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Challenges of Improving Urban Forest Canopy in the Chicago Region

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Summary

Since the completion of the 2010 Tree Census and founding of the Chicago Region Trees Initiative, significant action has been initiated to address many of the challenges identified and to begin to produce desired outcomes. These challenges and outcomes, outlined in the CRTI Master Plan, are being undertaken by a wide range of partners as they become increasingly more aware of the benefits trees provide, the need to expand our regional canopy, reduce threats to our forest, and protect our native oak ecosystems. These challenges are too vast for any one organization to address alone and it will take a wide range of partners and participants, working together, to implement the CRTI Master Plan resulting in a healthy, diverse, and equitably distributed tree canopy benefiting all people in the Chicago region.

INTRODUCTION

Trees and green infrastructure are undervalued in our society partially because their value is not well understood. Urban trees are critical infrastructure. They lower temperatures, improve air quality, reduce flooding, clean water, improve mental and

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physical health, increase property values, and reduce crime (Turner-Skoff, et al. 2019). The study, the Urban Trees and Forests of the Chicago Region (2010 Tree Census) (Nowak, et al. 2013) revealed that the urban forest in the Chicago region is in a state of "transition". As a result, The Morton Arboretum, along with fourteen other leading organizations from the Chicago region founded the Chicago Region Trees Initiative (CRTI) to begin to address these challenges. The mission of the CRTI coalition, is to *ensure that trees are healthier, more abundant, more diverse, and more equitably distributed to provide needed benefits to all people and communities in the Chicago region.* In 2019, CRTI completed a 3-year effort to gather stakeholder feedback and direction across the seven-county region, resulting in a Master Plan (http://chicagorti.org/MasterPlan) for the Chicago region's urban forest. The plan identified four major goals to address challenges to the urban forest in the Chicago region. They are: Inspire people to value trees, Increase the Chicago region's tree canopy, reduce threats to trees, and enhance oak ecosystems, and CRTI has begun to implement this plan.

DISCUSSION

To drive action and better understand individual and community needs, CRTI has collected one of the largest datasets on urban forestry in the county. This data has been coupled with population vulnerability, air quality, flooding, temperature, and health data. This data is presented as an interactive online resource (http://chicagorti.org/PriorityMap) for all landowners, managers and interested organizations and individuals to inform and prioritize action. In addition, a capacity survey was completed to focus development of resources and trainings based on the capacity of communities to fund and support tree planting and care. The objectives of all of these tools and resources are to improve tree health and capacity to increase quality of life. Additionally, these tools and resources allow for prioritized action, have informed the CRTI Master Plan, and desired outcomes.

Inspire People to Value Trees

The first goal of the CRTI Master Plan is to inspire people to value trees. In order to inspire individuals and communities to value trees we must first understand their values and goals. We must determine how their goals and values can be supported and help them understand how urban trees relate to those goals so they can be inspired to take action. Once people are inspired, ownership and a positive change can take place.

CRTI staff work to engage all levels within the community including elected officials, community administration and staff, volunteers, residents, and community groups. These engagements include discussions of their vision for their communities and development of actions and resources they can utilize, to create change and build excitement in the community for urban trees.

In 2020, The Morton Arboretum, repeated the 2010 Tree Census and found that the canopy had grown from 21% to 23%. The canopy now provides $191 million in annual pollution removal, $3.5 billion in carbon storage, $93 million on carbon sequestration, 1.5 million cubic feet in avoided stormwater runoff, $32 million in energy savings and has a replacement value of $45 billion (Figure 1: Chicago Region Tree Features; Figure 2: Chicago Region Tree Benefits.).

CHICAGO REGION FOREST FEATURES			TOTALS
Number of trees	Chicago	3,997,000	172,297,000
	Seven-County Region	168,300,000	
Tree and shrub canopy cover (i-Tree canopy)	Chicago	16%	23%
	Seven-County Region	26%	
Most common species of trees	Chicago	white mulberry, European buckthorn, tree of heaven	-
	Seven-County Region	European buckthorn, boxelder, black cherry	
Species with the most total leaf area	Chicago	silver maple, Norway maple, white ash	-
	Seven-County Region	European buckthorn, silver maple, black walnut	
Percentage of trees smaller than 6" (15.2 cm) diameter	Chicago	65%	75%
	Seven-County Region	76%	

Figure 1. 2010 Tree Census Canopy (https://mortonarb.org/app/uploads/2021/05/2020-Chicago-Region-Tree-Census-Report__FIN.pdf) – Chicago Region Forest Features.

CHICAGO REGION FOREST FEATURES *continued*			TOTALS
Pollution removal (tons/year)	Chicago	800	18,600
	Seven-County Region	17,800	
Pollution removal ($/year)	Chicago	$36,600,000	$191,600,000
	Seven-County Region	$155,000,000	
Carbon storage (tons)	Chicago	876,500	20,836,500
	Seven-County Region	19,960,000	
Carbon storage ($)	Chicago	$149,000,000	$3,549,000,000
	Seven-County Region	$3,400,000,000	
Carbon sequestration (tons)	Chicago	21,000	542,600
	Seven-County Region	521,600	
Carbon sequestration ($/year)	Chicago	$3,610,0000	$92,610,000
	Seven-County Region	$89,000,000	
Oxygen production (tons/year)	Chicago	23,000	648,800
	Seven- County Region	625,800	
Avoided runoff (cubic feet/year)	Chicago	65,000,000	1,490,000,000
	Seven-County Region	1,425,000,000	
Avoided runoff ($/year)	Chicago	$4,350,000	$99,650,000
	Seven-County Region	$95,300,000	
Building energy savings ($/year)	Chicago	$1,930,000	$32,430,000
	Seven-County Region	$30,500,000	
Carbon avoided (tons/year)	Chicago	1,800	58,800
	Seven-County Region	57,000	
Carbon avoided ($/year)	Chicago	$314,000	$10,094,000
	Seven-County Region	$9,780,000	
Replacement value ($)	Chicago	$2,050,000,000	$44,850,000,000
	Seven-County Region	$42,800,000,000	

Figure 2. 2020 Tree Census, (https://mortonarb.org/app/uploads/2021/05/2020-Chicago-Region-Tree-Census-Report__FIN.pdf) Chicago Region Forest Features (Benefits).

CRTI, also had local LiDAR imagery analyzed enabling interpretation of much of this information at the community and census tract scale. Mapping of the results has been provided to the public on the CRTI website (http://chicagorti.org/PriorityMap) (Figure 3: Chicago Region Prioritization Map). Canopy summary information packets have been developed for each of the 284 individual communities and each of the 50 Chicago wards and 70 Chicago neighborhoods has been provided via the website and shared with community leadership (http://chicagorti.org/interactivemap) (Figure 4: Urban Forestry Summary details). Included within the summary information is a quantification of the value of the communities' trees for air quality, flooding, and carbon storage. These resources support understanding of the value of the urban forest to communities and individuals.

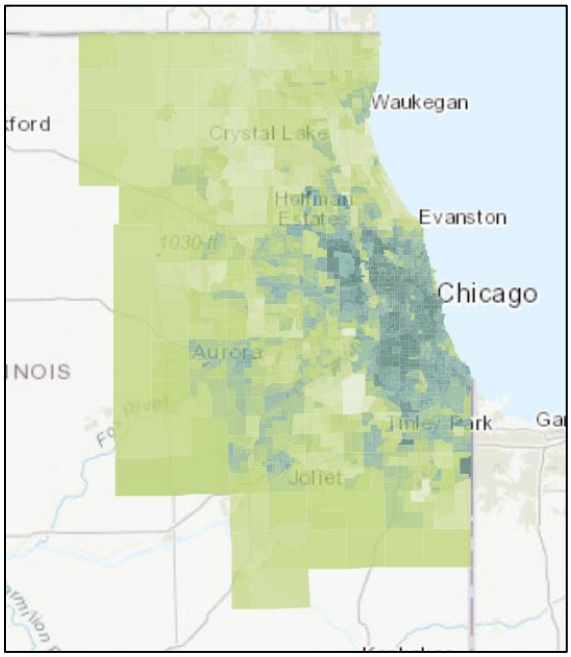

Figure 3. Chicago Region Prioritization Map (http://chicagorti.org/PriorityMap) (the darker the green the higher the priority). The Priority Map combines singular layers (also shown independently) of canopy cover, temperature, air quality, stormwater, and vulnerable populations.

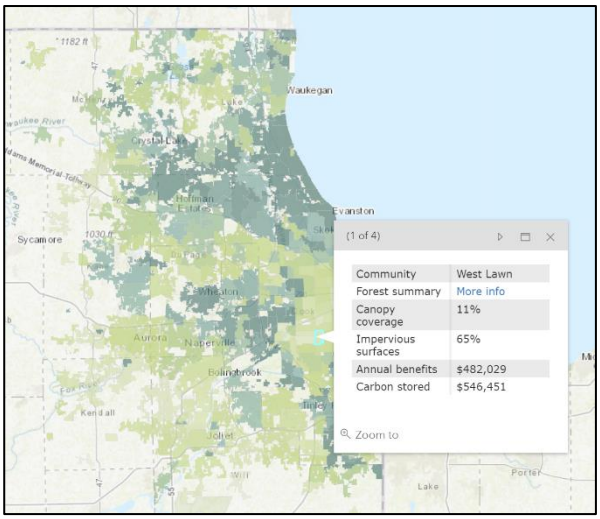

Figure 4. Interactive Community Summary Map, Communities can click on the map to see detailed information about each community or Chicago ward/neighborhood. By clicking on 'More info', Urban Forestry Summary details are presented allowing the community to review a wide range of details about their community's urban forest.

Within each Urban Forest Summary detail packet is a chart that shows tree benefits for three variables — air quality, runoff reduction, and carbon storage. These benefits are calculated using iTree, science-based tools. The chart enables decision makers to weigh their investment in the urban forest with some of the benefits it provides, helping to verify the value of their investment. (Figure 5: Chicago Forest Summary annual benefits for air quality, stormwater, and carbon sequestration.)

In 2020, CRTI launched the Plant Trees (http://chicagorti.org/PlantTrees) digital campaign to help communities and partners share the value of trees with their constituents. The campaign was designed to direct viewers of these outreach pieces to explore deeper messaging and provide increased knowledge and understanding of the value of trees. Key messages include Plant trees to cool and save energy, Plant trees to improve health and well-being,

Plant trees to strengthen communities, Plant trees for nature, Plant trees for clean air, Plant trees for shade and beauty, and Plant trees to help manage stormwater.

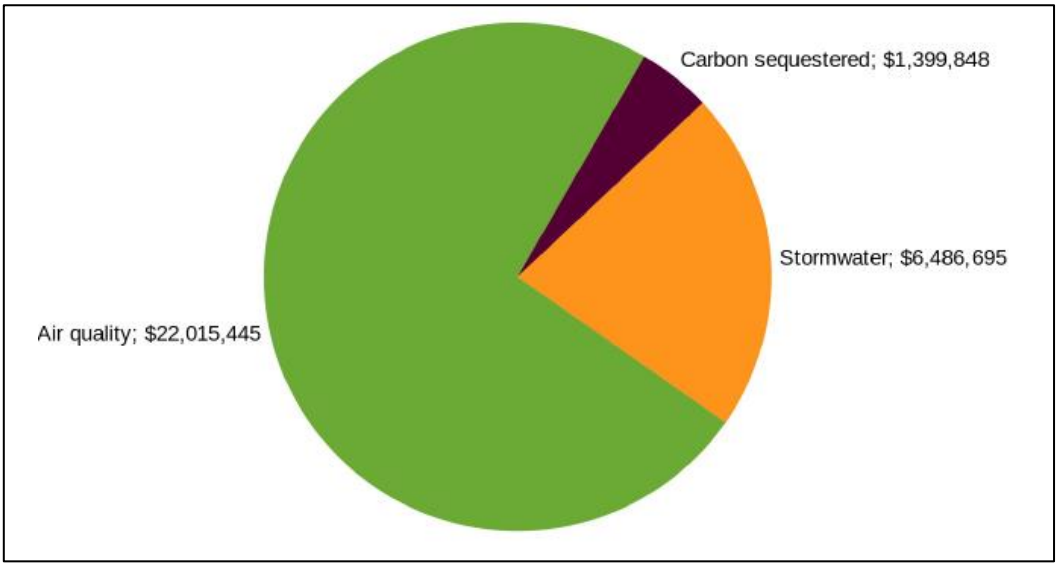

Figure 5. Chicago Urban Forest Summary packet information showing the annual benefits provided by Chicago's trees for air quality, carbon sequestered, and stormwater interception.

Ultimately, CRTI is working to share the value and benefits of trees to the 284 communities, 50 Chicago wards, and 9.4 million people living in the Chicago region so they can make informed decisions about the health of their portion of the urban forest and have a better understanding of its value and services, so they are inspired to preserve, protect, and enhance this critical resource.

Increase the Chicago Region's Tree Canopy

The second goal of the CRTI Master Plan is to increase the Chicago region's tree canopy. In order to achieve and expanded canopy we need to improve preservation and protection of trees through stronger policies, improve their care through increased training and professionalism of tree care, and plant more trees — especially where they are needed most.

Protection and care of existing trees is the greatest need because bigger trees provide bigger benefits. Existing trees need to be protected so they are not removed and can grow to maturity — providing maximum benefits. CRTI, with the help of the Illinois Department of Natural Resources and the USDA Forest Service, is working with the communities to improve their local tree ordinances and policies so that trees are better protected and care for. Funding opportunities are provided for tree ordinances, development of forest master plans, and completion of tree inventories.

The majority of the region's trees are located on private property and CRTI is working to encourage decision makers to implement policies that protect trees on both public and private property – trees are a communitywide asset regardless of ownership. Most communities are reluctant to regulate trees on private property and this is taking some outreach to change. CRTI encourages communities, not ready to implement private property ordinances, to incentivize expanded tree planting and care on private property. This can be accomplished through cost shares for tree purchases, allowing residents to purchase trees through the community's contract at discounted

rates and providing assistance in selecting broad species diversity to improve forest resilience. In addition, CRTI assists communities in providing education and outreach to residents through community events, online resources and improve community staff expertise. The CRTI data shows that residential property is the largest land use and has the greatest potential for expanded tree planting and care to increase the region's urban forest. (Figure 6: Urban Forest Canopy summary packet for the Village of Antioch, Illinois. Showing land use and potential plantable space.)

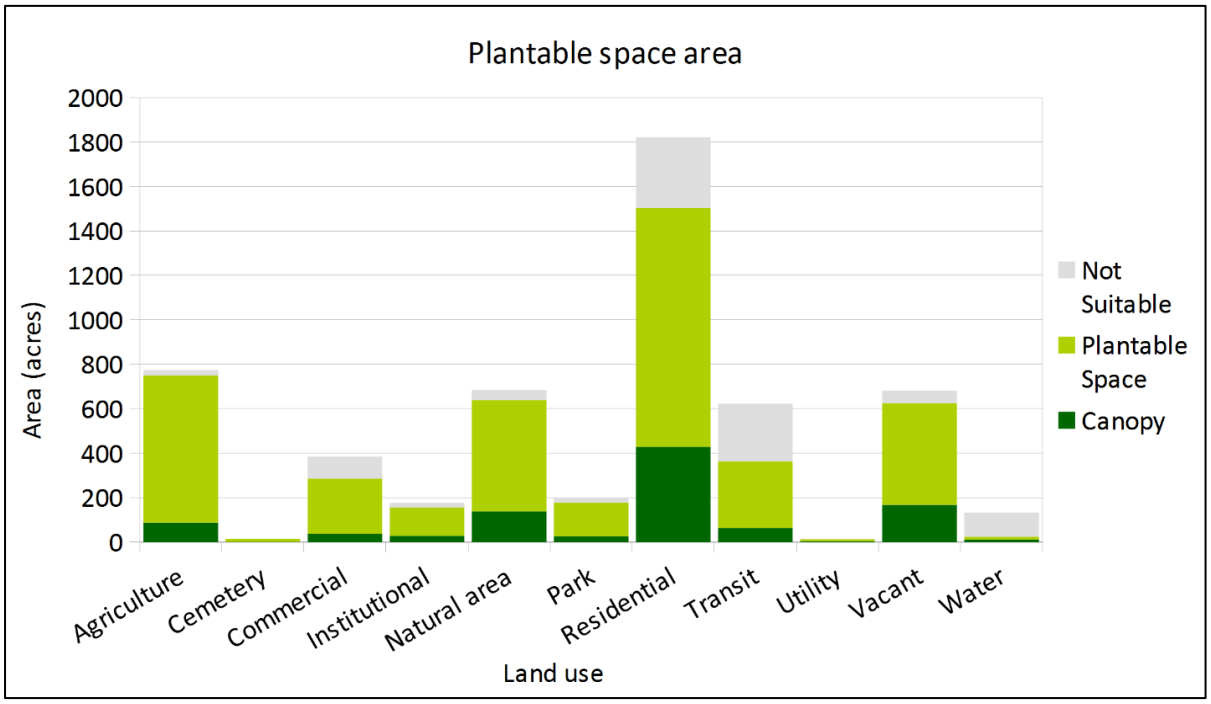

Figure 6. Urban Forest Canopy summary packet table for the Village of Antioch, Illinois. This table shows which land use is the largest in the village and where there is greatest potential for planting to help the village direct its resources to those areas where trees are needed most.

Improved care is important for an expanded tree canopy. Seventy-five percent of all of the region's trees are less than 6 in. in diameter (2020 Tree Census). This is in part because of the enormous percentage of woody invasive species, but also because trees are not living very long. CRTI works with landowners and managers, individually and through workshops and training events, to identify and manage invasive species and their replacement in the landscape, and provides trainings on the importance of professional expertise by using International Society of Arboriculture Certified Arborists. Training is also provided to municipal staff through the Urban Forestry Basic Training and Community Tree Network training sessions. These learning sessions provide opportunities for municipal staff to learn critical basic information on tree planting and care, and chain saw safety. These sessions also provide opportunities for them to network and learn from each other. The end result is to achieve broadened understanding and knowledge about the value of trees, the benefits they provide, and to improve their selection, planting, and care.

Community tree canopy cover ranges from 3% to 66% (2010 LiDAR Analysis) across the region and is often lowest in under-resourced communities.

Historic disinvestment in some communities has led to a below average canopy cover resulting in fewer benefits and services. As discussed earlier, CRTI is prioritizing outreach and resources (using prioritization mapping (http://chicagorti.org/PriorityMap) to focus on those communities that need the most help. CRTI also uses this prioritization to direct federal, state, and private funding sources to purchase trees and provide community-based planting programs, to train communities and citizens to plant and care for trees, and build overall community capacity to support and advocate for trees.

The ultimate goal to increase tree canopy in the Chicago region is based on increasing knowledge, ownership, and advocacy for trees so they are protected, diversity is expanded, and they are planted and cared for correctly so they can grow to maturity.

Reduced Threats to Trees

A range of threats are impacting the current and future health of the urban forest in the Chicago region. Narrow species diversity is a significant concern — especially because of the recent loss of more than seven million ash trees with another six million in decline. Sixty-three percent of the trees in the Chicago region are within 10 species (2020 Tree Census). CRTI recommends not more than 5% of any one species, 10% of any one genus, and 15% of any one family be planted to reduce vulnerability and expand resilience of the forest. Nursery owners have told CRTI that they are limited on the species diversity they can grow because of limited species diversity provided by the liner suppliers. CRTI is working with local nurseries to request expanded species diversity and get trees at smaller sizes (sizes that volunteers and individual property owners can manage easily) through the development of a contract growing program. A contract growing program encourages communities to plan ahead and secure the supply chain by ordering and paying for the species and sizes they need over 5 years.

Another significant threat is invasive species. Forth-five percent of all of the tree species in the Chicago region are invasive species (2020 Tree Census). These species are replacing native species in our natural areas resulting in reduced ecological health and decline of native oak ecosystems. Communities do not manage for invasive species and many private landowners do not know that it is a problem. CRTI has developed resources and hosts workshops on the impact of invasive species. One guide of note is the Healthy Hedges (http://chicagorti.org/healthy-hedges) resource. This is a resource that was developed in poster size for display in nursery centers and also has a brochure that landowners can take with them to their local nursery center. This resource provides guidance on species that would be good replacements for invasive species. (Figure 7: Healthy Hedges poster – a guide to replacements for invasive species.)

Development and human impacts to tree health are another threat. CRTI has developed resources to help communities and landowners understand the impact of construction on trees and to encourage protection and preservation of trees through local policies and incentives. Trees experience threats and can sometimes be threats — in part due to poos maintenance. One such resource is a Tree Risk Toolkit (http://chicagorti.org/ReduceCosts) that includes an important video to educate decision makers.

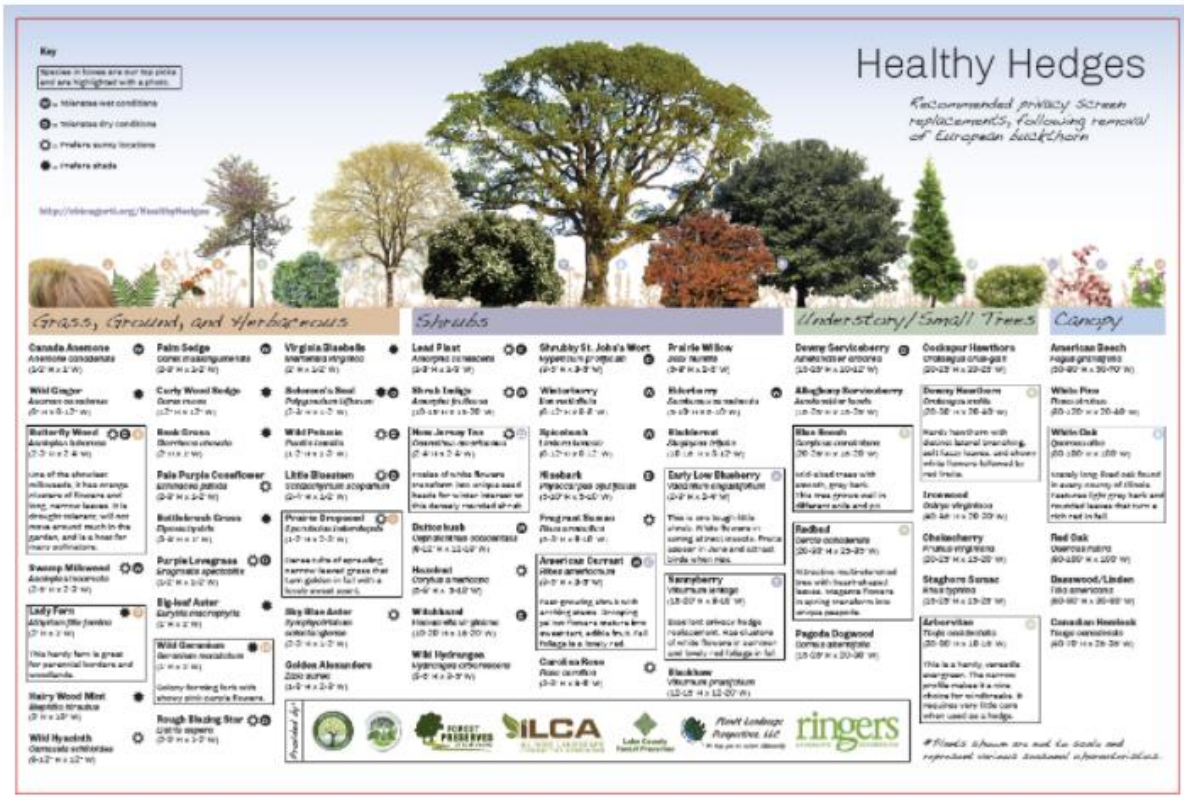

Figure 7. Healthy Hedges poster – a guide to replacements for invasive species.

Climate impacts are creating challenges for urban trees. These challenges include increased inundation, prolonged drought, and severe storm events. The Northern Institute of Applied Climate Science selected the Chicago region as a pilot for identification of community-based climate adaptation strategies and a regional assessment of the vulnerability of the urban forest to climate impacts. Twelve communities and forest preserves participated in this pilot and tools and resources were developed to help other communities and forest preserves in the region.

Enhance Oak Ecosystems

In 2015, Chicago Wilderness published a report on the state of oak ecosystems in the region. This report, the Oak Ecosystem Recovery Plan: Sustaining Oaks in the Chicago Wilderness Region (Fahey, et al. 2015) (http://chicagorti.org/OakRecovery). This plan was based on mapping of remnant oak ecosystems and revealed an 83% loss of these ecosystems. CRTI administers and supports the implementation of this plan through an Oak Ecosystem Recovery Plan Work Group. The group consists of public and private landowners (70% of oak ecosystems are owned by private landowners) with the goal to improve the health of these ecosystems through improved knowledge, practices, and collaboration. CRTI provides funding opportunities and training, through the partnership, to help improve ecosystem health through improved connectivity, protection from extreme browse, reduction of invasive species, and other actions.

Important to supporting preservation and enhancement of oak ecosystems is providing access to local native tree and shrub species. This can sometimes be a challenge as most big-box stores, where many people shop for their trees and shrubs,

do not provide locally sourced plant material. Community groups, forest preserves, and conservation organizations work with native nurseries to help distribute their plants to landowners who would typically not have access.

In 2016, CRTI was successful in getting the governor of Illinois to declare October as Oak Awareness Month — OAKtober. Every October, CRTI encourages partners, communities, and individuals to host or participate in events that increase awareness of the need to preserve and protect oak ecosystems, plant more native species, removal invasive species, and work collaboratively with surrounding landowners to reconnect oak ecosystems.

LITERATURE CITED

Fahey, R.T., Darling, L. and Anderson, J. (2015). Sustaining oaks in the Chicago wilderness region oak ecosystems. http://chicagorti.org/OakRecovery

Nowak, D.J., Hoehn III, R.E., Bodine, A.R., Crane, D.E., Dwyer, J.F., Bonnewell, V. and Watson, G. (2013). Urban Trees and Forests of the Chicago Region. https://www.fs.fed.us/nrs/pubs/rb/rb_nrs84.pdf

Turner-Skoff, J.B. and N. Cavender (2019). The benefits of trees for livable and sustainable communities. https://doi.org/10.1002/ppp3.39