COMMUNITY CANOPY
ASSESSMENT

VALDESE,
NORTH CAROLINA
MARCH | 2024
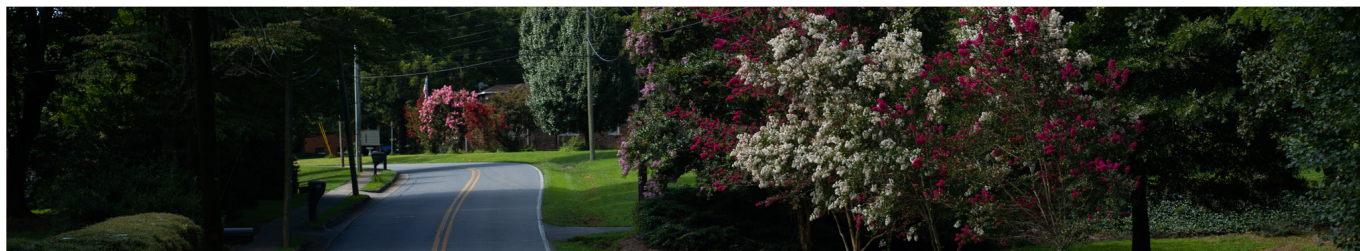
EXECUTIVE
SUMMARY

PURPOSE AND METHODS

Tree canopies are constantly changing. Growth and plantings add to the canopy, while development, disasters, disease, and pests can remove it. Canopy assessments based on aerial imagery can track these changes precisely. This report evaluates changes in tree canopy within Valdese, Burke County, North Carolina. Results are summarized at the public property, zoning, and census block group level to better understand how tree canopy is distributed in the town.

Based on 2022 imagery from the USDA's National Agriculture Imagery Program (NAIP), this study provides a near-current view of land cover in Valdese. The results enable the Town of Valdese to revise existing strategies and develop new ones for protecting and expanding the community forest. This study used machine learning techniques to create land cover data to facilitate more uniform comparisons in future tree canopy assessments. **Following US Forest Service standards, this assessment focuses on tree canopy as a percentage of land, excluding water.** The key goals of this tree canopy cover assessment include:

- **Quantify the amount and location of tree canopy and other land cover types**
- **Analyze the change in canopy cover from 2014 to 2022**
- **Measure the ecosystem services provided by the tree canopy**
- **Identify areas where tree canopy can be expanded (Possible Planting Area analysis)**
- **Provide data to inform future planning and to establish canopy coverage goals**

VALDESE'S COMMUNITY CANOPY

In 2022, more than two-thirds of Valdese was covered with tree canopy (68%). The remaining portion of the town was almost evenly split between areas suitable (17%) and unsuitable for planting (15%).

Valdese's tree canopy cover was assessed in 2014 and 2022. Over the 8-year study period, Valdese's tree canopy cover slightly increased. Within the current town boundary, tree canopy increased by 142 acres, a +2.9% increase from 2014 to 2022. While it's likely that the canopy coverage fluctuated over the past eight years, the imagery used in this assessment provides a snapshot of the canopy at the time the imagery was collected.
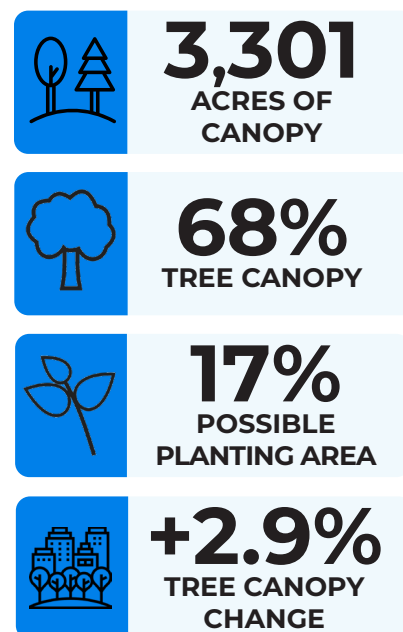
3,301
ACRES OF CANOPY

68%
TREE CANOPY

17%
POSSIBLE PLANTING AREA

+2.9%
TREE CANOPY CHANGE

Figure 1. Based on an analysis of 2022 high-resolution imagery.

PROJECT
METHODOLOGY

MAPPING LAND COVER

This assessment utilized high-resolution (60-centimeter) multi-spectral imagery from the US Department of Agriculture's National Agriculture Imagery Program (NAIP), collected in 2022, to derive land cover data and classify all types of land cover. Additionally, 1-meter resolution data from 2014 was utilized for historical tree canopy classification and change analysis.

The land cover data set, sourced from the EarthDefine US Tree Map (https://www.earthdefine.com/treemap/), provided a six-class land cover data set. EarthDefine employs machine-learning techniques to extract tree canopy cover and other land cover types from the latest 2022 NAIP imagery. Only the tree canopy land cover type was extracted from the 2014 imagery.

| TREE CANOPY | SHRUBS | OTHER VEGETATION | BARE SOIL AND DRY VEGETATION | IMPERVIOUS SURFACES | WATER |

Figure 2. This study identified six (6) unique land cover classes within the 2022 assessment imagery: tree canopy, shrubs, other vegetation, bare soil and dry vegetation, impervious surfaces, and water.

IDENTIFYING POSSIBLE PLANTING AREAS

In addition to quantifying Valdese's existing tree canopy cover, areas suitable for planting trees (PPA-Possible Planting Area) to increase canopy cover were identified. To identify PPA, areas absent of tree canopy cover were classified as either PPA or unsustainable for planting. Unsuitable areas for tree planting, such as recreation fields, utility corridors, landfills, airports, wastewater treatment areas, golf courses, etc., were manually delineated and overlaid with the existing land cover data set (Figure 3). The final classifications include PPA Vegetation, Unsuitable Impervious, Unsuitable Vegetation, Unsuitable Soil, and Water.

Figure 3. The study identified vegetated areas where it would be feasible for tree plantings but undesirable based on their current usage (left) in the data as "Unsuitable" (right).

STATE OF THE CANOPY AND
KEY FINDINGS

The results of this study can be used to design a strategic approach to managing existing canopy and identifying future planting areas. The land cover data presented below depicts the current town limits of Valdese as of 2024.

This assessment report focuses solely on the metrics within the Town limits and does not include unincorporated areas. Figure 4 illustrates the distribution of land cover in Valdese, **including water bodies.** Results showed that over two-thirds of the town (68%) was covered with tree canopy. Vegetation, such as grass and low bushes, accounted for approximately 17% of the town's land cover. Buildings and roads made up another 13%. Bare soil and shrub areas each constituted 1%, while water bodies represented less than 1% of the total area.

Land Cover Classification

- Non-Canopy Vegetation
- Soil and Dry Vegetation
- Impervious
- Water
- Tree Canopy
- Shrub
- Tree Canopy Over Impervious

Table 1. Land cover classes in acres and percent in Valdese.

Class	Acres	Percent
Tree Canopy	3,301	68%
Non-Canopy Vegetation	838	17%
Impervious Surfaces	626	13%
Shrubs	62	1%
Soil/Dry Vegetation	54	1%
Water	11	<1%

Figure 4. Land cover classification results (percentages based on the total area of Valdese's boundary including water bodies).

TOWN-WIDE TREE CANOPY COVER

Excluding the 11 acres of surface water, the town occupied 4,883 acres of land. In 2022, 68% of Valdese's land area was covered by tree canopy and 17%, or 850 acres, were available to plant trees (PPA). However, it is not feasible to plant trees in certain land cover categories. The 15% of land considered unsuitable was mainly attributed to the presence of 629 acres of impervious surfaces.

In 2014, Valdese had 3,159 acres of tree canopy, indicating that the town has gained canopy (3% increase or 142 acres) over the eight-year study period.

Tree Canopy Potential

- Tree Canopy
- PPA Vegetation
- Unsuitable Vegetation
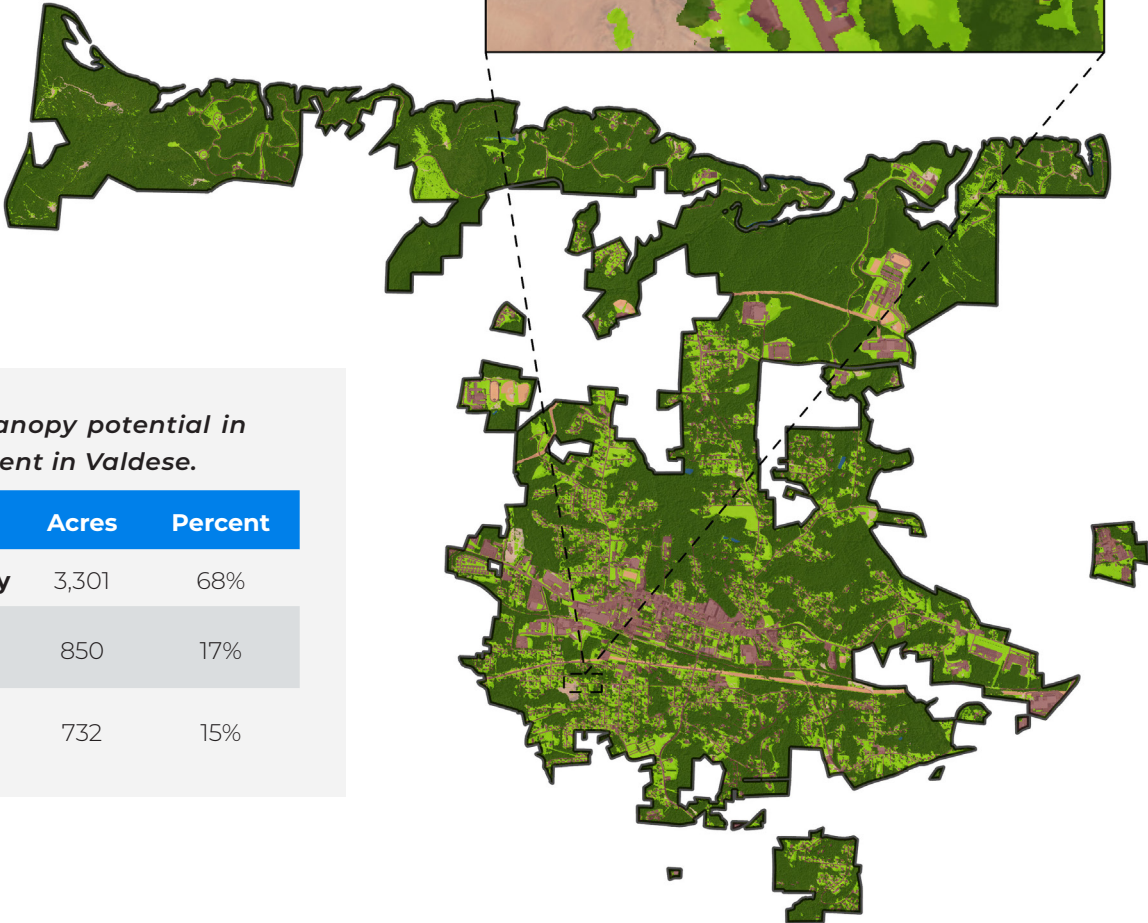- Unsuitable Impervious
- Unsuitable Soil
- Water

Table 2. Tree canopy potential in acres and percent in Valdese.

Class	Acres	Percent
Existing Canopy	3,301	68%
Possible Planting Area	850	17%
Unsuitable Planting Area	732	15%

Figure 5. Distribution of tree canopy possible planting area, and areas unsuitable for tree canopy within the Town of Valdese.

Valdese gained 3% tree canopy cover between 2014 and 2022.

TREE CANOPY COVER BY ZONING

Tree canopy was assessed on nine zoning classes to identify relationships between the town's permitted land uses and tree canopy cover. This approach provides insights for urban planning and environmental management, facilitating targeted strategies for sustainable urban development.

Residential zones (R-12A, R-12, and R-8) comprised 80% of the town's total land. These zones contained nearly 90% of all tree cover (2,894 acres), making these the most significant zones in the town in terms of total tree canopy coverage. Of the three residential zoning types, zone R-8 had the most opportunity to grow its canopy, with 25% (194 acres) of its area suitable for planting trees. Similarly, the R-12 Residential zone presents a significant opportunity for tree planting, with over 300 acres of viable land. Theoretically, this area could increase its canopy cover from 69% to 90% if the 317 acres of potential planting area (PPA) were fully utilized..

From 2014 to 2022, the Residential R-8 zone experienced the largest growth, gaining 79 acres of tree canopy, which translates to a 10% increase. All zoning classes either experienced gains in canopy cover or remained relatively stable, with no zoning class losing more than 1% of its canopy cover over the eight-year period.

Table 3. Tree canopy and possible planting acres, percent, and percent distribution by zoning classes.

| Zoning Classes	Distribution of Land Area (%)	TC (%)	Total PPA (%)	Total Unsuitable (%)	2014-2022 Change (%)
B-1 Business	1%	11%	17%	71%	-1%
B-2 Business	3%	43%	21%	36%	5%
M-1 Manufacturing	9%	49%	19%	32%	4%
O-I Business	1%	32%	30%	38%	2%
R-12 Residential	33%	69%	21%	10%	2%
R-12A Residential	36%	85%	10%	6%	0%
R-8 Business	0%	46%	34%	20%	5%
R-8 Manufacturing	0%	78%	17%	5%	-1%
R-8 Residential	17%	62%	25%	13%	10%
Totals & Averages	**100%**	**70%**	**17%**	**13%**	**+3%**

TREE CANOPY COVER BY CENSUS BLOCK GROUPS

The town's census block groups represent clusters of smaller census blocks organized into even population divisions. These areas are critical for assessing the equitable distribution of tree canopy, and can be readily linked to demographic and socio-economic data published by the American Community Survey (ACS).

The largest block group (37-023-020901-1) in the town, which encompasses most of downtown north of Main Street and extends through Valdese Lakeside Park, has the most tree canopy area (1,159 acres) and the third-highest canopy coverage (68%). On the other hand, the block group (37-023-020902-2) containing most of downtown south of Main Street has the lowest tree canopy coverage (41%). This block group is identified as 37-023-020902-2. In addition to current canopy coverage, block group 37-023-020902-3, located south of the town center within the contiguous boundary, has the highest percentage (26%) of its total area available for future planting, equaling 147 acres.

Among the seven block groups, six gained canopy while only one experienced a loss throughout the eight-year study period. The block group (37-023-020801-1) encompassing the northwest portion of the town experienced the only net decrease, losing of 40 canopy acres.

Figure 6. Tree canopy percentage by census block group.
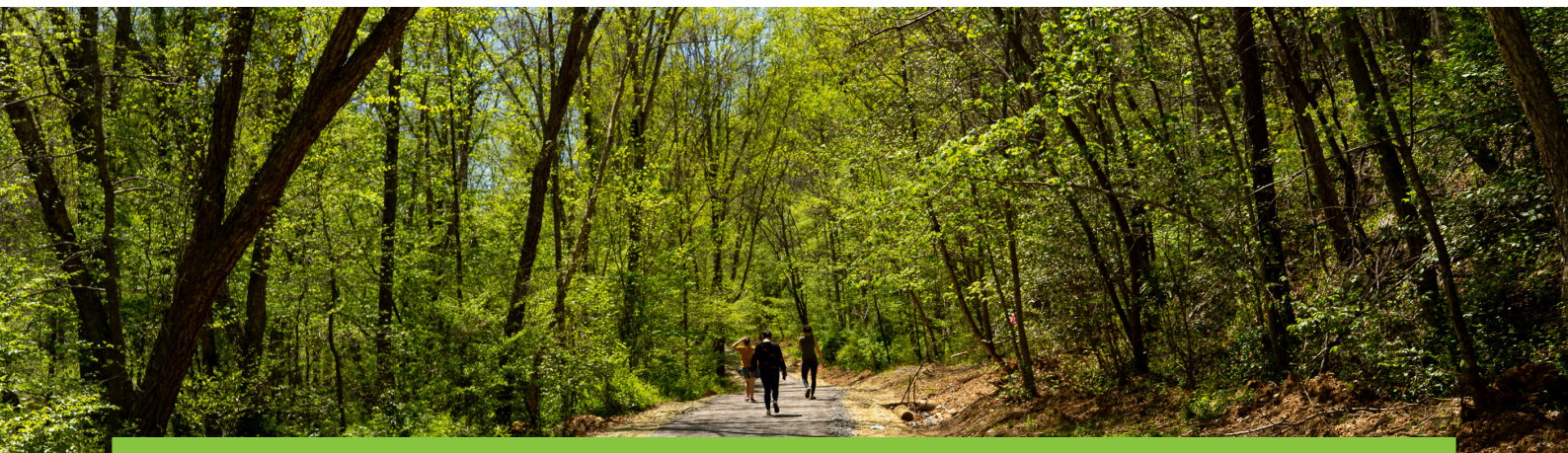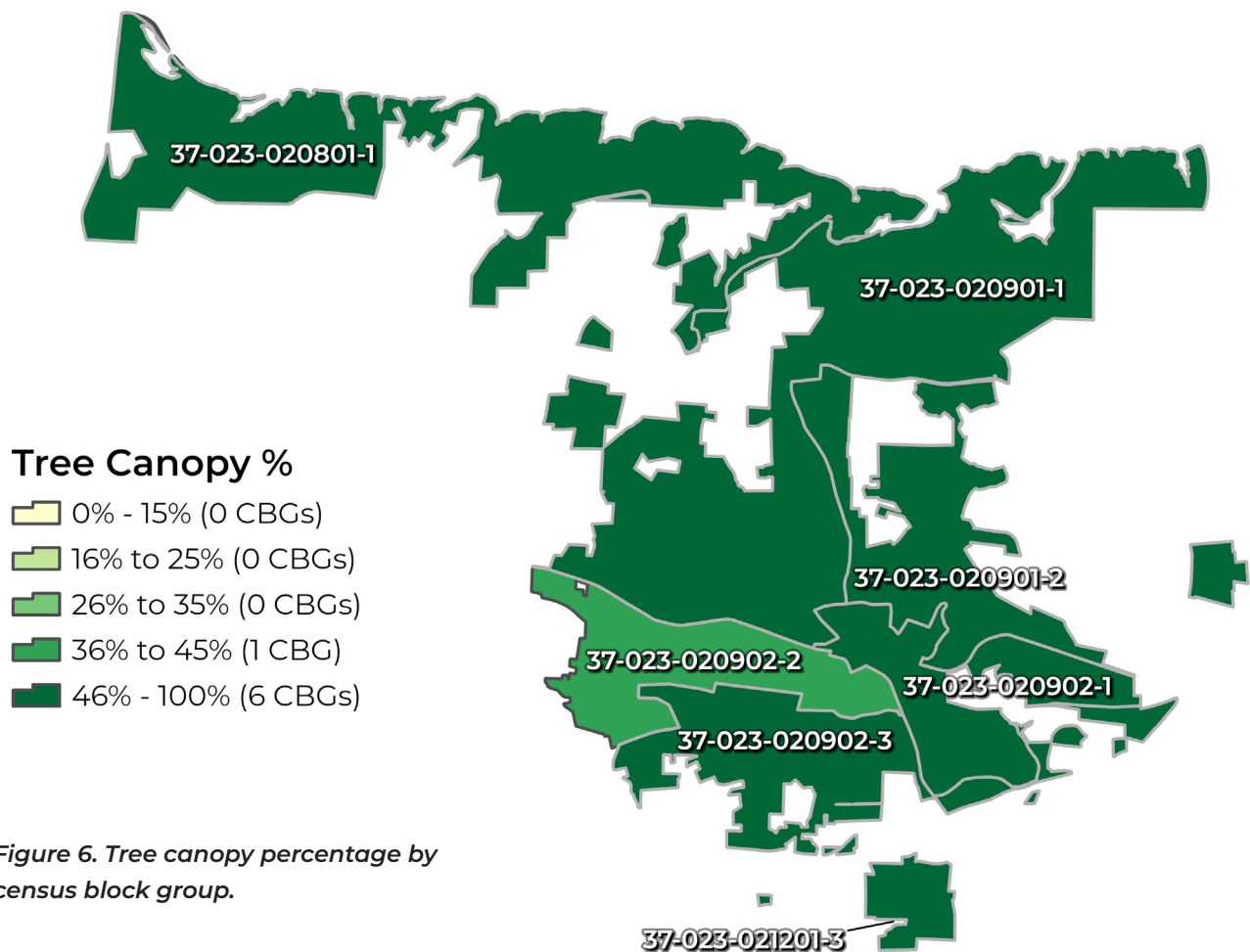
TREE CANOPY COVER BY PUBLIC PROPERTY

Tree canopy metrics were evaluated for 61 public property parcels in Valdese. These properties occupied 509 land acres and had 428 acres of tree canopy. Evaluating properties owned by Valdese helps set realistic canopy goals for areas under the town's direct management.

The largest parcel owned by the Town of Valdese, located south of Lake Rhodhiss and containing Valdese Lakeside Park, accounted for 66% of the tree canopy distribution among all publicly owned properties, covering 280 acres. Thirty public property parcels, mostly near Main Street, have less than 50% tree cover. These parcels make up only 5% of the total public property land area but account for 20% (8 acres) of the total area available for planting trees.

During the eight-year assessment period, 36 public property parcels experienced canopy gains of at least 1%, 8 experienced canopy losses of at least 1%, and the other 17 remained stable (less than a +1%/-1% change). All public properties combined saw a combined net gain of 9 acres of tree canopy.
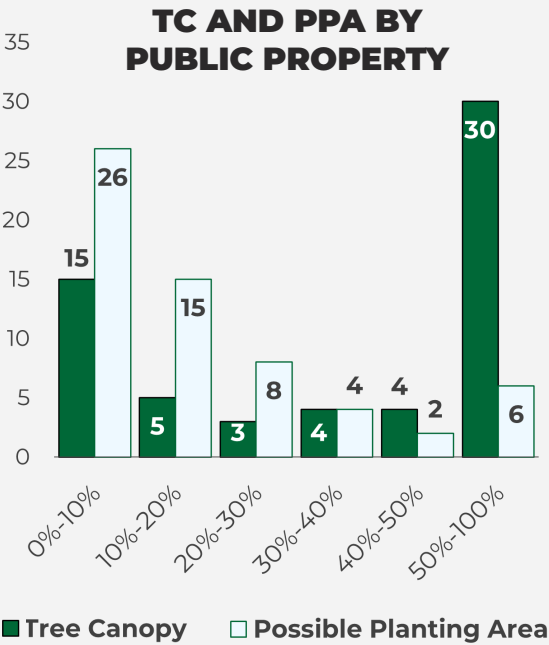

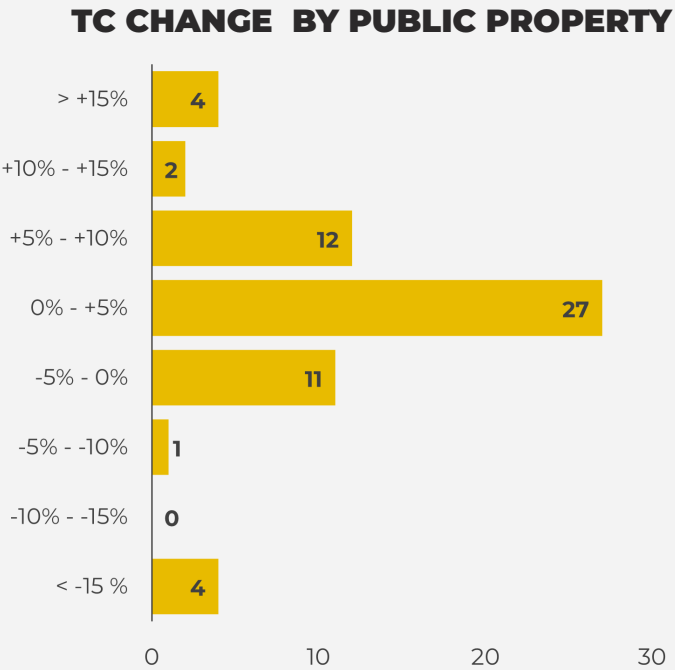*Figure 7. Distribution of public properties within TC and PPA ranges.*

Figure 8. Distribution of public properties within TC Change ranges

TREE PLANTING
PRIORITIZATION

Increased tree canopy cover can provide many benefits to a community and its visitors. Several socioeconomic, demographic, and accessibility data sources were analyzed at the census block group (CBG) scale, and each was ranked according to the area's unique needs. Rankings are sorted from high priority (dark blue) to low priority (light yellow) and were calculated for each criterion as well as overall to show where multiple needs overlap.

ASSESSED CRITERIA & RESULTS MAP:

Low Existing Tree Canopy:

prioritizes CBGs with higher percentages of areas that are not covered by tree canopy.

Possible Tree Canopy:

prioritizes CBGs with higher percentages of possible planting areas.

Unemployment Rate:

percentage of the labor force that does not have a job, are available to work, and are looking for a job.

Poverty Rate:

percentage of residents living below the federally designated poverty level.

Overall Prioritization Rank

- 6 - 7
- 2 - 3
- 4 - 5
- 1

Educational Attainment:

percentage of the population without a high school diploma or the equivalent General Educational Development (GED).

Median Household Income:

Median household incomes as reported by the American Census Bureau.

Vulnerable Population:

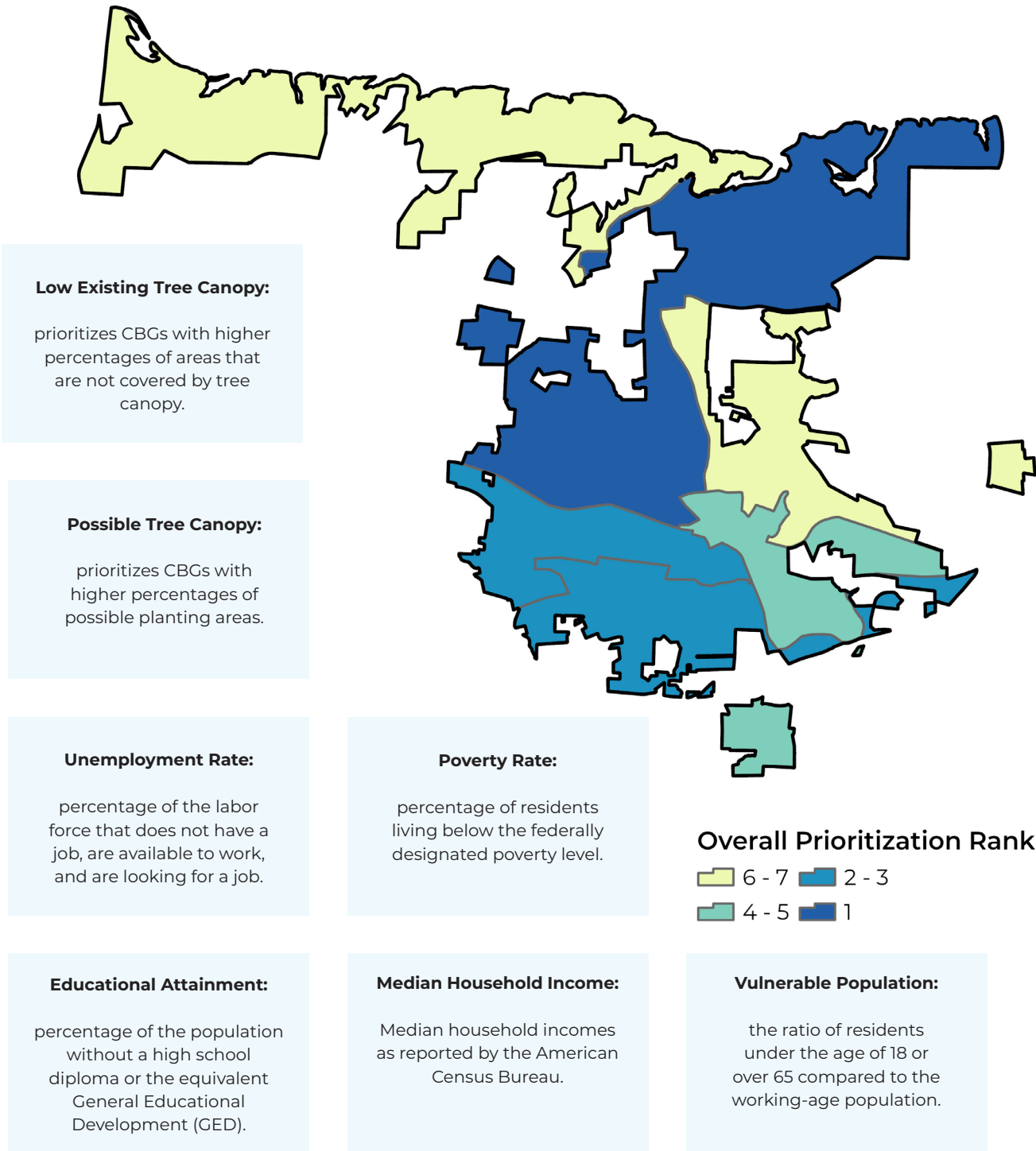the ratio of residents under the age of 18 or over 65 compared to the working-age population.

Figure 9. Overall prioritization rankings for Valdese's census block groups based on the seven above indicators. Rankings range from 1, indicating the highest priority for tree planting, to 7, signifying the lowest priority areas.

QUANTIFYING
ECOSYSTEM BENEFITS

Using i-Tree tools, values were calculated for some of the benefits and functions of the tree canopy throughout Valdese. Trees produce oxygen and improve public health by reducing air pollutants that can cause illness and death. Trees and forests mitigate storm-water runoff which minimizes flood risk, stabilizes soil, reduces sedimentation in streams and riparian land, and absorbs pollutants, thus improving water quality and habitats. Valdese's existing canopy provides over $628,000 annually in avoided infrastructure costs and ecosystem benefits.

THE VALUE OF VALDESE'S COMMUNITY FOREST

MENTAL HEALTH

People without views of nature from their desks claimed 23% more sick days than workers with views of nature.

TOTAL ANNUAL BENEFITS

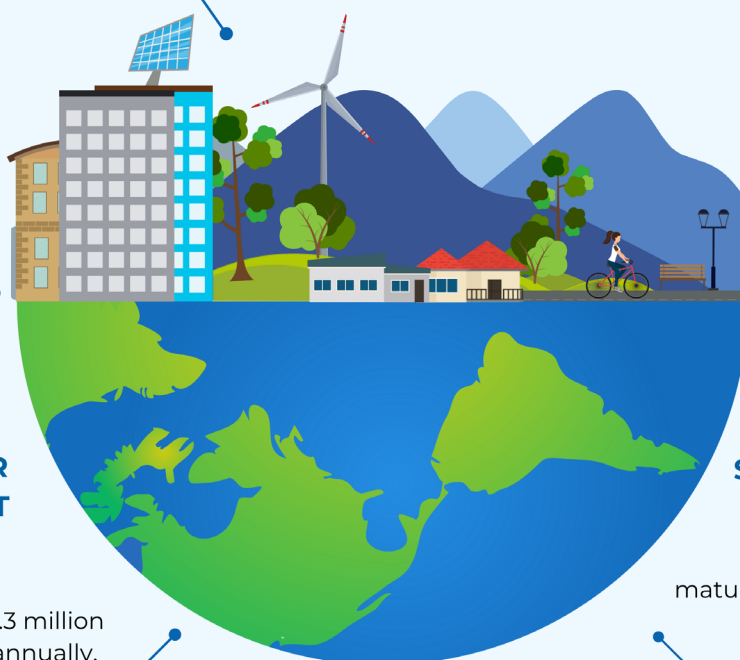Valdese's trees annually provide **$628,353** in ecosystem benefits.

CLEANER AIR

$90,513

Each year, Valdese's roadside trees remove 65 tons of particulate matter.

CARBON STORAGE

$13,682,131

Valdese's urban forest stores 80,223 tons of carbon.

STORMWATER MANAGEMENT

$56,179

Valdese's trees intercept about 6.3 million gallons of runoff annually.

CARBON SEQUESTRATION

$481,661

In one year, Valdese's mature trees absorb 2,824. tons of CO2 from the atmosphere.

Figure 10. Ecosystem service benefits of Valdese's canopy cover. Data sourced from i-Tree, the US Forest Service, the Arbor Day Foundation, and the US Environmental Protection Agency.

ASSESSMENT
RECOMMENDATIONS

1

Leverage the results of this assessment to promote the community forest
The findings of this assessment are pivotal for promoting investment in community forest monitoring, maintenance, and management. They also offer essential support for state, county, and local budget requests and grant applications. These results can be used to craft targeted presentations and resources for government leaders, planners, engineers, resource managers, and the public to make an empirical case for canopy needs and benefits.

2

Learn from cities with the largest canopy gains and losses
There is a story behind the tree canopy change in every community. Are tree ordinances proving effective? Are management plans working? Are storms and disease taking a toll? Valdese can seek out nearby and similarly-sized communities using the North Carolina Urban & Community Forestry CANOPY Application to understand what's working and what isn't.

3

Use TreePlotter to prioritize planting efforts
Utilization of TreePlotter™ CANOPY enables the Town of Valdese to create detailed planting priority maps. Users can create uniquely weighted scenarios to target areas based on specific criteria such as low TC, high PPA, or specific socio-demographic criteria. By focusing on these areas, the allocation of community forest management resources can be maximized, offering a greater return on investment.

4

Set evidence-based canopy goals
As Valdese's population grows and urbanization expands, the preservation and growth of existing canopy is vital. These assessment findings can be used to develop short and long-term goals, such as: establishing annual tree planting targets, improving the quality of tree cover by planting a wider variety of large maturing trees, or setting specific canopy coverage goals by a future date.

5

Develop outreach programs towards private landowners
To increase canopy in Valdese, it's important to understand that most of its community forest is on private land. Incorporating these findings into community outreach and education programs for citizens and private landholders is crucial. Disseminating these data will help residents understand the changes in their local community forests and the numerous benefits trees offer. Pairing educational programming with tree giveaways, tree planting programs, and tree maintenance events can help increase tree canopy on private property.

6

Continue community forest monitoring to track progress and revise strategy
Regular canopy assessments with the latest available imagery are recommended to manage and expand tree canopy effectively. The imagery used in this assessment is updated every two to three years. By conducting recurring assessments, all forest stakeholders can keep an accurate pulse on the community forest and get key feedback on areas of growth and loss.

GLOSSARY/KEY TERMS

Land Acres: The total land area in acres of the assessment boundary (excludes water).

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

Possible Planting Area - Vegetation: Areas of grass and open space where tree canopy does not exist, and it is possible to plant trees.

Shrub: Areas of shrub or other leafy and woody vegetation (smaller than 10ft tall) that are not classified as tree canopy.

Soil/Dry Vegetation: Bare soil and dried, dead vegetation.

Total Acres: Total area, in acres, of the assessment boundary (includes water).

Unsuitable Impervious: Areas of impervious surfaces that are not suitable for tree planting. These include buildings, roads, and all other types of impervious surfaces.

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.

Unsuitable Soil: Areas of soil/dry vegetation considered unsuitable for tree planting. Irrigation and soil augmentation may be required to keep trees alive in these areas.

Unsuitable Vegetation: Areas of non-canopy vegetation that are not suitable for tree planting due to their land use.

Tree Canopy (TC): 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 the community forest. The tree canopy was generally taller than 10-15 feet tall.

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

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