



CHICAGO
REGION
TREES
INITIATIVE

Our Trees.
Our Communities.
Our Future.

Master Plan 2050





Chicago
Wilderness



Metropolitan
Mayors
Caucus

The Nature
Conservancy

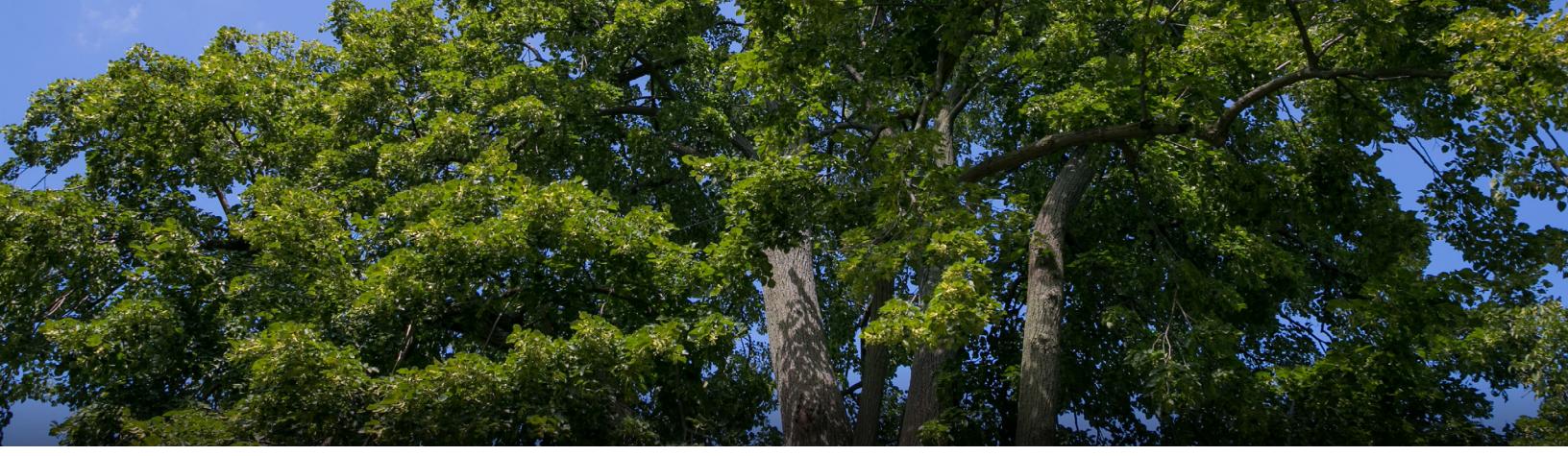


Chicago
Metropolitan
Agency for Planning



Metropolitan Water
Reclamation District
of Greater Chicago





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V

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EXECUTIVE SUMMARY

The CRTI Master Plan is a significant effort for the Chicago region leading to 2050.

There are approximately 200 Chicago Region Trees Initiative (CRTI) partner organizations across the seven-county Chicago region. These partners have worked together through the CRTI organizational framework to identify the vision, mission, goals, outcomes, and tactics that form the CRTI Master Plan to improve the health and canopy of the Chicago region's forest by 2050. The master plan was designed to coincide with and support stakeholder needs, goals, and strategies including those of the lead partner organizations of the Executive Advisory Council (EAC).

Vision: The Chicago region will be the most verdant, most livable, most resilient region in North America.

Mission: Chicago Region Trees Initiative believes that trees are critical to achieving this vision. We will ensure that trees are healthier, more abundant, more diverse, and more equitably distributed to provide needed benefits to all people and communities that live in the Chicago region.

There are four overarching goals to ensure that the region's "trees are healthier, more abundant, more diverse, and more equitably distributed to provide needed benefits to all people and communities that live in the Chicago region." These goals are:

- Inspire people to value trees
- Increase the Chicago region's tree canopy
- Reduce threats to trees
- Enhance oak ecosystems

There are four outcomes for each of the goals resulting in increased benefits provided and improved quality of life in the Chicago region:

- Improved tree health
- Improved urban forest policy
- Increased funding for urban forestry
- Integration of science

This plan recognizes that trees and the collective urban forest in the Chicago region provide critical benefits and services to the people who live here. The Chicago region has many challenges, which include an expanding population and increased urban sprawl that create significant impacts on water and air quality, flooding, and loss of green space. In addition, areas within the region have too few resources. Reduced access to financial and physical resources impacts quality of life.

Urban trees are critical infrastructure—just like roads, storm sewers, or water mains. Studies show that the size and health of the tree canopy directly relates to the benefits and services these trees provide and the ability of this canopy to offset impacts from urban living. Every year, trees in the Chicago region intercept and absorb billions of gallons of stormwater, sequester and store 17 million tons of carbon and 24,000 tons of pollution, reduce the effect of the heat island and save \$44 million in building energy usage (Nowak et al. 2013), and offset impacts to a changing climate (Bonan 2008). The urban forest also provides important economic benefits such as

increased property values (Anderson et al. 1988; Sander et al. 2010), and improved sales in commercial areas (Wolf 2005). Trees provide important physical and mental benefits such as improved mental and physical health (Donovan et al. 2013; Villeneuve et al. 2012; James et al. 2016; Ulrich 1984), social cohesion and community engagement (Dwyer et al. 1991; Kuo et al. 1998 and Kuo 2003), and provide important habitat for wildlife (Lindenmayer and Laurance 2017).

To achieve these goals and outcomes, challenges to the urban forest need to be addressed. A study conducted by The Morton Arboretum and the US Forest Service in 2010, *Urban Trees and Forests of the Chicago Region* (referred to as the Tree Census) (Nowak et al. 2013), revealed that 30 percent of the 157 million trees in the Chicago region are the exotic invasive species European buckthorn and Amur honeysuckle. These species grow aggressively and replace desirable species in the landscape. Invasive species change the soil structure, making it inhospitable for other native plant species, which can harm wildlife (Sacerdote and King 2014). The region's trees are not growing to maturity, which is when they could provide the most benefits. Seventy-three percent of the region's trees are less than six inches in diameter (Nowak et al. 2013). Native oak ecosystems are under threat from development, fragmentation, lack of age diversity, and impacts from exotic invasive species (Fahey et al. 2015). In addition, diversity of species is low, which provides greater opportunity for catastrophic tree loss due to a pest or pathogen that attacks a specific species. Eight percent of the region's trees are being killed by an exotic pest species, the emerald ash borer (Nowak et al. 2013). In the Chicago region, 60 percent of the region's trees are from only ten tree species, and this lack of species diversity provides an increased opportunity for ongoing catastrophic loss (Nowak et al. 2013).

Each of the CRTI Work Groups has identified specific tactics to support successful achievement of the master plan. These tactics are related to each group's area of focus: stewardship and planting; green infrastructure, policy, and native ecosystems; forest composition and analysis; and risk assessment and management. Accomplishment of the tactics will result in successful achievement of the master plan goals and outcomes. The CRTI goals and outcomes are explained below.

I. Goal: Inspire people to value trees

a. Improved tree health:

The CRTI will help landowners, managers, individuals, agencies, and organizations across the Chicago region and across diverse populations understand why increased canopy is important and appreciate the benefits that trees provide. They also need to know how to correctly care and advocate for trees in their communities and across the region. Everyone has an important role to play to improve tree health.

b. Improved urban forest policy:

Improved policies will only take place when the general public advocates to protect trees on public and private land. As infrastructure, trees cover a wide range of land uses and provide important functions for quality of life regardless of where they are growing. The CRTI will work with individuals and decision makers to develop, implement, and enforce tree preservation policies, practices, and incentives on both public and private land.

c. Increased funding for urban forestry:

Strong, well-armed advocates can urge decision makers to support and provide strong urban forestry budgets. Something that is not typical, but that CRTI would like to see in the next 32 years, is inclusion of urban forestry funding in 10-year capital improvement schedules. Trees are critical infrastructure and need to be recognized and supported to provide the most possible benefits. Support for urban forestry needs to be integrated into strategic planning and funding allocations. In addition, the CRTI would like to achieve a regionwide funding pool that would allow for grants and funding assistance for under-resourced communities to plant, inventory, and care for trees. Participants in this pool would range from individuals to large corporations. Partnerships between public and private organizations are going to be required to meet the challenges of the CRTI goals.

d. Integration of science:

The CRTI has spent significant time and resources to understand and communicate forest composition and canopy cover and to communicate that knowledge on a regional and community scale. This foundation in science enables landowners, managers, and individuals to better understand the urban forest resource they own or manage. This information, coupled with the science behind the values, benefits, and services trees provide, and the knowledge of how to properly protect, plan, plant, and care for trees, are some of the tools needed to build ownership and action by individual and collective landowners, managers, and individuals.

2. Goal: Increase the Chicago region's tree canopy (achieve 22 percent canopy cover by 2050)

a. Improved tree health:

All individuals who interact with trees must understand that more mature trees and increased canopy result in increased value, benefits, and resources. Engineers, planners, contractors, landscape architects, nurserymen, decision makers, landscapers, stewards, and others need to work to actively protect, plant, and care for trees. To achieve a healthier urban forest with a larger canopy, the CRTI needs to ensure that landowners, managers, and individuals are trained to plant trees correctly, with adequate root space and soil composition, and that they know how to properly water, mulch, and care for them; that nurseries and big box stores have broad diversity of species and high-quality tree stock available; that large public and private landowners have a certified arborist on staff or contract for professional arboriculture services; that there are increased opportunities for professional arboriculture training and International Society of Arboriculture certification; and that urban forest management plans are in place.

b. Improved urban forest policy:

Trees across the state, region, counties, communities, and private properties need to be protected as critical infrastructure. This can only happen when strong policies are in place to protect this resource.

The CRTI will work to ensure that strong policies, incentives, and rebates are provided across public and private landownership so that this resource can continue to improve and to provide benefits and services.

c. Increased funding for urban forestry:

Significant funding is needed to implement the CRTI Master Plan. Of considerable concern is the inequitable distribution of trees across the Chicago region. Special focus and attention will be provided to help reverse this situation in under-resourced communities and neighborhoods. Creative and thoughtful solutions need to be implemented to increase funding for the master plan including increased public/private partnerships; broad utilization of contract growing; funding and scholarships for increased forestry training, certification, school, and internships; and rebate or incentive programs for preservation and installation of green infrastructure practices, including support for healthy trees.

d. Integration of science:

The CRTI will need to regularly collect, analyze, and distribute forest composition data to decision makers, landowners, managers, and individuals through *Urban Trees and Forests of the Chicago Region* (Nowak et al. 2013), LiDAR analysis, public and private property inventories, and capacity surveys. The recommendation is that this data and analysis be updated every 10 years. As technology becomes more sophisticated and capable of replacing on-the-ground data collection, other methods will be explored over the course of the master plan implementation. The CRTI will collect, collaborate, and communicate the latest science related to trees and urban forestry to ensure that the most up-to-date information is easily accessible to all the CRTI partners and the public.

3. Goal: Reduce threats to trees

a. Improved tree health:

The loss of 8 percent of the Chicago region's trees due to invasive pest infestation has brought attention to the need for expanded species diversity



across the region. To accomplish this, the CRTI has recommended that not more than 5 percent of any one species, 10 percent of any one genus, and 15 percent of any one family be planted at any one time recognizing that age diversity needs to be considered to be sure that appropriate species are not eradicated from the landscape.

The presence of woody invasive species in our landscape is undermining the health of our urban forest. The CRTI will work to be sure public and private landowners, managers, individuals, and organizations have a working knowledge of how and why to control invasive species, existing and potential invasive species, and climate-related vulnerability and adaptation strategies.

Proper tree care is needed and the CRTI is recommending that tree pruning be practiced (ideally not more than a seven-year cycle) so that trees will not become a liability or challenge for landowners, especially during severe weather events. The CRTI Master Plan includes training to ensure landowners, managers, and individuals know how to conduct a tree health assessment so that problems can be identified early before they get out of control. With this training, tree owners, managers, and volunteers can establish a strong partnership with the US Department of Agriculture Animal Health Inspection Service and Illinois Department of Agriculture so that information and problems can quickly be identified and managed.

b. Improved urban forest policy:

Strategies for awareness and management of woody invasive species, existing pests and pathogens, and potential pests and pathogens need to be included in ordinances and regulations. This recommendation would also extend to the State of Illinois where reestablishment of the Illinois Invasive Species Council is needed to improve communication between states regarding new invaders and to develop strategies for control of invasive species including, but not limited to, restricting the movement of firewood within and from outside of the state.

c. Increased funding for urban forestry:

Millions of dollars are spent annually in the Chicago region to manage the impacts from invasive species. Investment in improved education, outreach, and management strategies for new and existing problems could reduce the dollars spent and needs to be quantified for use by decision makers. Studies have shown that early management of pests and problems and routine pruning and health assessments are less costly, result in lower catastrophic loss, and can help to improve the value, benefits, and services the urban forest provides.

d. Integration of science:

The CRTI has developed regional, county, and local mapping of species diversity. This information is available and can be used by landowners, managers, and individuals to reduce risk. The CRTI can also help communities learn how to keep their tree inventories up-to-date and actively use them to more effectively manage the urban forest. One area where more information is needed is composition of private property trees—70 percent of the region's trees are on private property. The CRTI will continue to work to more clearly define the composition of private property trees and educate those landowners to improve the health of the urban forest. CRTI is working with the Northern Institute of Applied Climate Science and the United States Forest Service to identify strategies to assess vulnerability and tools to assist with adaptation for threats from climate change and is working to share these resources.

4. Goal: Enhance oak ecosystems

a. Improved tree health:

The CRTI will work with public and private property owners to increase regeneration of oaks and associated species. This effort will result in expanded biological diversity through active management, reintroductions of native species for improved habitat; collaborative partnerships to reduce fragmentation and increase connectivity through oak ecosystem-dominated corridors; encouragement to public and private

landowners to use best management practices for managing their oak ecosystems (including management of invasive species); development of management plans; and access to locally sourced native trees in nurseries.

b. Improved urban forest policy:

The CRTI will work to increase awareness and protection of core remnant oak ecosystem complexes on public and private land. These unique areas are our natural heritage and they are in need of protection. The CRTI will work with decision makers and private landowners to formally protect or incentivize protection of oak ecosystem core, satellite, and corridor complexes both now and for future generations.

c. Increased funding for urban forestry:

The CRTI will work with state and federal agencies to secure funding for implementation of the Oak Ecosystem Recovery Plan. This will include teaching private landowners about local, state, and federal programs that provide tax incentives or funding assistance for protection, management plans, and implementation of best management practices for oak ecosystems, and encouraging their participation in these programs. Increased public/private partnerships are needed to support oak ecosystem protection and management and to ensure that funding is available for scientific research to support improved health of oak ecosystems.

d. Integration of science:

The CRTI will identify and map remnant oak ecosystems and distribute this information to public and private landowners; ensure that oak ecosystem scientists and land managers collaborate; communicate on best practices for oak ecosystems; and distribute the latest research related to oaks and oak ecosystems to public and private landowners and managers. ☀

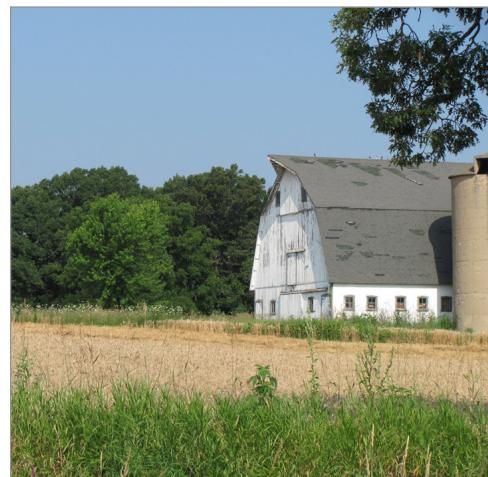


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ISSUES AND PLANNING

The urban forest is an interconnected network of trees across all land uses and ownerships.

What is the Chicago region's urban forest? The Chicago region is the seven-county Chicago metropolitan area including Cook, DuPage, Kane, Kendall, Lake, McHenry, and Will counties. This region represents 157 million trees across all land uses on public and private property. The urban forest comprises the individual trees located across all of these land uses and ownerships, including parkways, backyards, forest preserves, along agricultural fields, corporate and commercial properties, and city parks. The Chicago region's urban forest is all of the trees where people live, work, or recreate, across all land uses in the seven-county region.

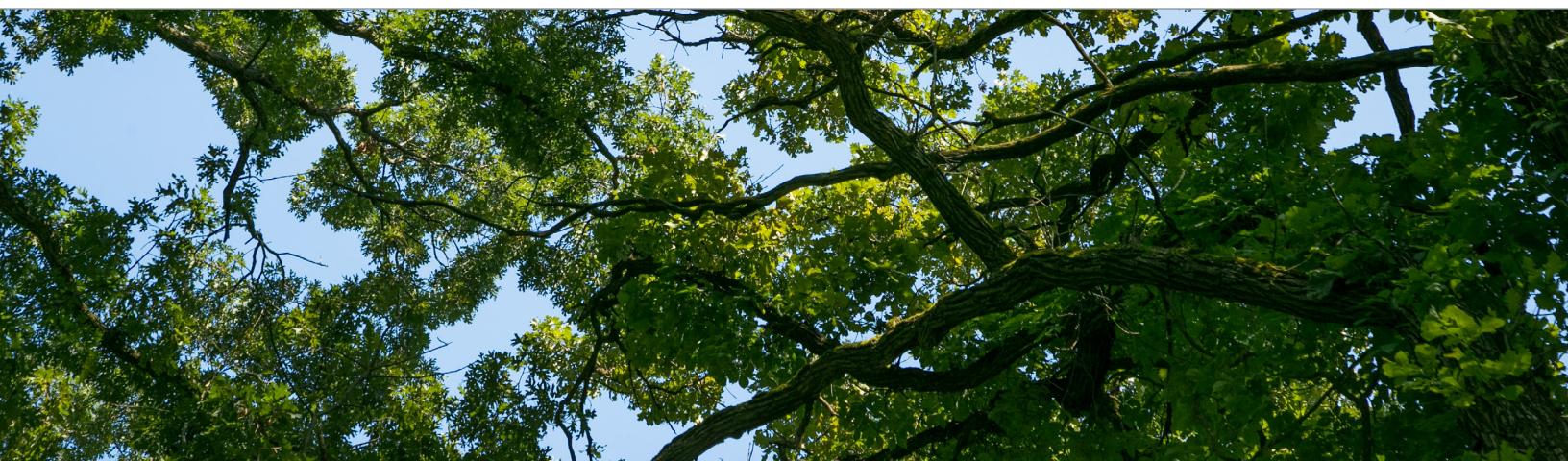


Trees grow across all land use types, including residential, agricultural, and natural areas.

Why is the urban forest important? Urban trees in the Chicago region provide critical benefits and services to the 8.4 million people who live here. Studies show that the size and health of the tree canopy directly relates to the benefits and services these trees provide. Urban trees are part of the urban infrastructure, just like roads, storm sewers, or water mains. Every year, trees in the Chicago region intercept and absorb billions of gallons of stormwater, sequester and store 17 million tons of carbon and 24,000 tons of pollution, reduce heat island effect saving \$44 million in building energy usage (Nowak et al. 2013), and offset impacts to a changing climate (Bonan 2008). The urban forest also provides important economic benefits such as increased property values (Anderson et al. 1988; Sander et al. 2010) and improved sales in commercial areas (Wolf 2005). Trees provide important physical and mental benefits such as improved mental and physical health (Donovan et al. 2013; Villeneuve et al. 2012; James et al. 2016; Ulrich 1984), social cohesion, reduced crime, and community engagement (Dwyer et al. 1991; Donovan et al. 2010; Kuo et al. 1998 and Kuo 2003), and an important habitat for wildlife (Lindenmayer and Laurance 2017).

Why does the Chicago region's urban forest need help?

The urban forest in the Chicago region is experiencing many challenges. In a study conducted by The Morton Arboretum and the US Forest Service in 2010, *Urban Trees and Forests of the Chicago Region* (referred to as Tree Census) (Nowak et al. 2013), it was revealed that 30 percent of the 157 million trees in the Chicago region are the exotic invasive species European buckthorn and Amur honeysuckle. These species grow aggressively and replace desirable species in the landscape. Invasive species change the soil structure, making it inhospitable for native plant species, which can harm wildlife (Sacerdote and King 2014). The region's trees are not growing to maturity, which is when they could provide the most benefits. Seventy-three percent of the region's trees are less than six inches in diameter (Nowak et al. 2013). Native oak ecosystems are under threat from development, fragmentation, lack of age diversity, and impacts from exotic invasive species (Fahey et al. 2015). Tree species diversity is low. When diversity of species in a forest is low, opportunity for catastrophic loss due to a pest or pathogen that attacks a specific species increases. Eight percent of the region's



Trees provide multiple benefits, including reduced flooding, reduced air pollution, reduced water pollution, reduced energy usage, reduced temperature, reduced noise pollution, storage and sequestering of carbon, increased property values, stimulated local economy, improved community cohesion, improved mental health, improved physical health, reduced crime, and habitat for wildlife.

trees are being killed by an exotic pest species, emerald ash borer (Nowak et al. 2013). In the Chicago region, 60 percent of the region's trees are from only 10 tree species (Nowak et al. 2013). The Chicago region's canopy is in need of intervention.

What is being done about the region's urban forest?

The Morton Arboretum viewed the results of the 2010 Tree Census as a call to action, and in 2013, it brought together leading federal, state, and regional organizations with an interest in the health of the urban forest. Together they formed the CRTI, a collaborative partnership to improve the health of the urban forest and quality of life within the Chicago region.

The Chicago Region Trees Initiative is organized around critical partnerships and collaboration.

CRTI partner organizations are working together to reach a common goal. Today, there are approximately 200 CRTI partner organizations across the seven-county Chicago region. These partners have worked together, through the CRTI organizational framework, to identify the vision, mission, goals, outcomes, and tactics that form the CRTI Master Plan to improve the health and canopy of the Chicago region's forest by 2050. The master plan was designed to coincide with and support stakeholder needs, goals, and strategies, including those of the lead partner organizations that form the Executive Advisory Council (EAC) of the CRTI.

The CRTI organizational framework is aligned around specific needs. (See Figure 1.) These needs are divided between four work groups, with additional support provided by ad hoc advisory committees based on expertise. The CRTI partners desired that the vision for the CRTI Master Plan inspire and motivate action. They also felt that the mission should be clear about the importance of the urban forest, its needs, and its ability to improve quality of life for all people and environmental communities in the Chicago region. The CRTI vision and mission provide the foundation for the CRTI Master Plan.

Vision: The Chicago region will be the most verdant, most livable, most resilient region in North America.

Mission: Chicago Region Trees Initiative believes that trees are critical to achieving this vision. We will ensure that trees are healthier, more abundant, more diverse, and more equitably distributed to provide needed benefits to all people and communities that live in the Chicago region.

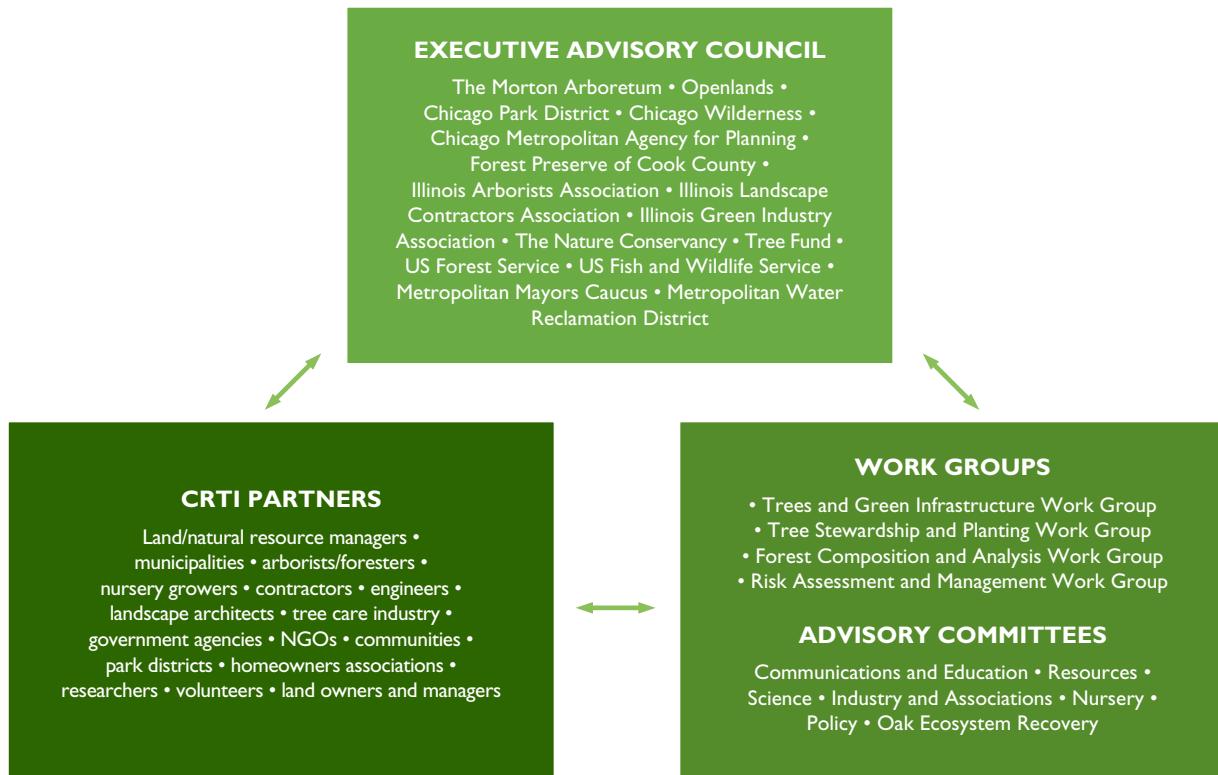


Figure 1. The CRTI Organizational Framework.

Development of a Master Plan for the Urban Forest of the Chicago Region

The Chicago Region Trees Initiative involved a wide range of stakeholders in the master plan process.

The four CRTI Work Groups: Forest Composition and Analysis, Stewardship and Planting, Trees and Green Infrastructure, and Risk Assessment and Management, using one of the largest data sets on urban forestry in the country, identified needs and strategies to improve the urban forest in the Chicago region. The needs and strategies were then divided into specific goals and outcomes. Individual county meetings were held with a wide range of stakeholders. These stakeholders included county board and commission members, not-for-profit organizations, corporations, individual citizens, state and federal agencies, farmers, and municipal and county staff. Participants were asked to identify what they believe is possible for the urban forest within their county by 2050. Their recommendations were then presented to the CRTI Executive Advisory Council for input and direction.

The Chicago Region Trees Initiative included recommendations from partners throughout the plan.

The plan. The CRTI Master Plan is designed to include recommendations from and for partner organizations to improve and support broad participation and collaboration in support of the region's trees. For instance, the Chicago Metropolitan Agency for Planning's (CMAP) *On To 2050 Regional Comprehensive Plan* provides a sustainable framework for development and livability in the seven-county Chicago region. The desire of CRTI partners is to support and inform the CMAP plan so that trees and natural communities are protected and enhanced, and important environmental benefits are provided.

CRTI Work Groups provide a road map for success

and evaluation. The CRTI Work Groups have developed specific tactics for each of the goals, including metrics and tracking. The outcomes and tactics are divided into five-year intervals to enable evaluation and adjustments to improve the performance and success of the master plan. The CRTI Master Plan is envisioned to be a living document that can be revised and updated to continue to guide active improvement, resulting in achievement of the vision and mission for CRTI.



ON TO 2050 strongly affirms that these natural resources are critical for protecting the quality of our air, land, and water, providing ecosystem services, wildlife habitats and recreational spaces, contributing to a high quality of life, and supporting a vibrant regional economy. . . . Local governments, park districts, and transportation agencies should expand urban forestry efforts to protect existing trees and to increase and diversify the tree canopy. . . . Local governments, transportation agencies, and landowners should incorporate site-scale green infrastructure, trees, landscaping, etc. into non-park spaces, including street right-of-ways, parking lots, and private property. (CMAP On To 2050, 2018)

Goals and Outcomes

There are four overarching goals to ensure that the region's trees "are healthier, more abundant, more diverse, and more equitably distributed to provide needed benefits to all people and communities that live in the Chicago region."

- Inspire people to value trees
- Increase the Chicago region's tree canopy
- Reduce threats to trees
- Enhance oak ecosystems

There are four suggested outcomes for each of the goals.

- Improved tree health
- Improved urban forest policy
- Increased funding for urban forestry
- Integration of science



Figure 2. The CRTI Master Plan Goals and Outcomes.



The foundation for the Chicago Region Trees Initiative (CRTI) is a strong collaboration of partners across the Chicago region—the Executive Advisory Council (EAC), CRTI staff, Work Group Chairs and members, Advisory Committee members, and CRTI partners.

There are six implementation phases to the master plan. Each phase builds on the last and is designed to form a structure that will lead to success. Each phase lasts five years with exception of the first phase, which is six years.

The Foundation Phase of the CRTI Master Plan is the first phase. It is focused on sharing our messages, teaching people that trees are important for our quality of life, and expanding the partnership to include all of the communities, park districts, townships, and many of the corporations, institutions, organizations, businesses, and individuals in the Chicago region. Without partnerships to provide the effort, expertise, and resources, the CRTI Master Plan cannot be successful. The cost in effort and resources to successfully complete this plan are significant, yet, if each partner takes a part the plan is readily achievable.

For instance, the CRTI has set a canopy goal to increase the Chicago region's canopy to 22 percent or 22 million trees by 2050. Canopy goals are a convenient tool for communicating forest growth aspirations. For a goal to be useful it must be achievable, yet inspiring. The CRTI crafted a canopy goal for the Chicago region by projecting county-specific growth across land-use types. Residential, institutional, and commercial properties could support the largest increases in canopy, while there is less room for growth in agriculture, cemeteries, and vacant properties. (See Figure 3.) After extensive meetings with regional stakeholders the CRTI settled on a 22 percent canopy

goal for the region, an increase of around 4 percent. (The canopy in 2010 was 20 percent. Loss of 13 million trees to emerald ash borer has brought our canopy down to 18 percent.) Canopy growth will come not only from the planting of new trees, but also from the growth of existing trees and from natural regeneration. The i-Tree Forecast, a computer-based modeling tool, was used to model the growth of the region's trees and to determine how many trees would be necessary to reach our goal. This model found that 687,500 trees would need to be planted each year to reach our canopy goal. That adds up to 22 million trees by 2050. Figure 4 describes the number of trees projected to be planted in each land-use type each year. The bulk of plantings will occur on residential properties.

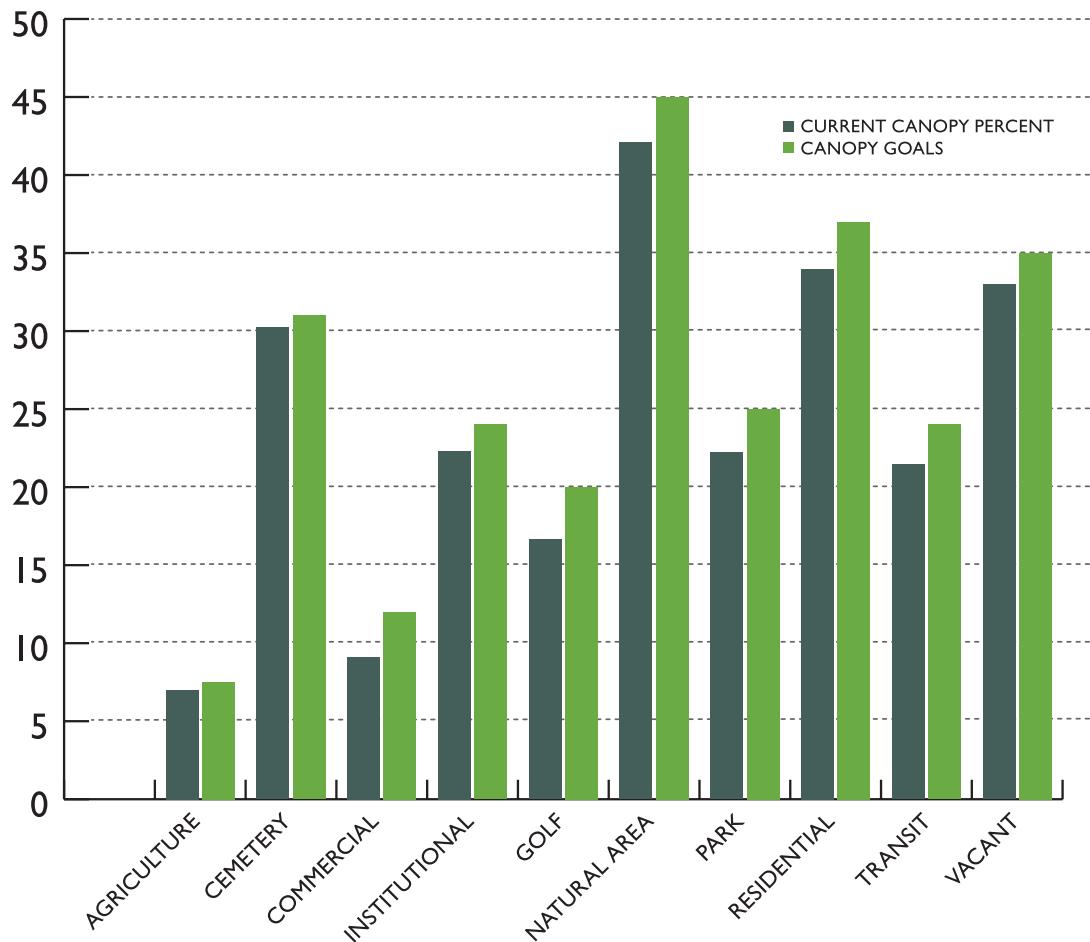


Figure 3. Current canopy and goals by land-use types. The largest increases are projected to occur in residential, commercial, and institutional properties.

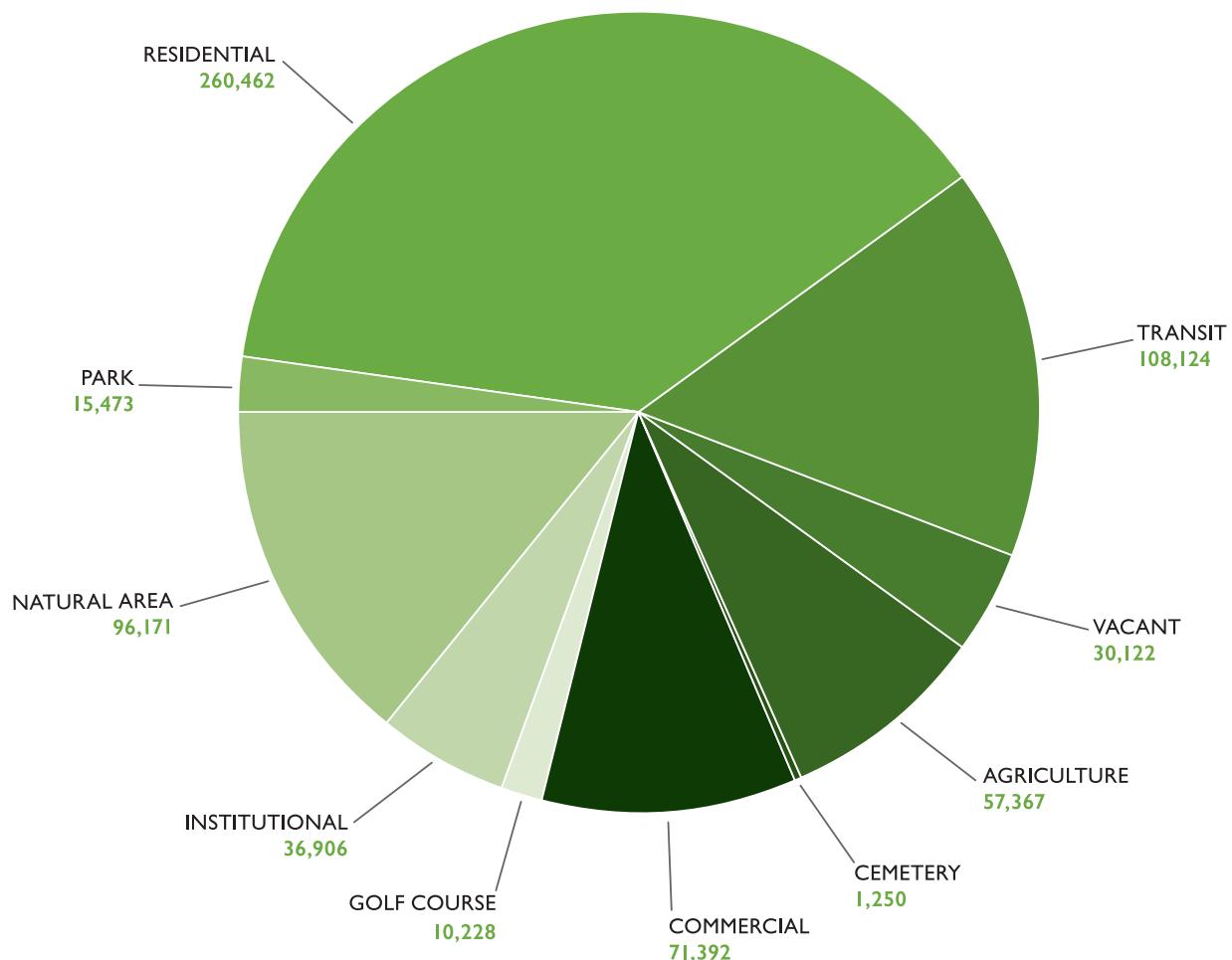


Figure 4. Annual planting in each land-use type to reach the goal of 22 million planted trees (and 22 percent canopy) by 2050.

This number seems herculean until you look at the collective impact of partnership. In 2018, an estimated 144 million trees exist in the Chicago region (13 million lost to emerald ash borer). The population of the Chicago region is 8.4 million people, resulting in 17 trees per person (including invasive species) in the Chicago region. Without invasive species calculated into the average, the number of trees per person equals 12. The Chicago Metropolitan Agency for Planning's estimate of population by 2050 is 10.8 million, or an additional 2.4 million people. If the CRTI partnership includes decision makers, communities, developers, transportation agencies, and those who are providing homes, parks, businesses, streets, and open space for those 2.4 million people, and we make sure trees are included in those plans at the level of 12 (not including invasive species) trees per person; that is 28.8 million more trees for the region, or 173 million trees by 2050. (See Figure 5.)



Figure 5. Number of trees per person in 2010 and projected for 2050.

Phases two and three are Building Phases. These phases provide the infrastructure of the plan, where the messages laid down in the Foundation Phase will result in on-the-ground action. Action will be seen by increased demand for trees by public and private landowners and managers, increased tree production, increased professional certification, increased tree care, proper planting, improved policies, and integration of science. As the tree infrastructure increases and individuals know the value of trees, stability will be experienced.

Phases four and five are the Stability Phases. In these phases, the goals and outcomes of the CRTI Master Plan become the norm. Landowners, managers, individuals, and those who have the potential to support the goals of the master plan are partners, accept trees as critical infrastructure within communities, and support the correct planting and care of trees to maintain that quality of life.

The sixth phase of the CRTI Master Plan is the Future Phase. This phase offers the opportunity to set new goals and outcomes for the future. CRTI will look at lessons learned, new science, and expanded opportunities for continued growth and partnership. At each phase of the master plan, evaluation and analysis will take place to allow for realignment to reflect realistic approaches to achieve success. The sixth phase of the master plan will allow a more in-depth analysis of past successes and failures and, importantly, projections for the future needs of the urban forest. (See Figure 6.)

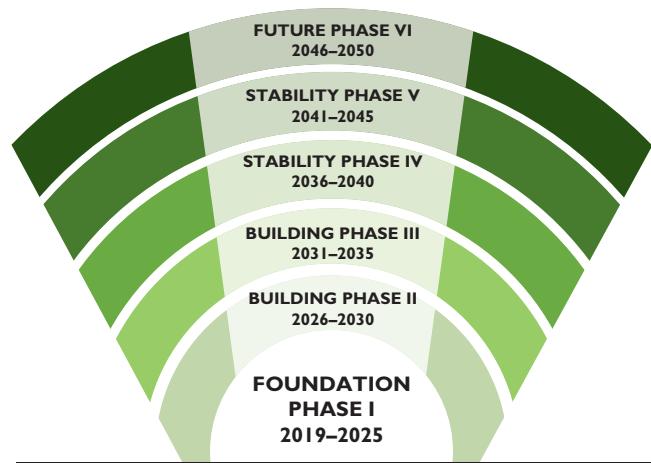


Figure 6. The six phases for achievement of the CRTI Master Plan.

I. GOAL: Inspire People to Value Trees

The CRTI Master Plan has set a goal to inspire people in the Chicago region to value trees to improve the health of the urban forest and provide the opportunity to experience the many benefits and values trees provide. The Oxford dictionary defines the word inspire: “fill with the urge or ability to do or feel something.” In order to urge people to action they need to fully understand why this action is important. Once they fully understand, they can take specific actions and be the catalysts for change. The CRTI Master Plan has outlined actions and results that everyone in the Chicago region can become part of, once these individuals know why trees are so critical to our quality of life.

Urban trees in the Chicago region provide critical benefits. Studies show that the size and health of the tree canopy directly relates to the benefits and services trees provide. Urban trees are part of the urban infrastructure, just like roads, storm sewers, or water mains. Every year, trees in the Chicago region intercept and absorb billions of gallons of stormwater, sequester and store 17 millions of tons of carbon and 24,000 tons of pollution, reduce the heat island effect and save \$44 million in building energy usage (Nowak et al. 2013), and offset impacts to a changing climate (Bonan 2008). The urban forest also provides important economic benefits such as increased property values (Anderson et al. 1988; Sander et al. 2010) and improved sales in commercial areas (Wolf 2005). Trees provide important physical and mental benefits such as improved mental and physical health (Donovan et al. 2013; Villeneuve et al. 2012; James et al. 2016; Ulrich 1984), social cohesion and community engagement (Dwyer et al. 1991; Kuo et al. 1998 and Kuo 2003), and provide important habitat for wildlife (Lindenmayer and Laurance 2017).

People can become the catalyst for change.

The Chicago metropolitan region is the third most populous region in the United States. Within the Chicago region, there are 8.4 million people (Nowak et al. 2013). Historic and current land-use practices have segmented, paved, de-watered, flooded, polluted, and built the landscape so that human and environmental health is impacted. Intervention is required to offset

Urban forestry is one of the numerous environmental issues that have risen to the forefront of public awareness . . . scholars, practitioners, and community leaders have documented many more ways in which trees, especially as part of a regional or urban green ecosystem, help create a better quality of life. By quality of life, we mean the sum of all things that make life enjoyable and meaningful, including physical, mental, economic, psychological, aesthetic, and recreational benefits. (*Planning the Urban Forest*, American Planning Association, J. C. Schwab editor, 2009)

these impacts and protect quality of life. The region covers approximately 5,645 square miles and includes 284 municipalities, 123 townships, and approximately 150 park districts. Each of these entities is a separate governmental unit with its own elected officials, policies, and challenges. Behind each of those entities are the individuals who live, work, or play there. They have a voice and can advocate for change.

CRTI can provide the knowledge, skills, and resources to help individuals advocate as partners. As these partners become advocates they can then share their knowledge and skills with others, creating exponential growth in knowledge and skills, building strength in numbers and ability to act. Advocates can share what they know about the value of trees and their needs to inspire decision makers to support the urban forest by encouraging increased professionalism of staff and managers, allocating needed resources, and utilizing one of their most important resources, their constituents. The CRTI 2014 Capacity Survey of 152 governmental entities across the Chicago region found that a very small percentage of community budgets, 1.84 percent, are allocated for urban forestry with 43 percent of communities allocating 1 percent or less of the overall budget. Few include urban forestry in their capital budgets or plan for the future

of this infrastructure (CRTI 2014). Trees are critical infrastructure in the urban setting, worth billions of dollars, and yet many staff and decision makers don't know how to properly budget, preserve, protect, select, plant, or care for this infrastructure. Highlighting the value of trees to these stakeholders is critical so that adequate resources can be provided.

Chicago Region Trees Initiative will provide a comprehensive stakeholder education plan. This comprehensive education and outreach effort will reach decision makers, landowners, managers, individuals, nurseries, contractors, developers, volunteers, planners, and any professional or other organization that interacts with the urban tree canopy, or has the potential to reduce or expand it. This plan needs to be focused on each specific audience, and the key skills and knowledge that each audience requires.

Chicago Region Trees Initiative will target decision makers. Decision makers and landowners are often the individuals who ascribe professional skill requirements of staff; set budgets; develop plans, laws, and regulations; and often provide information for and answer to constituents. The CRTI has identified education and outreach to this group of individuals as important. Decision makers and landowners, like other people, are often more open to learning and recommendations from their peers. The CRTI needs to work actively with councils of government. Additionally, the CRTI needs to develop short informative videos and resources, specifically focused on the concerns of decision makers, to help teach and engage them in improved tree care.

Engaging private landowners, both small and large, is critical. Private landowners are the largest tree owner group in the region, with 70 percent of the trees in the region located on private property (Nowak et al. 2013). Engagement with these individuals, who are represented by corporate, institutional, industry, commercial, residential, agriculture, and many other land-use

types, will need to be varied based on the needs of the landowner. CRTI believes that by dividing this group into small and large landowner classes, two approaches may be possible. Large landowners often rely on staff or contracted labor for management of their properties. Not all contractors have the same capacity or skill set to manage trees, and we want to convey the importance of professional arboriculture standards and the value that expertise provides. Small landowners may also use contractors for landscape and tree care, but they are also likely to do some of this work themselves. By engaging small landowners and individuals in training that enables them to properly care for their own trees, the trees of others, or know what skills to look for in contracted service, the CRTI can dramatically increase tree health and advocacy for trees. The knowledgeable small landowner and individual can work with elected officials to improve protection, preservation, and care of trees on public land and can become a steward or volunteer within the community to support improved tree care on public and private land.

Openlands is a founding partner in CRTI and is a member of the EAC. Openlands brings more than 50 years' experience in regional planning, conservation, advocacy, and community engagement to the CRTI. The Openlands tagline "Conserving Nature for Life" is in tandem with the CRTI vision and mission. Openlands has had a strong connection and support program for urban trees since 1992, when the Openlands TreeKeeper program was founded. This program has trained nearly 2,000 individuals to be stewards of trees in the city of Chicago and, in recent years, this program has been expanded to near-suburban communities. It is their desire that the Openlands TreeKeeper program have a strong presence in all seven of the Chicago region's counties by 2050.



Our Trees.
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Professional associations can set the standard and guide land managers and anyone responsible for landscape or tree care to improve practices. Land managers, including landscape contractors, arborists, lawn care companies, and anyone who is responsible for a landscape or tree vary greatly in their level of expertise and training. The Illinois Arborist Association, Illinois Landscape Contractors Association, and the Illinois Green Industry Association pride themselves on exceptional training and standards for their memberships. These associations provide year-round training opportunities for their members and opportunities to learn from local and international experts. All three associations are lead partners and members of the CRTI Executive Advisory Council, and their expertise in engaging and improving the professionalism of individuals who interact with trees is important to raising the standard of tree selection, production, planting, and care.

What is not addressed is the large number of individuals who care for trees who have not received proper training. The CRTI is working to engage untrained public and private land managers to learn basic tree care, planting, and preservation, and to find opportunities to connect these individuals to these professional associations to help them obtain professional credentials and expanded knowledge. Additionally there is a need to expand education and outreach opportunities to individuals who do not speak English, and to partner with professionals in the field who speak other languages who can assist in engaging and educating broader, more diverse audiences.

Chicago Region Trees Initiative can help raise awareness of arboriculture as a potential career path. A number of professional tree care companies are active partners with CRTI. One of their key priorities is increasing the number of interested candidates for arboriculture positions. This effort needs to be explored with expanded opportunities for youth and adults to learn about urban forestry as a career and support for local community colleges and technical school programs that could lead individuals to careers in forestry. Many communities in the Chicago region struggle with unemployment. Expanding awareness of arboriculture as a career and providing access to internships, courses, and on-the-job training creates a win-win situation for everyone.

The Chicago Region Trees Initiative will demonstrate the added value of trees to professionals who work in the built environment, and who have the potential to impact trees. The CRTI recognizes that there are many other people beyond landowners and managers who have a significant impact on the health and presence of trees. For instance, developers, engineers, planners, and utility professionals interact with trees almost daily. They may not recognize the infrastructure value of these trees, nor be knowledgeable about how to protect or maximize trees' benefits. By working with these individuals through their professional affiliations, in special training workshops and by improving permitting practices, preservation ordinances, and incentives, the CRTI can help to teach and engage them to include and preserve trees whenever possible. The correct tree planted in the correct place can help landowners and managers achieve their objectives and benefit their bottom line. For instance, increased planting of trees can help to reduce stormwater run-off. The number of gallons a tree intercepts will increase every year, providing greater benefits as the years pass.

Chicago Region Trees Initiative has identified where trees are needed most. The CRTI has collected one of the largest datasets on urban forestry in the country. These data enable the CRTI to look at needs based on specific criteria. Figure 7 identifies priority communities based on levels of vulnerable populations (high poverty, low income, and low English proficiency), air pollution levels, low canopy cover, urban flooding, and high urban heat island. These communities tend to have a lower capacity to manage their own trees, and experience a higher rate of issues such as flooding and poor air quality that additional trees could help ameliorate.

These communities may benefit from assistance in communicating the value of trees to improve local policies and increased resources for planting and care of urban trees. They would also benefit from education and outreach to their citizens to improve care of private property trees and community stewardship. Increased awareness of where trees are needed most will help to reduce impacts from potential flooding, poor air and water quality, medical claims, and high heat island effect.

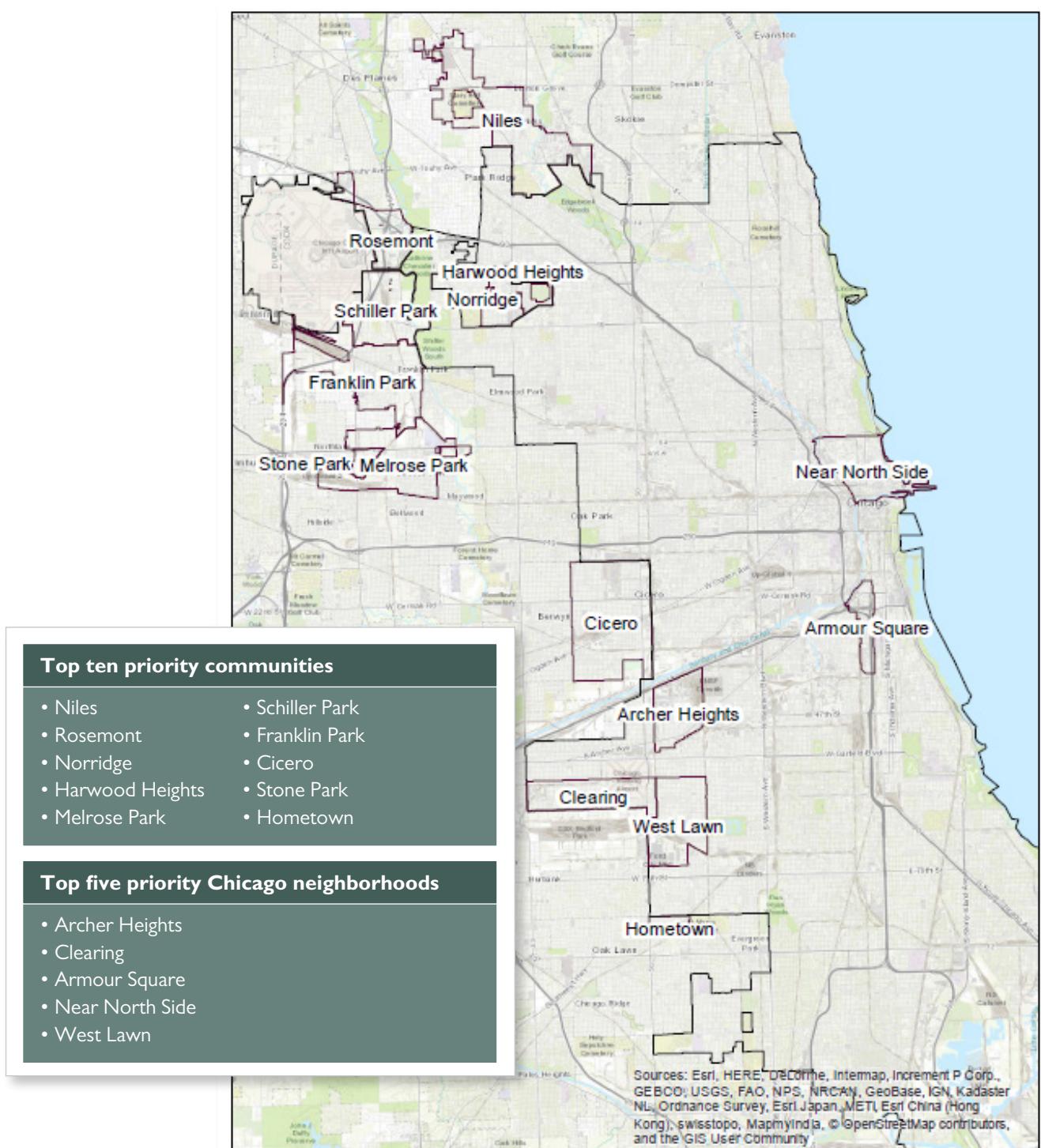


Figure 7. The CRTI priority communities and neighborhoods. The CRTI has identified the top ten communities and top five Chicago neighborhoods that need expanded tree canopy.

Training local “tree champions” creates advocates for trees. Some of the communities and neighborhoods identified in Figure 7 do not have urban forestry programs or staff who can focus on the needs of trees. In these areas the CRTI can provide outreach within the community through The Morton Arboretum’s Community Trees Champions program. The Community Trees Champions program teaches individual residents why trees are important and how to advocate for trees in their community. Participants also learn how to identify tree species and how to select, plant, and provide simple tree care for trees in the community. These local tree champions can then augment the community staff, increasing the capacity of the community to care and advocate for trees.

Under-resourced communities need to be connected with grants and volunteer help from public and private sources. Lack of funding for forestry staff and for the planting and care of trees is a problem in under-resourced communities. Grants through partner programs such as the Openlands Planters Grant, the US Forest Service Great Lakes Restoration Initiative, and Urban and Community Forestry, as well as trees from the Metropolitan Water Reclamation District’s *Restore the Canopy Plant a Tree*, can be directed to the communities in greatest need when tree stewardship is in place. This funding can help to jump-start improved urban forestry practices within communities.

Increased opportunities for public-private partnerships are needed. The Chicago region has many large international, national, and local businesses with an interest in reducing their environmental impact and increasing their sustainability, especially in the communities where these businesses are located. The CRTI can facilitate opportunities for corporate days of service and funding partnerships within those communities or in areas in the region where assistance is most needed.



Restore the Canopy Plant a Tree Program.

In 2016, the Metropolitan Water Reclamation District (MWRD), a lead partner and member of the CRTI Executive Advisory Council, founded a program: *Restore the Canopy Plant a Tree*, to increase tree canopy in Cook County, and to begin to replace ash trees lost to emerald ash borer. This program’s goal is to plant one million trees across the county to reduce flooding, and to educate schools, local agencies, and community groups about the benefits trees provide. In addition, the MWRD is developing a nursery that will grow small trees into larger trees that can then be given to communities in need.

The mission of the Chicago Park District, is to be “a leading provider of recreation and leisure opportunities; provide safe, inviting and beautifully maintained parks and facilities.” As a lead partner and member of the Executive Advisory Council, the Chicago Park District is a national leader in parks and recreation. Their experience in creating opportunities for all ages and backgrounds to be out in nature provides valuable expertise to the CRTI. They also have substantial experience building public/private partnerships that align with each entity’s values to achieve common goals. Collaboration with the CRTI will help to inform how urban forest resources could be better distributed throughout the Chicago region to provide needed recreational and health resources for citizens and also inform the CRTI collaborative of thoughtful and creative ways that public/private partnerships could be used to build capacity and canopy across the region.

Highlighting the value of trees is the utmost goal of the CRTI Master Plan. To improve quality of life in the Chicago region; it is critical to promote an understanding of the value and benefits that trees provide and a knowledge of how to properly protect, preserve, select, plant, and care for trees. Allocation of resources to support care of trees is critical. Without success in this goal success in the other goals will not be possible.



American Forests has been a strong partner with the CRTI to fund the LiDAR analysis of each county and also to help with the public/private partnership program. LiDAR is imagery that is captured using an airplane-mounted laser. Light is bounced off of objects on the ground, creating points. These points can then be analyzed to distinguish between buildings, trees, vegetation, roads and railroads, water and other paved surfaces. This LiDAR enables the CRTI to identify where canopy is needed.

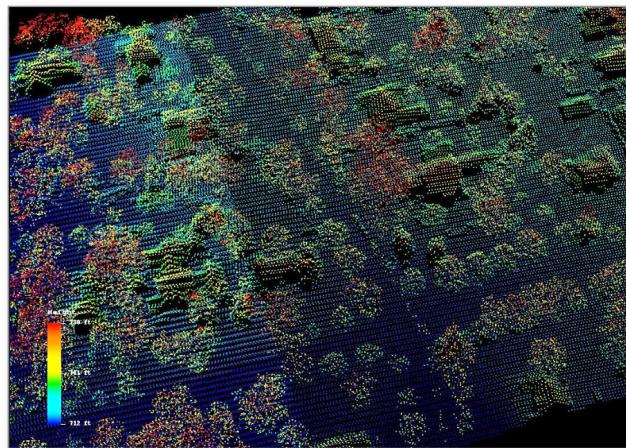
American Forests has also connected local corporations with the CRTI to identify locations of interest to the corporations where urban forestry assistance is needed. Through the American Forests connections, the CRTI has developed a School Planting Grant program. This program requires commitment from the schools to incorporate curriculum about trees, engage students in learning about trees and their care, and commitment to care for the trees from school leadership and grounds staff.

2. GOAL: Increase the Chicago Region Tree Canopy

The Chicago region tree canopy is below the national average. The national average for urban and community tree canopy in the United States is 42 percent (Nowak and Greenfield 2018). Based on the Tree Census and LiDAR imagery, the Chicago region's tree canopy was 20 percent in 2010. It is now estimated to be 18 percent due to the loss of 13 million trees from the emerald ash borer. Canopy cover directly relates to the benefits provided: when canopy declines, so do the benefits and services that canopy provides.

The Chicago Region Trees Initiative has been able to provide information on canopy cover to every community and Chicago neighborhood in the Chicago region. The community scale is where most land-use decisions are made. The 2010 Tree Census provided information at the regional and county scale but was not able to provide information at the community scale, the scale where most land-use and care decisions are made. To get to the community or property scale analysis of the urban forest, the CRTI worked with the US Forest Service, American Forests, and the University of Vermont to analyze LiDAR imagery (Light Detection and Ranging) for each of the seven counties in the Chicago region. The LiDAR measures height of buildings and vegetation. The University of Vermont uses LiDAR, aerial imagery, and other GIS layers to develop a model that can sort this information into seven land cover classes: trees, vegetation (plants shorter than 10 feet), bare soil, water, buildings, roads and rail, and other paved surfaces. The analysis of these data allowed the CRTI to interpret urban forest needs at a much finer scale for each community in the region and Chicago neighborhood. Each community

has a canopy summary packet on the CRTI website. (Streamwood is shown as an example in this report.) Here, land managers and other entities can view the percentage of land that falls into each of the seven different land cover classes, as well as the tree canopy potential, environmental benefits their trees provide (using the i-Tree analysis developed by the US Forest Service and Davey Resource Group), and locations of pre-settlement and existing oak ecosystems within the community. (See Figure 8.)



This LiDAR image shows heights of features in the landscape. These images can be used to identify where tree canopy, buildings, and other land surface features are located.

IMPLEMENTATION PHASES *continued*

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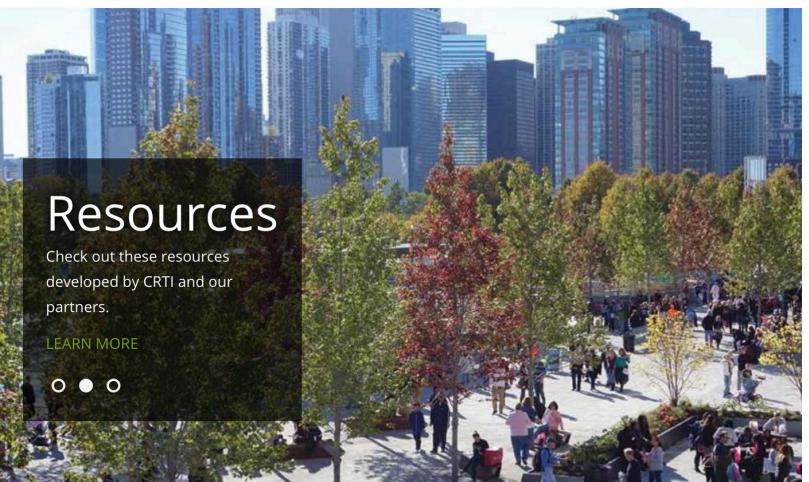


CHICAGO REGION TREES INITIATIVE

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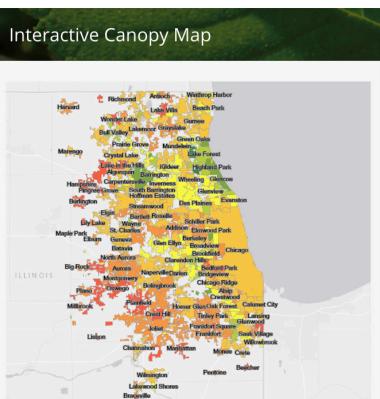
Resources

Check out these resources developed by CRTI and our partners.

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Interactive Canopy Map



Recent News

The CRTI has developed unique canopy information packets for each of the communities in the Chicago region. These packets have been placed in an interactive map and can be found on the CRTI website at ChicagoRTI.org.



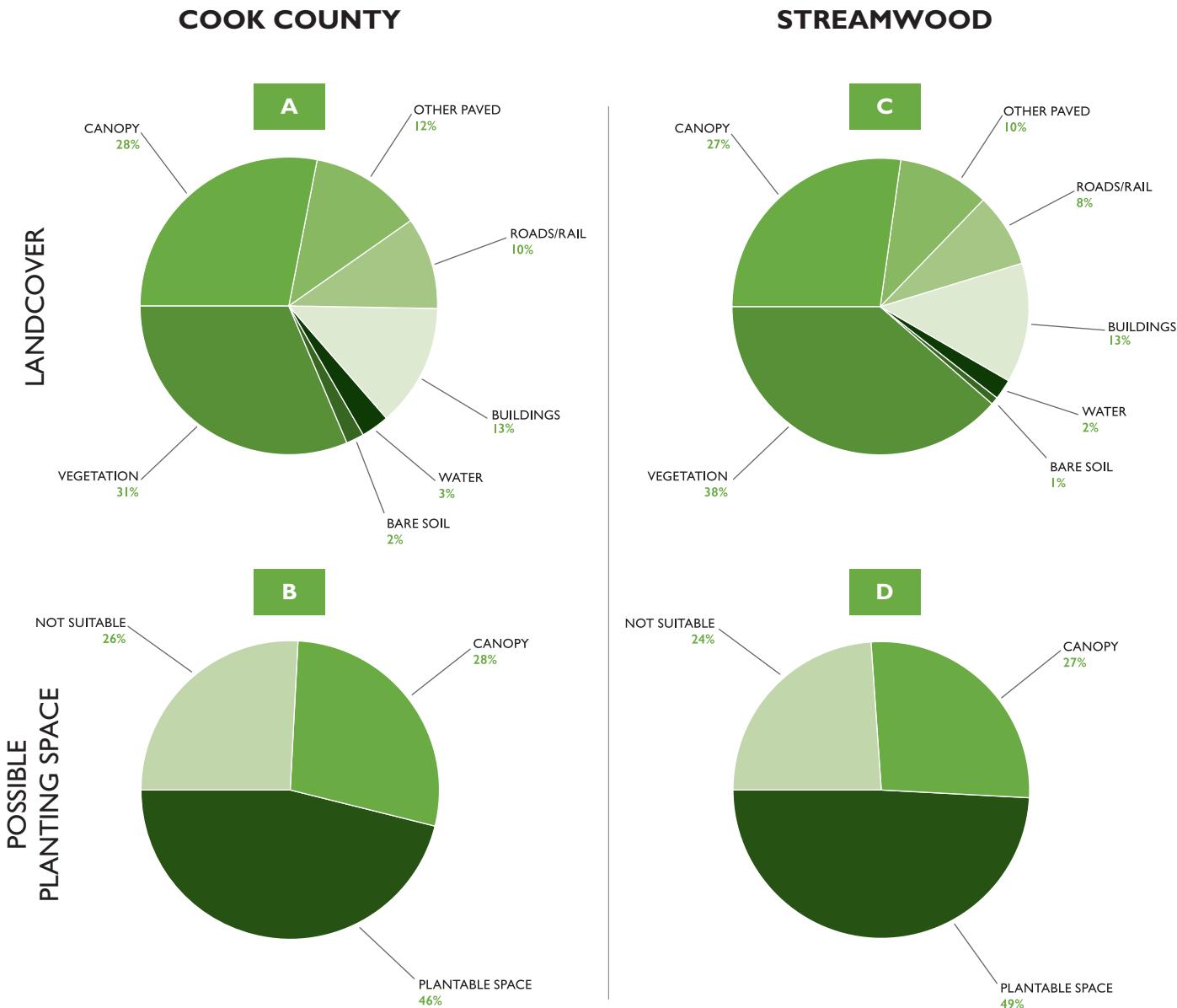


Figure 8. Cook County's current land cover (A) includes 28 percent canopy cover. An additional 46 percent of the county is suitable for planting (B). Streamwood currently has 27 percent canopy cover (C), and 49 percent of the land cover could potentially be converted to canopy (D).

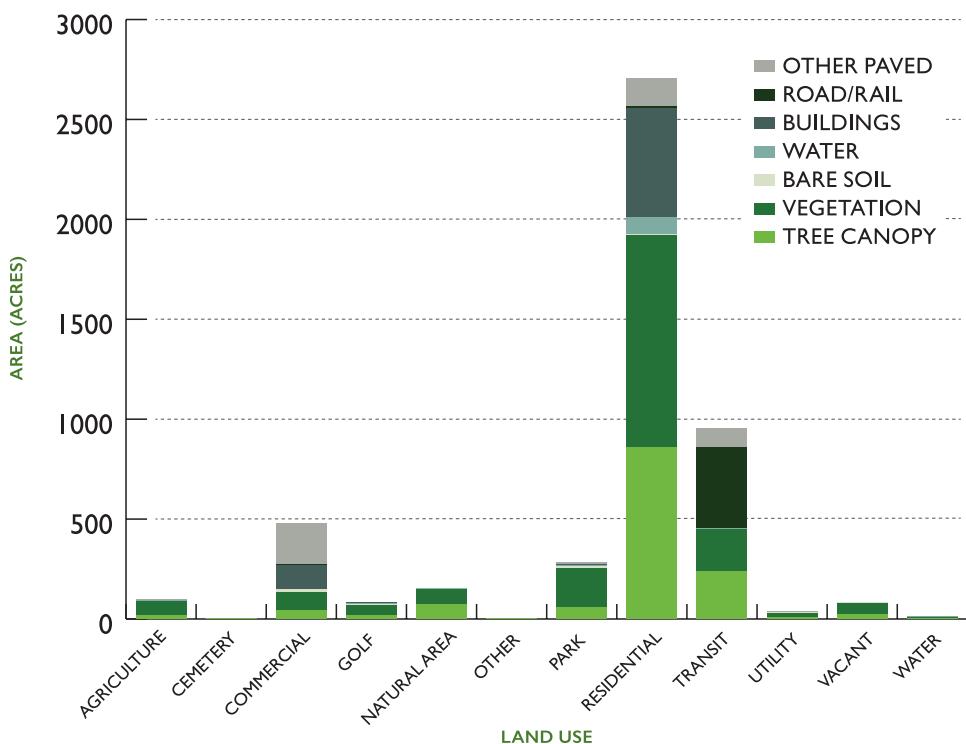


Figure 9. By understanding percentage of land use and land cover, the CRTI can work with the community to focus outreach and education on the areas with the greatest potential to improve canopy cover across the community. In the Village of Streamwood this area would be residential.

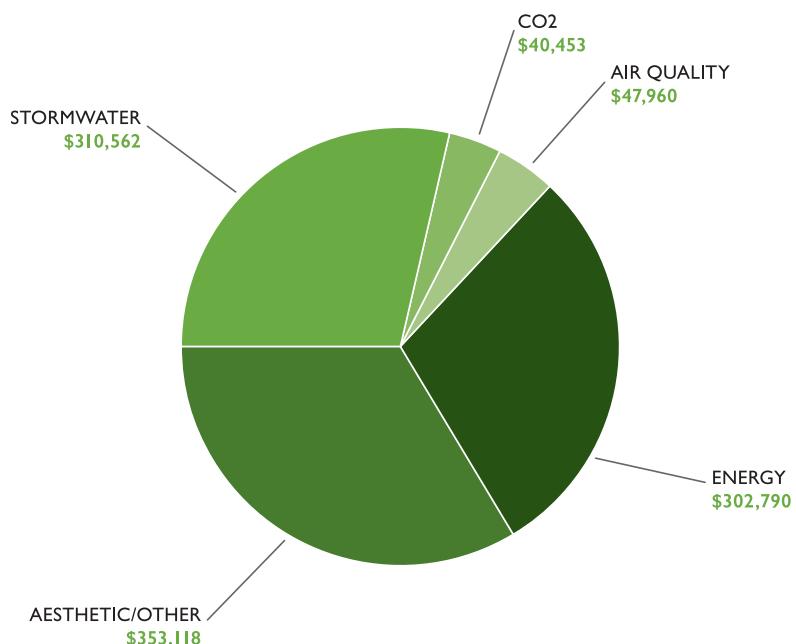


Figure 10. i-Tree Analysis of the Village of Streamwood's canopy cover benefits.

The CRTI, using this information, can provide a clear view of the community's urban forest and help decision makers in these communities to identify what support and resources might be most helpful to address their unique community's needs. (See Figures 9 and 10 for an analysis of Streamwood's land use and benefits from canopy cover.)

For communities that have tree inventories, additional information is provided in the canopy summary packet to identify potential risks and health of their urban forest based on diversity. Following is a species diversity page from the Village of Streamwood's canopy summary packet. (See Figure 11.)

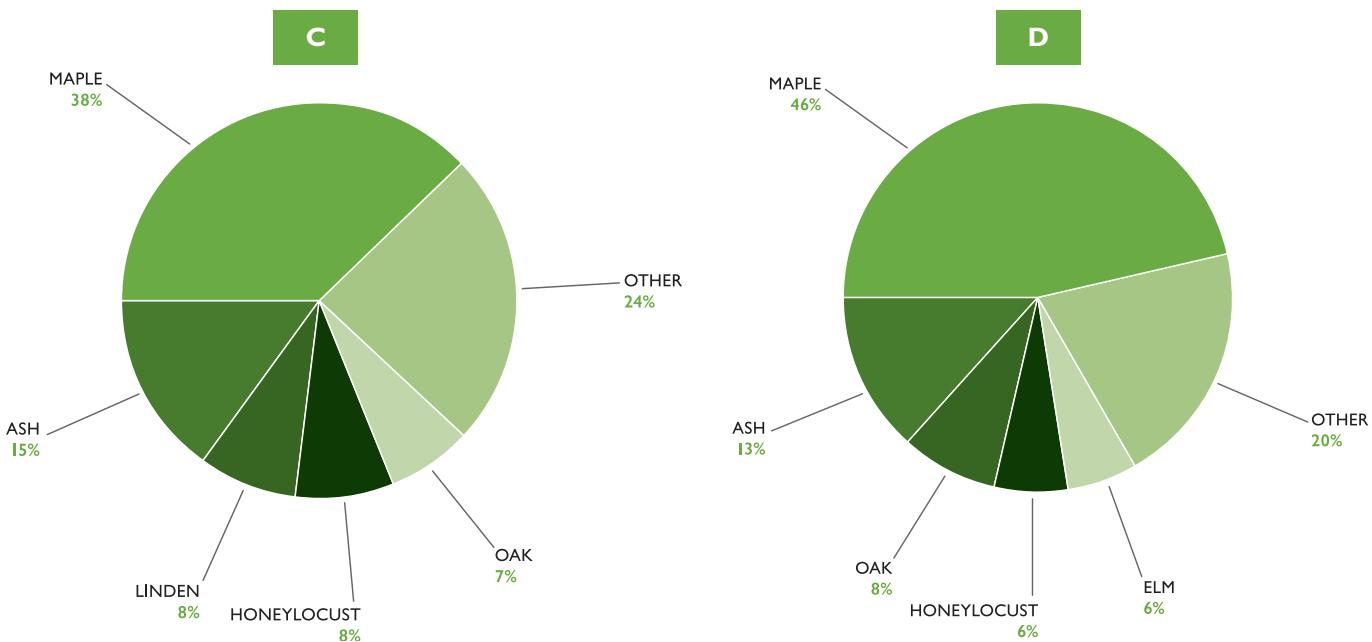


Figure 11. Information on genus diversity allows the community to better understand their potential risk from pests and pathogens. This inventory (C) shows the percentage of individual trees by genus; (D) shows the percentage of canopy cover by genus. Lower percentages of individual genus, such as maple, will help to reduce catastrophic loss of any one genus across the community.

A canopy goal includes planting but more importantly requires improving the health and longevity of trees.

The Chicago region has the potential for considerably more canopy, a 68 percent increase, in fact. However, “potential canopy” does not necessarily mean the region should achieve that amount. (See Figure 12.)

Each community and county is very different.

To understand some of these differences the following comparisons using pie charts are provided for each of the seven counties. (See Figures 13 and 14.) Chart A, in each county, shows the percentage of the seven land cover classes; and chart B merges the land cover classes into three categories: trees, potential plantable space, and land use not suitable for trees. Potential plantable space is defined as land cover where the presence of trees could be possible, however this does not necessarily mean trees should be planted or growing there. For example: in Kendall County, 85 percent of the total land cover is classified as vegetation. The vast majority of this vegetation is agricultural fields. It is not recommended that trees replace agricultural fields, however, where there are opportunities between fields, along drainage ditches, or around buildings, trees might be considered.

The best way to increase tree canopy is through improved tree care and proper planting of trees. Many communities in the Chicago region do not have a certified or trained arborist on staff. Additionally most property owners do not know how to properly plant and care for trees. This deficit would imply a lack of understanding of the need for professional management of a very valuable urban resource: the urban forest. Regionally, this resource has a compensatory value of \$51.2 billion (Nowak et al. 2013). Increased awareness of arboriculture as a profession and opportunities for individuals to study arboriculture as a profession are needed. Partnership with the Illinois Arborists Association provides information and opportunities for International Society of Arboriculture training and certification, and makes scholarships possible for those who could benefit from this training. Partnerships with community colleges, private tree care companies, and job training organizations can facilitate arboriculture apprenticeships for those interested in trees and in need of work.

CHICAGO REGION

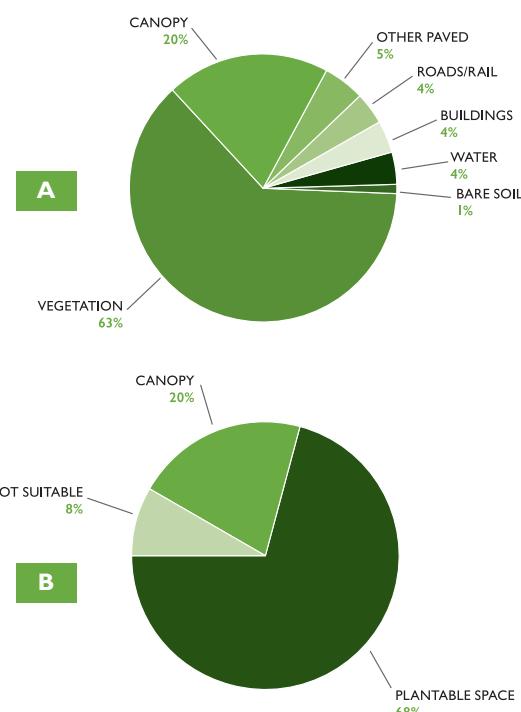


Figure 12. (A) Land cover classes and percentages for the Chicago region; (B) Theoretical potential to increase tree canopy.

Since the majority of the urban forest is located on private property, engaging community leaders and private property owners is key to success of the initiative. Seventy percent of the urban forest is located on private property. The CRTI needs to enlist community leaders across the region to help distribute information to private property owners to improve tree care, planting, and protection. This distribution can be accomplished through educational pieces in community newsletters and cable channel broadcasts, private property tree preservation ordinances and incentives, and tree-centered events such as community tree sales, tree adoptions, tree walks, Arbor Day, OAKtober, days of service, and other tree-centered activities.

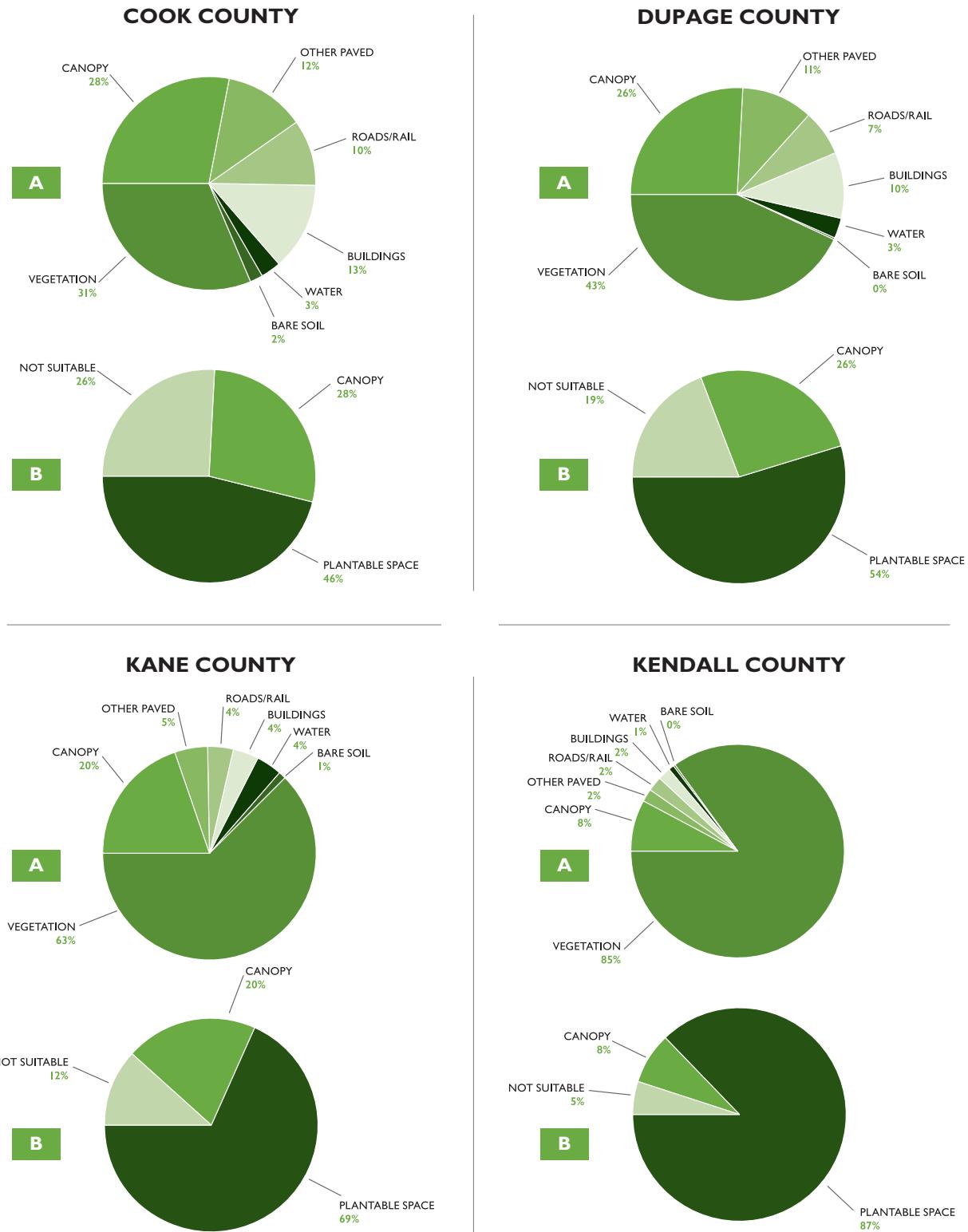


Figure 13. (A) Land cover classes and percentages for Cook, DuPage, Kane, and Kendall Counties; (B) Theoretical potential to increase tree canopy.

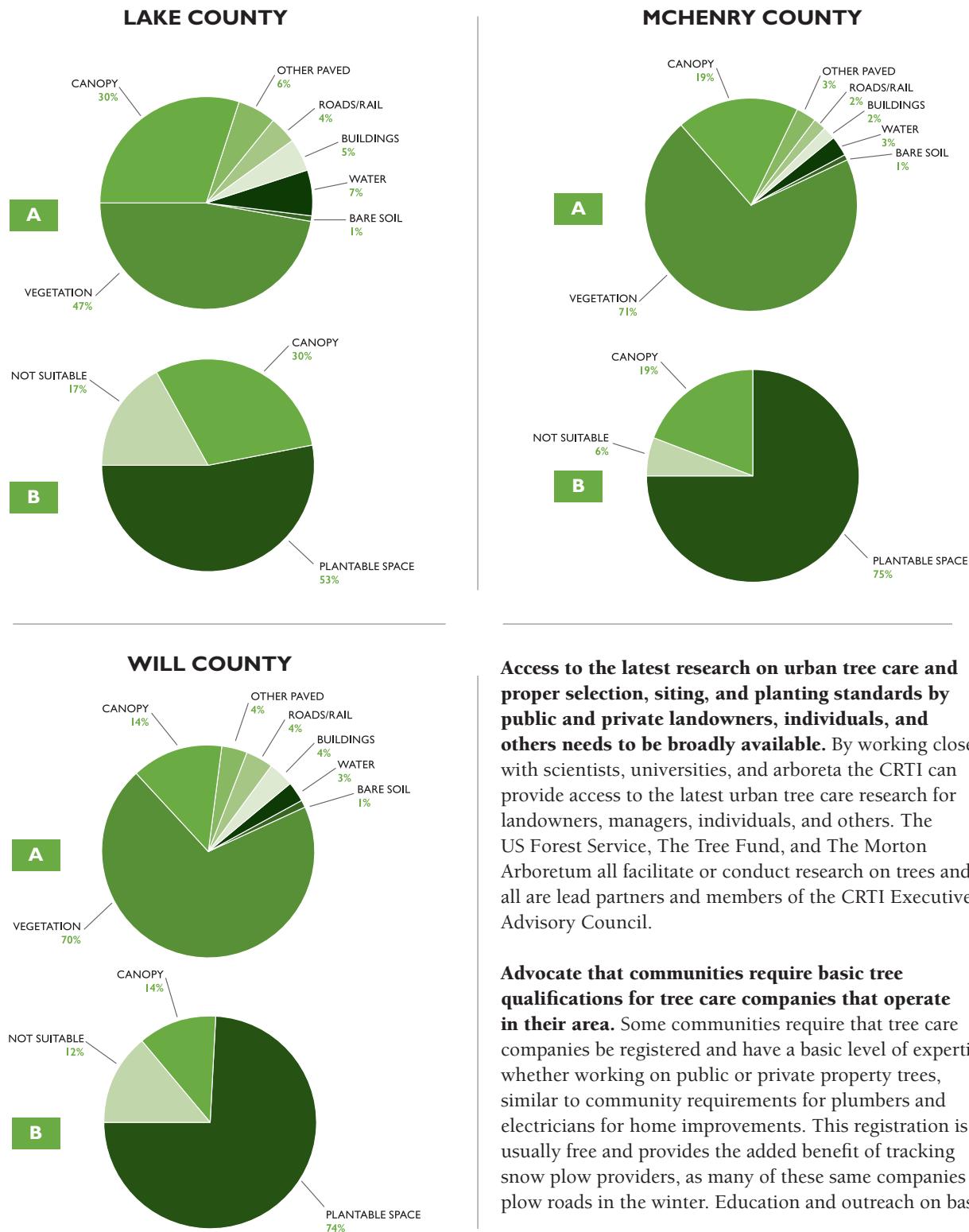


Figure 14. (A) Land cover classes and percentages for Lake, McHenry, and Will counties; (B) Theoretical potential to increase tree canopy.

Access to the latest research on urban tree care and proper selection, siting, and planting standards by public and private landowners, individuals, and others needs to be broadly available. By working closely with scientists, universities, and arboreta the CRTI can provide access to the latest urban tree care research for landowners, managers, individuals, and others. The US Forest Service, The Tree Fund, and The Morton Arboretum all facilitate or conduct research on trees and all are lead partners and members of the CRTI Executive Advisory Council.

Advocate that communities require basic tree qualifications for tree care companies that operate in their area. Some communities require that tree care companies be registered and have a basic level of expertise whether working on public or private property trees, similar to community requirements for plumbers and electricians for home improvements. This registration is usually free and provides the added benefit of tracking snow plow providers, as many of these same companies plow roads in the winter. Education and outreach on basic

tree care and planting and salt reduction practices for winter plowing can be provided to these companies when they register.

Improved policies to preserve and protect trees are needed to increase the tree canopy. The majority of communities in the region have some type of public property tree preservation ordinance. Many of these ordinances, however, do not all have the attributes to provide for increased tree health. The CRTI has developed tree preservation ordinance templates that encourage every community to have a tree preservation ordinance and, within the ordinance, recommend clearly defined, nationally recognized standards as the minimum standard for tree care, planting, preservation, and removal. These standards would be practiced by all contractors working on behalf of the community and also be required of staff who work on trees. It is encouraged that communities have at least two International Society of Arboriculture (ISA) Certified Arborists on staff. The ISA certification training and testing is readily available through the Illinois Arborists Association, a lead partner and Executive Advisory Council member of the CRTI. The CRTI ordinance templates provide sample language for the bronze level ordinance, which is the introductory ordinance for a community, as well as the silver level ordinance, which incorporates the use of an urban forest management plan into the community practices. The highest ordinance level, the gold tree preservation ordinance, includes all of the requirements of the silver level ordinance and provides for preservation and protection of trees on private lands. See Figure 15 for the basic requirements for a bronze level tree preservation ordinance.

Checklist for Basic Community Tree Preservation Ordinance

- Statement of purpose
- Definitions
- Clear scope of preservation, planting, and management
- Defined values and services of the urban forest as infrastructure
- Education and outreach provided to private property owners on tree care, preservation, protection, planting, removals, and invasive species
- Clear, defined national standards for tree planting, e.g. American National Safety Institute, Tree Care Industry Association, other nationally recognized standard
- Requirement for broad species diversity e.g. not more than 5 percent of any one species, 10 percent of any one genus or 15 percent of any one family be planted at any one time
- Allowance for a contract for growing trees
- Clear, defined national standards for tree purchasing, e.g. American Standard for Nursery Stock, American National Safety Institute, Tree Care Industry Association, other nationally recognized standard
- Defined skill and certification requirements for individuals managing the urban forest
- A timeline to develop an urban forest management plan
- Clear, defined national standards for tree care
- Adherence to a minimum pruning cycle. (Recommended 4–7 years)
- Clear, defined national standards for tree preservation due to construction
- Defined strategy and requirements for preservation of legacy trees
- Clear, defined national standards for tree removals
- Defined replacement requirements
- Defined penalties and actions for damage or death of a tree
- Defined woody invasive species management strategy
- Defined invasive pests or pathogens management strategy
- Development of an invasive species list
- Defined criteria for preservation of naturalized forest areas
- Defined tree replacement requirements
- Defined tree permit requirements and process
- Defined enforcement practices, variance guidelines, and civil remedies
- Outlined responsibilities and qualifications of the Tree Board
- A preferred species list

Figure 15. Bronze Level Tree Preservation Ordinance. A tree preservation ordinance needs to address specific issues to be effective and enforceable.



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The care and planting of trees on private property is critical and can be encouraged through incentives.

Many communities are reluctant to regulate the care and protection of trees on private property, though this is becoming more common as the benefits of trees are better able to be quantified and understood. Some communities have opted to develop incentives for private property tree owners to improve care, planting, and protection of trees on their individual properties. These include tree adoption, cost share, or opportunities for individual property owners to opt-in on village rates for services, including planting, removals, pruning, or pest treatments. Other programs include expedited permitting processes for property owners who provide a tree preservation plan with their building permit request, and credits toward tree removal costs for property owners who plant trees on their property. Increased tree planting, care, and protection on private property will need to be a priority to achieve canopy expansion. If private property tree care is not regulated, it should be incentivized. As mentioned, 70 percent of the region's trees are on private property.

Urban forest management plans for public and large private landowners will improve tree health by setting goals and strategies to improve tree care. An urban forest management plan is a guiding document that can help a landowner evaluate current capacity and areas where improvements can be made. It also identifies where the greatest weakness or vulnerabilities exist within the urban forest. The CRTI has developed an Urban Forest Management Plan Template that can be easily tailored to the individual community or landowner needs. Each section can be considered on its own or can be incorporated with other sections. The CRTI Community Canopy Summary packets provide an important foundation for the plan by allowing the community to clearly visualize where trees are needed most and the value those trees provide. Language has been provided in each section of the template to assist these landowners and includes questions for their consideration to make the plan uniquely designed to support their communities' needs. The Silver Tree Preservation Ordinance Template is designed to rely on a strong urban forest management plan. With it, a community or landowner can use the ordinance as the guiding strategy for urban forest care and facilitate updates without the need for an ordinance revision.

Low species diversity is an issue for the Chicago region's trees.

Sixty percent of the region's trees consist of ten species. Street tree inventory data collected by the CRTI suggests that 20 percent of all street trees are, or were, ash trees, and 32 percent are maple. If an invasive species selective to damage or kill maple trees arrives in the Chicago region, it will be devastating. Broad species diversity across the region needs to be achieved to reduce the potential for another catastrophic loss. The CRTI recommends that not more than 5 percent of any one species, 10 percent of any one genus, or 15 percent of any one family be planted at a time. The CRTI also understands that age diversity needs to be taken into consideration for overplanted species. For instance, focus should be placed on planting underplanted species for a few years, and then slowly reincorporate some of the overplanted species in new age classes so that entire species are not eliminated from the landscape.

The CRTI needs to work with nurseries to expand species diversity.

To increase species diversity, diverse species need to be produced in the nursery. In 2008, the US economy declined and communities were required to cut their budgets. One of the first cuts was any expense related to forestry, including forestry personnel. At this exact same time, emerald ash borer was killing millions of trees. As communities allocated resources to remove dead ash trees they reduced or eliminated purchases of new trees. Tree nurseries were left holding trees they could not sell. For several years after the recession and decline of tree purchases, nurseries have been reticent to take the risk to expand production, and especially to produce species that have not been commonly planted. Important to achieving broader species diversity is expanded production of diverse tree species in nurseries. The CRTI needs to work with nurseries, communities, and potential funders to expand funding for production, to increase public and private partnerships for tree planting and production, and to train and engage tree purchasers and producers to use contracts for growing. *Contract growing* is a process where a tree purchaser preorders trees and pays a deposit for the production of these trees, with anticipated acceptance in approximately five to seven years. This practice allows purchasers to order the trees they need to expand diversity and lock in a price for the production period. This practice also allows the

nursery to expand production and diversity with reduced financial risk. The CRTI lead partners, the Illinois Green Industry Association and Illinois Landscape Contractors Association, provide insight into nursery production challenges and opportunities and encourage integration of contract growing as a standard practice across the region.

Funding to improve tree care and planting is needed to support communities and landowners. One of the biggest challenges to the CRTI goals is equitable distribution of trees across the Chicago region. (See Figure 16.) Under-resourced communities often have lower tree canopy. The CRTI has set a goal to identify funding sources that will facilitate more equitable distribution of trees across the region so that all people in the region can benefit from improved mental and physical health, air and water quality, flood reduction, energy usage, and property values. To achieve this goal, the public and private sectors need increased awareness and commitment to invest in trees and tree care where trees are needed most.

The Metropolitan Mayors Caucus (MMC), a lead partner and member of the Executive Advisory Council, has developed the program Greenest Region Compact 2. This program promotes sustainability practices across the seven-county Chicago region. More than 95 communities have passed a resolution to support this compact and are enacting practices that will support community sustainability. Included in these practices are maintaining a robust urban forest canopy, reducing greenhouse gas emissions, improving air quality, increasing resiliency to climate change, mitigating and adapting to climate change, improving water quality, using natural systems to manage stormwater, and conserving, restoring, and sustaining natural ecosystems. All of these practices are directly related to the goals of CRTI, and partnership with MMC facilitates expanded capacity to improve the health of the urban forest.

The Chicago Metropolitan Agency for Planning's On To 2050 plan has made recommendations for Coordinated Growth Areas. (See Figure 17.) Recommendations emphasize that these areas should be carefully planned to balance the costs and benefits of community goals for growth. The plan notes that "strategically planning for conservation of natural areas and key agricultural lands, combined with sensitive development practices, emphasizes both natural and built environments." Some of the accompanying recommendations include that "local governments should adopt conservation-oriented development standards, and avoid development on key natural areas."

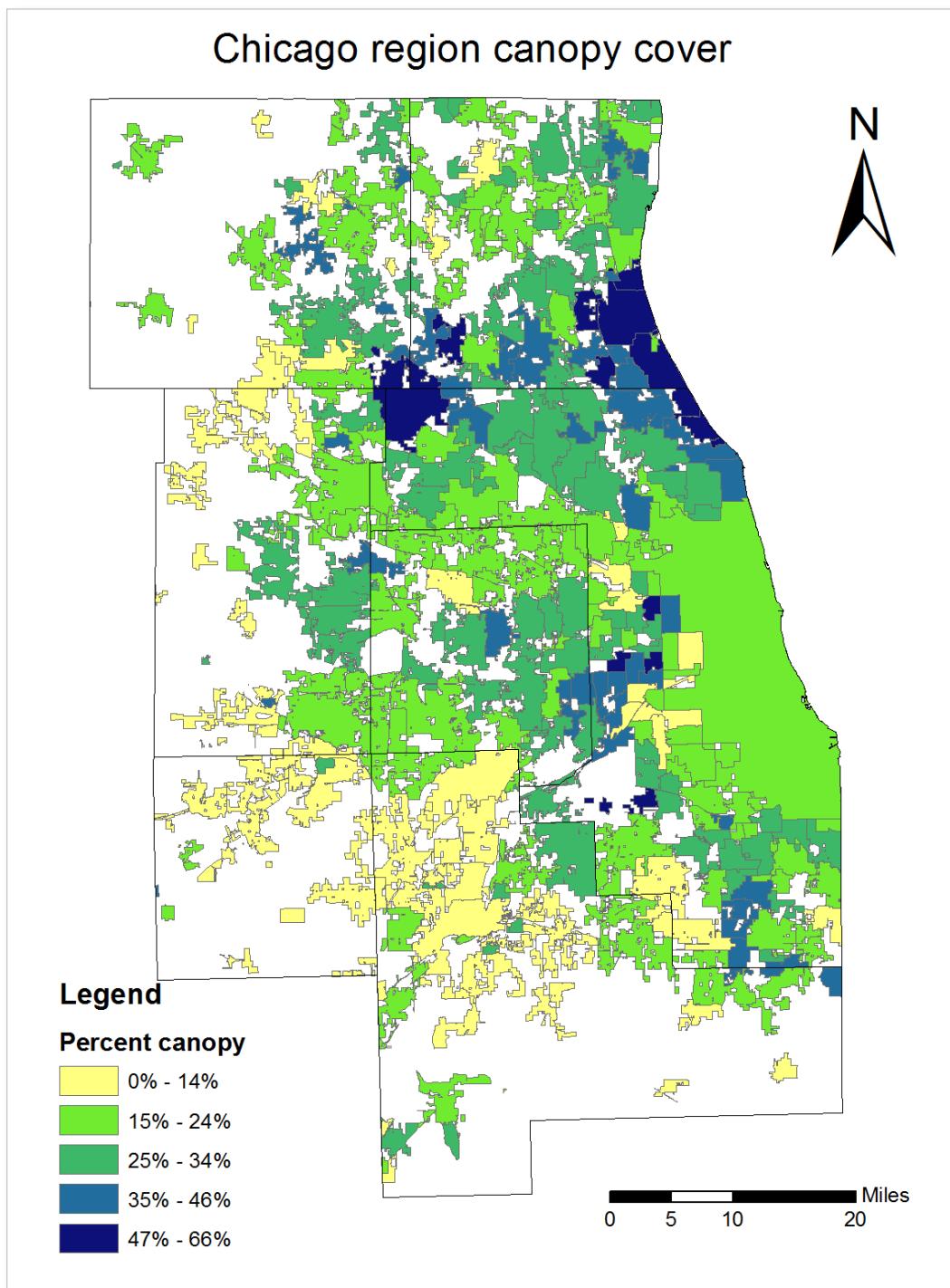


Figure 16. Urban forest canopy distribution across the seven-county Chicago region by community.

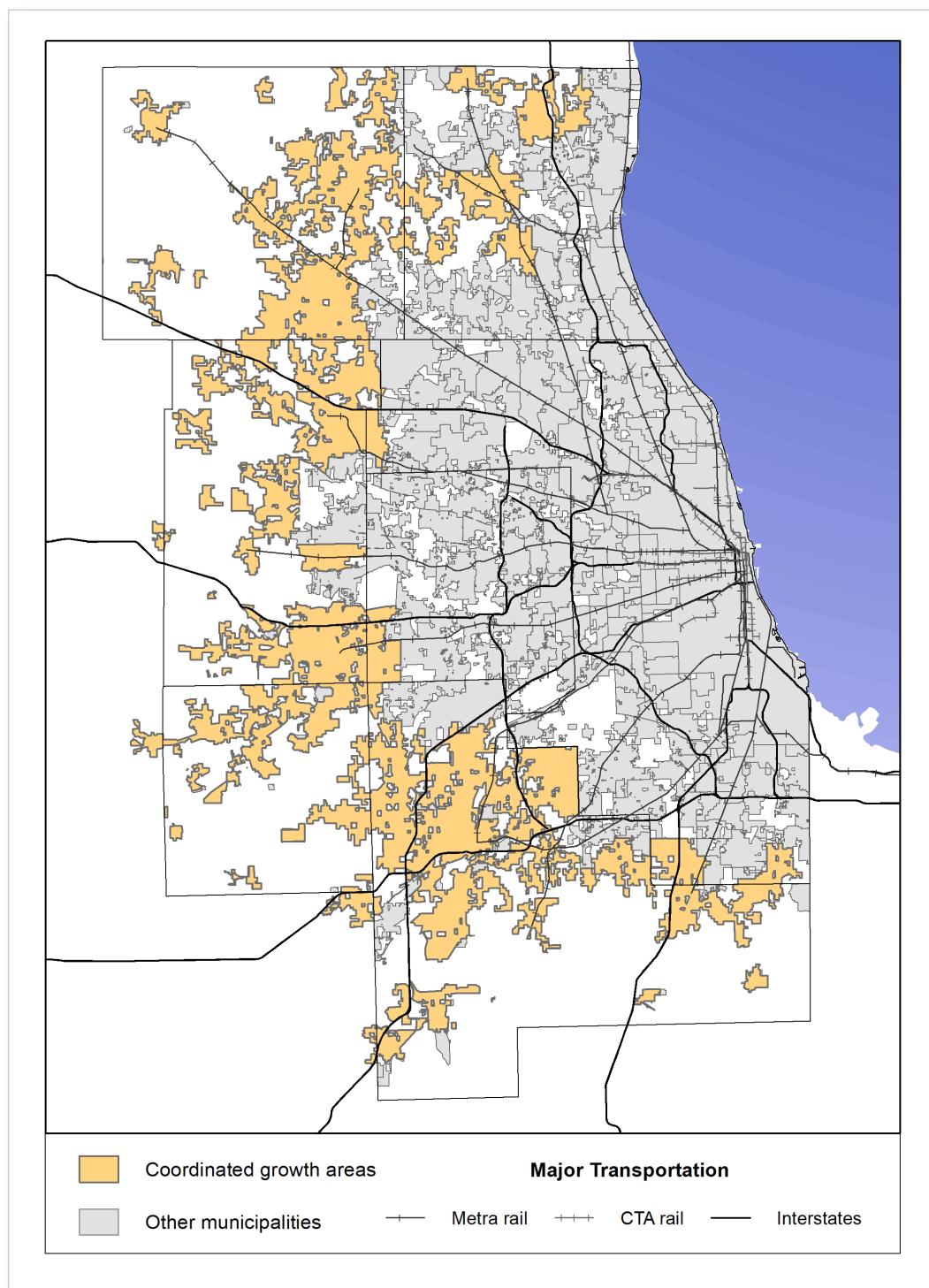


Figure 17. Coordinated growth areas (source: Chicago Metropolitan Agency for Planning).



CHICAGO
REGION
TREES
INITIATIVE

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The US Forest Service (lead CRTI partner and member of the EAC) and Illinois Department of Natural Resources Division of Forestry have provided significant funding to support improved urban forest health across the Chicago region. The CRTI lead partners have been successfully awarded funding through these sources to support their own tree programs and to sub-grant to other partners and communities across the region. Funding has been awarded to build community stewardship, tree planting, invasive species control, tree inventories, management plans, data collection and analysis, outreach, and education.

Increased public/private partnerships are needed. Today, many corporations have sustainability requirements and goals that require reporting to their shareholders or boards of directors detailing how they are reducing their carbon footprint or improving the health of the environment. The care and planting of trees are excellent ways to meet these goals, because trees provide such broad benefits. The CRTI needs to identify corporations in the Chicago region who can be partners in CRTI by supporting urban forest improvements in the communities where their corporate headquarters or operations are located or where urban forestry assistance is needed most. Additionally, many national sustainability campaigns support trees. The CRTI needs to connect and partner with these campaigns so that resources from these campaigns can be used in the Chicago region. The Resources Advisory Committee is an ad hoc committee of the CRTI made up of development staff from partner organizations. These individuals can help identify funding sources with sustainability and giving programs that closely align with CRTI goals. Resources are needed for partner programs, communities, landowners, ongoing data collection and analysis, and administration of the CRTI.

The Nature Conservancy (TNC), a lead CRTI partner and member of the Executive Advisory Council, has an international campaign to plant one billion trees. The application of this initiative in the Chicago region is taking place in the Imani Village, in the Pullman community in Chicago. The Imani Village is a social enterprise that engages businesses and residents to create a sustainable, ecofriendly, mixed-use, green, intergenerational community in an under-resourced neighborhood. The Imani Village mixed-use development includes a community center, sustainable housing, an organic community garden, a sports complex, and retail center—and lots of trees! The Nature Conservancy has partnered with the US Forest Service, The Morton Arboretum, and local corporations to fund the purchase of trees and training for community members, especially youth, to ensure that trees in the community are well cared for. The CRTI conducted a tree inventory of the Pullman community in 2017, which will provide a foundation for selection of trees across the neighborhood to ensure that expanded species diversity is achieved.

The forest composition and canopy analysis data provide a scientific foundation for the CRTI's work.

The Tree Census, LiDAR, and public and private property inventory data collectively provide a scientific foundation for understanding the regional and local urban forest and can project the potential for improvement. By working with the latest science on tree care we can provide education on proper planting, soil specifications, space requirements for roots, treatments for diseases, management strategies for new pests, pruning methods to reduce storm damage, vulnerability to climate and many other issues to landowners, managers, and individuals. By communicating and teaching the latest science the CRTI can help landowners, managers, individuals, and others to improve the health of the urban forest in the Chicago region.

Since 2002, the Tree Fund, a lead partner and member of the Executive Advisory Council, has provided \$3.3 million in funding. This money has been used for scientific research, scholarships, and program development for organizations and individuals to further their understanding of and increase the professional skills in arboriculture and urban forestry.

The funding provides opportunities for scientists to study issues related to plant health such as tree pests, diseases, and invasive species. The Tree Fund has also provided opportunities for scientists to study pruning, propagation, risk assessment and safety, root and soil management, urban forestry, utility, and other forestry practices that improve the health of trees. Educational funding provides opportunities for the development of educational programs and training for adults and youth.

The Morton Arboretum's Center for Tree Science provides opportunities for global scientific collaboration. These efforts generate new and increased knowledge about trees in both natural and built environments. Scientists at The Morton Arboretum partner with other scientists from around the world and study tree planting and establishment, soils, tree selection and improvement, biomechanics, forest dynamics, ecosystem management and restoration, biodiversity, endangered species recovery, historical vegetation patterns, and phylogenetics. The Center for Tree Science also provides small grants, fellowships, internships, workshops, and conferences on new knowledge and shares this information broadly. As the founder of the CRTI, The Morton Arboretum recognizes the strength in collaboration between scientists, the Center for Tree Science, and the CRTI to apply new knowledge in the Chicago region and actively shares this knowledge and partners with other organizations on application of new research.



The CRTI partners realize that an increase in canopy cover will take many years—trees are slow growing and take tens of years to reach maturity. A wide range of approaches must be undertaken and everyone has a part to play if success is to be achieved. Ultimately the CRTI has recommended a 4 percent increase in canopy, from 18 percent in 2018 to 22 percent by 2050.

Because of the CRTI's connection to scientists and institutions, opportunities develop to help the CRTI meet these goals. One such example is the completion of a tree inventory for the Village of Dolton.

The CRTI partnered with Ball State University and DePaul University on research funded by the Tree Fund. This research looked at the use of virtual street tree surveys using Google Street View. Tree inventories provide the foundation for urban forest management by identifying tree species, size, location, condition, and other information that helps the landowner and manager more effectively manage the urban forest. The scientists contacted the CRTI and asked if there was a community in the Chicago region that needed a tree inventory and whether CRTI partners could participate in the study. The CRTI identified the Village of Dolton as a location to test the virtual method and to verify the accuracy of this method by conducting an on-the-ground inventory in the Village of Dolton. The CRTI partners, of varying skill, participated in the study by using Google Street View to help scientists at Ball State determine the efficacy of this tool for tree inventories. At the same time, students from DePaul University conducted a traditional tree inventory by walking all of the streets in the Village of Dolton and collecting the data. This study was an opportunity to advance science, improve urban forest management, and assist an under-resourced community by providing them with a tree inventory to help them improve their urban forest.

FEMA-sponsored program that gives communities credits for reducing the potential for flooding. These credits come in the form of reduced flood insurance costs for homeowners by insurance companies. Another example is reduced stormwater fees for tree planting and care practices on property that reduces stormwater runoff. Now that we understand the benefits and services trees provide and can calculate those benefits, incentives and credit programs can be established to represent those benefits.

Participation of every landowner, manager, individual, profession, and organization in the Chicago region is needed to improve tree health, improve urban forest policy, increase funding, and integrate science. Additionally, support from experts and scientists across the country and around the world can provide significant insight and direction for improved tree care, planting, and management across all land uses.

Creating credits or incentives for tree preservation can help to expand the tree canopy. The CRTI would like to see credits provided to communities or landowners for increased preservation and protection of trees as infrastructure, recognizing that trees reduce stormwater and have a positive impact on air and water quality. An existing program where tree planting and care credits might be utilized is the Community Rating System, a

3. GOAL: Reduce Threats to Trees

There are a number of significant threats to trees in the Chicago region. These include existing and potential pests and pathogens, lack of proper care and pruning, exotic invasive plant species, land development, and a changing climate.

Existing and potential pests and pathogens are threats throughout the world because of international trade and travel. The Chicago region is a national and international transportation hub for materials and goods. Foreign hitchhiking pests on pallets and in packing materials can create havoc for our trees. This havoc was exhibited very clearly by the death of 13 million ash trees in the seven-county region due to an exotic invasive species, the emerald ash borer. This insect came from Asia to the United States on packing material and was first found in Michigan in 2002. It was then transported to the Chicago region and discovered here around 2006. Emerald ash borer has since moved throughout the United States, under its own power and via transportation corridors by movement of firewood and wooden product packaging. Lack of awareness of existing and potentially problematic species as well as human participation in the spread of these pests are very significant concerns. The CRTI needs to increase awareness and training for people all across the Chicago region so that we are all aware of potential problems and how to report them. Additionally, the CRTI needs to work closely with the US Department of Agriculture Animal Plant Health Inspection Service (APHIS) to outline a strategy that can quickly be put into place when a potential pest or pathogen is identified. This strategy needs to be broadly communicated to all of the CRTI partners so that the potential for catastrophic loss is controlled or eliminated.

The CRTI needs to work in partnership with APHIS to build increased collaboration with surrounding states. By sharing information and resources on challenges, states can learn from each other. Knowing what strategies are proving effective and what approaches are failing to control or prevent the expansion of pests and pathogens can improve control. One example is curtailing the movement of firewood across states.

The *Don't Move Firewood* campaign was developed by The Nature Conservancy to teach campers and recreationalists of the potential to spread pests and pathogens through the movement of firewood. These efforts need to be ramped up among states. The CRTI would like to see this program amplified within the State of Illinois.



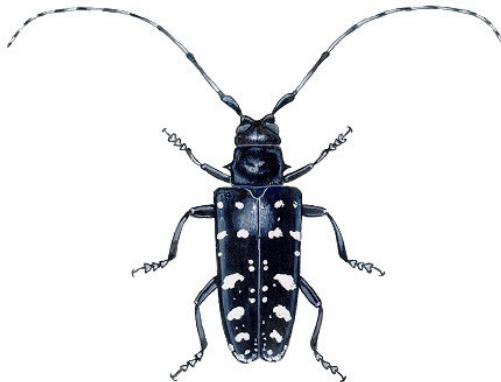
The USDA and The Nature Conservancy program to curtail the movement of firewood and stop the spread of invasive species.

Early detection of new invasive species is critical.

In 1998, Asian long-horned beetle, an exotic invasive insect, was found in the Ravenswood neighborhood of Chicago by a staff member of the Skokie Park District. This individual collected the specimen and turned it over to the US Department of Agriculture (USDA). The USDA, in partnership with the Chicago Department of Forestry, developed a rapid response to this finding and eradicated this insect in Illinois, saving millions of trees from devastation. Early detection is critical for eradication of new invaders, but this can only be achieved if individuals know what to look for and who to report it to.

A changing climate is a risk to our urban forest.

Climate change is exhibited in the Chicago region by more frequent and more intense storm events and longer, drier, and hotter summers. Increased awareness of these challenges and management strategies to lessen these stressors will help to extend the life of trees. Proper pruning can significantly reduce storm damage to trees as well as potential liability (Vogt et al. 2015). Additionally climate change provides opportunities for new invasive species to move into our region. These invasive species can be pests, pathogens, or plants.



Asian long-horned beetle (image courtesy of USDA APHIS) is an exotic invasive pest that will have damaging impacts on the Chicago region's trees.

The Northern Institute of Applied Climate Science (NIACS), working with the CRTI, conducted an analysis of the Chicago region's trees and held a workshop with 12 municipalities, park districts, and forest preserve districts to identify potential vulnerability of these communities to a changing climate and to discuss adaptation strategies that would mitigate impacts from a changing climate. The NIACS has since developed a series of training programs for landowners for this purpose. The CRTI needs to collaborate with experts to provide ongoing training and opportunities for communities to learn how to manage their urban forest in a changing climate.



Lessons Learned from the Urban Forestry

Climate Change Response Framework Project



The Chicago region was a case study to evaluate urban forest vulnerability and capacity to adapt to a changing climate.

Woody invasive species are another significant threat to the Chicago region's urban forest. The Tree Census found that 30 percent of the region's current tree cover is composed of two invasive species, European buckthorn (28 percent) and Amur honeysuckle (2 percent). (See Figure 18.) These species are prolific in their seed production and can out-compete native plants, quickly dominating the landscape. They also change soil chemistry, making it less hospitable for native species, and can impact the health of wildlife (Heneghan et al. 2002; Heneghan et al. 2004; Sacerdote and King 2014). The forest preserves in the region spend millions of dollars annually trying to control these species to protect native habitats. Without education and engagement of private property landowners, control of these species will be a futile effort. Private property owners with land that surrounds the forest preserves or other managed natural areas must eliminate these invasive species on

their properties, but many do not realize these species are problematic, and they enjoy the screening these small trees provide. Broad-based outreach and opportunities for funding assistance to landowners to remove and replace these species are needed. This effort also needs to include nurseries so that they are ready and able to provide needed replacement species. Collaboration with local outreach specialists such as Conservation@Home programs is important to help carry education and outreach to individual homeowners. Local land trust organizations, garden clubs, and school environmental clubs can partner with the CRTI to help provide outreach to landowners. Other important partners are the forest preserves. Their staff are well educated and informed. By engaging these individuals to share their knowledge with these landowners through workshops, walking tours, and community events the CRTI partners can help to spread the word.

Improved state, regional, and local policies are needed to manage existing and potential pests and pathogens, invasive plants, and a changing climate. The CRTI needs to improve communication with legislators on the incredible challenges of these risks and threats. The cost of ash losses across the Chicago region has been millions of dollars (CRTI 2014 Operations Survey). Additionally, the cost of removal of invasive buckthorn and honeysuckle to forest preserves in the region has cost millions more. Yet, the State of Illinois no longer has an invasive species council. Invasive species councils make recommendations for legislative regulation of invasive species. These councils also help to teach landowners, managers, plant nurseries, and others about new and potential threats. The CRTI will actively work with the Illinois Department of Natural Resources, the Illinois Forestry Development Council, and other lead organizations to reestablish the Illinois Invasive Species Council.

Percent of Trees That Are Buckthorn and Honeysuckle by County

County	Percent Buckthorn	Percent Honeysuckle
Cook	31	2
DuPage	25	3
Kane	15	6
Kendall	4	2
Lake	41	1
McHenry	36	2
Will	13	3

Figure 18. Percent of woody invasive species population by county (Nowak et al. 2013).



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The Chicago Region Trees Initiative has developed resources to teach landowners about the problems of invasive species. These materials include Invasive Species Fact Sheets, a Woody Invasive Species Native Replacement Guide, and resources on control and management of these species. Additional education and outreach is needed through local workshops and trainings and development of a recognition program for properties that are free of buckthorn and honeysuckle trees.

The CRTI Ordinance Templates and Urban Forest Management Plan Template provide direction to communities in establishing regulations on the management of invasive species. These two resources help to set local policy and a strategy to manage invasive species. Every community should have a standard for dealing with invasive pests, pathogens, and plants. Further work is needed to engage decision makers to understand the value of the urban forest and the need to reduce potential threats and risks.

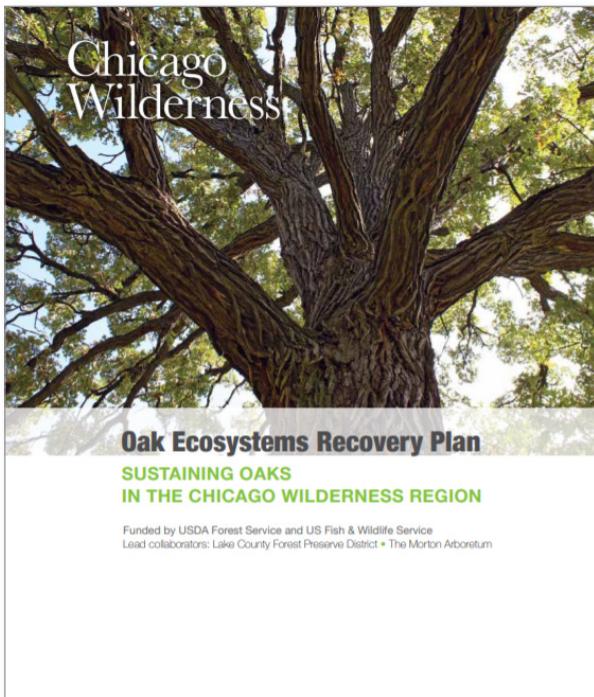
Funding to assist in managing invasive problems needs to be increased. Funding has been provided by the US Forest Service to help communities replace dead ash trees after the emergence of the emerald ash borer in the Chicago region, and the US Environmental Protection Agency provides funding for controlling invasive species that impact water quality. However, the funding allocated for these programs is not nearly enough. The CRTI would like to see increased federal and state recognition of the value and importance of the role trees play and increased funding to protect this important resource for the future. It is not yet clear how that might take place in Illinois but an investigation with recommendations is needed. Federal and state funding is provided to address significant problems such as forest fires. The CRTI would like to work with decision makers to identify strategies for increased funding and incentives for controlling invasive species and protecting the urban forest as an important infrastructure in the region. The cost of not proactively managing our urban forest is very

high. The CRTI wants to work to fund prevention, rather than funding life support after issues such as invasive plant and pest species are seemingly out of control.

Partnerships with scientists to identify management strategies for invasive pests and pathogens, invasive woody plants, and reduced impacts from climate change have been an important part of the Chicago Region Trees Initiative. For instance, the Risk Assessment and Management Work Group of CRTI includes representation from experts and scientists from the US Forest Service, APHIS, Northern Institute of Applied Climate Science, the University of Illinois Chicago, DePaul University, various tree care companies, and scientists from The Morton Arboretum. These individuals help to draw attention to new invasive pests, pathogens, and plants; provide insight into the latest research strategies for control; and help to develop resources that the Chicago region can use to address these challenges.

4. GOAL: Enhance Oak Ecosystems

In October 2015, the Oak Ecosystem Recovery Plan (OERP) was completed for the Chicago Wilderness Region (Fahey et al. 2015). This plan presented the plight of oak ecosystems in the Chicago Wilderness Region (northeastern Illinois, southeastern Wisconsin, northwestern Indiana, and southern Michigan). Based on mapping of oak ecosystems from the 1830s and on aerial photography from 1939 and 2010, only 17 percent of the region's oak ecosystems that existed in 1830 remain, and 70 percent of those ecosystems are in private ownership. These ecosystems are now very fragmented due to development. They often contain high concentrations of invasive species, and best management practices for these properties may not be in use. Additionally, the majority of oaks are in large size classes with few younger species surviving to replace them. Management strategies need to be employed to reconnect these ecosystems, improve their biological diversity, and preserve them for the future.



The Oak Ecosystem Recovery Plan outlines a regional strategy to preserve, protect, and enhance oak ecosystems.

The CRTI partners have identified important complexes of oak ecosystems. These ecosystems have been sorted into complexes and were ranked by parcel size; ecosystem areas/perimeter ratio; percentage of the parcel that is publicly protected; proximity to other oak remnants; and ecosystem quality (using the Illinois Natural Areas Inventory Database). The 300 highest ranked ecosystems were labeled as core complexes, with the next 300 most important parcels labeled as satellites.

A Case Study in Oak Ecosystem Recovery: Palos Preserve

The Forest Preserve District of Cook County has completed their strategy, "Next Century Conservation Plan," which outlines the goal to expand protected lands by 30 percent and to make their preserves open and accessible to diverse people. The Forest Preserve has selected the Palos Preserve as their priority area to begin implementation of the Oak Ecosystem Recovery Plan. (See Figure 19.) The Palos Preserve is surrounded by eight communities and many different property owners. The core, buffer, and corridor areas will provide opportunities for training of community decision makers and individual residents on the benefits and need for urban trees, native biodiversity, and the value of connectivity of native habitats. Partners assisting with this priority area are the Forest Preserves of Cook County, University of Illinois Extension, Conservation@Home, the eight communities around the preserve, and local community organizations. Individual property visits by the Conservation@Home program and workshops on utilization of native landscaping, the OERP, and other relevant topics are being provided to property owners.



Figure 19. Forest Preserves of Cook County Palos Preserves.

Existing oak ecosystems need to be protected and connected. Buffers were created around each of the cores and satellites to help protect them from external impacts and extend their functional size. The buffers for core complexes are 1,000 feet in width, with the buffers for satellite complexes measuring 500 feet in width. Finally, corridors between these cores, satellites, and buffer areas have been mapped to reconnect these oak ecosystems and facilitate movement of species. Most of the land within these buffer and corridor areas is privately owned. Training and outreach is required to help landowners understand the importance of these oak ecosystems, how to improve their biological diversity, and how to protect these sites if the property owner is interested. Close collaboration between the forest preserve districts in the seven-county region is needed to support compatible management, shared knowledge, and expertise. The CRTI is working within the partnership to gather organizations with on-the-ground education and outreach capacity to partner with the CRTI and to work with interested private landowners to teach them about their special properties

and how these rare oak ecosystems in the Chicago region can be preserved, protected, and enhanced.

Finding locally sourced tree seed can be a challenge. Within the Chicago region there are only a few nurseries that grow locally sourced trees. The majority of nurseries in the region purchase liner stock from Oregon, then grow and sell that liner stock here in Illinois. To protect local species composition, landowners, managers, and individuals are increasingly interested in obtaining locally sourced trees, shrubs, grasses, and herbaceous plants. The CRTI is working with public and private landowners and managers to identify what species they would like to plant, and is working with the Illinois Green Industry Association to find ways to get these species into production in local nurseries.

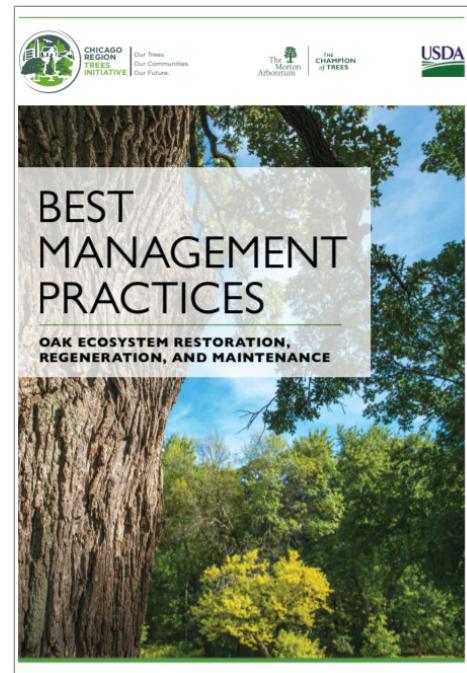
Resources are available to help landowners manage their oak ecosystems. A number of CRTI partners have resources that showcase the needs of oak ecosystems. These resources can be found at the ChicagoRTI.org

website in the Resource Library. The *Best Management Practices: Oak Ecosystem Restoration, Regeneration, and Maintenance* guide provides instructions on how to identify whether you have an oak ecosystem. This resource includes detailed, step-by-step instructions on how to effectively preserve, protect, and enhance oak ecosystems for improved biological diversity.

The *Oaks Need Your Help!* brochure developed by the CRTI explains to landowners, managers, and individuals that oak ecosystems are under threat, why they are important, and provides simple steps to support oak ecosystems.

The Illinois Forest Action Plan identifies the decline of oaks as a significant concern for the State of Illinois. In 2015, the CRTI requested designation of October as oak awareness month to draw attention to this problem. “OAKtober” provides an opportunity for groups and individuals across the State of Illinois to celebrate our natural heritage by hosting tree plantings, restoration work days, beer and wine festivals, service events, and other opportunities to draw attention to the plight of oaks in our state, and to learn how to help them.

Opportunities for preservation of oak ecosystems, in perpetuity, need to be more readily available and sought out. The majority of oak ecosystems are in private ownership with no protection. Thirty percent of the oak ecosystems are in public ownership by state, federal, county, or local governmental organizations and even these are not immune from potential land-use change. Currently, several state and federal programs exist that provide incentives for landowners to preserve and protect their land, but these programs have short timelines relative to the length of time it takes to achieve a high-quality ecosystem. These programs provide short-term financial incentives to facilitate development and implementation of management plans through funding and reduced property taxes. These are small incentives when compared with financial gain through opportunities for development. The CRTI partners can help facilitate protection of properties through land trusts if a landowner wishes to keep land in an oak ecosystem and can often provide incentives for this action. The CRTI would like to see opportunities and incentives



Tools and resources have been developed to help landowners, managers, and individuals preserve, protect, and enhance oak ecosystems on their property or in their community.

expanded for public and private landowners to protect their land through dedication, trusts, and conservation easements in perpetuity.

Funding for restoration of oak ecosystems is needed. While the Illinois Department of Natural Resources and Natural Resources Conservation Service have funds set aside to aid landowners with management plans and practices, this money often goes unused, with landowners unaware they can apply for assistance. The CRTI is working with both organizations to identify how funding can be allocated to the Chicago region to preserve oak ecosystems. In addition, the Oak Ecosystem Recovery Plan Advisory Committee is developing strategies for landowner engagement across the seven-county region to encourage community support for oak ecosystems, individual property owner education programs, and restoration and collaborative opportunities between public and private entities to support improved ecosystem health. Intergovernmental agreements between county and local organizations may be another way to facilitate management practices across jurisdictions, enabling cost reductions and increased management.

Chicago Region Trees Initiative will build creative alliances with hunting and recreational groups, in addition to working with state and federal representatives, to conserve oak ecosystems.

Working with hunting and recreation organizations, the CRTI will develop sources of funding for preservation and protection of healthy oak ecosystems. Additionally, the CRTI will work more closely with state and federal representatives to fully represent the needs of the Chicago region and to apply for funding to implement conservation practices for oak ecosystems. The challenges of the Chicago region are not unique. The CRTI will work with national and international forestry organizations to learn how they are addressing these same challenges and replicate those solutions in Chicago region.

Continued financial support for the latest scientific research on oaks is essential. Expanded funding for oak-based scientific research is needed to better understand the means and methods required to preserve and protect remnant oak ecosystems. Communication with scientists through the Center for Tree Science will help to identify

knowledge gaps in land manager practices and oak ecosystem research. Potential research needs and public or private partnership opportunities can be identified. It may be possible to acquire funding support from public or private sector landowners or nontraditional sources based on specific research needs. Through improved relationships with scientists, land managers, recreation, hunting, and other organizations it may be possible to increase funding for research based on local needs.

A better understanding of remaining oak ecosystems enables landowners and managers to more effectively manage this important resource. In the winter of 2017, the CRTI hosted a land manager and scientist round table discussion centered around current management strategies and the latest scientific research. Land managers were able to pose questions and concerns about management strategies, which provided the scientists with ideas for new research based on the land managers' needs. This meeting identified several new research needs, opportunities to conduct research on landowner property, and recommendations for future CRTI workshops around oak ecosystems. The CRTI has developed an oak ecosystem resource section on the CRTI website where land managers and owners can read the latest research and learn from others. The CRTI is currently working on private landowner and manager education and engagement. Through the CRTI partnerships new science can be shared with landowners. More opportunities for landowners and managers to get together and share their experiences have been expressed.

Monitoring and Adjustments to Achieve Success

This master plan is a living document. Imbedded into each phase are tracking and evaluation measures that will result in adjustments in subsequent phases so that success can be achieved. These measures include the Capacity Survey, which is conducted every five years.

This survey was first conducted in 2014 and the results inform programmatic changes and adjustments in CRTI to improve practices, resources, and effectiveness to meet challenges. In subsequent surveys stakeholders

and constituents will be asked to assess the success of the CRTI and make recommendations that will help to achieve the master plan goals and outcomes. It is the success of the stakeholders and constituents that results in success of the CRTI Master Plan. There are several annual surveys planned. In one survey, stakeholders will be asked to provide data on species, size and number of trees planted, size and number of trees lost annually, and who planted or removed the trees. We will continue to work with the Illinois Green Association on the nursery survey and expand it to include information on how trees are sold (bagged, containerized, balled and burlapped, or bare root), and on the number, size, and species of trees sold. This information will help to inform production practices and also alert stakeholders and constituents to opportunities for trees as they need them.

CRTI will continue to engage the Work Group and Advisory Committee members to direct the work of CRTI and align programs and resources to address needs to achieve the master plan goals.

Implementation of the CRTI Master Plan

Vision: The Chicago region will be the most verdant, most livable, most resilient region in North America.

Mission: Chicago Region Trees Initiative believes that trees are critical to achieving this vision. We will ensure that trees are healthier, more abundant, more diverse, and more equitably distributed to provide needed benefits to all people and communities that live in the Chicago region.

The Chicago Region Trees Initiative Master Plan is meant to be a holistic approach resulting in:

- People who understand the value of trees and are inspired to advocate and care for them;
- A larger healthier tree canopy that can provide increased benefits and services to improve quality of life;
- Threats to trees are reduced to improve the structure and function of the urban forest and make it more resilient to impacts; and
- Oak ecosystems are protected, enhanced, and restored to improve biological diversity and health now and for future generations.

This master plan is meant to be accomplished by 2050. It is not going to be easy and it is going to require that everyone work together to make success possible. It is important to recognize that this master plan is a living document that will be modified and adjusted to facilitate successful completion of the goals. Specific tactics have been identified to address individual goals and outcomes and are unique to each milestone phase. These tactics have measurements of success that will be evaluated at the end of each milestone phase. The first milestone phase will last six years, ending in 2025. Subsequent milestones will be achieved in five-year increments. At the end of each milestone period an evaluation report card will be produced to measure how the CRTI is doing in achieving its goals and what recommended changes need to take place to facilitate successful goal achievement.

The Chicago Region Trees Initiative Master Plan for 2050

Goal: Inspire People to Value Trees

Outcome: Improved Tree Health

1. Landowners, managers, individuals, agencies, and organizations across the Chicago region, across diverse populations, understand why increased canopy is important and the benefits trees provide.
2. Individuals, governmental entities, agencies, and organizations in the Chicago region know about CRTI and collaborate in implementation of the master plan.
3. Individuals volunteer in their communities to care and advocate for trees.
4. Public and private landowners and managers and governmental entities advocate for the preservation and protection of oak ecosystems.
5. Partners across the CRTI will have a thorough understanding of the perspectives, concerns, and needs of under-resourced communities, and these communities will be given priority attention to achieve equity of urban forest benefits.
6. Training and outreach is focused in priority communities for decision makers, staff, residents, and individuals interested in learning to be stewards.
7. Support partnerships are developed to assist these communities.
8. There is increased interest in forestry as a career and job training in urban forestry is expanded and includes returning adults, disadvantaged youth, and young adults.

Measurement of Success

- Messaging, resources, and information on the importance of trees are distributed to all the CRTI partners.
- Ninety percent of all communities in the Chicago region understand why increased canopy is important and the benefits trees provide.
- Ninety percent of all communities in the Chicago region are partners in CRTI and have set goals to increase the community's canopy, and to improve the community's professionalism and protection of trees.
- One thousand businesses or organizations partner in CRTI to implement the master plan.
- Seventy-five percent of communities have identified stewardship programs and tree advocates.
- Forty percent of oak ecosystem landowners participate in some type of conservation practice, especially on those properties identified in priority areas.
- Priority analysis will be completed for each community in the region and for all neighborhoods in Chicago. The top 50 priority communities and top 25 priority neighborhoods will be identified.
- Outreach materials and resources will be integrated into at least one event in 75 percent of the communities and neighborhoods annually.
- Seventy-five percent of priority communities and neighborhoods will utilize CRTI messaging with their constituents to educate them about the value of trees.
- Thirty-five percent of under-resourced communities will have support from public/private partnerships.
- CRTI will have strong partnerships with NGOs and service organizations, and professional organizations such as engineers, landscape architects, developers, planners, community leaders and those who can facilitate knowledge distribution to their constituents.
- There is an urban forestry job training program.

Goal: Inspire People to Value Trees

Outcome: Improved Urban Forest Policy

1. The general public advocates for and supports strong tree preservation policies and practices on public land and supports strong tree preservation policies, practices, and incentives on private land.
2. Decision makers develop, implement, and enforce tree preservation policies and practices on public land and tree preservation policies, practices, and incentives on private land.

Measurement of Success

- Eighty-five percent of communities have public property tree preservation ordinances that require standards and are enforced.
- Fifty percent of communities have private property tree preservation ordinances that require standards and are enforced.
- Twenty-five percent of communities that do not have a private property tree ordinance have incentive programs for tree preservation on private land for practicing standards.
- Seventy-five percent of communities have a tree board or other board that advises the community on tree issues.
- Eighty-five percent of communities have development ordinances that require protection and integration of trees into plans, and standards are required and are enforced.

Goal: Inspire People to Value Trees

Outcome: Increased Funding for Urban Forestry

1. Individuals advocate for strong urban forestry budgets.
2. Individuals, businesses, and organizations support, contribute to, and join together for increased tree planting and care.

Measurement of Success

- Seventy-five percent of communities allocate funding for tree care.
- Eighty-five percent of communities annually allocate funding for tree planting.
- Seventy-five percent of communities have a certified arborist on staff or contract with a certified arborist.
- Twenty-five percent of communities allocate funding for forestry through their 10-year capital budget.
- Fifty percent of communities prune public trees on a seven-year (or shorter) cycle.
- A minimum of 15 percent of people across the Chicago region participate in or contribute to some form of tree support, planting, or care within a five-year period.
- Two thousand businesses or organizations participate in some type of community tree program or support within a five-year period.
- A 10-year urban forest data collection process will be funded with provision for annual analysis.
- A fund will be established for tree grants for communities, neighborhoods, and others to plant and care for trees with at least \$500,000 allocated annually.

Goal: Inspire People to Value Trees**Outcome: Integration of Science**

1. The latest scientific research on the benefits and services trees provide is shared with decision makers, public and private landowners, and individuals.
2. The latest research on tree planting and care is broadly communicated.
3. The CRTI forest composition and canopy cover data is shared with public and private landowners and individuals so they understand the value of trees and what needs to be done within their community.
4. The CRTI has a clear understanding of the ability, desire and resources of those who own and manage trees and use this information to increase support for trees.

Measurement of Success

- Every two years a research review will be conducted and synthesized into a summary document to be shared with all partners.
- Every five years an urban forestry conference will be held on new research.
- Every two years a series of short information pieces will be developed and shared with partners for distribution to their constituents.
- Annually tree resources will be developed and distributed to partners to be shared with their constituents and also through the CRTI website.
- Presentations and hands-on training will be provided on the latest tree planting and care at the IAA, ILCA and IGIA annual conferences.
- An interactive map is developed for public use and hosted on the CRTI website. This map will allow access to the CRTI data so that the user can select specific information based on needs.
- Canopy Summary information will be updated as new resources are developed.
- The CRTI Operations Capacity Survey is completed and analyzed every five years.
- A five-year phase review is completed to determine what the CRTI needs to change to improve success.

Goal: Increase the Chicago Region's Tree Canopy (4 percent by 2050)

Outcome: Improved Tree Health

1. Landowners, managers, individuals, agencies, and professionals such as engineers, planners, developers, and others understand they are critical to increasing canopy cover by actively planting and caring for trees.
2. Landowners, managers, and individuals are trained to correctly select and plant trees with adequate root space and soil composition and know how to properly water, mulch, and care for them.
3. Broad species diversity and high-quality tree stock are available through nurseries and big box stores.
4. Large public and private landowners have a certified arborist on staff or contract for professional arboriculture services.
5. Opportunities for professional arboriculture training and International Society of Arboriculture certification increase.
6. Large public and private landowners have urban forest management plans.

Measurement of Success

- Annual training opportunities will be coordinated in partnership with professional organizations and associations.
- Annual training and resources will be available to all large landowners including train the trainer and information that can be relayed to their constituents.
- Seventy-five percent of large public landowners have an urban forest management plan.
- Thirty-five percent of large private landowners have an urban forest management plan.
- Seventy-five percent of communities have a tree inventory and keep it up to date.
- Seventy-five percent of communities will have trained stewards or advocates within the community who can help to facilitate local trainings.
- Every five years a round table discussion will be hosted by CRTI with foresters, landscape architects, and nurserymen to discuss challenges. Problems will be identified in the Capacity Survey.
- Every five years a training and round table discussion will be hosted by CRTI for engineers, transportation professionals, and contractors.
- IGIA will present tree-related training..
- Contract growing will be practiced by 50 percent of communities and 85 percent of nurseries.
- CRTI will have an established relationship with at least two of the big box store chains resulting in improved inventory and increased education to consumers for better tree and shrub selections.
- Seventy-five percent of large public landowners will have a certified arborist on staff or will use professional arboricultural services.
- Fifty percent of large private landowners will have a certified arborist on staff or will use professional arboricultural services.
- A scholarship program will be established that will allow for individuals with financial need to receive funding assistance to become a certified arborist.
- Forestry training and certification opportunities and online courses will be more broadly distributed across the Chicago region.



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- Partnerships with NGOs, community colleges, and arboriculture businesses will be established to introduce jobs and careers with internships and apprenticeships available.
- New trees are planted with specifications of not more than 5 percent of any one species, 10 percent of any one genus, or 15 percent of any one family.
- Nurseries will be surveyed to identify species in production, availability of trees, and consumer needs to address projected needs. This information will be used to inform consumers and assist in acquisition of species diversity.

Goal: Increase the Chicago Region's Tree Canopy (4 percent by 2050)

Outcome: Improved Urban Forest Policy

1. State, regional, county, and local trees, on public and private land, are recognized as critical infrastructure and are provided protection. Recognition and protection is provided for legacy trees.
2. Incentives or rebates are provided to public and private landowners who improve urban forest health and canopy cover.

Measurement of Success

- Eighty-five percent of communities have public property tree preservation ordinances that set standards for tree care and these ordinances are enforced.
- Fifty percent of communities have private property tree preservation ordinances that set standards for tree care and these ordinances are enforced.
- Twenty-five percent of communities that do not have a private property tree ordinance have incentive programs for tree preservation on private land for practicing standards.
- Seventy-five percent of communities have a tree board or other board that advises the community on tree issues.
- Eighty-five percent of communities have development ordinances that require protection and integration of trees into plans and standards are required and enforced.

Goal: Increase the Chicago Region's Tree Canopy (4 percent by 2050)

Outcome: Increased Funding for Urban Forestry

1. Funding is provided for implementation of the CRTI Master Plan.
2. Funding is available to achieve equitable distribution of trees across the Chicago region with special emphasis on under-resourced communities and neighborhoods.
3. Public/private partnerships to support trees increase in number.
4. Contract growing is firmly established and used.
5. Funding and scholarships are available for increased forestry training, certification, school, and internships.
6. A rebate or incentive program is in place for preservation and installation of green infrastructure practices and support of healthy trees.

Measurement of Success

- Eighty-five percent of CRTI operations and administration expenses are funded from grants or public/private partnerships.
- One hundred percent of CRTI programs and opportunities are funded through public/private partnerships.
- Seventy-five percent of communities allocate funding for tree care.
- Eighty-five percent of communities annually allocate funding for tree planting.
- Seventy-five percent of communities have a certified arborist on staff or contract with a certified arborist.
- Twenty-five percent of communities allocate funding for forestry through their 10-year capital budget.

- Fifty percent of communities prune public trees on a seven-year (or shorter) cycle.
- A minimum of 15 percent of people across the Chicago region participate in or contribute to some form of tree support, planting, or care within a five-year period.
- Two thousand businesses or organizations participate in some type of community tree program or support within a five-year period.
- A fund is established for tree grants for communities, neighborhoods, and others to plant and care for trees, with at least \$500,000 allocated annually.
- Contract growing will be practiced by 50 percent of communities and 85 percent of nurseries.
- There are two county agency rebate or incentive programs for green infrastructure and trees.

Goal: Increase the Chicago Region's Tree Canopy (4 percent by 2050)

Outcome: Integration of Science

1. Forest composition data is regularly collected, analyzed, and distributed to decision makers, landowners, managers, and individuals. (Urban Trees and Forests of the Chicago Region, LiDAR analysis, public and private property inventories, capacity surveys)
2. Research on the latest science related to trees and urban forestry is collected and taught, and outreach materials are easily accessible.

Measurement of Success

- Forest composition data collection is completed every 10 years. (Analysis is ongoing.)
- Every two years, a research review will be conducted and synthesized into a summary document to be shared with all partners.
- Every five years an urban forestry conference will be held on new research.
- Every two years a series of short information pieces will be developed and shared with partners for distribution to their constituents.
- Annually, tree resources will be developed, shared on the CRTI website, and distributed to partners to be shared with their constituents.
- Presentations and hands-on training will be provided on the latest tree planting and care at the IAA, ILCA and IGIA annual conferences.
- An interactive map is developed for public use and hosted on the CRTI website. This map will allow access to the CRTI data so that the user can select specific information based on needs.
- Canopy Summary information will be updated as new resources are developed.
- The CRTI Operations Capacity Survey is completed and analyzed every five years.

Goal: Reduce Threats to Trees**Outcome: Improved Tree Health**

1. New species planted do not exceed more than 5 percent of any one species (except when addressing age diversity or conservation needs).
2. Public and private landowners, managers, individuals, and organizations have a working knowledge of:
 - a. How and why to control invasive species;
 - b. Existing and potential invasive species; and
 - c. Climate-related vulnerability and adaptation strategies.
3. Landowners, managers, and individuals know how to conduct a tree health assessment.
4. Public and private landowners and managers actively observe and manage their oak ecosystems for potential invasive species and vulnerability to climate change.
5. There is a strong partnership with the USDA APHIS and IDA to reduce impacts from potential threats and to include public education and reporting.
6. Public and private landowners, managers, and volunteers are making decisions and managing the urban forest for climate resilience.

Measurement of Success

- Operations Capacity Survey is completed every five years and provides current information on species diversity and survival of trees.
- Annually, county-based workshops are held to teach landowners, managers and individuals how to manage invasive species and how to conduct a tree health assessment.
- Annually, New Invader Watch programs on new and potential pests and pathogens are taught on a county basis.
- Fifty percent of communities participate in the Northern Institute of Applied Climate Science training.
- Seventy-five percent of communities have an up-to date tree inventory.
- Each of the seven counties has identified at least three oak ecosystem core areas where active management across landownerships is taking place.

Goal: Reduce Threats to Trees**Outcome: Improve Urban Forest Policy**

1. Public landowners have ordinances and regulations that include strategies for awareness and management of:
 - a. Woody invasive species
 - b. Existing pests and pathogens
 - c. Potential pests and pathogens
 - d. Climate change
2. The Illinois Invasive Species Council is reestablished and functioning.
3. Communication between states regarding new invaders is improved.
4. The State of Illinois has a strong policy restricting the movement of firewood within and from outside of the state.

Measurement of Success

- Sixty-five percent of communities have public property tree preservation ordinances that include sections on management of woody invasive species, pests and pathogens.
- The Illinois Invasive Species Council meets regularly and CRTI reports out results and recommendations.
- Surrounding states participate in an annual meeting to discuss new invaders.
- Outreach and education materials are provided along highways, campgrounds and rest stations on the prohibition of moving firewood. (Coordinated by USDA and IDA in partnership with CRTI.)

Goal: Reduce Threats to Trees

Outcome: Increased Funding for Urban Forestry

1. Financial impacts of invasive species are quantified and used to teach and encourage management.
2. Resource allocation is increased for reduction and prevention of pests and diseases.
3. Funding is allocated for routine health assessments and pruning of trees (within a seven-year cycle) by public and private landowners.
4. CRTI will work with federal and state organizations to identify catastrophic loss relief.

Measurement of Success

- Costs associated with invasive species management will be included in the Operations Capacity Survey and shared.
- Invasive species, health assessment, and pruning will be included in the CRTI fund for communities, neighborhoods, and others to plant and care for trees.
- Funding is provided to assist with catastrophic loss of trees from invasive pests or severe weather

Goal: Reduce Threats to Trees

Outcome: Integration of Science

1. Regional, county, and local mapping of species diversity is available and used to reduce risk.
2. Communities have up-to-date tree inventories and actively use them.
3. Private property trees are inventoried.
4. The latest science on climate change, invasive species, and management strategies is disseminated.

Measurement of Success

- A CRTI interactive map is available online for public use. Included in the map is a “hot” list for increased risk.
- Seventy-five percent of communities have an up-to date tree inventory.
- A data analysis system is in place that can estimate private property species and age diversity.
- CRTI and partners share information on climate change and invasive species and recommendations for management through social media, website, and the latest communication technology.

Goal: Enhance Oak Ecosystems

Outcome: Improved Tree Health

1. Oak ecosystems on public and private property are managed to increase regeneration of oaks and associated species.
2. Biological diversity is expanded through reintroduction of native species for improved habitat.
3. Broad collaboration is occurring to reduce fragmentation and increase connectivity through oak ecosystem dominated corridors.
4. Public and private landowners know and use best management practices for managing their oak ecosystems.
5. There is broad access to locally sourced native trees in nurseries.

Measurement of Success

- Each of the seven counties has at least three oak ecosystem core areas where active management across landownership types is taking place.
- In the 21 core areas, best management practices are implemented and tracked.
- Twenty percent of local nurseries are selling locally sourced trees.



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Goal: Enhance Oak Ecosystems**Outcome: Improved Urban Forest Policy**

1. Core remnant oak ecosystem complexes on public and private land are recognized as our natural heritage and are protected.
2. Decision makers and private landowners recognize, protect, and incentivize protection of Oak Ecosystem Recovery Plan core, satellite, and corridor complexes.

Measurement of Success

- Six of the counties in the region pass a resolution that recognizes oaks as our natural heritage.
- Sixty-five percent of communities have development ordinances that require review and protection of oak ecosystems.
- Five of the counties invest manpower and funding assistance for collaborative partnerships with private landowners who work to implement the Oak Ecosystem Recovery Plan.

Goal: Enhance Oak Ecosystems**Outcome: Increased Funding for Urban Forestry**

1. Funding is secured for implementation and coordination of the OERP.
2. Private landowners know about and participate in local, state, and federal programs that provide tax incentives and funding assistance for protection, management plans, and implementation of best management practices for oak ecosystems.
3. There are increased public/private partnerships that support oak ecosystem protection and management.
4. Funding is available for scientific research that supports improved health of oak ecosystems.

Measurement of Success

- CRTI is successful in getting Natural Resources Conservation Service Partnership Program funding for management plans and implementation practices on private lands.
- CRTI is successful in getting federal funding through the Landscape Scale Restoration program for oak recovery.
- Conservation@Home participation is provided in each county and is active in 90 percent of the communities in the region.
- CRTI will work with local, regional, state and national partners and the Center for Tree Science to identify at least one research project every five years that is focused on oak research to achieve funding through National Urban and Community Forestry Advisory Council, Tree Fund, or other sources.

Goal: Enhance Oak Ecosystems**Outcome: Integration of Science**

1. Remnant oak ecosystems are identified and mapped, and the information is distributed to public and private landowners.
2. Oak ecosystem scientists and land managers collaborate and communicate on best practices for oak ecosystems.
3. The latest research related to oaks and oak ecosystems is distributed to public and private landowners and managers.

Measurement of Success

- An interactive map is posted that identifies cores, satellites, buffers, and corridors for the OERP. This information is available to the public.
- Every five years an oak scientist and land manager roundtable will be hosted.
- CRTI will track and distribute the latest oak research directly to public and private landowners and managers who participate in the OERP as well as post it to the CRTI website. ☀

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