that provide a strategic framework to reduce greenhouse gas emissions and promote resilient communities. Additionally, Executive Order B-55-18 sets a goal of carbon neutrality in California by 2045, which can in part be supported by tree planting and preservation of canopy cover.

Why Does Chico Need a UFMP?

Preserve Canopy Cover

- Ensure that Chico's high level of 36% canopy cover continues to support climate resiliency for current and future community members.

Extreme Heat

- Chico is projected to average 16–30 extreme heat days per year by 2030 (Cal-Adapt 2017).

Storm/Flooding Events

- Intense storms are projected to overwhelm local waterways and threaten the integrity of flood control structures (Butte County Department of Water Resources and Conservation 2016).

City Policy – General Plan Safety Element

Goal S-9: Protect the community from risks posed by climate change.

Policy S-9.1 (Climate Adaptation and Resiliency) - Promote public safety through the development of climate adaptation and resiliency strategies to reduce risks associated with climate change.

Action S-9.1.1 (Climate Change Adaptation) - Update the Safety Element or the City's Local Hazard Mitigation Plan to include climate adaptation and resiliency strategies consistent with Senate Bill 379, including preparation of 1) a vulnerability assessment that identifies community risks associated with climate change; 2) a set of adaptation and resilience goals, policies, and objectives for the protection of the community; and 3) implementation measures to avoid or minimize climate change impacts.

Urban forests help to create resilient communities by providing cooler temperatures during extreme heat, intercepting and storing stormwater, and offering cleaner air to those who live beneath the tree canopy. Growing and maintaining a sustainable urban forest will help ensure trees continue to deliver maximum levels of these vital services when adverse conditions arise.

2 Key Findings

Key Finding #1, Trees and Canopy Cover are a Valued City Asset: The City of Chico has a high level of canopy cover at 36%, and benefits from being developed in an area that historically consisted of dense riparian and oak woodland vegetation communities. City founders and leaders recognized the value of the natural environment and trees from the beginning stages of City development, and that value continues today with elected officials, City staff, and community members. This is reflected in survey data collected for this UFMP that shows 97% of respondents indicated trees contribute to their quality of life, and 92% view trees as more or equally important to other City-maintained infrastructure. The value and pride for its urban forest is further reflected in the Chico motto as a "City of Trees".

Key Finding #2, Progressing Towards Equitable Distribution of Canopy Cover: Often canopy cover in a city is an unequally distributed, with disadvantaged and vulnerable communities experiencing lower levels of canopy cover in comparison to more advantaged areas of the city. While this is true in some areas of Chico, overall canopy cover is relatively equally distributed amongst all neighborhoods. Six of the seven council districts experience canopy cover above 32%, with Council District 6 having 28% canopy cover, which is largely accounted for in a portion of the district that is designated for commercial buildings and shopping centers.

Key Finding #3, New Development Must Properly Plan for Trees: New residential housing developments are an essential need to support the growth of Chico and present an opportunity to expand canopy cover. A canopy cover change analysis was conducted using aerial imagery from 2005 and 2020. The analysis identified the largest gains and loss of canopy cover resulted from new residential housing developments. The Northwest Chico neighborhood experienced a 14.39% decrease in canopy cover as a new residential was built over an area that comprised of an orchard. Conversely, the Foothill Park neighborhood experienced a 10.74% increase in canopy cover, which can be contributed to the trees planted in an area that was largely grass and shrub land. This analysis indicates the importance of City planners to develop strategies and guidance for new residential home builders to preserve trees when possible and ensure neighborhood plans incorporate trees in a manner that will help achieve a high level of canopy cover.

Key Finding #4, Additional Resources are Needed to Plant, Maintain, and Preserve Trees: Current funding levels will need to be increased to support urban forest goals and priorities identified during the UFMP process. The City has been successful in receiving grant funding to support planting and maintaining new trees, but this is not a guaranteed line of funding. Actions that are not typically grant funded, like pruning and removing City managed trees, will require additional City funds to achieve goals like increasing the pruning cycle from the current 11 year cycle to a 5-to-7 year cycle. The City must also consider the future management needs of the urban forest that will require steps to sustainably remove declining tree species like the black walnut, and ensure canopy cover is preserved for current and future community members.

Key Finding #5, Prioritize Tree Planting on Commercial Corridors, Retail Centers, and Parking Lots: As stated, Chico benefits from a high level of city-wide canopy cover at 36%, but it is not equally distributed amongst all land use types. The canopy cover analysis when broken down by parcel type shows an average of 39% canopy cover across all residential home types, including 45% for single family home parcels, 45% for multi-family parcels, and 48% for rural residential properties. Conversely, the canopy cover analysis shows 21% for commercial parcels, 15% for retail parcels, and 10% for industrial parcels. It will be important to continue to plant and water new trees in residential communities to maintain canopy cover, but the greatest opportunity for

canopy cover increase exists with non-residential private property. This need was also identified by community members in the online survey data that shows respondents selected parking lots as the second highest priority, and Urban Forest Summit attendees as the highest priority, for where new trees should be planted.

3 Urban Forest Data

3.1 Urban Forest Sustainability

3.1.1 Canopy Cover Analysis

Canopy cover refers to the layer of leaves, branches, and stems that provide tree coverage of the ground when viewed from above. Tree canopy cover has a positive impact on communities as it provides many environmental benefits and services (Figure 1, Benefits of Trees), such as shade, cooler temperatures, improved air quality, improved stormwater quality, enhanced community character, improved mental and physical health, as well as an overall improved quality of life. Chico currently has a canopy cover of 36% within its developed area footprint (see Table 1 and Figure 2, Canopy Cover Map). This high level of canopy cover supports the statement that Chico is known as the "City of Trees" and that City-wide efforts to maintain the dense canopy cover are resulting in a robust urban forest.

Table 1. Land Covers and Canopy Cover

Land Cover Type	Canopy Cover Assessment			
	Acres (2020)	% Canopy (2020)	Acres (2005)	% Canopy (2005)
Tree	5,357	36%	5,197	35%
Landscape, shrubs, grasses	725	5%	2,052	14%
Impervious surfaces	6,113	41%	4,967	33%
Bare ground	2,580	17%	2,547	17%
Water	58	0.4%	63	0.4%

3.1.2 Canopy Equity

Achieving an equitable canopy cover is a challenge for most cities. Of the many benefits and services provided by the tree canopy, residents who live in areas with greater canopy cover receive more direct benefits from the surrounding trees than those who live in areas with lower canopy cover. Areas with low canopy cover are more susceptible to pollution, extreme heat, and associated potential health issues (Wolf 2020). As such, creating an equitably distributed canopy can help to create more equitable communities, where residents receive the same quality of life improvements provided by Chico's trees. Even with a dense tree canopy, some portions of Chico experience lower canopy cover, many of which coincide with areas of urban heat islands and increased vulnerability to pollution.

Figure 3 depicts urban heat islands in Chico overlaid with canopy cover, and Figure 4 depicts the CalEnviroScreen results for the City. The urban heat island effect occurs when urban areas experience higher temperatures relative to surrounding non-urban areas. Shade provided by robust tree canopy can help to reduce urban heat islands. CalEnviroScreen is an online mapping tool created by the Environmental Protection Agency that identifies pollution burden and vulnerability to the health effects of pollution in California communities (OEHHA 2018). The data is

presented as percentages that are mapped by census tract on a scale where 1%–10% are the least vulnerable and 90%–100% are the most vulnerable to pollution.

Census tracts with the greatest area of urban heat islands include tracts 6007000103 and 6007000401, which have a canopy cover percentage of 21% and 17%, respectively, and are among the census tracts with the lowest canopy cover in the City (see Table 2). However, these census tracts also have CalEnviroScreen scores of 10%–20% and 20%–30%, respectively, indicating that they are not highly vulnerable to pollution. These census tracts contain relatively new residential development and bare ground areas poised for development. Trees should be included as development occurs to help control urban heat.

Table 2. Census Tracts with High Concentrations of Urban Heat Islands

Census Tract	CalEnviroScreen Score	Canopy Percentage
6007000102	20%–30%	34%
6007000103	10%–20%	21%
6007000104	20%–30%	36%
6007000300	40%–50%	31%
6007000201	20%–30%	39%
6007000202	40%–50%	38%
6007000401	20%–30%	17%
6007000402	10%–20%	39%

The Benefits *of* TREES

CLEANER AIR
100 trees remove 53 tons of carbon dioxide and 430 pounds of other air pollutants per year.

COMBATS CLIMATE CHANGE
By reducing energy demand and absorbing carbon dioxide, trees and vegetation decrease the production and negative effects of air pollution and greenhouse gas emissions.

CAPTURES RAINWATER
100 mature trees can capture and store about 139,000 gallons of rainwater per year.

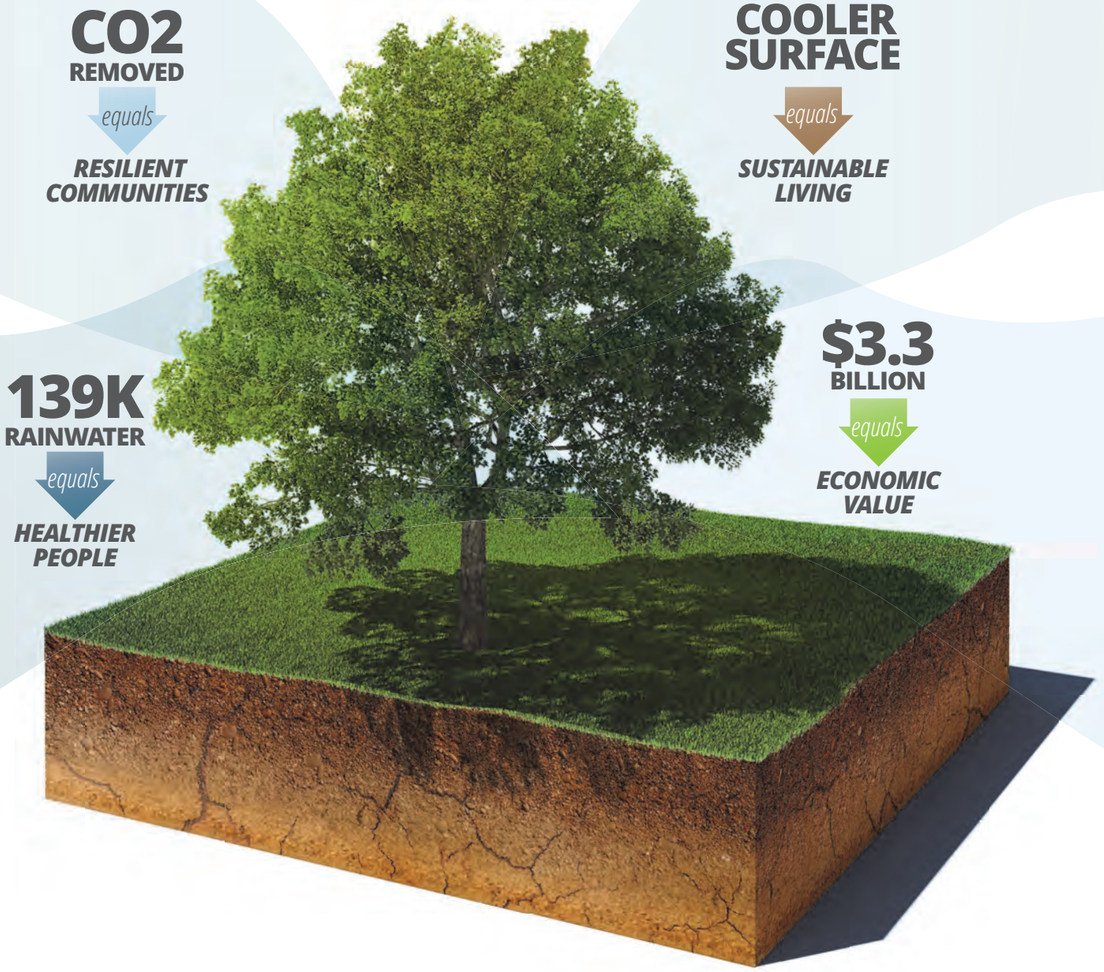
CLEANER WATER
A medium-sized tree intercepts up to 2,300 gallons of stormwater runoff per year.

CO2 REMOVED *equals* ***RESILIENT COMMUNITIES***

COOLER SURFACE *equals* ***SUSTAINABLE LIVING***

139K RAINWATER *equals* ***HEALTHIER PEOPLE***

$3.3 BILLION *equals* ***ECONOMIC VALUE***



SAVES ENERGY
Strategically placed shade trees can help save up to 56% on annual air-conditioning costs for homes and businesses.

REDUCES URBAN HEAT ISLAND EFFECT
Shaded surfaces may be 20–45°F cooler than the peak temperatures of unshaded areas.

INCREASES BUSINESS
Shoppers will spend 9% to 12% more for goods and services in business districts with a high quality tree canopy.

GREEN ECONOMY
In 2009, urban forestry supported 60,067 jobs in California resulting in $3.3 billion individual income.

IMPROVES PUBLIC HEALTH
People are less likely to be hospitalized for athsma when they live in neighborhoods with many trees.

IMPROVES MENTAL HEALTH
People living in neighborhoods with less than 10% tree canopy are more likely to report symptoms of depression, stress and anxiety.

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City of Chico Incorporated Area
Analysis Area
Land Cover
Impervious Surface (41%)
Bare Ground/Dead Vegetation (17%)
Low/Medium Height Vegetation (5%)
Tree Canopy (36%)
Water (<1%)

SOURCE: NAIP 2020

DUDEK

0 2,750 5,500 Feet

FIGURE **2**

Canopy Cover Map

City of Chico UFMP

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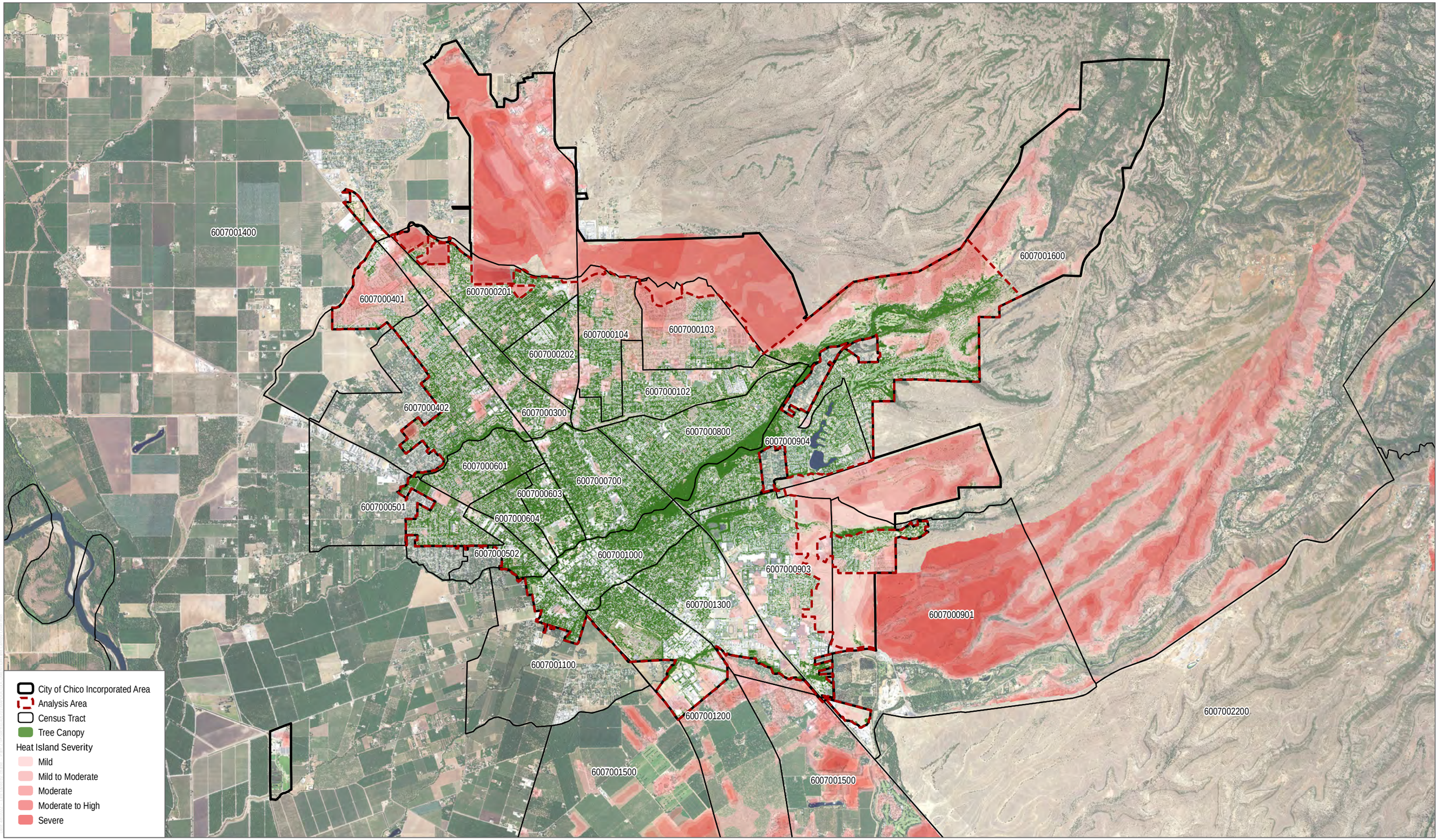

SOURCE: NAIP 2020

DUDEK

0 2,750 5,500 Feet

FIGURE **3**

Urban Heat Islands and Canopy Cover

City of Chico UFMP

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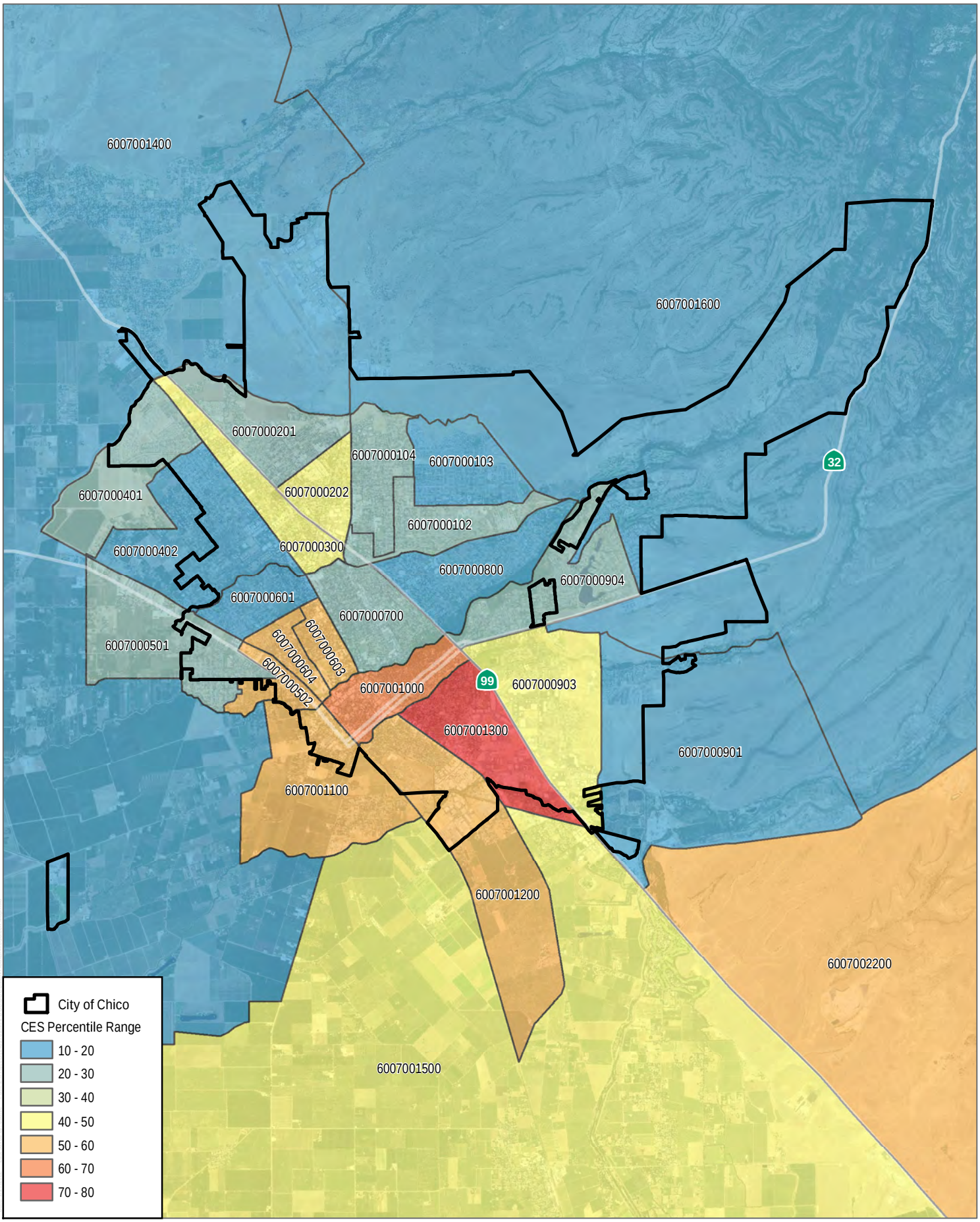

SOURCE:

DUDEK

FIGURE **4**

CalEnviroScreen Map

City of Chico UFMP

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Increasing Canopy Cover

Achieving a 40% canopy cover over the next 40 years is a realistic and achievable goal for Chico. Table 3 depicts the number of trees of varying canopy sizes that would need to be planted to increase canopy to a given percentage. As shown below, the City would need to plant 4,800 20-foot canopy trees, 1,567 35-foot canopy trees, 768 50-foot canopy trees, or 341 75-foot canopy trees per year over the next 40 years to achieve a 40% canopy cover. In reality, it is anticipated that planting 20,000 trees on both public and private property, with a combination of tree sizes, would be required to achieve a 40% canopy cover.

Table 3. Number of Trees Needed Per Year to Increase Canopy Cover

Total Canopy Cover	20-Foot-Diameter Canopy	35-Foot-Diameter Canopy	50-Foot-Diameter Canopy	75-Foot-Diameter Canopy
37%	1,018	332	163	72
38%	1,559	509	249	111
39%	2,099	685	336	149
40%	4,800	1,567	768	341
45%	7,501	2,448	1,200	533
50%	10,203	3,330	1,632	725

Annual planting goals should be adjusted each year based on progress made in the previous year. As such, the 5-year milestones shown in Table 4 can be used to help the City monitor progress.

Table 4. Total Trees Planted Every 5 Years

Total Canopy Cover	20-Foot-Diameter Canopy	35-Foot-Diameter Canopy	50-Foot-Diameter Canopy	75-Foot-Diameter Canopy
40%	24,000	7,834	3,839	1,706

3.1.3 Species Diversity

Chico's tree inventory consists of 34,874 trees, composed of 120 genera and 321 species. The top 10 genera and species are shown in Tables 5 and 6 and depicted on Figures 5 and 6. Sustainability goals are as follows[1]:

- **Sustainability Goal (Genus):** No genus represents more than 10% of inventory.
- **Sustainability Goal (Species):** No species represents more than 5% of inventory.

Table 5. Genus Diversity

Rank	Genus	Number of Trees	Percentage of Inventory[a]
1	*Acer* (maples)	6,340	18%
2	*Quercus* (oaks)	5,099	15%
3	*Pistacia* (pistaches)	2,833	8%

[1] Genus and species sustainability goals are based on Barker 1975, "Ordinance Control of Street Trees."

Table 5. Genus Diversity

Rank	Genus	Number of Trees	Percentage of Inventory[a]
4	*Platanus* (sycamores)	2,640	8%
5	*Lagerstroemia* (crape myrtles)	2,280	7%
6	*Juglans* (walnuts)	1,631	5%
7	*Celtis* (hackberries)	1,226	4%
8	*Fraxinus* (ashes)	1,199	3%
9	*Zelkova* (zelkova)	954	3%
10	*Nyssa* (tupelos)	849	2%
	Total	**25,051**	**72%**

Source: Davey Resource Group 2021.
Note: The sustainability goal is that no genus represents more than 10% of inventory (Barker 1975).

Table 6. Species Diversity

Rank	Botanical Name	Common Name	Number of Trees	Percentage of Inventory[a]
1	*Pistacia chinensis*	Chinese pistache	2,830	8%
2	*Quercus lobata*	valley oak	2,661	8%
3	*Acer rubrum*	red maple	2,297	7%
4	*Lagerstroemia* spp.	crape myrtle	2,276	7%
5	*Platanus* × *hispanica*	London plane	1,302	4%
6	*Juglans hindsii*	Northern California black walnut	1,253	4%
7	*Acer platanoides*	Norway maple	1,075	3%
8	*Acer* × *freemanii*	Freeman maple	992	3%
9	*Zelkova serrata*	Japanese zelkova	954	3%
10	*Celtis sinensis*	Chinese hackberry	875	3%
		Total	**16,515**	**47%**

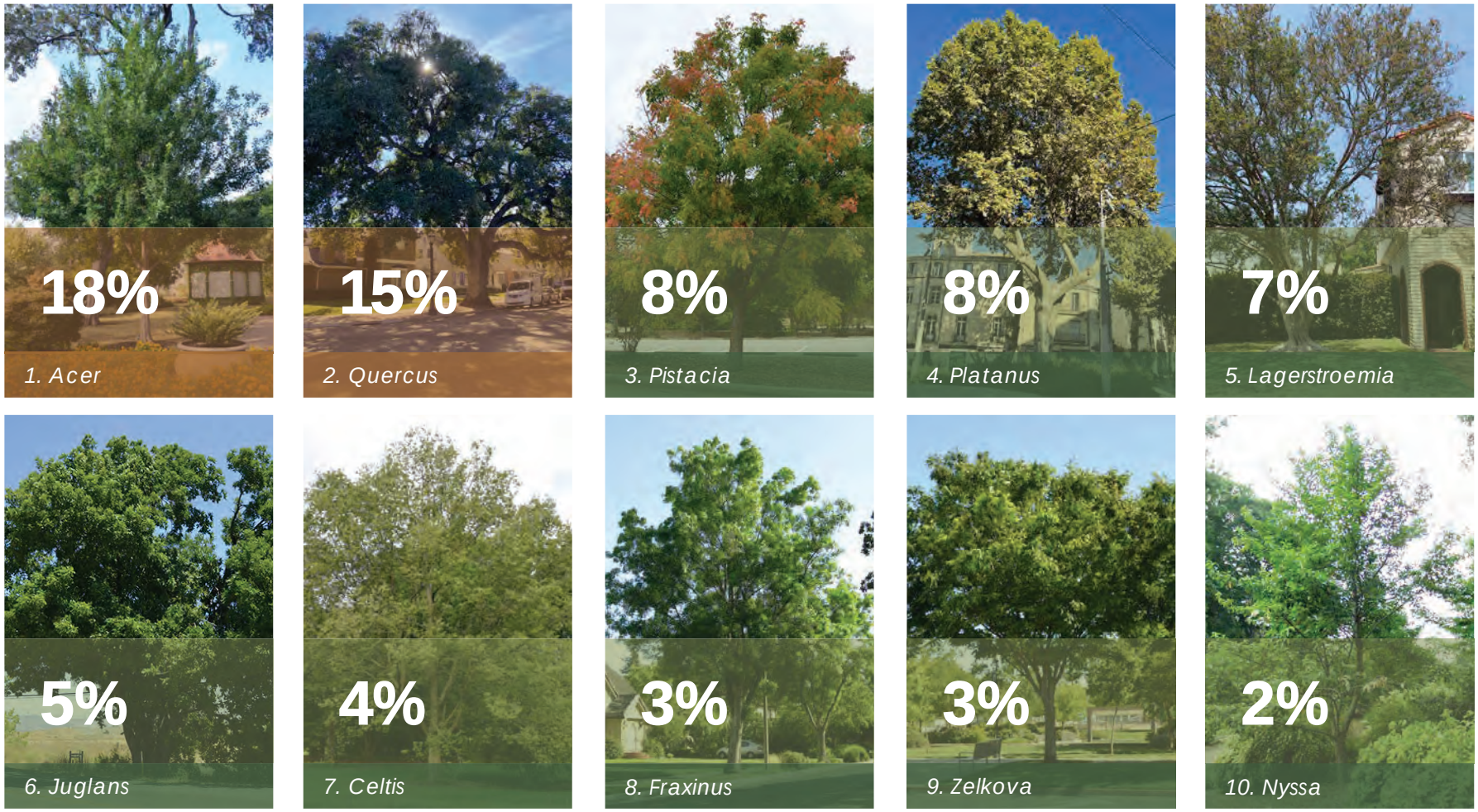
Source: Davey Resource Group 2021.
Note: The sustainability goal is that no species represents more than 5% of inventory (Barker 1975).

Genus Diversity

TOP 10 Genera in the City of Chico Tree Inventory

Sustainability Goal: No Genus Greater than 10% of Inventory

Meets Goal **Does Not Meet Goal**



Source: City of Chico Tree Inventory (Davey Resource Group 2021).

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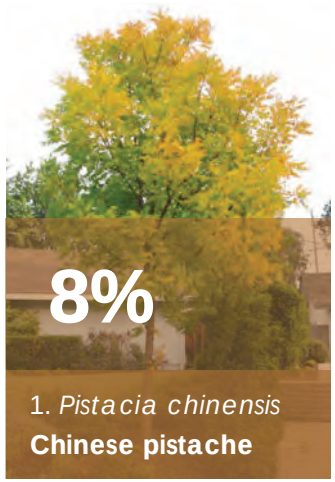
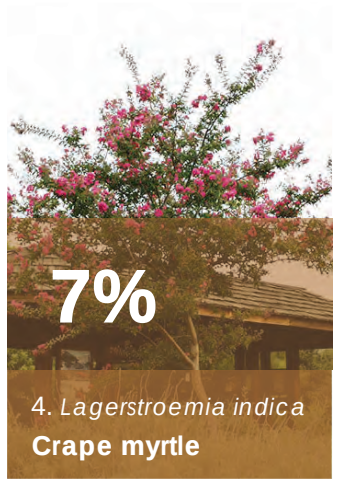
Species Diversity

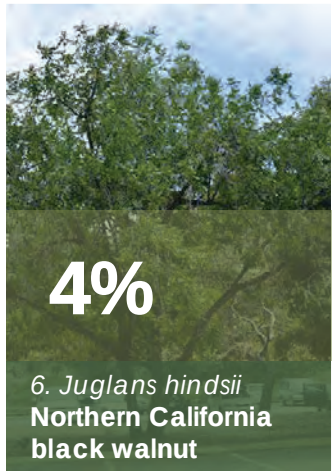
TOP 10 Species in the City of Chico Inventory

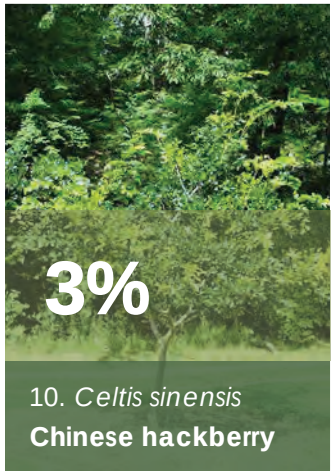
Sustainability Goal: No Species Greater than 5% of Inventory

Meets Goal | Does Not Meet Goal









Source: City of Chico Tree Inventory (Davey Resource Group 2021).

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3.1.4 DBH Distribution

Table 7 presents a summary of data showing recommended distribution of trees by DBH.

Table 7. Recommended DBH Distribution

Age Category	DSH (inches)	Number of Trees	Recommended Percentage of Tree Inventory[a]	% of inventory
Immature	1–6	11,861	40%	34%
Young	7–18	14,493	30%	42%
Middle-aged	19–24	2979	20%	9%
Mature	25+	5542	10%	16%

Source: Davey Resource Group 2021.
Note:
[a] Recommended percentages are based on Morgenroth et al. 2020 and Richards 1983.

3.1.5 Tree Condition and Relative Performance Index

The tree conditions represented in Chico's tree inventory are shown in Table 8.

Table 8. Tree Condition and Relative Performance

Condition	Number of Trees	Percentage
Very good	267	1%
Good	18,678	54%
Fair	13,068	37%
Poor	2,454	7%
Critical	192	1%
Dead	197	1%
Total	**34,856**	**100%**

Source: Davey Resource Group 2021.

The relative performance index (RPI) identifies which species are doing well and which may be underperforming. Trees with an RPI of 1 or higher are performing as well or better than the entire inventory.

The relative performance index of the top 10 species in Chico's Inventory are shown in Table 9. The performance goal is as follows:

- **Performance Goal:** Top 6 species have an RPI score of 1.0 or higher.

Table 9. Relative Performance Index

Rank	Botanical Name	Common Name	RPI
1	*Pistacia chinensis*	Chinese pistache	1.20
2	*Quercus lobata*	valley oak	0.72
3	*Acer rubrum*	red maple	1.18

Table 9. Relative Performance Index

Rank	Botanical Name	Common Name	RPI
4	*Lagerstroemia* spp.	crape myrtle	1.26
5	*Platanus* × *hispanica*	London plane	0.87
6	*Juglans hindsii*	Northern California black walnut	0.04
7	*Acer platanoides*	Norway maple	0.94
8	*Acer* × *freemanii*	Freeman maple	1.40
9	*Zelkova serrata*	Japanese zelkova	1.05
10	*Celtis sinensis*	Chinese hackberry	0.95
		City Inventory Total[a]	0.55

Source: Davey Resource Group 2021.
Notes: RPI = relative performance index.
The RPI is based on data from the U.S. Forest Service Center for Urban Forest Research.
[a] Total is not additive.

3.1.6 Environmental Services and Economic Benefits

Chico's tree inventory was assessed using i-Tree eco and is determined to provide the environmental services and benefits shown in Table 10 (see also Appendix A, i-Tree Report).

Table 10. Environmental Services and Benefits

Service	Annual Environmental Benefit	Annual Environmental Impact	Annual Economic Value
Carbon Sequestration	626,000 pounds	The carbon removed from the City's tree inventory is equivalent to the emissions of 226 cars driven per year.	$53,400
Avoided Runoff	12,680 cubic feet	This benefit is the equivalent to the 1.5 times the amount of water the average American home uses in 1 year.	$8,470
Pollution Removal	15,913,000 pounds	The pollution removed by the City's tree inventory is equivalent to the carbon dioxide emissions of 7,977,953 pounds of burned coal.	$10,300

Source: Davey Resource Group 2021.

The financial value of Chico's tree inventory is laid out in Table 11.

Table 11. Tree Inventory Value

Value	Description	Asset Amount	Per-Tree Value
		Number of City-Managed Trees	34,874
Structural	Tree replacement cost	$139,000,000	$3,985.78
Functional	Value based on the services trees perform	$72,170	$2.07
Carbon Storage (carbon held in tree)	23,450 tons stored	$4,000,000	$114.69

Source: Davey Resource Group 2021.

3.2 Urban Forest Management

3.2.1 Staff

The City uses a combination of in-house staff and external contractor services to maintain and manage the City's urban forest. The total number of Full Time Equivalents (FTEs) involved with tree management for Chico is 8.25 (Table 12), which is lower than the average number of FTEs (11.8) for urban forest programs of cities with comparable population sizes (Hauer and Peterson 2016a).

Table 12. City of Chico Tree-Related Staff Positions

Type	Number of Positions	Number of FTEs
Management Director/Supervisor	3	3.0
Arborist/Tree Trimmer	5[a]	5.0
Clerical/Office Support	1	0.5
Seasonal Employee	1	1.0
Internship	1	0.50
Nonprofit	1	0.25
Total	12	10.25

Notes: FTE = full-time employee.

[a] A new FTE (maintenance worker) was approved in the 2022/2023 budget approval process.

In addition to City staff positions, the City holds contracts with private tree-care businesses to carry out additional tree management tasks, such as planting, pruning, tree and stump removal, and storm cleanup. The relative percentages of tree management work carried out by these contractors are shown in Exhibit 1.

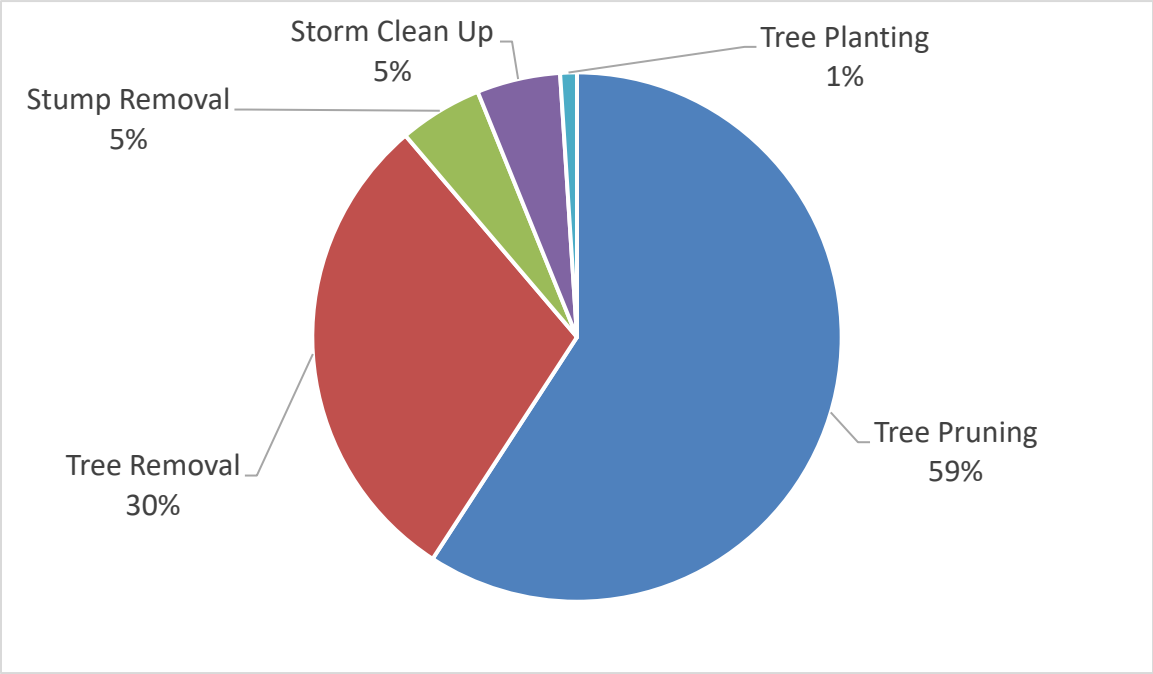

Exhibit 1. Distribution of Contractor Workload

3.2.2 Budget

The 2020–2021 budget provided to the City's Urban Forest program was $2,287,403 (Table 13). The sources of the program budget are presented in Exhibit 2.

Table 13. 2020-2021 Total Municipality-Funded Tree Care & Management Budget

Tree Management Areas	Budget
Tree Maintenance Funding[a]	
Street Trees	$1,656,395
Park Trees	$121,661
Public Ground Trees	$226,000
Nursery Tree Maintenance	$44,573
Infrastructure Repairs	$450
Total	**$1,823,079**
City Staff Salary Funding	
Public Works Director: 0.1 FTE[a]	$19,707
Manager[a]: 1 FTE	$95,599
Supervisor[a]: 1.2 FTE	$159,019
Arborist/Tree Trimmer[a]: 4 FTE	$343,232
Clerical/Office Support[a]: 1 FTE	$61,222
Seasonal Employee[a]: 1 FTE	$48,395
Internship: 0.5 FTE	$6375

Table 13. 2020–2021 Total Municipality-Funded Tree Care & Management Budget

Tree Management Areas	Budget
Nonprofit: 0.5 FTE	$17,829
Total	**$751,380**
Contractor Services	
Tree Pruning	$278,685
Tree Removal	$133,639
Stump Removal	$25,000
Storm Cleanup	$25,000
Tree Planting	$2,000
Total	**$464,324**
Total Urban Forest Program Funding	
Total	**$2,287,403**
Per-Tree Spending	**$65.59**

Notes: FTE = full-time employee.
[a] City staff salary breakdown is Included in tree maintenance funding.

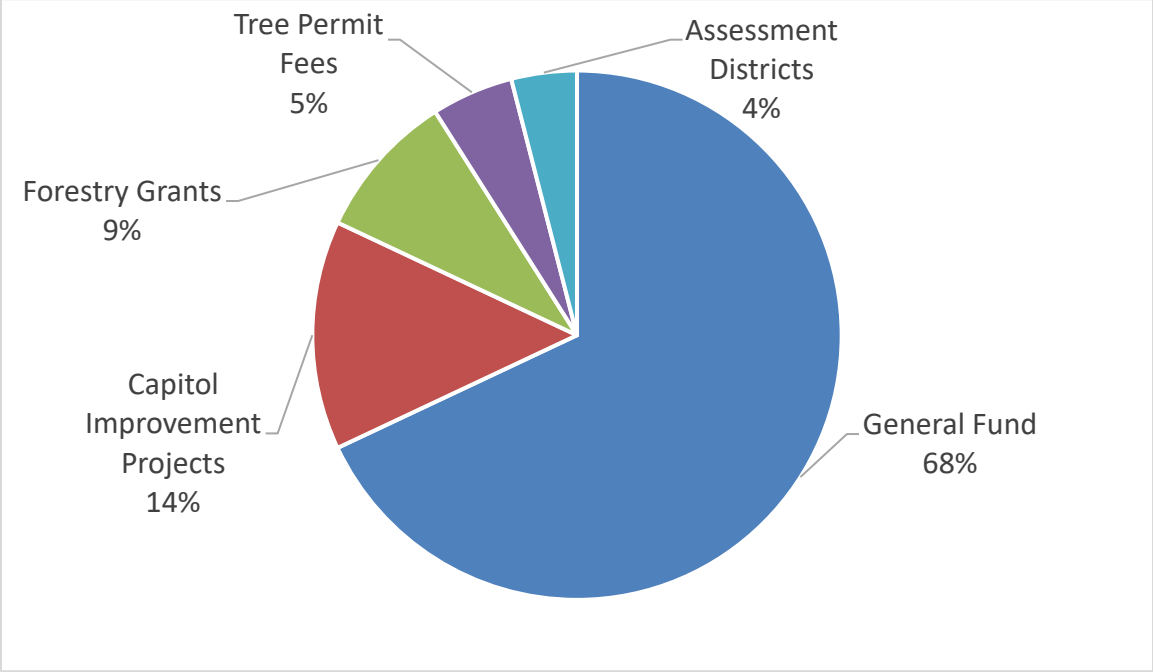

Exhibit 2. Chico's Urban Forest Program Funding Sources

3.2.3 Annual Service Data

Annual service data relating to tree maintenance and assessment are provided in Table 14.

Table 14. Annual Tree Service Data

Tree Planting	Establishment Care	Tree Pruning	Tree Removal	Urban Wood Reuse	Tree Inspection and Assessment
Leveraged existing City funds to obtain two CAL FIRE grants in the amount of $604,681 for the 'Seeds to Shade' tree planting project, and another $425,811 for the 'Urban Forest Revitalization Project' towards planning to support tree planting efforts.	3–5 years of establishment care is provided to newly planted trees.	The City currently operates an 11- to 12-year pruning cycle, with approximately 2,947 trees pruned per year. This is below a recommended 5-7-year municipal pruning cycle.	Approximately 294 trees are removed per year.	City-operated chipping program to be used as a local mulch source.	Level 1 and Level 2 tree risk assessments are performed on City-maintained trees, as needed.
1,000 new trees to be planted by 2025	Care is provided by homeowners adjacent to new tree in ROW or by City staff.				
	Homeowner is provided a drip bag and instruction manual.				

Notes: CAL FIRE = California Department of Forestry and Fire Protection; ROW = right-of-way.

3.3 Community Engagement

3.3.1 Public Survey

An online survey in English and Spanish was created to identify the public's perception and understanding of the City's trees, and to offer a space for public feedback as the City developed its UFMP. The 29-question survey was open between June 14, 2021, and April 20, 2022, and was distributed through various City social media outlets, local newspapers, door to door canvassing, farmers markets, the Urban Forest Summit, and communications sent by City staff and BEC. In total, 316 survey responses were recorded. A summary of themes is included in Table 15.

Table 15. Summary of Public Survey and Responses

Topic	Responses
Communication and marketing of the Urban Forest program	▪ 21% knew of the City's tree care activities, and learned about them through various media outlets ▪ 16% had visited the City's website to get more information on tree care ▪ 53% learned about the survey on social media or from an email
Views of trees as a City asset	▪ 72% view trees as equally important as other City-maintained infrastructure ▪ 97% believe the trees contribute to their quality of life ▪ 75% strongly agreed or agreed that residents should be encouraged to increase number of trees on their property
Threats facing trees in Chico	▪ 31% view drought as the most important threat facing trees in Chico ▪ 32% view water use and risk of falling branches as the top two concerns of respondents to growing trees on their property
Trees on public property	▪ 68% of responses want to see more trees planted in parks and open spaces, and parking lots ▪ 63% selected growing needs, water needs, and suitability to Chico's climate as the most important factors to consider when selecting a tree to plant
Opinions on tree protection ordinances	▪ 65% were in support of the tree protection ordinance (Chapter 14 of the Municipal Code) ▪ 62% were in support of the tree protection during construction ordinance (Chapter 16 of Municipal Code) ▪ 34% would support a tree protection ordinance that extends to all trees, and 15% would support the ordinance only for trees of a certain size/species. ▪ 14% would oppose extending the tree protection ordinance to existing development
Outreach campaigns to strengthen the urban forest	▪ Tree species selection and maintenance/care (29%), assistance with maintenance and care costs (27%), healthy trees on private property. ▪ To assist the City with reaching its canopy cover goals, respondents were willing to plant and maintain trees on their property, attend educational workshops, volunteer at community tree plantings, and volunteer to water City-owned trees near their property

3.3.2 Urban Forest Summits

The first Urban Forest Summit was held at the Arc Pavilion on July 31, 2021. The summit introduced community members to the UFMP, provided preliminary inventory and community survey data analysis, and created a venue for community members to voice their opinions and perceptions about the City's urban forest. The summit was

attended by 59 individuals, who completed a voluntary demographic survey to help the City understand who attended the event. The success of this model was presented at the International Society of Arboriculture 2021 Virtual Conference.

Attendees shared the ideas and opinions shown in Tables 16 and 17.

Table 16. Post-It Activity Response Themes

What do you love about Chico's trees?	What should improve about Chico's trees?	What do you hope for the future of Chico's trees?
▪ Shade and cooling ▪ Habitat for wildlife ▪ Diversity ▪ Beauty ▪ Fall colors ▪ Maturity and size ▪ Environmental and health benefits ▪ Iconic to Chico's history	▪ More funding ▪ More education for community members ▪ Improved tree maintenance ▪ Collaboration with utility companies ▪ Improved planning and development ▪ Improved maintenance ▪ Increased tree planting in specific locations ▪ Species selection	▪ More trees in specific areas ▪ Better aligned planning and development ▪ More healthy, larger trees ▪ More native trees ▪ More edible trees ▪ More climate-adapted species

Table 17. Guided Brainstorming Activity Themes

Engage: How do we get more residents involved in the urban forest?	Preserve: How do we help preserve the existing urban forest?	Grow: Where/how can we get more trees planted on non-City-owned land?
▪ Improved marketing/outreach campaigns ▪ Public education campaigns ▪ Citizen science programs ▪ Focus on climate change	▪ Protecting existing trees in developed areas ▪ Protecting existing trees in undeveloped space and during construction ▪ Protecting trees in general ▪ Increased education	▪ Host events and contests to incentivize tree planting ▪ Protect private trees ▪ Improved development and planning ▪ Proper planting and establishment care ▪ Increased education ▪ Appropriate enforcement of ordinances ▪ Plant trees in specific locations

3.3.3 Working Group

The City's UFMP Working Group was formed to bring together City staff, Chico Area Recreation and Park District (CARD) staff, environmental non-profit staff, and community members to help advise the UFMP's development. A list of the Working Group's members and their areas of expertise is included in Table 18. Four working group meetings were held between July 2021 and XXX, and each meeting was facilitated by the consultant team.

Table 18. Chico's Urban Forest Master Plan Working Group Members

Name	Affiliation	Area of Expertise
Richie Bamlet	City of Chico	Urban forestry
Bill Smith	City of Chico, Registered Professional Forester, former Bidwell Park & Playground Commissioner	Urban forestry
Megan Thomas-Petty	Bidwell Park & Playground Commission, Tree Committee	Urban forestry
Aaron Haar	CARD, Parks Commission, Tree Committee	Parks and recreation, tree maintenance
Robin McCollum	Chico Tree Advocates	Urban forestry
Ken Chase	Chico landscape Industry	Landscape architecture
Caitlin Dalby	Butte Environmental Council	Environmental non-profit sector, City grant partner
Julia Gowin	CAL FIRE	Urban forestry
Mike Sawley	City of Chico	City planning
Jason Bisho	Chico landscape industry	Landscape architecture
Joe Glacken	CARD	Parks and recreation, tree crew
Garrett Liles	Chico State University Professor	Soil ecology
Luke Pyle	CARD	Parks and recreation, crew foreman

Note: CARD = Chico Area Recreation and Park District; CAL FIRE = California Department of Forestry and Fire Protection.

3.4 City-Wide Planting Plan

A City-wide tree planting plan was developed to assist the City in determining the number of available street tree planting locations in neighborhoods, and the appropriate species for those locations The available planting locations are derived from the current inventory, broken down by the 99 neighborhoods within the City (see Figure 7, Neighborhoods with Future Tree Planting Sites), and includes the type of planting location (parkway, median, front-yard, etc.) and the size of the planting space. The planting plan also includes the top ten species planted within each neighborhood to inform what species could be planted to increase species diversity. Finally, the combination of available locations, planter space, and species diversity is compared against the recommended tree species planting list to narrow down which species would be appropriate for the individual locations. The planting plan is included in Appendix B.

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City of Chico

Future Planting Sites

367	81
259	80
256	75
236	74
234	70
215	68
198	65
186	59
183	56
177	55
174	41
160	34
159	32
158	30
136	23
133	20
130	19
129	17
126	16
109	14
105	12
99	9
97	7
95	6
93	5
89	4
88	3
	2
	1

SOURCE: NAIP 2020

DUDEK

0 2,300 4,600 Feet

Neighborhoods with Future Tree Planting Sites

City of Chico

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3.5 Strategic Plan

The City of Chico's Strategic Plan is the method by which it will progress towards achieving its vision over a 40-year timeframe. Below is a description of the various Strategic Plan components and how they relate to each other:

- **Vision statement**: Expresses the future desired state of the City's urban forest over 40 years.

Guiding principles: Further defines the vision statement by the specific values of the City, community members, and stakeholders and the priorities they wish to address in the UFMP.

- **Goals:** The specific and measurable ways the City can measure progress towards achieving its Vision.
- **Action:** The specific steps to be accomplish to progress towards reaching a goal.

The following vision statement, guiding principles, goals, and actions were developed based on the UFMP analysis process, and input provided by City staff during interviews, the Working Group, and community members.

3.5.1 Vision

Our urban forest is a resilient network of trees that is sustainably managed by the City and residents, providing equitable social, economic, and ecosystem benefits to all residents and habitat for wildlife, and reflects Chico's identity and legacy as the City of Trees.

3.5.2 Guiding Principles

The Guiding Principles reflect the overall vision and help to direct the goals and objectives of the UFMP. These are presented, with definitions, in Table 19.

Table 19. Guiding Principles of the Urban Forestry Management Plan

Guiding Principle	Definition
A Connected Community	All cultures, histories, and perspectives are welcomed and work together to strengthen the urban forest.
The Comfort of Trees	The urban forest protects and enhances the physical, mental, and emotional well-being of Chico community members and provides habitat for wildlife.
Start with Trees	Growth and development in the City will prioritize trees in the planning process and maximize the available space to expand tree canopy cover.
Sustainable Resources	The urban forest program will have the human and financial resources necessary to reach its long-term vision.

3.5.3 Strategic Plan

Guiding Principle: A Connected Community

Goal	
1.	By 2037, engage at least 20% of residents through outreach and engagement efforts that is representative of all residential types and demographics within the City of Chico.
Action Items	
1.a	Develop a comprehensive education program to enhance community member understanding of tree maintenance practices including planting, establishment care, pruning, and the importance of continuing to water trees to maintain tree health during drought conditions.
1.b	Prioritize tree planting efforts to the residential parcel types that have the lowest levels of canopy cover, including mobile home parks, rural residential, and suburban areas.
1.c	Develop an incentive program that offsets the cost to water a newly planted tree over one year, when residential property owners elect to provide establishment care for a newly planted City-managed tree.
1.d	Collaborate with a local utility company to develop a free residential shade tree giveaway program.
1.e	In partnership with the Butte Environmental Council, hold quarterly community engagement activities such as tree planting and care events, educational workshops, and free tree give aways.
1.g	Develop an urban forest advisory committee consisting of City staff, community members, and other invested stakeholders to ensure a broad range of voices have a say in urban forest practices in Chico.
1.h	Grow the network of community partners, to assist in community engagement and outreach activities.
1.i	Identify both communities and places of interest to focus engagement efforts.

Guiding Principle: The Comfort of Trees

Goal	
2	By 2032 increase tree canopy cover across all land use types by engaging all identified nonresidential stakeholders.
Action Items	
2.a	Enforce municipal code Municipal Code 19.70.60, which requires parking lots to be covered with 50% shade.
2.b	Provide resources to Butte Environmental Council to conduct outreach and engagement efforts to businesses along commercial corridors and retail centers.
2.c	Develop a comprehensive educational program for commercial, retail, and industrial landowners on how trees add economic value to their business or property, City standards, proper tree maintenance practices, and the importance of continuing to water trees to maintain tree health during drought conditions.
2.d	Develop an urban forest coalition comprised of other significant local and regional landowners like Chico Area Recreation and Park District, Chico Unified School District, Chico State University, Mechoopda Tribe, Butte County, utility companies, and others to ensure shared urban forest goals and policies.
2.e	Increase canopy cover by 50% across all non-City-managed land use types by 2042.
2.f	Update municipal code Municipal Code 19.70.60 parking lot standards for tree planting that provides adequate space and soil volume to support long-term tree growth and health.
2.g	Ensure not net less of canopy cover on both public and private land.

Guiding Principle: The Comfort of Trees

Goals	
3.	Increase City-wide canopy cover to 40% by 2062.
Action Items	
3.a	Plant at least 500 more trees than are removed annually by the City.
3.b	Achieve a minimum stocking rate of 95% of all identified City-managed planting sites by 2042
3.c	Prioritize tree planting actions towards City-managed vacant sites on commercial corridors and neighborhoods with low canopy cover.
3.d	Select tree species for individual locations that will provide the highest possible canopy cover for the space given the planting area.
3.e	Develop City of Chico Best Practices Manual with alternative design standards for City infrastructure such as sidewalks, streets, and curb and gutters, that increase the available space and soil volume for trees, and likelihood of tree preservation when infrastructure conflicts occur.

Guiding Principle: The Comfort of Trees

Goals	
4	By 2032, the City-managed tree inventory will achieve target urban forest sustainability metrics.
Action Items	
4.a	Limit the planting of tree species that represent more than 5% of the City inventory including, Chinese pistache, valley oak, red maple, and crape myrtle.
4.b	Annually review the City recommended tree species list and update it as appropriate to ensure species are suitable for current and future climate conditions, are low water use, will achieve species diversity standards, and will prioritize well-adapted local and regionally native species.
4.c	Ensure that the top six most common trees in the City inventory have a relative performance index score of 1 or better.
4.d	Conduct an analysis of tree species in the inventory that are marked as poor or critical to further understand if they are suitable for the City recommended tree species list, or if they should be removed.
4.e	Adopt standards for green stormwater infrastructure projects to include trees. Update the tree species selection process for such projects to align with the standards established in the UFMP.
4.f	Provide resources and educational materials for private property owners on current and emerging threats to trees, such as drought, pests, and diseases, and steps they can take to improve tree health.

Guiding Principle: Start With Trees

Goals	
5	By 2032, City planning processes, ordinances, and policies will be aligned with the standards of the UFMP.
Action Items	
5.a	Review and update the Municipal Code Section 16.66: Tree Preservation Regulations to ensure that defined protected tree regulations apply to all private property regardless of qualifications, entitlements, or lot size.
5.b	Update the City Tree Preservation Regulations to apply to capital improvement projects, so trees removed through a project will require replacement.
5.c	Update the standards for new residential developments to require a neighborhood plan that will meet the adopted canopy cover goals of the UFMP.
5.d	Update the General Plan to adopt the canopy cover and urban forestry goals of the UFMP.
5.e	Update the General Plan to reference species selection, planting guidelines, and other best management practices identified in the UFMP.
5.f	Ensure the permit review process for landscape plans aligns with goals of the UFMP, and are approved in consultation with the City's urban forester or a City-qualified certified arborist prior to issuance of permits.
5.g	Review the placement of trees during the landscape plan review process to avoid impeding sight distance views at intersections.
5.h	Develop, standards and guidelines to better protect and preserve trees during construction.
5.i	Establish and implement a performance bond process for development projects to ensure trees are successful 5 years after planting.
5.j	Update the City Design Guidelines Manual to include tree planting guidance and landscape design standards that include minimum tree planting requirements by land use type.
5.k	Adopt a policy requiring trees in streetscape improvement projects.

Guiding Principle: Start With Trees

Goals	
6	By 2037, the City will have tree management practices and policies that lead to sustainable management of the urban forest.
Action Items	
6.a	Conduct an analysis of the Northern California black walnut (Juglans hindsii) species, to identify strategies that preserve trees in the short-term. and replace failing trees over the long-term.
6.b	Develop a long-term plan to replace failing trees based on the analysis of the Northern California black walnut (Juglans hindsii) species.
6.c	Achieve a 5-to-7-year pruning cycle. and inspection cycle of all City-managed trees.
6.d	Annually conduct a level 1 survey of all City-managed trees.
6.e	Complete first formative pruning of trees within 5 years after planting.
6.f	Provide all newly planted trees a minimum of 3 years of establishment care and watering.
6.g	Identify historic trees in Bidwell Park and develop additional protection, preservation, and maintenance standards appropriate for their age and condition.
6.h	Develop a program that provides incentives for tree removal companies to utilize removed trees in an urban wood reuse program.
6.i	Update standard details to align with the standards discussed in this UFMP (Section 5.3).
6.j	Implement the street tree planting plan included in this UFMP.

Guiding Principle: Sustainable Resources

Goals	
7	By 2037, the City will have the financial and human resources to fully support implementation of the UFMP.
Action Items	
7.a	Achieve appropriate funding to meet Goal OS-6 of the General Plan, to ensure a healthy and robust urban forest.
7.b	Continue to seek external funding sources that support tree planting and establishment care projects like the Community Choice Aggregation (CCA) program to reduce the energy load on the grid by providing shade trees to residents.
7.c	Conduct an analysis of mitigation and in-lieu fees to determine if fees are adequate to replace and care for newly planted trees, and adjust fees as appropriate.
7.d	Explore opportunities to leverage future development projects to increase resources for urban forest management.
7.e	Annually provide a report on the City's return on investment from the funding that is allocated to urban forest management.
7.f	Develop a process that incentivizes City staff to obtain Tree Risk Assessment Qualification (TRAQ) through the International Society of Arboriculture (ISA).
7.g	Ensure the City has funding to create a staff position or on-call contract for a certified arborist to effectively manage and implement planning policies on private property including code enforcement, site plan review, post-installation inspections.
7.h	Achieve one City tree crew per each of the seven maintenance zones and one City tree crew to manage Bidwell Park.
7.i	Ensure a City arborist is directly involved in reviewing new development designs, project permits, and removal applications to ensure best arboricultural practices are being instituted.
7.j	In partnership with other agencies, bring International Society of Arboriculture training opportunities to Chico that will help support the greater arboriculture industry north of Sacramento.

3.6 Implementation Plan

[This section will be developed after the Strategic plan is complete]

3.7 Monitoring Plan

[This section is being developed with support from the Working Group and City. A Vibrant Cities Gap Score Analysis is to be completed with the Working Group and will be used to complete the Monitoring Plan.]