Riverside 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 grass and shrubs, 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.

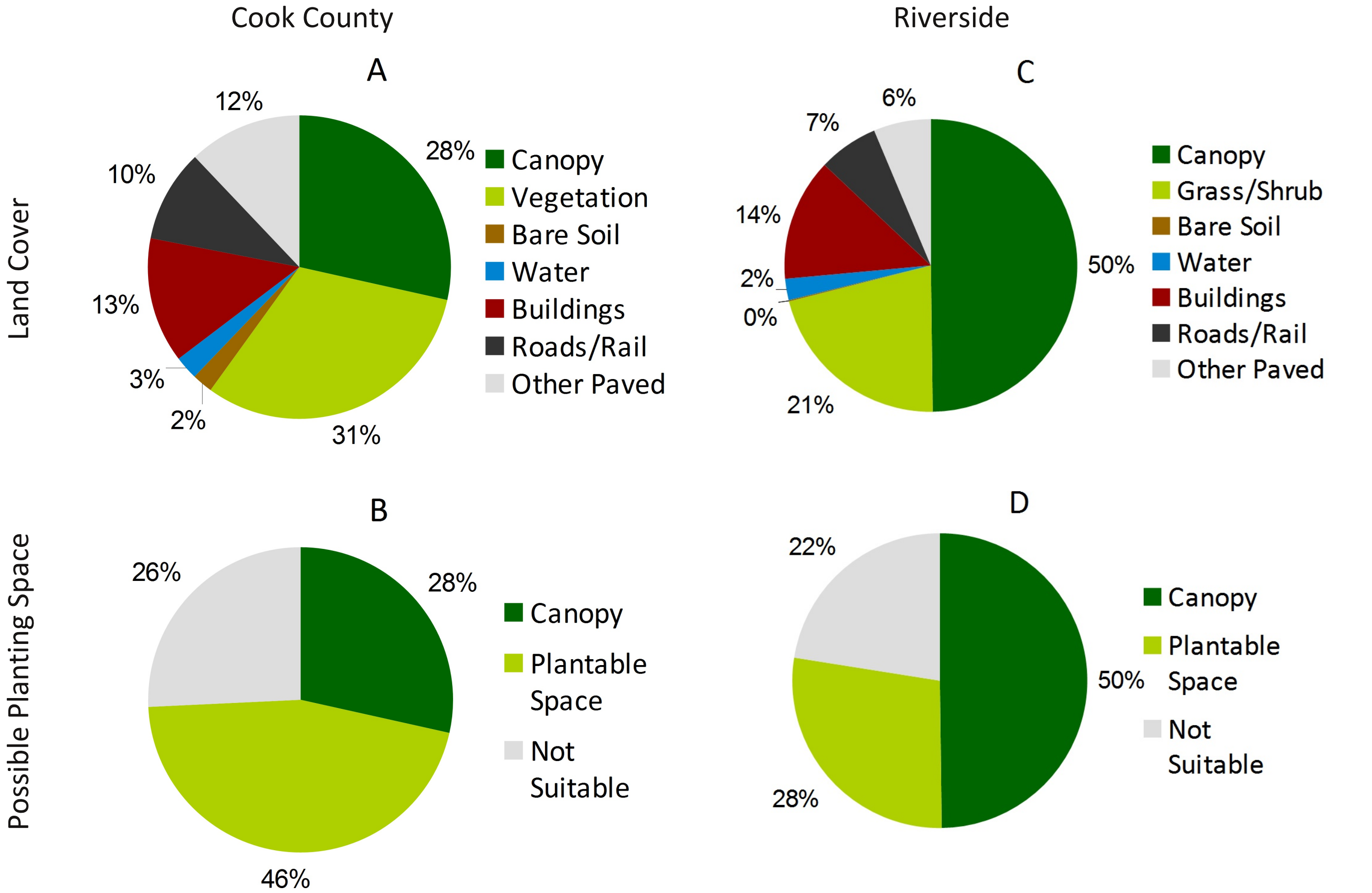

Fig 2: Cook County's current land cover (A), including 28% canopy cover. An additional 46% of the county is suitable for planting (B). Riverside currently has 50% canopy cover (C), and 28% of the land cover could potentially be converted to canopy (D).

Overall, 28% of Cook 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 grass/shrub, 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 46% of the county's area, meaning that canopy cover could potentially be raised to 74% 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. Riverside currently has 50% canopy cover, and could potentially increase their canopy to 78% (Fig. 2).

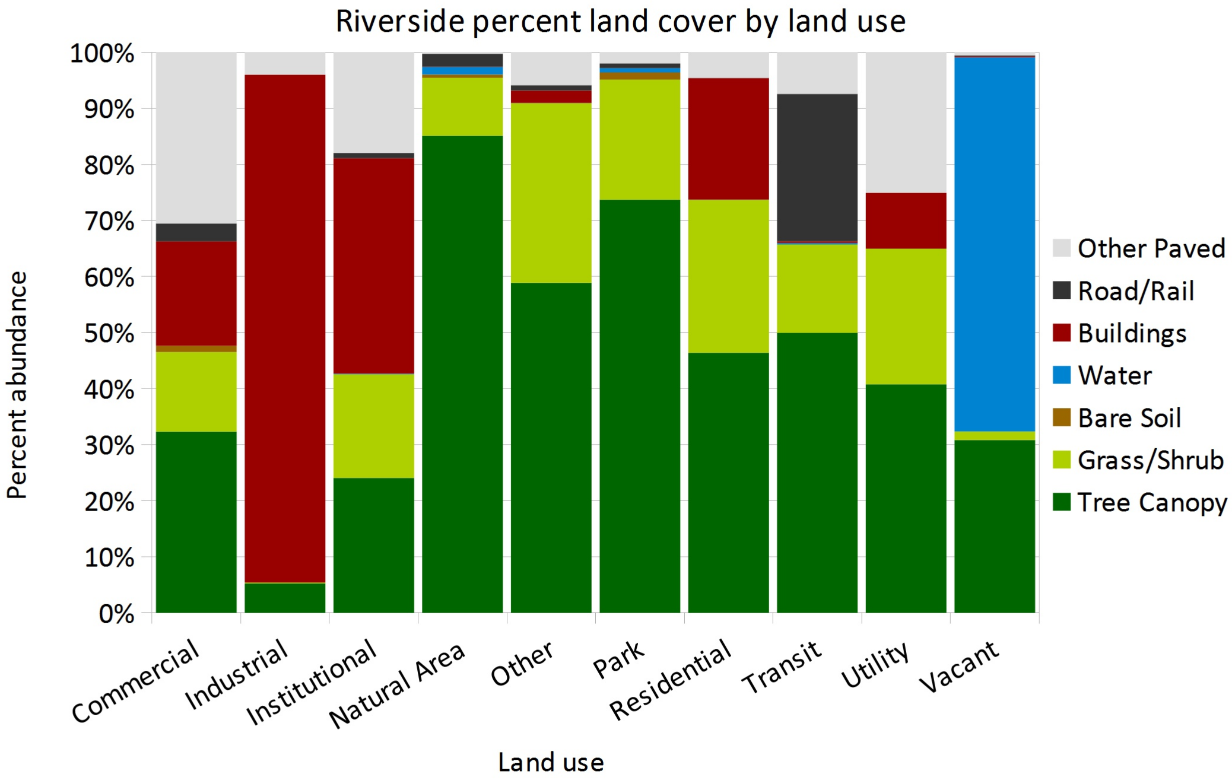

Fig 3: Variations in land cover across land use types.

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 Riverside, the highest percentage of canopy is found in natural areas and parks (Fig. 3). Industrial and institutional properties and 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 at the end of this report for more details.

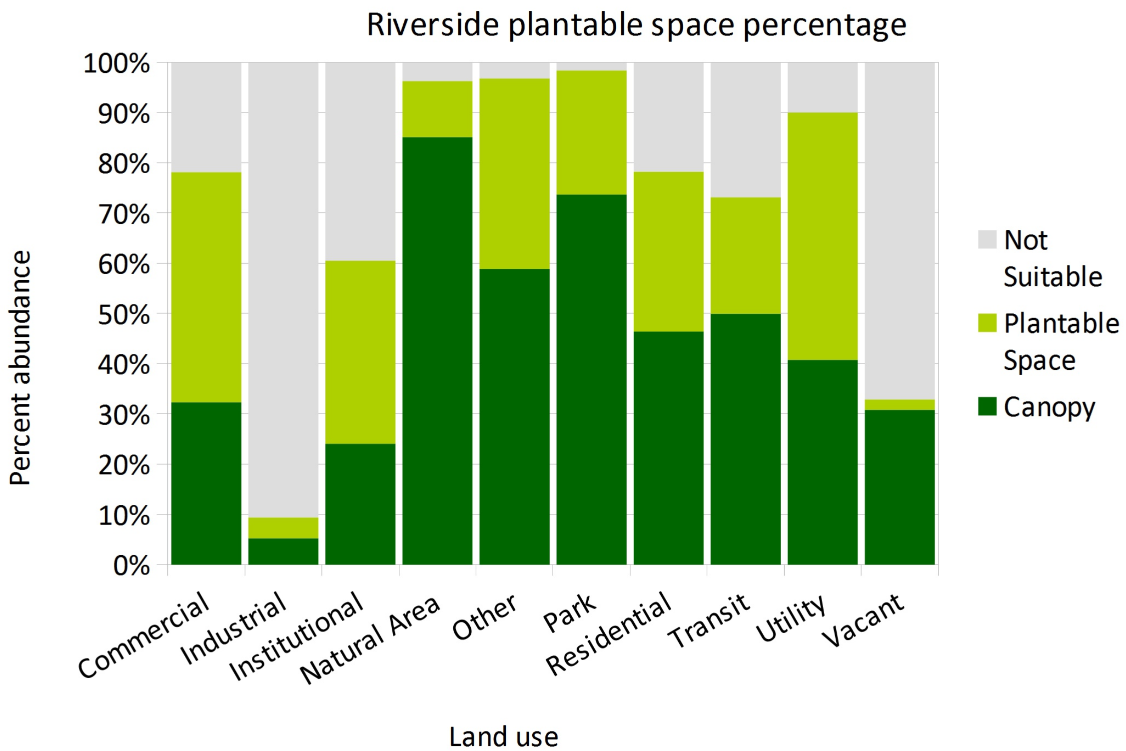

Fig 4: Current canopy and possible planting space across land use types.

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

While commercial and utility properties have a high proportion of plantable space, these land use types make up a relatively small area in Riverside (Fig. 5).

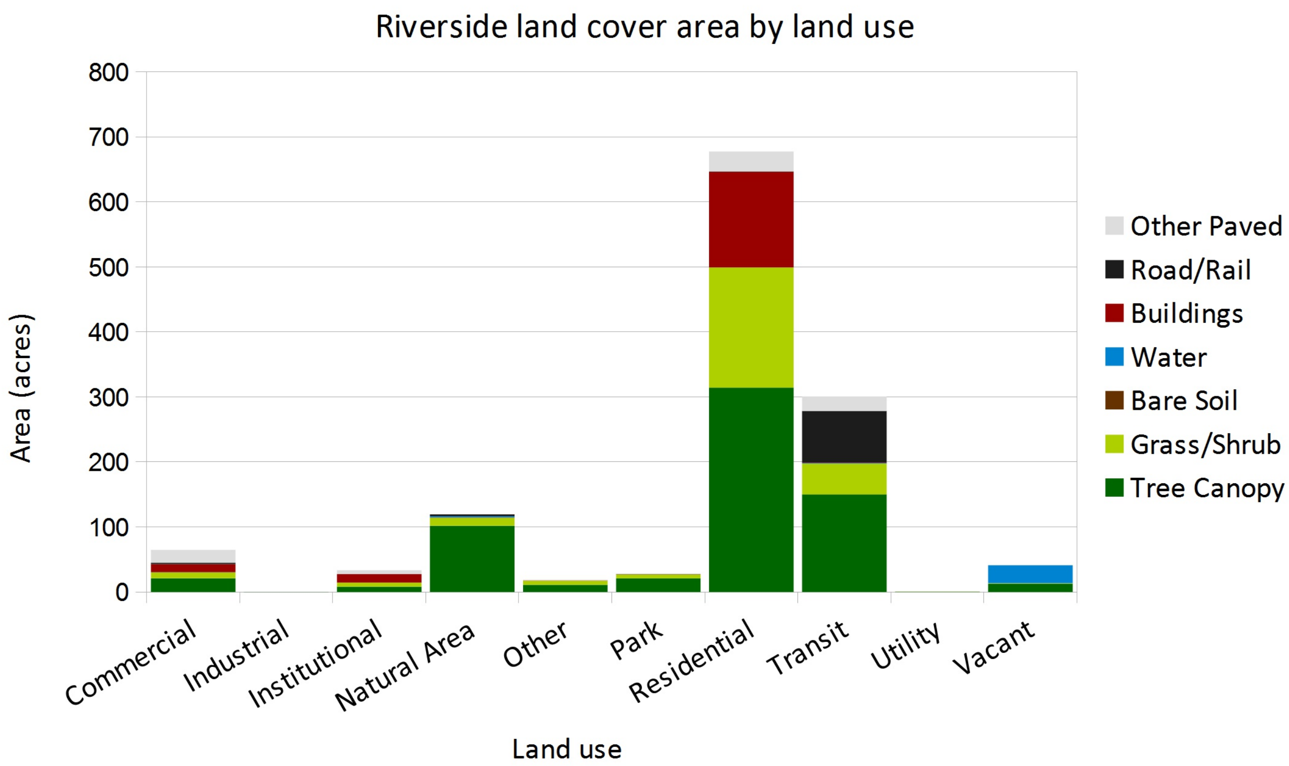

Fig 5: The majority of Riverside is residential land use, followed by transit.

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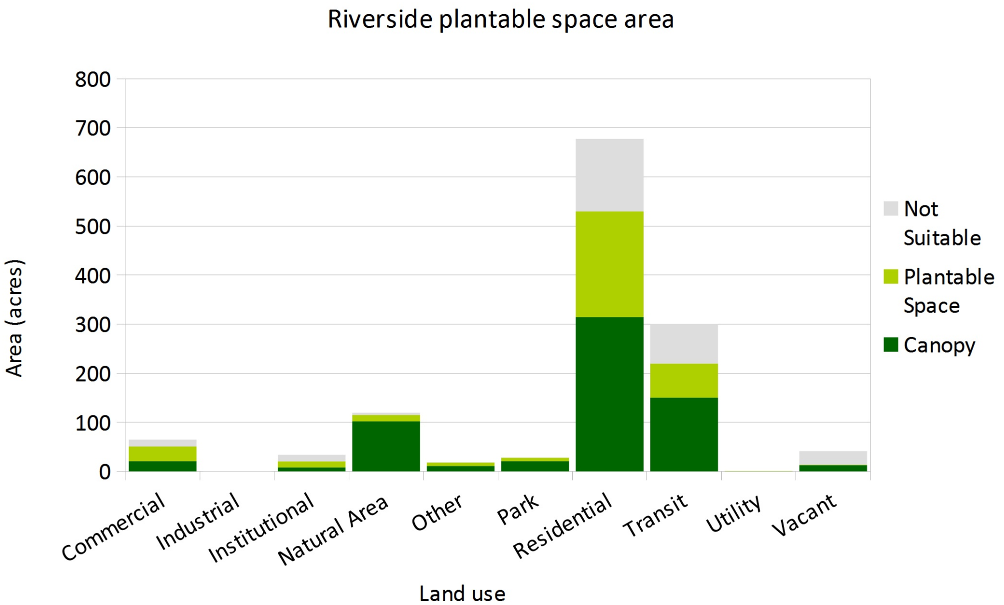

Fig 6: Residential has the greatest potential for increasing the canopy, followed by transit.

Residential and transit 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		**Turf**		**Bare soil**		**Water**		**Buildings**		**Roads and rail**		**Other paved**	
	Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Commercial	20.9	32.3%	9.2	14.2%	0.7	1.1%	0.0	0.0%	12.1	18.6%	2.1	3.2%	19.8	30.5%
Industrial	0.0	5.3%	0.0	0.2%	0.0	0.0%	0.0	0.0%	0.2	90.6%	0.0	0.0%	0.0	4.0%
Institutional	8.1	24.1%	6.2	18.5%	0.0	0.0%	0.0	0.1%	12.9	38.5%	0.3	0.9%	6.0	17.9%
Natural Area	101.8	85.1%	12.4	10.3%	0.7	0.6%	1.6	1.3%	0.1	0.1%	2.8	2.3%	0.3	0.3%
Other	10.9	58.9%	6.0	32.1%	0.0	0.0%	0.0	0.0%	0.4	2.2%	0.2	0.9%	1.1	5.9%
Park	20.8	73.7%	6.1	21.4%	0.4	1.3%	0.2	0.8%	0.0	0.0%	0.2	0.8%	0.6	2.0%
Residential	314.2	46.4%	184.9	27.3%	0.0	0.0%	0.0	0.0%	147.0	21.7%	0.3	0.1%	30.8	4.6%
Transit	150.1	49.9%	47.4	15.8%	0.0	0.0%	0.8	0.3%	0.9	0.3%	79.0	26.3%	22.3	7.4%
Utility	0.3	40.8%	0.2	24.2%	0.0	0.0%	0.0	0.0%	0.1	9.9%	0.0	0.0%	0.2	25.1%
Vacant	12.8	30.8%	0.6	1.5%	0.0	0.0%	27.7	66.8%	0.1	0.2%	0.1	0.1%	0.2	0.6%
Total	640.0	49.8%	272.9	21.2%	1.8	0.1%	30.4	2.4%	173.7	13.5%	85.0	6.6%	81.3	6.3%

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Riverside has higher canopy cover than its neighbors, and lower abundances of gray infrastructure (Fig. 7).

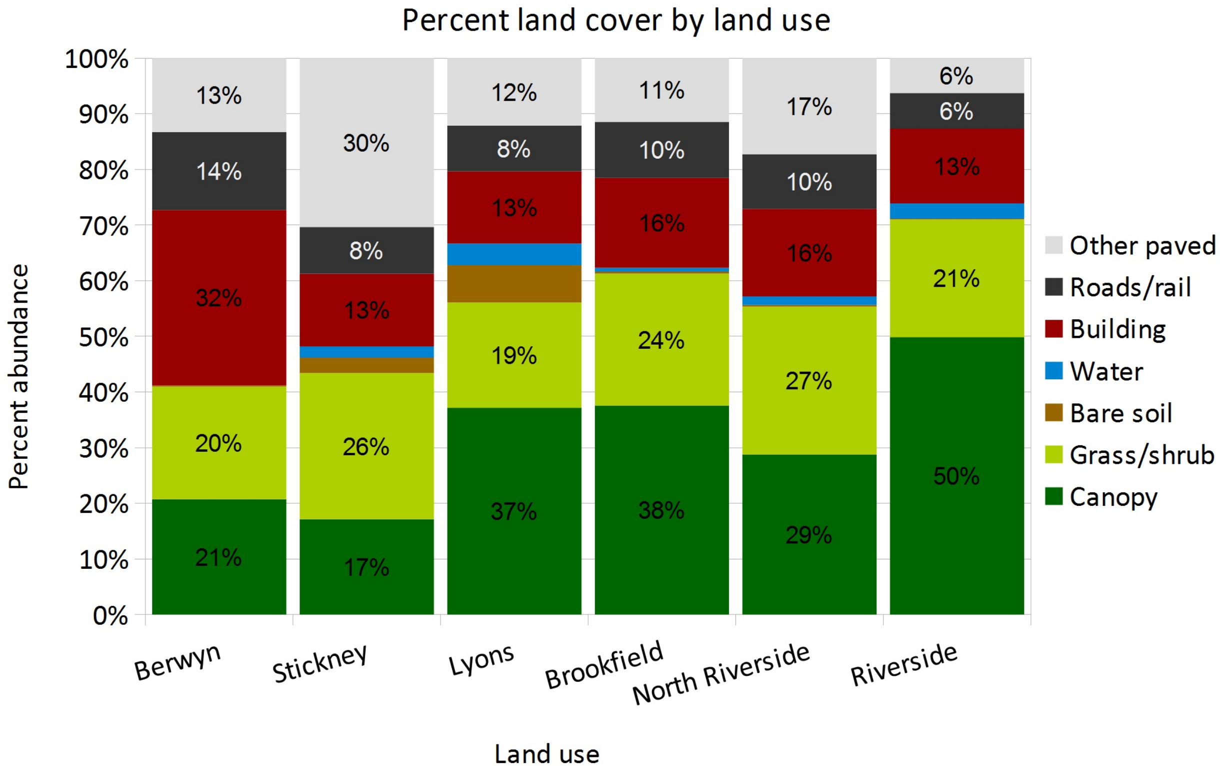

Figure 7: Comparison of land cover of Riverside and its neighbors.

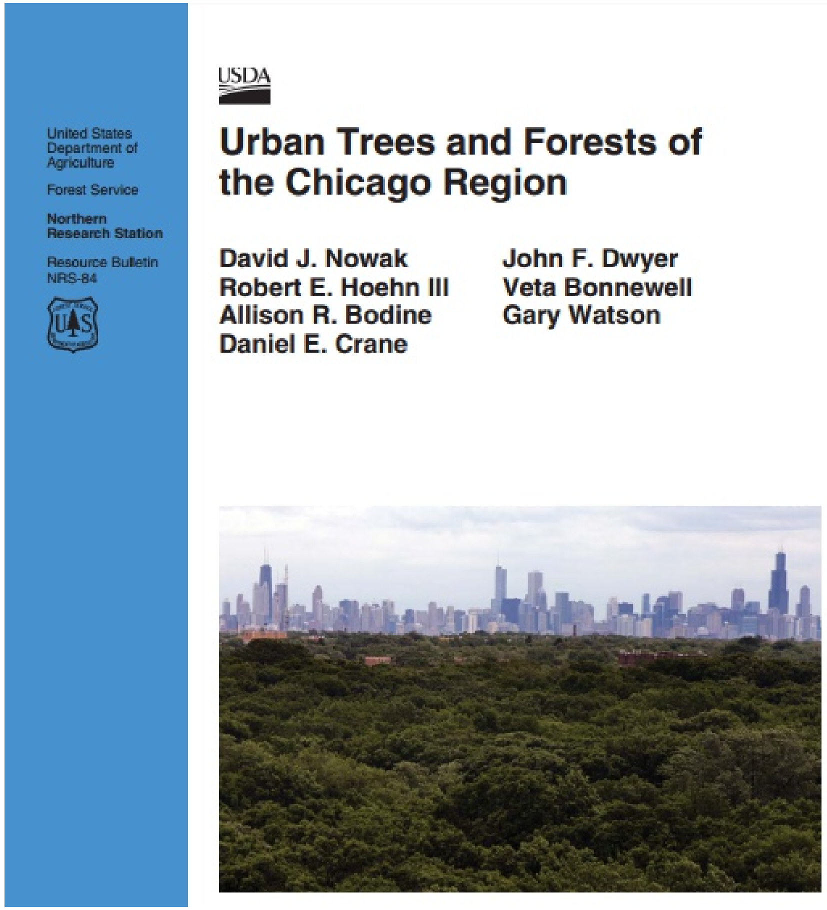

Figure 9: This Forest Service publication be found in its entirety at: http://www.nrs.fs.fed.us/pubs/44566.

While understanding canopy is an important component of urban forestry, canopy alone does not show the whole picture. We can use canopy to quantify the number and extent of trees, but not their identity, health, nor vulnerability to pests, diseases or climate change. In order to better understand the urban forest, we need a tree inventory, which will describe the abundance and location of tree species (Fig. 8).

Tree inventories come in many shapes and sizes. The most complete inventories gather data on every tree in the study area, and include information like each tree's species, any health issues the tree may have, and its specific location. This sort of inventory is invaluable for planning and monitoring the urban forest's health and growth over time. The Morton Arboretum and the USDA Forest Service conducted a sample inventory across the seven county region, and determined species composition at the county scale (Fig. 9). This resource is invaluable in understanding broad-scale composition.

To measure species composition on a finer scale, rely on inventories that measure every tree. Many communities, including Riverside, have conducted such inventories on public property. We can use these inventories to better understand the state of its urban forest, and to compare municipalities who have an inventories to each other and to the region as a whole.

Figure 8: Measuring tree size is a critical component to completing a tree inventory.

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CHICAGO REGION TREES INITIATIVE
Our Trees. Our Communities. Our Future.

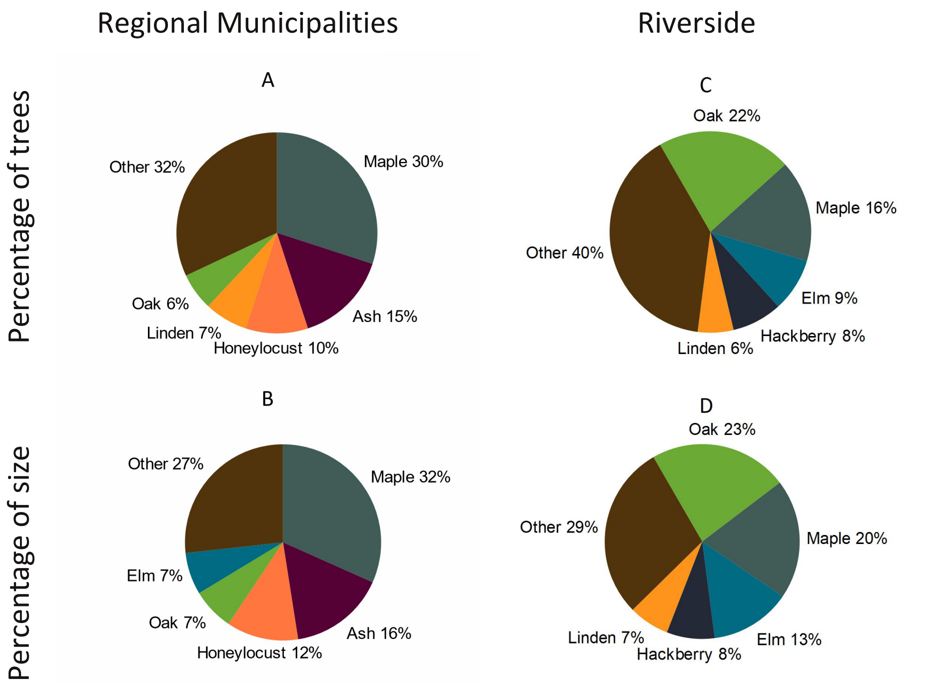

Figure 10: Region-wide, maple is the most abundant genus by number of trees in municipal plantings (A), as well as by proportion of canopy (B). Riverside is different from the average, and oaks is the most abundant tree by stem and size (C and D).

Inventories allow us to look at diversity in two ways, by the abundance of individual trees, and the proportion of the entire canopy that these trees make up. To determine the second figure, we can use the diamater of the trees as a correlate for canopy abundance, as those values are closely related. Both of these measures are important. Number of individual stems is useful when calculating the number of trees that might be affected by a given pest or disease. The abundance of canopy will show how the entire forest might change. That is, losing ten, small apple trees would have a much smaller impact on the ecosystem services that a forest offers then losing ten, mature oaks. Figure 10 shows the most abundant genera in Riverside and across 55 other municipalities.

Many municipalities have very low species diversity. They rely heavily on tried and true species, like Freeman maples, white ash and honey locust. Maples, on average, comprise 30% of municipal plantings. Ashes were generally in similar abundances, and losing them was a terrible ordeal. As devastating as losing ashes was for the Chicago region, losing maples would be much worse.

This illustrates how critical it is to actively increase species diversity where possible. Most pests and diseases (like emerald ash borer and Dutch elm disease) only attack a specific species or genera of plants. By diversifying species, we can ensure that our forest is resilient to these attacks. CRTI recommends that municipalities strive to have no more than 15% of a single family, 10% of a genus, and 5% of a species in their plantings. These guidelines should be met not only across the whole municipality, but at smaller scales like individual blocks.

As a whole, Riverside has higher species diversity than most municipalities. It is a bit heavy on oaks and maples, but is conisderably more balanced then most municipalities.,

Figure 11: There are more trees in smaller age classes than in larger ones in Riverside and across all municipal inventories.

There is another type of diversity to consider beyond species diversity. A sustainable forest has a variety of ages and sizes of trees. If all of the trees in an area were planted at the same time, they will grow, age and die at the same time. When these trees reach the end of their lives, it could leave a property without trees.

For that reason, it is important to try to increase age diversity of a forest. This can be done by planting trees over several years, planting trees with different growth habits (some trees grow quickly and have shorter lifespans than others), and by under planting aging trees, so that something is ready to replace them when they die.

Paying attention to size diversity is especially critical when recovering from emerald ash borer. Many communities have vowed to replace all of the trees that they remove, but this could become problematic if they are planting all of those trees within a short time period. It may be better for overall health of the forest to space these plantings out over several years.

Overall, size diversity for the Riverside and averaged across all municipalities looks sustainable (Fig. 11). There is room for some trees to die between each age class, with plenty to remaining to grow into the next size class Riverside has more trees in the smallest size class, which could lead to increases in canopy over time. It also has more trees in the largest size classes. This could be due to good management of mature trees, but could also mean that many of these trees could die soon, leading to decreases in canopy.

While size diversity is sustainable on the county and regional scale, it is also important to zoom into smaller areas, like specific municipalities, subdivisions or properties. Planning for size class diversity on these scales is important to local ecosystem services, like reducing energy use, managing stormwater and retaining soil.

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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 12 shows the benefits that all of the trees (including trees public and private property) in Riverside offer. These values were calculated with i-Tree Landscape. Each year, Riverside's trees provide the municipality with $708,000 worth of benefits. These trees also store a lot of carbon, which is valued at an additional $1,331,100.

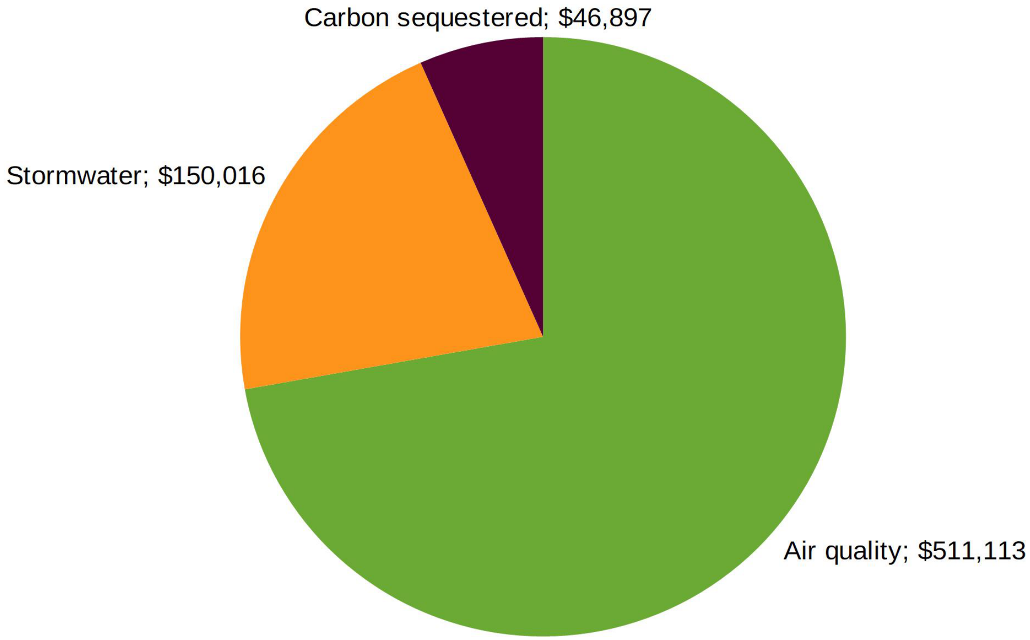

Figure 12: Trees offer myriad benefits, including intercepting stormwater, improving air quality and removing carbon from the atmosphere.

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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 13). Planting more trees in parking lots and around buildings can be especially helpful in reducing urban temperatures and making cities more comfortable.

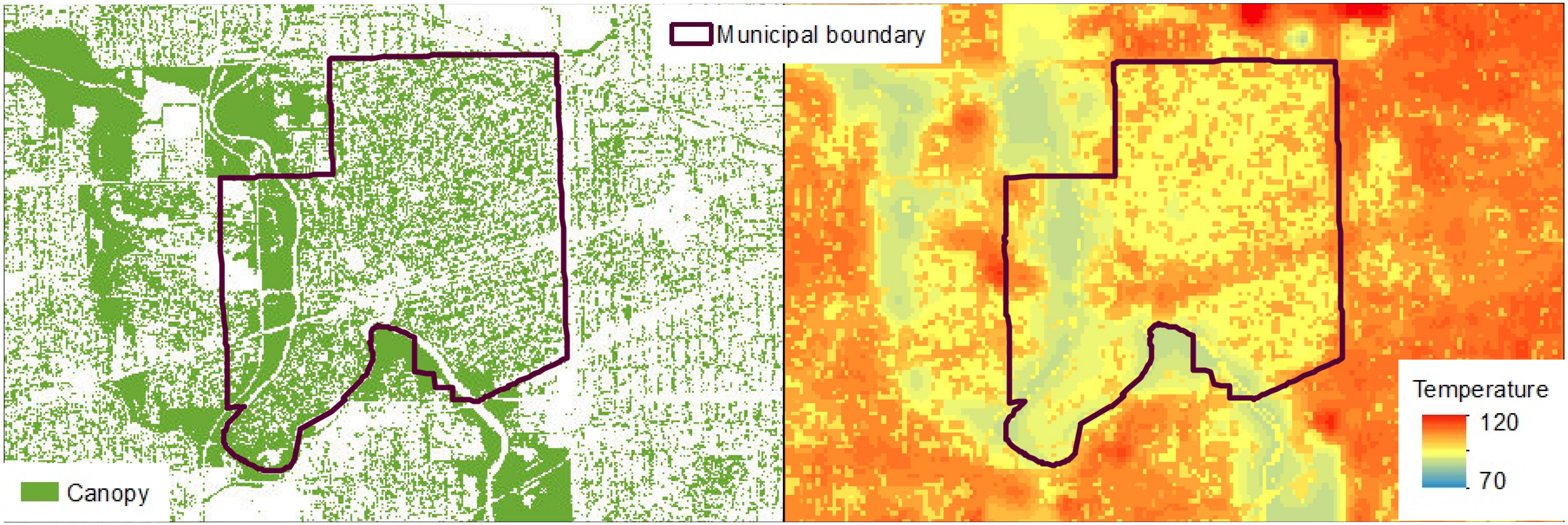

Figure 13: The image on the left shows tree canopy and on the right shows surface temperature. Surface temperature was calculated using a landsat image from September 2014. Areas that have higher tree canopy tend to have lower temperatures.

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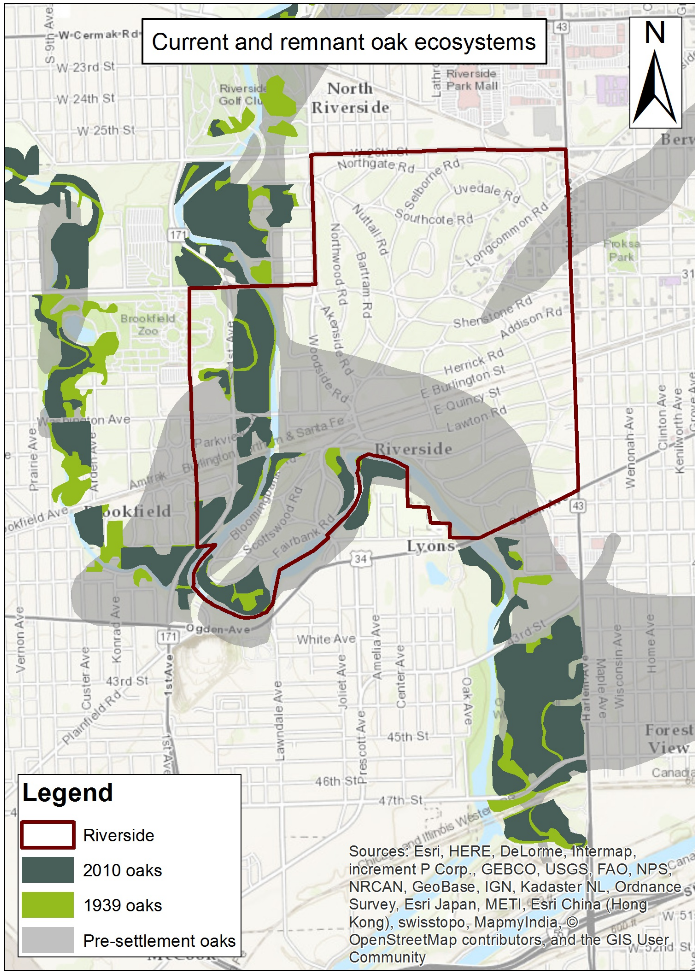

Figure 14: Many of the oak ecosystems that were present prior to Euro-American settlement were destroyed prior to 1939.

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 region-wide. For more information on oak ecosystems in the Chicago region, see Chicago Wilderness's *Oak Ecosystem Recovery Plan*.

Few of the original oak woodlands persist in Riverside (Fig. 14). While oaks currently the most abundant tree on public property in Riverside, and make up 22% of all trees (Fig. 9), prior to Euro-American settlement oaks made up 60% of the region's canopy.

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.

Riverside has far more oaks than most municipalities. It is a case study in how oaks can be effectively used in urban conditions. In fact, Riverside has so many oaks that it might consider planting fewer of them to increase species diversity. If more oaks are planted, Riverside might focus on the areas that were oak ecosystems prior to settlement (Fig. 11). Also, while oaks are abundant on public property, they may not be on private property. Riverside could investigate strategies to increase oak plantings on private lands, 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. 15). 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. 16). While there are very few woody invasives in Riverside's inventory, these trees likely exist on private property, or on unmanaged land. 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 15: A buckthorn thicket. Note that no other species are growing beneath the buckthorn.

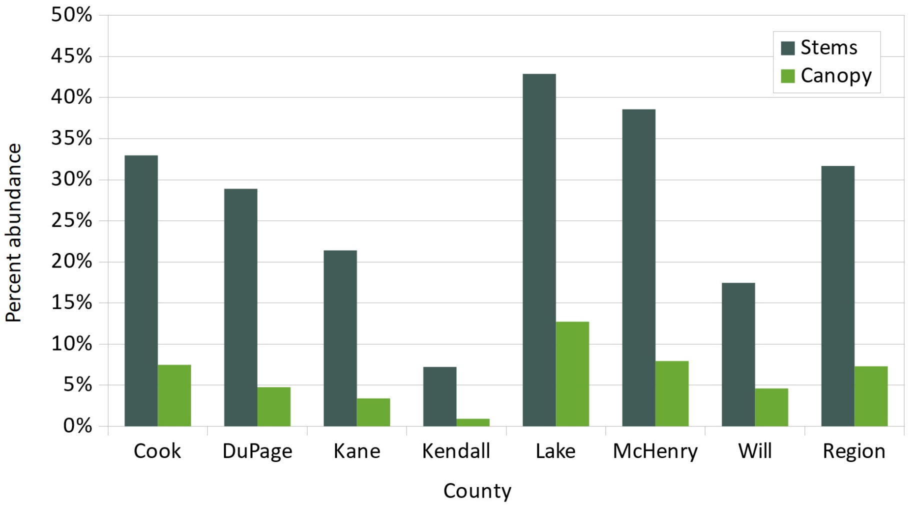

Figure 16: Woody invasive abundance across all counties. They are the most abundant in Lake and McHenry Counties, but is a threat region-wide.