# Harvard
# Urban Forestry Summary

CHICAGO REGION TREES INITIATIVE
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The Chicago Region Trees Initiative's (CRTI) goal is that by 2050 the Chicago region will have a healthier urban forest with a diversity of tree species and ages, appropriately distributed across land use types. To achieve that goal, CRTI works with municipalities to help them understand their urban forest and identify strategies that they can use to improve the environmental, economic, and social benefits that trees can provide their residents. This document provides information municipalities need to effectively manage their local forest.

## The Importance of Urban Trees

The urban forest includes all trees in an urban setting regardless of who owns or manages them, such as parkway trees, forested natural areas, and the trees on residential property. Trees improve air and water quality, reduce flooding and the urban heat island effect, and reduce energy use by shading buildings. They also provide habitat for wildlife and improve residents' quality of life by reducing crime rates, increasing property value, and boosting social cohesion in neighborhoods.

Understanding the extent of tree canopy is critical for urban planning. The magnitude of benefits that trees provide correlates with the size, structure, and location of their canopy. Canopy maps can be used to quantify the benefits that their trees provide, identify where new plantings would have the greatest impact, and to develop strategies for expanding the canopy.

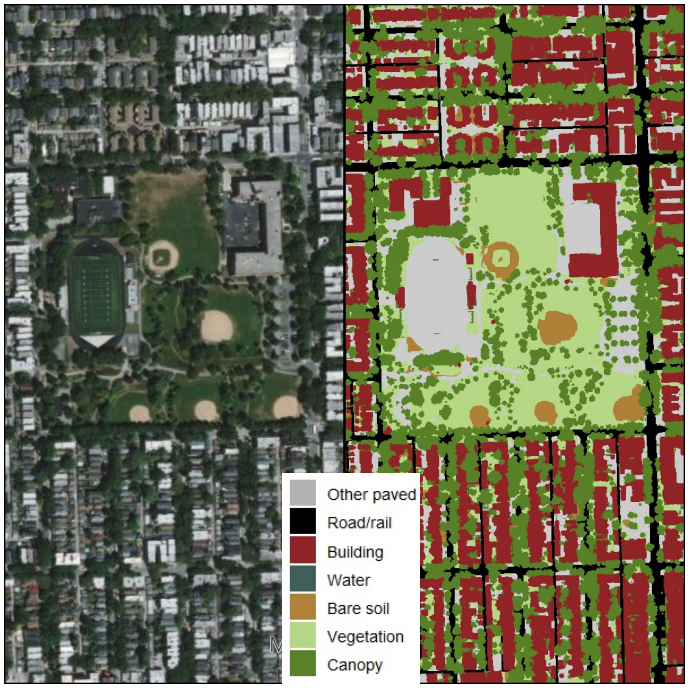


Figure 1: Comparison of imagery and land cover map. Seven types of gray and green infrastructure are in the land cover map.

The Chicago Region Trees Initiative, US Department of Agriculture Forest Service, and the University of Vermont mapped land cover across the seven-county Chicago region in a project funded by the Illinois Department of Natural Resources, the Rice Foundation, and the US Forest Service. This project not only identifies tree canopy, but also other green infrastructure, including grass and shrubs, bare soil and water, and gray infrastructure including buildings, roads and rails, and other paved surfaces like sidewalks and parking lots (Fig. 1). Hereafter, these seven layers will be referred to as "land cover types."

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## Land and Canopy Cover in Your Community

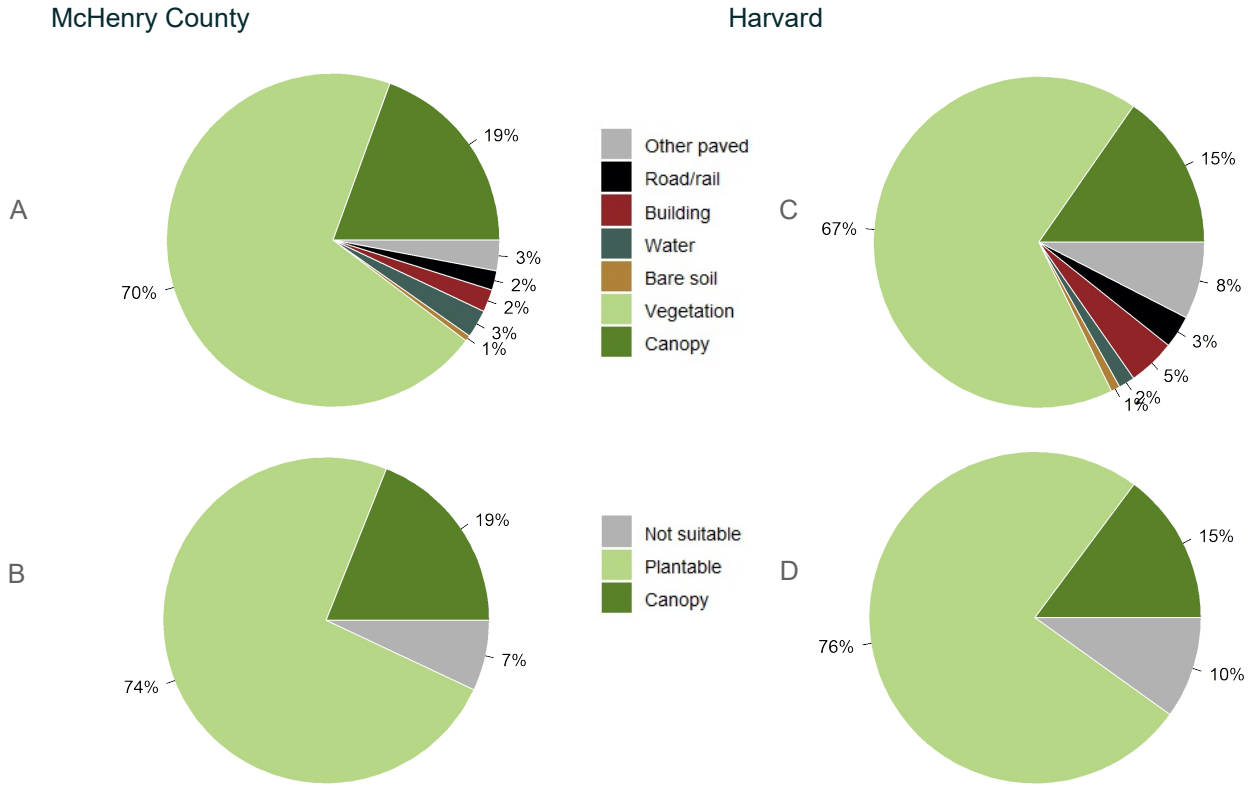


Figure 2: Land cover distribution and plantable space in McHenry County (A and B), and in Harvard (C and D).

Overall, 19% of Kane County is covered by tree canopy (Fig. 2). In all, 74% of the county is plantable, meaning that canopy cover could potentially be raised to 93% if these areas were converted to trees. Spaces where trees could potentially be planted (plantable spaces) can be identified by adding together land cover types that could be converted to canopy: vegetation, bare soil, and other paved surfaces like sidewalks and parking lots.

It is important to note that while these surfaces could theoretically be covered with canopy, it is not necessarily preferable. For example, agricultural fields and baseball diamonds are included as "plantable space," but they may not be considered ideal sites to expand the forest canopy.

Land cover data can also describe canopy at the municipal scale. Harvard currently has 15% canopy cover and could potentially increase its canopy to 85% (Fig. 2).

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## Pecent Land Cover by Land Use

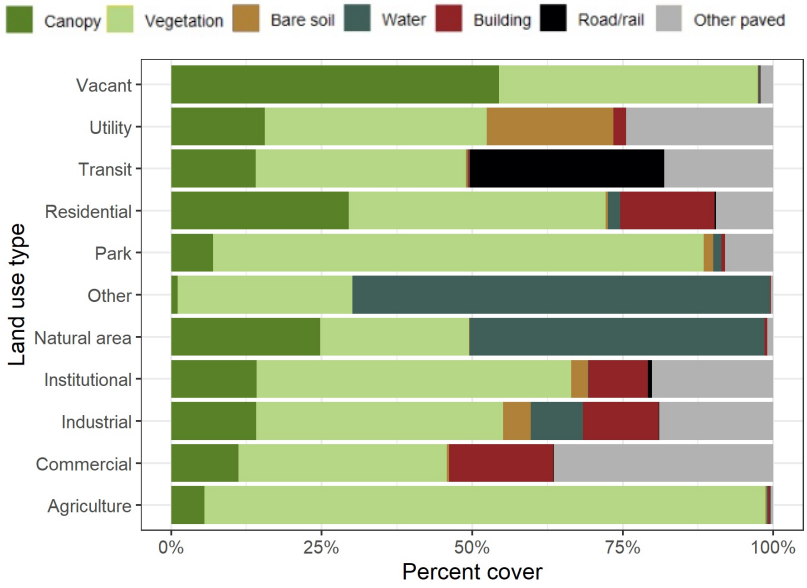


Figure 3: Variations in land cover across land use types.

Canopy cover is not distributed evenly across the region or within municipalities. To better understand how land cover patterns vary, they are compared across land use types like residential, commercial, or park properties. In Harvard, the highest percentage of canopy is found in residential and vacant properties (Fig. 3). Agricultural and other properties have the lowest canopy cover. As one might expect, transit areas have the largest proportion of roads, and industrial, residential, and commercial land use types have an abundance of buildings. See Table 1 on page 5 of this report for a detailed analysis of land cover distribution.

## Plantable Space Percentages

By combining turf, bare soil, and other paved surface categories, we can identify which land use types have the most room for growth. In Harvard, the highest proportions of plantable space are found in agricultural, utility, and park properties (Fig. 4).

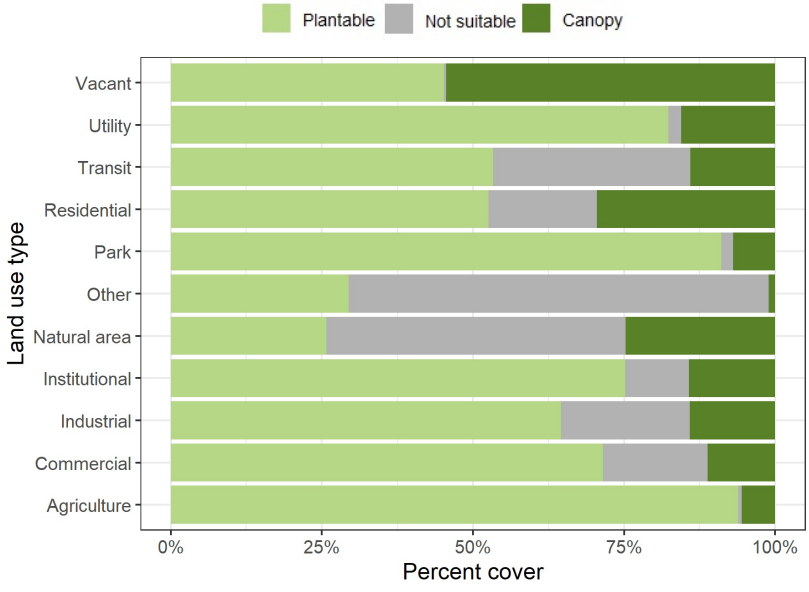


Figure 4: Current canopy and possible planting space across land use types.

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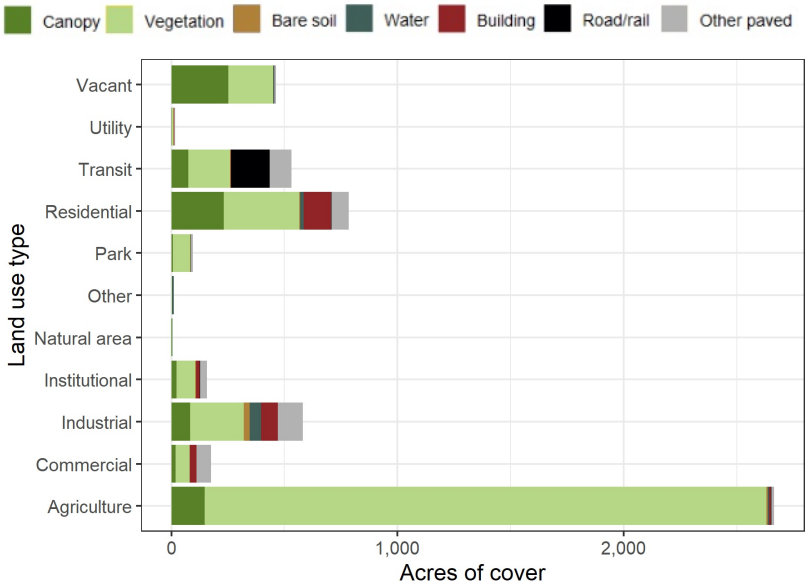
## Land Cover Area by Land Use




While utility and park properties have a high proportion of plantable space, these land use types makes up a relatively small area in Harvard (Fig. 5). Most of the land is agriculture followed by residential.

Figure 5: Acres of land cover types across land uses.

## Plantable Space Area

Residential and agricultural land use types could have the greatest impact in expanding the canopy (Fig. 6). However, each of these land use types require different strategies to increase canopy. Residential property owners could be encouraged to plant more through tree giveaways, ordinances that encourage preservation, or stormwater tax breaks for properties that have more canopy. Agricultural properties could host more trees along roads and waterways, and these trees could reduce erosion and fertilizer runoff.

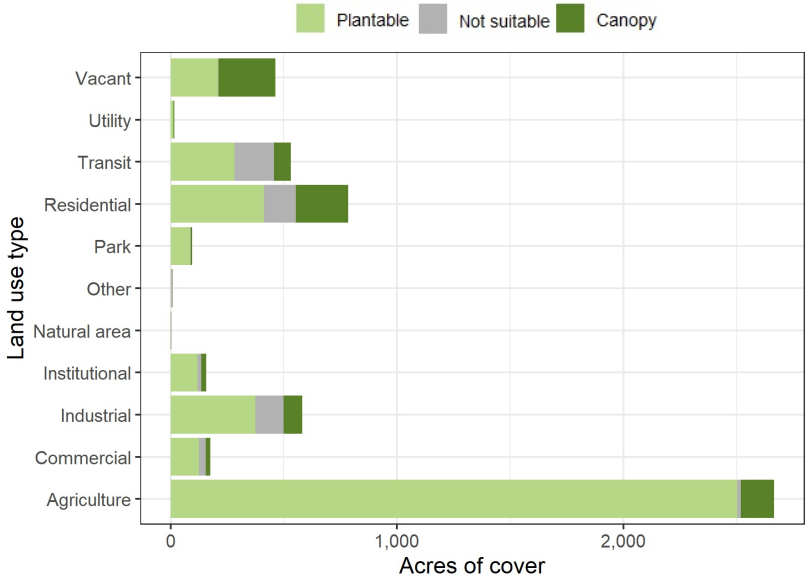



Figure 6: Acres of plantable space, canopy, and not suitable land cover types across land uses.

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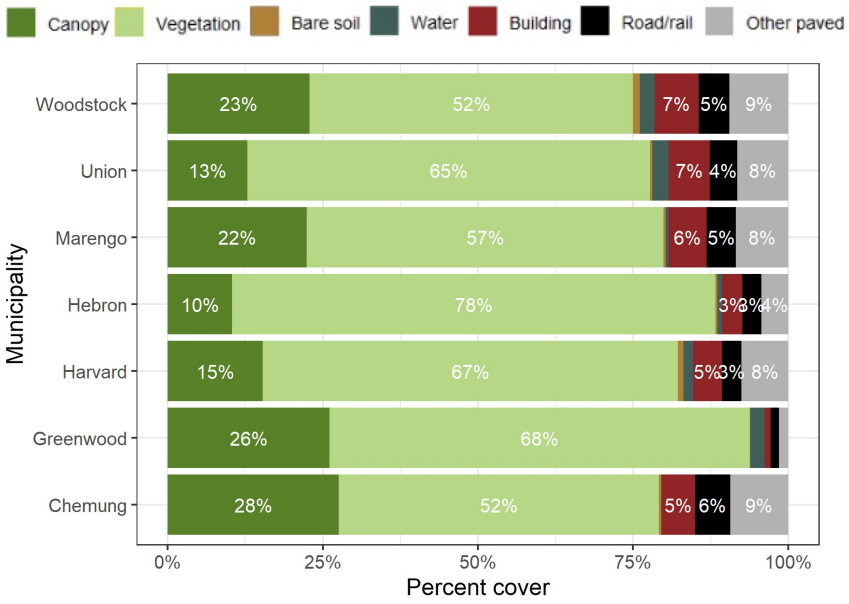
## Land Cover Across Land Use Types

Table 1: Summary of land cover across land use types.

| | CANOPY | | VEGETATION | | BARE SOIL | | WATER | | BUILDINGS | | ROADS/RAIL | | OTHER PAVED | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAND USE | ACRES | PERCENT | ACRES | PERCENT | ACRES | PERCENT | ACRES | PERCENT | ACRES | PERCENT | ACRES | PERCENT | ACRES | PERCENT |
| Agriculture | 147.6 | 5.5% | 2,483.1 | 93.1% | 6.0 | 0.2% | 6.6 | 0.2% | 8.9 | 0.3% | 0.6 | 0.0% | 13.5 | 0.5% |
| Commercial | 19.6 | 11.2% | 60.9 | 34.6% | 0.6 | 0.4% | 0.0 | 0.0% | 30.4 | 17.3% | 0.1 | 0.0% | 64.1 | 36.5% |
| Industrial | 82.2 | 14.1% | 238.1 | 41.0% | 26.9 | 4.6% | 50.2 | 8.6% | 73.3 | 12.6% | 0.2 | 0.0% | 110.3 | 19.0% |
| Institutional | 22.6 | 14.2% | 82.7 | 52.2% | 4.5 | 2.8% | 0.0 | 0.0% | 15.7 | 9.9% | 1.1 | 0.7% | 31.9 | 20.1% |
| Natural area | 1.4 | 24.8% | 1.4 | 24.7% | 0.0 | 0.1% | 2.7 | 49.1% | 0.0 | 0.4% | 0.0 | 0.0% | 0.1 | 1.0% |
| Other | 0.1 | 1.1% | 3.4 | 29.0% | 0.0 | 0.0% | 8.1 | 69.3% | 0.0 | 0.2% | 0.0 | 0.0% | 0.0 | 0.4% |
| Park | 6.6 | 6.9% | 77.5 | 81.5% | 1.5 | 1.6% | 1.2 | 1.3% | 0.6 | 0.7% | 0.0 | 0.0% | 7.6 | 8.0% |
| Residential | 231.4 | 29.5% | 334.3 | 42.6% | 3.0 | 0.4% | 16.1 | 2.0% | 122.8 | 15.7% | 1.5 | 0.2% | 74.8 | 9.5% |
| Transit | 74.8 | 14.1% | 185.2 | 34.9% | 1.5 | 0.3% | 0.6 | 0.1% | 1.3 | 0.3% | 171.3 | 32.3% | 96.2 | 18.1% |
| Utility | 2.5 | 15.6% | 5.8 | 36.9% | 3.3 | 21.0% | 0.0 | 0.0% | 0.3 | 2.1% | 0.0 | 0.0% | 3.9 | 24.5% |
| Vacant | 252.6 | 54.4% | 199.2 | 42.9% | 0.3 | 0.1% | 1.3 | 0.3% | 0.4 | 0.1% | 0.2 | 0.0% | 10.0 | 2.2% |

## Land Cover in Surrounding Communities




Harvard has less canopy cover than most of its neighbors and similar amounts of gray infrastructure (Fig. 7).

Figure 7: Comparison of land cover of Harvard and its neighbors.

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## Canopy change from 2010 to 2017

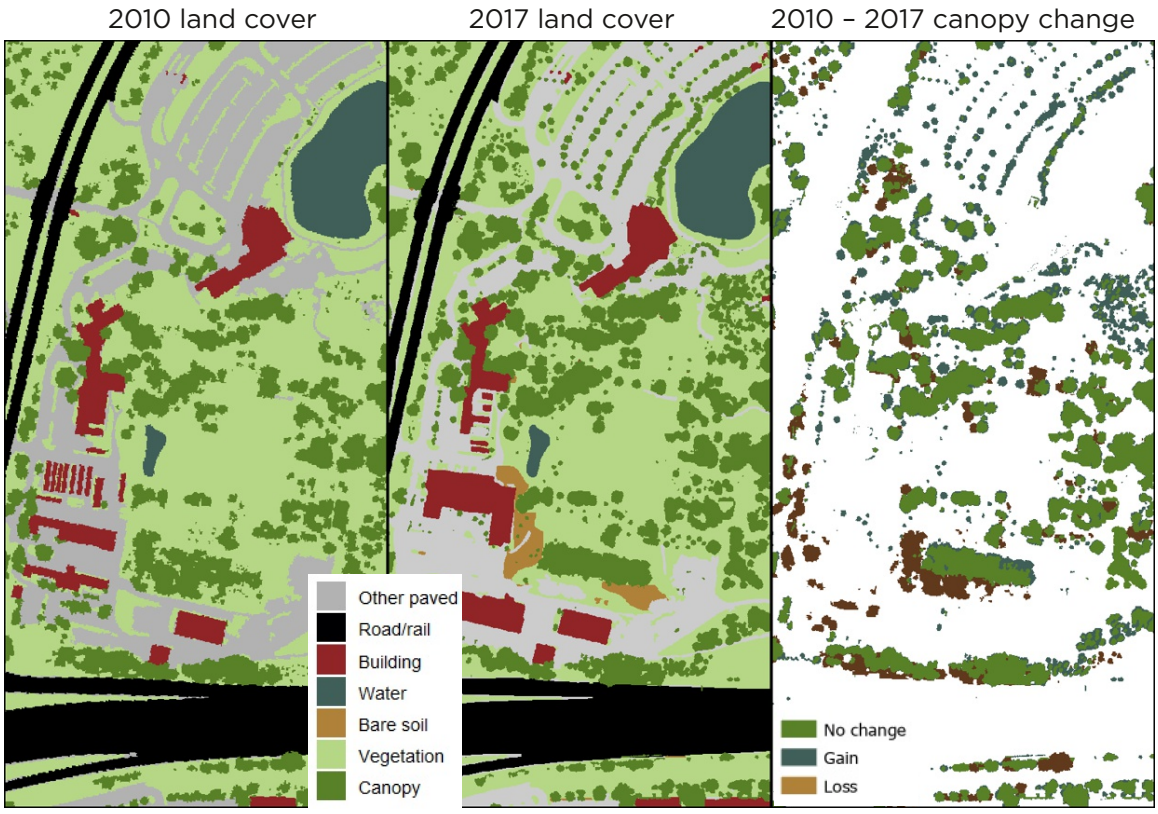


Figure 8: Example of land cover and canopy change at the Morton Arboretum.

The Chicago region has changed a lot from 2010 to 2017, including new development, tree plantings, and growth of existing trees. Examples of this can be seen at the Morton Arboretum (Fig 8).

In Harvard, canopy remained at 15% with canopy increasing and decreasing small amounts across land use types (Fig. 9).

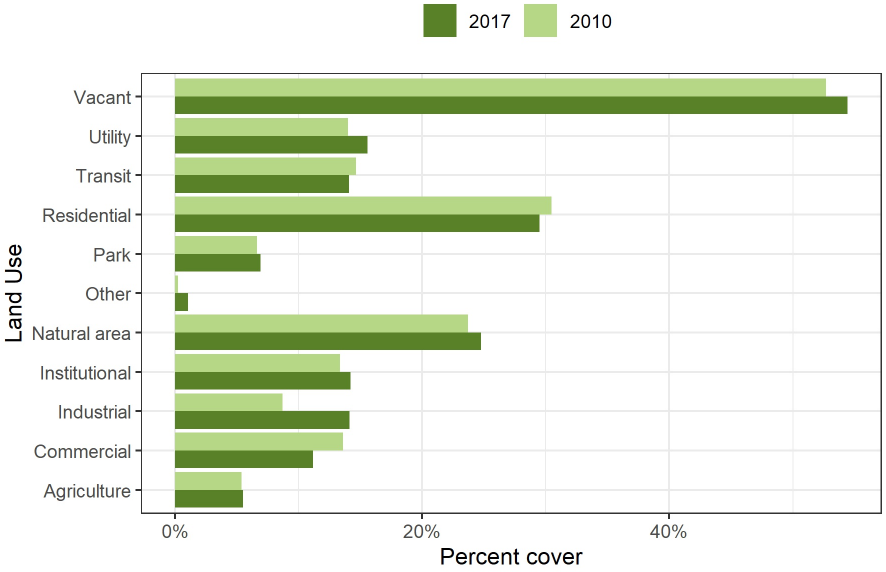


Figure 9: Canopy change across land use types in Harvard.

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## Know What You Have

While understanding canopy is an important component of urban forestry, canopy does not show the whole picture. It cannot identify tree species, health, or vulnerability to pests, diseases, or climate change. A tree inventory is needed to better understand and manage the urban forest (Fig. 10).

Types of tree inventories vary. The most complete inventories gather data on every tree in the study area and each tree's species, size, any health issues it may have, and its specific location. This type of inventory provides the most complete data for planning and monitoring the urban forest's health and growth over time. Many communities have conducted such inventories on public property.

Complete inventories are invaluable for urban forest management but are expensive and time consuming to conduct. They may not be practical for very large areas. Sample inventories (that only gather information on a subset of trees) are much easier to conduct but can only be used to estimate species and size diversity, and tree abundance. The Morton Arboretum and the USDA Forest Service conducted a sample inventory of 1,600 plots across the seven-county region and determined species composition at the county scale (Fig. 11).

The CRTI does not currently have access to a tree inventory from Harvard. If an inventory is sent to CRTI, we will add summary information to this document.

Figure 10: Measuring a tree for an inventory.


Figure 11: You can learn more about the tree census here: https://mortonarb.org/science/tree-census/

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## The Unique Benefits of Your Community

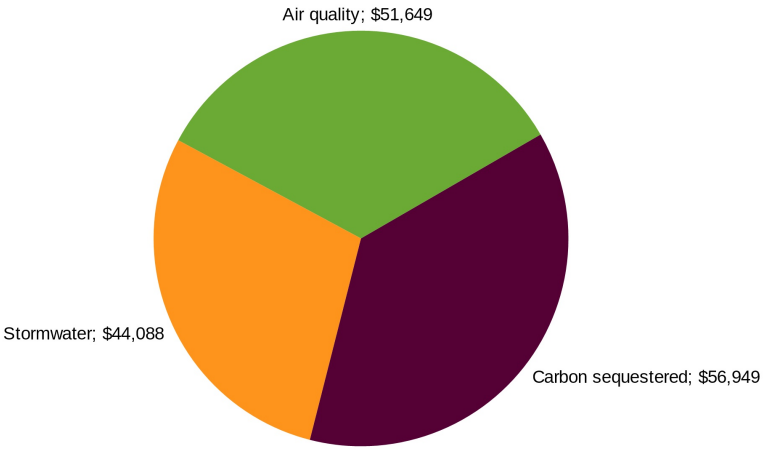


Figure 12: Trees offer myriad benefits, including intercepting stormwater, improving air quality and removing carbon from the atmosphere.

Urban trees are extremely valuable. Research has provided data to help quantify the values that trees provide, far beyond the aesthetics that are readily recognized. For example, urban trees:

1. Save energy by reducing surface temperatures and shading buildings.
2. Store carbon dioxide and remove pollutants from the air.
3. Intercept stormwater and help reduce flooding.
4. Increase property values and make our communities more pleasant.
5. Improve health.

The i-Tree suite of tools was developed by the USDA Forest Service. They allow users to calculate tree benefits at a variety of scales—from an individual tree to entire tree inventories, and even landscape scale assessments of canopy and hydrology. For more information on i-Tree tools and methodology, visit iTreetools.org.

Figure 12 shows the benefits that all the trees (including trees public and private property) in Harvard offer. These values were calculated with i-Tree Landscape using a 2010 land cover layer. Each year, Harvard's trees provide the municipality with $153,000 worth of benefits. These trees also store a lot of carbon, which is valued at an additional $1,239,000.

## Temperature and Trees

Figure 13: The image on the left shows tree canopy and on the right shows surface temperature. Surface temperature was calculated using a LandSat8 image from July 2017. Areas that have higher tree canopy tend to have lower temperatures.

Cities tend to be hotter than rural areas because buildings and pavement absorb the sun's energy and release it as heat—known as the urban heat island effect. High urban temperatures increase the use of energy within buildings. It can also cause health issues, and extreme heat can even cause death. Trees help lower urban temperatures by shading built surfaces and through evaporative cooling. Urban areas that have more tree canopy tend to have lower surface temperatures (Fig. 13). Planting more trees in parking lots and around buildings can be especially helpful in reducing urban temperatures and making cities more comfortable.

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## Oak Ecosystems – Our Natural Heritage

Oaks are a keystone species in our region's ecology. They provide habitat and food for countless animals, and they influence which plants grow around them. However, conversion of natural areas to agriculture and development has removed many of the oaks from our region. Only 17% of oak ecosystems remain region wide.

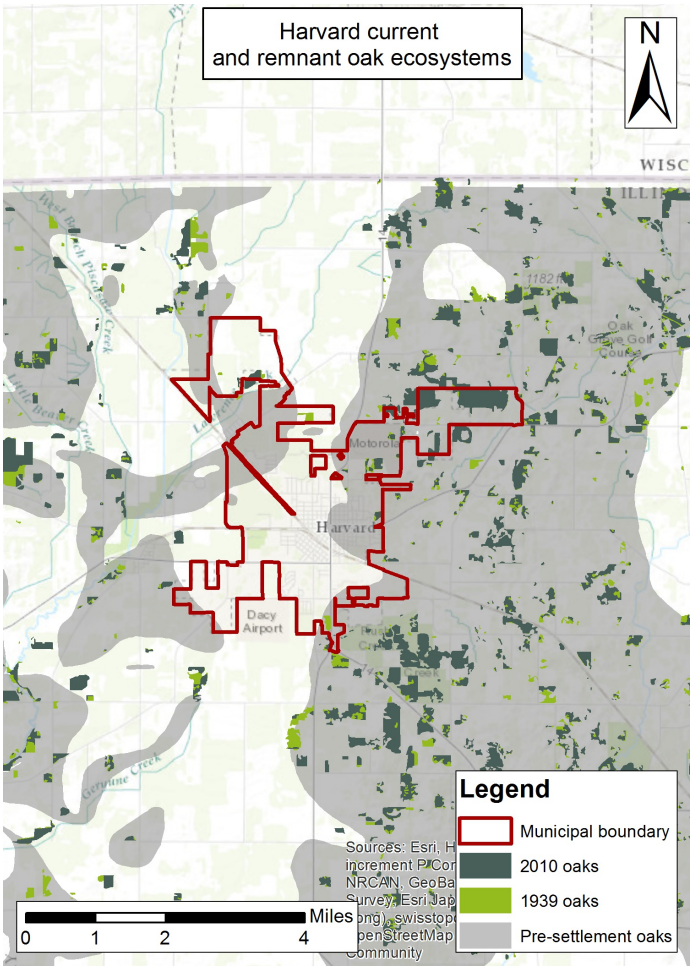


Figure 14: Oak ecosystems were abundant prior to Euro-American settlement. This map shows which of these ecosystems still remained in 1939 and 2010.

Restoring oak ecosystems is a major focus of CRTI. Its efforts include improving oak management in natural areas and encouraging their use in municipal plantings. Many municipalities avoid oaks because some foresters believe that they do poorly as street trees. CRTI strives to dispel these stereotypes and teach foresters how oaks can be used effectively in urban areas. The expanded use of oaks can help increase species diversity and continue the legacy of oaks in our region. For more information, see Chicago Wilderness's Oak Ecosystem Recovery Plan.

Prior to Euro-American colonization, oaks made up over 60% of the region's canopy. Now, they only make up 6.5% of municipal plantings. Increasing the use of oaks in municipal areas could make more resilient forests, improve habitat for wildlife, and restore the region's natural history.

Harvard had few forests in the pre-settlement era, but has lost most of them (Fig. 14). It is imperitive to protect what remains..

Find the Oak Ecoysystem Recovery Plan at chicagorti.org/OakRecovery.

## Woody Invasive Species

Woody invasive species like European buckthorn and bush honeysuckles make up over one in three trees in the region. These shrubs were introduced as ornamental specimens, but they have escaped cultivation. Birds eat the berries produced by buckthorn and honeysuckle and disperse the seeds into natural areas. Both genera are extremely disruptive to native plants and animals. They create dense thickets and prevent other species from growing around them (Fig. 5). In natural areas, they are one of the leading contributors to reduced oak regeneration.

It is imperative to remove buckthorn from all land uses, as the seeds can easily travel to natural areas. It is difficult to dictate plantings on private property but educating residents can encourage them to remove it of their own accord. This could include signage explaining invasive removal on public property, or expansion of programs like Conservation@Home.

Woody invasives are becoming more problematic region-wide according to 2010 and 2020 inventories (Fig. 16). For more information on how to manage woody invasive species, see: https://chicagorti.org/program/stop-invasives/.

Figure 15: A buckthorn thicket. Notice the lack of understory vegetation and dense shade. Photo credit: Brett Jelinek.

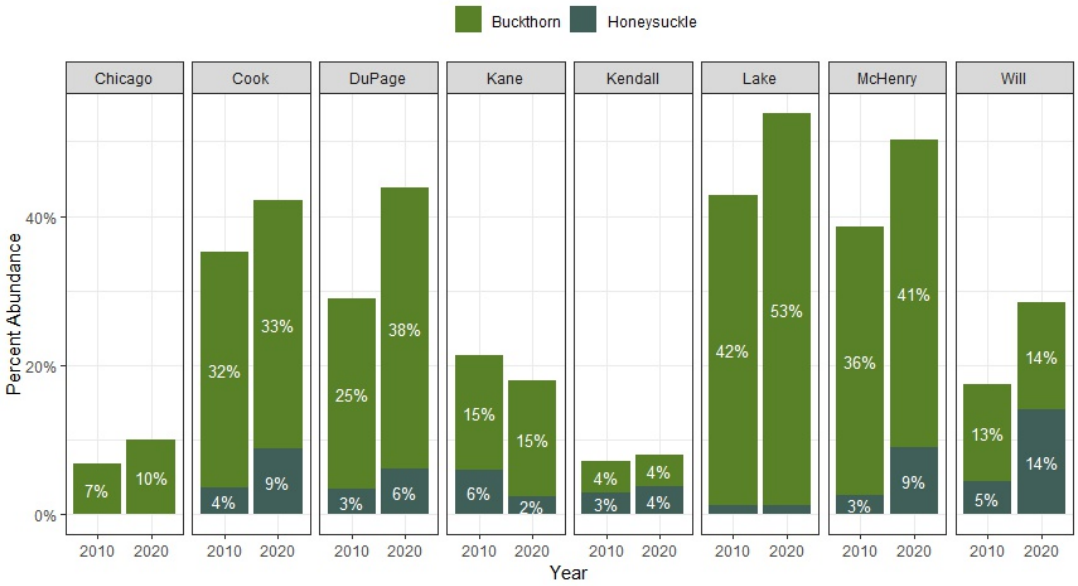


Figure 16: Woody invasive abundance across all counties in 2010 and 2020.

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## Important Considerations for Management of the Urban Forest

A healthy urban forest can provide a wide range of benefits that have significant impacts on quality of life. Understanding what you have is an important first step. Next is to manage the urban forest effectively. There are several key ingredients in a well-managed urban forest and these are resources and organizations that can help you achieve that goal.

1. Preservation and Protection Ordinances: Ordinances are the community's policy and guiding document for the care, protection and preservation of the urban forest. The Chicago Region Trees Initiative has staff who will work with you to help you at no cost and templates to get you started.

2. Tree Inventory: A tree inventory is a mechanism to inform what trees you have, where they are located, how many there are, and their condition. This is a critical tool in managing the urban forest—especially in improving species diversity and reducing the risk of catastrophic loss. Visit the CRTI website to learn about funding opportunities https://chicagorti.org/programs.

3. Urban Forest Management Plan: An urban forest management plan is a strategy document that guides communities in allocating manpower and funding to manage the urban forest. It is important to develop a plan that outlines where your community is now and a framework to improve level of care, species selection, proper practices, and qualifications, as skills and resources are developed. A template has been developed to help you get started and to identify areas where your community can begin to improve practices. https://chicagorti.org/program/tree-ordinance-templates.

4. ISA Certified Arborist: Your community would greatly benefit from having an International Society of Arboriculture certified arborist on staff. It is not a hard process and could improve the professionalism of your team. The Illinois Arborists Association has several training opportunities to train your staff and build skills and knowledge in urban forestry. Note: If you are not ready for staff to assume this role, be sure to use certified arborists to conduct the urban forestry work. A list is available on the IAA website.

5. Resident Engagement: 70% of our trees are located on private property. Communities can connect their residents to information and resources that will help them improve the health of the urban forest on their properties. The CRTI website has several resources for individual citizens.

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Important links:

Chicago Region Trees Initiative: chicagoRTI.org

Illinois Arborist Association:  illinoisarborist.org

Illinois DNR Urban Forestry: www2.illinois.gov/dnr/conservation/Forestry/UrbanForestry

Openlands TreeKeepers: openlands.org/what-we-do/trees/treekeepers