URBAN TREE CANOPY

# ASSESSMENT

ELLENSBURG, WASHINGTON

FEBRUARY | 2024

PlanIT Geo
developers of TreePlotter

City of Ellensburg WASHINGTON

WASHINGTON STATE DEPT OF NATURAL RESOURCES

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ELLENSBURG, WA

# TREE CANOPY ASSESSMENT

> **The true meaning of life is to plant trees, under whose shade you do not expect to sit.**
>
> **-NELSON HENDERSON**


**PREPARED BY**

PlanIT Geo, Inc., Arvada, Colorado

**PREPARED FOR**

The City of Ellensburg



**COMPLETED**

February 2024

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**583**
**ACRES OF CANOPY**

**11%**
**OF ELLENSBURG'S LAND AREA WAS COVERED WITH CANOPY IN 2021**

# EXECUTIVE SUMMARY

## BACKGROUND OF THIS ANALYSIS

Urban tree canopies are in perpetual motion. New tree plantings and existing tree growth add canopy, while development, natural disasters, disease, and pests take it away. These changes can be hard to gauge from the ground, but tree canopy change can be precisely tracked by analyzing aerial imagery from the past and present. This assessment evaluated urban tree canopy (UTC), possible planting area (PPA), and tree canopy change from 2015 to 2021 within the City of Ellensburg, located just east of the Cascades mountain range in Kittitas County, Washington.

Ellensburg was designated as the first Tree City USA in Washington in 1983. It has consistently upheld this award for more than four decades. This ongoing achievement highlights Ellensburg's commitment to maintaining a healthy and diverse urban forest. The urban forest is an invaluable asset for the City of Ellensburg, providing residents and visitors with meaningful, quantifiable environmental, social, and economic benefits. This assessment can be used for data-driven decision-making by city officials. Current canopy goals, policies, ordinances, management practices, and priorities can be amended based on the results provided herein. By highlighting areas where current efforts are working well, but also areas where improvement is needed, this assessment serves as a strategic compass for future planning efforts.

## PROJECT METHODOLOGY

The results, based on 2021 imagery from the USDA's National Agriculture Imagery Program (NAIP), provide a near-current look at land cover in Ellensburg and will allow the area to revise existing and develop new strategies to protect and expand the urban forest. This study utilized modern machine learning techniques to create land cover data that are reproducible and allow for a more uniform comparison in future tree canopy and land cover assessments. **This assessment report will follow the standards established by the US Forest Service and report tree canopy metrics as a percentage of the land area (excluding water bodies) unless stated otherwise.**

## ELLENSBURG'S URBAN FOREST

In 2021, Ellensburg's City Limits, excluding bodies of water, had 11% of its land covered with urban tree canopy and 45% available for potential planting. The remaining 44% of the City's land area was deemed unsuitable for planting without substantial land modification. **Taking into account the surface water in Ellensburg, the city's total area, inclusive of water bodies, was categorized by 9% tree canopy, 1% shrubs, 47% other vegetation; 5% soil/dry vegetation; 36% impervious surfaces, and 1% water.**

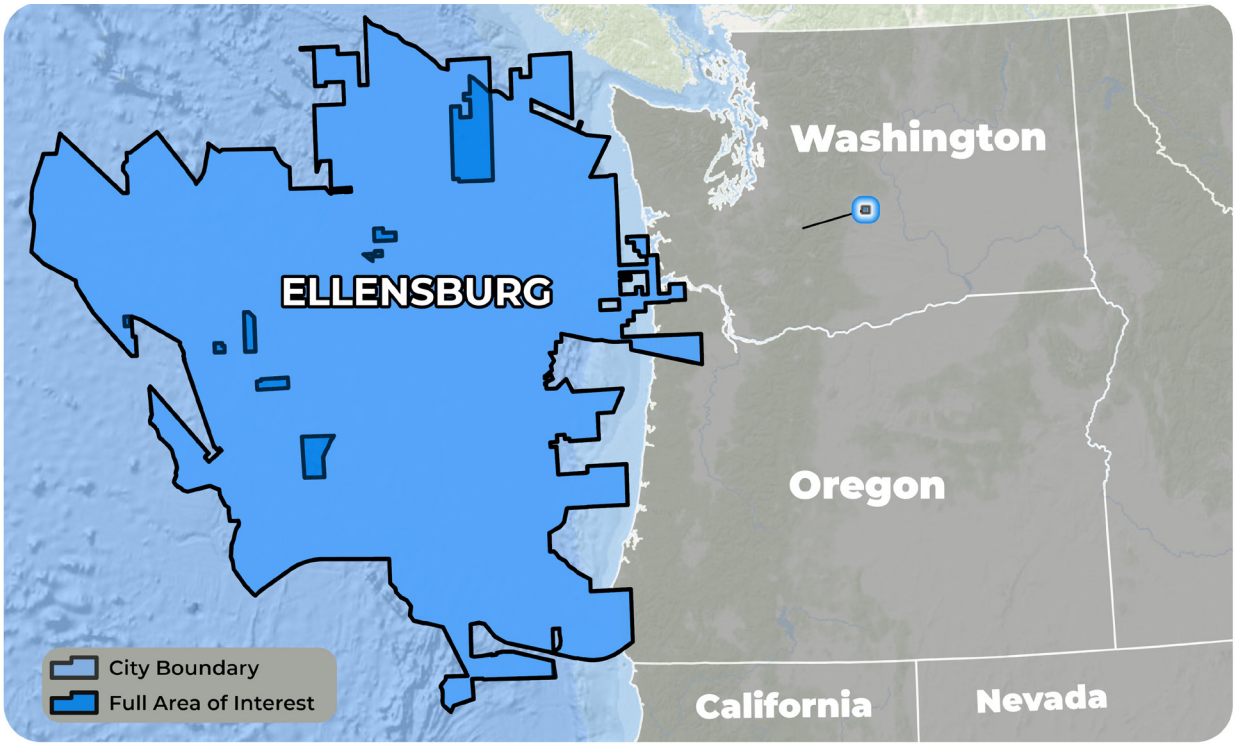



**Figure 1. The City of Ellensburg occupies approximately 9 square miles and is located just east of the Cascades Mountains in Kittitas County, Washington.**

## ELLENSBURG'S URBAN FOREST CONTINUED

Currier Creek stands out as the second largest of Ellensburg's three watersheds and holds the greatest potential for canopy growth with 65% of its land area available for new trees. The majority (62%) of the city's current tree canopy is found in areas zoned as Residential Suburban, Public Reserve, and Residential Low Density. In Ellensburg, 13 out of 19 census block groups have a canopy cover that exceeds the city's average of 11%. Additionally, nearly half (40%) of the city's total tree canopy is concentrated within just six block groups.

## RECOMMENDATIONS

This analysis serves as a foundation for devising a strategy to safeguard and enhance Ellensburg's 583 acres of urban forest. It highlights a significant opportunity for the city to expand its green spaces, particularly by focusing on right-of-way (ROW) areas, which encompass 80 acres of existing trees and an additional 112 acres available for new plantings. Targeting these specific areas for tree planting could increase the city's canopy cover by up to 13%. This initiative would not only beautify urban areas and provide more shade but also promote environmental equity and mitigate the adverse effects of nearly 2,000 acres of impervious surfaces. Beginning with the ROW areas is a crucial step toward expanding and improving the health of the city's urban forest, with the goal of achieving a sustainable and verdant future for all residents. This approach will be supported by meticulous management actions, strategic plantings, and protection measures for the existing canopy. The report offers tools, such as tree canopy and PPA metrics, to facilitate these efforts.

**11%**
**URBAN TREE CANOPY**

**45%**
**POSSIBLE PLANTING AREA**

**36%**
**IMPERVIOUS SURFACE AREA**

**Figure 2. Based on an analysis of 2021 high-resolution imagery.**

PROJECT

# METHODOLOGY

Land cover, urban tree canopy, and possible planting areas were mapped using the sources and methods described below. These data sets provide the foundation for the metrics reported at the selected geographic assessment scales.

## DATA SOURCES

This assessment utilized high-resolution (60-centimeter) multi-spectral imagery from the U.S. Department of Agriculture's National Agriculture Imagery Program (NAIP) collected in 2021 to derive the land cover data set. The NAIP imagery was used to classify all types of land cover. For canopy change analysis 1-meter resolution data was collected in 2015 to classify the historical tree canopy.

## MAPPING LAND COVER

The land cover data set is the most fundamental component of a tree canopy assessment. Tree canopy and land cover data from the EarthDefine US Tree Map (https://www.earthdefine.com/treemap/) provided a six-class land cover data set. The US Tree Map is produced using a modern machine-learning technique to extract tree canopy cover and other land cover types from the latest available 2021 and 2015 NAIP imagery. These six classes are shown in Figure 3.

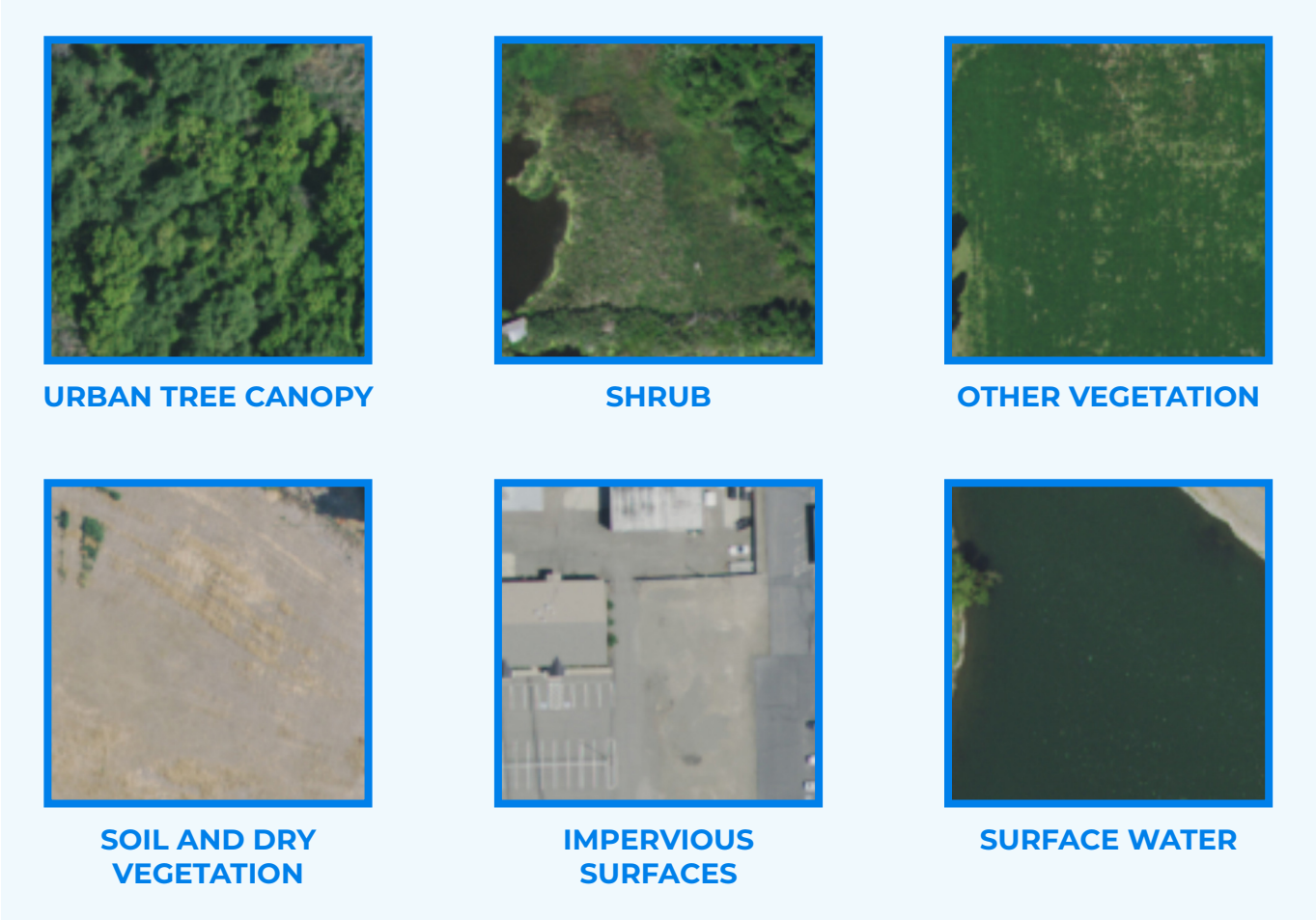



**Figure 3. Six (6) distinct land cover classes were identified in the 2021 assessment imagery: tree canopy, shrubs, other vegetation, bare soil and dry vegetation, impervious surfaces, and water.**

## IDENTIFYING POSSIBLE PLANTING AREAS

In addition to quantifying the City of Ellensburg's existing tree canopy cover, areas where trees can be planted (PPA-Possible Planting Area) were also identified. To assess this, all land area in the City of Ellensburg that was not currently tree canopy was classified as either possible planting area (PPA) or unsuitable for planting.

Possible planting areas were derived from the shrubs and other vegetation land cover classes. Unsuitable areas or areas where it was not feasible to plant trees (e.g. recreation fields, utility corridors, stormwater facilities, etc.) were manually delineated and overlaid with the existing land cover data set (Figure 4). The final results were reported as PPA Vegetation, Unsuitable Impervious, Unsuitable Vegetation, Unsuitable Soil, and Water.

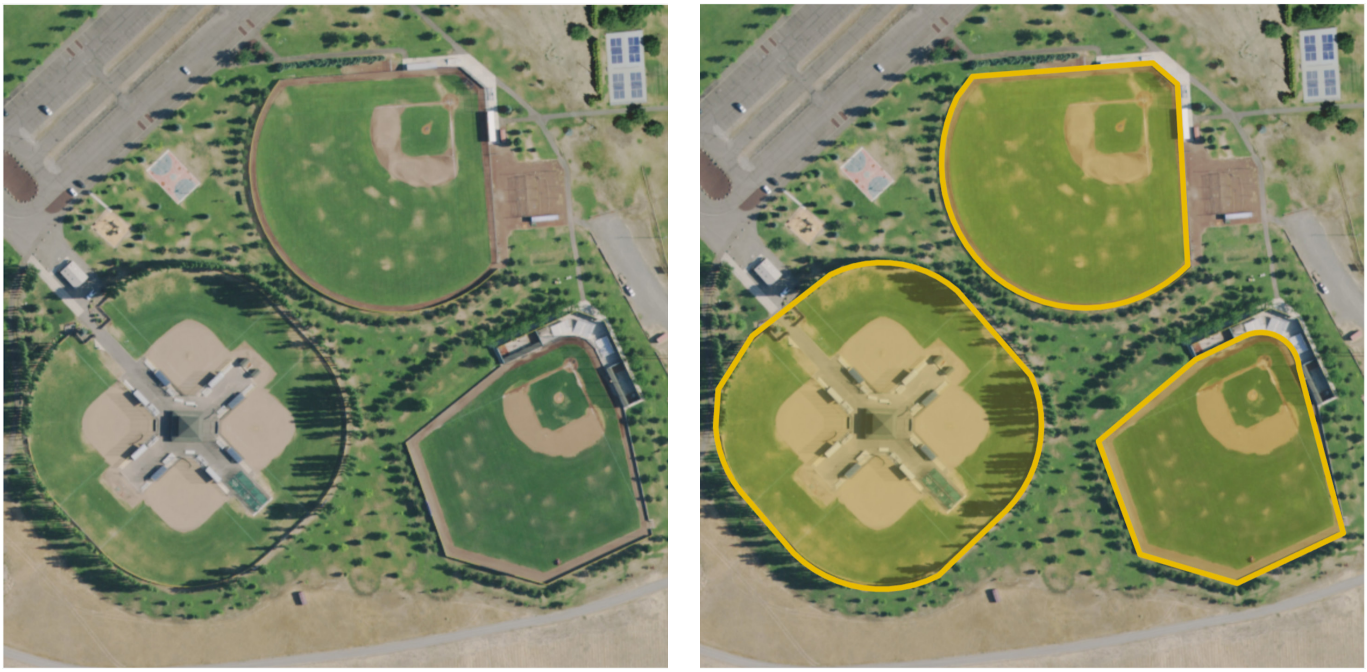


**Figure 4. Vegetated areas where it would be feasible for tree plantings but undesirable based on their current usage (left) were delineated in the data as "Unsuitable" (right). These spaces primarily consisted of recreational sports fields.**

## IDENTIFYING TREE CANOPY CHANGE

Tree canopy change was identified by comparing imagery captured from multiple years (2015 and 2021). The figures below provide examples of canopy loss and canopy gain.


**Figure 5. Maturing trees added canopy in this Ellensburg neighborhood along North Alder Street from 2015 (left) to 2021 (right).**

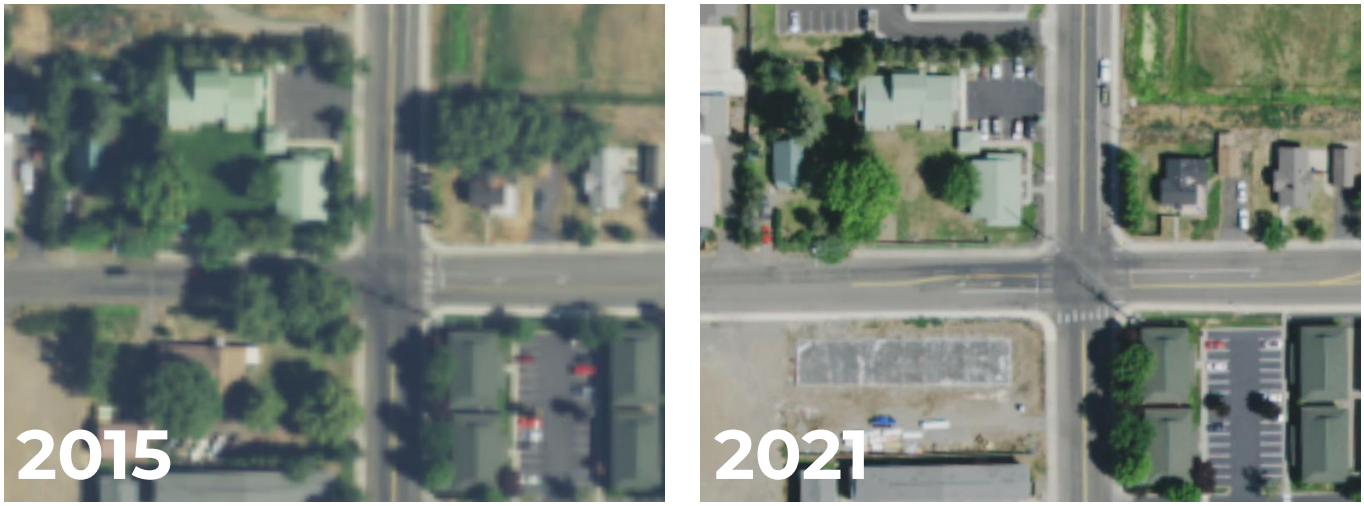
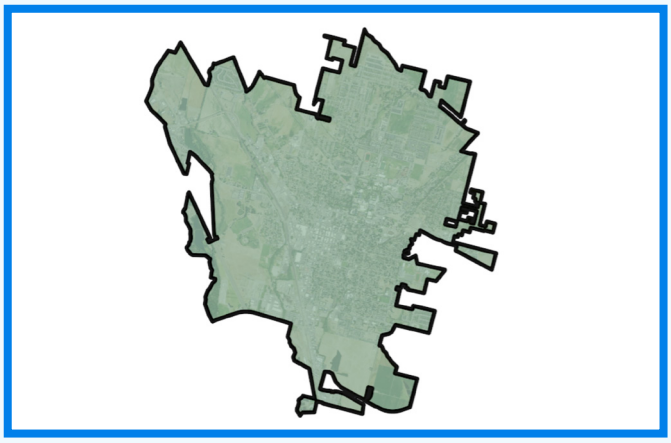



**Figure 6. Tree loss observed between 2015 (left) and 2021 (right) near the intersection of East Helena Avenue and Airport Road due to new development.**

## DEFINING ASSESSMENT LEVELS

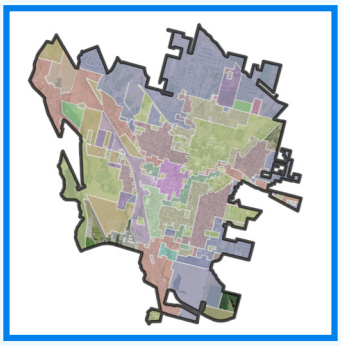
To best inform the City of Ellensburg and other stakeholders, urban tree canopy and other associated metrics were tabulated across several geographic boundaries. These assessment levels include the **Ellensburg Area of Interest (AOI), Ellensburg's City limits, watersheds, zoning types, census block groups, census blocks, and rights-of-way by census blocks**. Parcel-level data was also assessed as a part of this analysis but was not discussed in this report. Parcel-level data can be viewed in Ellensburg's Tree Plotter CANOPY application.



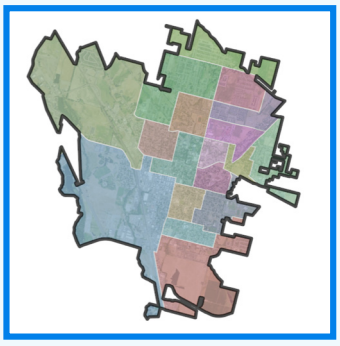
**Ellensburg AOI**
The Area of Interest is defined as Ellensburg city limits boundary with the inclusion of "unincorporated islands" zoning areas. This assessment level is used only for displaying land cover and UTC/PPA data for the purpose of this report.

**Ellensburg City Limits**
The Ellensburg City Limits boundary is the one (1) main area of interest over which all metrics are summarized.

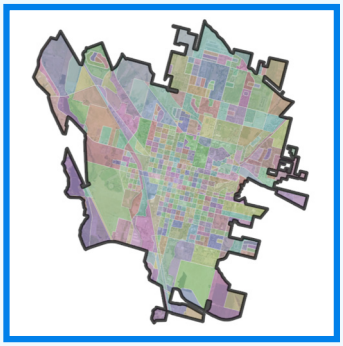
**HUC-12 Watersheds**
Because trees play an important role in stormwater management, three (3) watersheds were assessed.



**Zoning Types**
Tree canopy was assessed on seventeen (17) permitted zoning classes to identify any relationships between the City's zoned areas and tree canopy cover.



**Census Block Groups**
Nineteen (19) census block groups were assessed to show relationships between canopy and sociodemographic factors, and highlight potential environmental justice issues.



**Census Blocks**
Over five hundred (510) census blocks were assessed to provide granular, detailed data that can aid in developing tree canopy cover management strategies at a small geographic scale.

**Rights-of-Way Within Census Blocks**
To better understand the distribution and quantity of tree canopy adjacent to streets and roads, rights-of-way were summarized within four hundred and sixty five (465) census block groups .

**Figure 7. Seven (7) distinct geographic boundaries were explored in this analysis: Ellensburg AOI, City Limits boundary, watersheds, zoning type, census block groups, census blocks, and rights-of-way aggregated by census blocks.**

# STATE OF THE CANOPY AND KEY FINDINGS

The assessment results can be used to design a strategic approach to identifying existing canopy and future planting areas. Land cover and distribution of existing and potential urban tree canopy maps presented below show an area of interest (AOI) slightly larger than The City of Ellensburg's current city limits. The Ellensburg AOI comprises the Ellensburg City Limits boundary, along with unincorporated areas, which contribute an additional 132 acres to the City Limits boundary.

**This assessment report only includes metrics for the boundary of the City Limits, not covering any unincorporated areas.** Figure 8 shows a breakdown of land cover in Ellensburg. Nearly half the area (47%) contains vegetation like grass and low-lying bushes. Buildings and roads occupy 36% of the city. Trees overhanging pervious surfaces make up 9%, bare soil is 5%, and trees over impervious surfaces, water bodies, and shrub/scrub areas each take up just 1%.

## ELLENSBURG'S CITY LIMITS LAND COVER

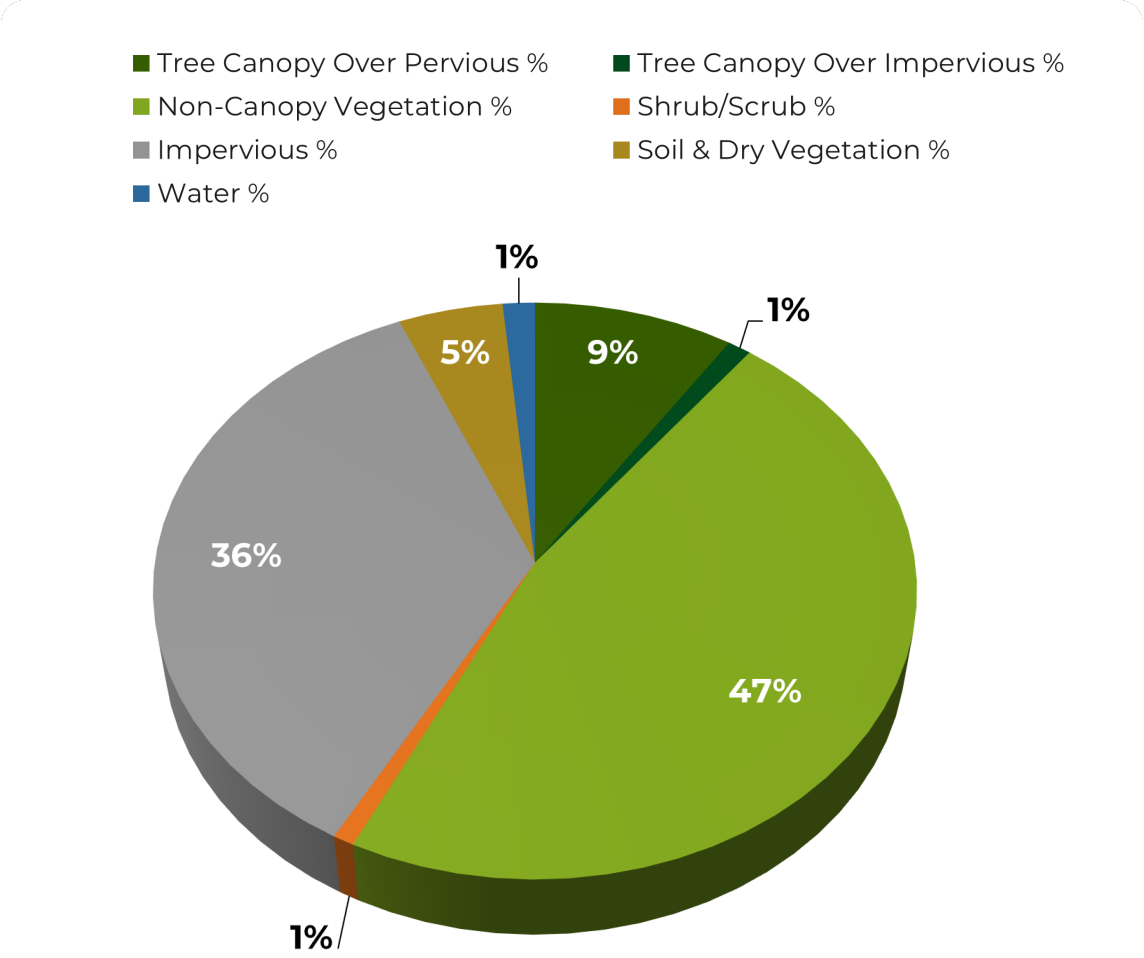



**Figure 8. Land cover classification results (percentages based on total area of Ellensburg's City Boundary including water bodies).**

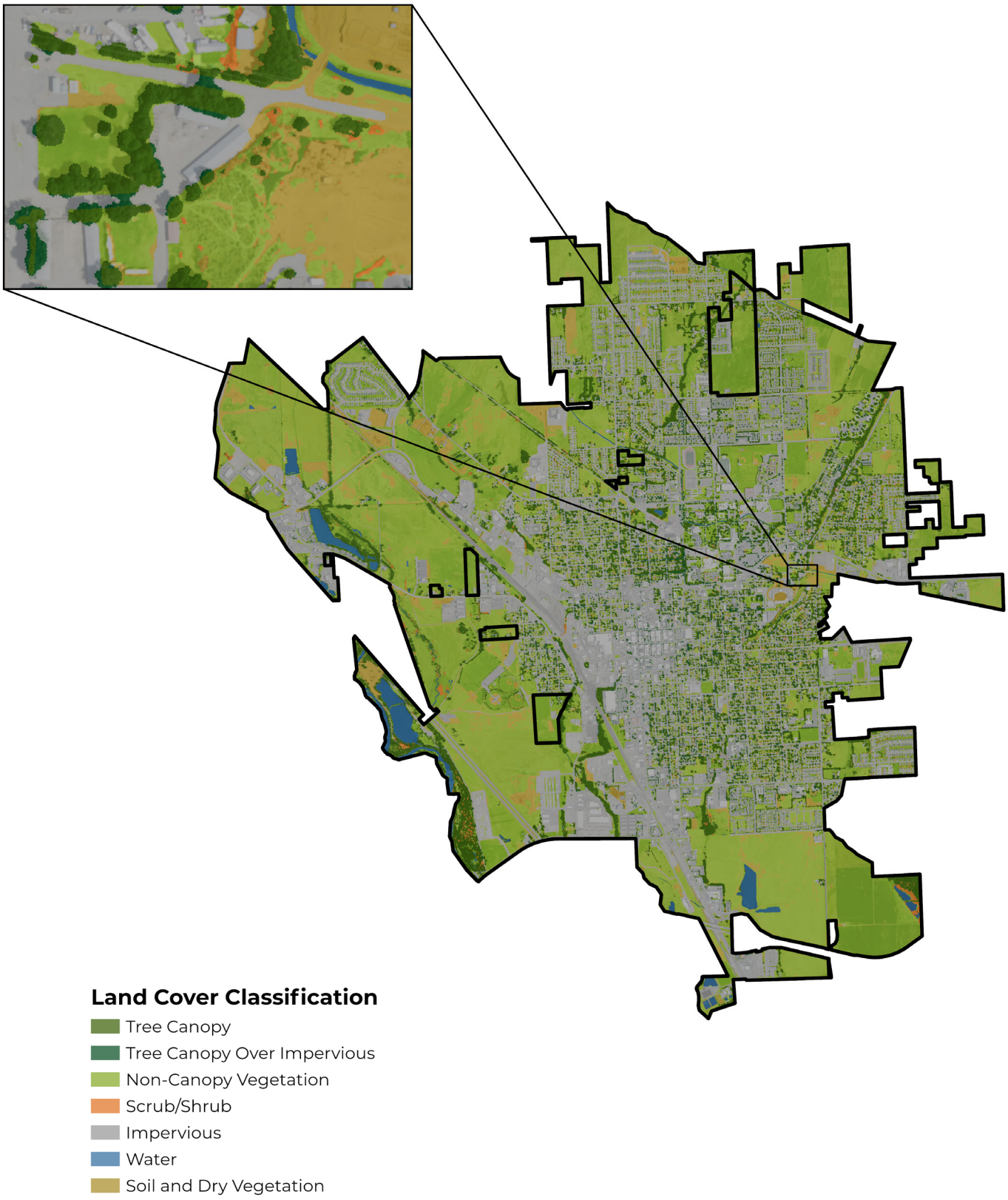



**Figure 9. Distribution of land cover classes throughout the City of Ellensburg including unincorporated areas (Ellensburg AOI).**

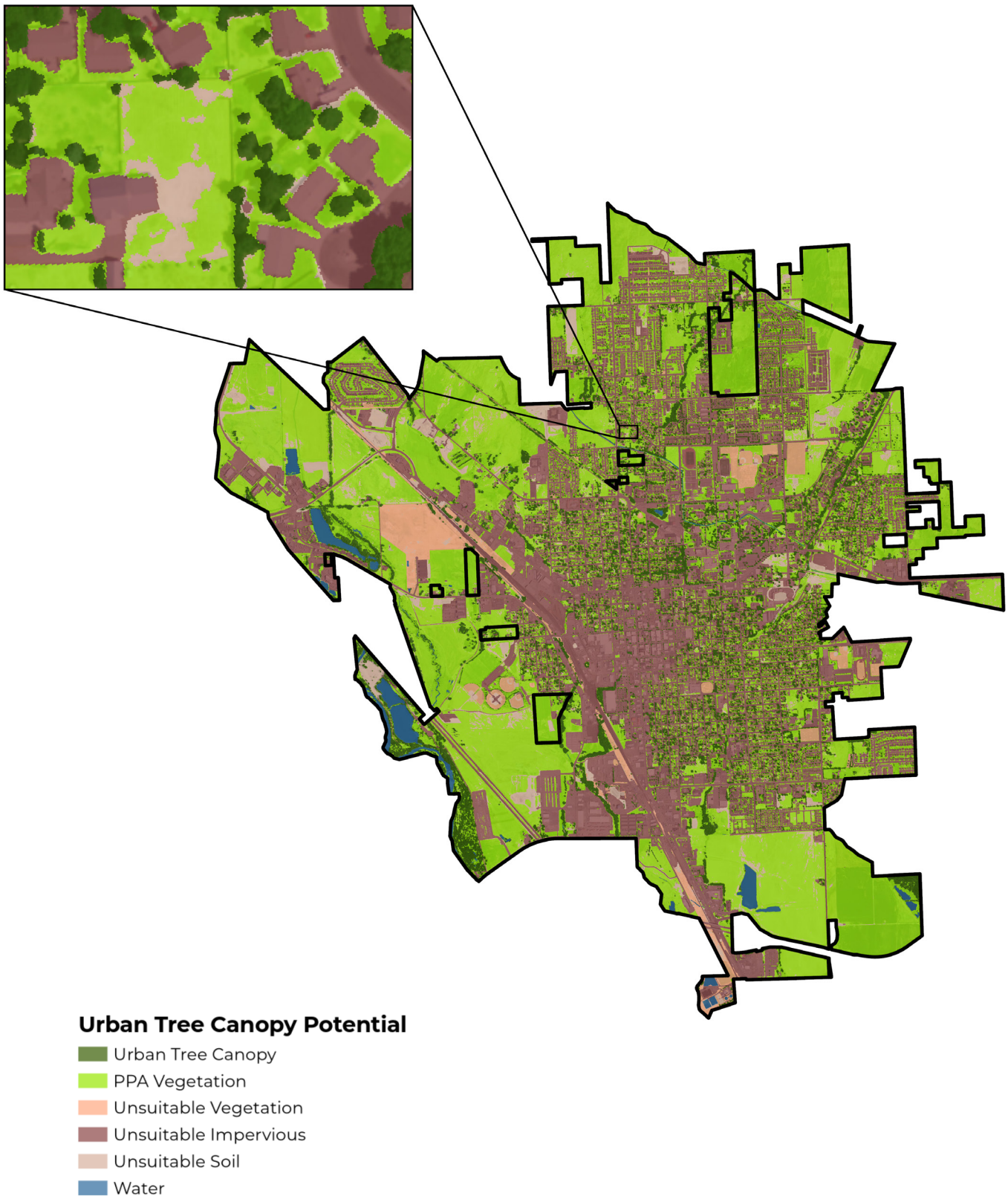



**Figure 10. Distribution of UTC, possible planting area, and areas unsuitable for UTC within the Ellensburg AOI.**

## CITY-WIDE TREE CANOPY COVER

This urban tree canopy assessment utilized the land cover data as a foundation to determine tree canopy cover and possible planting areas (PPA) throughout Ellensburg. Results of this study indicate that within the City boundary, 583 acres are covered with urban tree canopy, making up 11% of the city's 5,507 land acres; 2,488 acres are covered with other vegetation where it would be possible to plant trees, making up 45% of the city; and the other 2,437 acres were considered unsuitable for tree planting, making up 44% of the city. Impervious surfaces made up 82% (or 1,991 acres) of total unsuitable areas.

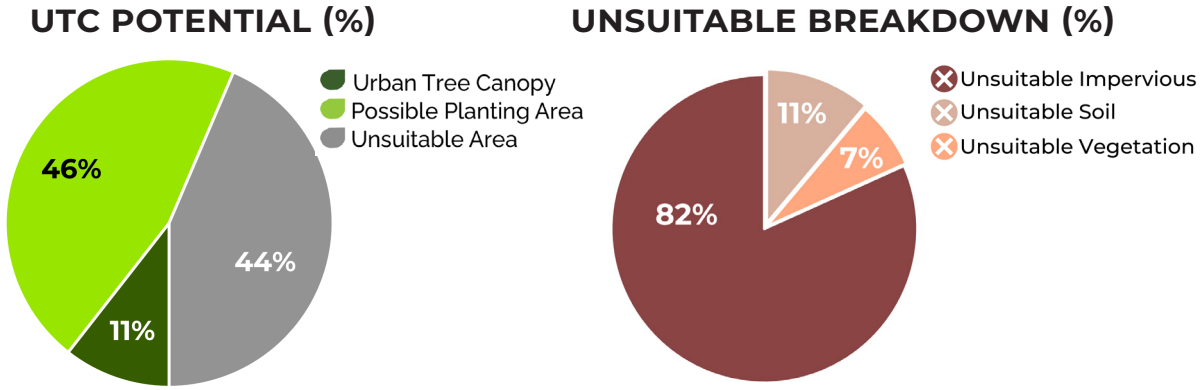



**Figure 11. Percentage of tree canopy, potential planting spaces, and areas not suitable for tree canopy within Ellensburg's city limits (left), with a detailed breakdown of the total unsuitable area into categories: unsuitable soil, impervious surfaces, and vegetation (right).**

**Table 1. Land cover classes (including PPA and unsuitable planting area) in acres and percent in Ellensburg.**

| Ellensburg City Limits | Acres | % of Total |
|---|---|---|
| City Limits Boundary | 5,590 | 100% |
| Possible Planting Area | 2,488 | 45% |
| Impervious Surface Area | 1,991 | 36% |
| Urban Tree Canopy | 583 | 11% |
| Other Unsuitable Planting Area | 445 | 9% |
| Water | 84 | 1% |

## CANOPY AND IMPERVIOUS SURFACES

The City's 583 acres of urban tree canopy were further divided into subcategories based on whether the canopy was overhanging pervious or impervious surfaces. Tree canopy overhanging an impervious surface offers many ecological advantages such as localized cooling through shading and increased stormwater absorption.

**Results indicated that Ellensburg's UTC was predominantly overhanging pervious surfaces at 90%, while 10% was overhanging impervious surfaces.** Planting trees in rights-of-ways, along streets and sidewalks, and in other public areas, as well as strengthening ordinances for planting around parking lots in new developments can help to offset the negative effects of impervious surfaces.

**ELLENSBURG'S 583 ACRES OF URBAN TREE CANOPY**
**is roughly 5 times the size of Irene Rinehart Riverfront Park**

### CITY-WIDE TREE CANOPY CHANGE

Over the 6-year study period, Ellensburg's tree canopy remained relatively stable. **Within the current City boundary, tree canopy decreased by only 3 acres, a -0.1% raw decrease from 2015 to 2021.**

While it's likely that the canopy coverage fluctuated over the past six years, this assessment provides a snapshot of the canopy at the time the imagery was collected. Instances of canopy growth can be attributed to the growth of existing trees on established residential properties.

Generally, most large losses of canopy can be traced back to vacant lots being cleared for developments. Given these considerations, it becomes crucial to prioritize commercial and residential zones for canopy preservation and replanting efforts in tandem with development projects.

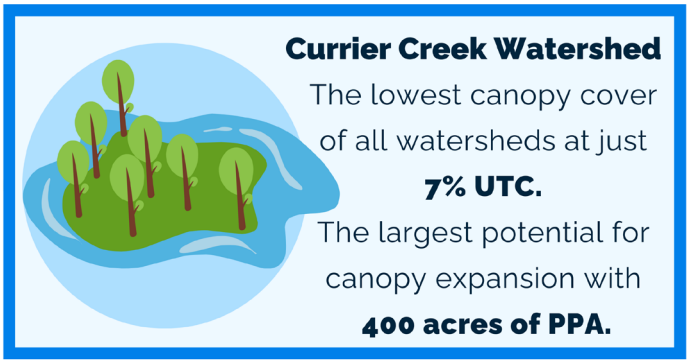
**Table 2. Urban tree canopy within Ellensburg in 2015 and 2021.**

| City Limits | Land Area | UTC 2015 | | UTC 2021 | | UTC Change (2015-2021) | |
|---|---|---|---|---|---|---|---|
| | *Acres* | *Acres* | *%* | *Acres* | *%* | *Acres* | *%* |
| Urban Tree Canopy | 5,590 | 586 | 10.6% | 583 | 10.6% | -2.3 | -0.1% |

## TREE CANOPY COVER BY WATERSHED

Trees mitigate stormwater runoff, filter pollutants, and sediment and as a result, reduce flooding and enhance water quality. UTC and PPA were assessed across Ellensburg's three watersheds. The Naneum Creek-Wilson Creek watershed is the largest one in Ellensburg, covering 87% of the City. This watershed had the largest area of UTC (503 acres), which only translates to a 10% canopy cover. Fortunately, this watershed has more than 2,000 acres of PPA, offering a great opportunity to make use of the 44% of the land that's perfect for adding more tree cover.

Manastash Creek-Yakima River is the smallest watershed, covering just 169 acres of land. However, it had the largest and most dense tree coverage, with 36% (45 acres) of its land area occupied with canopy.




Even though the Currier Creek Watershed is nearly four times the size of the Manastash Creek-Yakima River area, they both have about the same amount of trees, covering around 48 acres each. This means only 7% of Currier Creek is covered by trees, which is quite low. However, it has the largest percentage of land available for new trees, with 65% of its land being suitable for tree planting. Utilizing the plantable space in these riparian areas will increase shade around crucial water bodies, in turn, helping to keep them at optimal temperatures for bull trout, native salmon, and other aquatic species that are state or federally listed as endangered, threatened, or special concern in Washington State.

### WATERSHED TREE CANOPY CHANGE

Currier Creek and Naneum Creek-Wilson Creek both experienced modest gains in canopy over the 6-year study period, resulting in a less than 1% increase in UTC each. The Manastash Creek-Yakima River watershed lost -7% canopy cover from 2015 to 2021, translating to a loss of 9 acres. The 44% of the land area designated as PPA in this watershed should be used to help the watershed reverse its negative canopy change trend and offset the negative impacts of nearby impervious surfaces.

**Table 3. Urban tree canopy in 2015 and 2021 by watershed.**

| Watershed | Land Area | UTC 2015 | | UTC 2021 | | UTC Change (2015-2021) | |
|---|---|---|---|---|---|---|---|
| | *Acres* | *Acres* | *%* | *Acres* | *%* | *Acres* | *%* |
| Currier Creek | 613 | 43 | 7.1% | 45 | 7.4% | 2 | +0.3% |
| Manastash Creek-Yakima River | 134 | 57 | 42.7% | 48 | 36.0% | -9 | -6.7% |
| Naneum Creek-Wilson Creek | 4,891 | 498 | 10.2% | 503 | 10.3% | 5 | +0.1% |

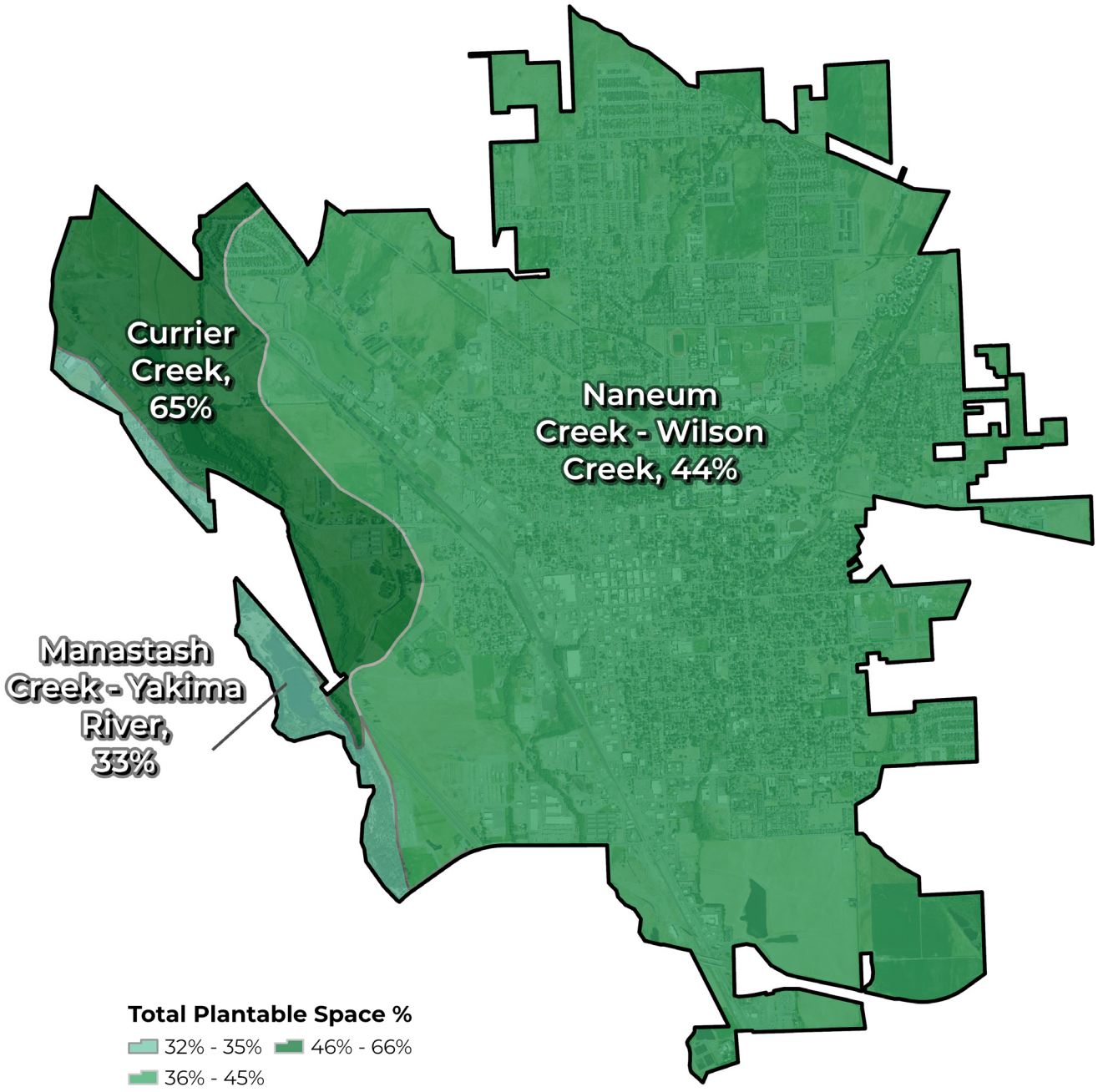



Figure 12. Possible planting area percent by watersheds.

## TREE CANOPY COVER BY ZONING TYPE

Tree canopy cover and PPA were assessed across the City's 17 zoning districts. While Planned Unit Development zoned districts had the highest canopy levels (25%), it should be noted that these zones only represent 1% of all areas within the city, and have yet to be developed. **Residential Suburban, Public Reserve, and Commercial Highway zoned areas make up the majority of Ellensburg's overall area (57%) and represent the City's largest opportunity to affect canopy change due to scale.** Four zoning types, namely Commercial Highway, Residential High Density, Industrial Light, and Regional Center Mixed-Use, all had UTC percentages of 5% or less.

**Residential Suburban**

**Largest land area (1,576 acres)**

**Low UTC (7%)**

**High PPA (66%)**

Residential Suburban zoned areas cover 1,576 acres of land within the city, contributing 1,044 acres of potential plantable space. This zoning type contains 42% of all available PPA within the city. Unincorporated Island and Regional Center Mixed-Use zones had the largest percentage of their land area available for new trees, with 77% and 88% PPA, respectively.

**Table 4. Urban tree canopy change, PPA, and impervious surfaces by zoning type.**

| Zoning Type | Land Acres | UTC % in 2021 | UTC Change % (2015-2021) | PPA % in 2021 | Impervious Surface % in 2021 |
|---|---|---|---|---|---|
| Planned Unit Development | 61 | 25% | +7% | 52% | 18% |
| Residential Low Density | 539 | 23% | -2% | 31% | 44% |
| Commercial Neighborhood | 1 | 22% | -1% | 1% | 77% |
| Neighborhood Center Mixed-Use | 25 | 20% | -1% | 47% | 24% |
| Residential Office | 112 | 20% | -3% | 24% | 55% |
| Residential Medium Density | 395 | 18% | 0% | 25% | 55% |
| Public Reserve | 918 | 15% | -1% | 38% | 31% |
| Manufactured Home Park | 61 | 11% | +2% | 41% | 45% |
| Unincorporated Islands | 149 | 9% | +1% | 77% | 12% |
| Industrial Heavy | 194 | 9% | 0% | 4% | 67% |
| Commercial | 109 | 9% | -2% | 6% | 85% |
| Central Commercial II | 93 | 8% | +1% | 8% | 83% |
| Residential Suburban | 1,576 | 7% | +1% | 66% | 21% |
| Commercial Highway | 666 | 5% | 0% | 37% | 46% |
| Residential High Density | 25 | 4% | +1% | 24% | 67% |
| Industrial Light | 405 | 2% | -1% | 58% | 21% |
| Regional Center Mixed-Use | 92 | 1% | 0% | 88% | 1% |

### ZONING TYPE TREE CANOPY CHANGE

Among Ellensburg's 17 zoning types, four gained canopy, five lost canopy, and the remaining eight classes remained relatively stable (less than a 1% increase or decrease throughout the study period). Residential Suburban zoned areas gained an impressive 20 acres in six years. Residential Low Density zoned areas saw the largest loss in tree cover, with a decrease of 9 acres from 2015 to 2021.

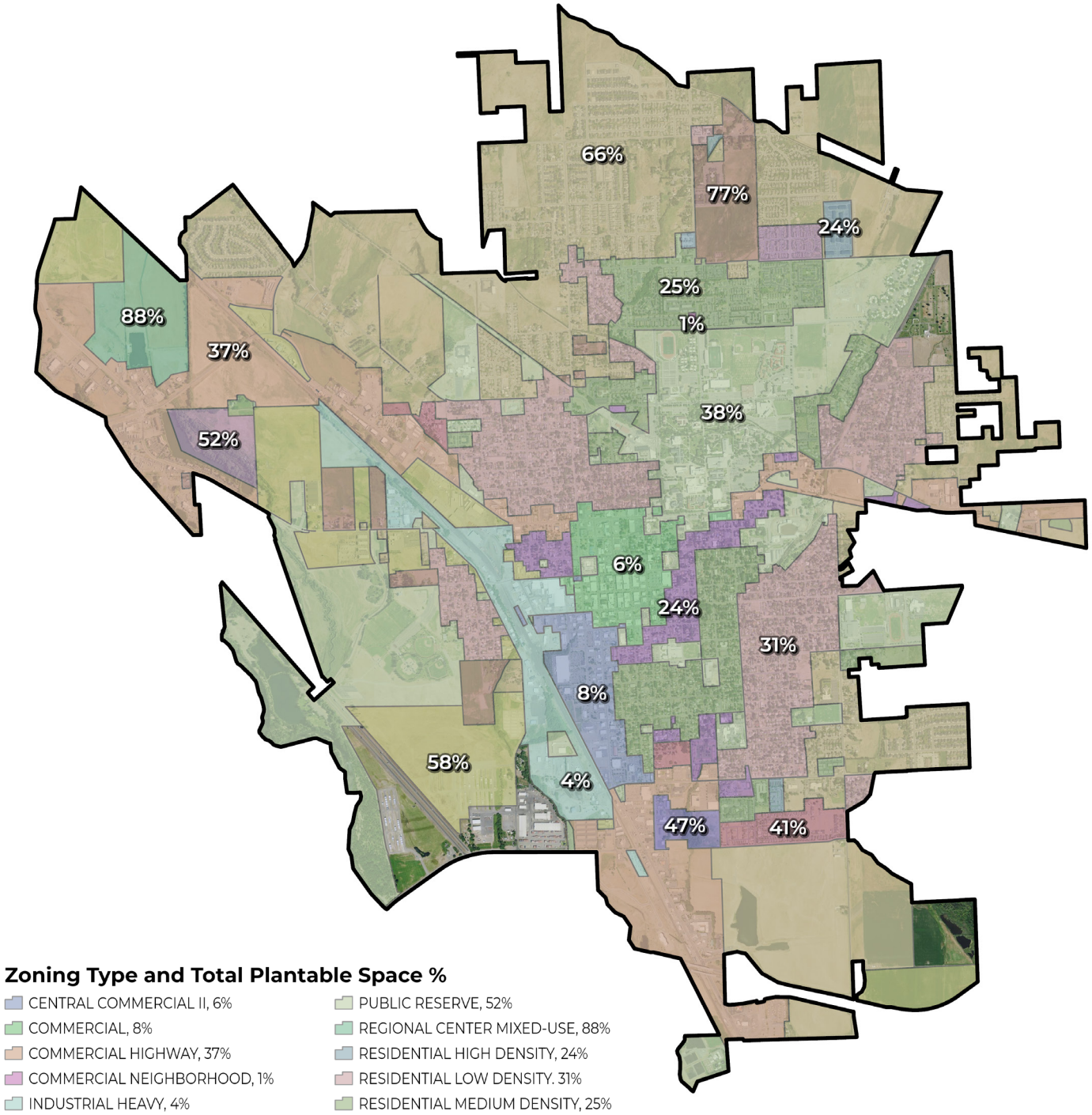
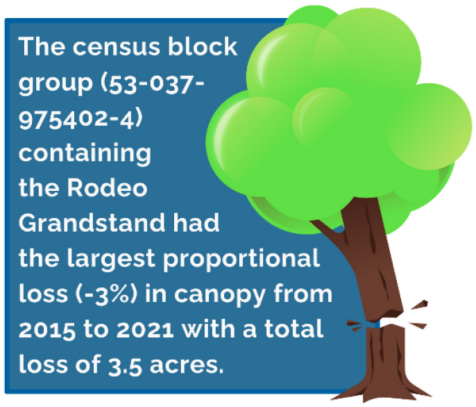



**Figure 13. Possible planting area percent by zoning type.**

## TREE CANOPY COVER BY CENSUS BLOCK GROUPS

UTC and PPA were also assessed at the census block group level, which is valuable for assessing the equitable distribution of tree canopy throughout the city, as the block groups are linked to readily available demographic and socio-economic data. Census block groups contain clusters of census block boundaries. This is the second smallest geographic unit of measure at which the U.S. Census publishes statistical data within a state and represents between 600 and 3,000 people.




**Results indicated that block groups located in east-central Ellensburg (containing the City's downtown) have UTC percentages that are higher than the rest of the City, and therefore, in general, have less potential planting area.** Consistent with this trend, the block groups outside of east-central Ellensburg have relatively lower levels of UTC and therefore higher PPA percentages than the block groups located in other parts of the City.

The block group in central Ellensburg (53-037-975500-3), that contains the residential neighborhood southeast of Mount Stuart Elementary School, boasted the highest canopy coverage at 21%. The large block group (53-037-975500-1) in the northwest portion of the City had the lowest canopy coverage at 6%.

**NUMBER OF CENSUS BLOCK GROUPS WITHIN EACH UTC AND PPA RANGE**

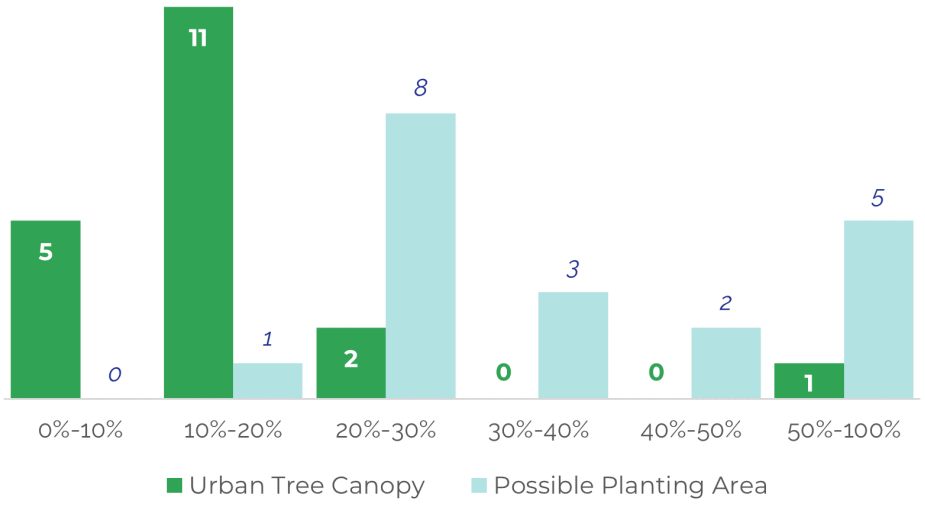



**Figure 14. Distribution of census block groups within UTC and PPA ranges.**

### CENSUS BLOCK GROUPS TREE CANOPY CHANGE

During the 6-year study period, five block groups gained canopy cover, seven block groups lost canopy cover, and the other seven block groups remained mostly unchanged (less than a 1% increase or decrease throughout the study period). The highest change within a single census block group was +4%, which occurred in block group 53-037-975404-3 which contains the Helena Ave. Substation and North Alder Street Park. **Spatially, the largest decrease in canopy cover occurred in block groups within the east-central portion of Ellensburg, while the largest gains occurred in the northeast portion of the City.**

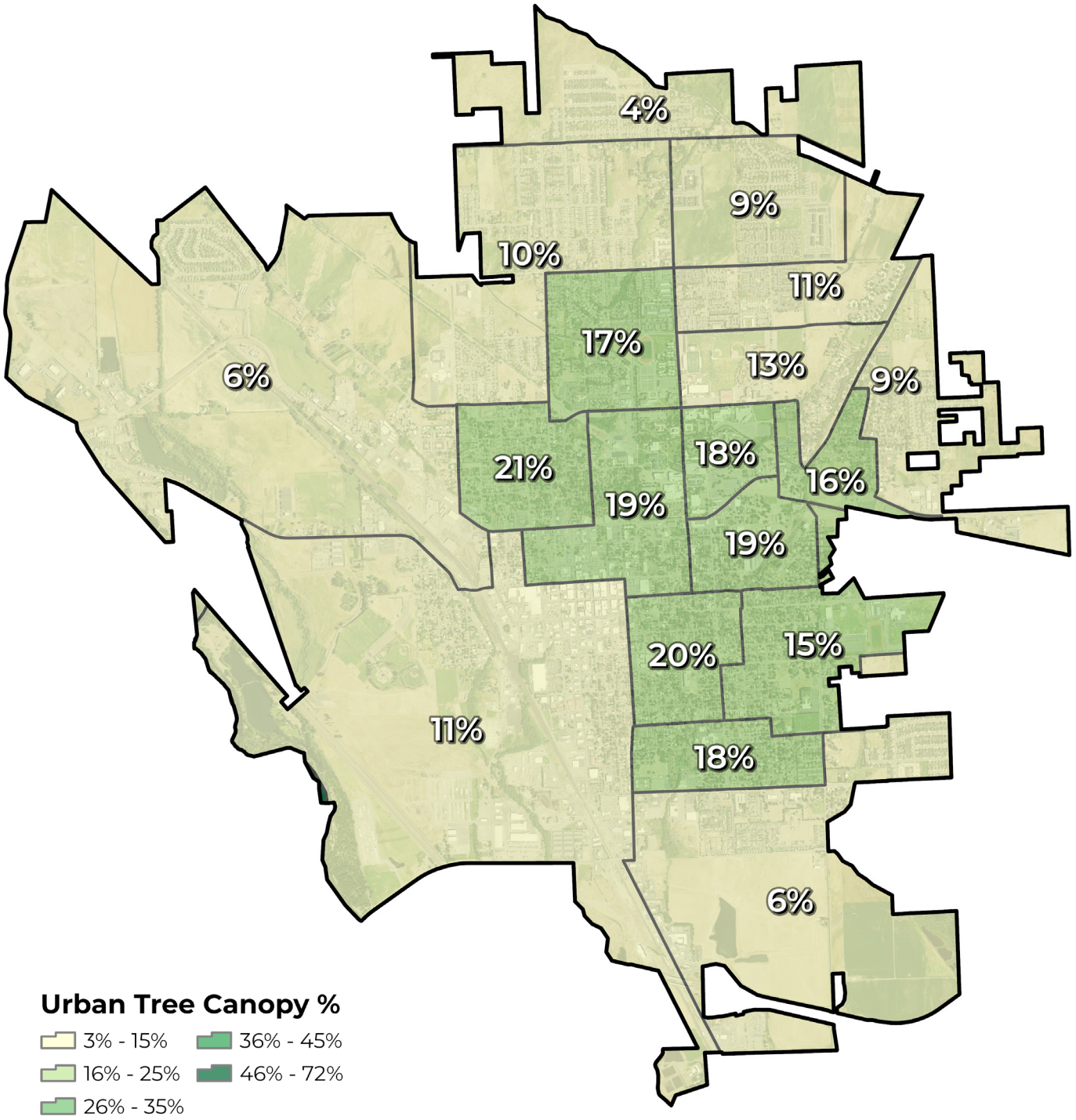



Figure 15. Urban tree canopy percent by census block groups.

## TREE CANOPY COVER BY CENSUS BLOCKS

To understand tree canopy metrics at a granular scale, UTC and PPA were assessed at the census block level, the smallest geographic census unit that is bounded by visible features such as streets, streams, and railroads. This small-scale data is ideal for evaluating localized canopy data in small pieces to help manage urban green spaces and other specific plots of land.

Of the 495 census blocks in Ellensburg, nearly 30% had UTC percentages of 20% or higher. However, these blocks only made up 7% of Ellensburg's total land area. There were 192 cenus blocks (nearly 40%) that had 10% UTC or less, and these groups made up nearly 50% of the total land area in the City, bringing the average UTC down to 11%. T**he three blocks in central Ellensburg that contain the University House, the LDS Institution of Religion, and Chi Alpha CWU along Wildcat Way have the densest canopy cover among all of the City's census blocks.**

Looking at PPA, the same pattern identified for census block groups remains true for this assessment scale. The census blocks located outside of the east-central portion of Ellensburg generally have the most space designated as potential planting area. There are 73 blocks that contain at least 50% PPA, these blocks make up nearly 40% of the total land area in Ellensburg.

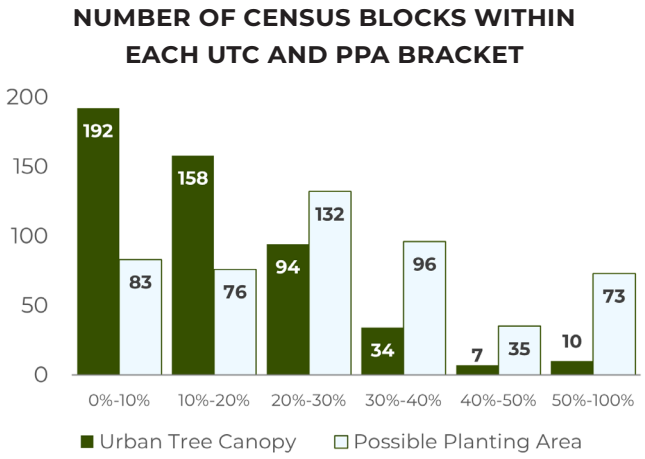



**Figure 16. Number of census blocks within UTC and PPA ranges.**

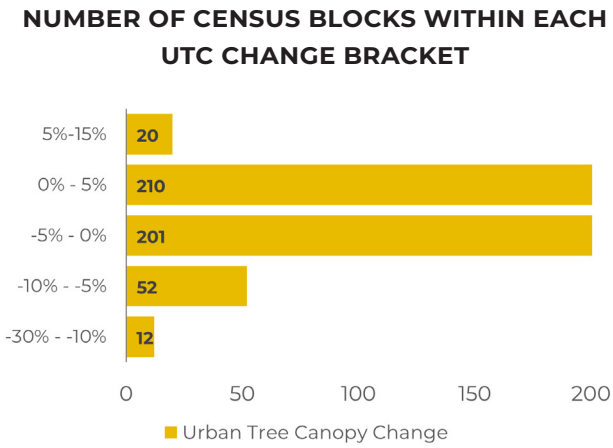



**Figure 17. Number of census blocks within UTC change ranges.**

### CENSUS BLOCKS TREE CANOPY CHANGE

From 2015 to 2021, 124 blocks gained canopy, 209 blocks lost canopy, and the remaining 162 stayed relatively stable (less than a 1% increase or decrease throughout the study period). The largest acreage increase in an individual block was +3 acres, and the largest acreage decrease was -5 acres. In general, the census blocks in the east-central portion of the City experienced the most canopy loss.

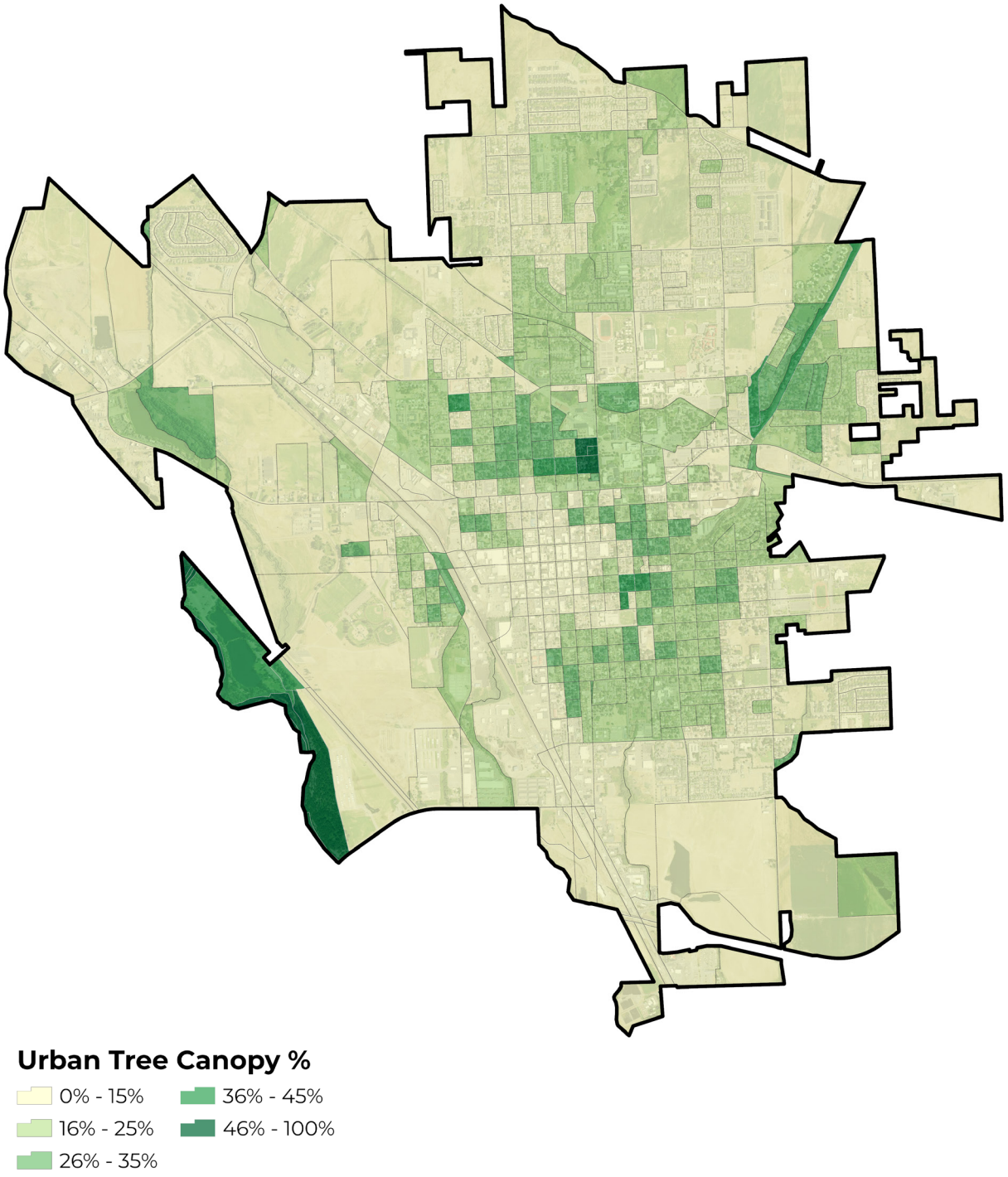



Figure 18. UTC percentages by census blocks.

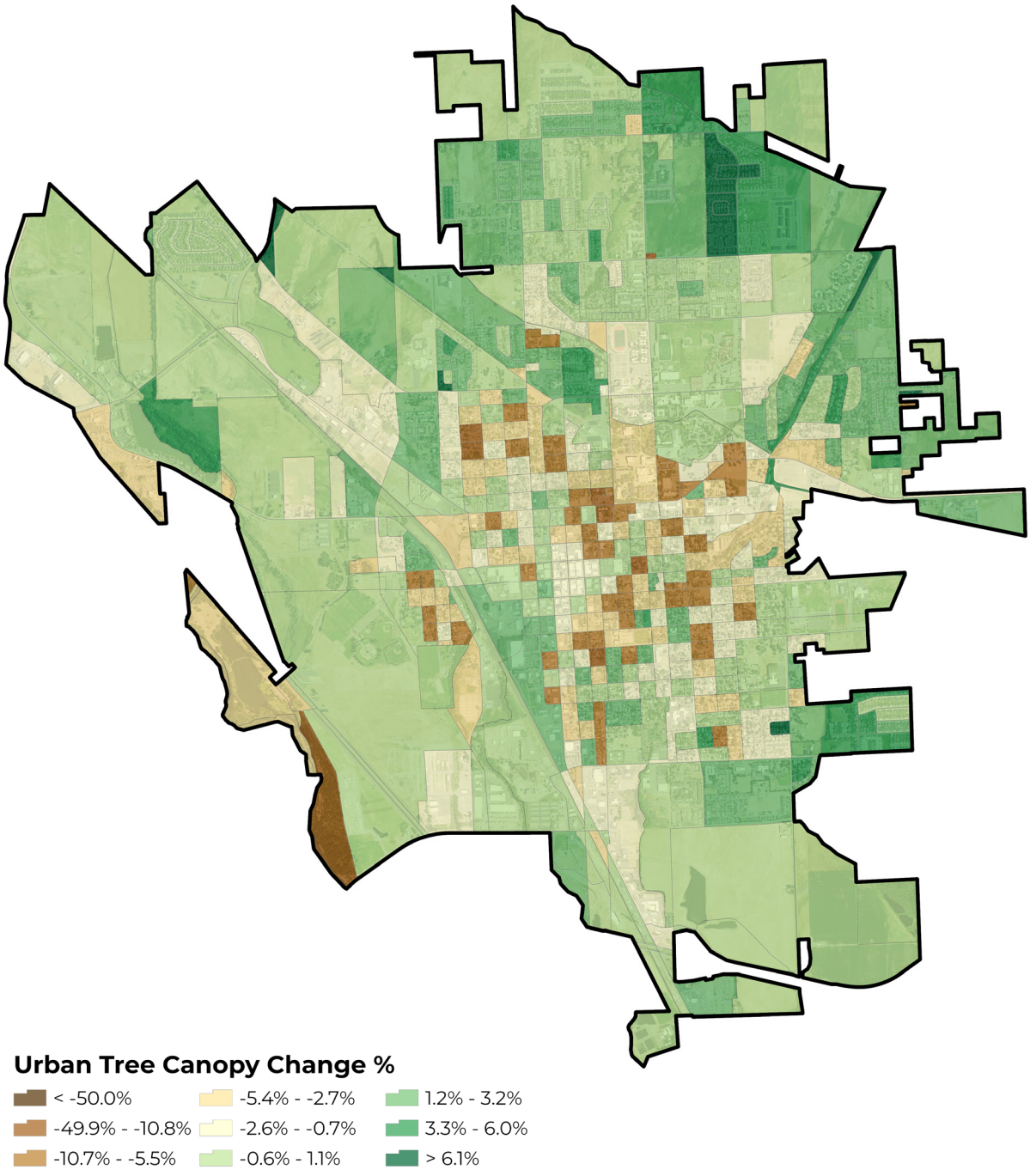



Figure 19. UTC change percentages by census blocks.

## TREE CANOPY COVER BY RIGHTS-OF-WAY BY CENSUS BLOCKS

Urban tree canopy metrics were assessed for rights-of-way (ROW), and these findings were subsequently aggregated and summarized within the context of census blocks. This metric helps quantify trees adjacent to streets and roads that are managed and maintained by the City of Ellensburg. **These ROW parcels occupy 737 land acres across Ellensburg (13% of the total land area) and contain a total of 80 canopy acres.** The ROW in the City offered 112 acres of possible planting area, which if utilized could theoretically bring the citywide UTC percentage from 11% to 13%. It's worth noting that the ROW only contributes 5% of the total PPA within Ellensburg's City Limits, so the City should consider planting in public parks and other publicly owned spaces, as well as working with neighborhoods and local organizations/businesses to establish trees on private property.

**There are 112 acres of plantable space in the right-of-way.**

### ROW BY CENSUS BLOCKS TREE CANOPY CHANGE

Generally, rights-of-way areas followed the same canopy change pattern as the larger block group that contained them. Meaning, that if a ROW area lost canopy, the entire block group saw a loss too. This suggests that when a block group experienced overall tree loss, it's likely that some of this loss was due to trees being removed in these public ROW areas. As trees are removed in the ROW, it is good practice to replace them (if the space still allows) to maintain tree canopy that shades sidewalks, filters unoff, and provides beauty to the streets of Ellensburg.

Three areas were highlighted as optimal locations for street tree planting.

- West University Way in northern Ellensburg (shown below in the top inset map).
- Suburban areas south of the Rodeo Grandstands near the intersection of North Poplar Street and East Capitol Ave (shown below in the bottom inset map).
- Neighborhoods surrounding West Ellensburg Park.

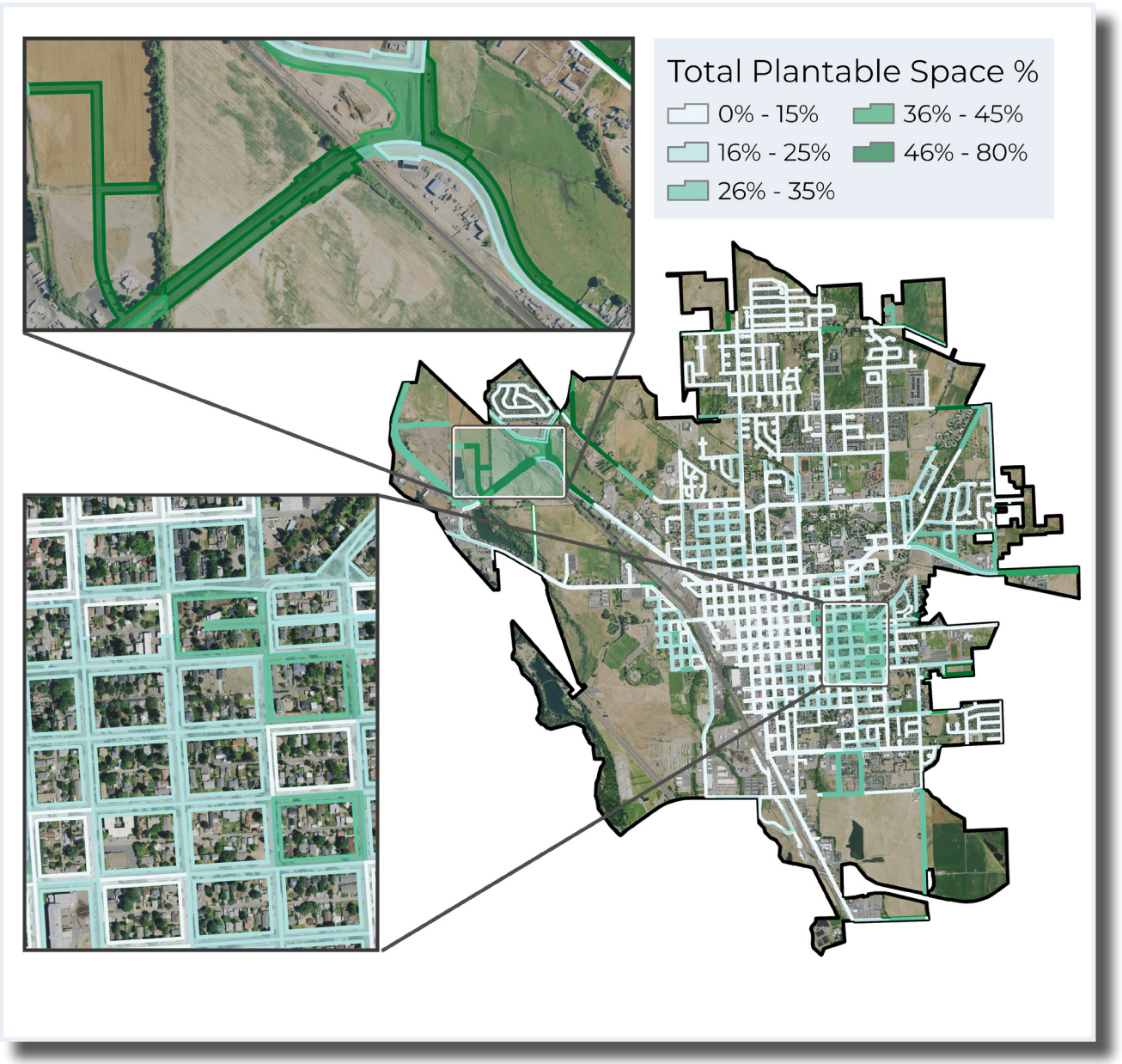



**Figure 20. Possible planting areas within rights-of-way, segmented by census blocks.**

QUANTIFYING

# ECOSYSTEM BENEFITS

Using the best available science from i-Tree tools, values were calculated for some of the benefits and functions provided by the urban tree canopy in Ellensburg, Washington. The urban forest holds millions of dollars of savings in avoided infrastructure costs, pollution reduction, and stored carbon. The following values were calculated using the USDA Forest Service's i-Tree Landscape tool with the City of Ellensburg's total acres of urban tree canopy as the input data.

## AIR QUALITY

Trees produce oxygen, indirectly reduce pollution by lowering air temperature, and improve public health by reducing air pollutants which can cause death and illness. The existing tree canopy in Ellensburg removes approximately 37,056 pounds of air pollution annually, valued at over $114,000.

## STORMWATER AND WATER QUALITY

Trees and forests mitigate stormwater runoff which minimizes flood risk, stabilizes soil, reduces sedimentation in streams and riparian land, and absorbs pollutants, thus improving water quality and habitats. The tree canopy in Ellensburg absorbs almost 7 million gallons of water per year. Extrapolated citywide, this means that the City of Ellensburg's canopy provides over $61,800 annually in stormwater benefits.

## CARBON STORAGE AND SEQUESTRATION

Trees accumulate carbon in their biomass; with most species in a forest, the rate and amount increase with age. The trees of Ellensburg store approximately 21,830 tons of carbon, valued at over $3.7 million, and each year the tree canopy absorbs and sequesters approximately 1.3 million pounds of carbon dioxide, valued at over $109,300.

**Table 5. Breakdown of ecosystem benefits in the City of Ellensburg.**

| Benefit | Units | | Value |
|---|---|---|---|
| Pollution Removed | 19 | tons/yr | $114,155 |
| Runoff Avoided | 7 | M gal/yr | $61,862 |
| CO2 Sequestered | 642 | tons/yr | $109,390 |
| | **ANNUAL VALUE PROVIDED** | | **$285,409** |
| CO2 Stored | 21,830 | tons | $3,723,226 |

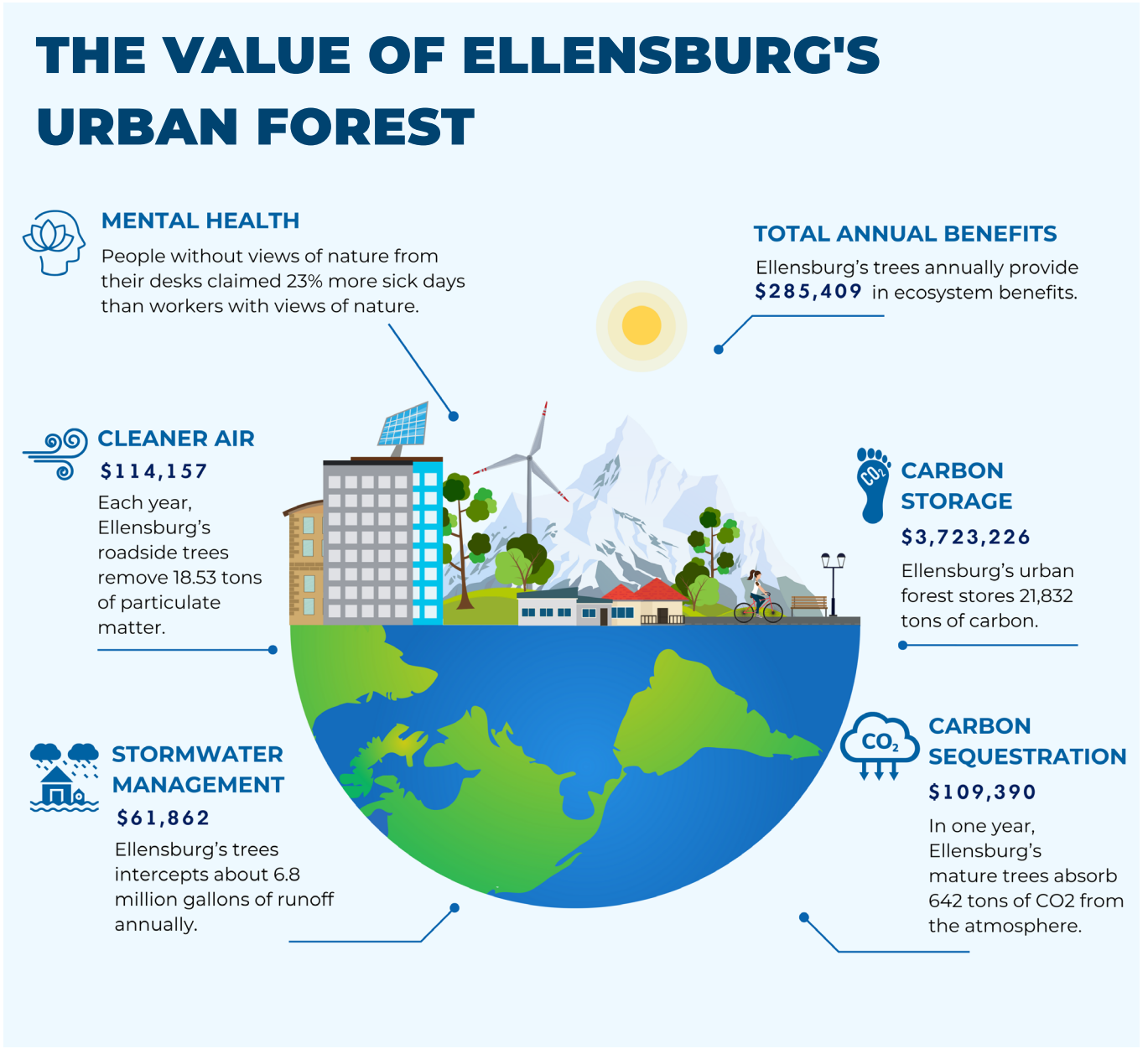



**Figure 21. Ecosystem service benefits of Ellensburg's canopy cover. Data sourced from I-tree, the US Forest Service, the Arbor Day Foundation, and the EPA.**

TREE PLANTING

# PRIORITIZATION

Increased tree canopy cover can provide a wide array of benefits to a local community and its residents and visitors. To locate specific areas in need, several socioeconomic, demographic, and accessibility data sources were analyzed at the census block group scale and each was ranked. Rankings are sorted from high (dark blue) to low (light yellow) and were calculated for each criterion as well as overall to show where multiple needs overlap.

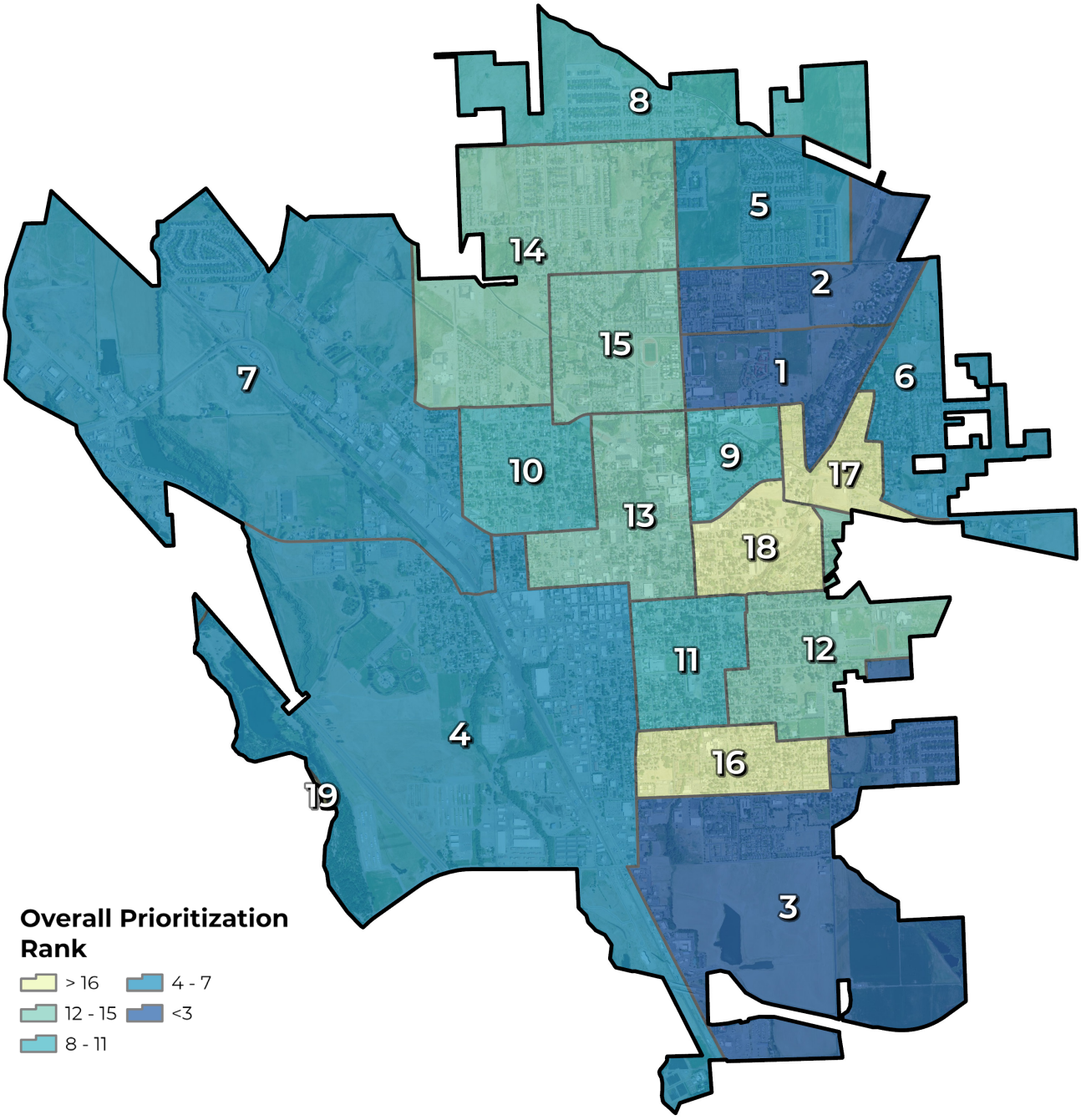
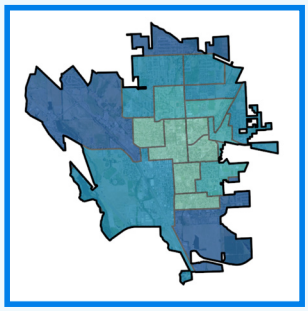
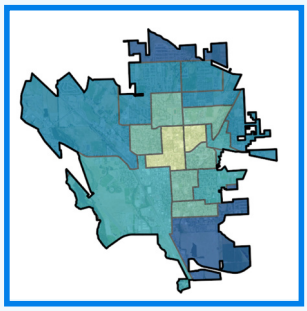


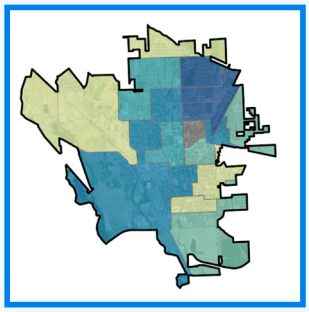

**Figure 22. Overall prioritization rankings for Ellensburg's census block groups. Lower rankings indicate higher priority for tree plantings.**



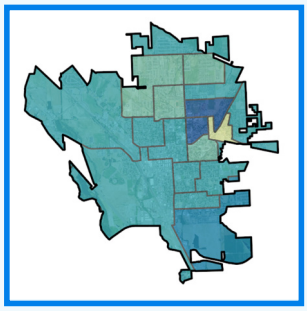
**Areas with Low Existing Tree Canopy:** This indicator highlights census block groups with low percentages of existing canopy cover. This criterion prioritizes areas with higher percentages of area that are not covered by tree canopy.



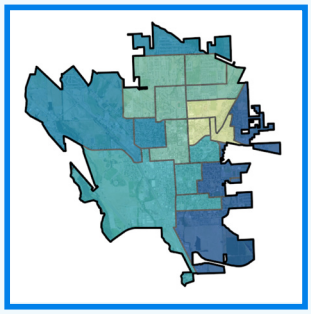
**Possible Urban Tree Canopy:** Identifying areas that can support tree plantings is the first step to expanding urban tree canopy cover in the future. This indicator shows the percentage of the total area available for planting within each census block group. This criterion prioritizes areas with higher percentages of possible planting areas.



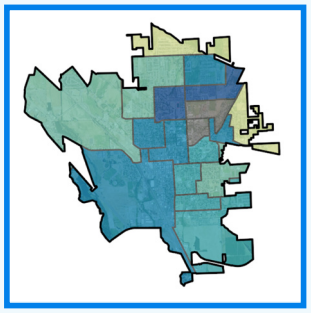
**Poverty Rate:** Trees provide many environmental and health benefits to nearby residents. This indicator shows the percentage of residents living below the federally-designated poverty level.



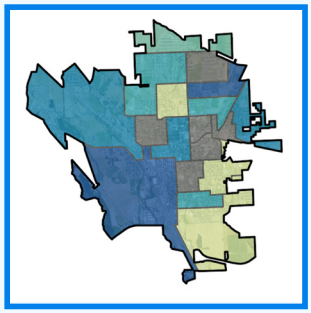
**Unemployment Rate:** Percentage of the labor force that does not have a job, are available to work, and are looking for a job as reported by the Census Bureau. Areas of high unemployment were considered high priority for planting.



**Vulnerable Population:** Trees provide many environmental and health benefits to its residents. This indicator shows the ratio of residents under the age of 18 or over the age of 65 compared to the working-age population. This criterion prioritizes areas with larger ratios of vulnerable populations.



**Median Household Income:** Income inequality often occurs with environmental inequality where lower-income residents live in highly impervious areas with limited numbers of trees, parks, and other greenspaces. This criteria shows areas with lower median household incomes.



**Educational Attainment:** The presence of trees aligns with improved educational performance and social connections. This criterion shows the percentage of the population without a high school diploma or the equivalent General Educational Development (GED) as reported by the U.S. Census American Community Survey 5-year summaries.

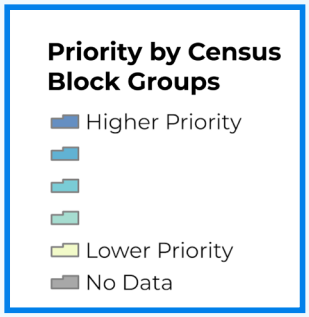



**Figure 23. Prioritization criteria by census block groups in Ellensburg**

# CONCLUSIONS AND RECOMMENDATIONS

The City of Ellensburg has demonstrated that it values its natural resources and wants to maintain a healthy and sustainable urban environment. Recurring assessments of the city's tree canopy are pivotal for the long-term vitality of its urban forest. With strategic planning, investment, and diligent care for existing trees, Ellensburg can significantly enhance its canopy cover. The City should continue to monitor the health of the urban forest and implement the following recommendations to ensure the urban forest is considered during future city planning and development to sustain and enhance the benefits that trees provide to the community.

Regular tree canopy assessments, facilitated through tools like Ellensburg's TreePlotter CANOPY subscription or ongoing projects, are essential as Ellensburg expands. These assessments will inform urban forest policies and management practices, emphasizing the maintenance, health, and growth of the City's trees. By utilizing assessment results, Ellensburg can identify areas for canopy preservation, expansion opportunities, and areas where investments in the urban forest would yield the most significant returns, ensuring a greener, more vibrant city for future generations.

## RECOMMENDATIONS

1. **Leverage the results of this assessment to promote the urban forest and set evidence-based canopy goals**
   The findings of this assessment are pivotal for promoting investment in urban forest monitoring, maintenance, and management; and 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 urban forest needs and benefits.

   As Ellensburg's population grows and urbanization expands, the preservation and growth of the 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.**

2. **Identify areas to prioritize canopy expansion**
   The City and its various stakeholders can utilize the results of the UTC, PPA, and prioritization analyses to identify the best locations on City-owned canopy expansion efforts. **Utilizing the 112 acres of PPA in the right-of-way (ROW) could provide significant shading for walkways and roadways. The City can develop a proactive street tree maintenance program to take on the responsibility of planting and managing street trees, ensuring healthy trees are distributed equitably across the city.**

   The City should evaluate city codes to increase tree preservation, create space for existing trees during the development process, and set aside space for new larger stature trees to be planted within the public ROW to maximize the benefits of trees. Adopting ordinances and policies that reflect a "complete green streets" design methodology can help harmonize gray and green infrastructure, simultaneously maximizing public functionality and environmental benefit, while reducing associated costs.

3. **Develop outreach programs toward private landowners**
Residential zoned areas (Residential Suburban, Residential Low Density, and Residential Medium Density) accounted for 50% of the City's total tree canopy and contained over 50% of all citywide PPA. To increase canopy in Ellensburg, it's important to understand that most urban forests are often situated on private land.

   Incorporating these findings into community outreach and education programs for citizens and private landholders is crucial. Disseminating the data derived from this assessment will help residents understand the changes in their local urban forests and the numerous benefits trees offer. **Pairing educational programming with tree giveaways, tree planting programs, and tree maintenance events can help increase urban tree canopy in the 1,300+ acres of plantable space on residential zoned lands.**

4. **Use TreePlotter to identify areas in need of tree canopy, prioritize planting efforts, and continue to monitor the urban forest**
Utilization of TreePlotter™ CANOPY enables the City of Ellensburg and other urban forest stakeholders to create detailed planting priority maps. Users can create uniquely weighted scenarios to target areas based on specific criteria such as low UTC, high PPA, or specific socio-demographic criteria. By focusing on these areas, the allocation of urban forest management resources can be maximized, offering a greater return on investment.

REPORT

# APPENDIX

## GLOSSARY/KEY TERMS

**Land Acres**: 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 biophysically possible to plant trees.
**Shrub:** Areas of shrub or other leafy and woody vegetation (smaller than 6ft tall) that are not classified as tree canopy
**Soil/Dry Vegetation:** Areas of bare soil and/or 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 and 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 other modifiers may be required to keep a tree alive in these areas.
**Unsuitable Vegetation:** Areas of non-canopy vegetation that are not suitable for tree planting due to their land use.
**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 the urban forest. Tree canopy was generally taller than 10-15 feet tall.
**Water:** Areas of open, surface water not including swimming pools.

FEBRUARY | 2024

URBAN TREE CANOPY

# ASSESSMENT

## ELLENSBURG, WASHINGTON

PlanIT Geo
developers of TreePlotter

City of Ellensburg WASHINGTON

WASHINGTON STATE DEPT OF NATURAL RESOURCES