Lake Zurich 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.

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*.

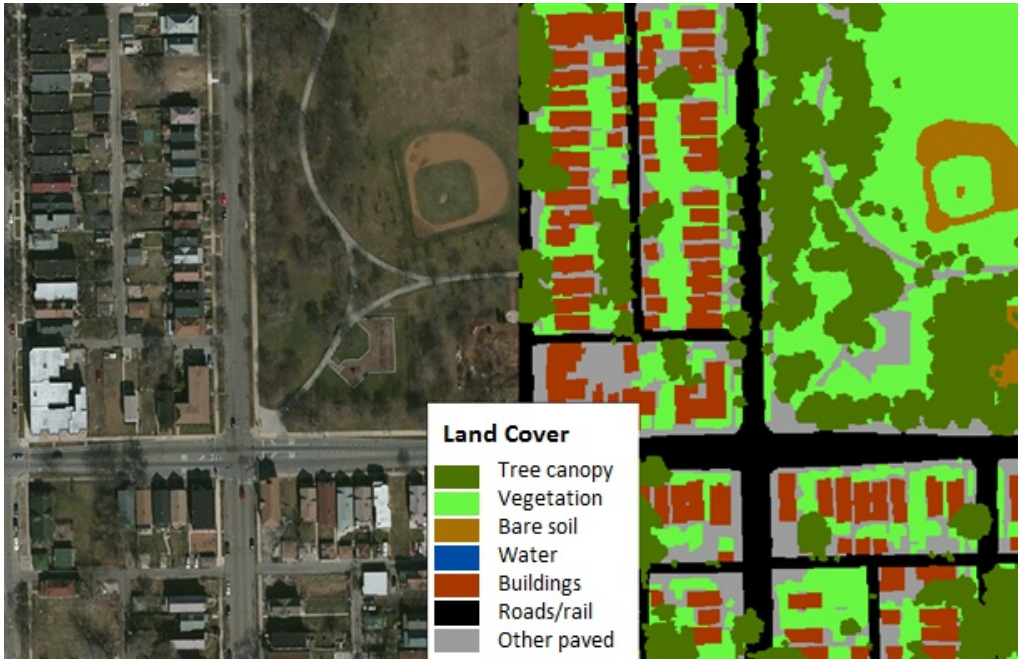

Fig. 1: Comparison of satellite image and land cover map. Seven types of gray and green infrastructure are in the land cover map.

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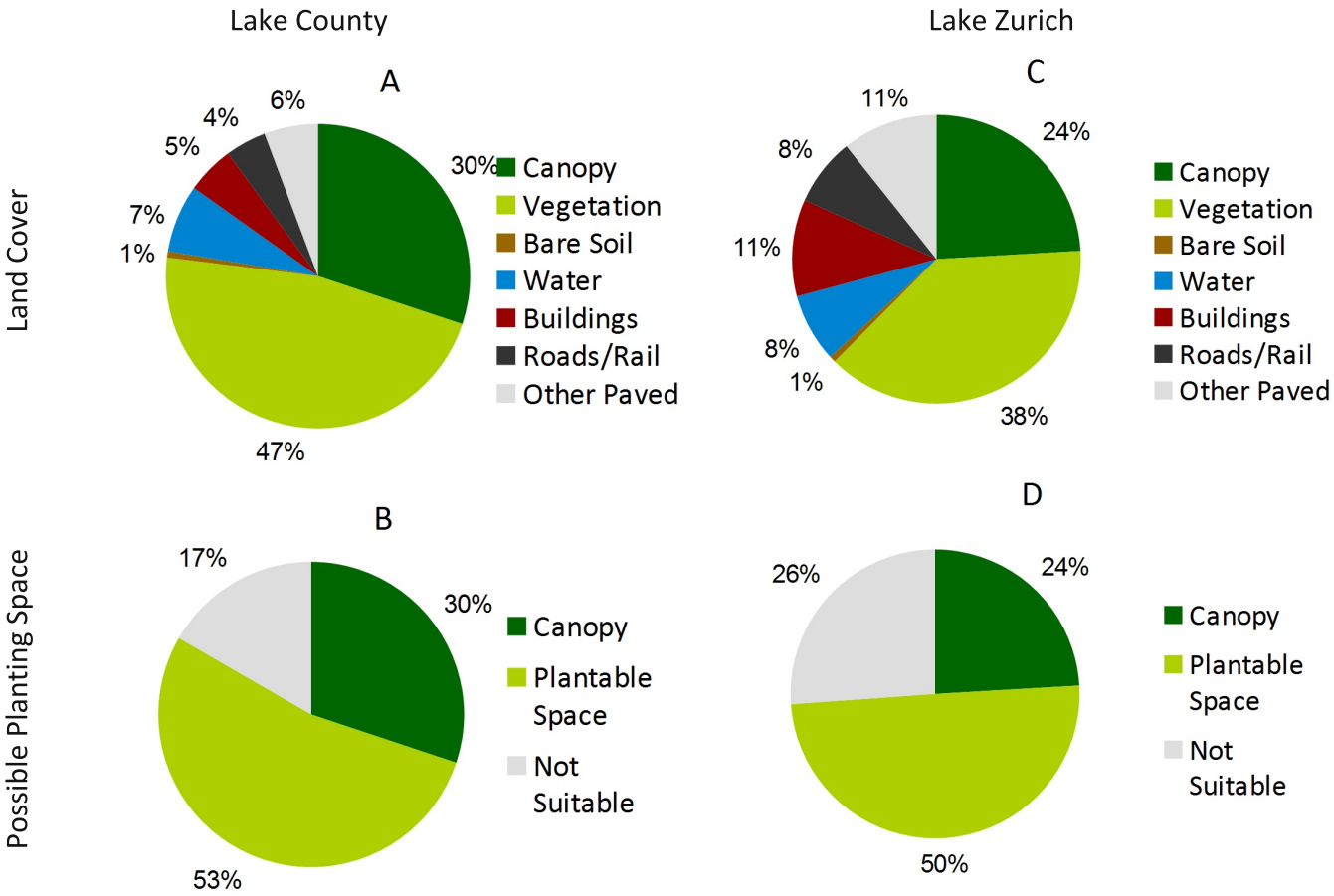

Fig 2: Lake County's current land cover (A), including 30% canopy cover. An additional 53% of the county is suitable for planting (B). Lake Zurich currently has 24% canopy cover (C), and 50% of the land cover could potentially be converted to canopy (D).

Overall, 30% of Lake 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 53% of the county's area, meaning that canopy cover could potentially be raised to 83% 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. Lake Zurich currently has 24% canopy cover, and could potentially increase their canopy to 74% (Fig. 2).

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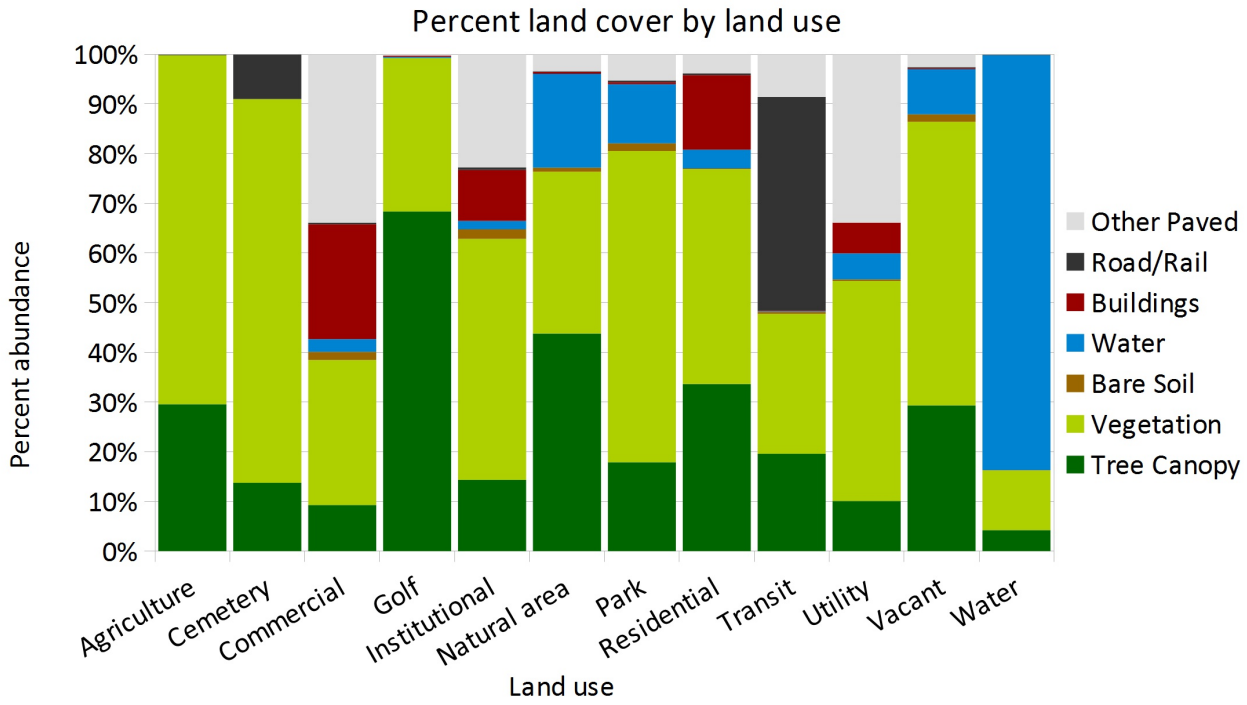

Fig 3: Variations in land cover across land use types.

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 Lake Zurich, the highest percentage of canopy is found in golf courses and natural areas (Fig 3). Commercial properties and water ways 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.

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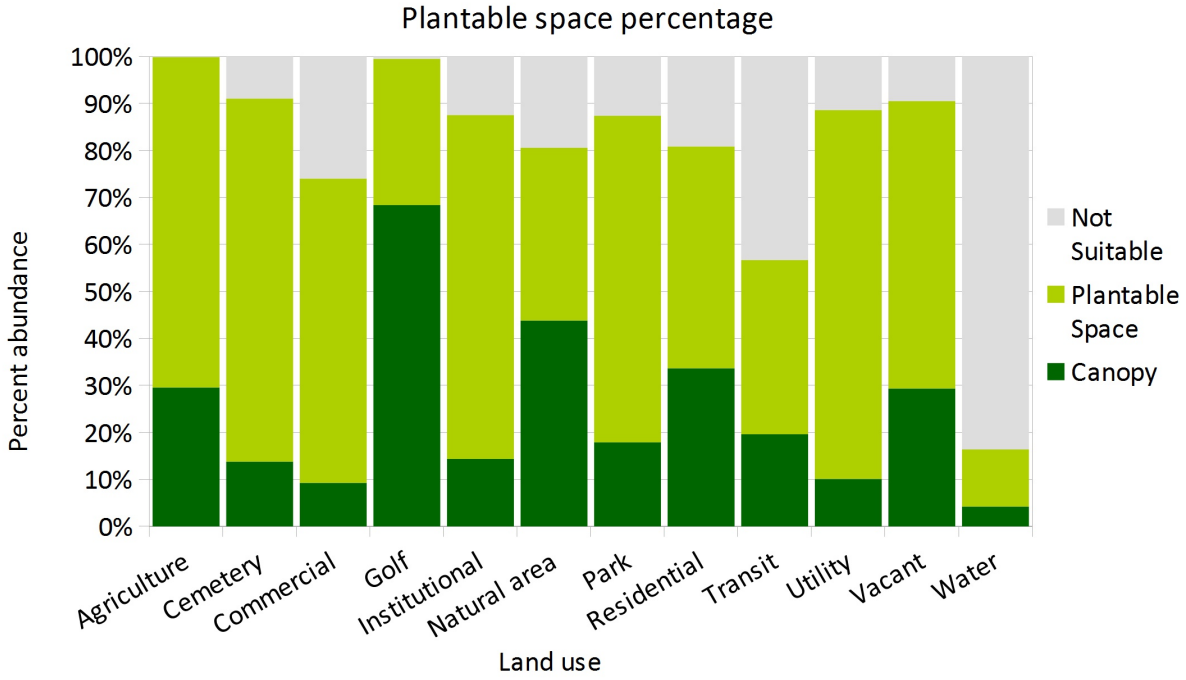

Fig 4: Current canopy and possible planting space across land use types.

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

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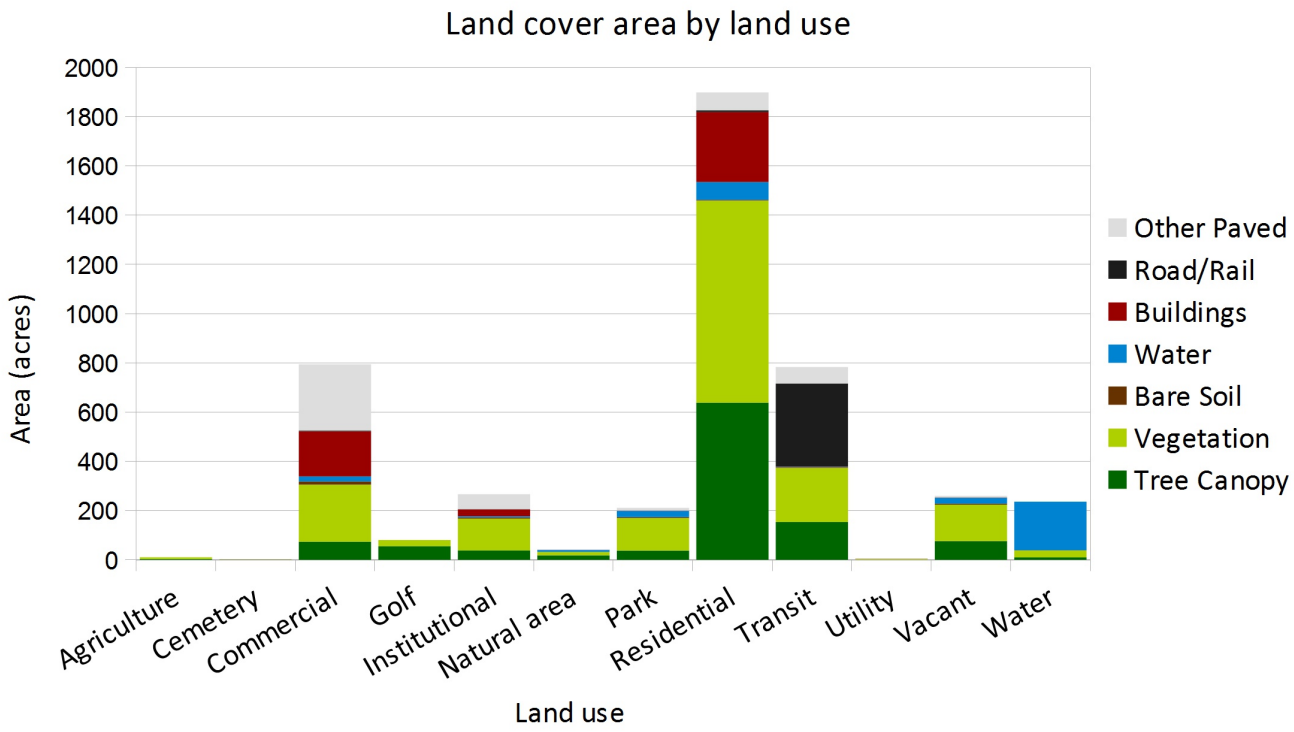

Fig 5: The majority of land is residential land use, followed by commercial.

While cemetery and utility properties have a high proportion of plantable space (Fig. 4), these land use type makes up a relatively small area in Lake Zurich (Fig. 5). The majority of its land is residential, followed by commercial.

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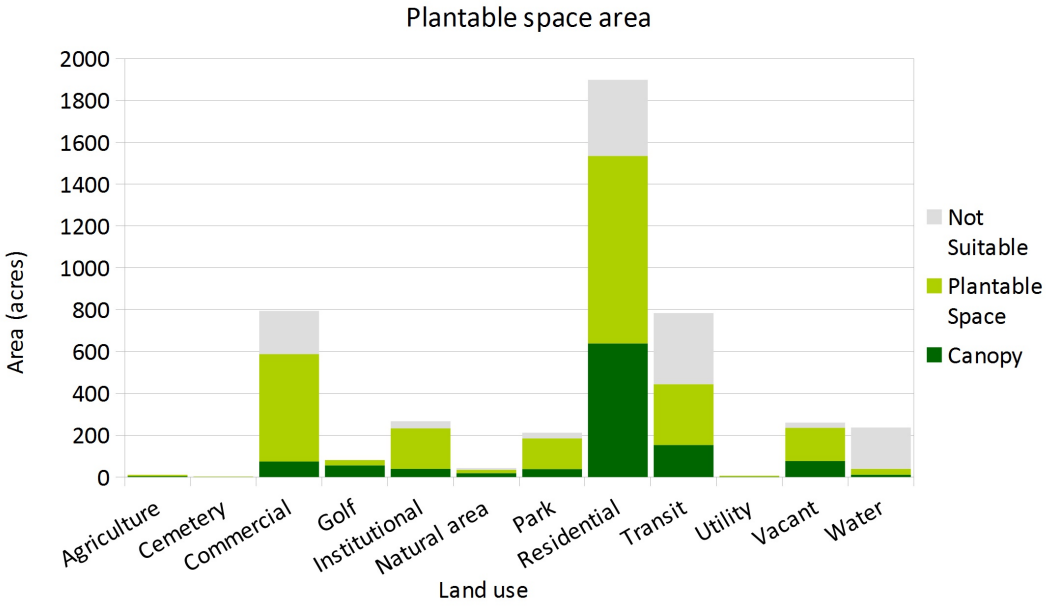

Fig 6: Residential has the greatest potential for increasing the canopy, followed by commercial.

Residential, transit 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 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. Commercial property owners could be encouraged to plant more trees through tree cost shares, tree adoptions, ordinances that encourage tree preservation, or stormwater fee rebates for properties that have more tree canopy.

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	3.1	29.6%	7.3	70.3%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.1%	0.0	0.1%
Cemetery	0.3	13.8%	1.4	77.2%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.2	9.0%	0.0	0.0%
Commercial	73.8	9.3%	231.9	29.2%	13.0	1.6%	20.4	2.6%	183.5	23.1%	2.5	0.3%	269.1	33.9%
Golf	55.5	68.4%	25.1	30.9%	0.0	0.0%	0.2	0.2%	0.2	0.2%	0.0	0.0%	0.2	0.2%
Institutional	38.3	14.3%	129.4	48.5%	5.1	1.9%	4.5	1.7%	27.3	10.3%	1.3	0.5%	60.7	22.8%
Natural area	18.5	43.8%	13.7	32.6%	0.3	0.8%	8.0	18.9%	0.2	0.4%	0.1	0.1%	1.4	3.4%
Park	37.9	17.9%	132.6	62.6%	3.3	1.6%	25.2	11.9%	0.9	0.4%	0.7	0.3%	11.1	5.3%
Residential	638.7	33.6%	820.7	43.2%	2.9	0.2%	72.2	3.8%	284.8	15.0%	6.4	0.3%	72.9	3.8%
Transit	153.6	19.6%	220.6	28.2%	3.0	0.4%	1.1	0.1%	1.0	0.1%	337.1	43.0%	67.0	8.6%
Utility	0.7	10.1%	2.9	44.3%	0.0	0.3%	0.3	5.2%	0.4	6.2%	0.0	0.0%	2.2	33.9%
Vacant	76.3	29.3%	148.4	57.1%	3.9	1.5%	23.6	9.1%	0.6	0.2%	0.5	0.2%	6.7	2.6%
Water	10.0	4.2%	28.5	12.0%	0.1	0.1%	197.8	83.5%	0.0	0.0%	0.2	0.1%	0.2	0.1%
Total abundance	1106.5	24.1%	1762.6	38.4%	31.7	0.7%	353.3	7.7%	498.9	10.9%	349.1	7.6%	491.7	10.7%

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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 Lake Zurich offer. These values were calculated with i-Tree Landscape. Each year, Lake Zurich's trees provide the municipality with $360,400 worth of benefits. These trees also store a lot of carbon, which is valued at an additional $2,837,400.

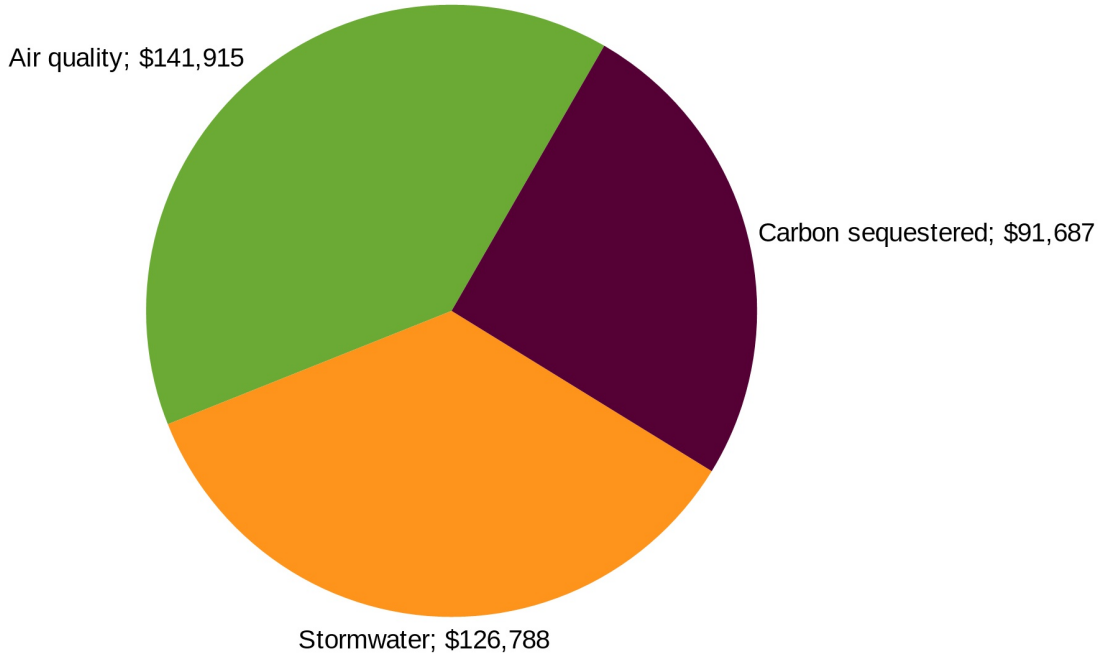

Figure 7: Trees offer myriad benefits, including intercepting stormwater, improving air quality and removing carbon from the atmosphere.

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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.

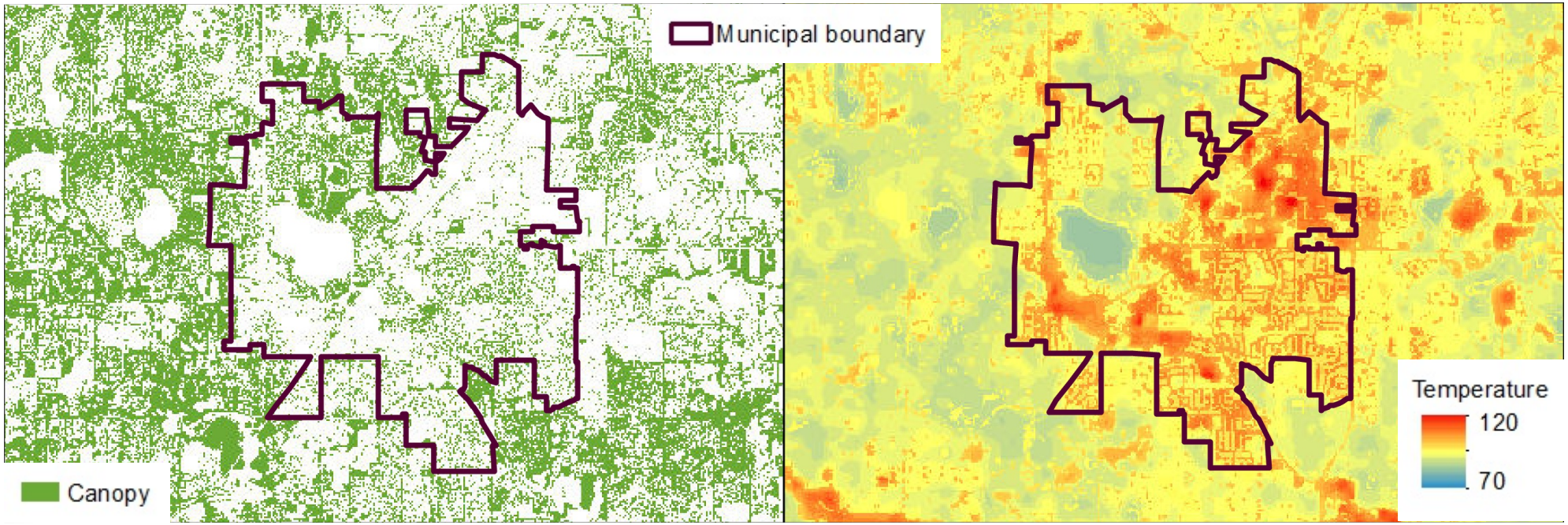

Figure 8: The image on the left shows tree canopy and on the right shows surface temperature. Surface temperature was calculated using a landsat image from September 2014. Areas that have higher tree canopy tend to have lower temperatures.

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Lake Zurich has less canopy than all of its neighbors (Fig. 9).

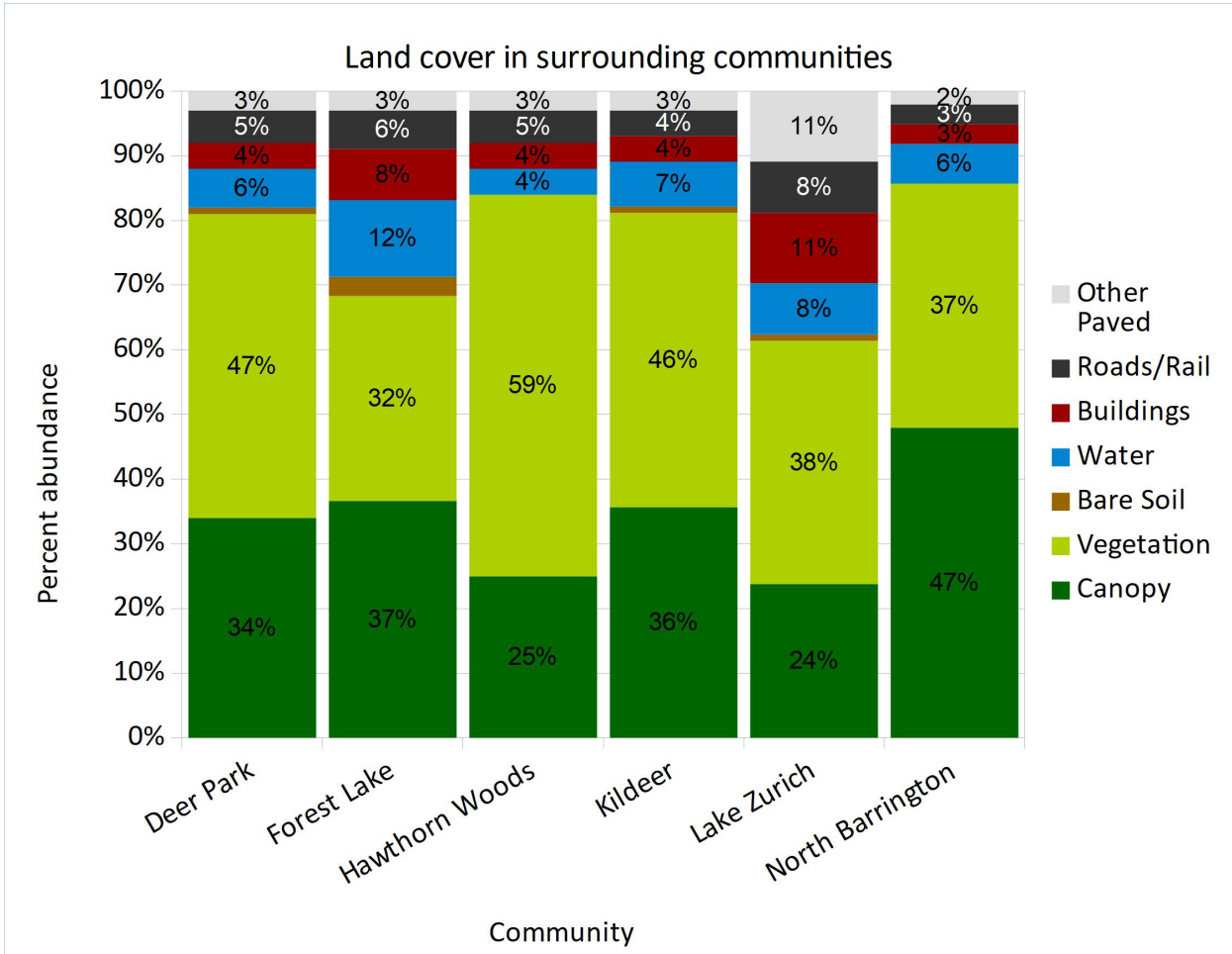

Figure 9: Comparison of land cover of Lake Zurich and its neighbors.

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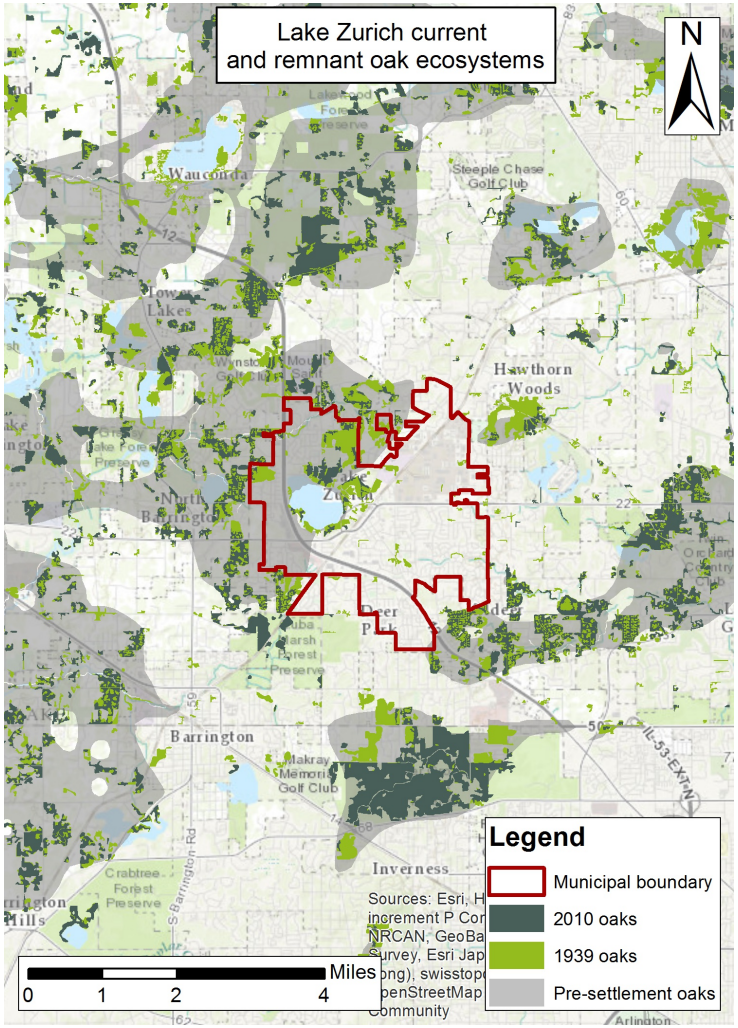

Figure 10: Oak ecosystems were abundant prior to Euro-American settlement. This map shows which of these ecosystems still remained in 1939 and 2010.

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.

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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.

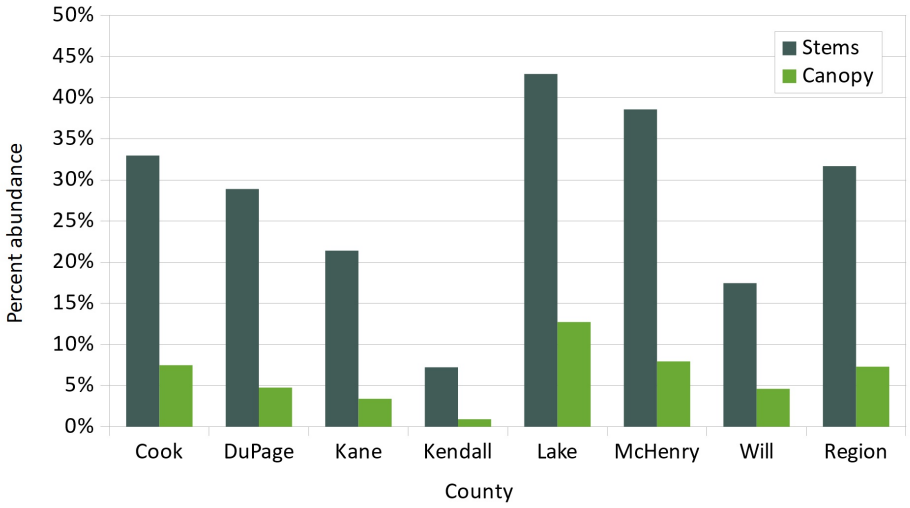

Figure 12: Woody invasive abundance across all counties. They are the most abundant in Lake and McHenry Counties, but is a threat region-wide.