Harvard Urban Forest Summary

The Chicago Region Trees Initiative (CRTI) goal is that, by 2050, the Chicago Region will support and host a healthier urban forest, comprised of a diversity of tree species and ages, appropriately distributed across land use types in the region. The forest will provide the region improved environmental, economic, and social benefits. In order to achieve that goal CRTI works with a wide variety of people who work with and manage trees. This document is intended to help municipalities understand their urban forest, and identify strategies that they can use to make it better.

The *urban forest* is comprised of all of the trees in an urban setting, regardless of who owns or manages them. It is made up of street trees, forested natural areas and even the trees in resident's back yards. These trees are all included in the urban forest, because they all provide benefits that municipalities depend on. They improve air and water quality, reduce flooding and the urban heat island effect, and reduce energy use by shading buildings. Trees provide habitat for wildlife and improve residents' quality of life by reducing crime rates, increasing property value and boosting social cohesion in neigborhoods.

The magnitude of benefits that trees provide correlates with the size, structure and location of their canopy. Understanding the extent of tree canopy is critical for urban planning. 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 priorities and strategies for expanding the canopy.

Fig. 1: Comparison of satellite image and land cover map. Seven types of gray and green infrastructure are in the land cover map.

The Chicago Region Trees Initiative, USDA Forest Service, American Forests, and the University of Vermont mapped land cover across the seven-county Chicago Region. This project not only identifies tree canopy, but also other green infrastructure including vegetation under 10 feet tall, bare soil and water; and gray infrastructure including buildings, roads and rail and other paved surfaces like sidewalks and parking lots (Fig. 1). Here after, these seven layers will be referred to as *land cover types*.

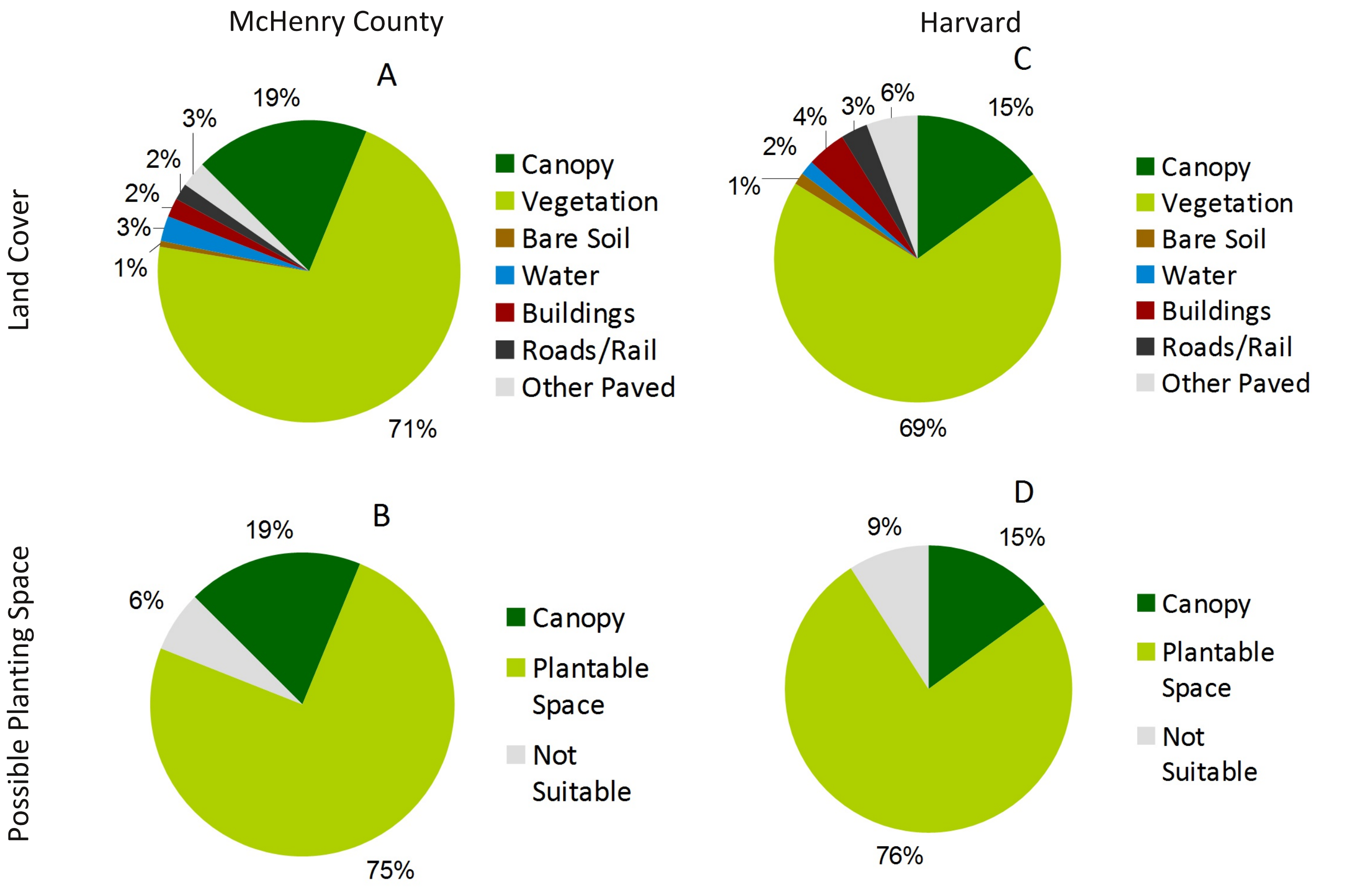

Fig 2: McHenry County's current land cover (A), including 19% canopy cover. An additional 75% of the county is suitable for planting (B). Harvard currently has 15% canopy cover (C), and 76% of the land cover could potentially be converted to canopy (D).

Overall, 19% of McHenry County is covered by tree canopy (Fig. 2). There is a lot of room for growth across the county. We can identify spaces where trees could potentially be planted by adding together the vegetation, bare soil and other paved surface land cover types, as these land cover types could be converted to canopy with minimal effort. In all, these land cover types make up 75% of the county's area, meaning that canopy cover could potentially be raised to 94% if all of these surface were converted to trees. It is important to note, that while these surfaces could theoretically be covered with canopy, it is not necessarily preferable. Agricultural fields and baseball diamonds are included as “plantable space,” but few would agree that these are ideal sites to expand the forest canopy.

These land cover data can also describe canopy at the municipal scale. Harvard currently has 15% canopy cover, and could potentially increase their canopy to 91% (Fig. 2).

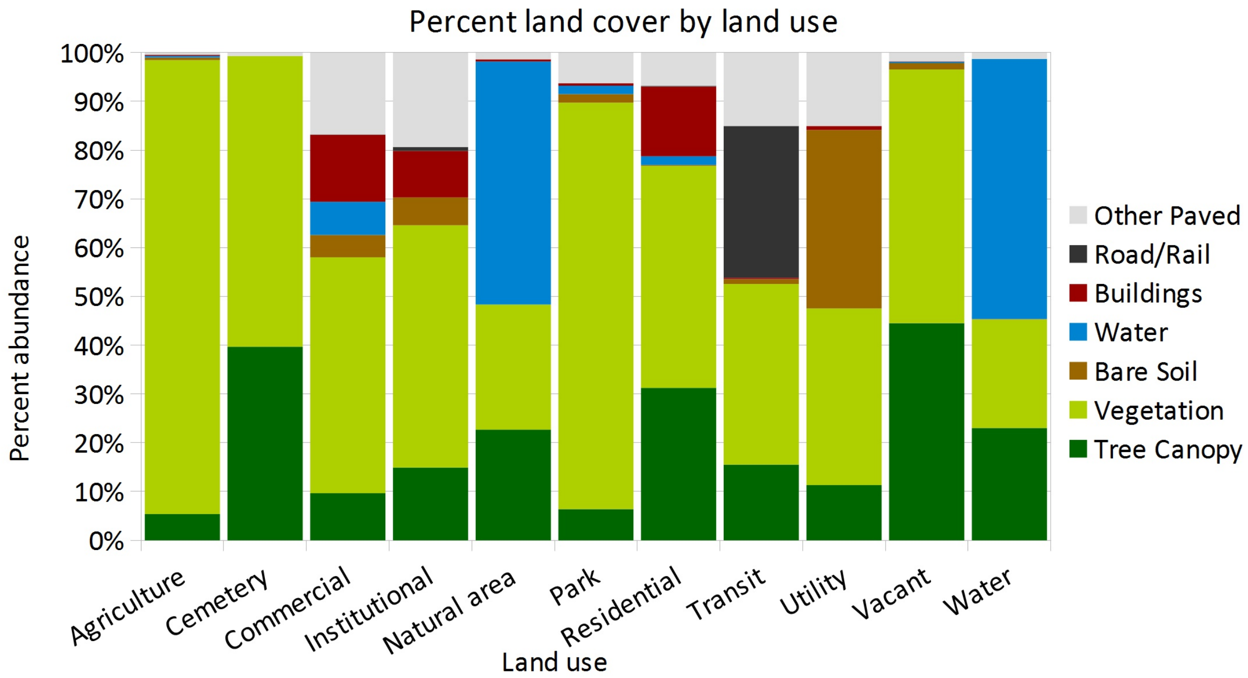

Fig 3: Variations in land cover across land use types.

Canopy cover is not distributed evenly across the region, nor within municipalities. To better understand how land cover patterns vary, we can compare them across land use types, like residential, commercial or park properties. In Harvard, the highest percentage of canopy is found in cemeteries and vacant properties (Fig 3). Agricultural properties and parks have the lowest canopy cover. As one might expect, transit areas have the largest proportion of roads, and residential and commercial land use types have an abundance of buildings. See Table 1 at the end of this report for more details.

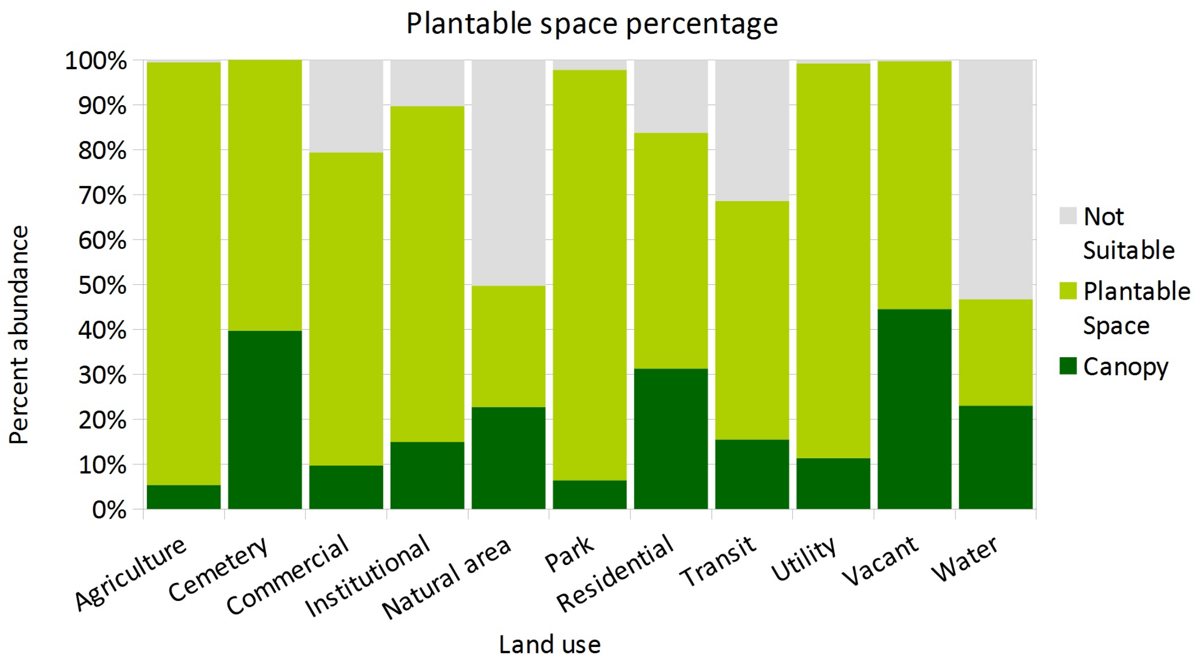

Fig 4: Current canopy and possible planting space across land use types.

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, park and utility properties (Fig. 4).

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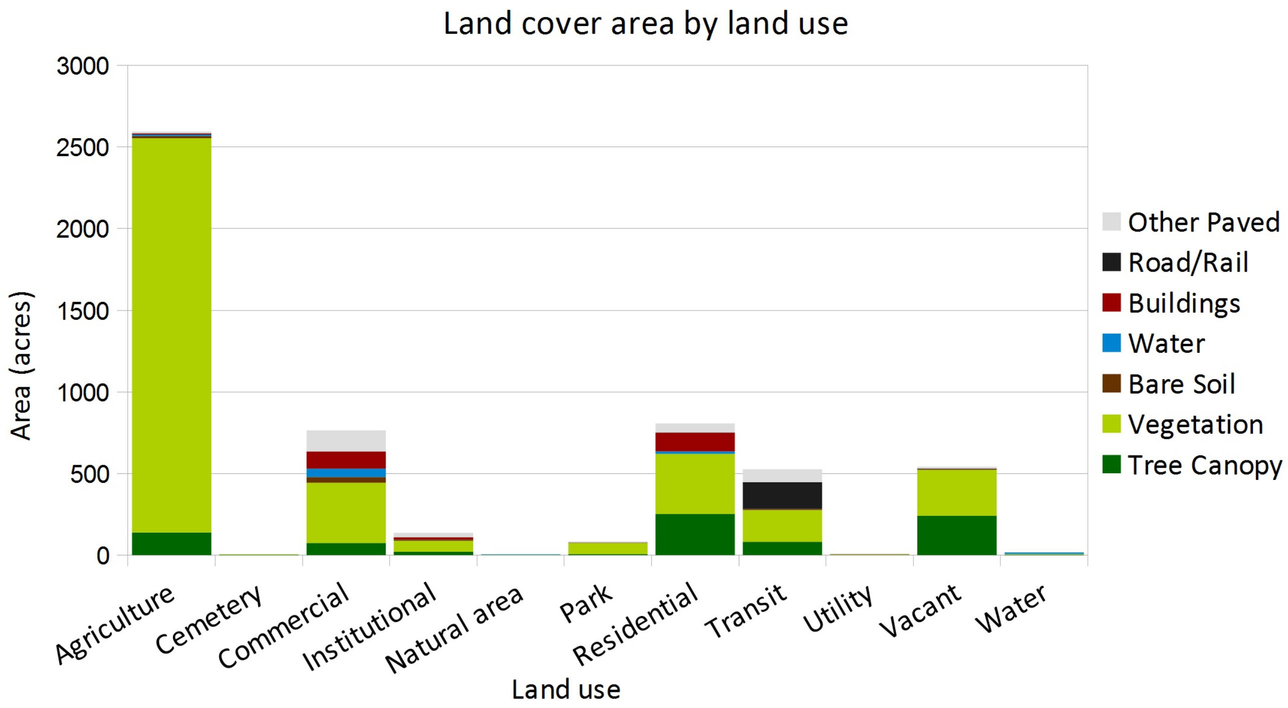

Fig 5: The majority of land is agricultural land use, followed by residential.

While park and utility properties have a high proportion of plantable space, these land use types make up a relatively small area in Harvard (Fig. 5). The majority of its land is agricultural followed by residential.

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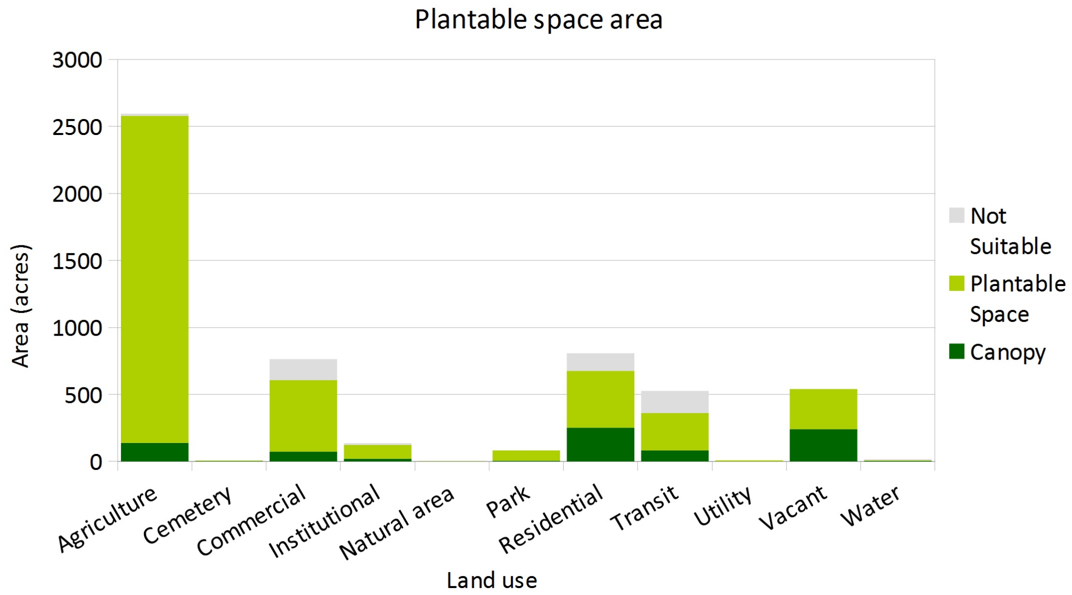

Fig 6: Agriculture has the greatest potential for increasing the canopy, followed by commercial.

Agricultural, transit, residential and commercial land use types have the most area that could possibly be converted to canopy (Fig. 6). Targeting these areas could have the greatest impact in expanding the canopy. However, each of these land use types will require different strategies to increase canopy. Many of the transit properties are publicly owned, and could therefore be the easiest to work with. Residential and commercial property owners could be encouraged to plant more trees through tree giveaways, ordinances that encourage tree preservation, or stormwater tax breaks for properties that have more tree canopy. Agricultural properties can be more challenging to plant trees on, but some canopy expansions can be made along roadways and drainage areas. Additionally, ordinances can mandate that trees be planted if these sites are converted from agricultural use.

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

	Tree canopy		**Vegetation**		**Bare soil**		**Water**		**Buildings**		**Roads and rail**		**Other paved**	
	Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Agriculture	138.7	5.3%	2416.1	93.1%	13.6	0.5%	8.7	0.3%	6.1	0.2%	0.7	0.0%	10.9	0.4%
Cemetery	2.4	39.7%	3.6	59.6%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.7%
Commercial	73.8	9.7%	369.6	48.4%	34.8	4.6%	52.1	6.8%	105.0	13.7%	0.5	0.1%	128.3	16.8%
Institutional	20.5	14.9%	68.1	49.7%	7.8	5.7%	0.0	0.0%	13.1	9.5%	1.1	0.8%	26.6	19.4%
Natural area	1.3	22.7%	1.4	25.6%	0.0	0.0%	2.8	49.8%	0.0	0.4%	0.0	0.0%	0.1	1.4%
Park	5.3	6.4%	69.4	83.4%	1.5	1.8%	1.4	1.7%	0.4	0.5%	0.0	0.0%	5.2	6.3%
Residential	252.3	31.3%	367.2	45.5%	1.4	0.2%	14.6	1.8%	115.5	14.3%	1.1	0.1%	55.1	6.8%
Transit	81.5	15.5%	195.1	37.1%	5.2	1.0%	0.2	0.0%	1.4	0.3%	163.8	31.1%	79.1	15.0%
Utility	0.9	11.3%	3.0	36.2%	3.0	36.6%	0.0	0.0%	0.1	0.8%	0.0	0.0%	1.2	15.0%
Vacant	241.2	44.5%	282.0	52.0%	7.0	1.3%	1.3	0.2%	0.5	0.1%	0.1	0.0%	9.8	1.8%
Water	3.8	23.0%	3.7	22.3%	0.0	0.1%	8.9	53.3%	0.0	0.0%	0.0	0.0%	0.2	1.3%
Total abundance	821.8	15.0%	3779.3	68.8%	74.3	1.4%	89.8	1.6%	242.2	4.4%	167.2	3.0%	316.6	5.8%

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Urban trees are extremely valuable. Research has allowed us to to quantify the values that trees provide, and these values go far beyond the aesthetics that are readily recognized. For example:

- Urban trees save energy by reducing surface temperatures and shading buildings.
- They store carbon dioxide and remove pollutants from the air.
- They intercept stormwater and help reduce flooding.
- Residents preferentially buy properties that have more trees, meaning that trees increase property values.

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

Figure 7 shows the benefits that all of the trees (including trees public and private property) in Harvard offer. These values were calculated with i-Tree Landscape. Each year, Harvard's trees provide the municipality with $152,700 worth of benefits. These trees also store a lot of carbon, which is valued at an additional $1,238,600.

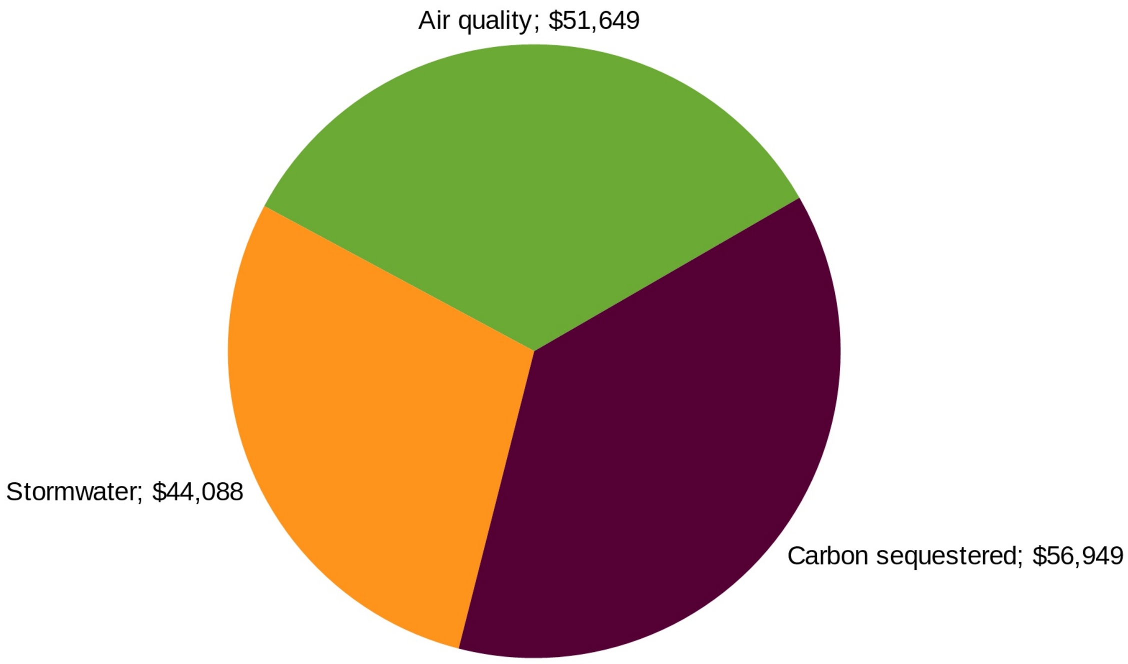

Figure 7: Trees offer myriad benefits, including intercepting stormwater, improving air quality and removing carbon from the atmosphere.

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Cities tend to be hotter than rural areas because buildings and pavement absorb the sun's energy and release it as heat. This is known as the urban heat island effect. High urban temperatures increase the use of energy within buildings. It can also cause a variety of health issues to residents, 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 (Figure 8). Planting more trees in parking lots and around buildings can be especially helpful in reducing urban temperatures and making cities more comfortable.

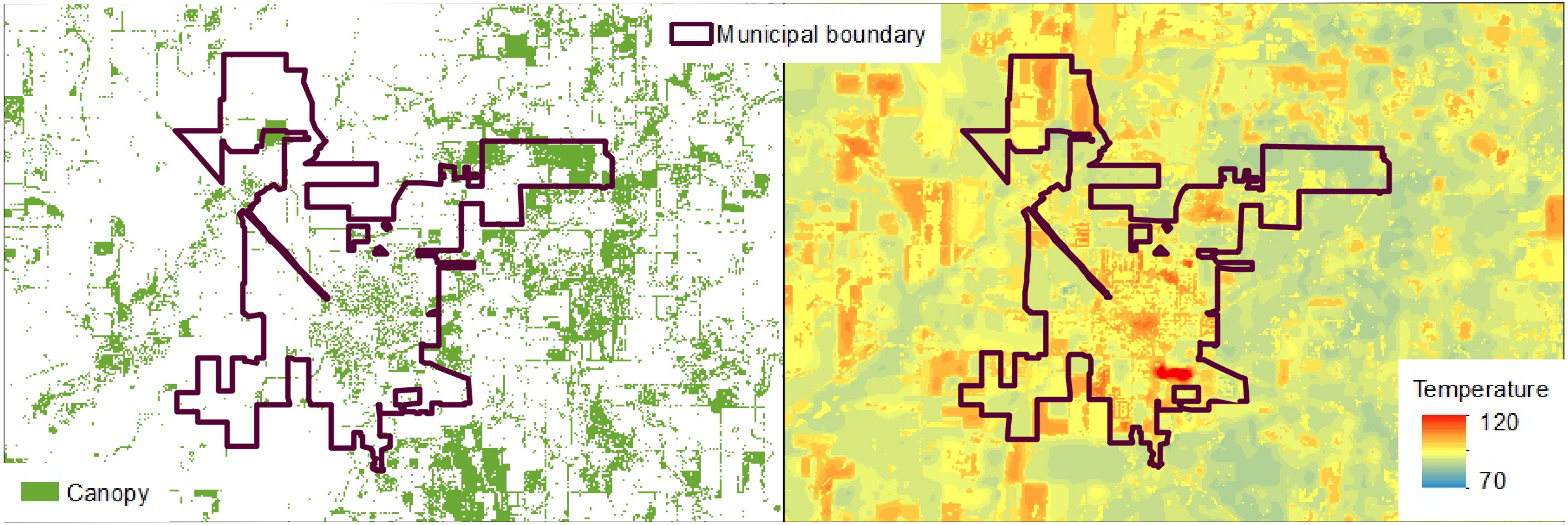

Figure 8: The image on the left shows tree canopy and on the right shows surface temperature. Surface temperature was calculated using a landsat image from September 2014. Areas that have higher tree canopy tend to have lower temperatures.

Harvard has similar canopy to its neighbors (Fig. 9).

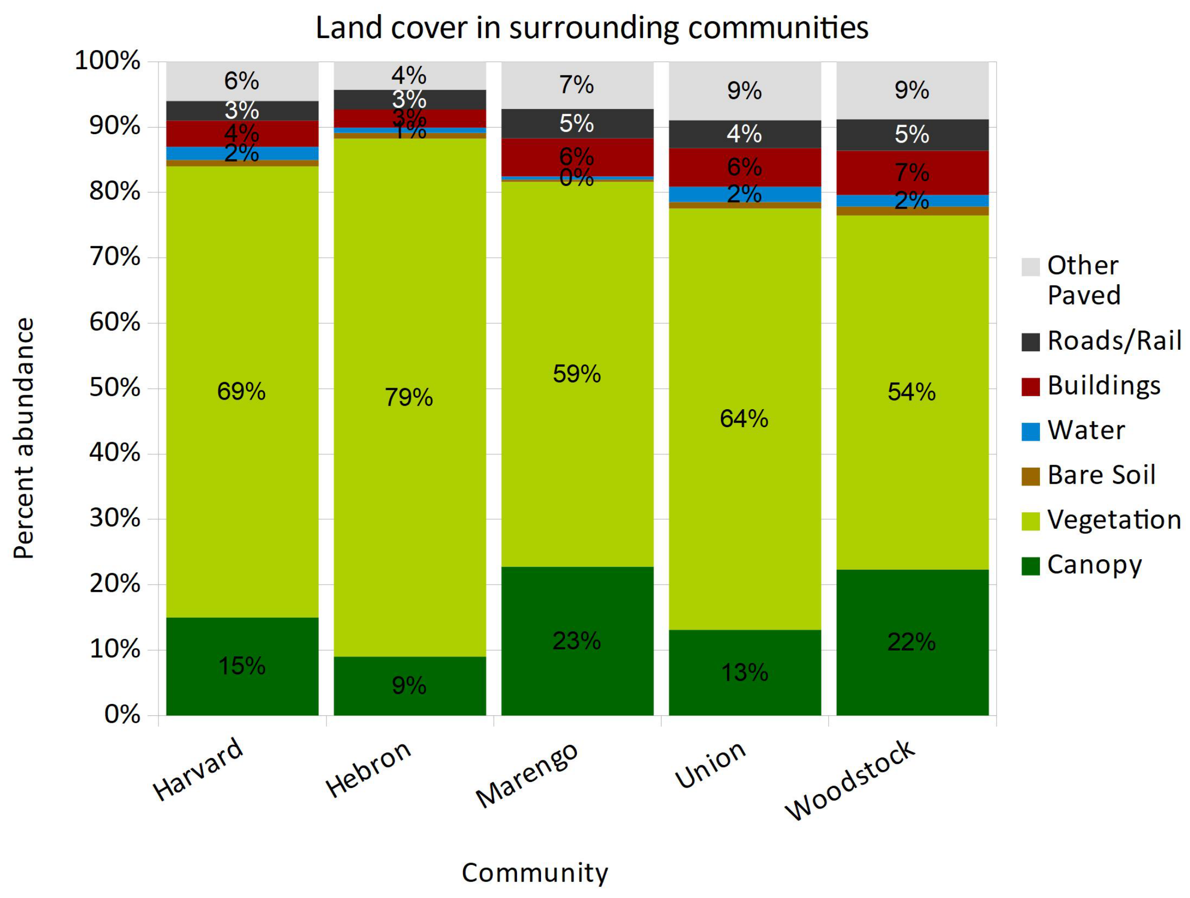

Figure 9: Comparison of land cover of Harvard and its neighbors.

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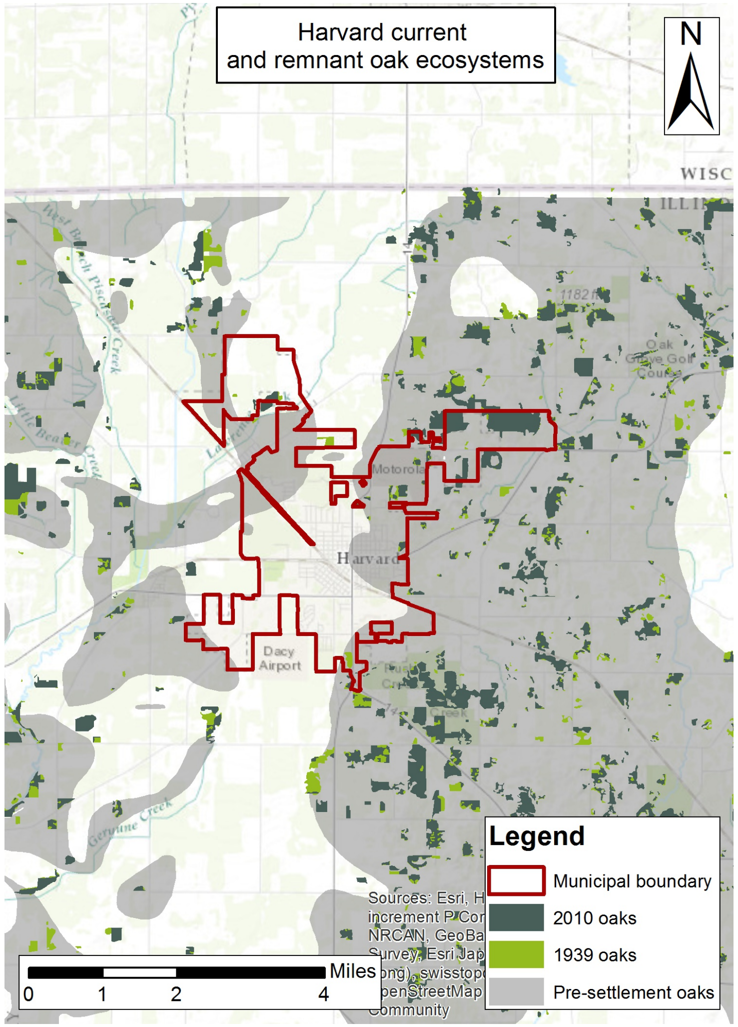

Figure 10: Oak ecosystems were abundant prior to Euro-American settlement. This map shows which of these ecosystems still remained in 1939 and 2010.

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. Prior to Euro-American settlement, they were the most abundant tree species in the region. However, conversion of natural areas to agriculture and development has removed many of the oaks from our region. Only 17% of oak ecosystems remain in the Chicago region. For more information on oak ecosystems in the Chicago region, see Chicago Wilderness's *Oak Ecosystem Recovery Plan*.

Prior to Euro-American settlement, oaks made up 60% of the regions canopy. Currently, the municipal average for oaks in public plantings is 6.5%. Adding additional oak trees, or using oaks to replace dying ashes, could serve to increase species diversity, and to improve habitat for the birds, insects and wildlife that depend on them.

Restoring oak ecosystems is a major focus of CRTI. It's efforts include improving oak management in natural areas, and encouraging their use in municipal plantings. Many municipalities avoid oaks because foresters believe that they do poorly as street trees. CRTI strives to dispel these biases, and to 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.

Municipal plantings are not the only place where oaks can be used. Muncpalities might also consider working with residents and commercial land owners to increase oaks abundance across all land use types. This could be done through programs like tree give-aways, or handouts that describe the benefits of planting oaks. CRTI is creating documents that could help in this endeavor.

Woody invasive species like European buckthorn and bush honeysuckles make up almost 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, allowing the seeds to be dispersed 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. 11). In natural areas, they are one of the leading contributors to reduced oak regeneration.

Woody invasives are the most abundant in Cook, DuPage and Lake Counties, but they are becoming problematic region-wide (Fig. 12). While there are very few buckthorn and honeysuckle among municipality's managed trees, these trees likely exist on private property. 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.

Figure 11: A buckthorn thicket. Note that no other species are growing beneath the buckthorn.

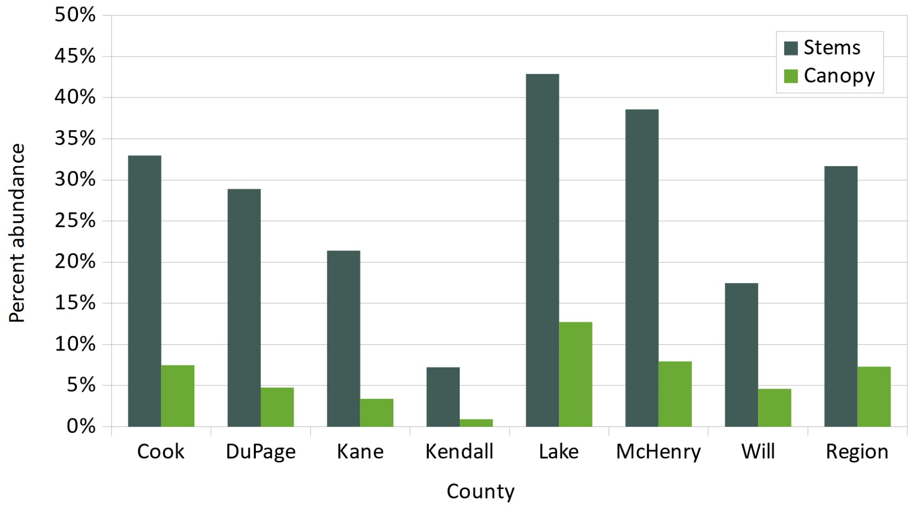

Figure 12: Woody invasive abundance across all counties. They are the most abundant in Lake and McHenry Counties, but is a threat region-wide.