

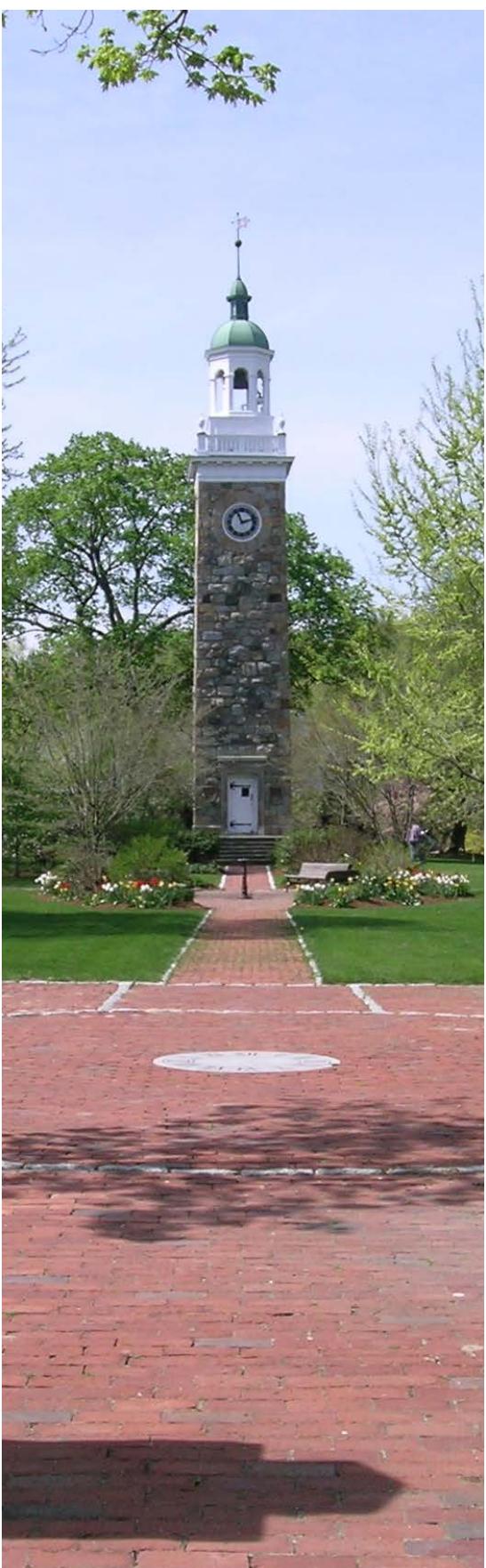


URBAN TREE CANOPY ASSESSMENT

WELLESLEY, MASSACHUSETTS

JUNE | 2023





AN ASSESSMENT OF URBAN TREE CANOPY IN **WELLESLEY, MASSACHUSETTS**



**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

Town of Wellesley, Massachusetts

COMPLETED

June 2023

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**3,708
ACRES OF CANOPY**
**57%
OF WELLESLEY
WAS COVERED BY
TREE CANOPY IN 2021**

EXECUTIVE SUMMARY

INTRODUCTION AND PURPOSE

Located in eastern Massachusetts and part of the Greater Boston area, the Town of Wellesley is approximately 10.5 square miles, or 6,752 acres, in size. This assessment mapped urban tree canopy (UTC), possible planting area (PPA), and tree canopy changes from 2012 to 2021 and analyzed distribution throughout Wellesley and its census blocks, block groups, watersheds, ZIP codes, two-acre hexagons, and the Town's map grid. The purpose of this analysis was to establish the baseline of existing tree canopy and identify plantable areas within Wellesley that will help the Town reach 60% tree canopy cover by 2050.

PROJECT METHODOLOGY

The results, based on 2021 and 2012 imagery from the USDA's National Agriculture Imagery Program (NAIP), provide a current and historical look at canopy cover in Wellesley and will allow the Town to develop new strategies to protect and expand the urban forest. This study used modern machine learning techniques to create land cover data that are more reproducible and will allow for a more consistent comparison during future tree canopy and land cover assessments.

WELLESLEY'S URBAN FOREST

In 2021, Wellesley had 57% UTC and 17% PPA, excluding any surface water bodies within the town. Urban tree canopy and PPA percentages above are based only on land area, since water bodies are not suitable for planting new trees without significant modification. The 3,708 acres of tree canopy in Wellesley provide a multitude of economic, environmental, and social benefits, valued at over \$2 million annually. Single Residence Districts, zones that allow for single, detached residential houses only, made up 72% of Wellesley's total land area, had 60% urban tree canopy cover, and contained 73% of Wellesley's townwide canopy in 2021. Educational zoned areas, including Wellesley and Babson Colleges, contained 56% canopy coverage, approximately 355 of Wellesley's total 3,708 tree canopy acreage.

Air Quality Benefits: \$889,459
Carbon Benefits: \$608,855
Stormwater Benefits: \$506,779

URBAN TREE CANOPY CHANGE

Results from this assessment found that Wellesley's canopy cover increased from 54% to 57% (+3% or +210 acres) from 2012 and 2021. While the overall trend of townwide canopy is positive, losses on finer scales should not be ignored. 24% of Wellesley's census blocks experienced losses in canopy between 2012 and 2021. These losses are likely due to development and re-development of homes on private property.

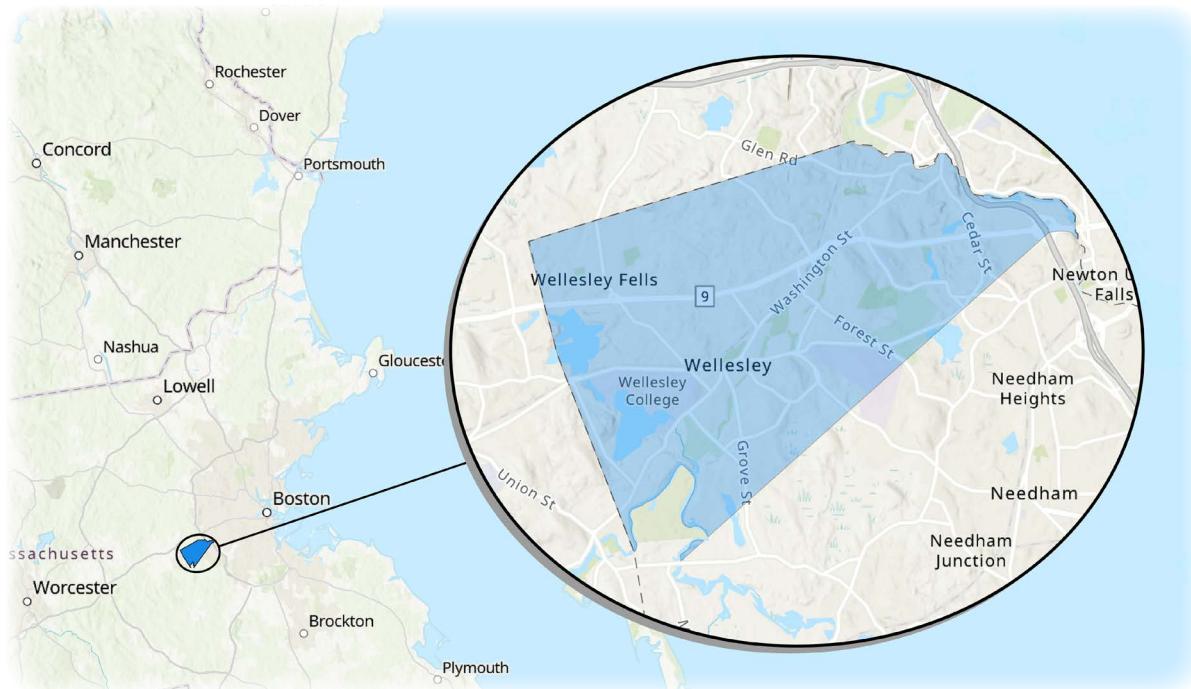
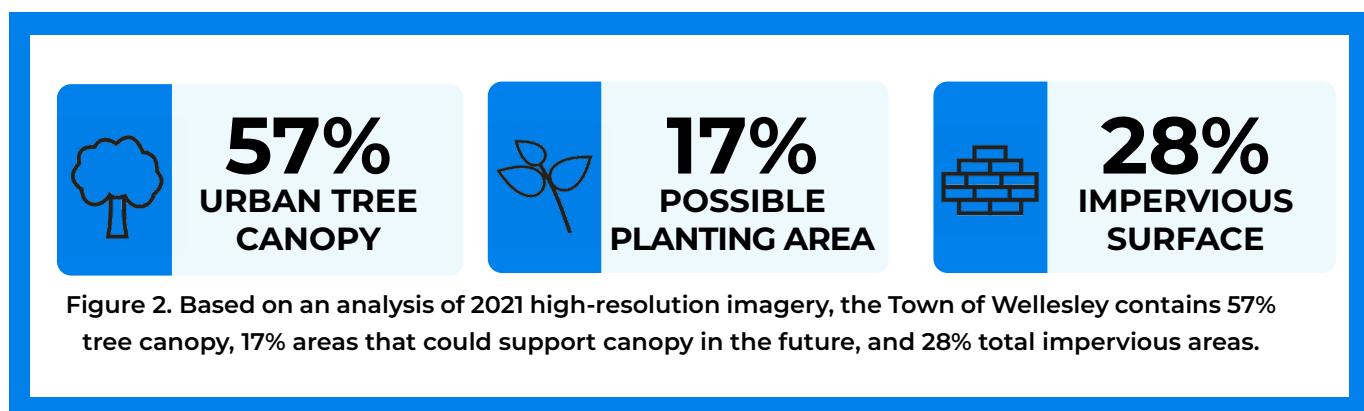


Figure 1. Wellesley occupies approximately 10.5 square miles in eastern Massachusetts.

RECOMMENDATIONS

The results of this analysis can be used to develop a continued strategy to protect and expand Wellesley's urban forest. This study revealed that townwide canopy increased by 210 acres within Wellesley's current town boundary. With 1,129 acres of possible planting area, Wellesley has an opportunity to increase urban tree canopy coverage on both public and private property. The Town should proactively work to continue planting new trees to support the townwide goal of 60% canopy cover by 2050, a ~3% increase from the current 57% baseline. In 2021, 76% of total PPA acreage was on Single Residence property, and 12% fell on Educational zoned areas. With partnerships, education, and outreach programs to private landowners, Wellesley can aim for gains in the townwide canopy numbers. It is important for the Town to use this assessment to inform future investments in the urban forest so that all those who live, work, and play in Wellesley can benefit from the urban forest. Through management actions, strategic plantings, and protections for existing canopy informed by the UTC, PPA, and change metrics included in this report and the town's TreePlotter™ CANOPY app, Wellesley has an opportunity to expand its current urban tree canopy to its fullest potential and reach its tree canopy cover goals.



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) multispectral imagery from the U.S. Department of Agriculture's National Agriculture Imagery Program (NAIP) collected in 2021 to derive land cover. The NAIP imagery was used to classify all types of land cover. For canopy change analysis, 1-meter resolution NAIP imagery collected in 2012 was used to classify the historical tree canopy.

MAPPING LAND COVER

The land cover data set is the most fundamental component of an urban 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 NAIP imagery. These six classes are shown in Figure 3 and described in the Glossary found in the Appendix. EarthDefine also provided 2012 tree canopy classification metrics used for canopy change analysis.

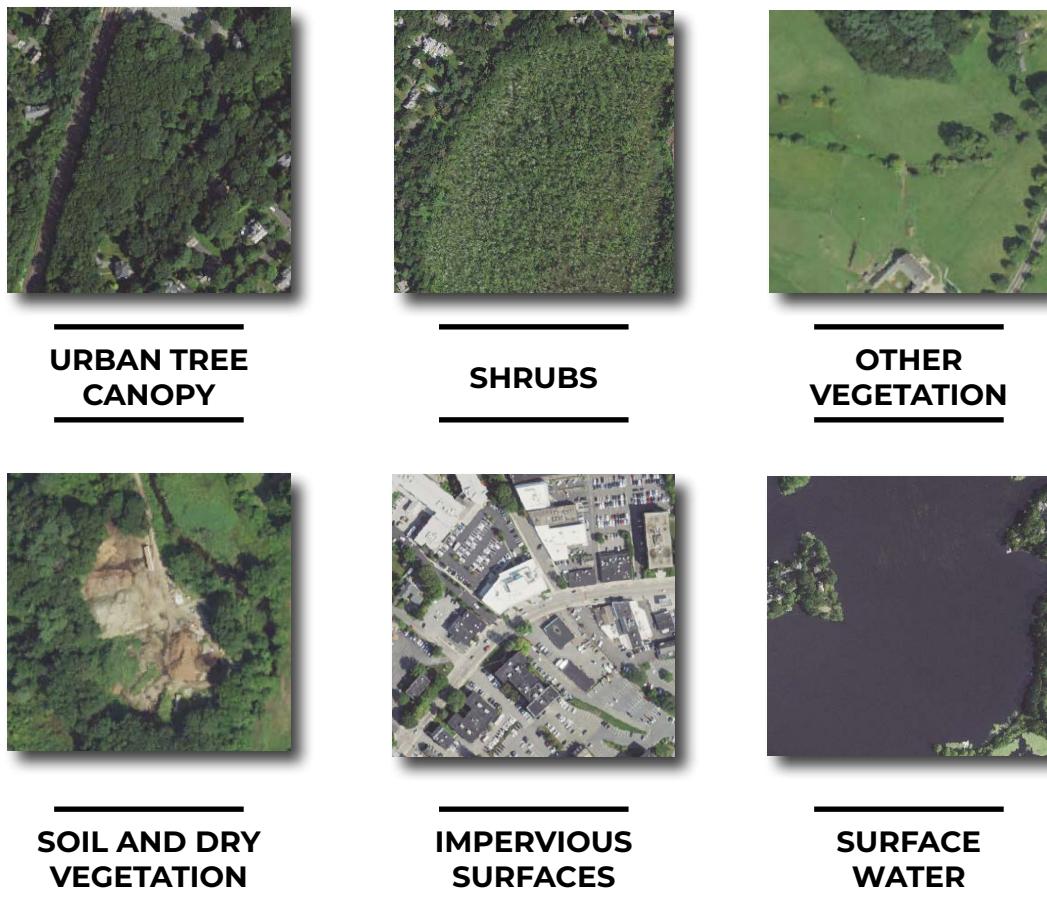


Figure 3. Six (6) distinct land cover classes were identified in the 2021 tree canopy assessment: urban tree canopy, shrubs, other vegetation, bare soil and dry vegetation, impervious surfaces, and water.

IDENTIFYING POSSIBLE PLANTING AREAS AND UNSUITABLE AREAS FOR PLANTING

In addition to quantifying Wellesley's existing tree canopy cover, another metric of interest in this assessment was the area where tree canopy could be expanded. To assess this, all land area in Wellesley that was not existing tree canopy coverage was classified as either possible planting area (PPA) or unsuitable for planting.

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

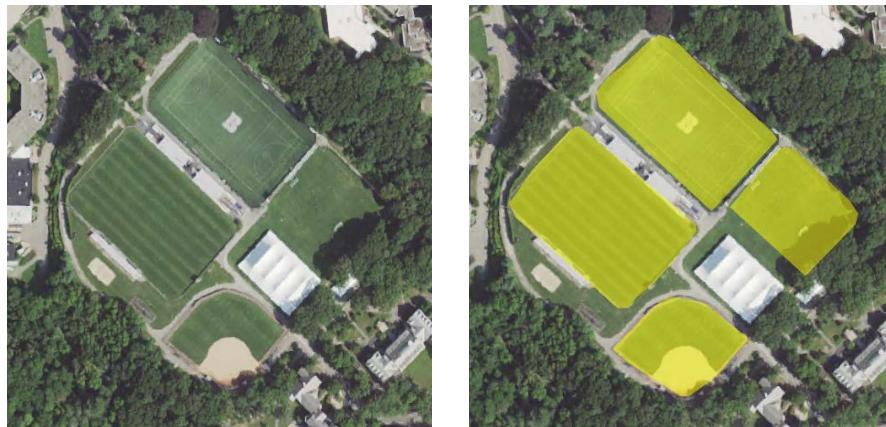
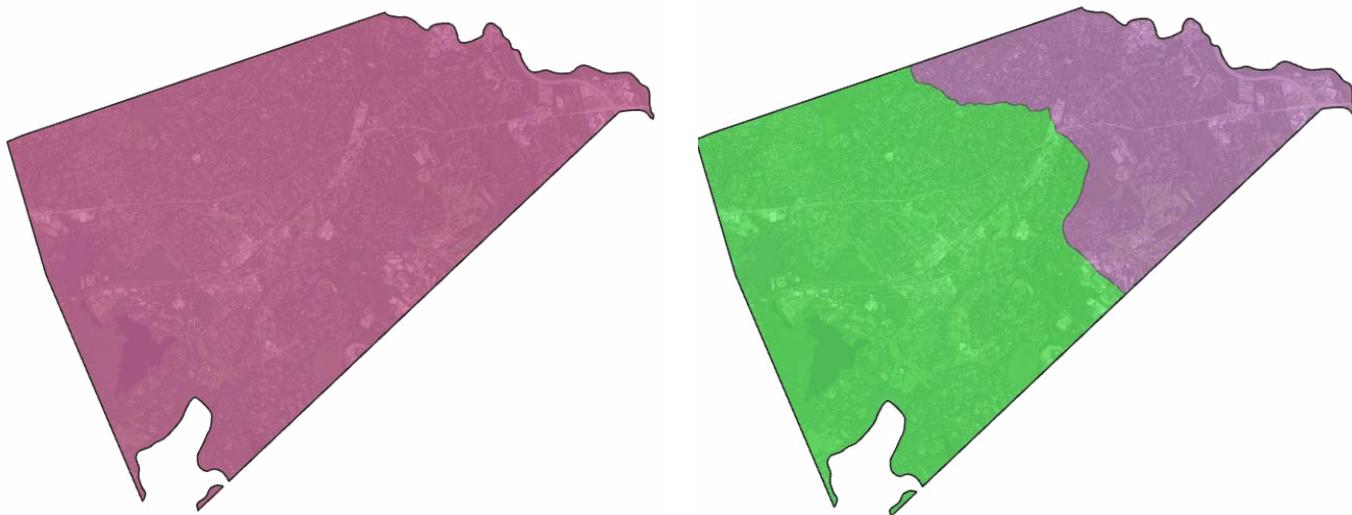


Figure 4.

Vegetated areas where it would be biophysically feasible for tree plantings, but undesirable based on their current usage (left) were delineated in the data as "Unsuitable" (right). These areas included recreational sports fields, golf course playing areas, and other open space.

DEFINING ASSESSMENT LEVELS

In order to best inform Wellesley's various stakeholders, urban tree canopy and other associated metrics were tabulated across a variety of geographic boundaries. These boundaries include the Wellesley town boundary, USGS HUC-12 watersheds, ZIP codes, zoning, census block groups, the Town's planning map grid, census blocks, and two-acre hexagons.

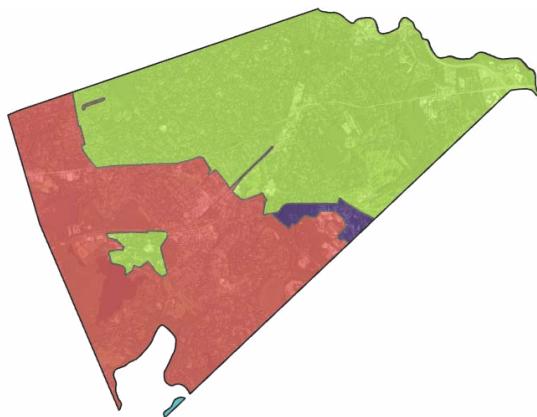


WELLESLEY

Wellesley's **town boundary** is the one (1) main area of interest over which all metrics were summarized.

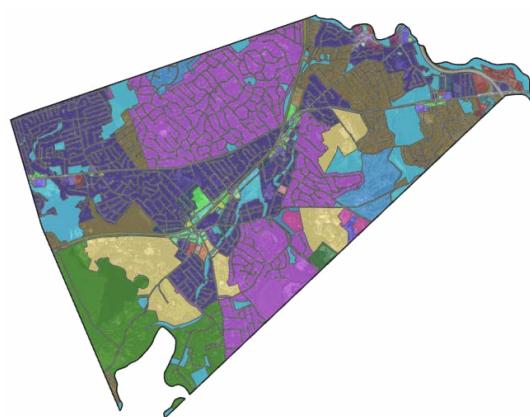
WATERSHEDS

Since trees play an important role in stormwater management, two (2) **watersheds** were assessed.



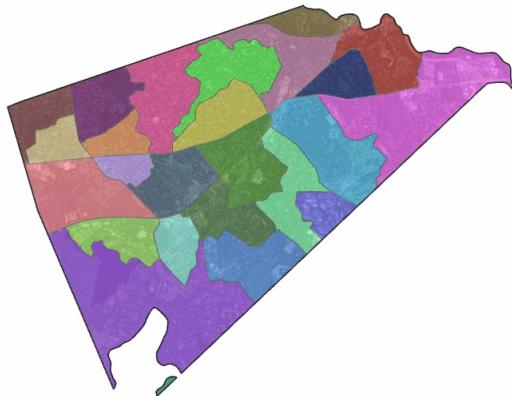
ZIP CODES

Four (4) **ZIP codes** were analyzed to further dissect tree canopy cover within Wellesley's town boundary.



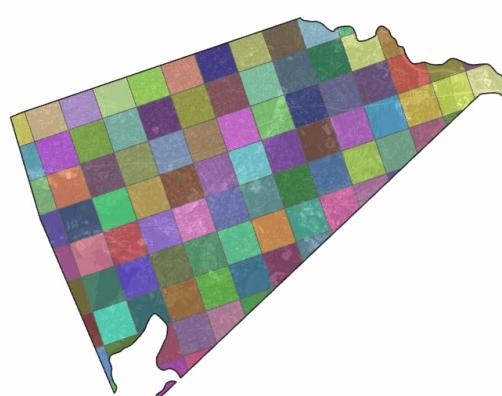
ZONING

The town's twenty-four (24) **zoning** types were assessed to measure tree canopy cover within different human uses of land.



CENSUS BLOCK GROUPS

Twenty-five (25) **census block groups** were assessed to show the relationship between tree canopy and socio-demographics and highlight potential environmental justice issues.



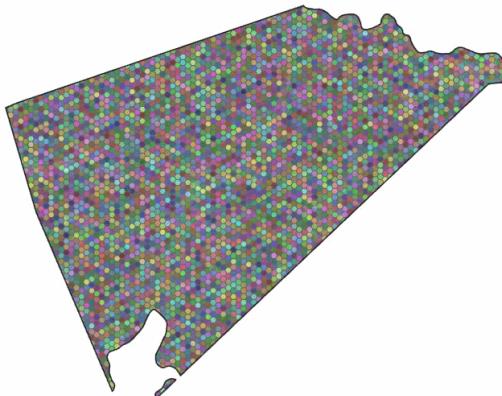
MAP GRID

Ninety-six (96) **map grid** cells were assessed to quantify urban tree canopy at a scale often used by the Town.



CENSUS BLOCKS

Smaller than census block groups, 507 **census blocks** were also assessed.



HEXAGONS

To better understand the distribution of tree canopy on an even finer scale, a layer with 3,552 two-acre **hexagons** was created and assessed.

Figure 5. Eight (8) distinct geographic boundaries were explored in this analysis: Wellesley town boundary, watersheds, ZIP codes, zoning, census block groups, map grid, census blocks, and hexagons.

STATE OF THE CANOPY AND

KEY FINDINGS



The results and key findings of this study, including the canopy change analysis results, are presented below. These results can be used to design a strategic approach to identifying existing canopy and future planting areas. **Urban tree canopy, possible planting area, and unsuitable percentages are based on land area. Water bodies are excluded from land area because they are typically unsuitable for planting new trees without significant modification.**

TOWNWIDE URBAN TREE CANOPY

This urban tree canopy assessment utilized the land cover data as a foundation to determine urban tree canopy (UTC) and possible planting areas (PPA) throughout Wellesley. Results indicated that within the town boundary, 3,708 acres are covered by urban tree canopy, making up 57% of the Town's 6,476 land acres; 1,129 acres (17%) were covered with other vegetation where it would be possible to plant trees; and the other 1,639 acres (25%) were considered unsuitable for tree planting. The unsuitable areas include recreational sports fields, golf course playing areas, Pierce Hill reservoir, areas of bare soil and dry vegetation, and impervious surfaces.

Table 1. Urban tree canopy assessment results by acres and percent (percentages based on land acres).

| Wellesley, Massachusetts | Acres | % |
|-------------------------------------|-------|------|
| Total Area | 6,752 | 100% |
| Land Area | 6,476 | 96% |
| Urban Tree Canopy | 3,708 | 57% |
| Total Possible Planting Area | 1,129 | 17% |
| Unsuitable Vegetation | 113 | 2% |
| Unsuitable Impervious | 1,503 | 23% |
| Unsuitable Soil | 23 | <1% |
| Total Unsuitable Area | 1,639 | 25% |

The Town's 3,708 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 can provide many benefits through ecosystem services such as localized cooling provided by shading and increased stormwater absorption. Results indicated that 91% of Wellesley's urban tree canopy overhung pervious surfaces, while 9% extended over impervious surfaces. These results are presented in Table 2.

Table 2. Detailed urban tree canopy classifications.

| Wellesley, Massachusetts | Acres | % |
|--|--------------|-------------|
| Overhanging Pervious Surfaces | 3,386 | 91% |
| Overhanging Impervious Surfaces | 322 | 9% |
| Total | 3,708 | 100% |

TOWNWIDE URBAN TREE CANOPY CHANGE

Between 2012 and 2021, there was an overall increase in Wellesley's urban tree canopy. Tree canopy increased by 210 acres townwide, a 3% raw increase (acreage change relative to land area) over the nine-year study period (+6% relative to 2012 acreage). Current levels of urban tree canopy in Wellesley can continue to be improved with careful planning and planting efforts.

Wellesley Urban Tree Canopy Potential

Urban Tree Canopy Possible Planting Area
Unsuitable Area

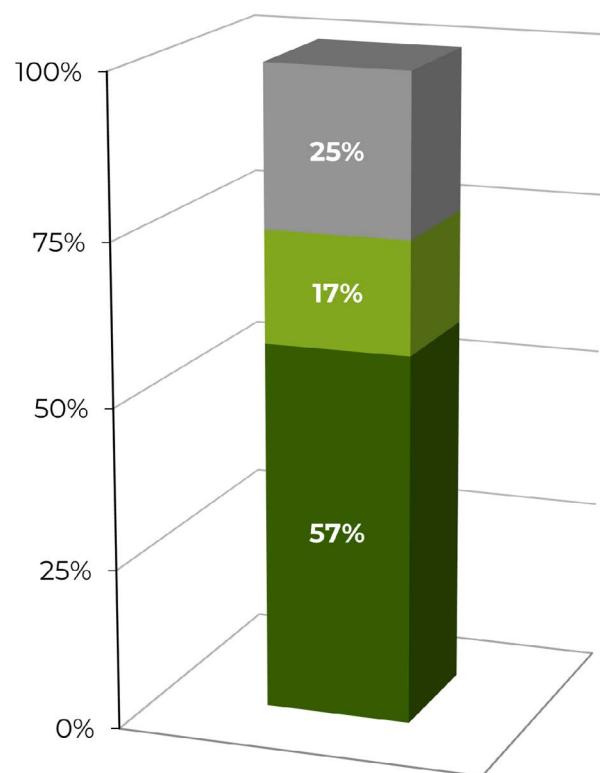


Figure 6. Urban tree canopy, possible planting area, and area unsuitable for UTC in Wellesley. (Percentages based on land area and may not total 100% due to rounding of decimals.)



URBAN TREE CANOPY BY WATERSHEDS

Due to their benefits for regulating stormwater, reducing flooding, and maintaining a healthy water cycle, urban tree canopy metrics were also assessed by watersheds. Trees planted within these areas can help to intercept and absorb stormwater runoff that may otherwise carry harmful pollutants into surface water bodies. Two watersheds cover Wellesley's town boundary and contained relatively similar amounts of UTC and PPA. Fuller Brook-Charles River watershed contained 58% UTC, or 2,498 acres, while Beaver Brook-Charles River watershed had 55% UTC, or 1,210 acres. Beaver Brook-Charles River watershed had a slightly higher percent of PPA (18%) than Fuller Brook-Charles River watershed (17%).

URBAN TREE CANOPY CHANGE BY WATERSHEDS

Both watersheds experienced increases in tree canopy cover over the nine-year study period. Fuller Brook-Charles River watershed had a larger increase of 155 acres, or +4%, since 2012. This equates to a 7% gain relative to 2012 canopy acreage. Beaver Brook-Charles River watershed experienced a 55 acre increase, which translates to a 2% raw change and 5% relative change to 2012.

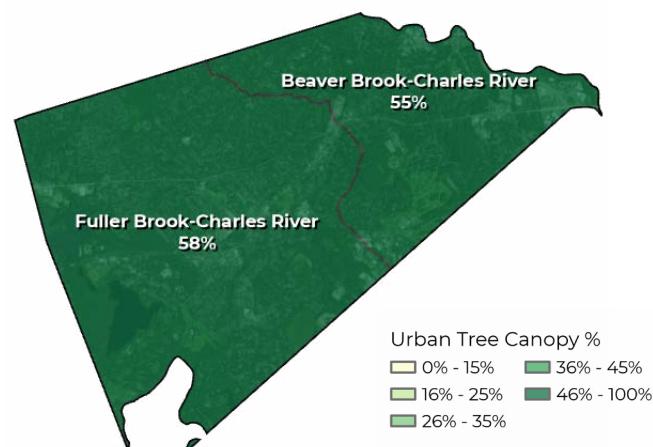


Figure 7. Urban tree canopy by Wellesley's watersheds.

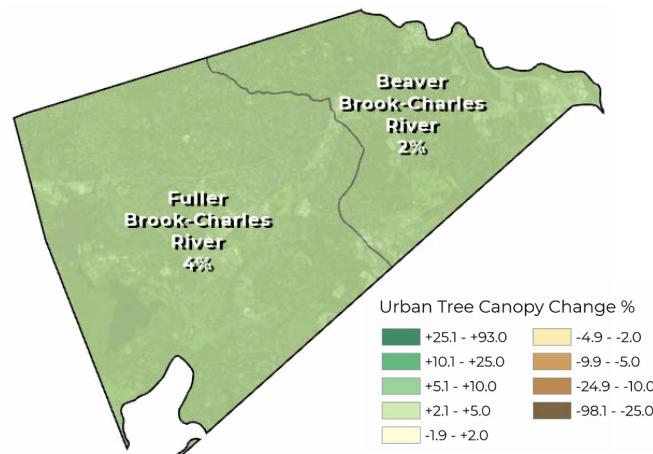


Figure 8. Urban tree canopy change by watersheds.

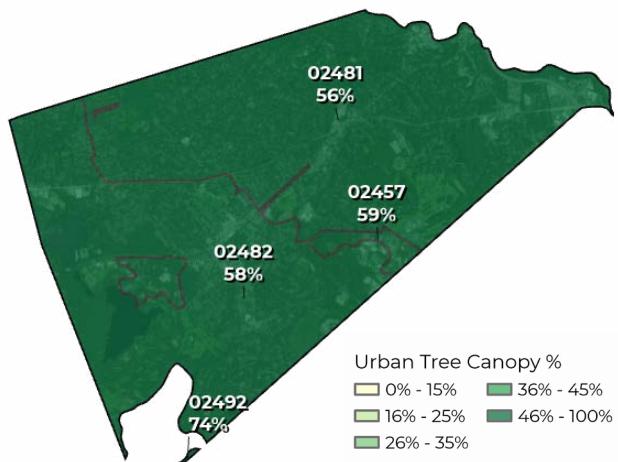


Figure 9. Urban tree canopy by ZIP codes.

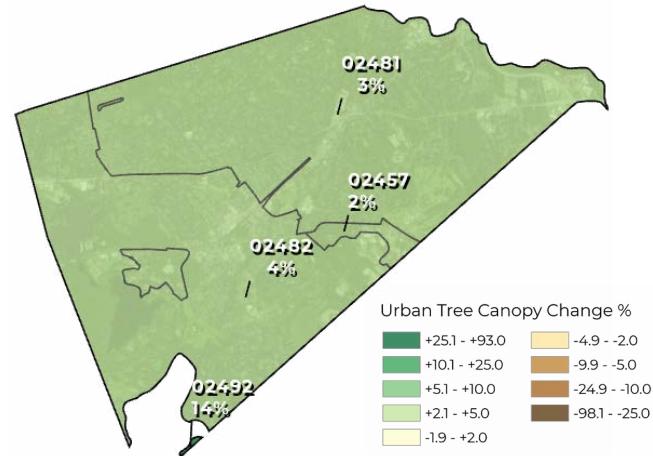


Figure 10. Urban tree canopy change by ZIP codes.

URBAN TREE CANOPY BY ZIP CODES

UTC metrics were also assessed for Wellesley's four ZIP codes. Over 98% of the town and its urban forest is located in ZIP codes 02481 and 02482. Canopy cover was slightly higher in 02482 with 58% compared to 56% in 02481. ZIP code 02492 had a higher UTC percentage but only covered a small area of town (8 acres). There was 17% PPA in both 02481 and 02482.

URBAN TREE CANOPY CHANGE BY ZIP CODES

All four of Wellesley's ZIP codes experienced tree canopy gain between 2012 and 2021. ZIP code 02481, the largest of all areas, gained 102 acres, an increase of 3%. The second largest ZIP code, 02482, gained 104 acres (4%). The smaller ZIP codes, 02457 and 02492, had minimal gains.

URBAN TREE CANOPY BY ZONING

Urban tree canopy metrics were also assessed for Wellesley's 24 zoning types. These zoning types were aggregated into 12 categories for reporting purposes. In 2021, Parks, Recreation, and Conservation zoning had the highest percentage of urban tree canopy with 81%, or 464 acres. Single Residence zoning types (SR10, SR15, SR20, SR30, SR40, SRA) made up 72% of Wellesley's land area, had 60% UTC coverage, and contained 73% of Wellesley's entire canopy cover. Educational (Ed, Ed A, Ed B) zones contained 355 acres of canopy, accounting for 10% of the town's total tree canopy. Lower Falls Village Commercial District (LFVCD) zones contained the least amount of tree canopy within its boundaries with only 0.68 acres, or 8% tree canopy coverage. This small acreage accounts for 0.02% of all Wellesley's canopy cover. Educational zones had the highest percentage of PPA within its boundary with 23% PPA.

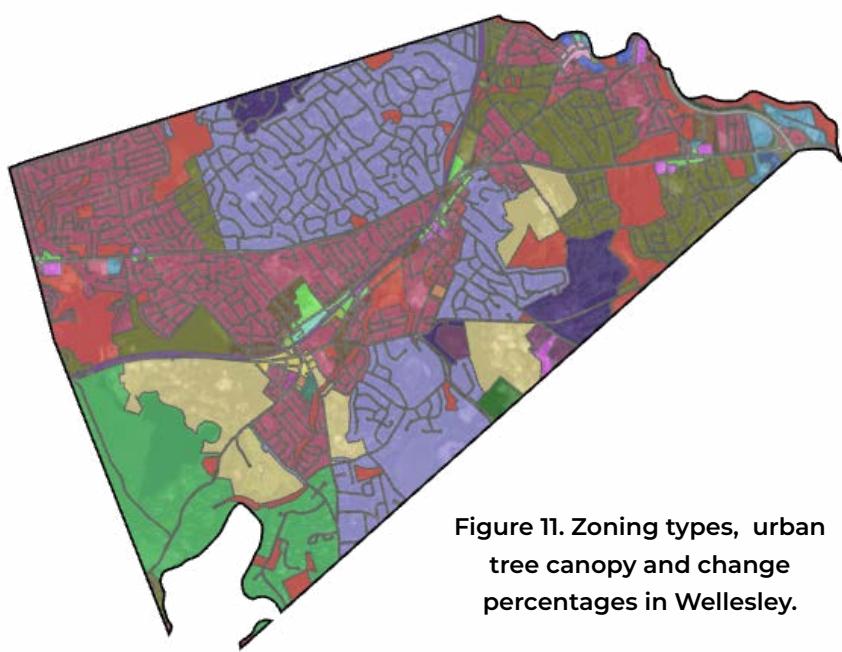


Figure 11. Zoning types, urban tree canopy and change percentages in Wellesley.

| Zoning and Urban Tree Canopy % | | | | | | | | | | | |
|--------------------------------|-----------|------------|-----------|-----------|-----------|--|--|--|--|--|--|
| Ad/P, 25% | Ed, 56% | Ind, 11% | Lt B, 20% | SR15, 64% | SRA, 24% | | | | | | |
| Bus, 17% | Ed A, 61% | Ind A, 27% | Lt R, 33% | SR20, 64% | T, 47% | | | | | | |
| Bus A, 22% | Ed B, 65% | LFVCD, 8% | MR, 49% | SR30, 39% | TH, 48% | | | | | | |
| Con, 81% | GR, 39% | Lt A, 37% | SR10, 53% | SR40, 71% | WSCD, 13% | | | | | | |

| Zoning and Urban Tree Canopy Change % | | | | | | | | | | | |
|---------------------------------------|-----------|------------|-----------|-----------|-----------|--|--|--|--|--|--|
| Ad/P, +1% | Ed, +5% | Ind, +5% | Lt B, +5% | SR15, +4% | SRA, -2% | | | | | | |
| Bus, +3% | Ed A, +1% | Ind A, +5% | Lt R, +5% | SR20, +2% | T, -6% | | | | | | |
| Bus A, 0% | Ed B, +6% | LFVCD, 0% | MR, +7% | SR30, -2% | TH, +2% | | | | | | |
| Con, +4% | GR, +2% | Lt A, 0% | SR10, +4% | SR40, +5% | WSCD, -1% | | | | | | |

Table 5. Urban tree canopy and urban tree canopy change in Wellesley's zoning types.

| Zoning Category | Land Use Size | | UTC | | Change | |
|--|-------------------|-------|-------|-----|--------|-------|
| | Land Area (Acres) | Dist. | Acres | % | Acres | % |
| Business | 157 | 2.7% | 33 | 21% | 2 | 1% |
| Parks, Recreation, & Conservation | 572 | 10% | 464 | 81% | 22 | 4% |
| Educational | 630 | 11.0% | 355 | 56% | 29 | 5% |
| General Residence | 82 | 1% | 32 | 39% | 1 | 2% |
| Industrial | 28 | 0.5% | 6 | 21% | 1 | 5% |
| Lower Falls Village Commercial District | 9 | 0.2% | 0.68 | 8% | <0.1 | <0.1% |
| Limited | 26 | 0.5% | 8 | 29% | 1 | 3% |
| Multi-Family Residence | 6 | 0.1% | 3.0 | 49% | 0.4 | 7% |
| Single Residence | 4,150 | 72% | 2,479 | 60% | 137 | 3% |
| Transportation | 51 | 1% | 24 | 47% | -3 | -5% |
| Town House | 4 | 0.1% | 2 | 48% | 0.1 | 2% |
| Wellesley Square Commercial District | 18 | 0.3% | 2 | 13% | -0.2 | -1% |

Single Residence zones contributed 895 acres, or 76% of total PPA within Wellesley. Both General Residence (GR) and Multi-Family Residence (MR) had less than the townwide average UTC, but both contained 22% PPA despite their smaller land areas.

URBAN TREE CANOPY CHANGE BY ZONING

Ten of the 12 zoning categories experienced tree canopy gain between 2012 and 2021. The greatest tree canopy acreage gain occurred in the Single-Residence zone, adding 137 acres of tree canopy. The largest percentage of canopy gain came from the Multi-Family Residence zone with an increase from 7% in 2012 to 12% canopy cover in 2021. The Transportation zone experienced the greatest loss in canopy acres with -3 acres of canopy, or a -5% change. Wellesley Square Commercial District (WSCD) experienced a 1% decrease, losing 0.2 acres of its 2 acre canopy cover.

URBAN TREE CANOPY BY CENSUS BLOCK GROUPS

UTC and PPA were assessed at the census block group level. Census block groups are divisions of census tracts and bound census blocks. Block groups are 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. Census block groups are particularly valuable for assessing the equitable distribution of tree canopy throughout the town, as they are linked to demographic and socio-economic data.

By and large, the results indicated that UTC was equally distributed throughout Wellesley. Out of the town's 25 census block groups, 72% contained greater than 50% canopy cover. Six census block groups contained between 40 and 50% canopy cover, and only one, covering Babson College, contained between 30 and 40% canopy cover. The highest canopy cover among census blocks was 74%, located in the southwestern corner of the town. Plantable space was also normally distributed throughout Wellesley's census block groups. 84% of census block groups contained between 10-20% plantable space.

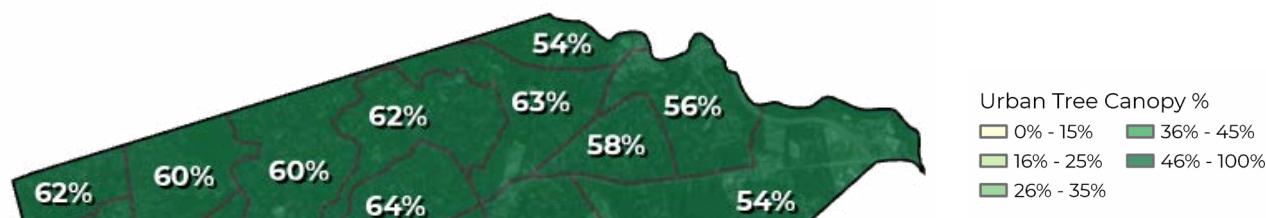


Figure 12. Urban tree canopy by Wellesley's census block groups (left).

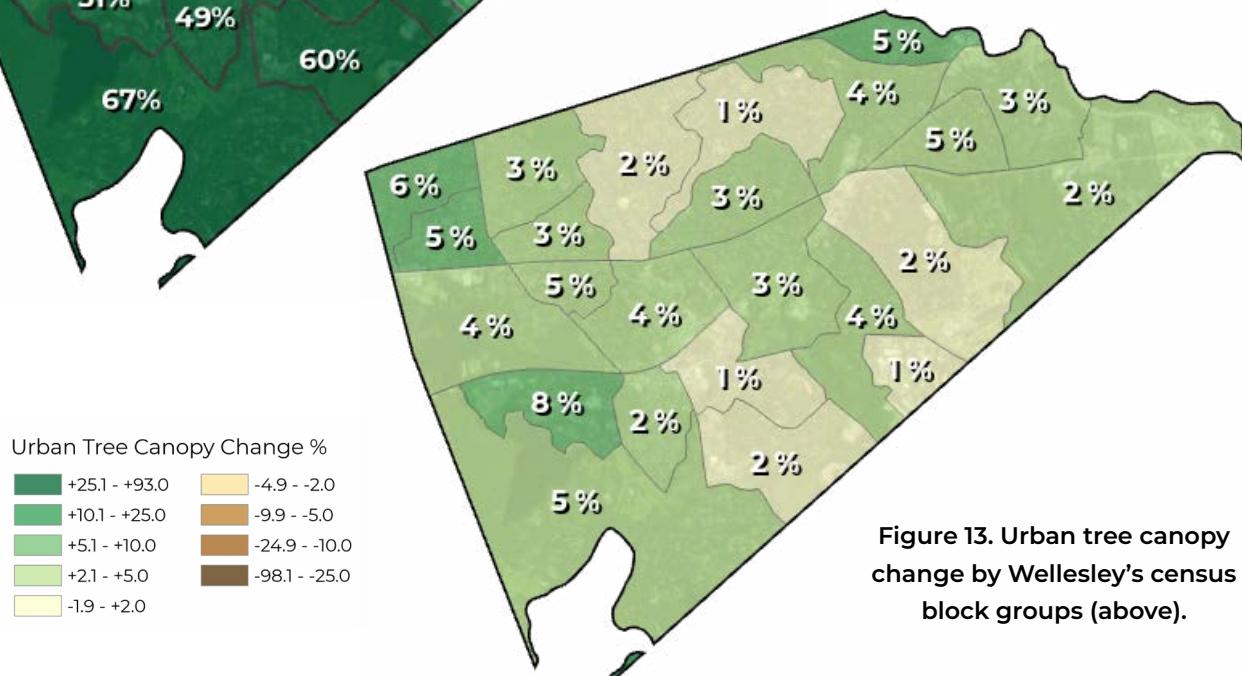


Figure 13. Urban tree canopy change by Wellesley's census block groups (above).

URBAN TREE CANOPY CHANGE BY CENSUS BLOCK GROUPS

During the nine-year study period, all of Wellesley's 25 census block groups experienced a UTC gain. Gains of 2% or more occurred in 19 block groups. The greatest increase within a block group was 8%, a gain of 17 acres. This block group covers Wellesley College. Greater gains in canopy were generally distributed to the edges of Wellesley's town boundary.

URBAN TREE CANOPY BY MAP GRID

UTC and PPA were analyzed for Wellesley's planning map grid. 71 of 96 map grid cells contained greater than 50% canopy cover. Only two grid cells contained less than 30% canopy cover. The highest canopy cover percentages were found along the western edge and southwestern part of the town boundary. 57% of all grid cells contained between 10-20% PPA. No grid cells exceeded 50% PPA.

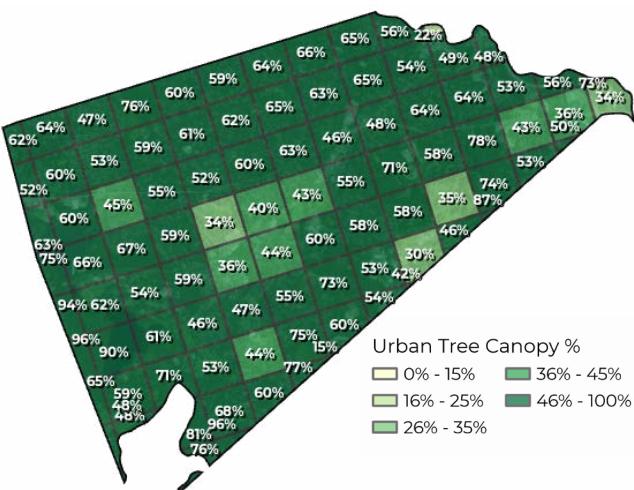


Figure 14. Urban tree canopy by Wellesley's map grid.

URBAN TREE CANOPY BY CENSUS BLOCKS

Similar to other geography's results, more than half of Wellesley's 507 block groups contained greater than 50% canopy cover. 34 census blocks contained less than 20% canopy cover, most of which were located near the MBTA line and stations and Lower Falls area. Half of all blocks contained 10-20% PPA. Only 33 census blocks exceeded 30% PPA.

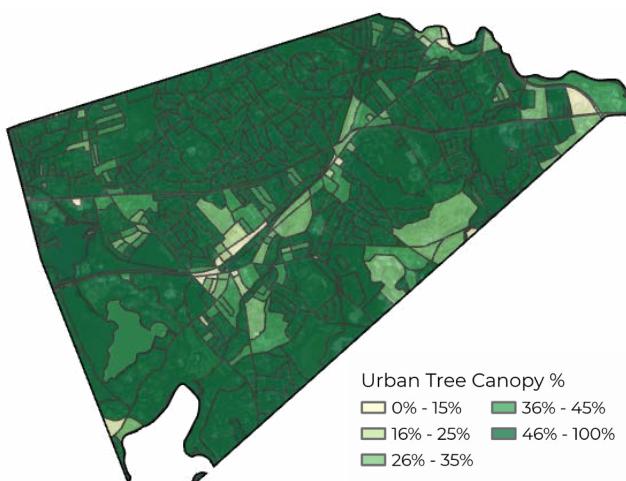


Figure 16. Urban tree canopy by Wellesley's census blocks.

URBAN TREE CANOPY CHANGE BY MAP GRID

Between 2012 and 2021, 84 of Wellesley's 96 map grid cells experienced a UTC gain, while 12 experienced loss. The greatest increase of UTC within a grid cell was 30%. A majority of grid cells experienced a gain between 2-5% UTC. The largest canopy acreage loss was -3 acres in the eastern tip of the town. Greater losses in canopy were generally distributed to the southern edges of Wellesley's town boundary.

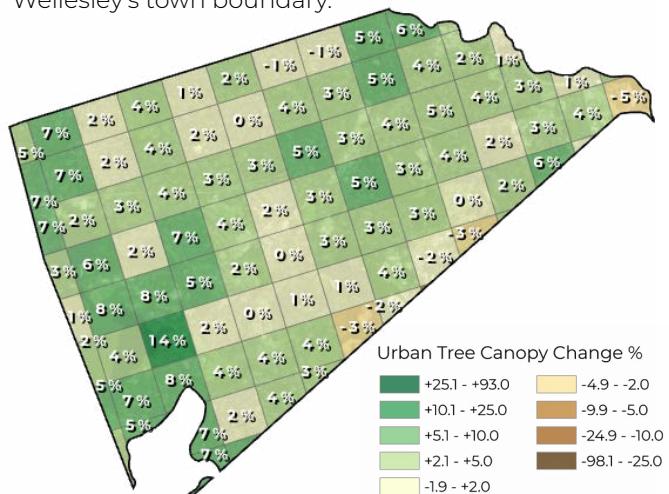


Figure 15. Urban tree canopy change by Wellesley's map grid.

URBAN TREE CANOPY CHANGE BY CENSUS BLOCKS

Of Wellesley's 507 census blocks, 121 experienced urban tree canopy loss. The greatest loss, 28%, occurred in a small block that includes a parcel that is subject to the town's Tree Protection & Preservation Bylaw. Other losses in canopy were scattered across Wellesley. The greatest gains in canopy cover were generally located along the Charles River.

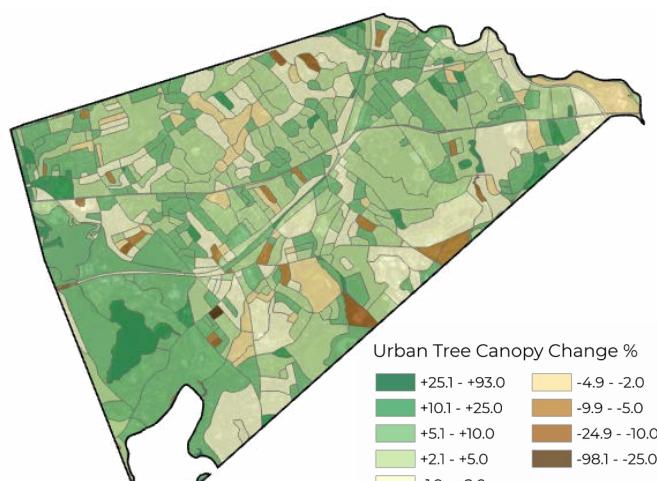


Figure 17. Urban tree canopy change by Wellesley's census blocks.

URBAN TREE CANOPY BY HEXAGONS

Hexagons were the finest scale at which UTC and PPA were analyzed. Each hexagon covers a two-acre area. Out of 3,553 hexagons, 64% contained greater than 50% canopy cover. 116 hexagons had less than 10% canopy cover and were mostly found in and near commercial centers like Wellesley Square, transportation hubs, Wellesley Country Club, and recreation fields. 122 hexagons contained 100% canopy cover. Over 50% of hexagons contained between 0% and 20% PPA, and 7 hexagons were 100% plantable.

URBAN TREE CANOPY CHANGE BY HEXAGONS

Canopy change through the lens of hexagons can show losses otherwise masked by the overall, long-term growth experienced throughout the town. Over the nine-year study period, 75% of hexagons experienced UTC gain or no change, while 25% experienced loss. The greatest gain in a single hexagon boundary was 89%, and the greatest loss within a hexagon was -91%. The average (mean) canopy change per hexagon was over a 3% gain. However, in hexagons that included a parcel that is subject to the town's Tree Protection & Preservation Bylaw, the average was just under a 1% loss. Special care should be taken to protect and preserve existing trees in these areas during construction. For more information on the Tree Protection & Preservation Bylaw, please refer to Policy and Operations (page 15) and Town of Wellesley's Tree Bylaw Factsheet (page 17).

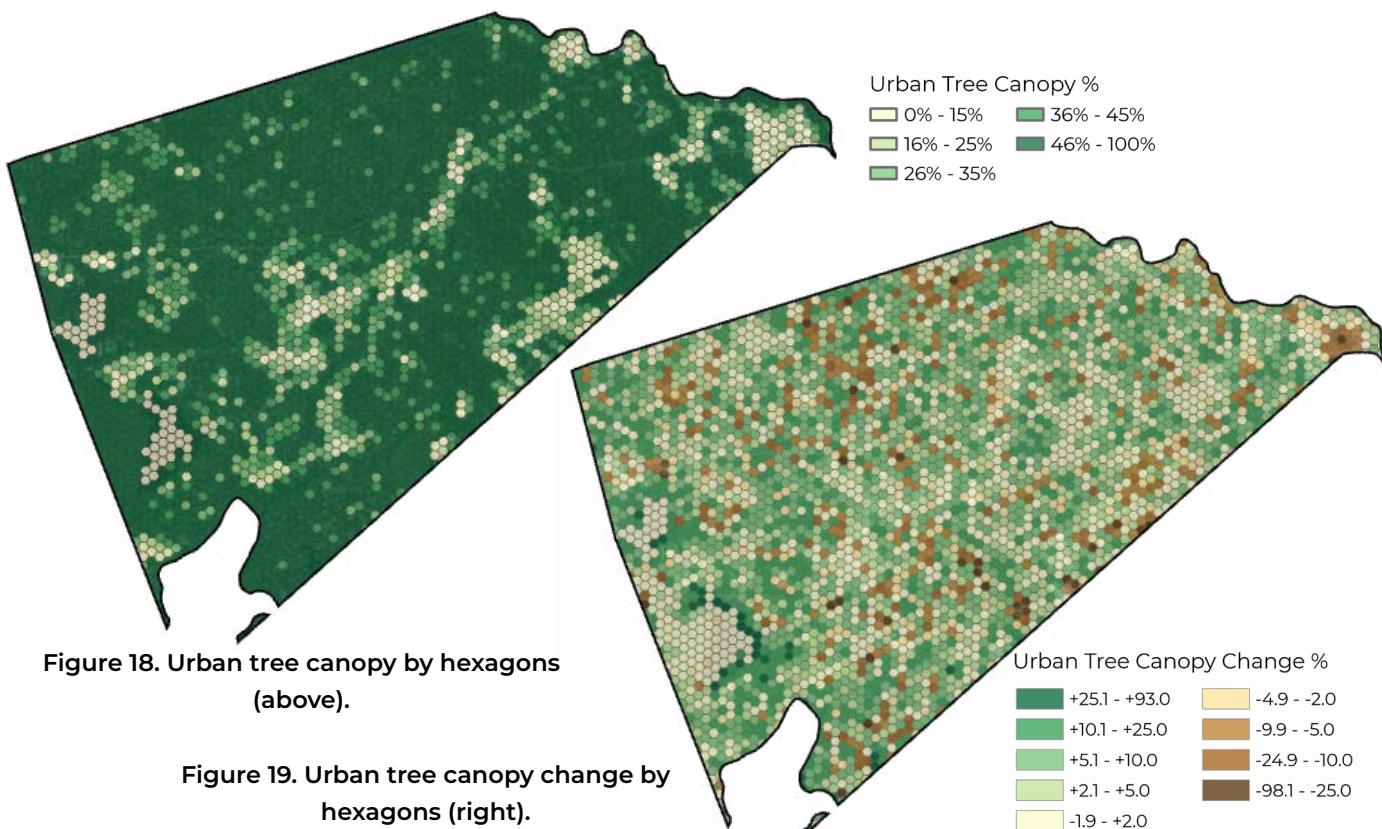


Figure 18. Urban tree canopy by hexagons (above).

Figure 19. Urban tree canopy change by hexagons (right).

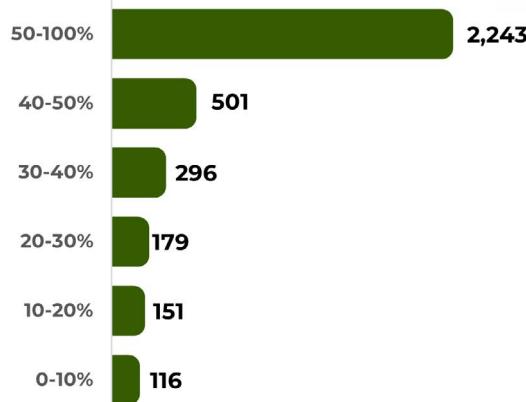


Figure 20. Number of hexagons within percent canopy cover ranges.

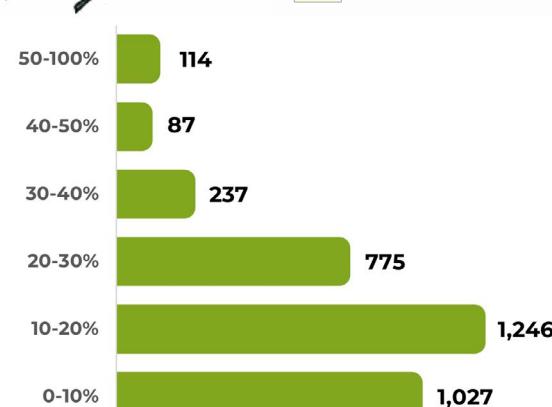


Figure 21. Number of hexagons within percent possible planting area ranges.

URBAN TREE CANOPY

GOAL SETTING

TREE PLANTING GOALS AND SCENARIOS

Multiple tree planting scenarios were considered to assist the Town of Wellesley in reaching future canopy goals. Tree canopy and plantable space information were used as inputs to create three planting scenarios: 1) maintain 57% townwide tree canopy cover, 2) Business as Usual, where the Town would continue to plant 125 trees per year, 3) grow to 60% canopy cover by 2050. The calculator provided an accurate depiction of real-life scenarios by considering the estimated natural growth of existing trees, regeneration, and loss of canopy due to mortality or development that could occur over the next 27 years. Tree planting targets were set to reach the townwide canopy goal, taking into consideration that the built environment and real-world conditions can limit the amount of actual canopy increase. Model parameters were chosen based on local and national standards.

COMPARISON OF PLANTING SCENARIOS

As shown in Table 4, Wellesley could stop planting trees and still maintain 57% townwide canopy cover in 2050 based on the model parameters listed in Table 3. Due to natural growth of the existing canopy, the Town's tree canopy would gain 0.6%, or 39 acres of additional canopy coverage. If the Town continues its Business as Usual strategy with 125 tree plantings a year, a gain of 1.7% in canopy cover would occur, or +107 acres. For Wellesley to reach its 60% townwide canopy cover goal, 6,939 trees would need to be planted over the next 27 years (approx. 257 per year). The 6,939 trees needed to be planted by 2050 can be broken down further by small, medium, and large sized trees based on typical species distributions. 3,363 small trees, 1,168 medium trees, and 2,408 large trees are required. In total, these plantings would add 177 acres across the Town over the 27-year period.

Table 4. Planting scenario descriptions and tree planting results for Wellesley.

| Scenario | Goal | Planting Required | | | |
|---|---|-------------------|--------------------|--------------------|----------------|
| | | UTC Growth (%) | UTC Growth (Acres) | No. of total trees | Trees per year |
| Maintain 57% Townwide Canopy Cover | Determine the number of tree plantings required to maintain 57% UTC in 2050 | +0.6% | 39 | 0 | 0 |
| Business as Usual | Calculate the resulting UTC % in 2050 if the town continues to plant 125 trees a year for the next 27 years | +1.7% | 107 | 3,414 | 125 |
| Grow to 60% Townwide Canopy Cover | Determine the number of tree plantings required to reach 60% UTC in 2050 | +2.7% | 177 | 6,939 | 257 |

Table 3. Assumptions for canopy goal setting

| Category | Assumption |
|---|-------------------------|
| Time Period | 27 years |
| New Tree Mortality Rate | 1% |
| Annual Canopy Loss to Mortality | 1% |
| Annual Loss to Development | 12 acres |
| Annual Natural Regeneration Rate | 0.2% |
| Annual Canopy Growth Rate | 0.2% |
| Distribution of Sm/Med/Lg Trees to Plant | 30% / 15% / 55% |
| Crown Radius (Sm/Med/Lg) | 12.5 ft / 15 ft / 20 ft |

CONCLUSIONS AND

RECOMMENDATIONS

Wellesley has demonstrated that it values its natural resources and wants to maintain a healthy and sustainable urban environment. The Town should continue to monitor the health of the urban forest and implement the following recommendations to ensure the urban forest is considered during future town planning and development to sustain and enhance the benefits that trees provide to the community.

Parks, Recreation, and Conservation Zoning

14% of all canopy cover
8% of all plantable space

industrial, and commercial areas where an increase in tree canopy could provide these benefits to the town's residents and visitors. Focus on planting the right tree in the right place and planting large-species trees where appropriate to maximize ecosystem services and further counteract Wellesley's 1,825 acres of impervious surfaces. With Wellesley's high existing canopy cover, ultimately, the most important thing that can be done to maintain or expand tree canopy is to preserve and protect the town's existing trees.

2. Develop outreach programs towards private landowners

In Wellesley, 76% of PPA is found in Single Residence zoned areas, and 12% of PPA is found within Educational zoned areas. The Town should focus on community outreach and education programs to better inform citizens and private landholders of the environmental, health, and financial benefits that trees provide. With 1,129 acres of plantable space within its boundaries, the town should explore options to develop grant programs for tree maintenance. To promote new plantings, expand the partnership with local contractors to plant more trees on redeveloped or newly developed property. The Town should also continue to develop partnerships with community-based organizations to build stewardship at the community level.

3. Use TreePlotter CANOPY to identify areas in need of tree canopy and continue to monitor the urban forest

To maximize impact, see greater return on investment, and provide the greatest number of benefits to the community, we recommend that the Town focus planting and management efforts in areas with high weighted priority rankings. Planting priority maps and data, displayed in TreePlotter CANOPY app's Plan Tool, show land cover metrics and the areas of highest priority collectively and individually for all planting prioritization criteria by census block groups. The map to the right shows planting priority ranking for census block groups by low existing tree canopy cover and high plantable space. Red census block groups have lower tree canopy and higher plantable space, while green census block groups have higher tree canopy and lower plantable space. Census block groups symbolized by red are considered high priority for planting efforts.

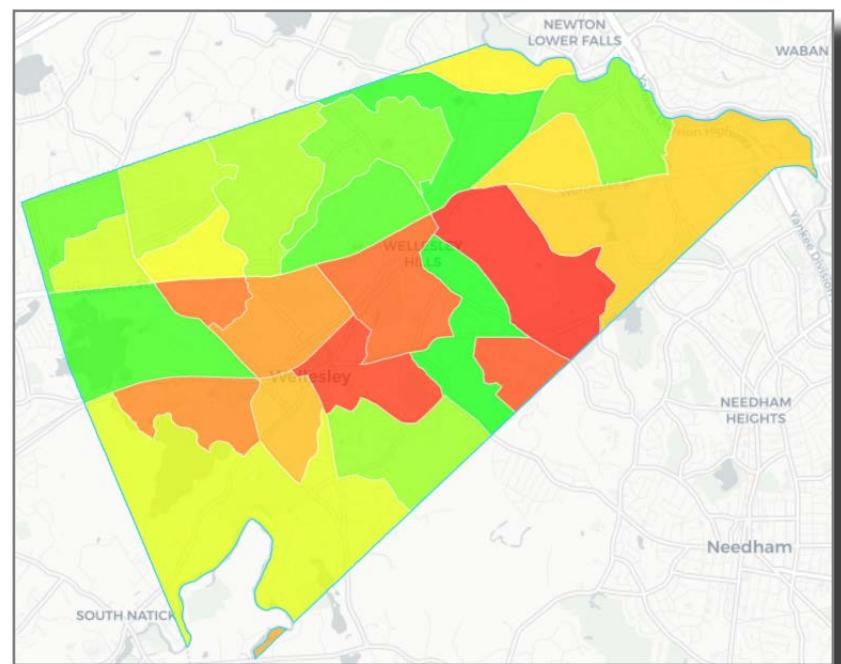


Figure 22. Wellesley's census block groups prioritized for planting by low existing tree canopy and high plantable space.

WELLESLEY TREE CANOPY

IMPLEMENTATION

Managing – even expanding – our tree canopy is critical to protecting our community from climate change, mitigating flooding, supporting biodiversity, and contributing to the Town's resilience. Trees provide climate mitigation benefits through sequestration, or removal of greenhouse gases from the atmosphere, at an estimated rate in suburban tree canopies of approximately 48lbs CO₂/year, equal to 20 gallons of gasoline. The findings and recommendations listed above will allow Wellesley to better understand how policy, budgeting and operational decisions help maintain and increase the Town's tree canopy.

1. Policy Revisions

Changes to the Tree Preservation Bylaw were adopted by Town Meeting in 2020, and revised rules and regulations were promulgated in May 2023. The regulations now protect a greater number of trees, remove some of the exemptions, and require additional mitigation for removal. The Town should continue to audit the tree preservation plans, and seek strategies that incentivize tree protection.

Figure 23 illustrates those hexagons where parcels had building permits that triggered the Tree Bylaw; many hexagons lost canopy while others gained canopy despite the development activity. The Town might also consider how Trees are or can be protected under other regulations (Large House Review, Wetlands Protection Act, Wetlands Protection Bylaw), and create uniform standards.

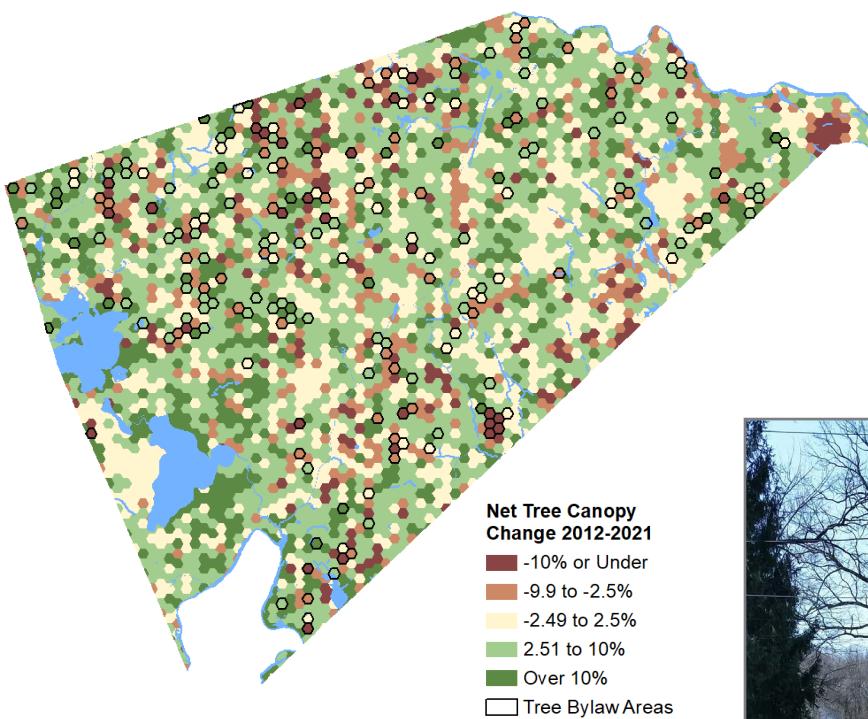


Figure 23. Urban tree canopy change by hexagons and Tree Bylaw activity.

2. Tracking

The Town has more than 7,500 public shade trees, with over 200 distinct species included in the last tree census. Public shade trees are documented on the Town's GIS system (available [here](#)). This census was completed in 1997 and while updated for most newly planted or removed trees, is dated. The Town may consider updating the tree census, which would provide more accurate data about the size, overall condition, and environmental benefits of the canopy. This would involve substantial capital investment. The Town should continue to track the planting and removal of public and private trees to the maximum extent possible.



3. Tree Planting and Maintenance

For decades, the Town of Wellesley has offered public shade tree planting to residents. Residents choose from a list of species, and the DPW plants trees after confirming the site are clear of utility conflicts. A total of 2,719 trees have been planted since the Town has been recording the plantings. Figures 24 and 25 show the top ten species that have been planted by the Town over the last decade on both public and private land. The Town should continue to promote the public shade tree program and offer a variety of hardy species planted in the right space for success. The Town should also consider procurement and planting of bare-root trees, which may lower shipping costs, reduce labor, and increase overall planting efficiency. Additionally, the Town may want to work with growers to begin growing species that traditionally grow in warmer climates, but may be successful as temperatures rise in Massachusetts. Furthermore, the Town should anticipate the unknown threats to trees such as disease and invasive species. To meet or exceed the 60% canopy goal, planting numbers will need to increase, and as public spaces may be limited, the Town should encourage plantings on private property. In addition to additional funds to support the Public Shade Tree program for trees within 20' of the Right of Way, Tree Preservation Bylaw Funds could be used to plant on private property. Figure 26 displays targeted planting areas that focus on areas with greater tree canopy loss.

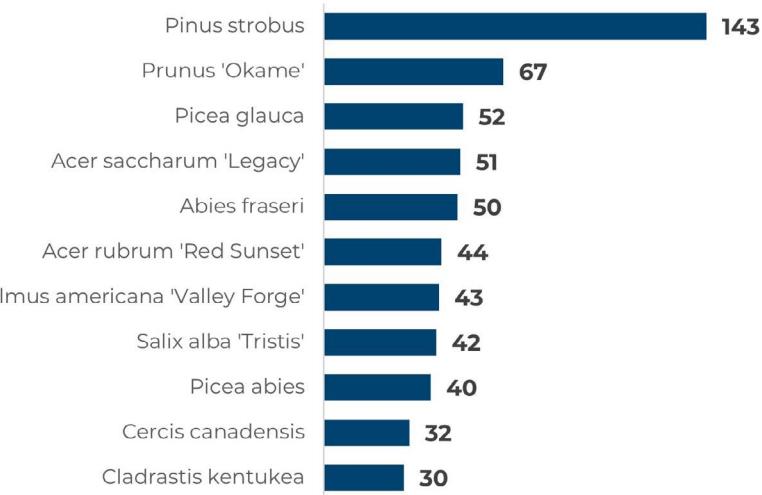


Figure 24. Top 10 species and number of trees that have been planted by the Town of Wellesley over the last decade on public property.

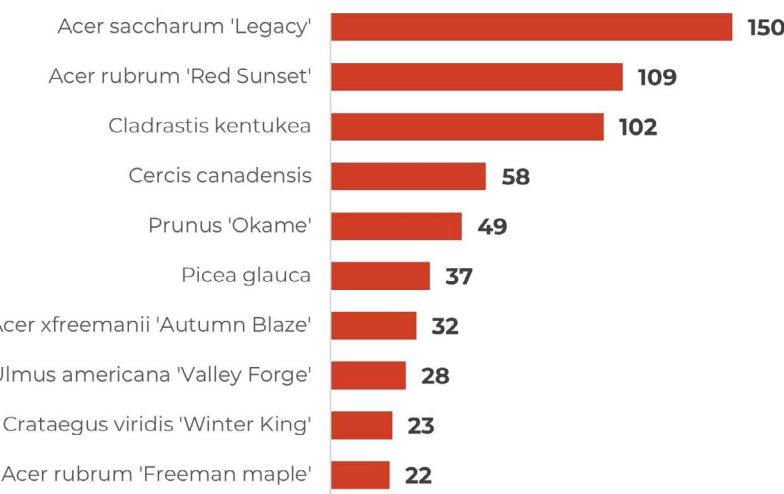
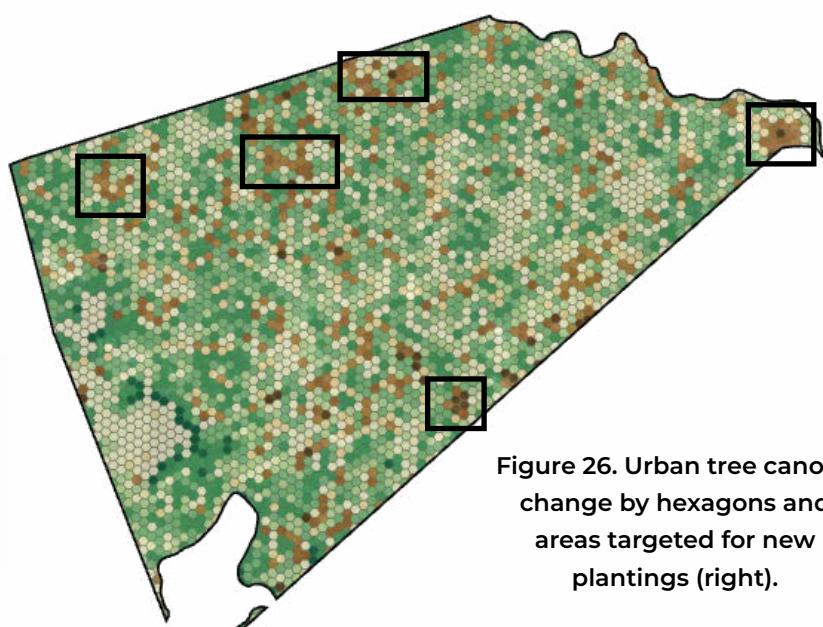


Figure 25. Top 10 species and number of trees that have been planted by the Town of Wellesley over the last decade on private property.



4. Planting Prioritization

In addition to overall community-wide prioritization exercises achievable through the TreePlotter CANOPY app (see page 14 of this report), knowledge of our Town tree professionals of streets and neighborhoods with canopy gaps, and additional tools such as i-Tree Design allow users to prioritize planting on individual properties relative to the buildings to maximize environmental and climate benefits. Below is an example from 888 Worcester Street, highlighting the areas around the building to plant a new Red Maple to maximize stormwater, air quality, and carbon sequestration. Similar analyses could be performed for every tree planted on private property at no cost except minimal staff, volunteer, or homeowner time.

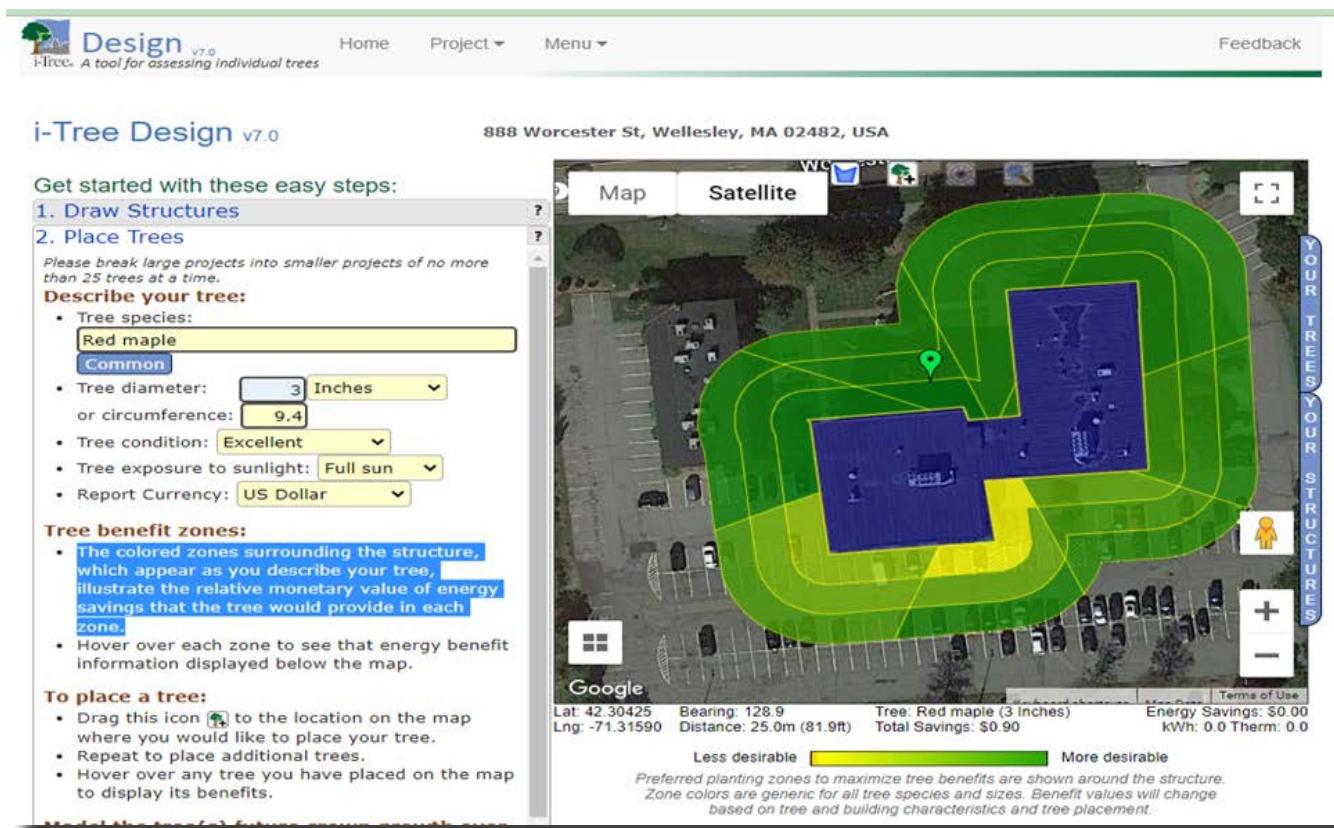


Figure 27. Screen image of i-Tree Design exercise for 888 Worcester Street, Wellesley, Massachusetts).

Wellesley is a community that cares about the environment. The Town is currently the longest-running Tree City USA location in New England. Through thoughtful planning to preserve and promote the Tree Canopy, the Town can help protect itself against climate change, ensure biodiversity and maximize the many benefits of trees.

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 (PPA)- Vegetation: Areas of grass, open space, or shrub vegetation where tree canopy does not exist, and it is biophysically possible to plant trees.

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

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

TreePlotter™ CANOPY: a web browser based, interactive, online map, complete with a full set of cartography and administrative tools built to view, plan, and grow urban tree canopy (UTC).

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.



Quick Summary: Town of Wellesley Tree Bylaw

The **Town of Wellesley Tree Bylaw** was passed by Annual Town Meeting in 2011 and amended by Special Town Meeting in 2020. (Please refer to the complete bylaw to determine whether it applies to a specific property. Click here for the full text: [Town of Wellesley Zoning Bylaw, Section XVIE.](#).)



Credit: [House & Oak Tree Silhouette Landscape | Company](#)

Purpose of the bylaw:

- To encourage property owners to protect large, mature trees when a property is undergoing construction activities, such as demolition, new construction, or the construction of significant additions.

Trees protected by the bylaw:

- The tree bylaw only applies to trees that are 6 inches in diameter at breast height or larger and located in the "tree yard," which is the area around the perimeter of the property, similar to building setbacks. (The size of the tree yard varies depending on how the property is zoned.)
- These trees are defined as "protected trees".

When to apply the bylaw:

- The tree bylaw only comes into play when an application is made to the Building Department for a permit for one of the following activities:
 - If a project includes **demolition** of a structure that is 250 square feet or larger
 - If a project includes construction of a **retaining wall**
 - If a project includes construction on **vacant lot**; or
 - If a project **enlarges the footprint** of an existing structure (or structures) by 50 percent or more.

What the bylaw requires the property owner to do:

- If a project meets any of the applicable conditions (see above), the property owner must provide a plan identifying the protected trees located on the property, and whether the trees are to be retained and protected or removed.
- If protected trees are to be retained, the plan must show the manner in which the tree will be protected (i.e. chainlink fencing), with additional measures proposed if the entire root zone of the tree is to not be protected with fencing.
- If protected trees are to be removed, the property owners must:
 - Propose new trees to be replanted equaling one inch for every inch of trees removed;
 - Make a financial contribution to the Town's Tree Bank, based on an established formula; and/or

JUNE | 2023

URBAN TREE CANOPY

ASSESSMENT

WELLESLEY, MASSACHUSETTS

