ReLeaf
CEDAR RAPIDS

February **2022**
Cedar Rapids, Iowa

A Plan to Bring Back our Trees

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Plan approved by City Council February 2022

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Book design and illustrations by Chad Jewell.
Learn more at **chadjewelldesign.com**

CHAD JEWELL DESIGN

On August 10, with very little time to prepare, the City of Cedar Rapids was hit with a derecho, bringing wind speeds of well over 100 mph and causing widespread devastation throughout our community.

During and immediately after the storm, City crews began responding to emergency needs, including clearing tree debris from roads for residents and emergency vehicles, responding to emergency calls, and more. Beyond the critical safety and shelter needs, we knew in these early days that it was going to take years of thoughtful work and planning to recover from the devastation the storm brought to our precious trees.

Trees are an important part of the identity of Cedar Rapids, and replanting and restoration of our tree canopy is a priority of the City. The life of a tree is not easily or quickly replaced, so the need to start this piece of recovery is urgent. The City is very lucky to have Trees Forever, a nationally recognized organization, right here in our community. We are fortunate to have a strong public-private partnership, working together with Trees Forever to implement this comprehensive plan and fundraising effort so we not only replace trees, but also provide a diverse tree canopy that can withstand disease and bad weather. ReLeaf Cedar Rapids is a visionary plan to build back the 669,000 trees — 70 percent of our tree canopy — that was lost. It requires a significant investment of resources, but the impact of our efforts will be felt for generations.

I would like to thank the Cedar Rapids community for your support and patience during this challenging time. From an extremely difficult and trying situation, Cedar Rapids continues to show we are a strong and resilient community. Thank you for supporting this effort and showing the best of Cedar Rapids.

Jeff Pomeranz
Cedar Rapids City Manager

CEDAR RAPIDS
City of Five Seasons®

For tree lovers, the August 10 derecho was a horrible disaster. We watched as our trees went down, one by one, in such a short time. These were our friends, our shelter and homes for countless creatures—our living green infrastructure. We shed a lot of tears. With each change in season, we are reminded of our loss, yet we are a resilient community.

There's no time to waste ramping up our plan to replant. Trees grow faster than we think, especially when they have healthy root systems and enough water to thrive. Within five years, we will see a major difference along our streets, in our yards and in our many parks.

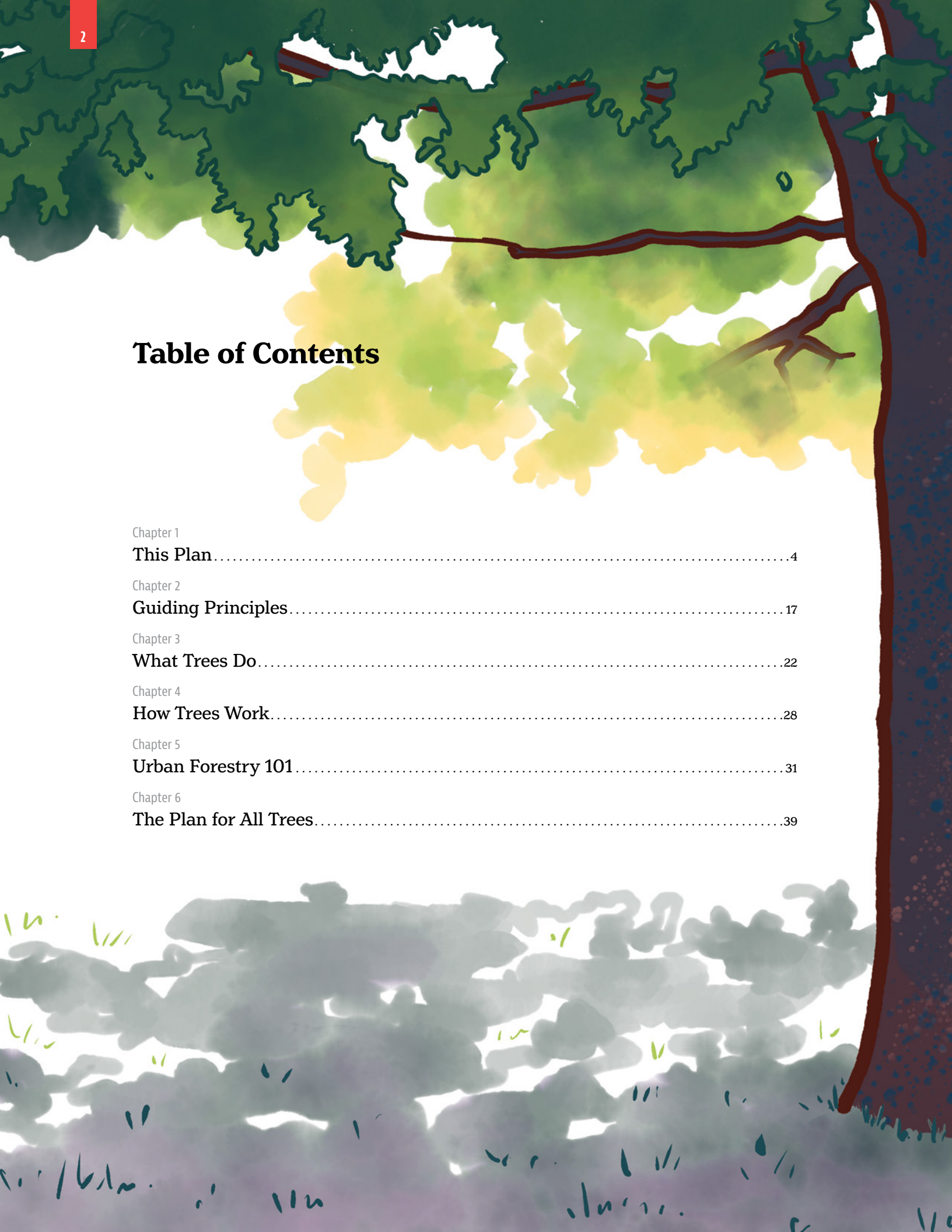
The Trees Forever mission is to plant and care for trees and the environment by empowering people, building community, and promoting stewardship. Our mission pretty much explains why we quickly said "yes" when asked to help lead the replanting effort. We've always collaborated with many community organizations, and will need to grow even more partnerships and build an army of volunteers to accomplish this ambitious plan.

Thanks to the many donors, volunteers and future helpers who have and will contribute to ReLeaf Cedar Rapids. Thanks to our Mayor, Council Members, City Manager and staff leadership for making replanting a priority! Future generations will indeed thank us for our hard work and generous commitments. As we plant and nurture our trees, they will once again shade and nurture us.

Best wishes for a green and growing future,

Shannon Ramsay
Trees Forever Founder

TREES FOREVER
Planting a better tomorrow™



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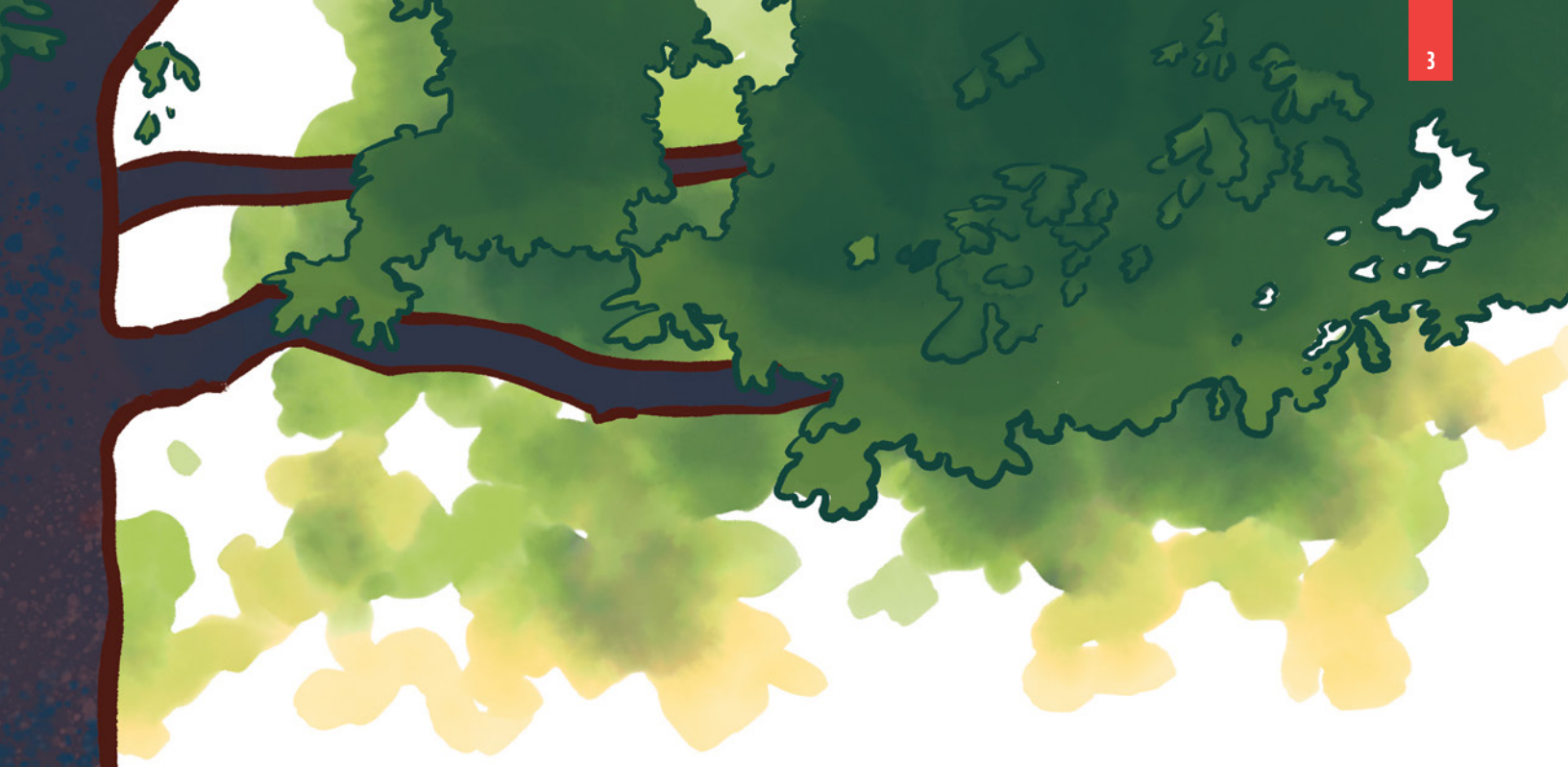

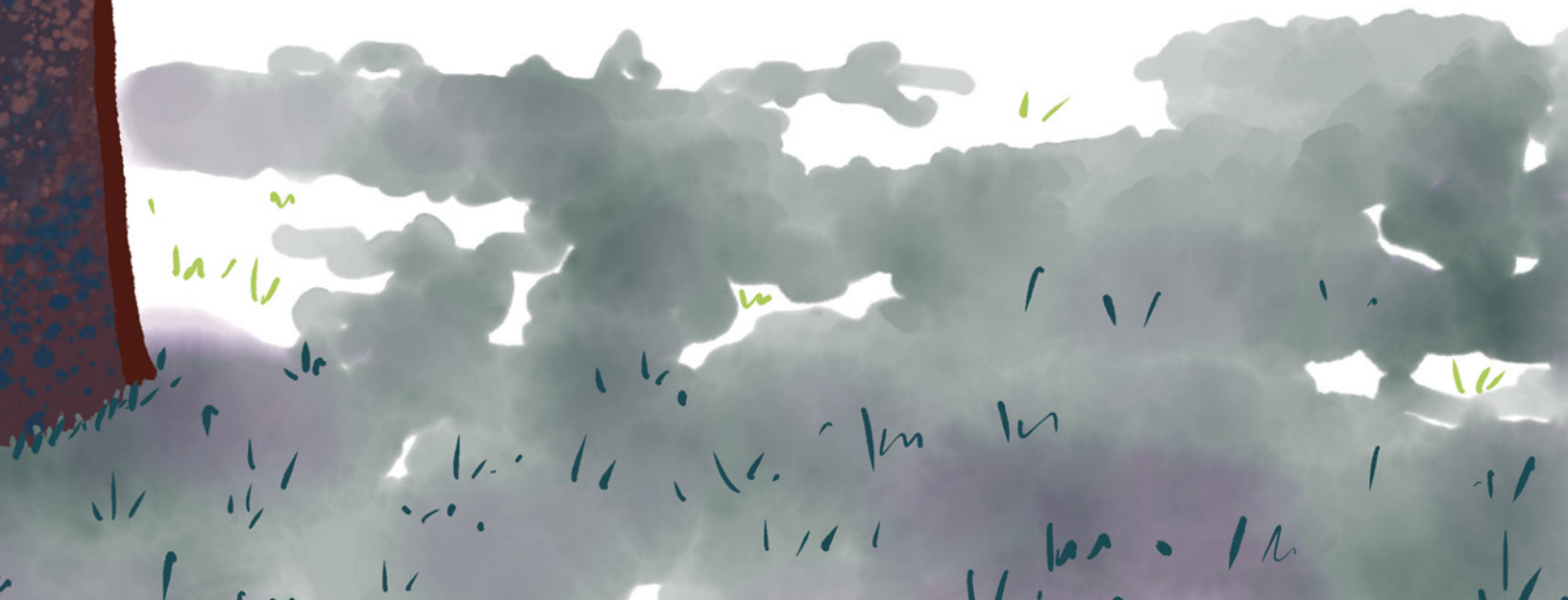

ReLeaf
CEDAR RAPIDS

This Plan

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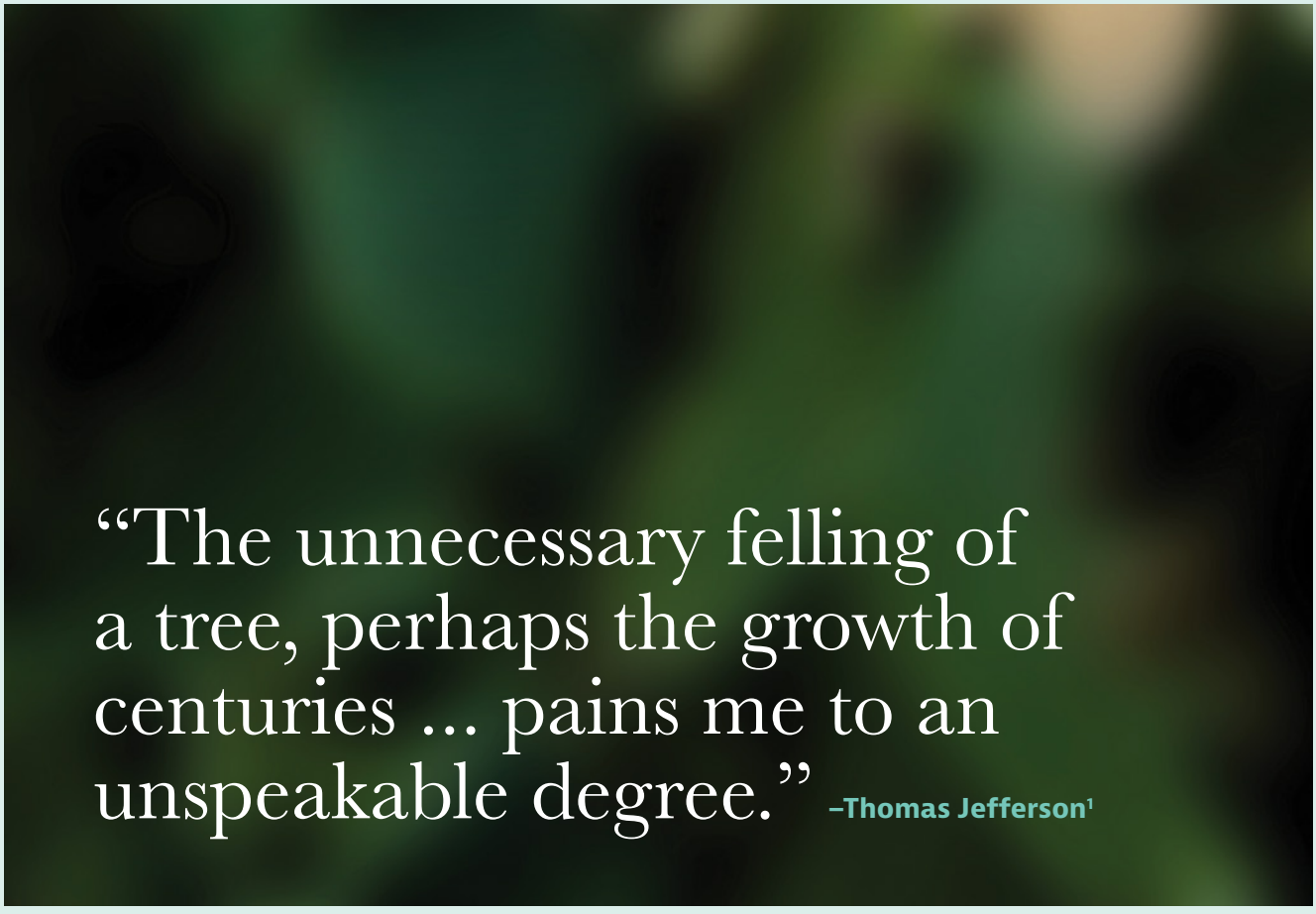

The Crisis

August 10 2020: It came with little warning. On a day that started sunny, the storm gathered in Nebraska and South Dakota and gained power as it sliced east. By the time it reached Des Moines, its gusts were surpassing 100 mph. It kept growing, and just as it reached peak strength, slammed into Cedar Rapids at 12:30 PM.[2]

For the next 30 to 45 minutes, an "inland hurricane" with gusts equivalent to an F3 tornado tore at the city. Sustained winds were estimated at 100 to 130 mph, gusting as high as 140. As described by Mary Sharp in The Gazette:

"Trees and power poles snapped. Roofs flew off. Homes and buildings collapsed. Huge trees—ones that had withstood decades of storms—were uprooted. Corn was flattened. Steel bins and steel street signs folded to the ground. Streets and roads were impassable. The lights went out—and stayed out—in 98 percent of Cedar Rapids. Every block in the 75-square-mile city and in nearby Marion, Hiawatha, Robins, and Ely suffered damage. An extraordinary 50 percent to 65 percent of the region's lush tree canopy was destroyed."[3]

Along the storm's path, four people were killed and hundreds injured. 350,000 Iowans lost power as 4,600 utility poles snapped. More than 1,500 gas leaks and emergencies were reported. A dozen semis were toppled on I-380, and 850,000 acres of corn was destroyed—an area larger than the state of Rhode Island. Property damage in Iowa has been estimated at $4.9 billion.[4]

No major city was hit harder than Cedar Rapids. A thousand homes were rendered uninhabitable, and hundreds of the hungry lined up at meal sites. But what one noticed first was the trees. Or, rather, the broad sky where the trees used to be.

In a place historically called the "Emerald City" for its lush canopy, a "Tree City USA" whose very city seal is a picture of a tree, two-thirds of the tree canopy was destroyed. Almost 670,000 trees were lost, creating a pile of debris 50 percent larger than the great pyramid of Giza, or 5 million cubic yards. Sadly, many of the trees felled were the largest, the most beautiful, and the most cherished. And while houses, businesses, and schools were being repaired in the months that followed, the trees did not miraculously reappear.

Such a catastrophic loss of tree canopy in a sizable American city is, quite literally, unprecedented. It is possible that no other weather event in modern history has killed so many city trees. Extraordinary challenges call for extraordinary responses, and the desire to be extraordinary motivates this plan. Completed over a full year under the direction of the City and Trees Forever, it has involved more than thirty all-hands meetings, over a dozen public and focus-group events, and at least a thousand staff and consultant hours, all directed towards the goal of becoming once again the Emerald City.

Completing this plan is just the first step in a ten-year effort, an effort that it hopes to direct. It was created with a conviction that how we build back matters; that the simple replacement of all that was lost—hard as that will be—is not enough. Cedar Rapids has a real opportunity here, not just to restore its canopy, but to do so in a way that maximizes so many of the things that residents care about: neighborhood beauty, comfort, and resilience; supporting wildlife and limiting global warming; empowering young people and improving equity; and even helping to create community. Trees can do all these things if we do this right.

Let's get started.

Google Street View of Center Point Road NE taken pre-derecho in June of 2019.

Same Google Street View of Center Point Road NE taken after the derecho in August of 2021.

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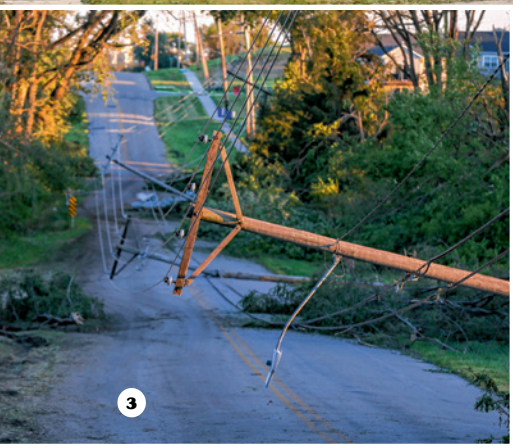

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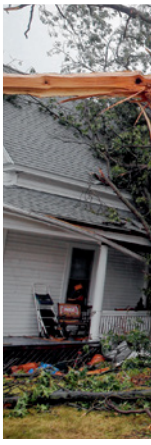
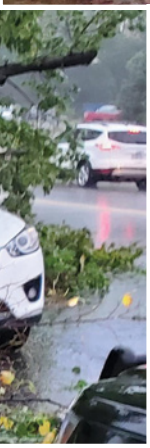


1. Archer Daniels Midland grain bins wrecked by the derecho. **2.** The Iowa State Patrol estimated that the storm's winds toppled a dozen semis on I-380. **3**. 4,600 utility poles required replacement after the storm. **4.** On First Avenue East, a tree fell on this car, trapping a woman inside. **5.** More than 1,000 houses in Cedar Rapids were deemed uninhabitable. 250 were destroyed.

Photographs by The Gazette and Tyler Richardson (4)

2



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6. Volunteers clear fallen trees at Second Ave SE **7.** A downed tree in northwest Cedar Rapids lifts sod and sidewalk. **8.** Eight large trees in downtown's Greene Square were destroyed. **9.** A home and an auto mechanic shop damaged by trees. **10.** One of the many sites where tree debris was collected.

Growing Back Better

Restoring the canopy of Cedar Rapids is a project for the next decade. In truth, it will take a generation of growth to regain the lovely shade and habitat we once had. But as the Chinese proverb goes: "The best time to plant a tree is twenty years ago. The second-best time is now."

Sometimes you need to lose something to realize how much it meant to you. For the people of Cedar Rapids, the destruction of the better part of the city's tree canopy has spurred a tremendous sense of loss. But it has also spurred a powerful resolve to build back, and a commitment to waste no time. Within a week of the derecho, this plan was conceptualized, and the City quickly pledged millions of dollars to the ReLeaf effort. Private tree adoptions and park re-plantings began as soon as the debris could be cleared. Not since Iowa's first Arbor Day, almost 150 years ago, has Cedar Rapids witnessed such collective momentum around planting trees.

> Give me a land of boughs in leaf
> A land of trees that stand;
> Where trees are fallen there is grief;
> I love no leafless land.
>
> –A.E. Housman

But a lot has changed in 150 years, especially when it comes to our understanding of how trees work. In the 1870s, few people were aware of the essential role that trees play in the food web that keeps us alive. Urban heat islands were a new phenomenon demanding little attention. Trees' ability to clean our water and our air was only beginning to be recognized. And nobody anticipated that manmade climate change would eventually cause us to see trees in a whole new light. It's fair to say that most of the trees destroyed in the derecho were planted at a time when their true value was not known.

Also not as well understood in past generations of planting was how to select and locate trees to optimize their lifespans and their benefits to us. We didn't know that non-native trees don't feed native animals. We didn't know that trees share nutrients and valuable information underground. We didn't know, it would seem, that planting street after street with ash trees was an invitation to blight. We didn't know—or didn't care—that a white oak easily provides ten times the ecosystem benefits of a Bradford Pear. There remains a tremendous amount that we don't understand about trees. But it is essential that the effort to replant our city be guided by what we do know. That is the purpose of this plan.

ReLeaf Cedar Rapids is a plan of who, what, when, where, why, and how. It describes the role that each of us can play; it recommends trees by species; it devises a ten-year sequence

Photograph by The Gazette

for street and park planting; it directs the location of these street and park trees and makes recommendations for yards; it attempts to justify these decisions with ample evidence; and it even provides some detailed instructions for tree planting and care. It does all this with the conviction that, as we tell our children, anything worth doing is worth doing the best that we can.

Above: As food spoiled in refrigerators and freezers without power, distribution sites kept residents from hunger.

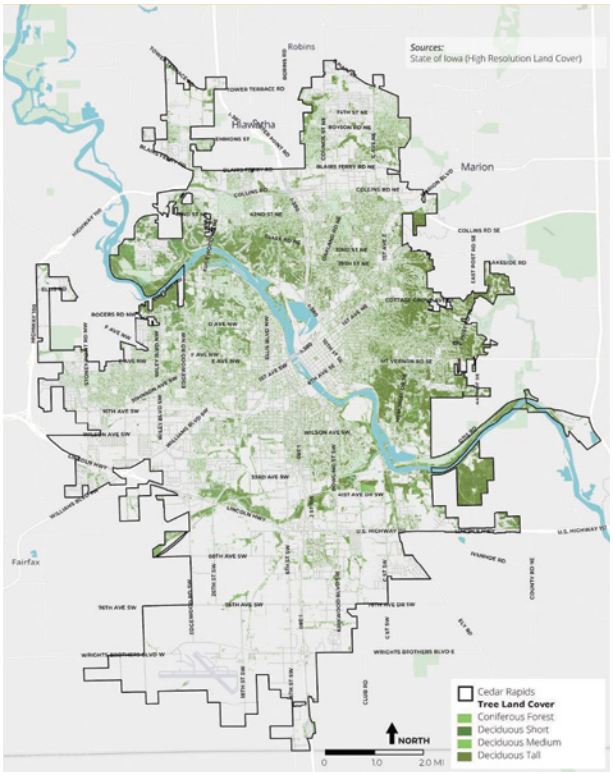
The Challenge at Hand

Before the storm, Cedar Rapids was already working to grow its canopy, which then covered about 24 percent of the city's land area, as illustrated on Map 1. The goal was to bring it up to 30 percent, on par with other midwestern cities. That change represented a 25 percent increase in tree cover, an ambitious but achievable goal.

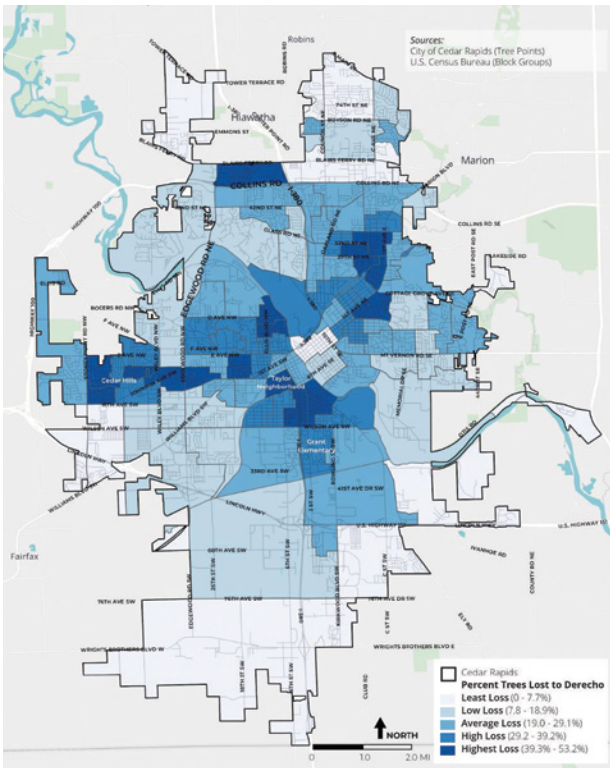
While post-derecho LIDAR measurements are not yet available, the estimated two-thirds loss of all canopy would suggest that only 8 percent of the city's land area is now shaded by trees. The goal of 30 percent coverage, once a marginal increase, now represents nearly a quadrupling, a daunting prospect. It's almost like starting from scratch.

Since so much of the canopy loss came from larger trees, the actual percentage of trees destroyed was considerably less than two thirds. This can be seen on Map 2 - Percentage of Street Trees Removed, which ranges only as high as 42 percent per census block group, and averages at 24 percent citywide. This could be considered good news. It means that many of the trees that will grow the city's canopy have already been planted. . . they just need time to mature.

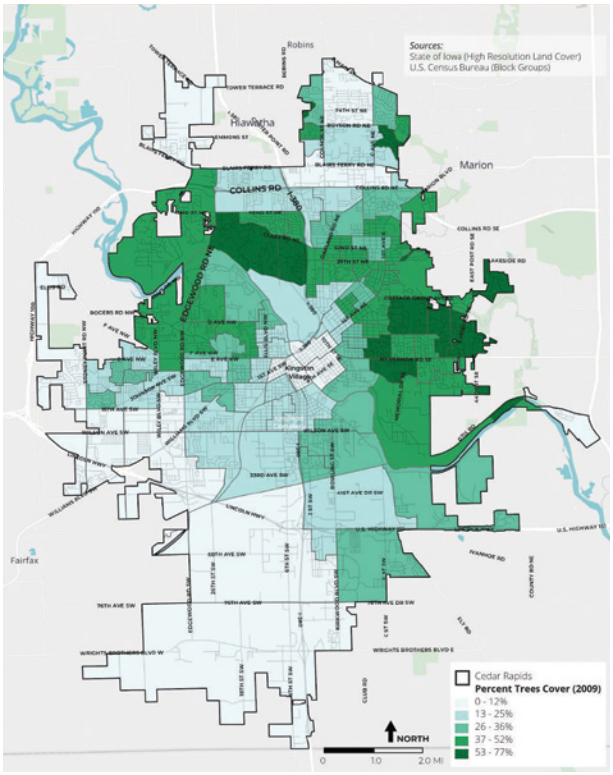
Some other important information can be gleaned from Map 2, most notably how different parts of town were more badly hit than others. Downtown, where trees are smaller and sheltered by buildings, fared relatively well. But areas to the immediate south, west, and northeast suffered badly. Also hard hit were some areas farther afield: Cedar Hills on the west side of town, the neighborhood just



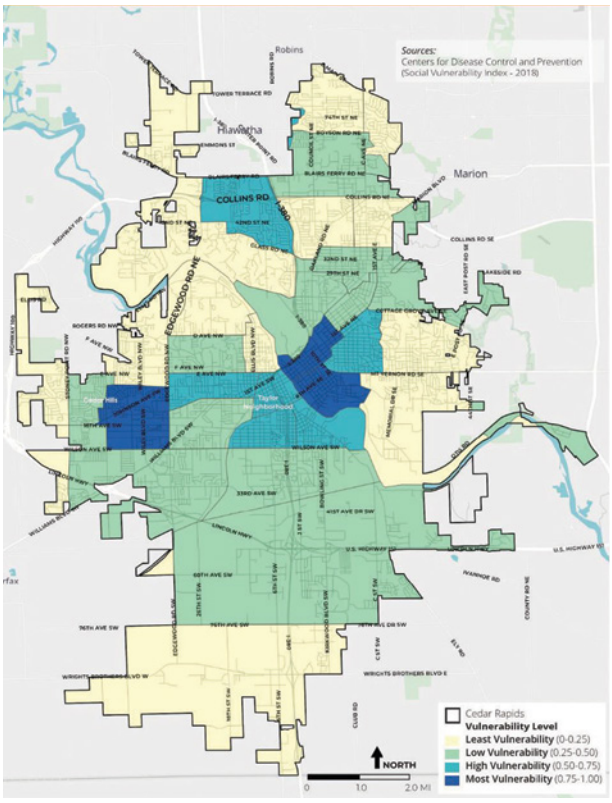
Map 1: The pre-derecho LIDAR mapping of Cedar Rapids canopy



Map 2: Percentage of street trees removed by census tract: a stand-in for tree loss overall



Map 3: Pre-derecho canopy cover by census tract



Map 4: Social vulnerability as measured by the CDC

south of Grant Elementary, and north of Collins Road between Edgewood and I-380, to name a few.

This map of loss should of course be considered in the context of Map 3 which represents the Pre-Derecho Canopy Cover by Block Group. As in most American cities, the pre-derecho tree canopy in Cedar Rapids was distributed inequitably. Downtown lost relatively few of its trees, but it had the least to begin with. Other areas, like the neighborhoods surrounding Linwood Cemetery and north of Collins Road between Edgewood and I-380, suffered the double-whammy of high percentage loss of a canopy that was already quite sparse.

A fourth image deserves our attention, especially in comparison to the three adjacent: the CDC's map of social vulnerability (Map 4). This map takes into account fifteen factors including unemployment, crowded housing, lack of vehicle access, and non-English speaking households to determine what parts of the city hold populations that are most at risk.

This map's correspondence with pre-derecho tree coverage is somewhat hit or miss, with the obvious exception of downtown: in a familiar pattern, downtown and its surrounding areas are among the most vulnerable. Otherwise, some of the city's more at-risk areas began with more canopy than one sees in the typical city.

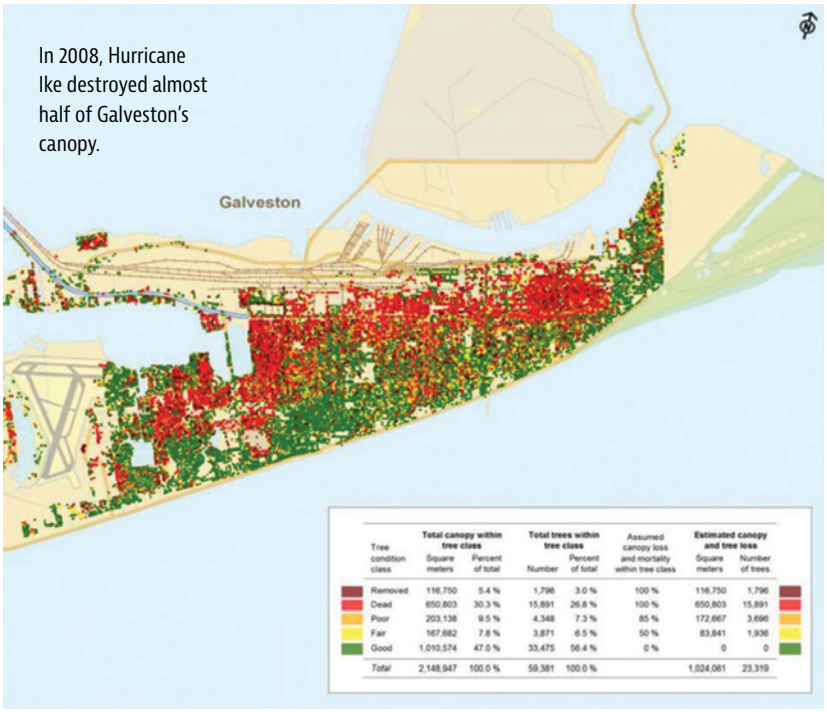
However, comparison with the derecho tree-loss map (Map 2) tells a more troubling story: with the exception of the downtown core, we can see that some of the most vulnerable areas lost the most canopy. This is especially evident in the neighborhoods flanking Collins Road, west of I-380, Cedar Hills, and Taylor Neighborhood. This unfortunate coincidence means that, in post-derecho Cedar Rapids, poor canopy and corresponding heat-island impacts track more closely with social vulnerability than was previously the case.

As will be shown in Chapter 2, the people of Cedar Rapids feel strongly that social equity should drive the plans to rebuild its canopy, so these maps of pre-derecho canopy, derecho tree loss, and social vulnerability will figure strongly in determining where the City plants first.

Other Cities Respond to Massive Tree Damage

A few decades ago, landscape architect and author Henry Arnold commented that "when tree plans become as common as zoning plans and transportation plans, we will have made a major change for more humane and livable cities."[5] Since then, dozens of cities from Sacramento to Cambridge have undertaken plans to grow their canopies, especially as people have become more aware of the role trees play in fighting climate change. There is a lot to be learned from these plans, and this effort began by reviewing many of them.

The experience of two cities in particular seem most relevant here: Galveston and Calgary. While no sizable North American city has ever experienced an event as destructive to its canopy as the 2020 derecho, these two places both lived through catastrophic weather events that led to massive citywide efforts to reforest.



In 2008, Hurricane Ike destroyed almost half of Galveston's canopy.

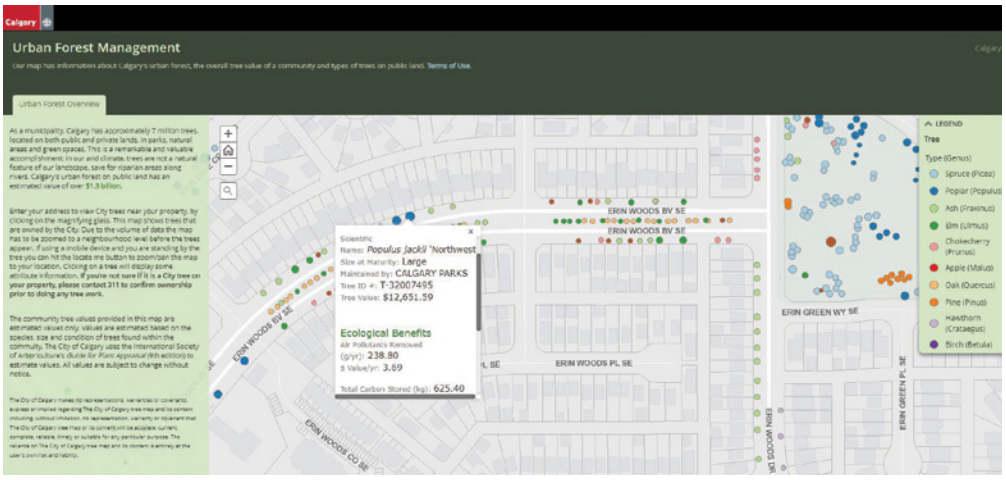
Tree condition class	Total canopy within tree class: Square meters	Total canopy within tree class: Percent of total	Total trees within tree class: Number	Total trees within tree class: Percent of total	Assumed canopy loss and mortality within tree class	Estimated canopy and tree loss: Square meters	Estimated canopy and tree loss: Number of trees
Removed	116,750	5.4 %	1,796	3.0 %	100 %	116,750	1,796
Dead	650,803	30.3 %	15,891	26.8 %	100 %	650,803	15,891
Poor	203,138	9.5 %	4,348	7.3 %	85 %	172,667	3,696
Fair	167,682	7.8 %	3,871	6.5 %	50 %	83,841	1,936
Good	1,010,574	47.0 %	33,475	56.4 %	0 %	0	0
Total	2,148,947	100.0 %	59,381	100.0 %		1,024,061	23,319

Estimated tree canopy loss in the city of Galveston, Texas between 2008-2009 as a result of Hurrican Ike From Galveston ReLeaf Strategic Plan

Galveston, Texas

In 2008, Galveston was hit by Hurricane Ike, its worst storm in more than a century. The island community lost an estimated 39 percent of its trees and 47 percent of its canopy. Being a smaller city than Cedar Rapids, this penciled out to roughly 40,000 trees, almost 11,000 of which were public. Many of these were the majestic live oaks for which Galveston is renowned.

The City's response was to commit to replanting 25,000 of those trees over the next five years. The plan was remarkable in the precision with which it ordered and budgeted the sequence of all public replanting. This was done across more than eighty parks, cemeteries, roads, public school campuses, public buildings, and parking lots, at a budget of $3,364,996. It counted every tree.



Top: In 2014, an early snowstorm in Calgary "peeled trees like bananas." **Bottom:** Calgary's public-facing forestry database tracks all city trees, including in parks.

Calgary, Alberta

In September of 2014, a storm dropped nearly a foot of wet snow on a city in full leaf, damaging almost all its trees. While relatively few were killed, 350,000 out of 400,000 public trees required major pruning.

Calgary has roughly ten times the population of Cedar Rapids but the lowest tax rate of any major city in Canada. In response to the storm, the City invested $47 million in just three years. It trimmed almost every damaged tree and refined an inventory system that keeps close track of all street and park trees, including data on each tree's size, value, ecosystem impacts, and the party responsible for its maintenance. The interactive map can be viewed at maps.calgary.ca/TreeSchedule.

Cedar Rapids currently has a similar database—do a web search for "CR Street Tree Viewer"—but it does not yet include park trees, and many of the data fields for each tree are not yet populated. In Calgary, all tree crews carry GIS-enabled tablets (Cedar Rapids does as well) and enter real-time updates as they traverse the city. The key metric is "trees touched," and each year, City staff tries to touch every one that needs it. This is a model worth emulating.

Different size cities, different weather crises, even different countries; Galveston and Calgary both show us how dramatic tree loss can be met with a dramatic commitment to recovery. And, how central to that recovery is a methodical focus on every tree: its health, its needs, and its value. A similar focus drives this plan.

Photograph by The City of Calgary

How to Use This Plan

ReLeaf Cedar Rapids was designed to be a plan for everyone, but how you use it depends on who you are. Created in partnership with the City, the plan is meant to direct City efforts to replant public streets and parks. But 85 percent of the trees in Cedar Rapids are privately owned, so the plan focuses first on helping families and institutions replant their own properties. There is a lot in here, and the curious are invited to read it all, but you can save time by turning to the chapters that matter to you.

Let's review the table of contents, and walk briefly through each chapter:

2. Guiding Principles

A plan is only as good as its principles. A key first step in creating this plan was to determine; through a public process, what foundational beliefs should drive the ReLeaf effort. This chapter describes the outreach process, lays out the resulting nine ReLeaf Principles, and ends with the Mission Statement that they generated.

3. What Trees Do

We are only beginning to understand all the ways that trees benefit us, our community, and our environment; the list keeps growing. Currently, there is ample evidence documenting how trees clean our water and air, sustain the food web, fight climate change, improve our physical and mental health, eliminate urban heat islands, generate social capital, improve home values, lower energy costs, help businesses succeed, and even reduce crime and car crashes. This chapter makes the powerful case for planting more trees.

4. How Trees Work

Trees are fascinating creatures. New discoveries about their biology are being made every day, and these insights should influence any plan to plant them. This chapter quickly shares the latest research on the lives of trees: how they grow and survive, how they support each other, and how they can thrive not just in forests, but in our neighborhoods.

5. Urban Forestry 101

We have been planting trees in cities for centuries, and much has been learned from that experience. Some of this knowledge has been forgotten and needs reinvigorating if this plan is to truly represent "best practices." Additionally, scientists like Doug Tallamy have recently shown how important trees can be to preserving the food

Daniels Park as seen on Google Street View from Oakland Road NE in June of 2019.

web that keeps our planet habitable; this knowledge gives further direction to the ReLeaf effort.

6. The Plan for All Trees

Some parts of this plan apply just to city trees, and other parts just to private trees, but this chapter applies to all trees and should be read by everyone. It begins with the ReLeaf Rules, eight mandates that grow naturally out of the lessons of Chapters 4 and 5. It then shares the ReLeaf Tree List, the plan's central resource, and provides basic instruction on how to plant and care for trees. It ends with a focus on daunting supply chain challenges and introduces a partial solution in the form of an ambitious program around seedlings.

7. Private Trees 1: The Plan for Yard Trees

Each of chapters 7, 8, 9, and 10 are individual plans for one aspect of the ReLeaf effort: private yards, institutions, streets, and parks. Each one discusses the issues unique to its category and ends with a simple summary of specific actions required. Chapter 7 focuses on house yards: how to replant them quickly and well; how to improve the number and quality of trees available; a campaign around seedlings; and other opportunities to generate the most public benefit from this private resource.

8. Private Trees 2: The Plan for Institutional Trees

The biggest institutions in Cedar Rapids are its school districts, colleges, universities, private schools, hospitals, golf clubs, cemeteries, churches, and major corporations. Most of these occupy large areas of land, and most lost a great number of trees. This chapter talks about what each of these institutions can do to replant most effectively, why it matters, and what resources are available to help.

9. Public Trees 1: Street Trees

Chapters 9 and 10 are special because they were made with the City for the City. They contain not recommendations or advice, but rather specific actions that the City itself will take as it replants. As such, each chapter begins with a version of the ReLeaf Rules that applies just to the topic at hand; in Chapter 9, these are called the Street Tree Rules. These are followed by discussions on tree spacing, species distribution, and strategies for special locations including downtown streets, gateway corridors, and those neighborhood streets that were built without any trees at all. Then, importantly, this chapter lays out a system for ordering the replanting of streets, in which priority is determined based on eight factors including derecho tree loss, pedestrian activity, and the social vulnerability of

Daniels Park is rendered nearly unrecognizable from its earlier self in this Google Street View taken from the same vantage point in August of 2021.

the neighborhood. Finally, measures are suggested for improving the street tree supply chain.

10. Public Trees 2: Park Trees

Chapter 10 begins with the Park Tree Rules, and then jumps into a discussion on how the replanting effort can make Cedar Rapids' parks even better than they were before the derecho. These techniques are applied in the specific replanting design of 38 separate park properties citywide; these plans are contained in this document's Appendix, with two featured in Chapter 10 as examples. This is followed by a description of Cedar Rapids' main types of park properties, and planting strategies for each. Finally, as with street trees, a system is presented for prioritizing the replanting of all city parks over the next ten years based on an objective analysis of their importance.

11. City Ordinances and Policies

A city's form is the outcome of its codes; the ordinances and manuals that dictate the design of the public realm. When it comes to the efforts of both private developers and City Public Works, these rules set the standard for tree spacing and location in streets and parking lots and for the protection of the existing canopy. How these rules are enforced also makes a difference. This chapter recommends changes to the wording and implementation of a few rules and policies that have a major impact on the City's canopy.

12. Implementation

Everyone in Cedar Rapids has a role to play in the ReLeaf process. City Council, City staff, Trees Forever, private nurseries, real-estate developers, corporations, non-profits, homeowners, and other residents—each can help in their own way. This final chapter makes an effort to name all the different players and what they can do. It then describes the funding process and summarizes the proposed ReLeaf budget. A section on advocacy talks about the different ways that we can keep the momentum to ReLeaf strong.

Appendix

This document includes a lot of valuable information that would have made this plan twice as long, including a detailed budget, the street and park tree replanting prioritization, plans for 38 city parks, and a lot more. It is available by request from Trees Forever or online at CityofCR.com/ReLeaf.

Greene Square as seen from 4th Ave. SE on Google Street View pre-derecho.

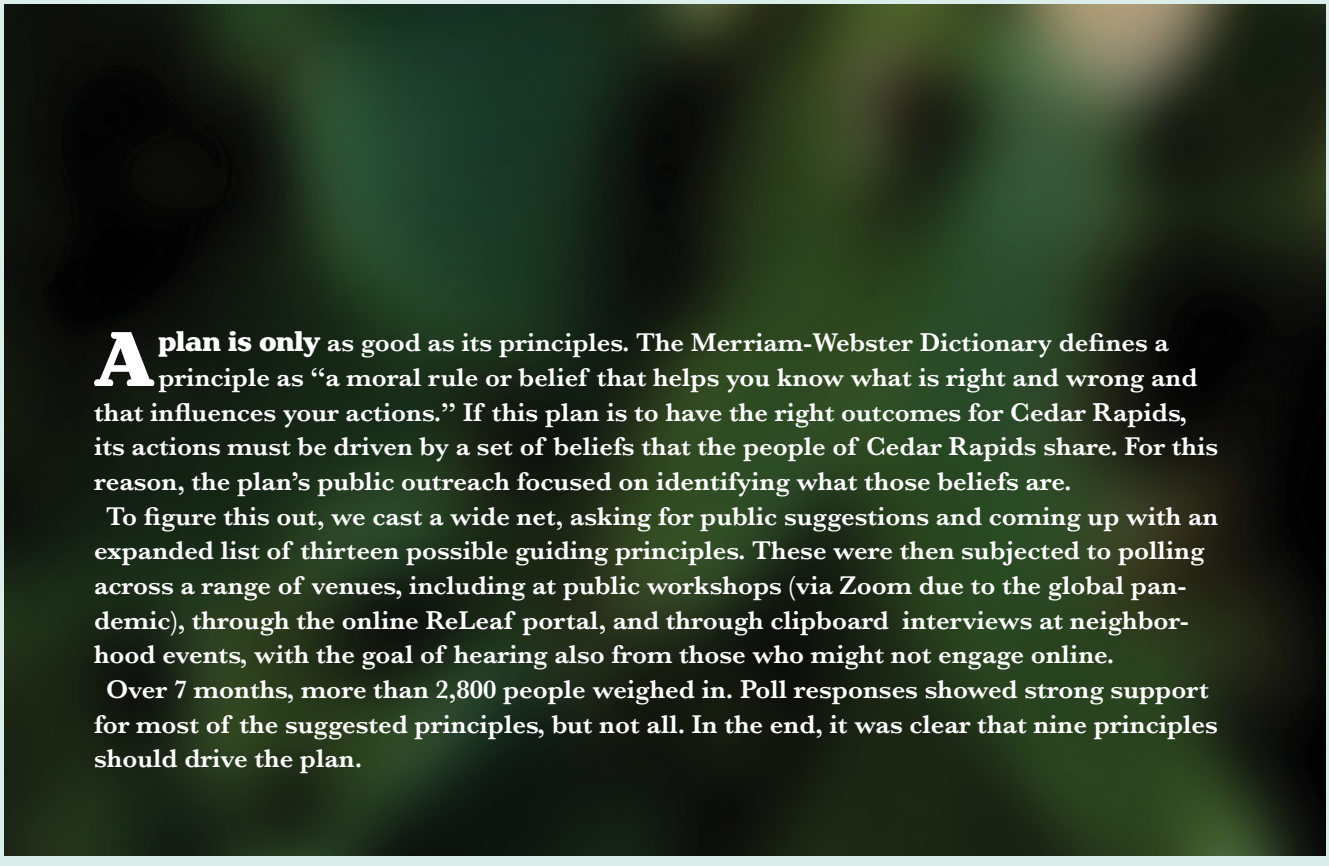
Greene Square as seen from 4th Ave. SE on Google Street View post-derecho.

ReLeaf
CEDAR RAPIDS

Guiding Principles

2

"We ought not to cease until every man feels it to be one of his moral duties to become a planter of trees." -Alexander Jackson Downing[6]



A plan is only as good as its principles. The Merriam-Webster Dictionary defines a principle as "a moral rule or belief that helps you know what is right and wrong and that influences your actions." If this plan is to have the right outcomes for Cedar Rapids, its actions must be driven by a set of beliefs that the people of Cedar Rapids share. For this reason, the plan's public outreach focused on identifying what those beliefs are.

To figure this out, we cast a wide net, asking for public suggestions and coming up with an expanded list of thirteen possible guiding principles. These were then subjected to polling across a range of venues, including at public workshops (via Zoom due to the global pandemic), through the online ReLeaf portal, and through clipboard interviews at neighborhood events, with the goal of hearing also from those who might not engage online.

Over 7 months, more than 2,800 people weighed in. Poll responses showed strong support for most of the suggested principles, but not all. In the end, it was clear that nine principles should drive the plan.

The Public Process

Poll participants were asked to rate the thirteen initial principles on a scale of 5 (most important) to 1 (least important), and also to rank them in order of preference. This second exercise turned out to be useful, as most people liked most principles, and the ranking forced some tough choices. The ratings and rankings were then combined to create overall scores, shown here.

It is clear that there were essentially three tiers of scores, with two principles under-performing the others: *Homeowner Choice* and *Edible Landscape*. These had been described in the poll as follows:

***Homeowner Choice*:** Homeowners in Cedar Rapids have traditionally been allowed to choose the species of street tree the City plants in front of their house, and sometimes to stop the City from planting at all.

***Edible Landscape*:** Street, yard, and park trees can feed people as well as animals. Planting fruit and nut trees can shrink urban food deserts.

Given its low performance, *Edible Landscape* was eliminated from the principles list. It was not cut from the plan, however, since it can be provided in certain locations like parks without conflicting with other principles. *Homeowner Choice*, in contrast, was eliminated entirely, because it directly conflicts with as many as six principles that were rated higher, such as *Native Landscape*, *Species Diversity*, and *Beauty & Character*. It just isn't possible to deliver fully on these goals without the City being able to select the species of the trees it plants.

Finally, the resulting list of eleven principles was reduced to nine based on two realizations:

- It turned out that the concept of *Expediency* simply wasn't up for debate. The mandate from the City was to complete the ReLeaf effort within a decade, so that principle became instead a mere given.

- Research demonstrated that the two principles of *Habitat Preservation* and *Native Landscape* were essentially the same, since only native plants provide adequate habitat for native creatures. They were combined into *Native Habitat*.

While each of the remaining nine principles received different average scores, the range of those scores ended up fairly small, only 0.75 points on a 5 point scale. We can comfortably say that they are all very important to the people of Cedar Rapids. Moreover, none of them conflict with any of the others; there is no reason that they can't all drive the plan.

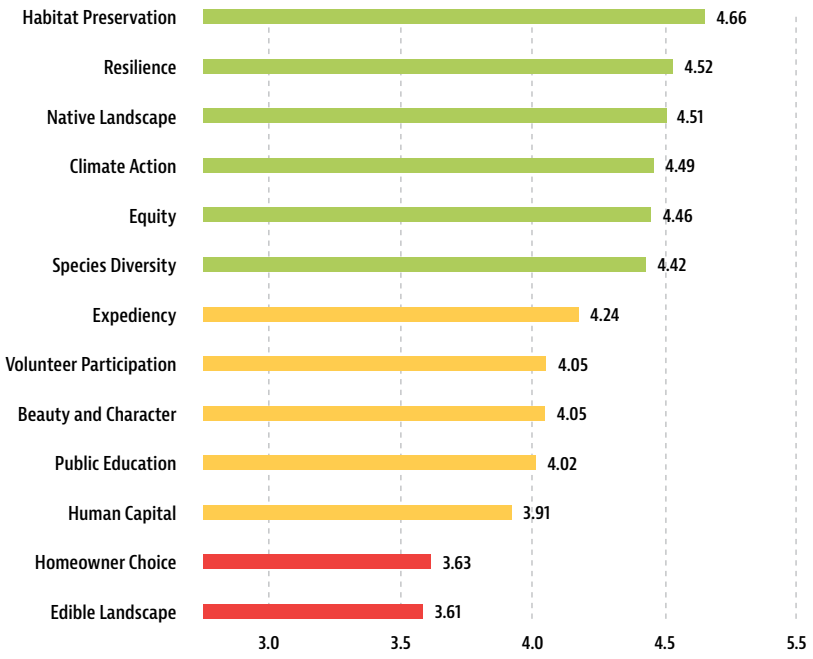
These nine principles can conveniently be grouped into three different categories:

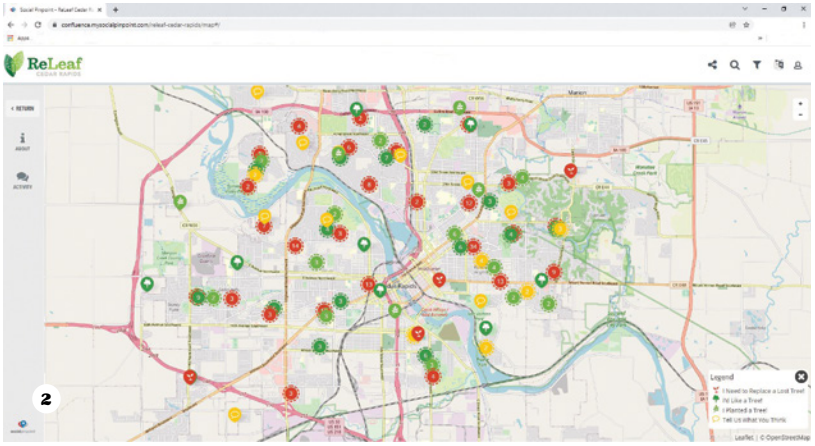
- Planet: Rebuilding the canopy to keep the earth supportive of life.

- People: Rebuilding the canopy for the best social outcomes.

- Plants: Rebuilding the canopy with trees that last and maximize their impact.

Guiding Principles Rankings





1. Jeff Speck provides an update on the ReLeaf planning effort at the Cedar Rapids Public Library in August of 2021 **2.** Residents were asked to provide input on the plan's guiding principles and to map their trees via the effort's interactive Social Pinpoint website **3**. Patrick Alvord with Confluence speaks with a resident during the Derecho Anniversary event at Bever Park on August 10, 2021

Photographs by Trees Forever

The ReLeaf Principles

Planet Principles

Native Habitat

Our continued presence on this planet is threatened by a "sixth mass extinction" already underway. Right now, 52 percent of insects and 25 percent of mammals face extinction risk thanks to habitat loss. Native trees are a key component of the food web that supports these creatures and, ultimately, us. Non-native trees do not feed local insects or birds.

Climate Action

Cedar Rapids must do its part to fight climate change. Trees are a primary defense against global heating, and trees near roads are uniquely effective at absorbing greenhouse gases.

People Principles

Equity

The benefits provided by local trees include improved air quality, greater stormwater absorption, lower summer temperatures, higher property values, and even reduced crime. These benefits matter everywhere, but are especially impactful in historically underserved neighborhoods, where investment in a robust tree canopy can balance out other disparities.

Human Capital

The job of replanting Cedar Rapids and tending to its canopy requires workers who can potentially come from anywhere. Given that this is a multi-year effort, and tree service management training can lead to a good career, local talent—especially low-income youth— should be nurtured in the plan's execution.

Volunteer Participation

Many positive personal impacts come from planting trees and helping them grow, and residents who help with planting are more likely to value and care for trees in the years ahead. Also, most of Cedar Rapids' trees are privately owned, so rebuilding a robust canopy will depend on robust citizen action.

Public Education

The post-derecho replanting of the Cedar Rapids canopy provides an unmatched opportunity to inform the public about the value of trees. It can also be used to involve and educate schoolchildren and adults around forestry, ecology, geography, and meteorology.

Plant Principles

Resilience

The derecho taught us a valuable lesson. Future storms are inevitable, as are blights like the emerald ash borer. Trees must be selected, sourced, planted, and tended with an eye to these risks. Stormwater management—key to a resilient community—must also inform planting decisions.

Species Diversity

A resilient ecosystem is built from a wide variety of trees and plants, and the threat of diseases and insects mandates that we don't rely on too few tree species. Additionally, good cities offer the delight of variety, and allow different neighborhoods to distinguish themselves through their trees.

Beauty and Character

One of the great benefits of trees is the pleasure provided by their changing shapes, colors, scents, and sounds. Also, urban trees rarely stand alone, but rather contribute to placemaking in combination with others. The selection and grouping of trees should be informed by their beauty and the goal of establishing places of distinct character.

Mission Statement

The nine principles can be summarized in one sentence, which can also be considered this plan's mission statement:

ReLeaf Cedar Rapids is committed to rebuilding a resilient canopy of mostly native trees, one that preserves citywide plant diversity and distinct neighborhood character, while striving to limit climate change, increase social equity, encourage volunteerism, grow human capital, and educate our children.

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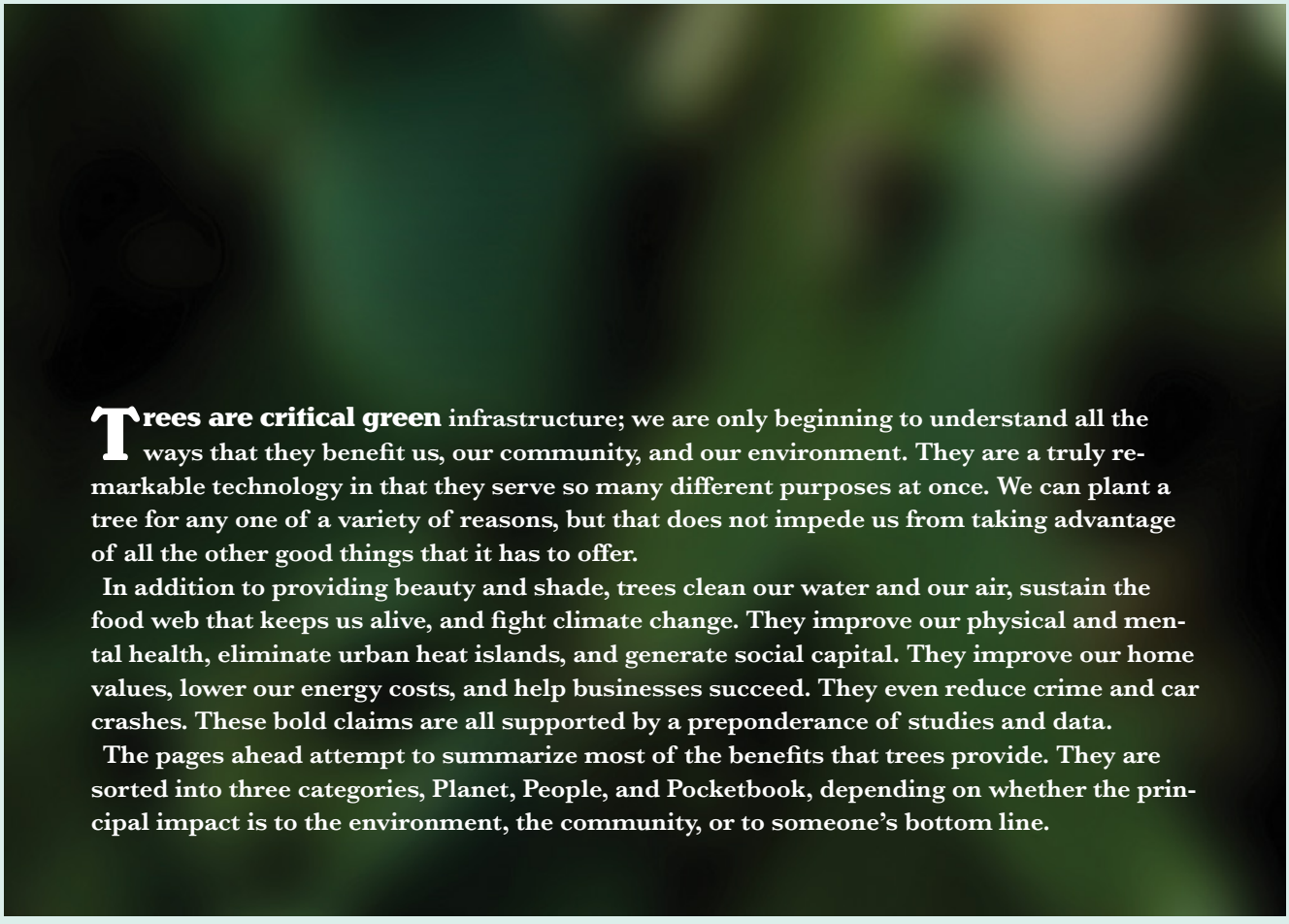
What Trees Do

3



Trees are critical green infrastructure; we are only beginning to understand all the ways that they benefit us, our community, and our environment. They are a truly remarkable technology in that they serve so many different purposes at once. We can plant a tree for any one of a variety of reasons, but that does not impede us from taking advantage of all the other good things that it has to offer.

In addition to providing beauty and shade, trees clean our water and our air, sustain the food web that keeps us alive, and fight climate change. They improve our physical and mental health, eliminate urban heat islands, and generate social capital. They improve our home values, lower our energy costs, and help businesses succeed. They even reduce crime and car crashes. These bold claims are all supported by a preponderance of studies and data.

The pages ahead attempt to summarize most of the benefits that trees provide. They are sorted into three categories, Planet, People, and Pocketbook, depending on whether the principal impact is to the environment, the community, or to someone's bottom line.

Planet

Trees Clean Our Water and Reduce Flooding

Cedar Rapids is a city that knows too well the threats posed by heavy rain. While flash flooding is a more alarming prospect, another serious concern is the ongoing impact of stormwater runoff on the Cedar River.

Stormwater is generally not treated in Cedar Rapids. It mostly flows directly into the watershed, picking up motor oil, tire dust, asphalt particles, fertilizers, bacteria, and other contaminants on the way.

Trees are amazing rain collection machines. They provide a dense vegetative canopy on a small footprint;[7] they are, quite literally, umbrellas. Their root systems are also massive sponges for stormwater, sucking up rainfall while protecting the soil from erosion.

A mature tree absorbs about the first half inch of each rainfall that hits it.[8] In a typical Cedar Rapids neighborhood, thousands of gallons of rainfall is absorbed by trees before it can become stormwater. The older, large-canopy trees lost to the derecho were especially active in protecting the Cedar River. Keeping our watershed clean and healthy means planting more fast-growing trees now.

Trees Provide Wildlife Habitat and Sustain the Food Web

In urban, suburban, and agricultural areas, the presence of wildlife is utterly dependent on trees. And as more of America urbanizes, maintaining an urban forest becomes essential to the survival of the species upon which our own survival rests.

Climate change and unchecked development have launched the Earth's sixth mass extinction event. Currently, 52 percent of insects, 13 percent of birds, and 25 percent of mammals face extinction risk due to habitat loss.[12] Key to human survival are the pollinators, which include butterflies, bats, hummingbirds, and especially bees. We rely on pollinators for 30 percent of our food crops and 87 percent of all plant life.[13]

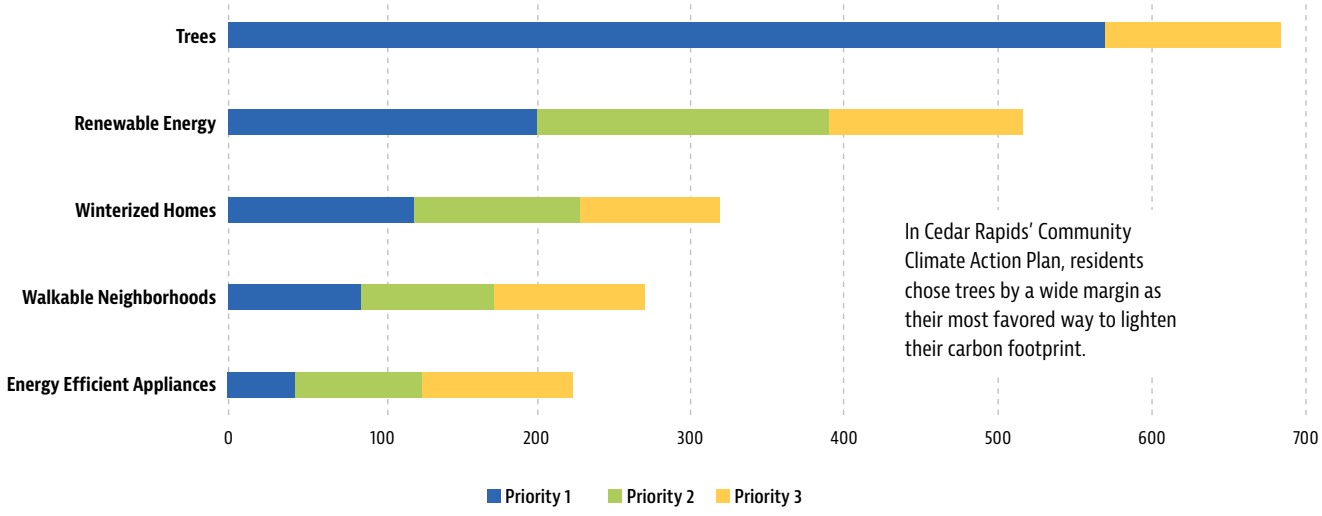
In many places, bees are experiencing Colony Collapse Disorder. In the last fifty years, half of the Midwest's native bee species have disappeared.[14] Just as crops, plants, and trees need bees and other pollinators, pollinators need trees, both as habitat and for food. Planting more trees—specifically native species—will help to heal the food web that sustains us all.

Trees Fight Climate Change

For Iowans, climate change is both a global and a local crisis. Cedar Rapids is already suffering from the increase in heavy rainfalls and storm events that come with a heating planet. National scientists point to last August's Iowa derecho as a prime example of the dangers posed by global warming.

One powerful way to limit climate change is to plant trees. In what economists call an "ecosystem service," trees are unsurpassed in the landscape at absorbing CO_2. A forest tree, over its lifetime, can store up to 22 tons of carbon dioxide in its trunk.[15]

Top 5 Priorities for Climate Action from Survey



In Cedar Rapids' Community Climate Action Plan, residents chose trees by a wide margin as their most favored way to lighten their carbon footprint.

And urban trees, located close to roadways, are ten times more effective than more distant vegetation at hijacking car exhaust before it hits the atmosphere.[16]

Additionally, thanks to their impacts on local temperatures, trees also reduce the amount of greenhouse gases released from power plants. Per capita, Iowa is the fifth largest energy consuming state in the nation, and about half of that energy comes from coal and natural gas.[17] Well-placed street and yard trees can dramatically reduce a building's air conditioning load and its heating load as well, lowering citywide demand for fossil-fuel-sourced electricity.

Trees Clean Our Air ›

As trees grow, they pump out the oxygen we breathe. A typical mature tree gives off hundreds of pounds of pure oxygen each year.

But even more impactful is the way that trees keep the air clean by filtering out dangerous pollutants. The leaves of trees draw in particulate matter like dust, pollen, ash, and smoke, and poisonous gasses like ozone, nitrogen dioxide, and sulfur dioxide. They specialize in absorbing the volatile organic compounds (VOCs) from car, lawnmower, and leaf-blower exhaust.[9] As Peter Wohlleben puts it, "acids, toxic hydrocarbons, and nitrogen compounds accumulate in trees like fat in the filter of an exhaust fan above a kitchen stove."[10]

As their shade reduces summer cooling loads, trees reduce emissions from the area's coal-fired powerplants. And trees also limit noise pollution, which has been linked to cognitive impairment, fatigue, and heart disease.[11]

People

Trees Eliminate Urban Heat Islands

As the planet warms, heat waves are becoming more frequent and deadly. Before long, many American cities could begin to experience climate crises like the record-setting heat wave that hit Moscow in 2010, killing more than 700 people every day. The most effective way to protect against similar outcomes is to plant more trees now, especially large trees that shade hard surfaces.

Cities are built of materials that absorb and radiate the sun's heat, creating urban heat islands. In these environments, trees have been shown to reduce local temperatures by as much as 22 degrees Fahrenheit.[22] They do this both through shading and through a process called transpiration: the cooling of the air that occurs when moisture evaporates from leaves. Evaporation is how refrigerators and air conditioners work and helps explain why trees make a street walkable on muggy summer afternoons.

Climate change threatens our cities with a dangerous feedback loop in which higher temperatures require more air conditioning, which in turn increases demand on local power plants, increasing greenhouse gas emissions that worsen air quality while further heating the planet. Planting trees is a great way to short-circuit this cycle.

Trees Reduce Car Crashes

The fact that trees contribute to traffic safety is a bit counterintuitive; cars do occasionally crash into trees, after all. But the data is clear: street trees cause safer driving and fewer deadly crashes overall.

One Toronto study found that the presence of street-trees and other vertical objects along the street edge correlated with a 5 to 20 percent decline in mid-block crashes. Another, in Orlando, found that the segment with no trees experienced 45 percent more injurious crashes and many more fatal crashes than those without.[23]

The prime factor at work here is speed. By visually narrowing the roadway, trees cause drivers to proceed more cautiously. They also contribute to a more relaxing trip, which may reduce road rage. A study by the traffic engineer Walter Kulash found that a drive on a tree-

less street is perceived to be significantly longer than an equal-length drive on a street lined with trees.[24]

And the impact of street trees on walking is likely even greater than on driving. Mature street trees form a sturdy barrier between moving vehicles and pedestrians. When viewed in perspective, a row of trees can feel like a natural wall between the sidewalk and the street, putting pedestrians at ease.

Trees Reduce Crime

A study of 431 crimes committed over three years in Portland found that trees in the public right-of-way were consistently associated with reduced crime.[25] Similarly, in the

What Do Trees Do for *ME*?

Sure, there are a dozen ways that trees help our city and help the planet, from preventing flooding to sequestering carbon. But how do YOU stand to gain from planting some trees around your house right now?

At first, not so much. It will take a couple of years (as few as five) for a young tree to start paying you back. But as you wait, tending your trees will get you outdoors, where you might meet a neighbor or two. Maybe one of them has a tool you need to borrow?

Soon enough, your trees will start providing some serious "local ecosystem benefits." In the summer, they will lower your air conditioning bills, eventually by hundreds of dollars. In the winter, evergreens will reduce your heating costs, and make your house less drafty.

You might begin to notice the sound of birds, and that the air smells cleaner. That's because it *is* cleaner and will help you stay healthy.

If you do get sick, make sure you have a nice view out the window. Looking at your trees will make you better faster. Crime in your neighborhood? Don't worry. Burglars are more likely to rob Mr. Jones down the street; his house has no trees! It sounds crazy, but the data doesn't lie.

Someday, you may want to sell your house. Studies suggest that the average house in Cedar Rapids is worth $14,000 to $36,000 more with trees in the yard.[18] Not a bad payoff for spending a few hundred dollars on trees.

So, plant some trees to benefit us all. Or do it just for you.

housing projects of Chicago's South Side, researchers found that "the greener a building's surroundings were, the fewer crimes reported."[26] Specifically, buildings surrounded by trees experienced 48 percent fewer property crimes and 56 percent fewer violent crimes than buildings without trees.

More recently, the removal of 646 trees devastated by the emerald ash borer in Cincinnati provided a rare opportunity for a longitudinal study in which other factors were held constant. In this case, the loss of trees was associated with "an uptick in property crimes, assaults, and violent crimes."[27]

This study would seem to serve as a warning about possible impacts that the 2020 derecho may continue to have on Cedar Rapids. Happily, the reverse is also true. A 38-month randomized trial of 500 properties in Philadelphia found, compared to others left unchanged, those planted with trees experienced a significant reduction in crime, including a 29 percent drop in gun violence in neighborhoods below the poverty line.[28]

The fact that trees reduce crime is better understood than the reasons behind that fact. But we do not need to understand why trees make places safer to act upon our confidence that they do.

Regular exposure to trees prolongs life, aids mental health, reduces asthma, obesity, stress, and heart disease, improves cognitive performance, and basically just makes us happier.

Trees Improve Our Health

In a now famous experiment, doctors tracked the recovery of surgical patients in a single hospital wing, where only half the rooms faced a row of trees. The patients with tree views had fewer negative evaluations, required many fewer doses of potent narcotics, had fewer postsurgical complications, and were discharged from the hospital, on average, a day earlier.[19]

This study is one of many that show how regular exposure to trees prolongs life, aids mental health, reduces asthma, obesity, stress, and heart disease, improves cognitive performance, and basically just makes us happier.[20] People living in places with good tree canopy are also more likely to exercise.[21]

Dr. Suzanne Bartlett Hackenmiller of the Van Diest Medical Center (Webster City, IA) is one of a growing number of American physicians and psychologists who now prescribe the Japanese treatment of Shinrin-Yoku, "forest bathing," for a range of maladies, from diabetes to cancer. While the biology is not yet fully understood, the outcomes are clear: trees improve public health.

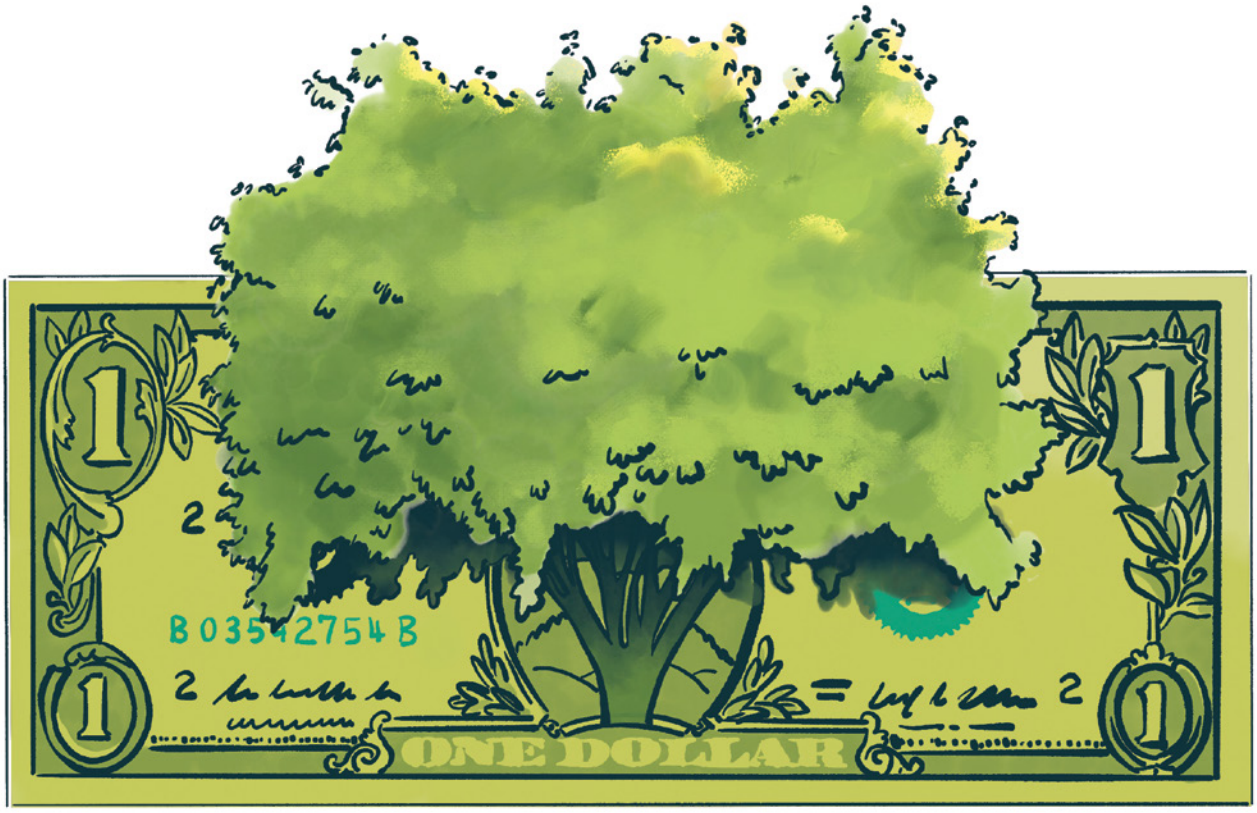
Trees Create Community

For the bonds of community to form, people need shared public places to come together. The profession of urban design is centered on this goal: creating the sense of place that comes from making "outdoor living rooms," well-shaped spaces with "defensible" edges. Street trees play a vital role in giving shape and shelter to public spaces that might otherwise feel poorly defined.

Also, people just like being around them. Often, it is the presence of trees that cause outdoor spaces to be occupied. No trees, no people; no people, no community.

By encouraging more people to walk, bike, and otherwise spend time in public, trees increase the number of eyes on the street and help people to look after one another. In this context, it is not surprising to learn that apartment buildings with trees house families that experience fewer divorces, higher graduation rates, and less juvenile delinquency than nearby apartments with no trees.[29]

Finally, the act of planting and tending to trees can be a creator of community spirit, civic mindedness, and social capital. Planting events provide a great opportunity to introduce neighbors who might not otherwise have reason to meet.



Pocketbook

Trees Cut Energy Costs

Many of the benefits that come from trees are intangible: important, but hard to put a price on. Not so with energy savings. Here it is easy to see how planting a tree can pay for itself in short order.

Trees provide cooling in the summer and insulation in the winter. A deciduous street or yard tree to the south or west of a home can dramatically reduce the need for air conditioning. According to the U.S. Department of Agriculture, the cooling impact of a single healthy tree "is equivalent to ten room-size air conditioners operating 24 hours a day."[30]

Meanwhile, evergreen trees planted to the north can reduce wind speeds around them by as much as 50 percent. These trees not only improve general thermal comfort in winter, but also reduce the conductive heat loss that buildings experience, resulting in potential annual heating savings of 25 percent.[31] Remarkably, a sturdy Iowa hedgerow creates a protected "wind shadow" five times as long as it is high.

While the majority of these savings are not immediate, they can begin right away with well-placed trees, and ramp up quickly. Before long, the cost of planting the tree is paid back annually, year after year.

Trees Increase Property Values and Help Businesses

An investigation conducted by the Wharton School of Business found that street trees planted within 50 feet of houses in one Philadelphia neighborhood increased home values by 9 percent.[32] Other studies have put that premium as high as 23 percent.[33] The City of Portland found that each of its street trees contributes about $20,000 in surrounding property value. This results in the City's tree investment paying the City back at a ratio of twelve to one.[34]

Trees also help merchants. From Nantucket to Beverly Hills, the most desirable Main Street districts in North America are, with few exceptions, characterized by consistently planted street trees. One study found that shops on streets with good tree cover earn 12 percent more income.[35] As downtown Cedar Rapids and its other commercial districts strive to compete against the lower prices and greater convenience of Amazon, providing a great shopping environment is going to become central to retail viability. Trees will help.

The Value of Trees

Some 170,000 trees and seedlings will be planted as a result of this plan. If each lives to be 40 years old, and assuming a small percentage loss for mortality, the cumulative energy savings and property value increases of these trees will exceed $20 million. That's real money saved on heating and cooling, carbon reduction, air pollution, and stormwater. Now imagine what 670,000 trees would equate to.

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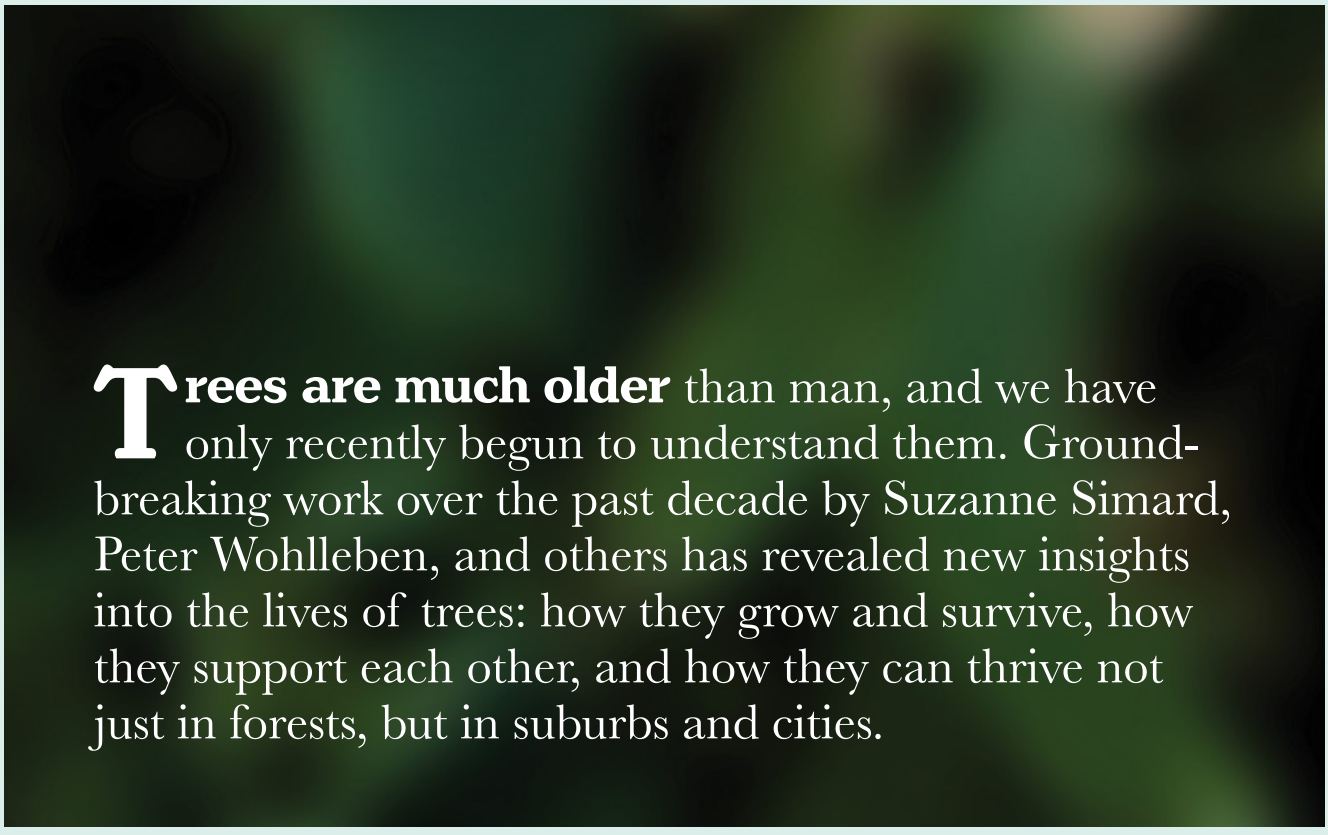
CEDAR RAPIDS

How Trees Work

4

"When trees grow together, nutrients and water can be optimally divided among them all so that each tree can grow into the best tree it can be. If you 'help' individual trees by getting rid of their supposed competition, the remaining trees are bereft."

– Peter Wohlleben, *The Hidden Life of Trees: What They Feel, How They Communicate–Discoveries from A Secret World*



Trees are much older than man, and we have only recently begun to understand them. Groundbreaking work over the past decade by Suzanne Simard, Peter Wohlleben, and others has revealed new insights into the lives of trees: how they grow and survive, how they support each other, and how they can thrive not just in forests, but in suburbs and cities.

Slowly Exciting

What happens during the life of a tree is very dramatic and exciting, but for the fact that it all happens very slowly. This is because their lives are very long. In sustaining environments, trees typically live many hundreds of years, and some species can stay alive for millennia. Peter Wohlleben identifies one spruce in Sweden that is more than 9,500 years old.[36] No wonder they take their time.

A beech tree becomes mature at 80 to 150 years old, and lives in the forest to about 400. Every five years, it produces more than 30,000 beech nuts; over its life, that adds up to more than 1.8 million. Of these, only one will develop into a full-grown tree. In the case of poplar, one in a billion seeds is likely to become a tree.[37] How exciting to be that seed!

Trees are smarter than they look. In the forest, trees work together to selectively starve their predators to keep herd sizes small enough that they won't devour all their leafy offspring.[38] This decision is made collectively.

Similarly, certain trees, when they are being chewed upon in a potentially unhealthy way, pump toxins into their leaves to drive away the diners. Not only that, they also give off a warning gas that causes their neighbors to do the same, even before those trees are under attack. They also release pheromones that summon predators to the insects that are eating them.[39]

The Society of Trees

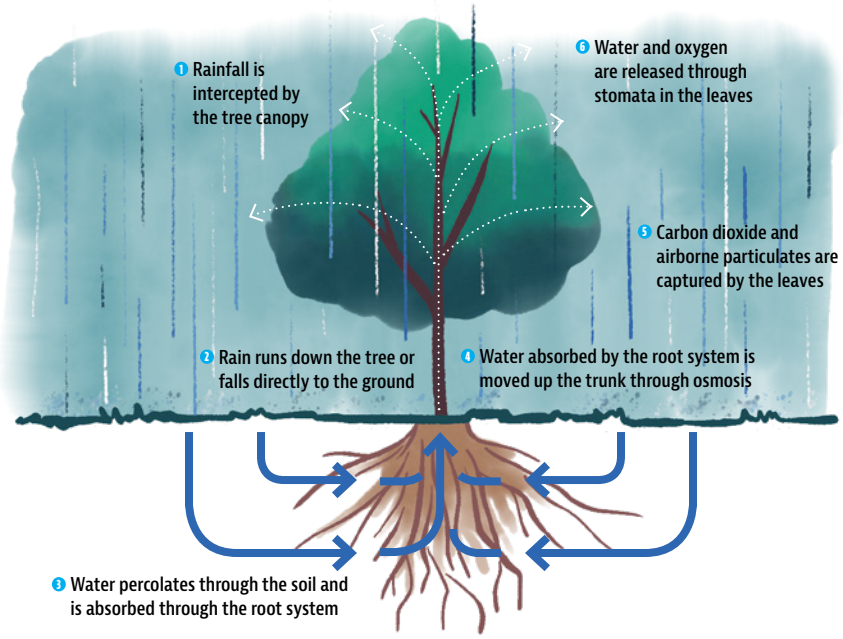
In this way and others, trees have slowly revealed themselves to be social beings. They communicate with each other, sometimes compete, but more often come to each other's aid.

Trees talk principally through their root systems or, more accurately, through fungal networks that surround their roots. Dr. Suzanne Simard has demonstrated how trees send messages to each other through this network with electrical signals that travel an inch every three seconds, what she calls the "wood-wide web."[40]

They also share resources. As Peter Wohlleben writes:

". . . most individual trees of the same species growing in the same stand are connected to each other through their root systems. It appears that nutrient exchange and helping others is the rule . . . Why do they share food with their own species and sometimes even go so far as to nourish their competitors? The reasons are the same as for human communities: there are advantages to working together."[41]

Through chemical signals sent underground, trees talk to one another, but the conversation is not universal. Trees communicate most with their children and siblings, and primarily with their own species. Some species talk to one another, while others don't. Suzanne Simard found that in a stand of birch, fir, and cedar, the birch and fir were engaged in a lively chemical conversation to which the cedar was completely oblivious.[42]



What Happens When Rain Hits a Tree

The deep relationship of trees and rainfall is little understood. Did you know that, if it weren't for trees, Cedar Rapids, and the vast majority of the continental US, would be mostly lifeless desert? Evaporation from oceans only directly moistens land within a few hundred miles of the coasts. Over the millennia, trees have absorbed coastal rainfall and passed it inland[50] . . . eventually to Iowa, where it has made farming and settlement possible.

Today, trees are less remarkable for how they transport rainfall than for how they protect us from its impacts as stormwater. Here's what happens when an inch of rain falls on a tree: the first 30 percent is typically absorbed directly by the leaves and never even touches the ground. Once the leaves are saturated, up to 30 percent more of the rain seeps into the soil, made more porous by the tree's root structure. This root structure then sucks the water back up into the tree, from which it is eventually transpired back into the air. This process allows a mature tree to absorb about half an inch of water from every rainfall. As a result, communities that add 25 percent additional tree cover will reduce their stormwater runoff by 10 percent.[51]

The forest ecologist Suzanne Simard.

Photograph by Diana Markosian

When it comes to helping each other, the bonds of family are the most powerful. Trees recognize their own kin and send them more nutrients than to non-kin, even within the same species. They reduce their root volume to make room for their seedlings to grow.[43] Remarkably, researchers in Germany found that beeches, in collective stands, synchronize their photosynthesis so that they all fare equally. "Whoever has an abundance of sugar hands some over; whoever is running short gets help."[44]

And yes, they do compete against others. As Wohlleben writes, "the beech is an amazingly socially oriented tree, but only when it comes to its own kind. Beeches harass other species such as oaks, to such an extent that they weaken."[45] Kept apart from beeches, oaks live longer.

It is important to remember that this modern understanding of trees comes from forest research and has limited application to city life. But to the extent that trees are planted in groups or gathered in parks, this research demands consideration.

A Tight-Knit Community

In this context, it is not surprising to learn that trees can thrive planted very close together. Tight trunks allow more communication, and cause trees to grow more up than out. Once their branch tips touch, trees politely keep to their own space while their roots intermingle.[46] Wohlleben discusses how most foresters get this wrong.

"Doesn't it sound logical that a tree will grow better if bothersome competitors are removed. . ? And for trees belonging to different species, this is indeed the case. They really do struggle with each other for local resources. But it's different for trees of the same species. . . In such a system, it is not possible for trees to grow too close to each other. Quite the opposite. Huddling together is desirable and the trunks are often spaced no more than 3 feet apart. . .[foresters] have discovered that a beech forest is more productive when the trees are packed together."[47]

The power of proximity is especially clear when it comes to resisting destructive winds. The experience of the 2020 derecho confirms that trees planted in groups are much less vulnerable. A windstorm can tear at the base of a trunk with a force of 220 tons.[48] In the face of this onslaught, solo specimens are sitting ducks.

The entomologist Doug Tallamy wrote presciently about the derecho threat in 2019. In *Nature's Best Hope*, he prescribed the solution of planting trees closer together:

"Because aesthetics have trumped function for so long, we have planted large, isolated specimen trees ready to blow over nearly everywhere. If we change our goal from creating majestic specimen trees to picturesque groves of trees, the interlocking effect of root matrices will be strongest. . . Few arborists would suggest planting trees on a three-foot center, but if we planted our trees in groups of three or more on ten-foot centers, the resulting root matrix would keep them locked in place through thick and thin."[49]

He adds that this approach requires that the trees be planted young, so that their roots can interlock as they grow. Happily, that is the more economical approach.

Street Kids

Peter Wohlleben calls city trees "street kids," and, as a forester more accustomed to pine-scented glades, showers them with pity. His greatest concern is the common practice of transplanting nursery-grown trees with closely trimmed roots.

The root ball of a young tree grows much wider than the crown. When these are cut back for transport, the tree's ability to grow is forever stunted.[52]

To this injury is added the insult of being planted in ground that is often not suitable for root growth. Without special attention, soil next to streets tends to be overly compacted and poorly drained. Road salt, dog waste, and excessive trimming around utility wires make life even harder. Wohlleben's overall take is not optimistic:

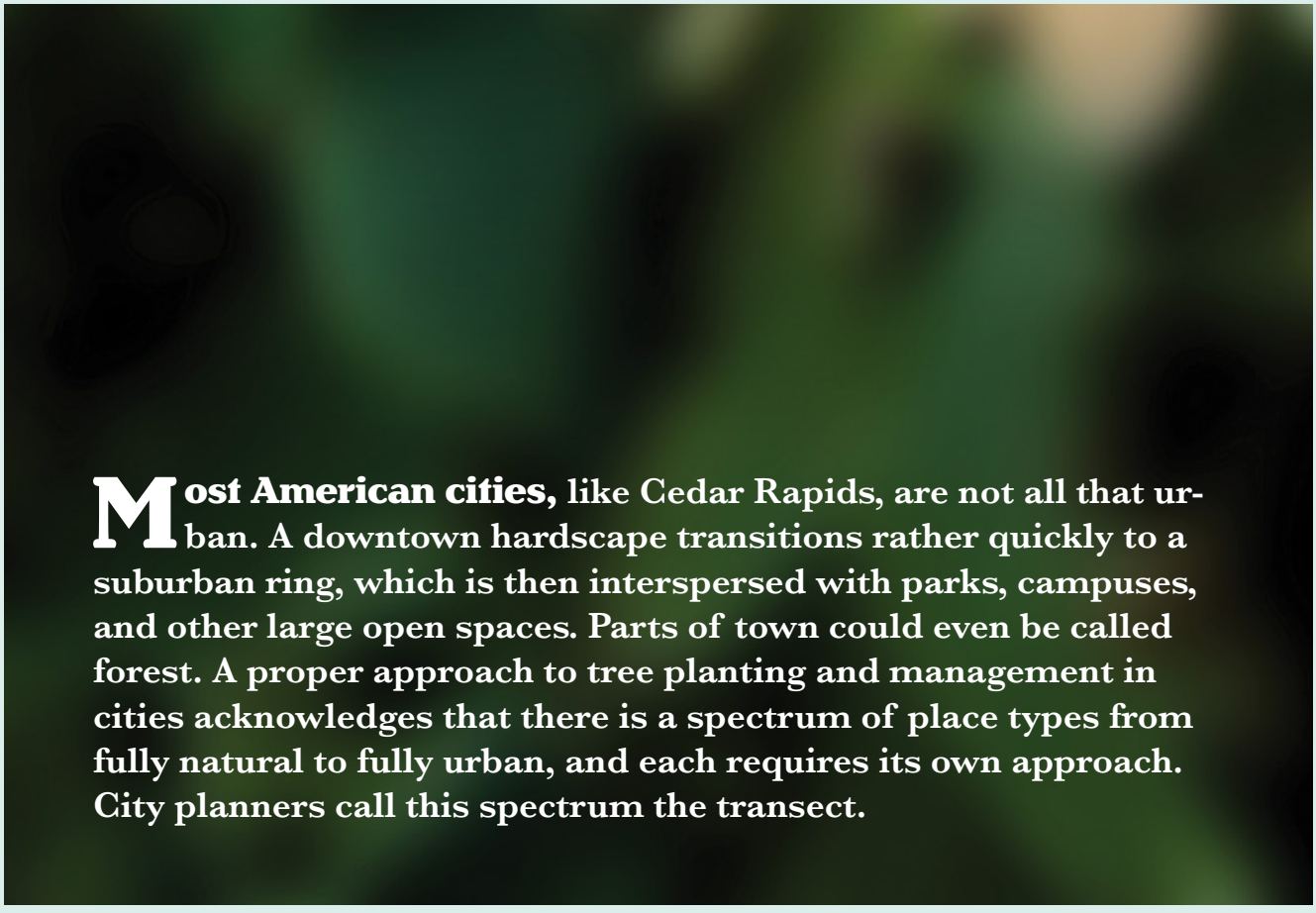
"At the end of the day, the stresses that [urban] trees must bear are so great that most of them die prematurely. Even though they can do whatever they want when they are young, this freedom is not enough to compensate for the disadvantages they face later in life. One consolation is that because streets and pathways are often planted with rows of the same species of trees, at least they are able to communicate with other members of their species."[53]

Clearly, city life is no match for country life for your average tree. Fortunately, there exists an entire profession, urban forestry, that is dedicated to optimizing the close cohabitation of trees and people.

ReLeaf
CEDAR RAPIDS

Urban Forestry 101

5



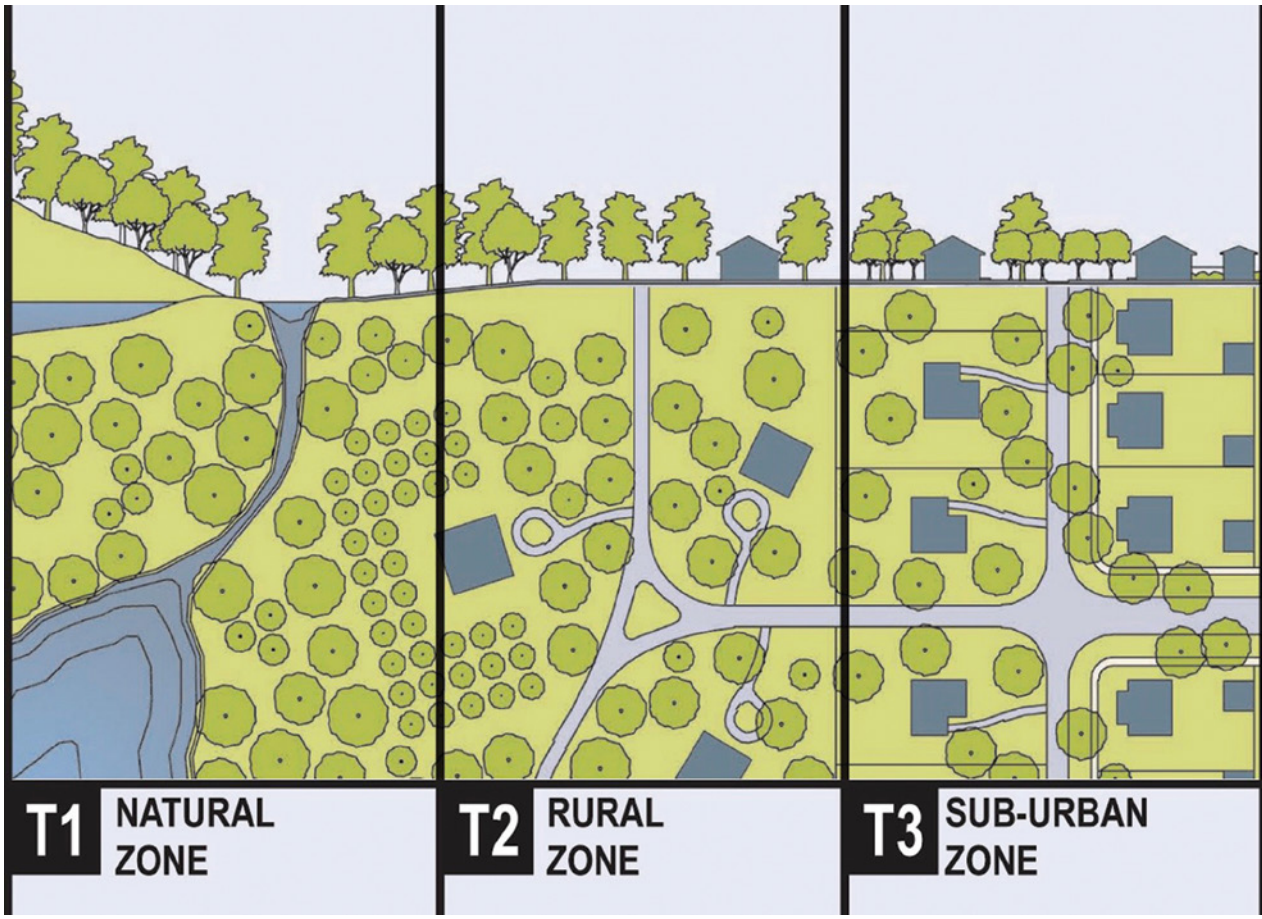
Most American cities, like Cedar Rapids, are not all that urban. A downtown hardscape transitions rather quickly to a suburban ring, which is then interspersed with parks, campuses, and other large open spaces. Parts of town could even be called forest. A proper approach to tree planting and management in cities acknowledges that there is a spectrum of place types from fully natural to fully urban, and each requires its own approach. City planners call this spectrum the transect.

The Natural-to-Urban Transect

In recent years, planners have come to the realization that the concept of the transect, taken from ecology, is a great way to understand, organize, and make decisions in cities. Literally a "slice," the transect began as a way to see how the characteristics of a landscape—mostly its plants and animals—change as you move through it, for example from river to valley to upland. In the 1990s, Douglas and Andres Duany proposed extending this slice up the food chain into the manmade world, to see what it could tell us. The answer, as it turns out, is: quite a lot.

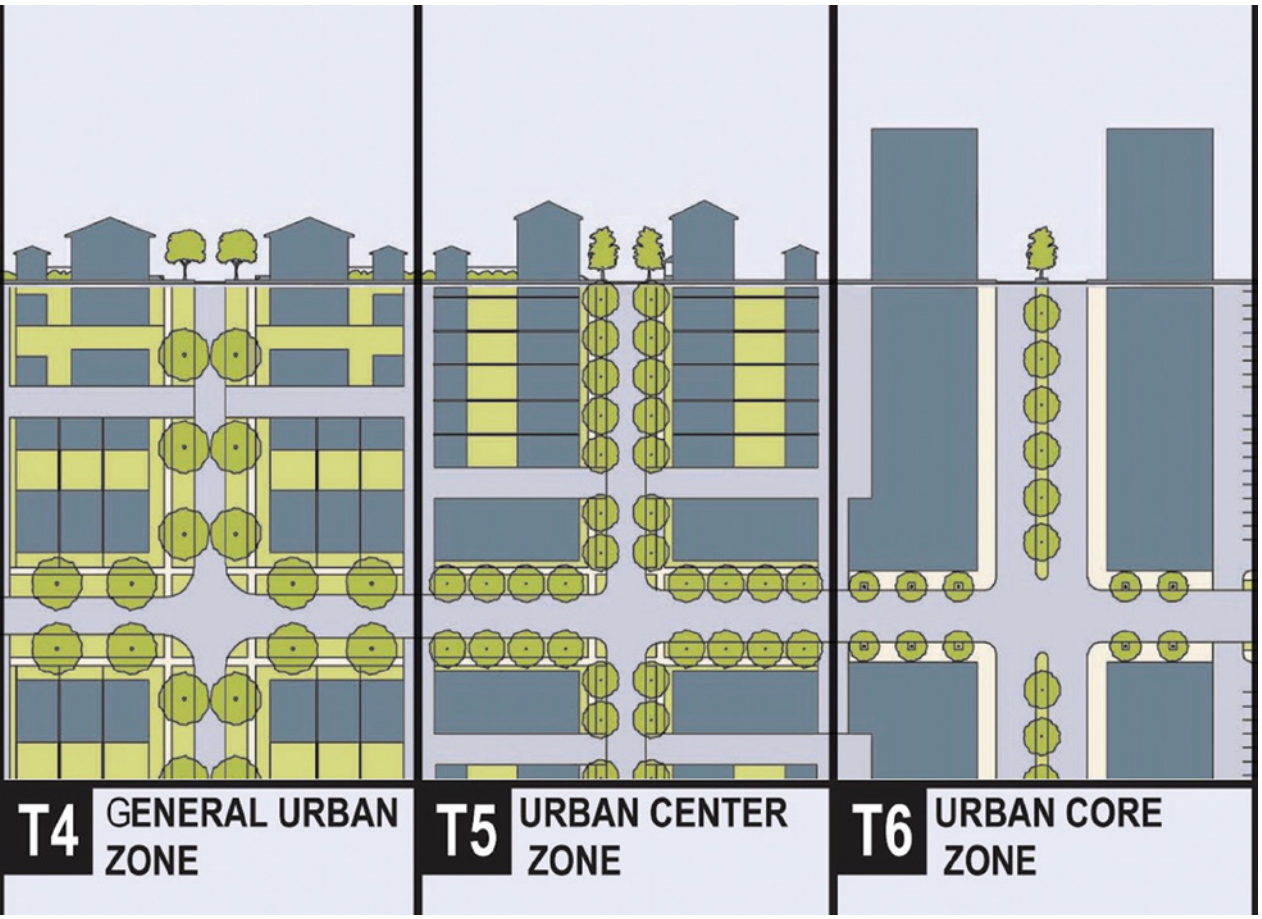
As can be seen in the transect diagram below, a typical city can be organized in zones that range from fully natural to fully urban. The natural areas bear little imprint from the hand of man, while the urban core is entirely manmade, including its ordered plantings of nursery-grown trees. In between are rural areas where humans manage nature, urban areas where nature enhances an ordered streetscape, and, between those, a vast suburban zone which, in its ideal form, consists of houses scattered in the woods.

For many, the suburban home is the American dream, and suburbs make up



the great majority of most American cities. The greatest practical and ecological challenge of these areas is their dependence on the automobile and the pollution that cars create. But a second challenge can be found in the way that suburban life falls short of its original pastoral ideal. Simply put, America's suburbs have the latent capacity both to fulfill humans' dream of the house in the woods and to provide a healthy foundation for the natural systems on which we all depend. The key is trees.

Because it is such a large part of Cedar Rapids, the suburban zone requires special attention in this plan. But a proper plan will be organized around the full range of transect zones, with an understanding that each demands its own approach to trees. At one end, natural areas can be mostly left to their own devices. At the other, urban areas can be managed with an understanding that the goal is not to recreate natural systems—impossible in a downtown—but to use trees to enhance inviting public spaces, discussed in the next section. The vast suburban landscape in between deserves a unique focus, one that builds upon its largely untapped potential to make the planet healthier and our lives better.



The Natural-to-Urban Transect is an exceptionally useful tool for understanding the landscape and development patterns of the city.

ORDER AND CONSISTENCY
Three pairs of Ash trees line a gentle curve on 5th Ave. SE.

Trees in the City

In the landmark classic, *Trees in Urban Design* (1980), the award-winning landscape architect Henry F. Arnold clearly lays out the central motivations, principles, and practices for planting trees in cities. While much of Arnold's instruction applies universally, it is most relevant as we approach the more urban end of the transect.

The book begins with the essential proposition that "human artistry can improve on rural nature by shaping the materials of the city, including trees, to create a better urban habitat than now exists, without copying 'nature'." It then goes on to list what the author considers to be the most commonly misunderstood facts about trees in cities. The first four are as follows:

1. **Density:** Landscapes are the most beautiful and healthy when trees are planted close together.
2. **Order:** Trees planted in straight rows or geometric patterns are visually more interesting and more effective than unordered "natural" arrangements.
3. **Consistency:** The principles of ecology provide no sound basis for planting a large variety of different tree species in each area of the city; and
4. **Scale:** It is better to plant large tree types than small tree types with limited growth.

Each of these potentially controversial points deserves elaboration.

Photograph from Google Maps Street View

Density

We've already heard from Peter Wohlleben and Doug Tallamy that planting trees close together makes them more resilient. Arnold agrees: "In urban situations, trees are most effective and healthy if grown close enough together for the branches to intermingle and create a continuous network as they do in the forest, genetic evolution favors trees in close groups. For example, it is not unusual to find northeastern forests growing at densities of 400 trees per acre. This is equivalent to trees ten feet apart in both directions."[54]

When it comes to shape, trees are remarkably malleable creatures. A tree in a tight spot will grow up rather than out, which is a better shape for sheltering (and not impeding) sidewalks. Trees grown close together require less pruning.[55]

It is clear that, in all locations on the transect, the limitation to tree spacing should be based on budget, not the misapprehension that trees need elbow room.

Order

Students of urban design will tell you that spaces become places when they have proper edges that give them a sense of enclosure. Good placemaking begins with the goal of creating "outdoor living rooms," and living rooms have walls and ceilings. Downtown, the walls are formed mostly by buildings, but elsewhere they are formed by trees. In perspective, a row of trunks functions like a living wall, and an overhead canopy, at its best, resembles the arched ceiling of a gothic cathedral. In this way, the classic suburban "Elm Street" is one of America's great contributions to the art of making cities.

Making a proper edge means lining the trees up, an approach that makes sense in all but the most naturalistic landscapes. But even greater impact can be achieved if trees are spaced evenly. Surprisingly, the more regular and consistent the planting pattern, the more dynamic and interesting a space becomes.

This fact is counterintuitive and needs explanation. When trees are planted with random spacing, moving among them produces little variety. They are disordered and without rhythm. But when trees are planted in evenly spaced rows, moving among them produces a range of effects depending on direction of motion and angle of view. The experience is rhythmic and unfolding, providing alternately orderly and disorderly views depending on where one looks. The rows of trees come to life.[56]

Around the world, this technique is most effectively deployed on avenues and boulevards, where it is even more impressive when experienced at the speed of an automobile. It can also be found on local streets, especially in some of the most coveted neighborhoods of Cedar Rapids. It is a practice that is available wherever trees are planted.

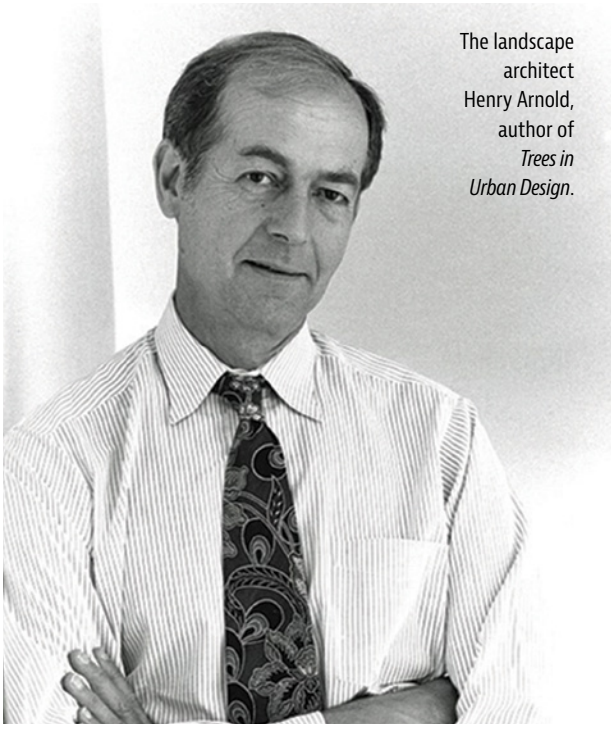
Consistency

Another feature that contributes to the beauty of the image at left is the use of a single tree species. In *Trees in Urban Design*, Arnold describes such streets this way: "There is a homogeneity of texture, pattern, light, and shade, resulting from the use of a single species that makes the collective impact more important than the individual trees."[57] He goes on:

"Plant only one type of tree on both sides of the street in any one block. . . Diversity, if desired, should be provided at the city or town scale, not within a single block or street. Diversity of tree species does not create a more robust stand of trees. In fact, on an urban site the reverse is generally true."[58]

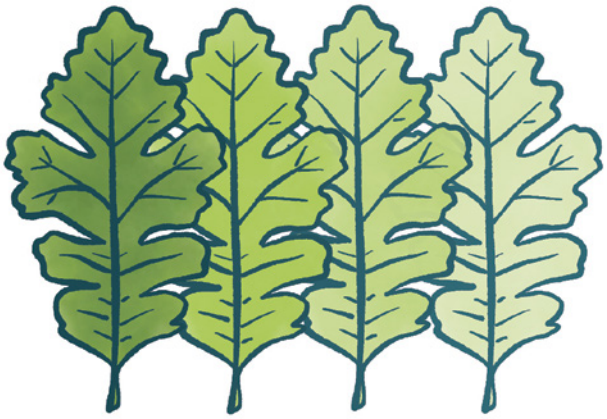
The positive visual impact of using a single species consistently along an entire block or avenue is undeniable. But for decades, a misunderstanding of ecosystem diversity has led urban foresters to view these "tree monocultures" as unnatural and unhealthy. We now know better. As Arnold notes, "it is now established that species diversity in the forest results from a long evolutionary period of time, and that the diverse plant community is actually very fragile. Diversity does not produce stability but rather results from a long period of stability."[59]

The effect has been mistaken for the cause. As Wohlleben teaches, the most resilient groups of trees are family members that help one another. But there are reasons to provide diversity across the city. Cedar Rapids should not be at risk of losing half its trees to an unanticipated

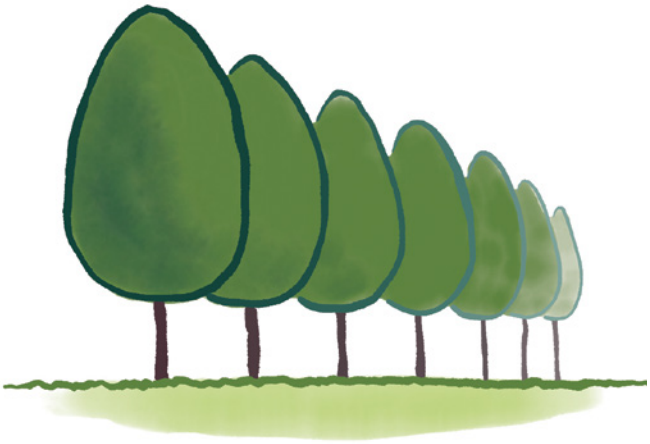


The landscape architect Henry Arnold, author of *Trees in Urban Design*.

Density



Consistency



Order

Scale

future blight like Dutch Elm Disease, and as discussed on the next page, different essential insects rely on different trees. But this diversity should not be imposed street by street, especially when a variety of yard trees contribute to the mix.

Scale

When it comes both to providing ecosystem benefits and to making great landscapes, it rarely makes sense to plant a small tree type when you can plant a large one. In terms of shade, cooling, and stormwater absorption, what matters is crown volume. Large tree types like oaks and sycamores have a mature crown volume that is ten times that of small tree types like crabapples and ornamental pears,[62] yet they cost no more to plant.

Sometimes smaller trees are selected because they are deemed more appropriate for smaller spaces like narrow streets. This is often the wrong choice. In tight spaces, large trees grow up rather than out, eventually reaching a height where they spread into a sheltering roof, shading and protecting the street. In contrast, small trees merely interrupt, fragment, and clog up the space.[63]

Arnold tells us, "only the large shade tree types make a significant functional impact on the urban habitat."[64] We should plant them wherever possible.

Trees in Urban Design is a book that should be studied by everyone who cares about the manmade landscape, and its principles still hold. But it was written at a time when the crisis of climate change was not yet fully understood, nor had we begun to grasp the latent potential of the American suburb to reverse the decline of our planet's natural systems, especially the food web on which our survival depends. For that, we turn to the recent work of Doug Tallamy.

The Homegrown National Park

In *Nature's Best Hope*, the renowned entomologist Doug Tallamy raises the alarm about "the sixth mass extinction in the history of life on Earth, and the first to be caused by a single species."[65] He observes how the undisturbed natural land in the U.S. has shrunk to an area too small to single-handedly preserve the animals and insects we are losing, and that a new approach is needed, one that acknowledges the inevitable overlap of the natural and manmade worlds.[66] He calls this approach the Homegrown National Park.

The Homegrown National Park presents the opportunity to reverse centuries of natural decline by modestly rethinking the composition of the typical American suburb. Simply by introducing more native trees and understory plants, suburban yards and thoroughfares can provide a robust foundation for ecosystem repair.

Far from being allergic to the human presence, the vast food web of greenery and animals on which our life depends can coexist happily in our suburban landscape. And by making our suburbs more natural, we can make them more appealing and sustaining for humans as well.

Return of the Natives

The key is species. For many years, urban foresters have debated the importance of planting native trees in streets and yards rather than the wide variety of attractive imported species that have proliferated across the continent. What the foresters have questioned, the biologists have now confirmed: non-native trees can provide many useful ecosystem services, but one thing they do not do is support the food web. In fact, they actively undermine it.

The reason for this is simple: plants and animals have evolved in tandem across the millennia. They change very slowly. It literally takes hundreds of thousands of generations for insects to alter their diets.[67] Moreover, most creatures are diet specialists; 90 percent of insect herbivores are restricted to eating just a few plants. Monarch butterflies, for example, have evolved to eat milkweed, and milkweed is the only thing they can eat.[68]

In this way, native plants support native wildlife, while importing foreign plants does not cause foreign wildlife to populate our shores. Case in point, Tallamy notes that "after nearly 500 years in residence in North America, Phragmites australis, the common reed, supports only 3 percent of the insects it supports in its European homeland [5 species vs. 170]."[70]

But it gets worse. Imported trees and plants arrive without their collection of natural enemies, "the insects, mammals, and diseases that keep them in check in their homeland."[71] This gives them an unfair advantage over native species, and many escape our gardens to overrun native plants in natural areas. Planting an imported tree is not merely a missed opportunity to plant a native tree; rather, it often leads to a net loss in native trees overall. And fewer native trees means less food for native creatures.

Studying four all-native and four "invaded" sites of similar size, Tallamy found that the invaded sites supported 96 percent less caterpillar biomass than was recorded in the native hedgerows.[72] Caterpillars are central to the food web. As Tallamy notes, "their bodies are like soft bags filled with food."[73]

The good news is that we now know so much about caterpillars that we can have a tremendous impact by picking the right plants. Remarkably, all over the U.S., about three quarters of local caterpillars are dining on a

Diversity vs. Adversity and the 10-20-30 Rule.

Henry Arnold's clarion call for single-species plantings was his rebellion against an urban forestry profession that he witnessed as diversity-happy. To his eyes, foresters were not seeing the city for the trees. By looking from the tree out rather than from the city in, they were missing the big picture in which trees' main role was in shaping spaces for people.

He was right to a point. Recent blights like the emerald ash borer have reminded us that it is foolish for a city to put all of its eggs in a few baskets: by relying too much on too few tree species, communities put themselves at risk unnecessarily.

In 1999, Frank Santamour of the National Arboretum suggested what has become known as the 10-20-30 Rule: cities, overall, should plant no more than 10 percent of any one species (such as white oak) , no more than 20 percent of any one genus (such as oak), and no more than 30 percent of any one family (such as beech, to which oak belongs).[60] Since then, this advice has become considered a best practice.

As this plan works to refine the City's tree list, the 10-20-30 rule will remain a mandate. But that mandate for overall diversity should not be confused as demanding diversity on every block, where an individual species can be used to establish a beautiful continuous canopy and make places of unique character. Santamour himself put it this way:

"Strips or blocks of uniformity should be scattered through the city to achieve spatial as well as biological diversity. Twenty to fifty trees of a single species, or even a single clone, do not constitute a 'dangerous' monoculture . . . Genetic diversity is achieved by mixtures of uniformity."[61]

Many streets in Cedar Rapids currently enjoy a pleasant potpourri of tree species, and that should not change. But when the beauty of local uniformity is possible, that is a goal that should drive the plan.

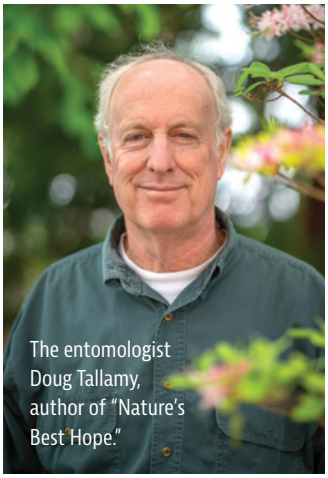
mere five percent of local species. Tallamy calls these "keystone plants."[74]

The white oak, for example, appears to be a caterpillar superfood. While the typical native American tree supports dozens of caterpillar species, white oaks support hundreds, and almost a thousand species nationwide.[75]

It's Not Just Trees

While no match for native oaks, other keystone tree species include cherries, willows, birches, and cottonwoods. They are supported closer to the ground by goldenrods, asters, sunflowers, and other key plants.[76] These understory plants are another important part of the puzzle, because most caterpillars drop to the ground to pupate, and they can't spin their cocoons in turfgrass; they need something softer to burrow into.[77]

So, planting the right native trees is only half the picture. The other half is finding alternatives to grass, and simply planting less lawn. This part is a bit trickier, as it represents more of a cultural shift than just picking the right trees; broad, sweeping lawns are an unmistakable component of the American suburban ideal. But they are destructive to the food web, and also to the watershed, given their great thirst and their use of fertilizer.



The entomologist Doug Tallamy, author of "Nature's Best Hope."

As Tallamy relates, lawn watering in the U.S. requires "32 gallons per day for every man, woman, and child in the country," and about a third of all household water in places like Iowa.[78] Meanwhile, as much fertilizer is used on American lawns as in all of its agriculture, and about half of that ends up as pollution in surface groundwater. Forty percent of the chemicals present in our lawn fertilizer are carcinogens banned in Europe.[79]

Clearly an outright ban on the beautiful American lawn is not possible, but we need to be aware of its impacts and act accordingly. This means replacing some of our grass with mulch, groundcover, and understory plants. In Tallamy's words:

"Every square foot that is dedicated to lawn is a square foot that is degrading local ecosystems. A general rule of thumb, then, might be to reduce your lawn by half. . . Think of a lawn as an area rug, not wall-to-wall carpeting."[80]

For many homeowners, this is a big ask, and most won't even hear it. Leaflets summarizing *Nature's Best Hope* will not be dropped from airplanes. Fortunately, the City can lead the way, in its parks and along its thoroughfares. Reversing Tallamy's quote above, every square foot that is transitioned away from lawn is a square foot that is strengthening local ecosystems. The proper path forward is clear.

If you're interested in learning more about Tallamy's Homegrown National Park and accessing a number of resources, visit their website at: homegrownnationalpark.org

It's Not Just Planting

The goal of this plan is to replenish and enhance Cedar Rapids' damaged tree canopy. The biggest and most impactful part of that effort will be to select and plant the right trees. But sticking trees into the ground is just one important step out of many in creating and sustaining a healthy urban forest. These other important issues also need our attention:

- **Nurseries and the Supply Chain:** The greatest challenge in planting the right trees is having access to the right trees to plant. For Cedar Rapids, this means establishing an uninterrupted pipeline of supply from trusted nurseries, and potentially creating a nursery of its own. For homeowners, this means finding the right plant stock for sale when they shop for a tree. Currently, the selection of saplings available at local merchants includes an undifferentiated collection of native and non-native trees. This needs to change.

- **Young-Tree Care:** Contrary to the popular perception, most trees are not just "plug and play;" they require special attention in their early years to set them on a healthy life path. This attention includes watering and pruning. For park trees and yard trees, there is little confusion about who does this work, but street trees are not so simple. The City may prune them, but watering is the responsibility of whoever plants the tree; the City does not water trees planted by homeowners. Many don't know about this responsibility, and most have not been trained in how to do it well. No new tree should be planted without clear communication on whose job it is to make it thrive and the methods for doing so.

- **Mixing with Utilities:** The experience of the derecho has reinforced the mandate that trees be selected and planted to minimize potential conflicts with utility wires overhead and gas lines underground. The common practices of planting only small trees under electrical lines, and keeping trunks three feet away from gas lines, are good rules of thumb. However, two circumstances occur that suggest a more localized approach, one that allows for exceptions. First, there are certain key corridors through the city, such as Mount Vernon Road and Edgewood Road, that by all rights should be tree-lined boulevards, but that also carry transmission lines. Second, in certain downtown locations, strict adherence to the three-foot rule effectively makes street trees illegal. In both of these instances, the many benefits of trees provide ample motivation for a more refined set of practices. Each of these issues will get more attention in the pages ahead.

Photograph by Rob Cardillo

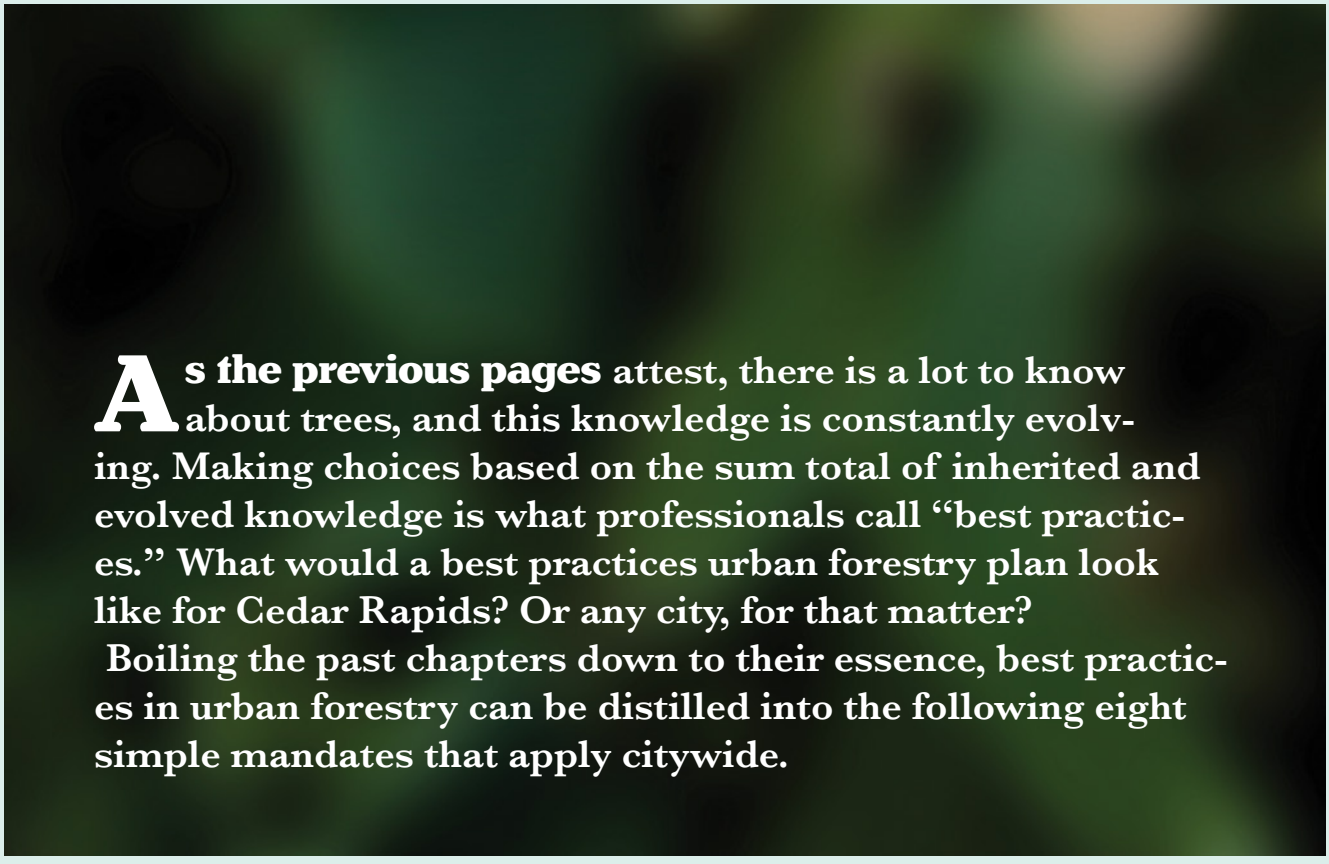
ReLeaf
CEDAR RAPIDS

The Plan For All Trees

6

"A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when it tends otherwise."

- Aldo Leopold, A Sand County Almanac and Sketches Here and There



As the previous pages attest, there is a lot to know about trees, and this knowledge is constantly evolving. Making choices based on the sum total of inherited and evolved knowledge is what professionals call "best practices." What would a best practices urban forestry plan look like for Cedar Rapids? Or any city, for that matter?

Boiling the past chapters down to their essence, best practices in urban forestry can be distilled into the following eight simple mandates that apply citywide.

The ReLeaf Rules

Boiling the past chapters down to their essence, best practices in urban forestry can be distilled into the following eight simple mandates that apply citywide.

1

Right Tree, Right Place, Right Reason

Trees belong everywhere; the trick is choosing a tree that belongs in a given spot.

The Right Tree, Right Place rule has driven urban forestry for decades. It simply acknowledges that different trees fit, and thrive, in different places. A tulip tree looks great in a park, but its low salt tolerance makes it a bad choice along busy roads. Other trees do better in wet soils or in dry soils, and some even tolerate the compacted soil under a sidewalk. Right Reason adds a new twist, focusing not just on survival, but purpose: different trees serve different needs, from blocking wind to evaporating and slowing stormwater. These qualities should drive selection and are embodied in the ReLeaf Tree List ahead.

2

Citywide Diversity & Local Character

We should meet overall diversity targets while grouping species locally.

The threat of blight means that the City must adhere to the 10-20-30 rule (page 37) and plant no more than 10%, 20%, and 30% of any one tree species, genus, or family respectively. But this rule applies citywide, not locally; even its originator advocated for groupings of the same species in one location, to create a diversity not just of trees but of places. The most beautiful streets often hold just a single repeated tree, and same-species trees are the best at supporting each other underground. (The only exception, and an important one, is that oaks should be kept at least 100 feet apart, due to oak wilt.) Let us all remember that trees do not know if they are public or private; when residents overplant a single genus, like maple, the City needs to compensate with its own choices.

3

Locals Not Imports

Don't plant a non-native tree where a native tree will thrive.

Non-native trees do not support native animals and insects and can actually undermine the efforts of those that do. All trees provide some ecosystem services like cooling and CO_2 absorption, but only natives support the food web. But true natives can be hard to find. Much more common are native cultivars (cultivated varieties), which have a mixed record when it comes to feeding insects. We are only now slowly learning which cultivars do that job well. The proper strategy for choosing a tree for any location is to first look for a true native that will thrive there. If that fails, select a native cultivar. Non-native trees should only be planted where a native tree can't be expected to achieve a healthy maturity.

4

Big Not Small

Don't plant a small-species tree where a large-species tree will thrive.

The typical large-species tree has a canopy roughly ten times the volume of the typical small-species tree. Almost one hundred percent of a tree's benefits come from its canopy. Large canopy trees can also be ideal for tight spaces, where they grow tall enough to shelter the space. The only bad location for a large tree is under utility wires, or where there is not enough room underground for roots to spread. Small, flowering trees can be lovely, but before planting one, ask whether the funds and effort would be better spent on a canopy ten times as large.

5

Tots Not Teens

If they can be protected, plant trees when they are young.

Transplanting a tree is a traumatic event that dramatically curtails root growth. The most resilient trees start in place as the smallest seedlings. But seedlings are vulnerable to being trampled, weed-whacked, or eaten. For locations where each tree matters, like along a street, established saplings are the proper choice. The City currently requires saplings to have a caliper (diameter) of 1½ inches but, in less vulnerable locations, like parks, a 1-inch caliper is preferred. 1-inch caliper trees generally catch up in size with 2-inch caliper trees within five years, and then surpass them in growth and vitality. This rule change will also expand the supply chain. And in less urban locations, carpet-bombing with seedlings is likely the most economical and productive strategy for expanding the canopy.

6

Let Trees Mingle

Where possible, plant trees in groups and close together.

The misapprehension that trees thrive best when given "space to breathe" is disproved in nearly every forest. Trees, especially same-species trees, share nutrients and information through their roots. More significantly, an intertwined root network makes groups of trees more resilient against windstorms than isolated "sitting ducks." The only reason to keep trees apart is economical: to shade more land with limited stock. This is most important above paved surfaces, where the best outcomes come from planting trees in a steady rhythm at a distance smaller than the width of their full mature canopy.

7

Plant With A Plan

Every tree planted needs a designated caretaker and plan.

Saplings are not "plug and play;" to survive and thrive, each needs at least two years of manual watering and periodic pruning. Private residents should reach out to Trees Forever for any needed guidance with their yard trees. Each City-owned sapling, when planted, must be assigned a waterer, given a pruning schedule, and logged into the City database. This database should be expanded to provide all relevant information about the tree, including its ecosystem value, which should be made publicly accessible to inspire its care.

8

Break The Grass Habit

Don't plant grass when other groundcovers will do.

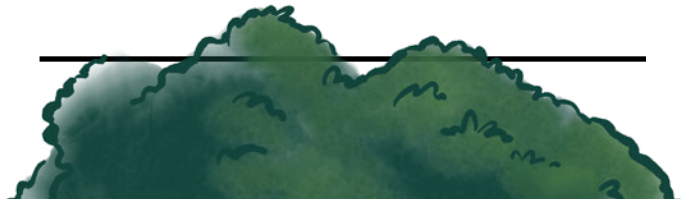
As lovely as it looks, grass is one of the least ecological uses of soil. It wastes water, inspires the spraying of carcinogenic toxins, causes tremendous CO_2 emissions through mowing, and interrupts the food web by killing most caterpillars that fall on it. While Iowans can't be expected to change our landscaping habits overnight, we can make a concerted effort to provide native prairie and woodland plants directly under trees so that they can properly support the food web.

The ReLeaf Tree List

The heart of this plan is a new citywide tree list for Cedar Rapids, a list that embodies the first four of the ReLeaf Rules: "Right Tree, Right Place, Right Reason," "Citywide Diversity & Local Character," "Locals Not Imports," and "Big Not Small." It is a modification, and mostly a reduction, of the City's current tree list. That list already contains much wisdom, but it doesn't fully reflect the ReLeaf Principles.

A key aspect of the ReLeaf Tree List is that it groups trees by desirability. Trees are either Superior, Allowed, or Contingent. To maximize community and ecosystem benefits, only trees from the Superior category should be planted. These trees are not only large and hearty; they also support the food web; all are either natives or native cultivars that support caterpillars. Ideally, newly planted trees would be sourced from this list alone, up to the point that any one species, genus, or family butts up against the 10-20-30 rule.

However, the "Right Tree, Right Place, Right Reason" rule means that the Superior list is not enough. So does the supply chain of trees: there just aren't that many natives to be had on short notice. For that reason, the Allowed category includes additional



big, locally adapted trees that may not be good food, but they are preferable to a hole in the canopy.

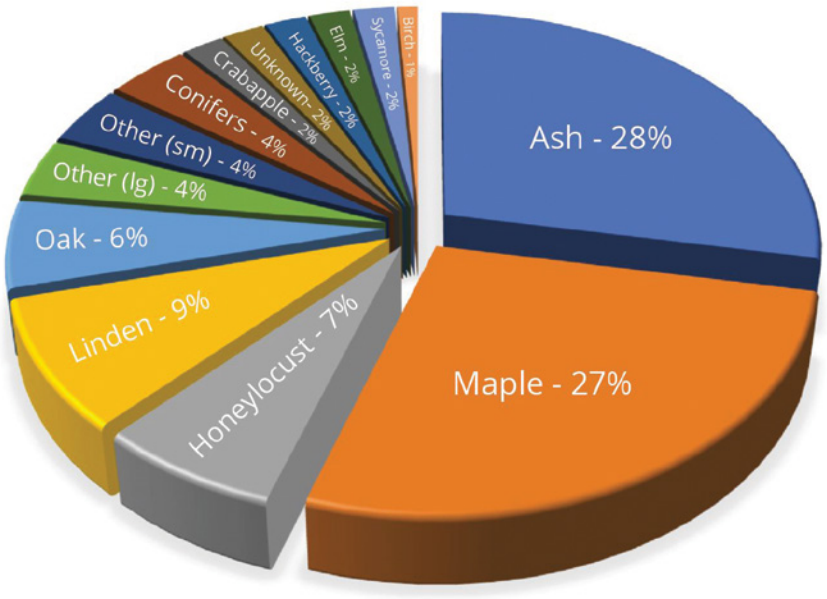
Finally, there is the Contingent category, so named because there are certain places where a large tree truly won't fit. Most often, that is under transmission wires. These trees are smaller, but none of them are exotics without roots in Cedar Rapids.

The ReLeaf Tree List encourages us to plant Superior trees whenever we can, and plant Contingent trees only when we have no other option. Residents are of course free to plant whatever they want on their private property, but will be encouraged in a variety of ways—discussed ahead—to learn about the ReLeaf Tree List and to follow its guidance.

Please take a look at the list; you'll notice that trees are ordered by their contribution to the food web, with the shape of the canopy and growth rate also shown.

Importantly, the ReLeaf Tree List shows the right place for each tree. This assignment is influenced by the Natural-to-Urban Transect, and also by where the tree thrives—further described in the Tolerance section. Finally, the tree list identifies which trees produce flowers, fall color, or edible fruit.

The ReLeaf Tree List is a living document, and should be updated periodically by City staff, but only in a way that upholds its current standards. For example, if a new native cultivar is shown to thrive locally, it should be added to the list. But small trees will always remain Contingent and exotics unwelcome except under special circumstances.



2014
Before Emerald Ash Borer (EAB) arrives in Cedar Rapids

Enough with the Maples, Already!

The pie chart above shows the diversity of Cedar Rapids' street trees in 2014. Does anything seem amiss?

It's worse than it looks. The 2015 incursion into Cedar Rapids of the latest great blight, the Emerald Ash Borer (EAB), means that the City stood to lose as many as a quarter of its street trees, a tremendous blow. Now, imagine if instead, the EAB was the EBB, the Emerald Birch Borer; the loss would be almost imperceptible.

The lesson here is clear: planting so many ash trees was a mistake. Looking back at the pie chart, does anything else troubling catch your eye?

Cedar Rapids is, in a word, over-mapled. At least as far as street trees go, we have well exceeded the 10-20-30 rule by planting 27 percent of one genus. This excess is mirrored on the private side, where maples are clearly the yard-tree of choice. This is understandable, given their lovely fall color, but it is not resilient or sustainable.

For this reason, maples are not included in the ReLeaf Tree List. This is the only responsible strategy. We can all look forward to a time when Cedar Rapids' canopy is so robust and diverse that the planting of maples can be encouraged once more.

The Iowa Department of Natural Resources has created a handy reference for those specifically wanting to 'Rethink Maples' which can be found at the following link: iowadnr.gov/Portals/idnr/uploads/forestry/urban/RethinkingMaple.pdf

The ReLeaf Tree List

Superior Native, Large, Food Web Supporters	Cultivar for Consideration	Iowa Native	Height/Width	Shape	Growth Rate	Fall Color	Flower	Food for Wildlife	Food for People	Forest	Park	Yard	Parkway	Median	Parking Lot	Tree Pit	Under Utility Lines	Wet	Moist/Well Drained	Dry	Clay Soils Tolerance	Road Salt Tolerance	Compaction Tolerance	Additional Notes
			FORM				ATTRIBUTE			SITE								SOILS							
Northern Pin / Hills Oak *Quercus ellipsoidalis*		Y																						· A native oak, among the most productive supporters of the food web
Shingle Oak *Quercus imbricaria*		Y																						· Has an atypical, unlobed leaf · A native oak, among the most productive supporters of the food web
Northern Pin / Hills Oak *Quercus ellipsoidalis*	Majestic Skies	Y																						· Vibrant fall color · Good tolerance for high pH soils · A native oak, among the most productive supporters of the food web
White Oak *Quercus alba*		Y																						· A native oak, among the most productive supporters of the food web
Bur Oak *Quercus macrocarpa*		Y																						· Iowa's state tree · A native oak, among the most productive supporters of the food web
Chinkapin Oak *Quercus muehlenbergii*		Y																						· A native oak, among the most productive supporters of the food web
Northern Red Oak *Quercus rubra*		Y																						· Vibrant fall color · A native oak, among the most productive supporters of the food web
Scarlet Oak *Quercus coccinea*		Y																						· Vibrant fall color · A native oak, among the most productive supporters of the food web
Black Oak *Quercus velutina*		Y																						· Vibrant fall color · A native oak, among the most productive supporters of the food web
Pin Oak *Quercus palustris*		Y																						· Vibrant fall color · Suffers from chlorosis (yellowing) in high pH soils · A native oak, among the most productive supporters of the food web
Oak Hybrids *Quercus x*	Bebbiana, Heritage	Y	V																					· Many promising hybrids available
Cottonwood (Eastern Poplar) *Populus deltoides*		Y																						· An important contributor to the food web · Use should be limited to naturalized areas due to mess and susceptibility to disease and breakage
Kentucky Coffeetree *Gymnocladus dioicus*	Espresso, Prairie Titan	Y																						· Seedless cultivars for use in parkway
Honey Locust (thornless) *Gleditsia triacanthos inermis*	Shademaster, Northern Acclaim, Skyline, Trueshade	Y	V																					· Vibrant fall color · Overplanted in some areas
American Sycamore *Platanus occidentalis*		Y																						
Common Hackberry *Celtis occidentalis*	Prairie Pride, Chicagoland	Y																						
American Linden (Basswood) *Tilia americana*		Y																						· Provides important shelter for birds and pollinators · Attracts Japanese beetles, which can defoliate the tree

Legend:

Keystone Species = **Bold Text**

V Varying Growth

Tree Height (ft): 70'+, 50', 30'

Tree Width (ft): 30', 50', 70'+

Round, Pyramidal, Columnar, Ovate, Vase, Irregular

The ReLeaf Tree List

			FORM			ATTRIBUTE			SITE								SOILS					
Superior Native, Large, Food Web Supporters	**Cultivar for Consideration**	**Iowa Native**	**Height/Width**	**Shape**	**Growth Rate**	**Fall Color**	**Flower**	**Food for Wildlife**	**Food for People**	**Forest**	**Park**	**Yard**	**Parkway**	**Median**	**Parking Lot**	**Tree Pit**	**Under Utility Lines**	**Wet**	**Moist/Well Drained**	**Dry**	**Clay Soils Tolerance**	**Road Salt Tolerance**	**Compaction Tolerance**	**Additional Notes**
Bitternut Hickory *Carya cordiformis*		Y																						
Shagbark Hickory *Carya ovata*		Y																						
Butternut *Juglans cinera*		Y																						· May be difficult to find in nurseries
Black Walnut *Juglans nigra*		Y																						· Produces a compound that may damage nearby vegetation confirm tolerance before planting
Elm, American/Hybrid *Ulmus x*	Princeton, Regal, New Horizon, Triumph, Accolade, Pioneer	N	V																					· Hybrids exhibit resistance to Dutch Elm Disease

			FORM			ATTRIBUTE			SITE								SOILS					
Allowed Large to Medium, Native or Adapted	**Cultivar for Consideration**	**Iowa Native**	**Height/Width**	**Shape**	**Growth Rate**	**Fall Color**	**Flower**	**Food for Wildlife**	**Food for People**	**Forest**	**Park**	**Yard**	**Parkway**	**Median**	**Parking Lot**	**Tree Pit**	**Under Utility Lines**	**Wet**	**Moist/Well Drained**	**Dry**	**Clay Soils Tolerance**	**Road Salt Tolerance**	**Compaction Tolerance**	**Additional Notes**
Yellow Birch *Betula alleghaniensis*		Y																						· May be difficult to find in nurseries
River Birch *Betula nigra*	Heritage, Dura-Heat	Y																						· Vibrant fall color · Unique, peeling bark
Quaking Aspen *Populus tremuloides*		Y																						· Tree can sucker · Is highly susceptible to ice damage
Black Cherry *Prunus serotina*		Y																						· An important contributor to the food web · Use should be limited to naturalized areas due to susceptibility to breakage from ice and potential to spread due to heavy fruit production
Black Willow *Salix nigra*		Y																						· An important contributor to the food web · Use should be limited to naturalized areas due to susceptibility to breakage, mess, and potential for water/sewer utility damage
Ohio Buckeye *Aesculus glabra*	Early Glow	Y																						· Not to be planted near horses or livestock to whom the nuts produced are poisonous
White Pine *Pinus strobus*		Y																						· Evergreen
Limber Pine *Pinus flexilis*		N																						· Evergreen · Less prone to storm damage than native pine
Tuliptree *Liriodendron tulipifera*	Emerald City	N																						· Black Walnut tolerant · Unique flower and leaf-shape

Slow Growth | Moderate Growth | Fast Growth

Mixed Fall Color | White Blooms

Nut | Fruit/Berry

Food Type:

NA = Not Allowed in Parkway
(per current Cedar Rapids tree list)

The ReLeaf Tree List

				FORM			ATTRIBUTE			SITE								SOILS						
Allowed Large to Medium, Native or Adapted	**Cultivar for Consideration**	**Iowa Native**	**Height/Width**	**Shape**	**Growth Rate**	**Fall Color**	**Flower**	**Food for Wildlife**	**Food for People**	**Forest**	**Park**	**Yard**	**Parkway**	**Median**	**Parking Lot**	**Tree Pit**	**Under Utility Lines**	**Wet**	**Moist/Well Drained**	**Dry**	**Clay Soils Tolerance**	**Road Salt Tolerance**	**Compaction Tolerance**	**Additional Notes**
Horsechestnut *Aesculus hippocasteana*	Baumanii, Fort McNair	N																						· Not to be planted near horses or livestock to whom the nuts produced are poisonous
Black Tupelo (Black Gum) *Nyssa sylvatica*	Snow Flurries, Wildfire	N																						· Vibrant fall color · May be difficult to find in nurseries
Baldcypress *Taxodium distichum*	Shawnee Brave, Green Whisper	N																						· Vibrant fall color
Northern Catalpa *Catalpa speciosa*		N																						· Produces large seed pods which can be messy · Weak wood and branch structure
American Beech *Fagus grandifolia*		N																						· Black Walnut tolerant
American Yellowwood *Cladrastis kentukea*	Perkins Pink	N																						· Vibrant fall color · Highly susceptible to breakage from ice · May be difficult to find in nurseries
Cucumbertree Magnolia *Magnolia acuminata*		N																						· Black Walnut tolerant · May be difficult to find in nurseries
Sweetgum *Liquidambar styraciflua*	Moraine, Rotundiloba	N																						· Vibrant fall color · Marginally hardy in Iowa climate · Unique, star-shaped leaves and spiked seedpods
Ware's Oak *Quercus x warei*	Chimney Fire, Nadler	N																						
Sawtooth Oak *Quercus acutissima*		N																						
English Oak *Quercus robur*	Regal Prince, Skymaster	N																						
Silver Linden *Tilia tomentosa*	Sterling	N																						
Dawn Redwood *Metasequoia glyptostroboides*	Gold Rush	N																						· Vibrant fall color
Ginkgo *Ginkgo biloba*	Samurai, Saratoga, Shangri-la	N																						· Vibrant fall color · Only male trees should be planted to avoid odorous fruit
London Planetree *Platanus x acerfolia*	Exclamation, Ovation	N																						
European Hornbeam *Carpinus betulus*	Fastigiata, Frans Fontaine	N																						· Well suited for screens, hedges, and windbreaks
Hardy Rubber Tree *Eucommia ulmoides*		N																						

Legend:

Keystone Species = **Bold Text**

Varying Growth

Tree Height (ft): 30′, 50′, 70′+

Tree Width (ft): 30′, 50′, 70′+

Round, Pyramidal, Columnar, Ovate, Vase, Irregular

The ReLeaf Tree List

Allowed (cont.) Large to Medium, Native or Adapted	Cultivar for Consideration	Iowa Native	Height/Width	FORM: Shape	FORM: Growth Rate	FORM: Fall Color	ATTRIBUTE: Flower	ATTRIBUTE: Food for Wildlife	ATTRIBUTE: Food for People	SITE: Forest	SITE: Park	SITE: Yard	SITE: Parkway	SITE: Median	SITE: Parking Lot	SITE: Tree Pit	SITE: Under Utility Lines	SOILS: Wet	SOILS: Moist/Well Drained	SOILS: Dry	SOILS: Clay Soils Tolerance	SOILS: Road Salt Tolerance	SOILS: Compaction Tolerance	Additional Notes
Turkish Filbert *Corylus colurna*		N																						· May be difficult to find in nurseries
Katsura Tree *Cercidiphyllum japonicum*	Red Fox	N																						
Japanese Zelkova *Zelkova serrata*	Green Vase, Village Green	N																						
Japanese Pagodatree *Sophora japonica*	Regent, Halka	N	V																					· May be difficult to find in nurseries

Contingent Small Native Trees	Cultivar for Consideration	Iowa Native	Height/Width	FORM: Shape	FORM: Growth Rate	FORM: Fall Color	ATTRIBUTE: Flower	ATTRIBUTE: Food for Wildlife	ATTRIBUTE: Food for People	SITE: Forest	SITE: Park	SITE: Yard	SITE: Parkway	SITE: Median	SITE: Parking Lot	SITE: Tree Pit	SITE: Under Utility Lines	SOILS: Wet	SOILS: Moist/Well Drained	SOILS: Dry	SOILS: Clay Soils Tolerance	SOILS: Road Salt Tolerance	SOILS: Compaction Tolerance	Additional Notes
American Plum *Prunus americana*		Y																						· An important contributor to the food web · Use should be limited to areas where dropping fruit will not land on pavements or neighboring properties
Common Chokecherry *Prunus virginiana*		Y																						· An important contributor to the food web · Use should be limited to naturalized areas due to its weak-wooded nature and susceptibility to disease and insects
American Hophornbeam *Ostrya virginiana*		Y																						
American Hornbeam *Carpinus carolinana*		Y																						· Vibrant fall color · Black Walnut tolerant
Pagoda Dogwood *Cornus alternifolia*		Y																						· Unique, horizontal growth habit · Black Walnut tolerant
Shadblow Serviceberry *Amelanchier canadensis*		Y																						· Vibrant fall color · Black Walnut tolerant
Eastern Redbud *Cercis canadensis*		Y																						· Black Walnut tolerant
Prairie Crabapple *Malus ioensis*		Y																						· Susceptible to cedar-rust · Can be difficult to find native variety in nurseries
Downy Hawthorn *Crataegus mollis*		Y																						· Tree should be sited carefully as it produces long thorns

Slow Growth · Moderate Growth · Fast Growth

Mixed Fall Color · White Blooms

Food Type: Nut · Fruit/Berry

NA = Not Allowed in Parkway (per current Cedar Rapids tree list)

How to Plant a Tree

1 Before planting, call 811 to locate underground utility lines for free

811 Know what's **below.** **Call** before you dig.

2 Mark where you'll plant your tree and dig a circle 2-3 times the diameter of your tree's container. The hole should be no deeper than 1 foot.

3 Remove your tree from its container or cloth bag.

6 Lower your tree into the hole. Place your shovel handle across the hole to provide a guide for the surrounding ground level. Ensure that the exposed root flare is at, or slightly above, ground level. Add or remove soil until the correct depth is met.

7 Use your shovel as a guide to confirm your tree is sitting vertical. Add or remove soil to the hole until it is. Be careful to maintain the root flare at ground level.

9 Fill in the planting hole with the remaining soil and build a berm (or donut) around the perimeter. Again, make sure the root flare is still exposed.

10 Apply a 2-4 inch layer of mulch around your tree. Mulch should be held back from the trunk and root flare—wet mulch can rot the trunk leading to disease and death.

Photograph by Trees Forever

4 Prep your tree for planting by finding the root flare. The root flare is where the base of the tree flares into the roots. Carefully remove the top layer of soil, stopping before you get close to the trunk, until you find the first root the size of a finger. Remove soil from around the entire tree so the root flare is exposed on all sides.

5 Make a vertical slice every few inches around the tree's root ball to prevent circling roots. Circling roots can strangle a tree as it grows and make it more prone to fall during heavy winds

8 Once your tree is sitting level, backfill the planting hole to roughly half full with the original soil. Pour one bucket of water around the planting hole to settle the soil and remove air pockets.

11 Place a tree guard over the trunk. Attach either a watering bag or 5 gallon bucket with a 1/8 inch hole drilled near the bottom. If using a bucket, make sure the hole is pointing towards the trunk.

Continued Care for Tree Health

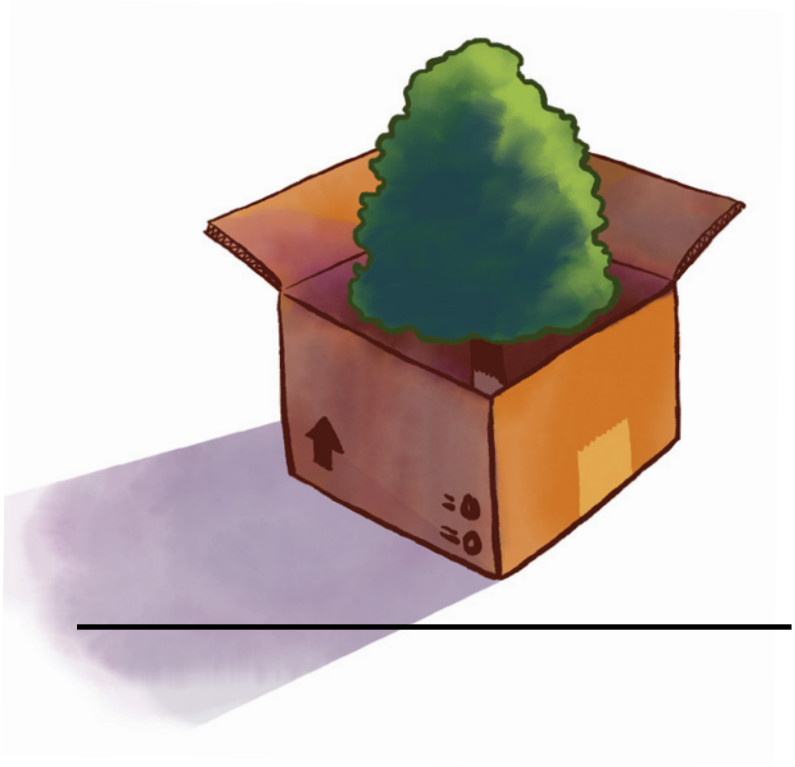
- Continue watering 5-15 gallons of water weekly for at least the next 2 years
- Water from ground thaw to freeze and remove bags or buckets during winter months
- Prune broken or dead branches and those crossed or rubbing together
- Remove tree guard and watering accessories as the tree grows to prevent damage
- Replenish mulch yearly to conserve moisture, control weeds, and prevent damage from lawn-mowing equipment
- Consider planting native plants under and around your tree to support the food web
- For guidance on preventing wildlife damage to your new tree, see: www.extension.iastate.edu/news/yard-and-garden-prevent-wildlife-damage-trees-and-shrubs

The Real Problem: Supply Chain

Choosing the right trees requires some effort, but it is not hard. Similarly, the cost of replacing more than 100,000 City-owned trees is daunting, but the will exists to raise the funds, and the City has already committed a million dollars a year to this effort. The limiting factor is not likely to be money or know-how, but plant material. Can enough trees be found for this plan to achieve its goals?

The City and its residents face two distinct sets of supply chain challenges, to be discussed in the Private and Public Plans ahead. But, whether private or public, trees need to find their way to Cedar Rapids to be planted. The math isn't pretty. Replacing within a decade the approximately 670,000 public and private trees lost in the derecho means that on average, more than 180 trees need to be sourced per day, every single day, for ten years. There aren't enough saplings in the upper Midwest, let alone eastern Iowa, to fill that order.

This is a problem that requires multiple solutions. Clearly, growing the capacity of regional nurseries is key. Having more production close at hand will both reduce costs and lead to more of the right trees being available. That's Plan A. But relying completely on nursery-grown saplings drastically and unnecessarily limits the number of trees that can go in the ground. Plan B is seedlings.

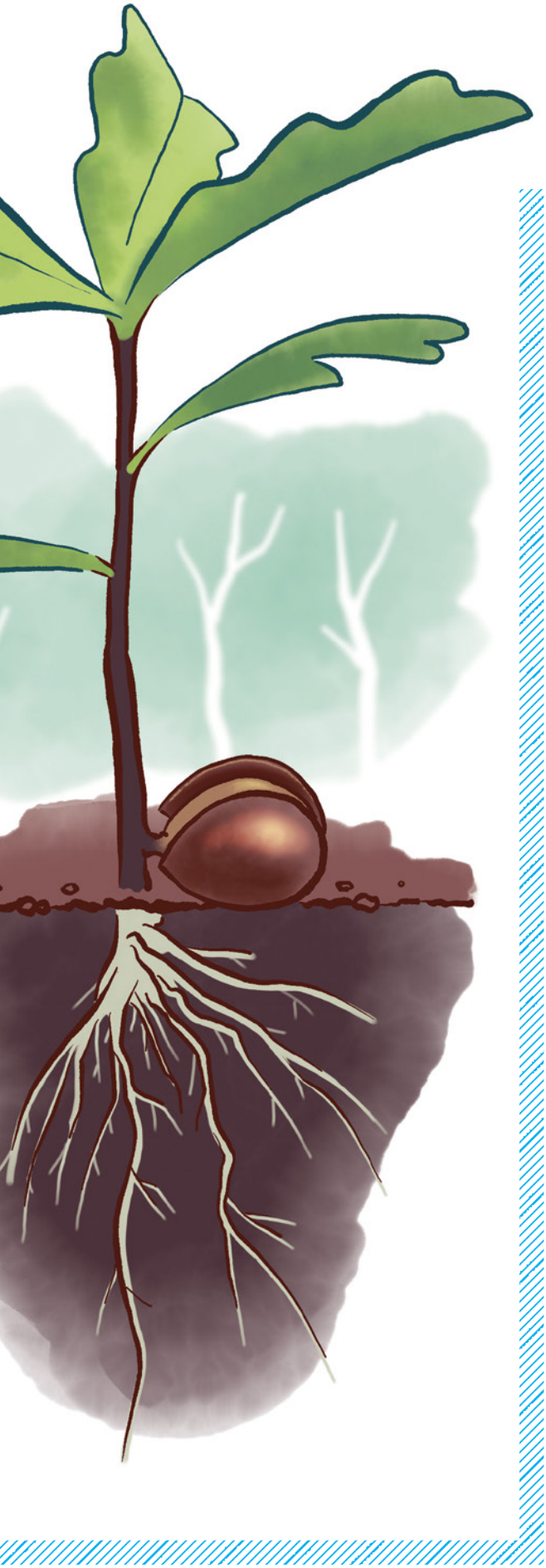


Direct Seeding Natives

Another option for replanting parks, yards, and other more natural areas is to directly plant acorns and nut seeds of highly sought-after native species such as oak, black walnut, and hickory. This method of reforesting is referred to as "direct seeding." These plantings have seen great success in state parks and rural lands. Residents who want to grow their own seedlings will find that direct seeding works especially well for hard-to-transplant varieties like white oaks.

To plant a larger area, first collect local acorns, nuts, and seeds—a great way to engage neighborhood volunteers. Ideally, the seeds are drilled into the soil with a specially modified planter. If one is not available, you can plant in rows that are roughly 4 inches deep by using one to two bushels of seeds per acre. Alternately, the acorns and nuts can be broadcast on top of prepared soil at a ratio of three to four bushels per acre.

Once seeding is complete, do your best to protect the area from livestock and wildlife. With good weather, and a little luck, your newly planted seeds will sprout and grow to maturity!



Growing Capacity

In stakeholder meetings with nurseries, landscape companies, and tree specialists, it became clear that the main limit to the tree supply was skilled labor. On the job, a worker can learn the basics in a year, but it generally takes three growing seasons to achieve full competency. Meanwhile, there is no work to do for three and a half months during winter, so most team members need to find another job, which causes staff loss.

The Growing Futures program at Trees Forever has proven to be an excellent path to college degrees and future employees. An important next step towards developing more local talent, and keeping it local, would be to explore stronger partnerships between Trees Forever and Kirkwood, Coe, Mount Mercy, Iowa State, and other schools, with the goal of developing more robust coursework locally and greater ties between arboriculture students and the Cedar Rapids area. Of particular promise might be programs that focus classroom instruction during the winter, or nursery off-season.

Plan B: Supplement with Seedlings

If the goal were simply to maintain and grow an established canopy, purchasing trees from nurseries would perhaps be enough. But Cedar Rapids faces a unique challenge that demands a unique solution. Replacing 670,000 destroyed trees in a decade simply can't be accomplished by transplanting juveniles one-by-one off the back of a truck.

One solution is seedlings. Seedlings are baby trees, one or two years old, that can economically be grown from seed by the thousands. They can be planted quickly in groups, protected by small tube-type tree shelters, and left with little care. Seedlings are extremely cheap: a seedling plus its shelter costs around $4 and takes just seconds to plant. In contrast, sourcing, planting, and watering a typical sapling costs hundreds of dollars. Unlike saplings, the supply of seedlings is essentially unlimited.

Seedling survival rates are typically low, but that is not a disincentive to planting them. If only ten percent of seedlings survive to sapling age, we are still growing trees at one tenth the cost. And a seedling that survives is more resilient than a sapling because it has never had its roots trimmed for transplanting.

Along the Natural-to-Urban Transect, seedlings are more of a rural solution. They are not precisely located and staked like street trees; rather, they belong in parks, along trails, in "unimproved" natural areas, and in suburban yards. In these locations, they are at risk from animals, but not as much from trampling or road salt. And, given their ease of propagation they can all be "Superior" large-species natives.

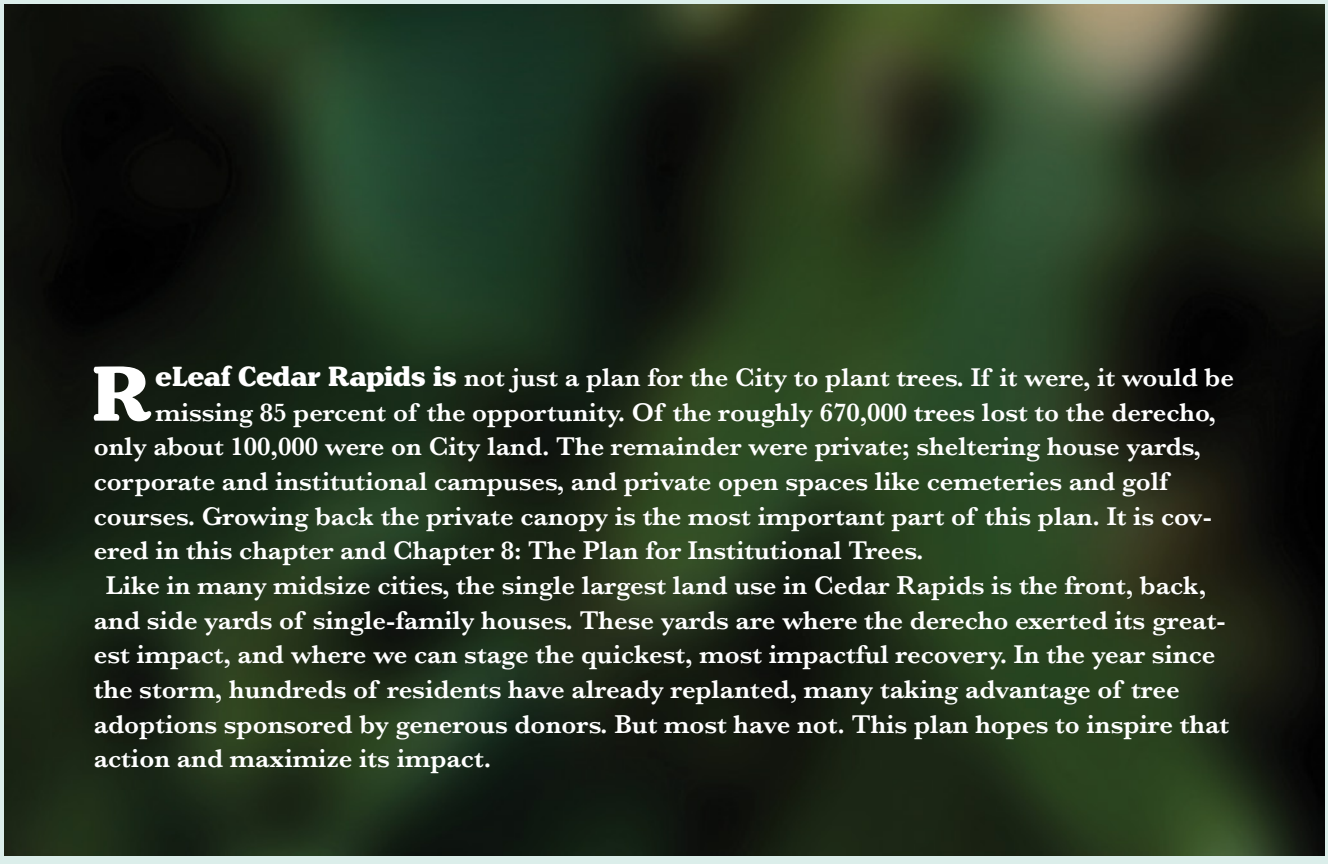
The Private and Public Tree Plans that follow show how the City and its citizens can make use of seedlings to turbocharge the ReLeaf effort.

ReLeaf
CEDAR RAPIDS

Private Trees: The Plan for Yard Trees

7

"If half of American lawns were replaced with native plants, we would create the equivalent of a 20 million acre national park; nine times bigger than Yellowstone, or 100 times bigger than Shenandoah National Park" - Doug Tallamy



ReLeaf Cedar Rapids is not just a plan for the City to plant trees. If it were, it would be missing 85 percent of the opportunity. Of the roughly 670,000 trees lost to the derecho, only about 100,000 were on City land. The remainder were private; sheltering house yards, corporate and institutional campuses, and private open spaces like cemeteries and golf courses. Growing back the private canopy is the most important part of this plan. It is covered in this chapter and Chapter 8: The Plan for Institutional Trees.

Like in many midsize cities, the single largest land use in Cedar Rapids is the front, back, and side yards of single-family houses. These yards are where the derecho exerted its greatest impact, and where we can stage the quickest, most impactful recovery. In the year since the storm, hundreds of residents have already replanted, many taking advantage of tree adoptions sponsored by generous donors. But most have not. This plan hopes to inspire that action and maximize its impact.

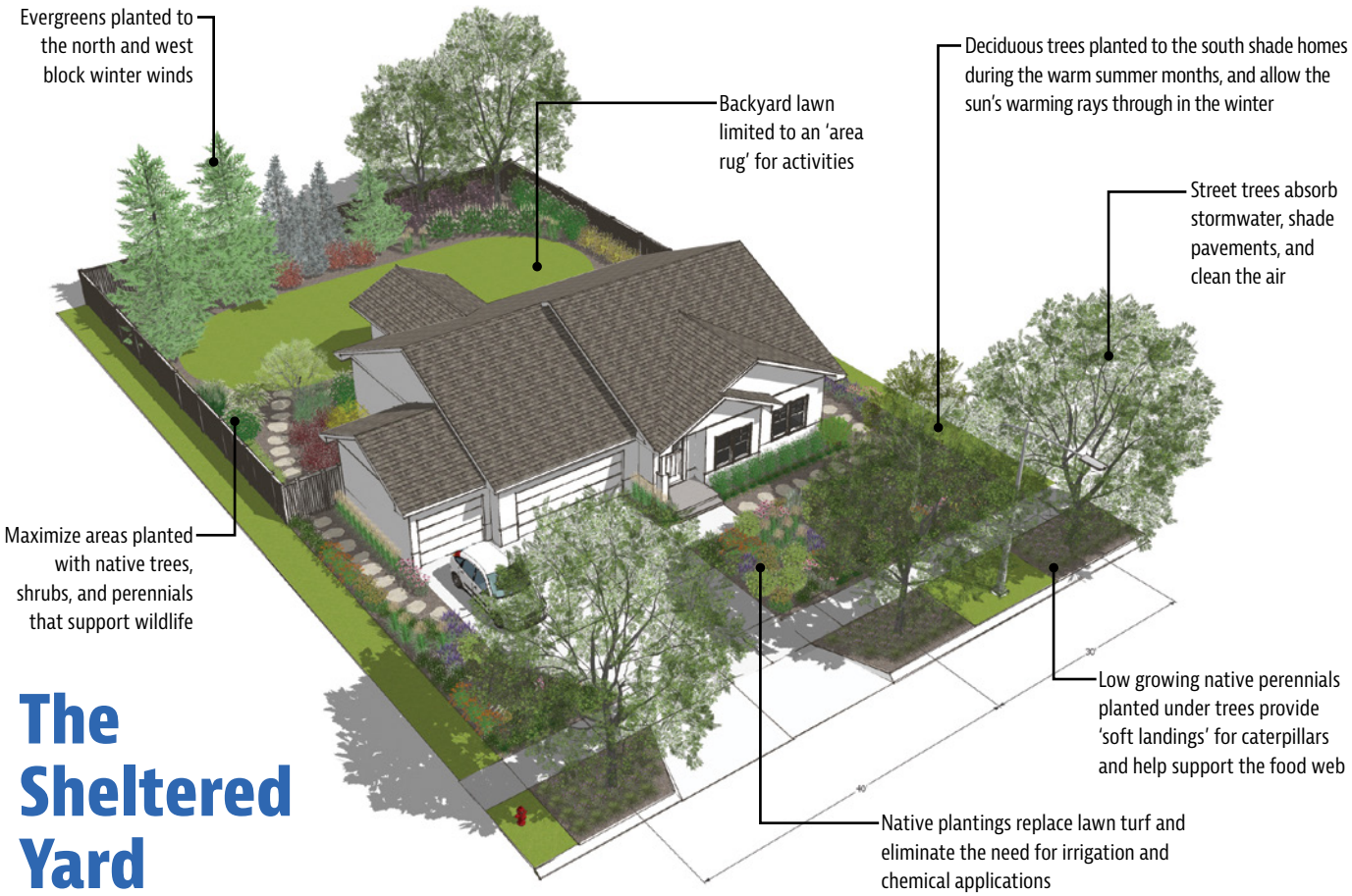
Why Yard Trees Matter

The North American front yard is a strange thing. Largely absent on most other continents—where building setbacks are small or nonexistent—it serves no useful purpose and is mostly ornamental. As such, most front yards can easily receive a new tree or two without causing any inconvenience. Depending on the house's orientation, that tree can lower summer cooling costs, winter heating costs, or both, while improving the property's sense of privacy.

Meanwhile, the back yard is often our own private Shangri-La, a cherished location of family activity for half the year. But these too often suffer from lack of privacy when they don't have fences or shrubs at their edges. And as the summers get warmer, adding a couple of well-placed shade trees can greatly extend their use. As in the front yard, these trees can be placed to create significant energy savings.

We have already discussed how neighborhood trees improve air quality and health, reduce heat islands and crime, and significantly increase property values. But collectively, they hold even more promise as Doug Tallamy's "Homegrown National Park," the path to sustaining the food web. Every yard counts, but as more and more yards become sheltered with canopy, a suburban neighborhood eventually crosses that threshold from a subdivision with trees to its conceptual inverse, houses carved out of the forest. This transformation is possible at any suburban density, and with the right tree species, it can make all the difference.

The Sheltered Yard



Campaigns to Grow

Trees Forever has been working for decades to help people plant yard trees in Cedar Rapids. It organizes tree adoptions to eliminate the cost barrier for people who are motivated to plant a tree. Since the derecho, Trees Forever and other partners such as the Monarch Research Project have organized tree adoptions, distributions, and tree sales leading to thousands of yard trees being planted in the community.

Ramping up these adoptions to the degree that funding and trees become available will be an important component of ReLeaf. However, given limited resources, all future adoptions should focus on those species designated as Superior and Allowed on the ReLeaf Tree List. These events should also be used to educate the public around the value of native species. Ideally, all tree adoptions will be tracked by address and mapped on a GIS system for follow-up on survival rates.

Trees Forever also runs a program called TreeKeepers, through which volunteers receive about eight hours training, and then work to organize and lend a hand with plantings in the community. If someone needs help planting a tree, they can call a TreeKeeper. TreeKeepers also help serve as team leaders in corporate employee planting events, and volunteer at tree adoptions as well.

There are several hundred graduates of the TreeKeepers program in the community; growing that program will be very helpful to the ReLeaf effort. As it has done in the past, Trees Forever should expand the deployment of its TreeKeepers program to plant yard trees at multi-family houses and other rental properties around the city. These properties, many of which house vulnerable populations, are places where yard trees can have the most positive impact.

The Great Seedling Campaign

As discussed in Chapter 6, planting thousands of seedlings on both public and private property will help us achieve our ReLeaf goals. Planting seedlings requires minimal instruction; we just need to get them into the hands of willing residents. Doing so effectively is a problem of packaging, distribution, and promotion:

- **PACKAGING:** Seedlings should be grouped into attractive, enticing, bundles that are easy to distribute. One promising idea is the "ReLeaf IPA Seedling Six-Pack"—IPA as in "I'm Planting A" Seedling. Using bold graphics and humor to inspire seedling take-aways will only help. Before bundling, each seedling should be inserted in its protective tube, ready for deployment. The package graphics should include clear instructions on planting.
- **DISTRIBUTION:** Seedling six-packs should be distributed to all local nurseries, to be offered for free to every person who purchases a tree: "Buy a tree, get a six-pack!" They should also be offered in conjunction with every tree picked up at a tree adoption. Additionally, they should be distributed in neighborhoods by the City's Rolling Rec Mobile. Whenever TreeKeepers help to plant a tree, they should look for the opportunity to plant a stand of seedlings.
- **PROMOTION:** A public campaign should be mounted surrounding the promise of seedlings. Posters should be distributed to garden centers and other key locations, and press releases and other PR should be directed to local news outlets. Most people aren't aware of the opportunity that seedlings represent, and this story is newsworthy.

Don't Forget Groundcover

ReLeaf Cedar Rapids is a tree plan, not a shrub plan or a yard plan. But, as we have learned, planting alternatives to grass under yard trees dramatically improves their contribution to the food web. Trees Forever should work with its partners, especially local nurseries, to increase awareness of the importance of groundcover. When someone buys a tree from a nursery, picks one up at a tree adoption, or solicits the planting help of the TreeKeepers, "what are you going to put under it?" should become a standard question. ReLeaf Partners should work with local garden centers to stock native groundcovers such as wild geranium, prairie dropseed, and wild ginger, and to also encourage large mulch circles in places where the owners do not want plants.

The border area between the sidewalk and street is public property, but—as in most cities—private landowners are asked to maintain it and are welcome to plant it. Since that area typically contains street trees, it too is a good location for alternatives to grass. Residents may plant lower-profile native plants and groundcovers that welcome caterpillars more generously than lawn.

This plan encourages larger circles of mulch around trees, both public and private, which ideally receive annual replenishment and maintenance. Mulching trees requires less mowing and, while inferior to native plantings, is better for pollinators than grass. Other benefits include retaining moisture, conditioning the soil, and protecting trees from "mower blight," the damage sustained from weed-whacker whips and mower decks.

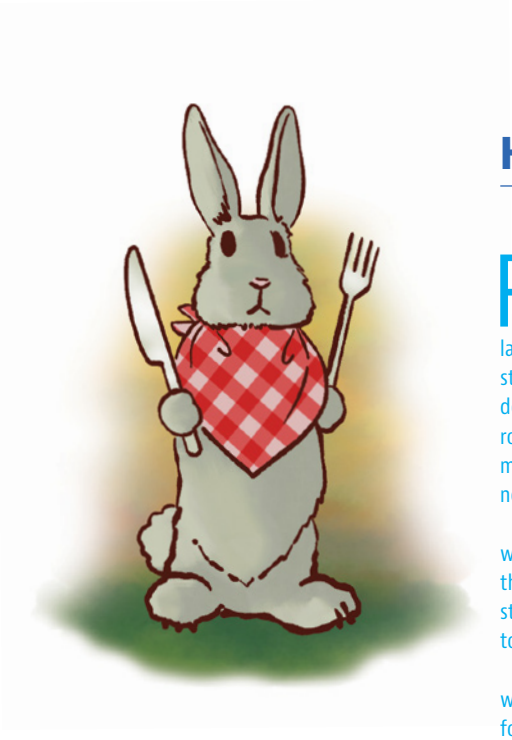
Backyard Forests

The derecho was devastating for many local large-acreage owners, many of whom lost between 50 and 100 trees. In most cases, these landowners had either planted many trees themselves, or had done their best to manage and enhance inherited forests. Much of this woodland now needs replacement, and a program at Trees Forever can help.

The Backyard Forests educational program was started as part of the Our Woodland Legacy effort with support from Jacque and Dennis Holloway. The owners of over 40 acres on the edge of Cedar Rapids, they wanted to create a program that "would be the voice and value for trees and woodlands." Done in partnership with the Iowa DNR and Trees Forever, the Backyard Forests program has helped advise and educate hundreds of landowners on being better stewards of the natural resources on their land.

Most large-acreage owners want their property to nurture both native forest and prairie so their private land is likely supporting many insects and animals as a result. One example is Katie and Tim Hill, whose property was found to be home to the endangered rusty patch bumblebee, right in the middle of Cedar Rapids.

In response to the derecho, the Backyard Forests program should be continued robustly, and tailored to assisting all landowners with more than ten acres of property. Backyard Forest events should include workshops on the value of native trees and understory plants, and special offerings of seedlings and saplings to aid in reforestation.



How Do I Protect My New Tree From Wildlife?

Few things are more disheartening than finding a newly planted tree that you've tenderly labored over nibbled down to a stub by nature itself. White-tailed deer, rabbit, and even voles—small rodents similar in appearance to mice—can wreak major havoc on new plantings.

Small seedlings can be protected with plastic 'tree tubes' surrounding the tree and held in place with a stake or small post. These will need to be removed as the tree grows.

For larger trees, fencing—ideally woven-wire with a mesh too small for rabbits or voles to squeeze through—is the most effective way to keep critters clear of your new planting. The fencing needs to be either high enough (6 to 8 feet) or far enough away from the leaves to prevent deer from reaching inside. The bottom of the woven wire material should make contact with the ground and be held in place with metal landscape staples to prevent smaller animals from squeezing underneath.

Once your tree outgrows its fencing, you may want to consider setting a few steel T-posts around the trunk to protect the tree from further damage caused by male deer rubbing their antlers along the bark. This protection is likely only necessary if your neighborhood has a resident deer population.

A last resort, or as an option for those unwilling or unable to install fencing materials, is to apply a deer and rabbit repellent spray or granules. These products require regular reapplication and can be quite foul smelling, often made from ingredients like putrescent egg solids and garlic. No wonder wildlife won't have an appetite for your planting!

The Private Tree Supply Chain

As discussed, achieving the ReLeaf Cedar Rapids goal of planting 180 trees per day for ten years is only possible with the help of seedlings. These can be sourced principally from the Superior section of the ReLeaf Tree List, and therefore can be mostly native species that support the food web. But what about the hundreds of trees purchased each year at nurseries and garden centers? Are they helping to meet ReLeaf goals?

The single highest-ranked principle among hundreds of local poll respondents was Native Landscape. Yet, to paraphrase one focus group participant, "You go to the store, and there's not a native tree to be found." The simple fact is that we have all been learning slowly about the value of natives, and the supply chain has yet to catch up.

Nor has demand. Most tree shoppers, unaware of ecosystem impacts, are looking for something with pretty flowers or fall color; caterpillar production is the furthest thing from their minds. But they can only buy what's in the store. And the store is the most opportune location to educate tree buyers as well.

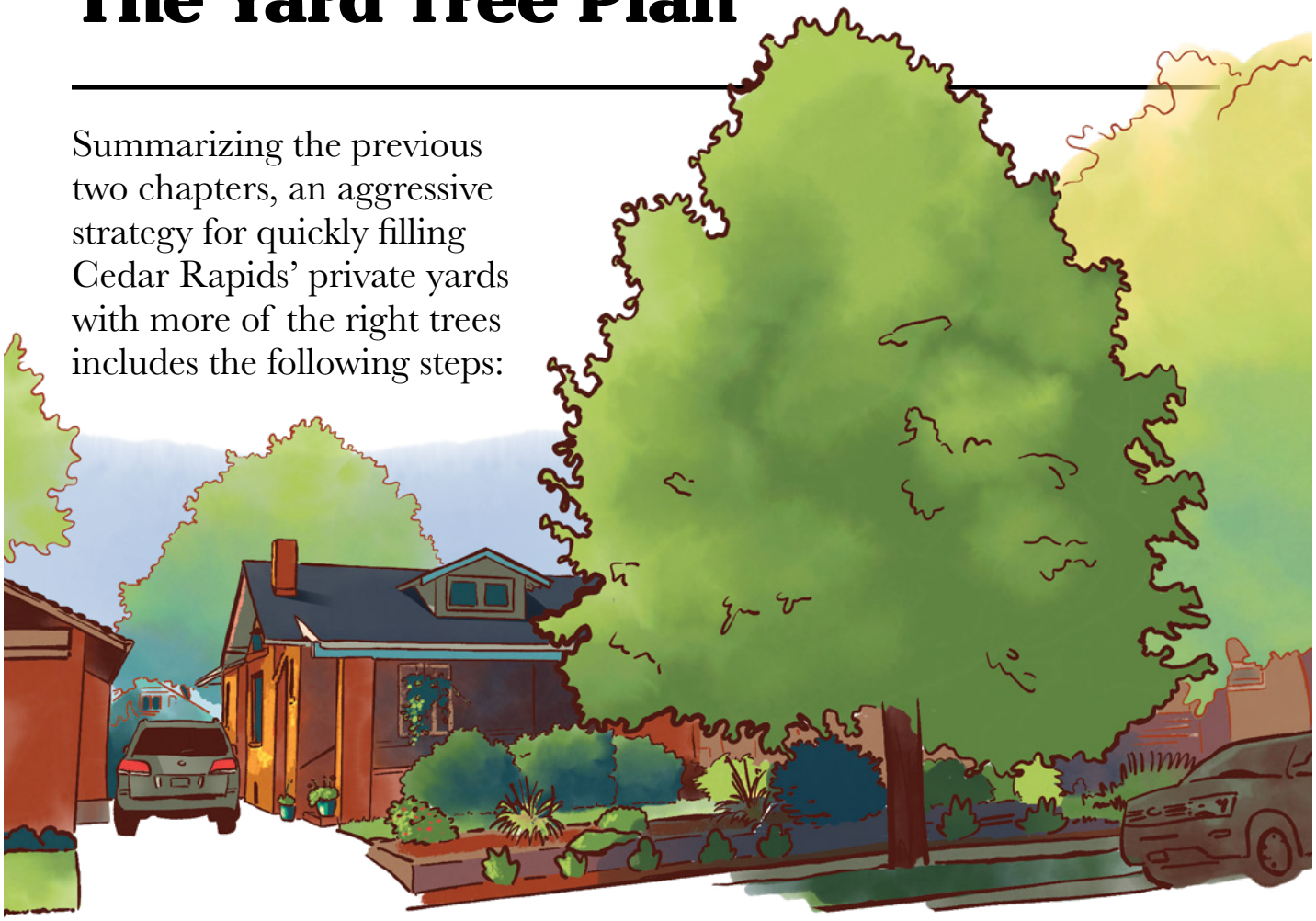
The resulting situation is a bit of a Catch-22: garden centers stock Bradford pears and Autumn Blaze maples because that's what people want, but most people don't know enough to want something else, and the stores are not motivated to teach them.

We can't begrudge the garden centers for selling what sells the best. We can't punish them for stocking trees like maples which actively undermine the community's resilience against blight. But we can reward them, and tree buyers as well, for making more informed choices.

One way to do this would be through store endorsement. The City and Trees Forever—collectively known as ReLeaf Partners—should create an official endorsement such as "ReLeaf Certified" for those nurseries and garden centers that build their tree supply around the ReLeaf Tree List. Modeled on the Blue Zones Project certification of restaurants, this program would award participants a prominent gold-star-type seal to display, and celebrate them annually. Compliance criteria would need to be set to create a high but achievable standard, and would likely include staff education and a commitment to display educational materials (including copies of this plan) at the point of sale.

The Yard Tree Plan

Summarizing the previous two chapters, an aggressive strategy for quickly filling Cedar Rapids' private yards with more of the right trees includes the following steps:



Giveaways
Trees Forever will continue—and work to expand—the tree adoption program, focusing its supply on Superior and Allowed yard trees from the ReLeaf Tree List.

Volunteers
Trees Forever will work to expand its TreeKeepers (and other similar) programs, teaching tree care skills to neighborhood volunteers, with the goal of a TreeKeeper in every neighborhood.

Target Yards
Trees Forever will work to expand the deployment of its TreeKeepers (and other similar) programs to plant yard trees at apartment houses and other rental properties around the city.

The Seedling Solution
Trees Forever will create a program that sources, packages, distributes, and promotes the private planting of native seedlings citywide.

Groundcover
ReLeaf Partners will work with local nurseries and garden centers to encourage the sale of, and education around, native groundcovers as an alternative to lawn.

Backyard Forests
Through its Backyard Forests program, Trees Forever will make a concerted effort to communicate with the owners of large properties, offering planting advice and access to native seedlings.

Store Endorsement
ReLeaf Partners will create a ReLeaf Certification for nurseries and garden centers that meet established guidelines in promoting and selling trees from the ReLeaf Tree List.

Growing Arborists
Trees Forever will explore stronger partnerships with local colleges and universities, with the goal of developing more robust coursework and greater ties between arboriculture students and the Cedar Rapids area.

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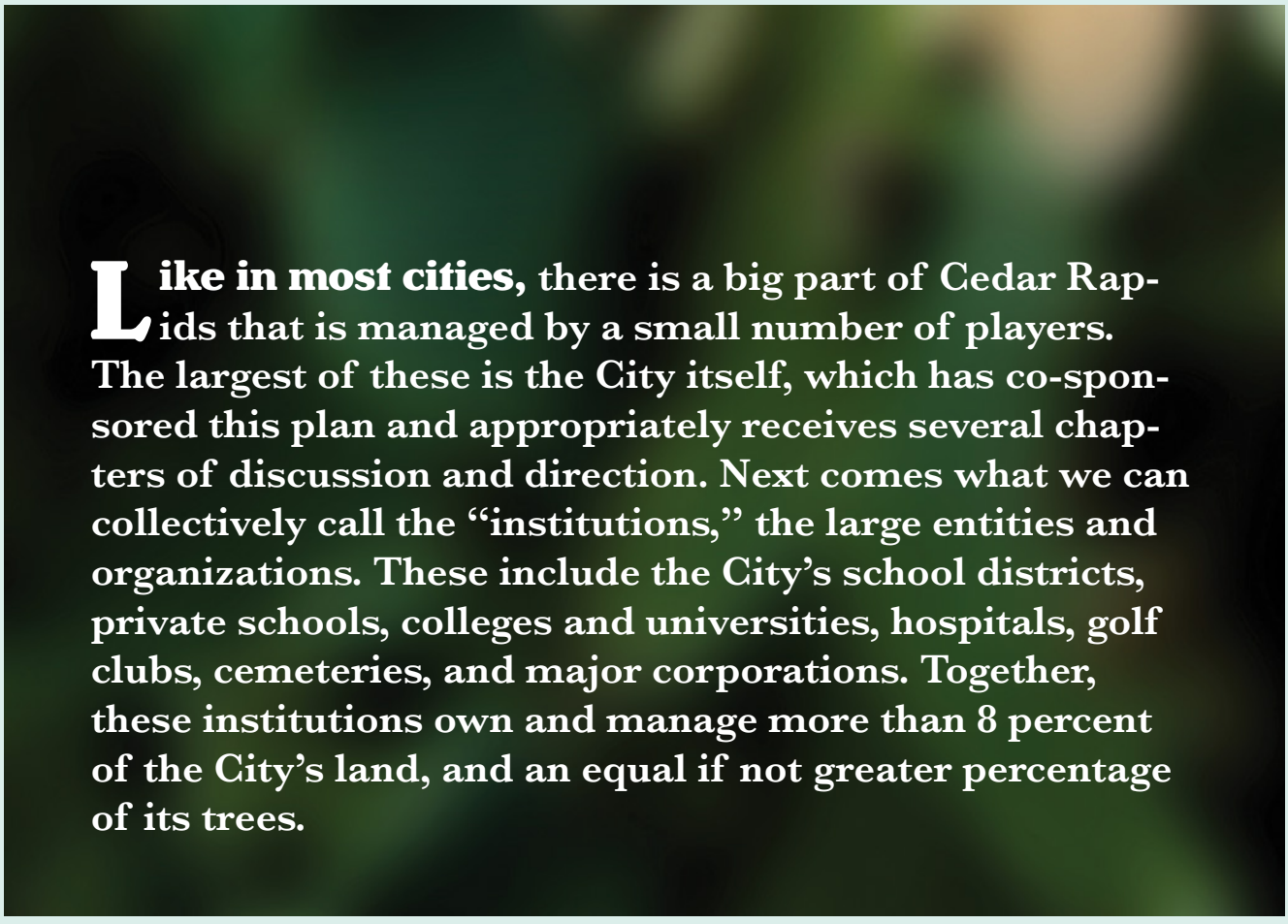
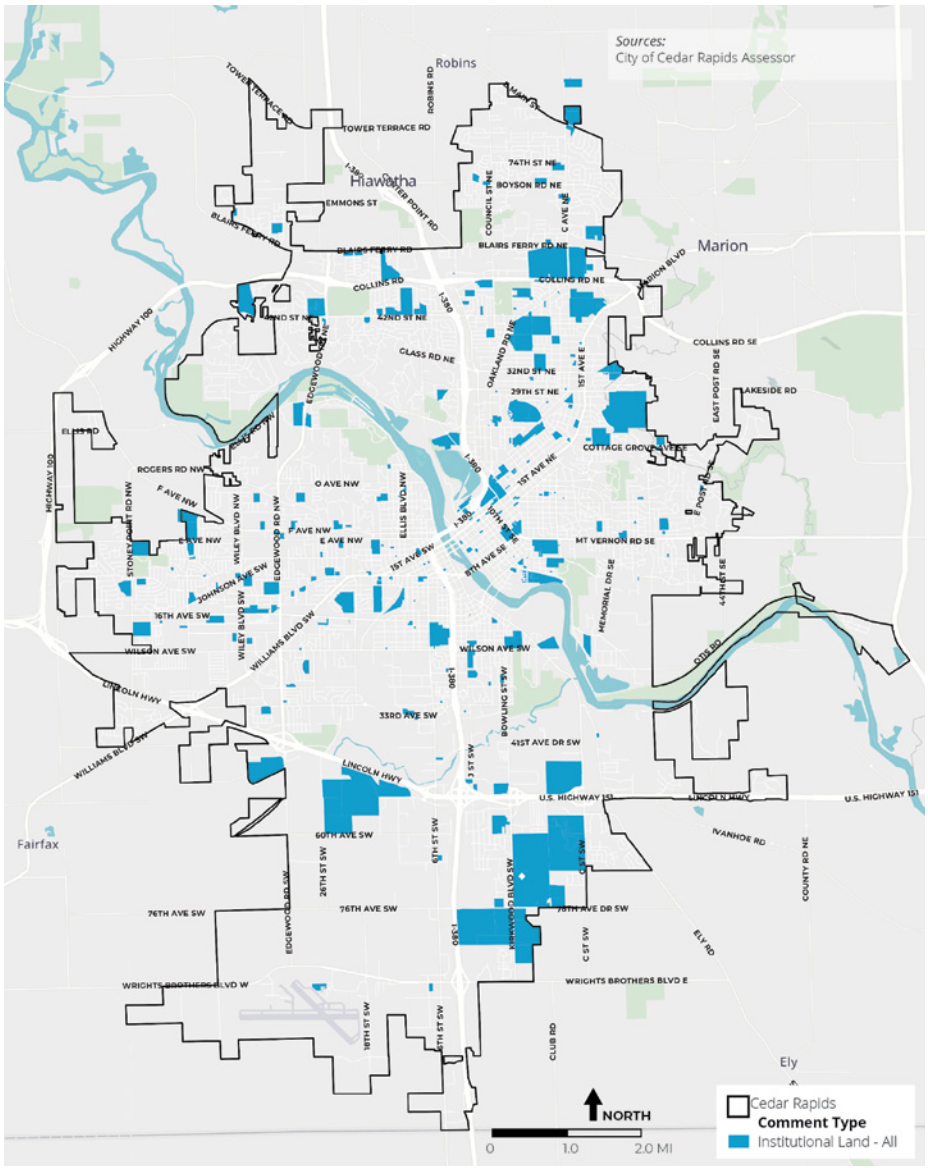
Private Trees: The Plan for Institutional Trees

8

KEY PLAYERS P. 60 | THE INSTITUTIONAL TREE PLAN P. 64



Like in most cities, there is a big part of Cedar Rapids that is managed by a small number of players. The largest of these is the City itself, which has co-sponsored this plan and appropriately receives several chapters of discussion and direction. Next comes what we can collectively call the "institutions," the large entities and organizations. These include the City's school districts, private schools, colleges and universities, hospitals, golf clubs, cemeteries, and major corporations. Together, these institutions own and manage more than 8 percent of the City's land, and an equal if not greater percentage of its trees.



Institutional land ownership in Cedar Rapids including school districts, private schools, colleges and universities, hospitals, golf clubs, cemeteries and religious campuses, corporations, and corporate parks.

The derecho hit institutions as hard as anyone. Oak Hill Cemetery lost more than 300 trees and three quarters of its canopy. Coe College, Mount Mercy University, and Kirkwood Community College lost over 600 trees between them. Collins Aerospace lost some 75 percent of its trees. The landscape of private golf clubs was rendered almost unrecognizable. Already struggling with the impacts of the Emerald Ash Borer, these organizations are now faced with a replanting challenge that seems insurmountable.

With their large holdings of open space, institutions represent a central opportunity for reestablishing and growing the city's tree cover. By identifying these organizations, this plan hopes to inspire and help institutions to replant a robust and resilient canopy that maximizes its contribution to the city's well-being.

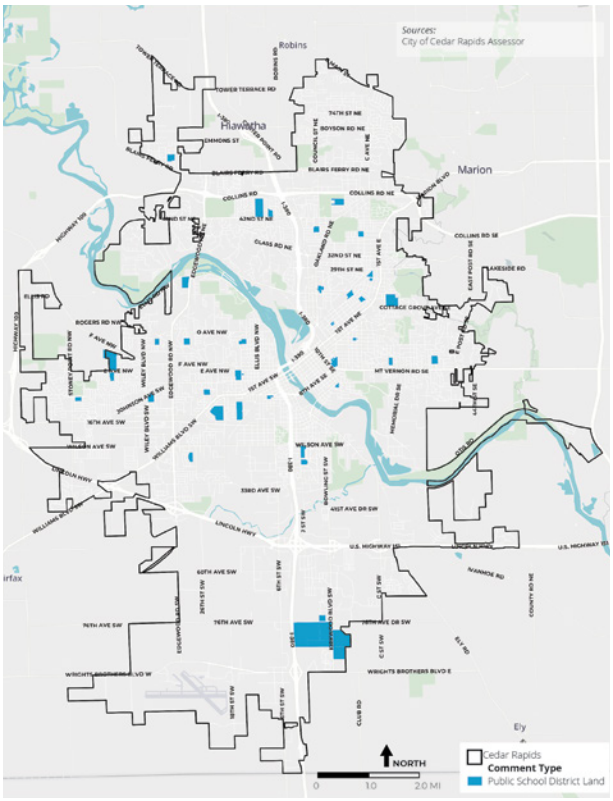
The Key Players

While many other (smaller) entities, together, control even more property, it is possible to identify the largest landowners in Cedar Rapids. Economies of scale suggest that forging relationships with and among these institutions will be key to bringing back the canopy in an efficient way. This planning effort included meetings with many of them and coming to know their needs and resources.

In addition to replanting wisely, these institutions can help in three different ways. First, they can lead by example, with bold replanting efforts that inspire smaller players. Second, the ones with large workforces—especially the corporations—can organize staff volunteer efforts within the community to replant public parks and other locations that need help. Third, the for-profit corporations, as always, can contribute funding towards the same end.

What you can do depends on who you are. For the purposes of this plan, Cedar Rapids' largest institutions can be grouped into seven categories:

- School Districts
- Private Schools, Colleges, and Universities
- Hospitals
- Golf Clubs
- Cemeteries and Religious Campuses
- Corporate Parks
- Other Corporations



Public School District Land

School Districts

Like most public school districts, the Cedar Rapids Community School District and College Community School District operate in a challenging budgetary environment where every dollar counts. But they also operate in a mission-driven environment where educating children is held paramount. Student performance is the measure of a school's success, and tremendous resources are invested towards that end.

Both of these circumstances suggest that rebuilding our public school tree canopy cannot happen fast enough. As with individual homes, properly located trees around a school building can significantly lower its heating and cooling costs. But more significantly, schoolyard trees have been repeatedly linked to higher academic outcomes. Just as trees make us healthier, they help children learn. One University of Illinois study of more than 50,000 Washington State middle-schoolers found that, "the more tree cover around a school, the better its standardized test scores in both math and reading."[81]

This study controlled for 17 other factors including neighborhood demographics, and looked at 450 schools in urban, suburban, and rural locations. Remarkably, what mattered was tree cover close to the school. Neither neighborhood greenery nor schoolyard grass had a similar impact. "Even if the larger neighborhood was leafy, students were no better off if the schoolyard wasn't."[82]

In this context, the impact of the derecho on Cedar Rapids' public schools must be considered more of a crisis than has previously been recognized. Repairing damaged school buildings is not enough. The College Community School District, for one, lost more than 40 percent of its trees on 680 acres of schoolyards. It will take many years for the 41 elementary, middle, and high schools in Cedar Rapids to regain the canopy that they lost, but every year of delayed replanting is likely a year of delayed positive academic impacts.

Finally, it's worth noting that as a public good, public schools stand out among the city's institutions as especially worthy destinations for private support. As much as it makes sense for the school districts to invest in their own trees, it is easy to imagine how additional motivation could be provided in the form of matching grants. As a part

of this plan, Trees Forever will establish a pool of grant funds, as fundraising allows, to support the replanting of public schoolyards and other worthy destinations.

Private Schools, Colleges, and Universities

Like its public schools, Cedar Rapids' private campuses should be motivated by academic outcomes to replant as quickly and robustly as possible. While less a subject of research, it can be assumed that the positive academic impact of trees extends beyond high school. Independent of this factor, it can't be denied that a leafy campus environment contributes immeasurably to the college experience. Cedar Rapids' three institutions of higher learning, Coe College, Kirkwood Community College, and Mount Mercy University, all have lovely green campuses that were badly damaged by the derecho, and all are determined to rebuild fully. Kirkwood, whose course list includes forestry electives, has already replanted about a third of 200 trees lost. Coe College is halfway to its goal of replacing 300 lost trees. These efforts would ideally include consideration of where else on campus trees could be planted. Kirkwood's more modern suburban campus is especially full of large grassy areas that would benefit from more shade.

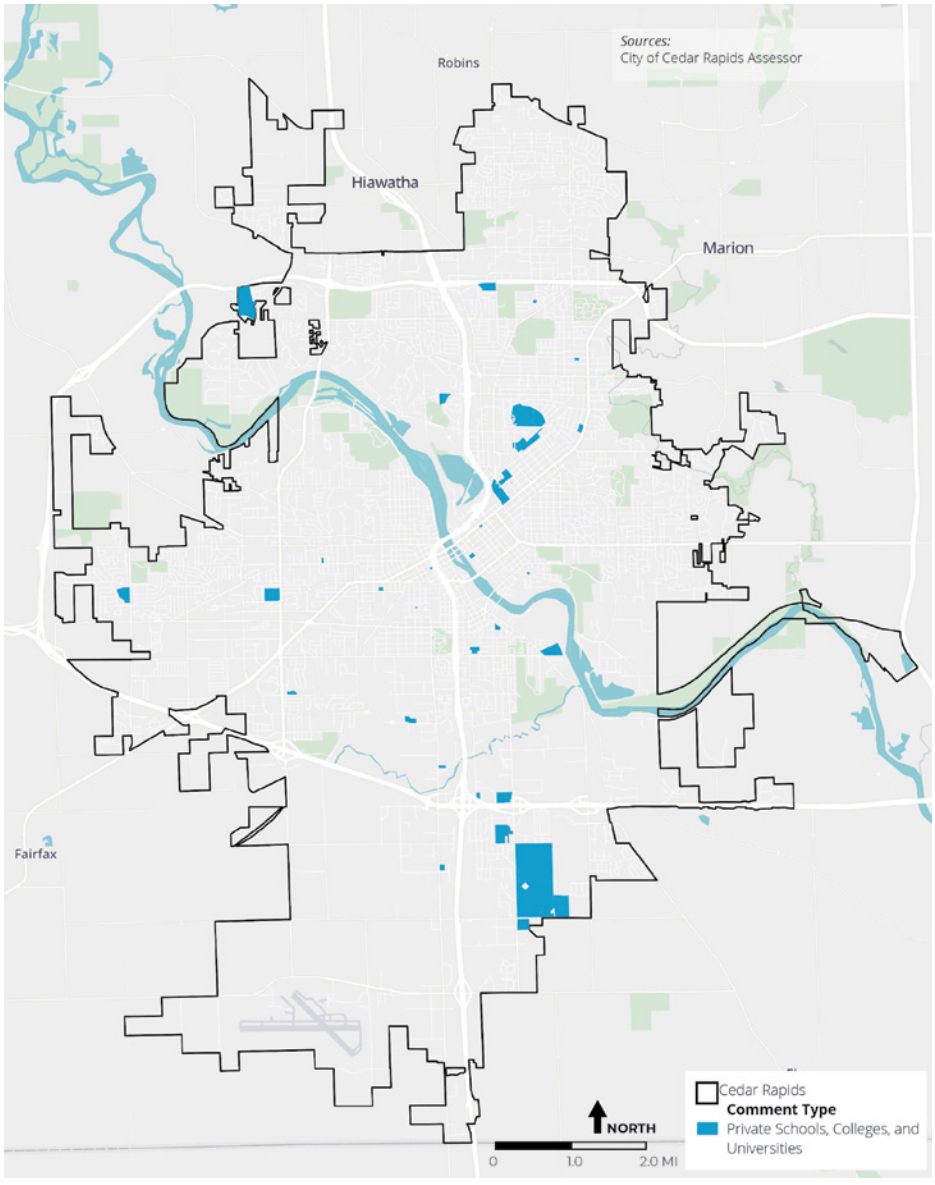
Hospitals

Chapter 3 describes the now-famous study demonstrating how the view of trees outside a hospital window resulted in surgical patients getting discharged, on average, a full day earlier. Cedar Rapids' two hospitals, Mercy Medical Center and UnityPoint Health St. Luke's Hospital, are both land-constrained, with limited locations for planting trees. But both have their share of open space and tree cover, and these trees were damaged badly. The benefits of replanting quickly and finding new locations for additional trees are clear.

Golf Clubs

Two of the largest private open spaces in Cedar Rapids are golf courses: the Cedar Rapids and Elmcrest Country Clubs. Impacts of the derecho on these properties were so severe that revised long-term landscapes with fewer trees are being considered.

It is understandable that



Private schools, colleges, and universities

growing back Cedar Rapids' canopy is not a high priority for all golf course managers, and that shaping a half-denuded landscape into something that looks complete, soon, has taken precedence. But golf courses, with their large acreage and steady, conscientious professional maintenance, are an ideal place to grow trees. With regular observation, watering, and pruning already on site, we can expect that trees planted on golf courses will thrive better than most in the city. Indeed, golf courses would seem the ideal place to locate hundreds of seedlings, where groundkeeper oversight would keep die-off to a minimum.

Cemeteries and Religious Campuses

There are more than a dozen cemeteries in Cedar Rapids, and many of them are quite large and lovely. All were hit hard by the derecho, and many lack the resources to replant. As one example, Oak Hill Cemetery lost more than 300 trees, and has not yet been able to replace many at all.

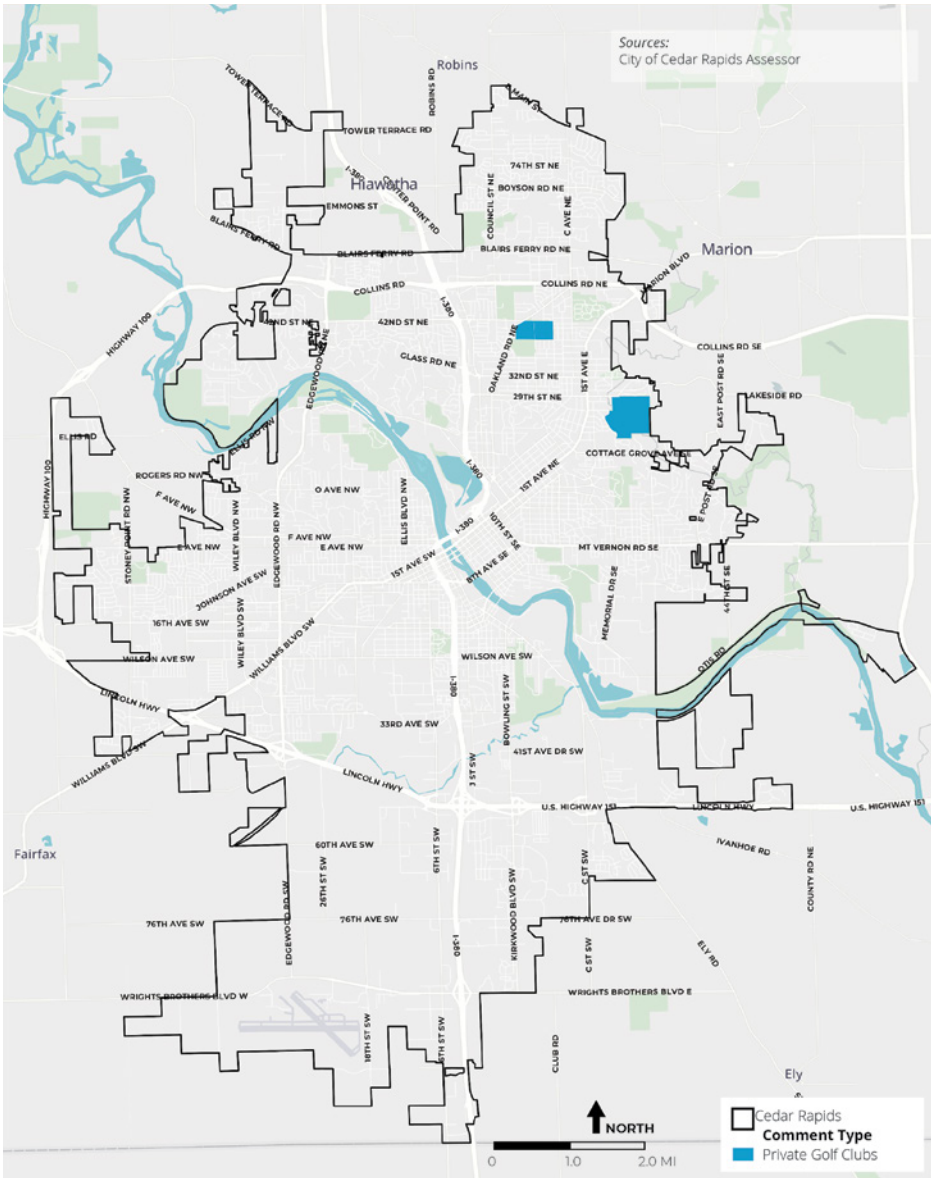
Of all the private landscapes in Cedar Rapids, cemeteries feel the most public—many people don't know that they aren't—as they are open and accessible most hours. As with public schools, it makes sense for Trees Forever to offer matching grants for their replanting to the degree that funds can be made available.

To a lesser extent, the same is true for houses of worship. Cedar Rapids is home to about two dozen churches, mosques, and temples. Many of these sites include large grassy areas that are well suited to planting, and some have large parking areas that would benefit from shade trees at their edges. Most also lost significant canopy during the derecho. Religious institutions with demonstrable financial constraints should also be eligible for matching funds to replant.

Corporate Parks

It is useful to divide Cedar Rapids' large companies into businesses with open space and businesses without. Large corporate properties in Cedar Rapids run the gamut from entirely industrial to exceptionally green. Roughly from least to most bucolic, these are Quaker Oats, Cargill, International Paper, CRST International, Collins Aerospace, and Transamerica.

In addition to meeting



Golf clubs

their responsibilities as good corporate citizens, companies with considerable open space have an opportunity to help with the ReLeaf effort on-site.

Probably the most promising opportunity is the Transamerica campus off C Street SW (see photo above). In compliance with the City's ordinances, the large parking lot was laid out with lovely 10-foot tree strips between every two bays of parking. Sadly, many of these trees were lost in the derecho, and there was already space within these strips to plant more densely. Meanwhile, the property's vast 194-acre rolling landscape, with its 2-mile walking trail, was originally designed with very few trees. Imagine how lovely that trail would be if shaded by twin allées of sycamores! Indeed, the entire grass landscape could be a forest in twenty years if planted with seedlings today.

Private property is private, and this plan has no business in controlling the future disposition of institutional land. What it can do is make clear that these properties hold enormous potential to help achieve ReLeaf goals, and establish a process (ahead) to avail their owners of assistance from Trees Forever in doing so.

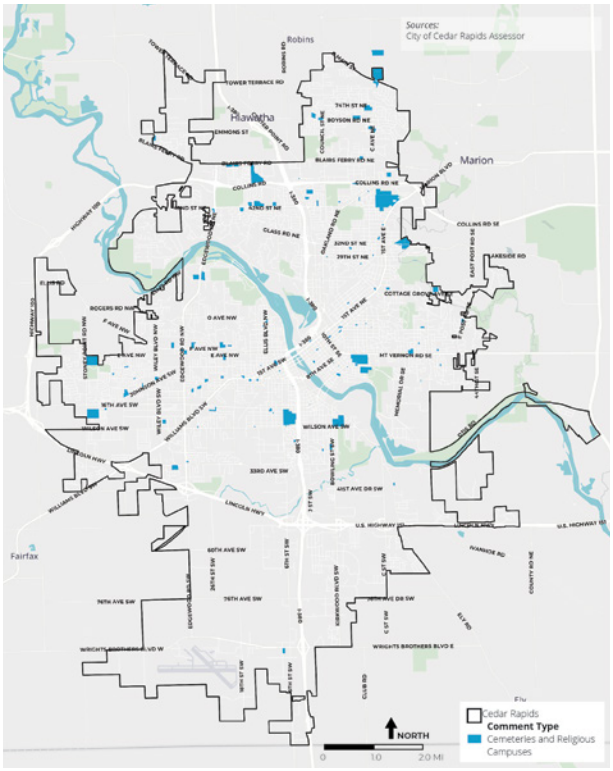
All Corporations

Corporations with large properties can plant trees on site. All corporations can plant trees off-site. They can do this with dollars, volunteers, or, ideally, both.

Financial Support:
The trauma of the derecho and the continued sense of a sadly diminished skyline have moved Cedar Rapidians like few other events in the city's history. Already, dozens of corporate citizens have stepped up to support the ReLeaf effort. Six-figure gifts from Alliant Energy, Collins Aerospace, ITC Midwest, Transamerica, and others have laid a solid foundation for the work of replanting to begin. Trees Forever will continue to reach out to companies and individuals to fund this plan. While the work is organized as a ten-year effort, the need to grow Cedar Rapids' canopy is profoundly immediate, and funds raised now will have the most impact. Moreover, we can assume that, as the memory of the derecho fades, people's compulsion to help may weaken, even as the need for funding continues unabated. For that reason, maximizing corporate support in 2022 will be essential.

Corporate Planting Events:
Nothing builds teamwork like planting a tree. There are also few better ways to give team members a sense of permanence in a community; to plant a tree is literally to put down roots. In terms of both workforce collaboration and workforce retention, corporate planting days pay for themselves many times over. Wouldn't it be great if every sizable company in Cedar Rapids were to spend one day a year—perhaps Arbor Day—planting trees? With the help of Trees Forever, businesses including Alliant Energy, Eco Lips, International Paper, and many others have already organized successful planting days. Responding to the derecho presents an opportunity to kick this program into high gear.

Above: Together, the parking lot and vast lawn of the Transamerica campus present a major opportunity to grow the city's canopy.



Cemeteries and religious campuses

Photograph from Google Maps

The Institutional Tree Plan

Summarizing the previous pages, an aggressive strategy for quickly filling Cedar Rapids' institutional properties with more of the right trees includes the following steps:

Well-Resourced Non-Profits

Private schools, colleges, universities, hospitals, golf clubs, and well-funded religious campuses are encouraged to reach out to the ReLeaf Partners for guidance on replanting and should know that Trees Forever is poised to provide technical support and other help.

Less-Resourced Non-Profits

Cemeteries and underfunded religious campuses are similarly encouraged, and may additionally qualify for replanting supported by Trees Forever's Matching Funds Pool. Cemeteries and religious campuses are encouraged to reinvigorate their "friends" groups around replanting; enlisting members to become trained TreeKeepers will be helpful, and may be a criterion for funding.

School Districts

Public schools may also qualify for grants from the Matching Funds Pool. However, district leaders are encouraged to consider the data presented earlier on the powerful impact of tree canopy on academic performance, and to prioritize replanting accordingly.

Matching Funds Pool

As a part of this plan, Trees Forever will establish a pool of grant funds as fundraising allows to support the replanting of cemeteries, underfunded religious institutions, and other worthy destinations.

Corporate Parks

Corporate campuses are encouraged to help recruit TreeKeepers, host educational sessions, and sign on to becoming an active ReLeaf Cedar Rapids campus. Early commitments have already been secured from Alliant Energy, Collins Aerospace, ITC, and Transamerica.

All Corporations

Trees Forever and community leaders will continue and expand current outreach to potential corporate sponsors, with the goals of raising ReLeaf funds generally, arranging corporate sponsorships of schoolyards and cemeteries (as well as public parks, discussed ahead), and inspiring corporate planting days—perhaps organized around Arbor Day—assisted by volunteers from its TreeKeepers program.

In working with all of these institutions, the City and Trees Forever will educate around and advocate for the mandates of the ReLeaf Rules, especially rules 2 through 8:

- Meet overall diversity targets while grouping species locally.
- Don't plant a non-native tree where a native tree will thrive.
- Don't plant a small-species tree where a large-species tree will thrive.
- If they can be protected, plant trees when they are young.
- Where possible, plant trees in groups and close together.
- Every tree planted needs a designated caretaker and maintenance plan.
- Don't plant grass when other groundcovers will do.

Additionally, ReLeaf Partners will help each institutional partner investigate options like the mass planting of seedlings or direct seeding, which may offer a more expeditious path to meeting ReLeaf goals.

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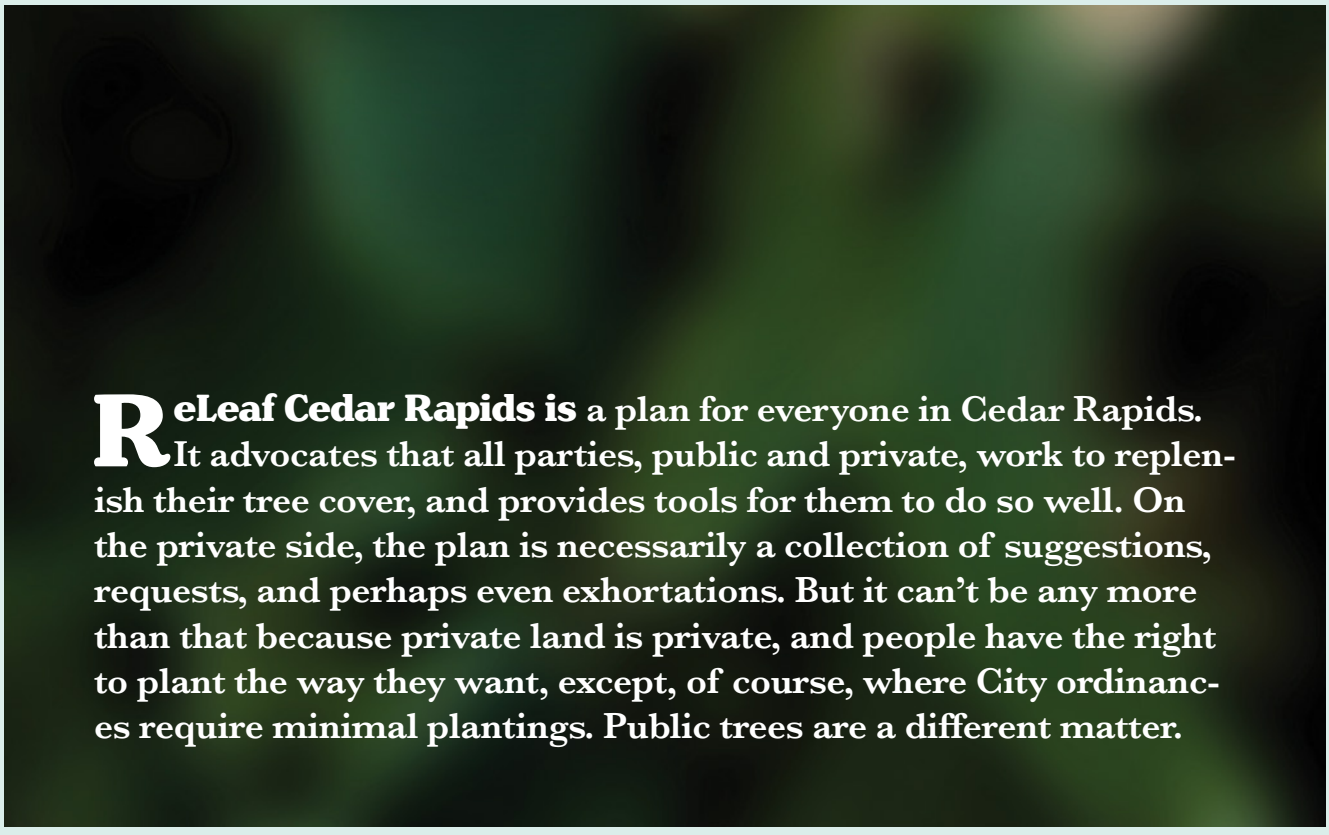
Public Trees: The Plan for Street Trees

9

Street trees principally shelter sidewalks, where they reduce urban heat islands and protect pedestrians from vehicles. Streets comprise the vast majority of Cedar Rapids' public spaces, and their trees play a large role in making them hospitable places where the bonds of community can form.



ReLeaf Cedar Rapids is a plan for everyone in Cedar Rapids. It advocates that all parties, public and private, work to replenish their tree cover, and provides tools for them to do so well. On the private side, the plan is necessarily a collection of suggestions, requests, and perhaps even exhortations. But it can't be any more than that because private land is private, and people have the right to plant the way they want, except, of course, where City ordinances require minimal plantings. Public trees are a different matter.

ReLeaf Cedar Rapids has been developed in partnership with City leadership and with a deep involvement of City staff, in order to be officially adopted by City Council and executed by City departments. In addition to Chapter 6 (The Plan for All Trees), the next two chapters lay out the direction that the City intends to follow as it works to rebuild its canopy. They are Chapter 9: The Plan for Street Trees; and Chapter 10: The Plan for Park Trees.

The idea of lining public streets with trees was brought to America by some of its earliest European settlers, who understood in their bones that a steady rhythm of trunks and a canopy of green makes a street feel comfortable and complete. "The first duty of the inhabitant of forlorn neighborhoods is to use all possible influence to have the streets planted with trees."[83] So stated the dominant landscape architect of the antebellum period, Andrew Jackson Downing. An editorial in the 1835 *New England Farmer* put it this way:

"Would it not be a regulation well deserving of the attention of the General Court to require every town to plant the sides of the public roads with forest trees? . . . the value of most farms would be raised ten or fifteen per cent by the addition of shade trees about the buildings and along the public road. [Moreover, trees] give the country an appearance of wealth, that nothing else can supply. . . the most spacious and princely establishments without them appear covered with the most prison-like gloom. . . A bald head is not comely, neither is a street seemly which is not well set with trees."[84]

Opinions on hairstyles may differ, but few people would attest that the derecho's impact on the streets of Cedar Rapids was a positive one. The preponderance of leaf-spouting patches where tall trunks used to stand, and an excess of bright sky along corridors once known for their dappled overarching canopies, are understood by most people in the community as a great loss. Bringing that canopy back as quickly as possible is a central focus of this plan.

Why Street Trees Matter

All trees provide value to a city and its residents—as described in Chapter 3—but none more so than street trees. Street trees are critical urban infrastructure that provide the following services:

- **Stormwater Absorption and Treatment:** Located above pavement, street trees collect and clean a disproportionate amount of the rainfall that would otherwise become polluted runoff.
- **Exhaust Absorption:** The tailpipes of cars and trucks emit carbon dioxide, sulfur dioxide, nitrogen oxides, carcinogenic hydrocarbons, and other greenhouse gases that damage public health and heat the planet. It is mainly street trees, located directly adjacent to the source, that absorb these gases before they enter the air we breathe.
- **Improved Public Safety:** Contrary to popular wisdom, the presence of street trees along a roadway has been shown to reduce the number and severity of car crashes, due to their impact on speeding. The loss of street trees is also associated with a rise in crime.[85]
- **Property Values and Business Success:** In studies documenting the positive impact of tree cover on home values and retail revenues, it is principally street trees that have made the difference.
- **Improved Walkability and Community:** Street trees principally shelter sidewalks, where they reduce urban heat islands and protect pedestrians from vehicles. Streets comprise the vast majority of Cedar Rapids' public spaces, and their trees play a large role in making them hospitable places where the bonds of community can form.

The Street Tree Rules

Each of the eight ReLeaf Rules (Chapter 6) have a special meaning when applied to street trees:

1

Right Tree Right Place, Right Reason:

As indicated in the ReLeaf Tree List, some species like tuliptree don't like road salt, and should be kept away from busy thoroughfares. Others like hackberry or northern red oak, in contrast, are fine with both road salt and compacted soil, and are ideal along a shopping street. The other local condition that impacts tree selection is utility wires; these almost always dictate the use of a smaller tree species with a lower canopy.

2

Citywide Diversity & Local Character:

As the City adheres to the10-20-30 rule overall, it can optimize beauty and local character by creating streets of consistent appearance. This opportunity is not widely available on Cedar Rapids streets; most already hold a diverse collection of trees. Where that diversity already exists, it should be reinforced. However, where a street holds no trees, few trees, or is already characterized by a dominant species, similar or similar-appearing trees should be planted to achieve a consistent canopy.

3

Locals Not Imports:

As covered in the ReLeaf Tree List, there are few circumstances where a native tree cannot meet the demands of a street-side location. City foresters should always look first to the Superior section of the list before resorting to the lower sections.

4

Big Not Small:

The places where a large-species street tree will not fit are easy to spot; under utility wires and where the soil volume is severely restricted. In all other locations, the City should plant street trees only from the larger end of the ReLeaf Tree List. Large-species trees have a remarkable ability to shape themselves to tighter spaces, which they eventually reach above to shelter.

5

Tots Not Teens:

To grow up resilient, street trees should be planted at the youngest age at which they can be securely protected from snowplows and other risks. The supply chain for larger trees also mitigates against planting more established specimens. But there is no wisdom in planting a tree that is likely to be flattened in the first winter. The current 1.5-inch minimum caliper seems a prudent standard to maintain, and trees must be solidly protected, and ideally warrantied for two full years.

6

Let Trees Mingle:

Unlike in more naturalistic settings, street trees perform their main function by being aligned in a steady rhythm so that they can consistently shape the street and eventually provide a continuous canopy overhead. Within that framework, the only limit to how close together they should be planted is the budget. However, planting trees too close results in each tree providing less shade than it otherwise would due to canopy overlap. A proper compromise will not waste plant material while also creating a situation where roots will eventually intermingle underground to make a more resilient canopy.

7

Plant With A Plan:

As already noted, each street tree, when planted, must be logged into the City database and assigned a watering plan and pruning schedule. This database, updated constantly, should be used by City foresters with a mandate that every tree thrive throughout its life. It will track all "tree touches" including watering, pruning, mulching, and other maintenance.

8

Break The Grass Habit:

Because grass under trees kills so many of the caterpillars that fall from them, most of Cedar Rapids' street trees don't do all they could to sustain the food web. City foresters or contractors cannot be expected to plant groundcover around new street trees, but they should mulch larger circles around trunks, ideally about 6 feet in diameter, to invite resident plantings of native groundcovers.

Replanting Our Streets

Almost every street in Cedar Rapids lost a tree to the derecho. Most lost many, and some lost them all. Rule 2—Citywide Diversity and Local Character—and Rule 6—Let Trees Mingle—lead to some additional useful guidelines when it comes to filling in the large gaps that now exist between surviving street trees, discussed ahead.

Additionally, prior to the derecho, Cedar Rapids had set a goal of increasing its canopy from 24 percent land-area coverage to 30 percent. This 6 percent uptick may seem small, but it comprises roughly a 25 percent increase in the number of trees. That number applies to all City trees, public and private. Sharing the burden equally means that the City would aim to increase its tree count by a quarter and encourage citizens to do the same.

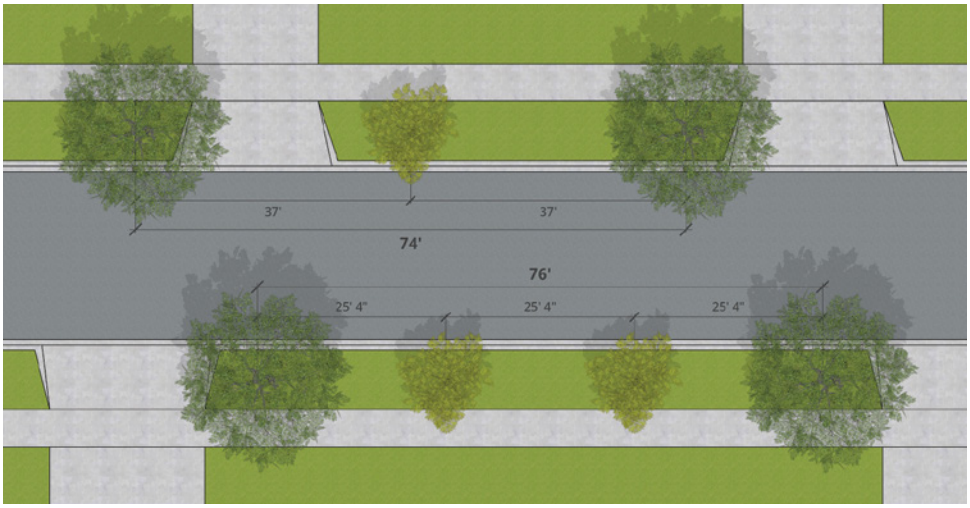
That 25 percent goal was not eliminated by the derecho and finds its way into this plan and its budget. The number of both park trees (covered in the next chapter) and street trees are increased by that amount. For street trees, that is accomplished by tighter spacing.

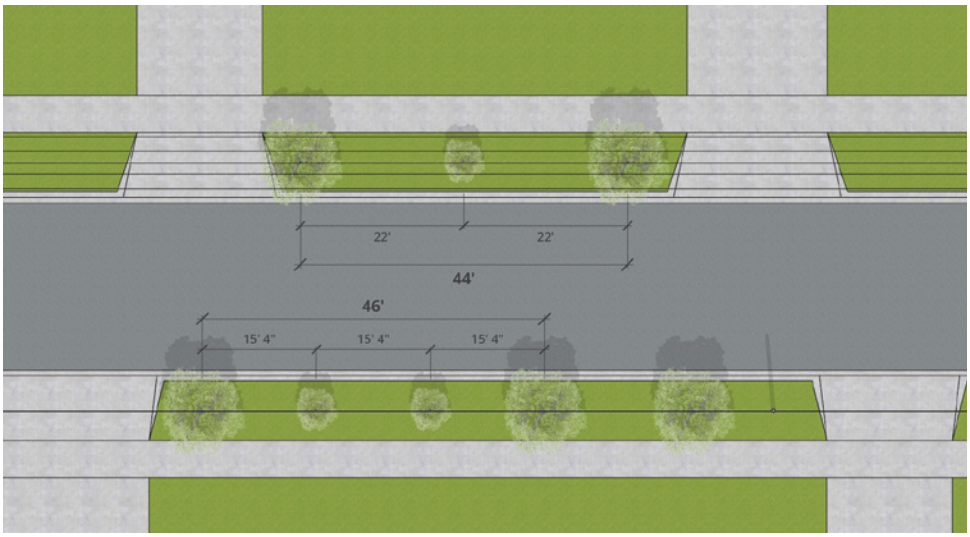
Tighter Spacing

As discussed in Rule 6, sparsely spaced trees do not make good streets. When developing new streets in Cedar Rapids, the current maximum spacing distance for planting trees is 40 feet. This is quite large; in other cities, a more typical maximum of 30 feet is used. This distance is more appropriate for large-species trees. For smaller trees that go under wires, a 20-foot maximum should be used.

Adapting this tighter spacing to the gaps now found throughout the city requires us to set thresholds as follows:

- **(Above right)** For large-species trees, fill gaps with trees that are as evenly spaced as possible to achieve an average on-center distance of 30 feet, such that no gap is greater than 40 feet or less than 25 feet. This means that a 74-foot gap would receive one tree while a 76-foot gap would receive two.
- **(Below right)** For small-species trees beneath utilities, fill gaps with trees that are as evenly spaced as possible to achieve an average on-center distance of 20 feet, such that no gap is greater than 25 feet or less than 15 feet. This means that a 44-foot gap would receive one tree while a 46-foot gap would receive two.





Streets of Character

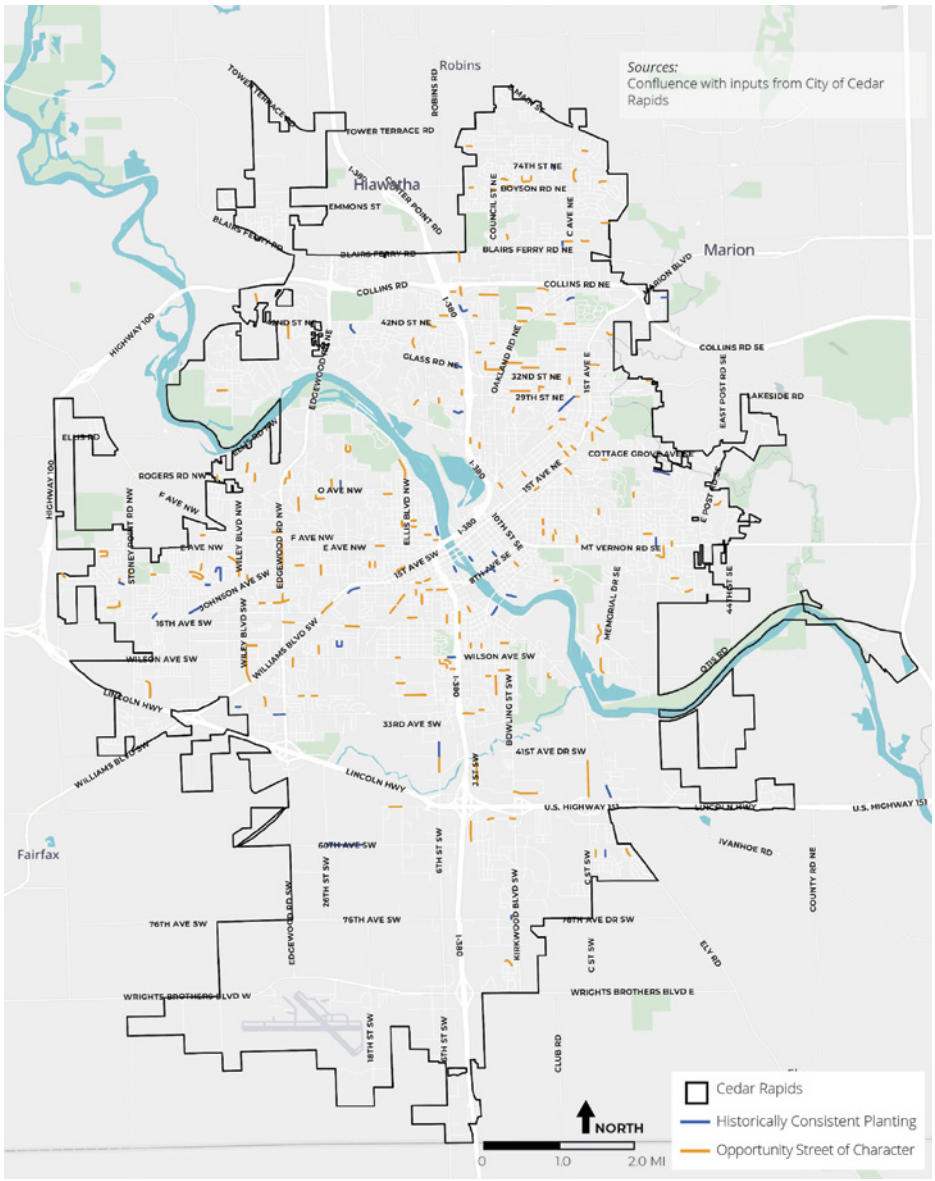
As noted, since most streets in Cedar Rapids hold a variety of trees, one goal of this plan is to establish local character through the use of a single species, or a mix of similar-appearing species, in those places where that is possible. This strategy should be applied to any location where a consistent species can be provided for a distance of 200 feet or more, which is a little less than a one-minute walk. Whenever presented with a street to replant, the City should first look for stretches of that length or greater and determine whether a variety of surviving trees makes a consistent canopy impossible. If it doesn't, then rows of similar or similar-appearing trees should be planted throughout that segment.

In such street segments with utility wires on one side, that side should (in most cases) receive a consistent row of smaller trees, while the other side receives a row of larger trees. The goal of consistency should not get in the way of planting trees that will grow large.

What if a block is already dominated by a tree that is not on the ReLeaf Tree List, like an ash or maple? In that case, the street should be replanted with Superior or Allowed species that resemble the dominant species in shape and color.

Again, risk of oak wilt dictates that oak trees not be planted in close proximity. Since they provide tremendous ecosystem benefits, oaks should be used generously along streets with a diversity of species.

Which street segments qualify to be planted with consistent species is a determination that can be made by City staff block-by-block as replanting occurs. But certain streets can already be identified as characterized by a single tree type. These historically consistent streets are shown on the map below, highlighted in blue. Streets that offer the opportunity to become a 'Street of Character'—either due to prior lack of planting or derecho loss—are highlighted in orange.



Right: Most streets in Cedar Rapids have a variety of trees along them, but some have historically been dominated by a single species that should be reinforced. Where the derecho left a blank canvas, an opportunity to create new Streets of Character exists.

Special Places

All streets matter, but some provide more opportunity than others for impactful replanting. Three types of streets deserve special attention in this plan:

- Treeless residential streets that were built at a time when canopy was not valued.
- Downtown streets, where the most people walk but where the most challenges to planting can be found.
- Gateway corridors, where new rows of trees can have the most impact on the beauty and reputation of the city.

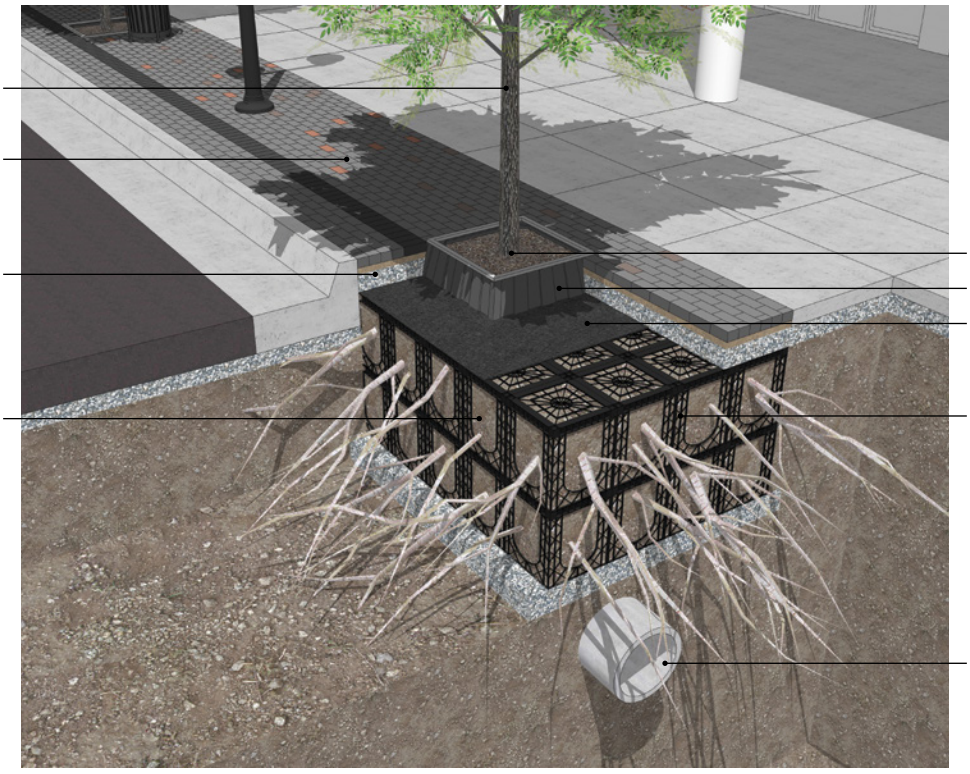
Downtown Streets

Downtown is the part of the city with the most pedestrian activity, the greatest daily presence of vulnerable populations, and the most powerful heat island impacts. It is also the neighborhood upon which the city builds its reputation, as well as the one part of the city that truly belongs to everybody. It doesn't matter where you may find your home; the downtown is yours, too. For these reasons, there is no place where an investment in improved canopy is more important.

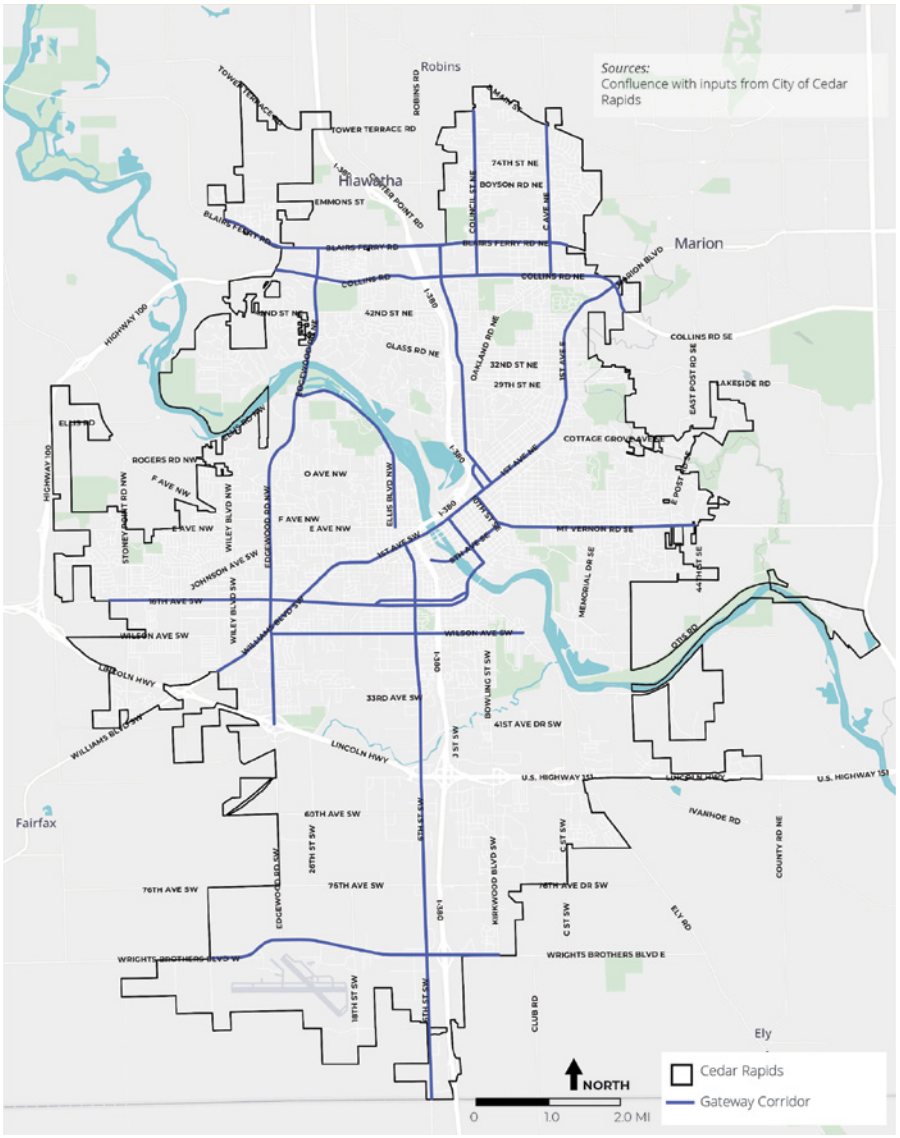
Unfortunately, the downtown is also the place where planting trees is the most expensive. Replacing sidewalk with viable planting beds is about the least efficient way to increase canopy. The ReLeaf budget would be exhausted quickly if it were dedicated to this task. The fiscally responsible way to improve downtown canopy is to focus on two main activities: locating soft targets and shading new sidewalks.

Locating Soft Targets
Downtown Cedar Rapids is not uniformly paved; it includes green spaces of three principal types: parks like Greene Square, corridors like the Cedar River Trail, and streets like 5th Ave SE that have grass strips along the curb. All of these areas are available for low-cost planting, either with rows of consistent trees spaced evenly along sidewalk edges, or with groups of seedlings in more parklike settings.

Shading New Sidewalks
Sidewalks are periodically rebuilt in the downtown, usually in conjunction with either City roadwork or a developer's construction of a large building. Any



*Not all urban street trees require grates, but those along the busiest streets in downtown should have them to prevent foot traffic damage



Map identifying principal Gateway Corridors through Cedar Rapids

sidewalk that is rebuilt should include a row of street trees planted no more than 30 feet apart and should be designed to allow trees to thrive.

In recent years, this standard has been lacking; the average downtown street tree in Cedar Rapids rarely grows large and is unlikely to reach maturity. A well-constructed sidewalk is built atop a continuous base of structural soil or implements a pavement suspension system underneath that allows each tree to reach out towards its neighbors and to receive a healthy amount of rainwater. New sidewalks should be planned in advance to include both trees and utilities without conflict.

Specifically, this plan recommends that the City modify its urban sidewalk standard to include an outer "tree zone" five feet wide. This zone would include a continuous trench of structural soil (or pavement suspension system) underneath a pervious paving solution, between tree pits, as illustrated on the previous page.

Wilson Avenue SW typifies a mostly unplanted streetscape on a major street crossing the city.

Photograph from Google Maps Street View

Gateway Corridors

While pedestrians get more benefit from street trees than drivers do, it must be acknowledged that most people get around Cedar Rapids by car, and street trees can contribute a lot to the quality of that experience. As noted, street trees make driving safer, but they also make it a lot more pleasant: drives seem shorter on streets lined with trees.[86]

Certain streets in Cedar Rapids see a lot more action than others. We can call them Gateway Corridors, the principal thoroughfares that people use to get around every day. Along with the downtown, they also play a significant role in establishing people's mental image of the city, and contribute markedly to its reputation, positive or negative. As noted in the 1835 *New England Farmer*, it is mostly the presence of trees that determine whether these streets convey "an appearance of wealth" or a "prison-like gloom."

The Map on page 71 identifies the principal Gateway Corridors through Cedar Rapids:

- 1st Avenue/Williams Boulevard
- 6th Street SW
- 16th Avenue SW
- Blairs Ferry Road NE
- C Avenue NE
- Council Street NE
- Collins Road NE
- Center Point Road NE
- Edgewood Road
- Ellis Boulevard SW
- Mt. Vernon Road SE
- Wilson Avenue SW
- Wright Brothers Boulevard SW

Many of these streets have sporadic plantings or no trees at all. Most of them have continuous green strips at the side of the road, ready to receive saplings. These streets offer a convenient opportunity to grow the city's canopy in a very visible way.

Most Gateway Corridors have utility wires on one side only, suggesting a solution of large-species trees planted across from smaller flowering trees. That circumstance is unfortunate, as these streets would benefit more than most from having a "kissing canopy" of identical trees on both flanks. But an asymmetrical canopy is better than no canopy at all.

As Henry David Thoreau put it, "to effect the quality of the day, that is the highest of arts." Planting these Gateway Corridors with consistent rows of steadily-spaced trees would positively affect the quality of most Cedar Rapidians' days. For that reason, these corridors are given special consideration in the replanting priority that follows.

Neighborwoods: Yes, Your Street Can Have Trees!

Like many cities, Cedar Rapids went through an era during which developers were not required to plant street trees. . . and they didn't. The resulting neighborhoods are perfectly nice but lack all the benefits that street trees provide. These benefits are summarized on page 25, "What Do Trees Do for

ME?," and include a major increase in property value.

With this plan, ReLeaf Partners are creating a new program called Neighborwoods. Residents who want to transform their streets can petition their neighbors and collect the addresses of all residents in support. If a majority of homeowners on a given block say yes, the project gets the green light. ReLeaf Partners would then help them select the best tree species and organize a planting day which could include assistance from TreeKeepers and Growing Futures. Priority would be given to streets that are home to active TreeKeeper volunteers.

The purpose of this program is not just to grow the canopy, but to create a new generation of great streets in Cedar Rapids. Neighborwoods could be available in two versions, standard and deluxe. The deluxe version would ask homeowners to match the street trees with similar trees planted in their front yards, to create the eventual impression of houses living in the forest. In both versions, supportive neighbors would be offered TreeKeeper training from Trees Forever.

Selected at random, a block of Mayfair St. SW shows us how a Neighborwoods planting could work. In the standard version, two rows of street trees are added, spaced about 30 feet on center. In the deluxe version, all the houses without yard trees receive one of those as well. The drawings below and example photos on the next page show how this could look, not too far in the future.

As with all neighborhood improvements, not all residents can be expected to participate, or even approve. For those that don't wish to take part, the street trees in front of their houses would be assigned to willing neighbors for watering. And then there will be the active objectors, those who simply don't like trees. They will be reminded that the boulevard is City property—part of the street—and that the City is relying on future trees to help it thrive.

Mayfair Street SW now.

Mayfair Street SW now.

Mayfair Street Neighborwoods 'Standard.'

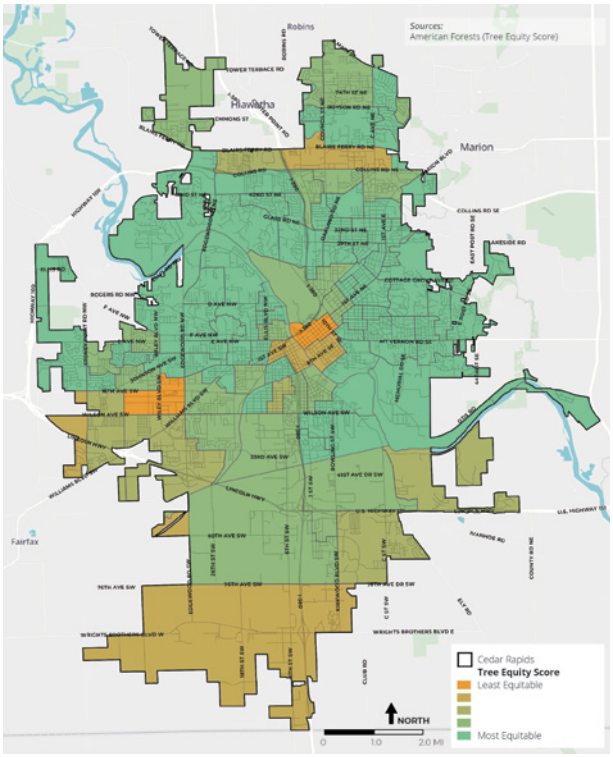
Mayfair Street Neighborwoods 'Deluxe.'

Photograph from Google Maps Street View

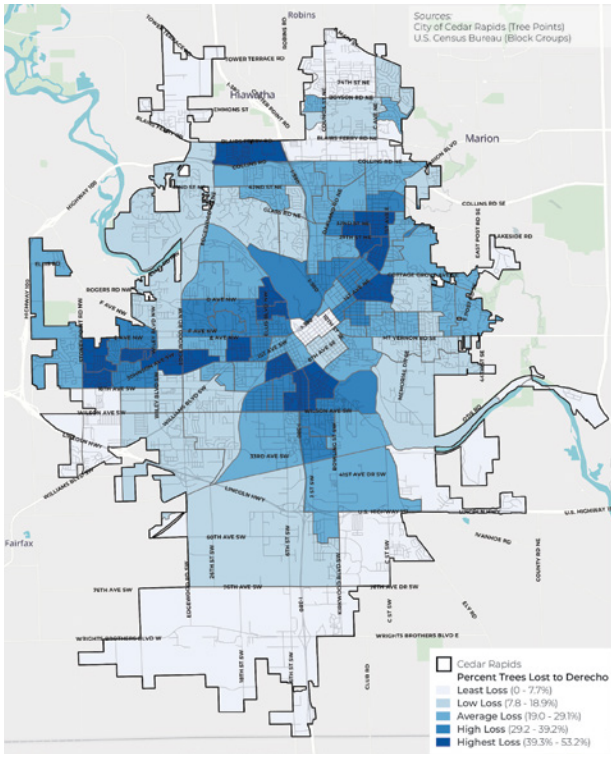
Prior to the derecho, Chandler Street SW was a great example of what a Neighborwoods 'Standard' planting would look like at maturity.

'Deluxe' criteria in which street trees are supplemented by same-species yard trees.

Photographs from Google Maps Street View



Tree Equity Scores across the City



Darker areas lost more of their trees.

Street Planting Priority

It is the goal of ReLeaf Cedar Rapids to replant all public streets within a decade. One of the biggest and most difficult tasks of this plan is to create a timeline for this work that reflects the plan's principles and goals. That timeline, in the Appendix as the Street Tree Planting Prioritization, must balance a collection of competing factors, giving appropriate weight to each.

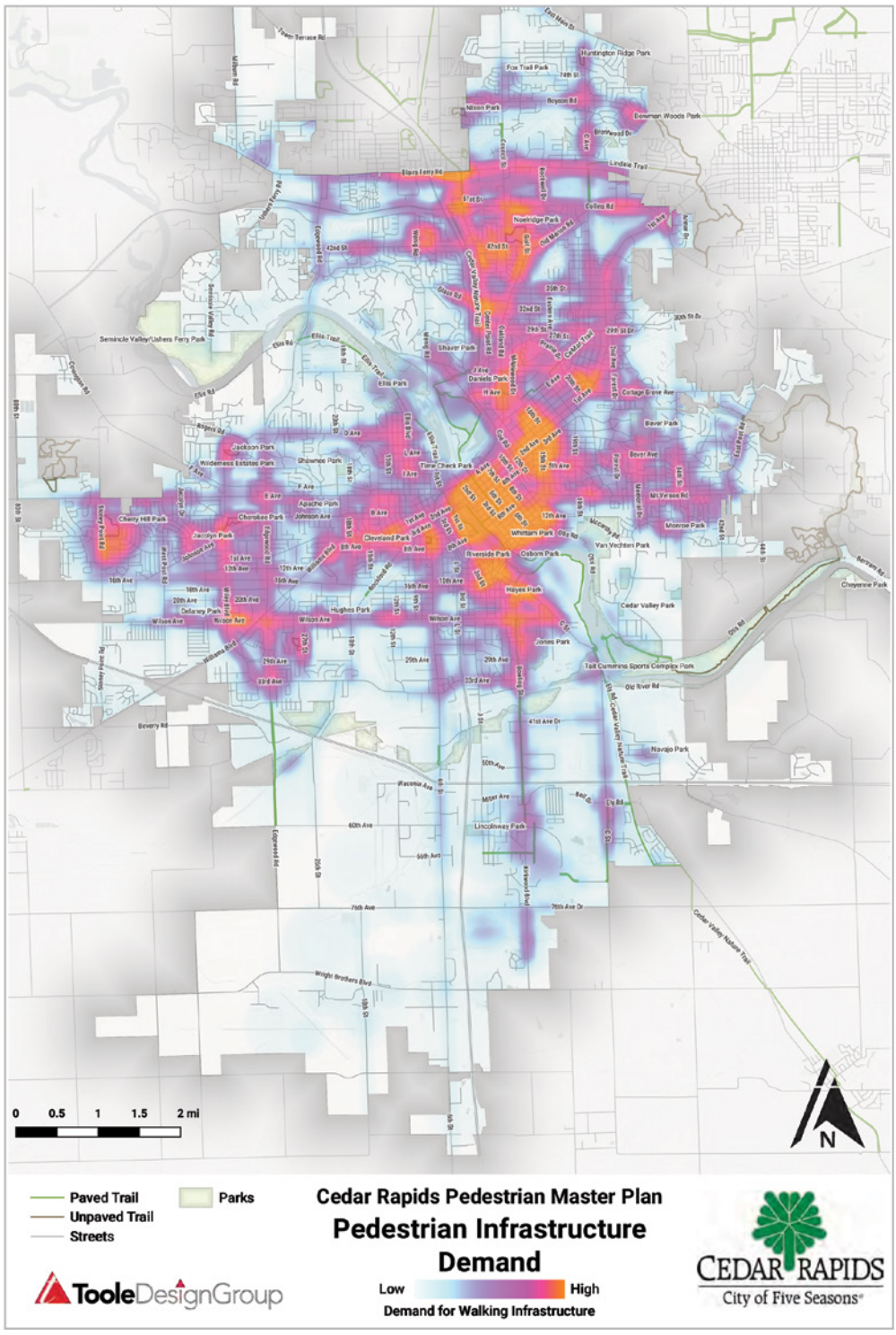
There is no single right answer to this challenge; the important thing is to establish a transparent, justifiable, methodology and to apply it consistently.

In creating the Street Tree Prioritization, each street location was considered in terms of eight factors: prior canopy, urban heat islands, population density, social vulnerability, derecho tree loss, pedestrian infrastructure demand, roadway classification, and available planting sites.

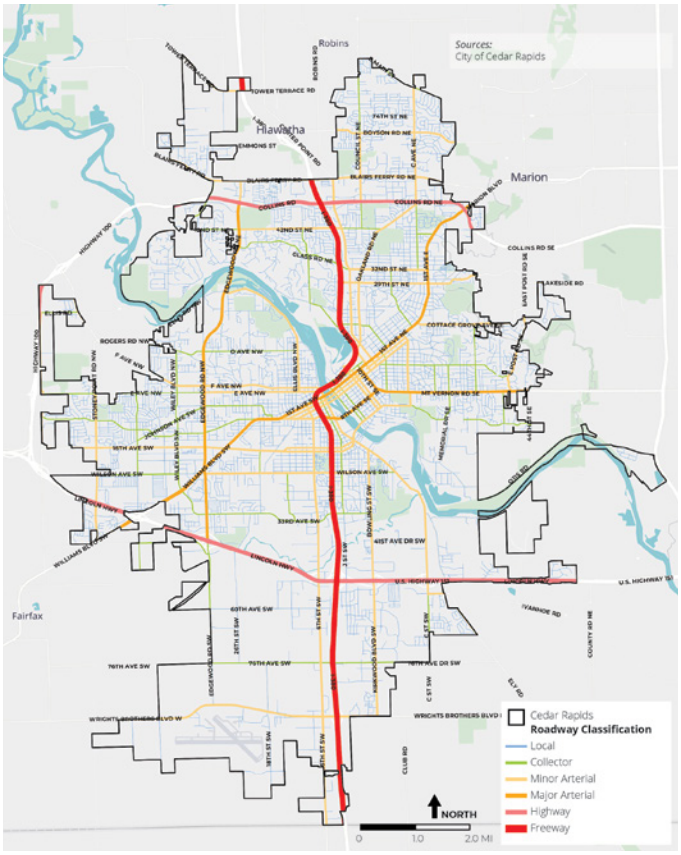
Of these eight, the first four—canopy, heat islands, density, and social vulnerability—are combined, along with other variables, into a single factor measured by American Forests and presented as the widely available Tree Equity Score. As a result, we can reduce our eight factors to five: percent tree loss, Tree Equity Score, pedestrian infrastructure demand, roadway classification, and available planting sites.

Tree Equity Score

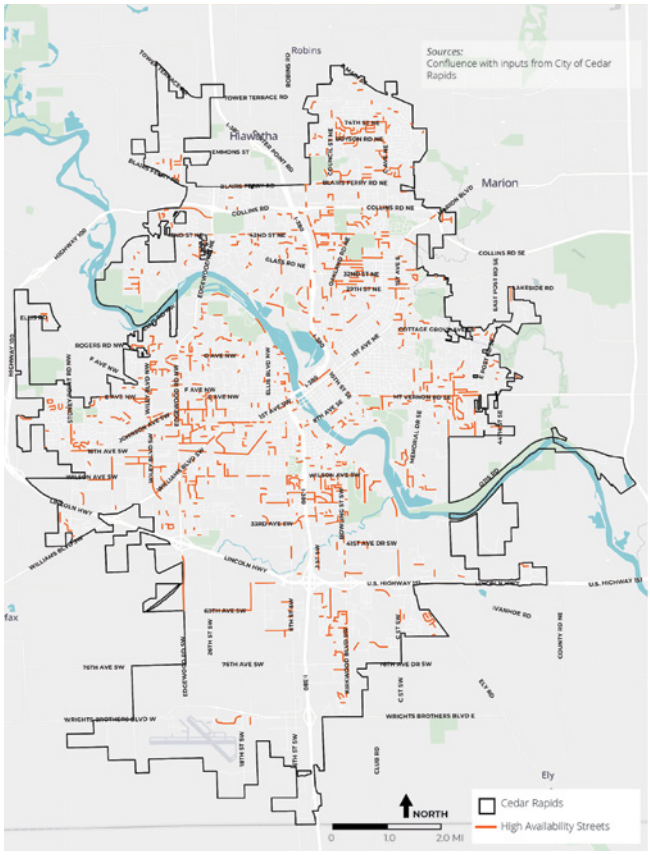
The Tree Equity Score tool from American Forests measures and weighs the important factors of exist-



The heat map of pedestrian infrastructure demand activity from the Cedar Rapids Pedestrian Master Plan.



Roadway Classifications



Streets with a higher number of available planting sites.

ing tree canopy, population density, income, employment status, heat island impacts, public health, and the presence of children, seniors, and people of color. Results across the city vary widely. About half of the city—neighborhoods like those surrounding Ellis Park and the eastern extents of Mount Vernon Road SE—received a score of 100, while other areas do not fare nearly as well: parts of 16th Avenue SW receive a 41, and the heart of downtown performs worst of all, with a 39. Organized by block group, this map does a lot of the heavy lifting for us, and it is easy to wrap it onto a larger prioritization system. Since it includes so many factors - including canopy cover - the Tree Equity Score should be heavily weighted.

Derecho Tree Loss

The derecho hit some parts of town worse than others. The tree canopy data included in the Tree Equity Score was measured before the derecho and should be adjusted by a factor that approximates what it would be today. The best measure we have available is the percentage of street trees that the City had to remove after the storm, shown on page 75.

Pedestrian Infrastructure Demand

Nowhere are trees more impactful than where people are walking. The Cedar Rapids Pedestrian Master

Plan lays out clearly where demand for this infrastructure is highest, shown on page 76. This factor is weighted heavily because it subsumes a number of other important factors like the presence of schools and higher-density development.

Roadway Classification

As discussed, streets with heavy traffic are more visible and impact more people than local roads.

Available Planting Sites

Given limited manpower, it is more efficient to plant streets that have more planting locations available.

The Overall Ranking

The above five factors, were weighted heaviest to lightest, from Tree Loss (5) down to Available Planting Sites (1). Each of over 7,500 street segments in Cedar Rapids was evaluated and scored according to the weighted factors, resulting in a numerical prioritization. The highest possible score any segment could have received was 15. Scores ranged from 0.13 on the low end to 12.2 on the high end. To properly implement this plan, street segments should be replanted in order, with all segments with a higher score being replanted before any of a lower score. It is worth mentioning that, since many of the scoring factors vary along the length of their streets, many streets will not be replanted all at once—but no segment is less than a full block long.

Like any system that distributes resources, this one creates shorter and longer wait times, and some people will want to change it to get their street replanted sooner. These impulses will hopefully be quelled by the understanding of two facts:

- This is simply a prioritization of where planting happens first, not where it happens; the plan is to replant the whole city; and
- The prioritization system may be flawed, but it represents an earnest effort to turn this plan's Principles into action.

Of course, other systems of prioritization are worthy of consideration to replace this one in the future if deemed necessary, but only if they, too, are created by similarly disinterested parties.

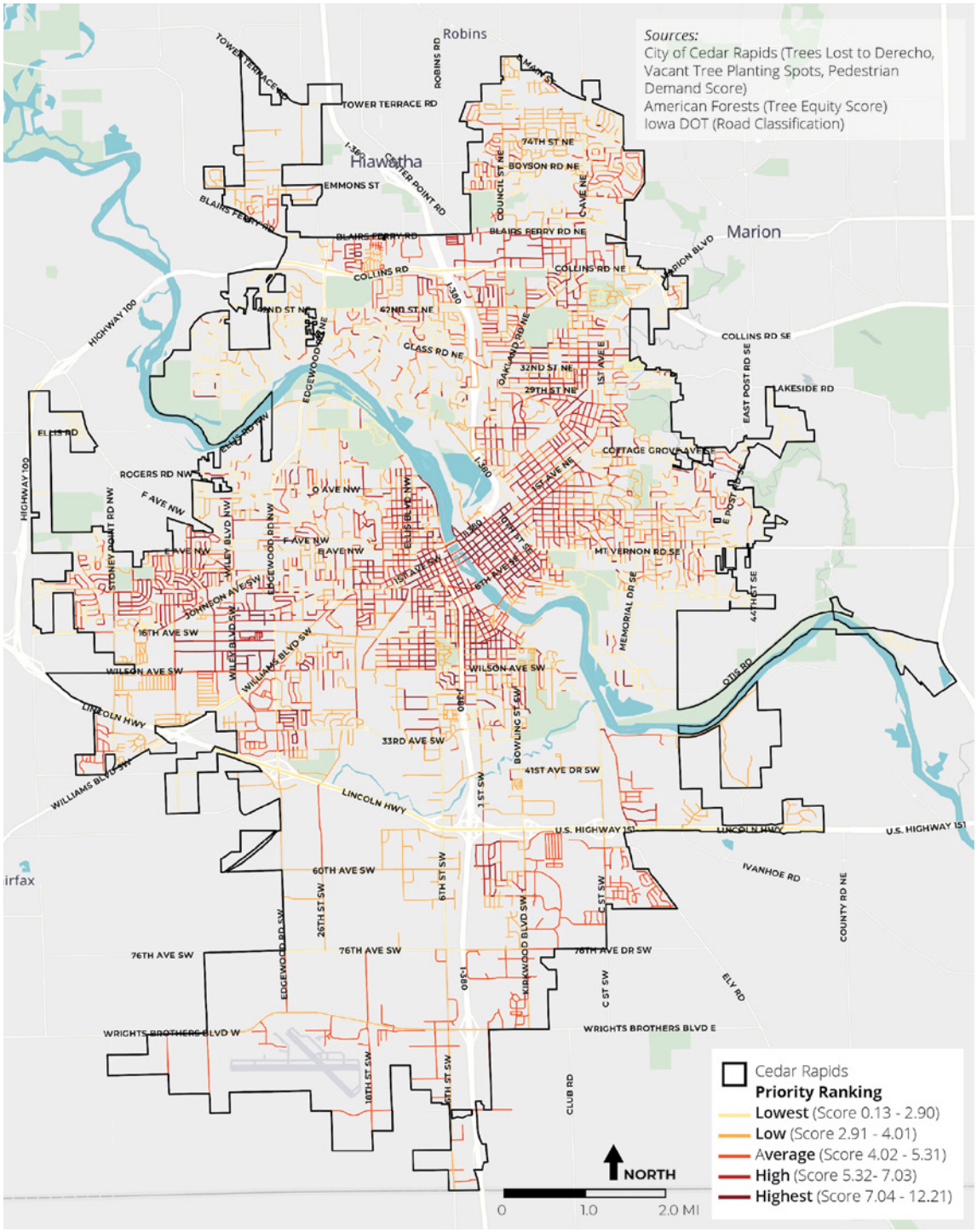
When Will MY Street Get Trees?

Over the next 10 years, every street segment within the city limits will be planted to the extent that planting sites are available. As described above, these efforts are scheduled to align with the greatest need as determined through the Street Tree Planting Prioritization ranking.

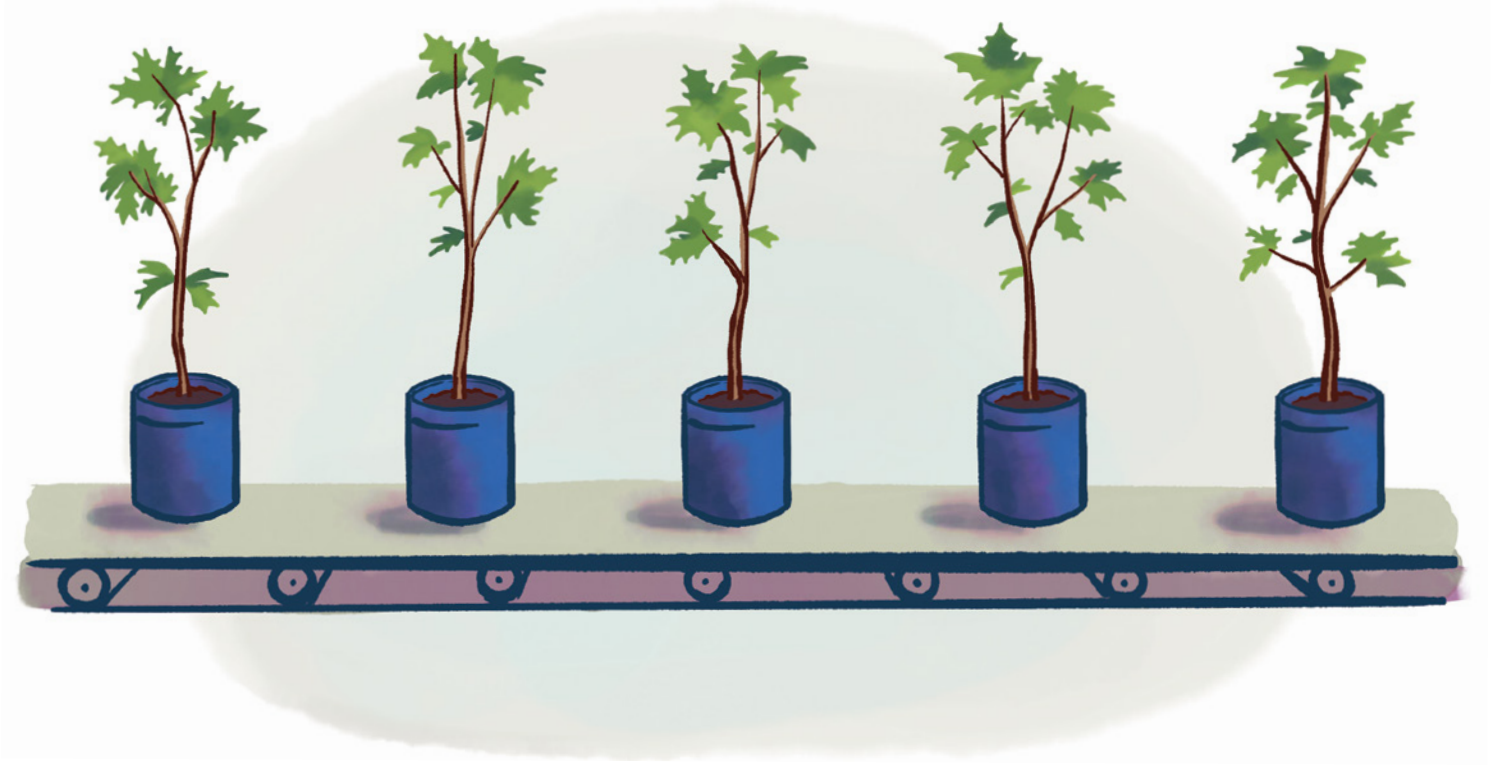
The ReLeaf Plan provides City staff with a year-by-year breakdown of street segments to focus on. The first two years of the plan are 'scaling' years in which the City will be planting and caring for just over 1,700 trees each year. In year three, the number jumps to 3,850 trees a year for the remainder of the plan. The scaling years give the City time to add staff and equipment needed to meet the plan goals and allow for the supply chain to catch up to demand. A total of 34,230 new street trees will be planted and cared for during the life of this plan.

While this information is already available to City staff through a geographic information system (GIS) program, it is the recommendation of this plan that during the initial ramp-up phase of the effort, City staff use that data to develop an interactive mapping service that will allow residents to search their street address to learn which year the ReLeaf planting efforts are scheduled to happen outside their front doors. The mapping service should also track the progress made over the years of the plan. A similar model has been implemented for the City's Paving for Progress program, with its dashboard viewable from the City's Public Works webpage.

Of course, if you prefer not to wait for the City's planting crews to arrive on your street, citizens are welcomed to plant their own street trees within the public right-of-way adjacent to their property at any time planting conditions are favorable. A permit must first be submitted and approved before planting, and the species must be selected from the ReLeaf Tree List in Chapter 6. Instructions on How to Plant a Tree are found on pages 48-49. To access the City's permit application, and to learn more about replanting in the right-of-way, please visit: cedar-rapids.org/residents/parks_and_recreation/replacing_street_trees.php.



The Overall Ranking



The Public Tree Supply Chain

When it comes to both street trees and park trees (the next chapter), the City can only plant the trees it can source. It is one thing to have a tree list that favors large, native trees, and quite another to find those trees available in good supply, ready to plant, when they are wanted. Clearly, building up a supply chain will take time and effort. Here are some specific strategies that can speed the process:

- **COMMUNICATIONS:** The ReLeaf Tree List is new; so is the City's determination to stick to it as much as possible. The creation and endorsement of this list are developments that should be shared immediately with all regional nurseries and other tree providers, to make them aware of the demand that they can expect for these trees over the next decade and more. The ReLeaf Tree List and this plan, broadly disseminated, can lay a foundation for future supply

- **PRE-ORDERS:** Tree suppliers must be able to grow their stock with confidence that it will be sold. The City approves its budget on a year-to-year basis, but that does not stop it from entering into multi-year contracts in anticipation of future approvals. Both the City and Trees Forever should reach out to current and potential suppliers to put agreements in place that will secure strong supply of Superior and Allowed trees into the years ahead. One caveat: trees that are currently in short supply will cost a lot more now than in a few years, when the market responds to this plan, so pricing should reflect that.

- **SEEDLINGS:** As discussed, planting seedlings rather than saplings in certain locations is an important feature of this plan, in part due to the limited supply of saplings. Seedlings are much easier to obtain in large numbers, but still require planning ahead. As with saplings, the City and Trees Forever should communicate now its likely upcoming demand for seedling varieties to an expanded list of potential suppliers, and establish informal pre-order protocols that give suppliers the confidence to grow their stock.

- **THE BEST WE'VE GOT:** The current limited supply of many Superior and Allowed tree species from the ReLeaf Tree List should not be allowed to delay the ReLeaf effort. The perfect is the enemy of the good. As the City commits to the ReLeaf Tree List, it should be allowed, when no Superior or Allowed tree from the list is available, to plant an alternative species, as long as citywide diversity thresholds (the 10-20-30 Rule) are met.

The Street Trees Plan

Summarizing the previous pages, an aggressive strategy for quickly filling Cedar Rapids' streets with more of the right trees includes the following steps:

The Right Species
Trees will be selected from the ReLeaf Tree List. No imported species will be planted where a native tree will thrive, and no small species will be planted where a large species will thrive. Exceptions will be made only when the desired plant stock is simply not available.

Citywide Diversity
The City will adhere to the 10-20-30 rule regarding the percentage use of any one species, genus, or family of trees it plants in streets and parks. For the time being, this means planting no maple trees.

Streets of Character
Street segments characterized by a variety of species will be replanted with a variety of species. Street segments (or flanks, where limited by utility wires) characterized by a single species, and streets with few trees, will be planted with a single species or with several species that give the appearance of a single species.

Plant Young and Protect
Street trees will be planted as saplings typically 1-½ inches in caliper and carefully protected by stakes.

Tight Spacing
Street trees will be planted an average of 30 feet apart, with smaller species planted an average of 20 feet apart.

Inventory, Track, Water & Prune
All street trees will be entered into an improved City database, assigned a watering and inspection schedule, and pruned as deemed necessary.

Soft Landings
Street trees will be planted with 6-foot mulch circles surrounding their trunks.

Downtown Trees
Unless circumstances are prohibitive, new commercial sidewalks will be built to avoid tree/utility conflicts and with a continuous trench of structural soil or a pavement suspension system underneath.

Gateway Corridors
The City will include in its plans the planting of consistent rows of trees in the key (non-highway) transportation corridors through Cedar Rapids, many of which currently lack trees.

Neighborwoods
ReLeaf Partners will establish a new program that helps residents of blocks originally built without trees to, by majority vote, receive rows of street trees.

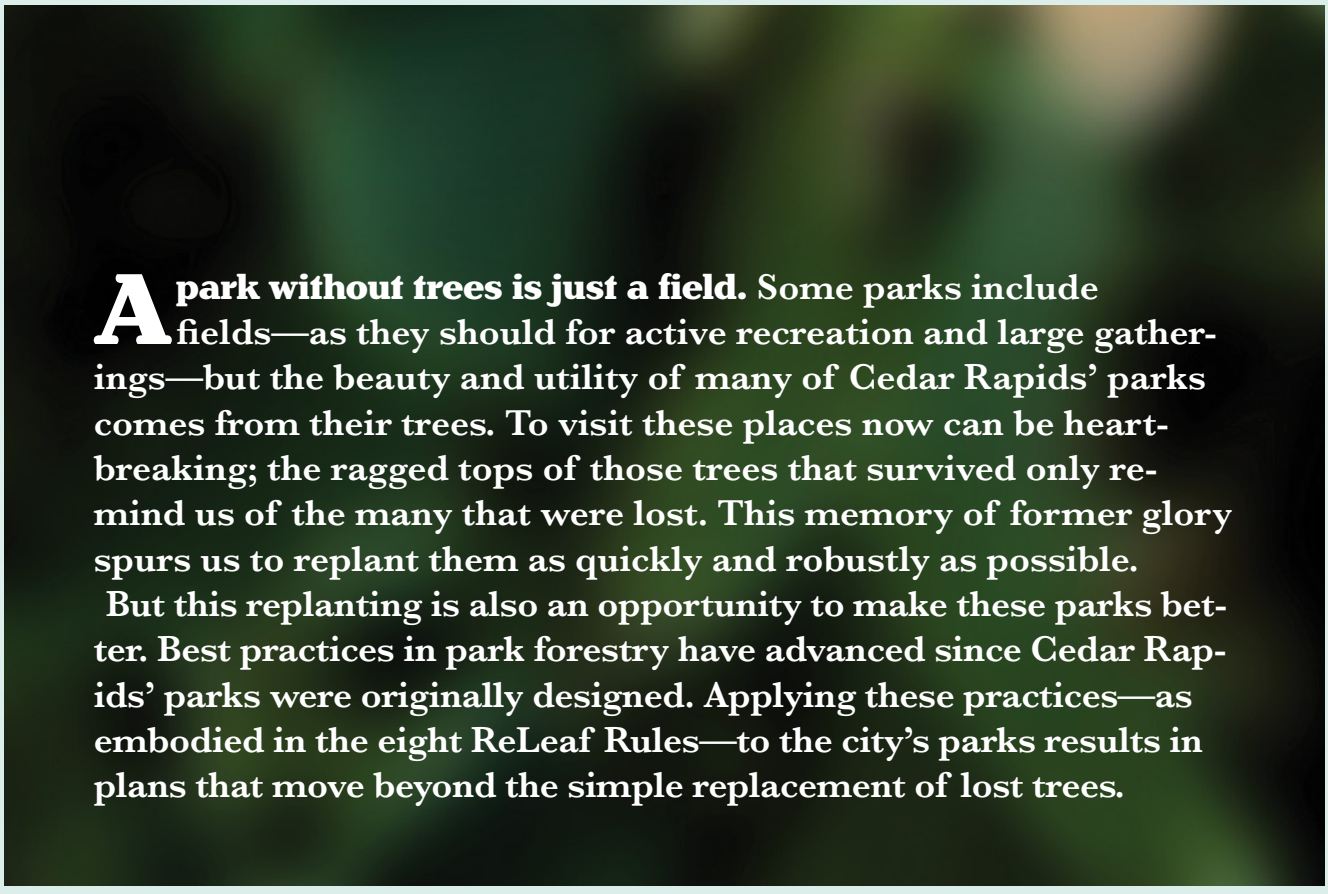
Replanting Priority
Street replanting will occur according to prioritization based on five factors: tree loss, Tree Equity Score pedestrian infrastructure demand, roadway classification, and available planting sites. Prioritization is based on a weighted score which combines each of the five factors. Street segments with the highest score are planted first. Streets that are under construction may jump the queue.

Supply-Chain Priming
ReLeaf Partners will mount a broad outreach effort to share the ReLeaf Tree List with current and potential suppliers and will endeavor to create arrangements around the future supply of both saplings and seedlings.

ReLeaf CEDAR RAPIDS

Public Trees: The Plan for Park Trees

10



A park without trees is just a field. Some parks include fields—as they should for active recreation and large gatherings—but the beauty and utility of many of Cedar Rapids' parks comes from their trees. To visit these places now can be heartbreaking; the ragged tops of those trees that survived only remind us of the many that were lost. This memory of former glory spurs us to replant them as quickly and robustly as possible.

But this replanting is also an opportunity to make these parks better. Best practices in park forestry have advanced since Cedar Rapids' parks were originally designed. Applying these practices—as embodied in the eight ReLeaf Rules—to the city's parks results in plans that move beyond the simple replacement of lost trees.

Why Park Trees Matter

We've already seen how street trees provide certain benefits that distinguish them from the rest. Trees in parks also make a unique contribution to our collective well-being:

- **Stormwater Absorption and Treatment:** Much of Cedar Rapids' natural stormwater treatment happens in its parks; some city neighborhoods would flood without them. A park's trees make the soil around them more porous and absorbent. They then actively suck up the moisture in the soil and transpire it into the air. Trees turn parks into stormwater treatment machines.

- **Wildlife Habitat:** Some city neighborhoods rely on their parks to provide a critical mass of greenery that is otherwise lacking; large enough for small animals like birds and chipmunks to take up residence. Many of these creatures either nest in trees or rely on trees for their food. The more trees a park has, the better it sustains the food web.

- **Food Provision:** It's not just critters that find their food in parks; community gardens give people without ample yards a place to grow fruits and vegetables for their families and neighbors. These gardens can be supplemented with fruit and nut trees that broaden the menu; such trees are best located in parks, where their droppings are not a nuisance. Especially in local "food deserts," they can help people eat healthy on a budget.

- **Summer Oases:** Parks can provide a wonderful respite from the summer heat, but only if they have shade trees in large enough number to create a localized island of cool. Most city parks get most of their use in the hotter seasons, when ample shade can be a prerequisite to their getting much use at all.

- **Community Creation:** As well as providing sports facilities, parks are the living room of the city; they are the places where people come together with their families and neighbors to relax and converse. In addition to the physical comfort of cooler air, trees provide people the social comfort that comes from well-shaped spaces. All animals, including humans, are most at ease in spaces with "defensible edges" where we feel that "our flanks are protected." The bonds of community are more likely to form in parks where rows of trees create the edges of outdoor rooms.

The Park Tree Rules

Each of the eight ReLeaf Rules (Chapter 6) have a special meaning when applied to park trees:

1

Right Tree Right Place, Right Reason

Parks provide a place to plant all sort of trees that can't find a home elsewhere. They should be used as a destination for those beneficial species that don't thrive in streets. As in an arboretum, tree stands, groves, and specimens in parks have the opportunity to be "about the tree" rather than just playing a supporting role. Additionally, species selection in parks should be informed by possible ecosystem benefits, especially stormwater absorption near the Cedar River.

2

Citywide Diversity & Local Character

Street trees are also welcome in parks as long as citywide diversity is maintained. But parks will be key to making full use of the ReLeaf Tree List. The organization of trees in parks benefits from both a variety of species where a picturesque, informal outcome is desired, and the repetition of a single (or similar-appearing) species to create impressive, space-shaping allées and forest-like groves.

3

Locals Not Imports

In a city park, there is rarely a reason to plant a tree that is not a native or a native cultivar, especially since the introduction of non-native species actively undermines the ecosystem services of the larger landscape.

4

Big Not Small

With the goal of creating picturesque, colorful four-season landscapes, there are places in parks where smaller understory or flowering tree species can be justified. These should be the exception to a larger planting strategy that gets the most canopy from its tree budget by favoring trees that grow tall and wide.

5

Tots Not Teens

When trees are planted with proper protection, parks offer an ideal environment for sourcing them when they are young and can be transplanted with the least root damage. In contrast to street trees, aiming for a 1-inch caliper rather than 1.5 inches is recommended. Additionally, parks are the right place to execute a seedling campaign with the goal of creating robust groves at the least cost.

6

Let Trees Mingle

With the goal of improving resilience, planting singular standalone "monument" trees should be eschewed in favor of a general strategy of grouping trees in groves, stands, and allées, where their roots can eventually touch, share nutrients, and hold each other up in storms. Because trees of the same species are better at supporting each other, some tree groups should be monocultures, but not all; variety has its place in parks.

7

Plant With A Plan

As already noted, each (non-seedling) park tree, when planted, must be assigned a watering and pruning plan, and be logged into the City database. This database, updated constantly, should be used by City foresters with a mandate that every tree thrive throughout its life. In the past, the City database has been limited to street trees; it needs to be expanded to include park trees as well.

8

Break The Grass Habit

Unlike streets, parks are an ideal location for optimizing the food web by planting an understory of native shrubs and/or groundcover that provides "soft landings" for the caterpillars that fall from trees to pupate. Where appropriate, these can grow taller than the 2-foot height limit imposed on streets.

Photograph from www.pollinatorsnativeplants.com/softlandings.html

Better Parks

In addition to applying the eight ReLeaf Rules, most of Cedar Rapids' larger parks can be improved with trees in as many as five separate ways: firmer edges, tree-lined paths, shade where people are, seedling groves, and edible landscape.

Firmer Edges

Our evolution as a species at the edge of the forest draws us to public spaces lined by trees.[87] Whether against a public street or private property, a row of substantial trees at the edge of a park defines the park's limits while turning it into an outdoor living room, giving comfort to visitors.

Against private property, this edge can be deciduous trees or evergreens; residents often prefer evergreens for year-round privacy. Against streets, this edge should be deciduous trees, with branches eventually trimmed above head height to avoid blind spots; perceptions of safety also depend on clear views in and out of the park. In most cases the trees that line a park edge against a street should be the street trees themselves, between the sidewalk and curb. In this way, the sidewalk is brought perceptually into the park, improving the walk. However, an ideal solution is to place rows of same-species (or similar-appearing) trees on both flanks of the sidewalk, turning it into a street-side tree-lined path.

Tree-Lined Paths

Like the famous mall in New York's Central park, the park path lined by trees is one of the most beautiful and comforting environments that humans can inhabit. People are much more likely to walk on paths lined with trees, thanks both to their cooling shade and the visual interest that framed views provide.

Many parks in Cedar Rapids have paths through them, but only some of them are lined by trees. The plan to replant should line existing paths with rows of same-species trees wherever possible. Where a less formal look is desired, the flanks of paths can also be scattered with clusters of seedlings. (More on them to follow)

Shade Where the People Are

As already discussed, the presence of formidable trees

overhead can lower the temperature of a space by 20 degrees or more. Places in parks where people gather to picnic, host parties, watch competitive sports, or just sit on benches should be sheltered by trees, ideally planted just to the south. Evergreens can also be located northward to serve as valuable wind breaks during cooler months.

Seedling Groves

As noted, a great way to build Cedar Rapids' canopy cheaply and quickly is by planting groves of seedlings, and the right place for them on public land is in parks. Where there is room, seedlings should be scattered in available areas of neighborhood parks and fenced collectively for protection. The best locations for them are at the edges of existing tree stands and along shared property lines, where they will not interfere with mowing or block views in and out of the park.

Seedlings are also the planting method of choice for along recreational trails and within "unimproved" (natural) city land, both discussed ahead.

Edible Landscape

Edible landscape—trees that produce fruits and nuts—was not ranked high among the Principles that citizens were asked to consider for this plan. Additionally, we have to consider the mess that these trees can produce along a roadway. Fruit trees are not good street trees.

That said, fruit and nut trees have their place, and there is ample reason to give people the opportunity to grow food in city parks, especially in locations that qualify as "food deserts" due to a lack of healthy food choices nearby. Community gardens already exist in Ellis Park, Tuma Soccer Complex, and near Gardner Golf Course. This is a good start, but more should be encouraged.

Of the 38 Park Plans completed as a part of this plan, nine reserve ample areas for community gardens as the demand arises. Adjacent to these gardens are the ideal locations for fruit and nut trees, which can be planted and tended by community gardeners to supplement the produce from their plots. The park plans locate these garden areas, which could potentially be planted with groups of seedlings in tree-protection tubes rather than staked saplings, to reduce cost.

Park Property Classification

The city of Cedar Rapids, like other cities, classifies its park properties to organize resources and prioritize service levels across its park system. There are 11 different classifications assigned to parks in Cedar Rapids. Five are deemed to have high priority, they are: School Park, Neighborhood Park, Community Park, Regional Park and Mini Park. Those with lower priority are: Special Use Park (Tuma Soccer Complex), Open Lands, Natural Resource Area, Trail Park Pavilion, Community and Touring Events (McGrath Amphitheater) and Public Golf Course.

This plan specifically addresses 38 of the 97 classified park properties with planting plans, all of which are included in the Appendix. A park's classification was not the determining factor in whether or not a planting plan was created for it. Rather, City staff and administrators determined which properties warranted focused attention by the design professionals and which did not. Those decisions do not factor into the replanting prioritization for parks described later on in this chapter.

It remains here to address those 59 parks that did not receive planting plans. The best way to do that is to address them by category as follows:

- Sports Complexes and other Special Use Parks
- Recreational Trails
- Natural Resource and Unimproved Park Areas
- Mini Parks

Each of these categories merits planting as described on the following pages.

Sports Complexes and Other Special Use Parks

Beyond the 38 parks redesigned in this plan, properties in this category all provide opportunities for active and/or passive recreation in their neighborhoods. Most of these did not have a large number of trees before the derecho. To the degree that each lost trees, it should be replanted from the ReLeaf Tree List. Additionally, if there is room in a given park for more shade trees, especially along edges and flanking any paths, these should be added. Some of these parks may have space for a small, protected seedling grove as well.

Recreational Trails

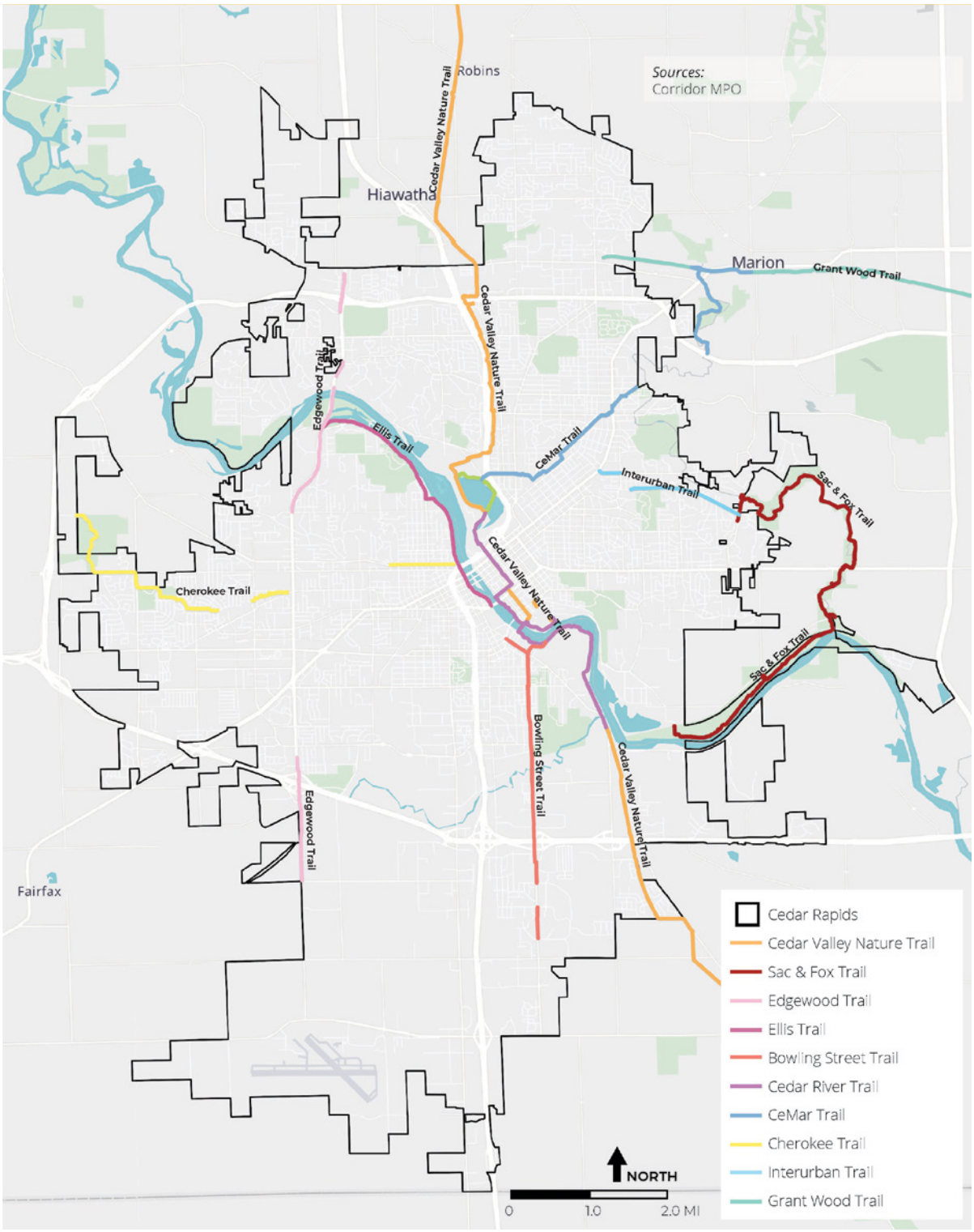
Cedar Rapids is amply served by a broad network of excellent recreational trails, connecting neighborhoods to downtown and surrounding communities. Through the dedicated efforts of City and County staff, area non-profits and citizens, plans exist for continued expansion of the existing network.

These existing and planned trails pass through a wide range of landscapes, some already forested. But for much of their length, many are flanked only by low-lying vegetation, and provide a great untapped resource for growing the local canopy through a concerted seedling campaign.

As discussed, compared to nursery-grown saplings, seedlings are cheap, plentiful, easy to plant (in protective tubes), and maintenance free. Most seedlings die, but those that survive can create a robust canopy at a fraction of the cost of saplings. This plan directs that the treeless stretches of Cedar Rapids' recreational trails be designated as priority target locations for groves of seedlings. In addition to growing the canopy, these would make the trail network even more attractive and accommodating.

Long stretches of the Cedar Valley Nature Trail and others would benefit from trees overhead.

Photograph by April Peska



Major recreational trails serving Cedar Rapids.

Above: With many mature trees laid down by the storm, sunlight is now making its way to the forest floor where invasive species may soon crowd out native flora.

Photograph from Google Maps Street View

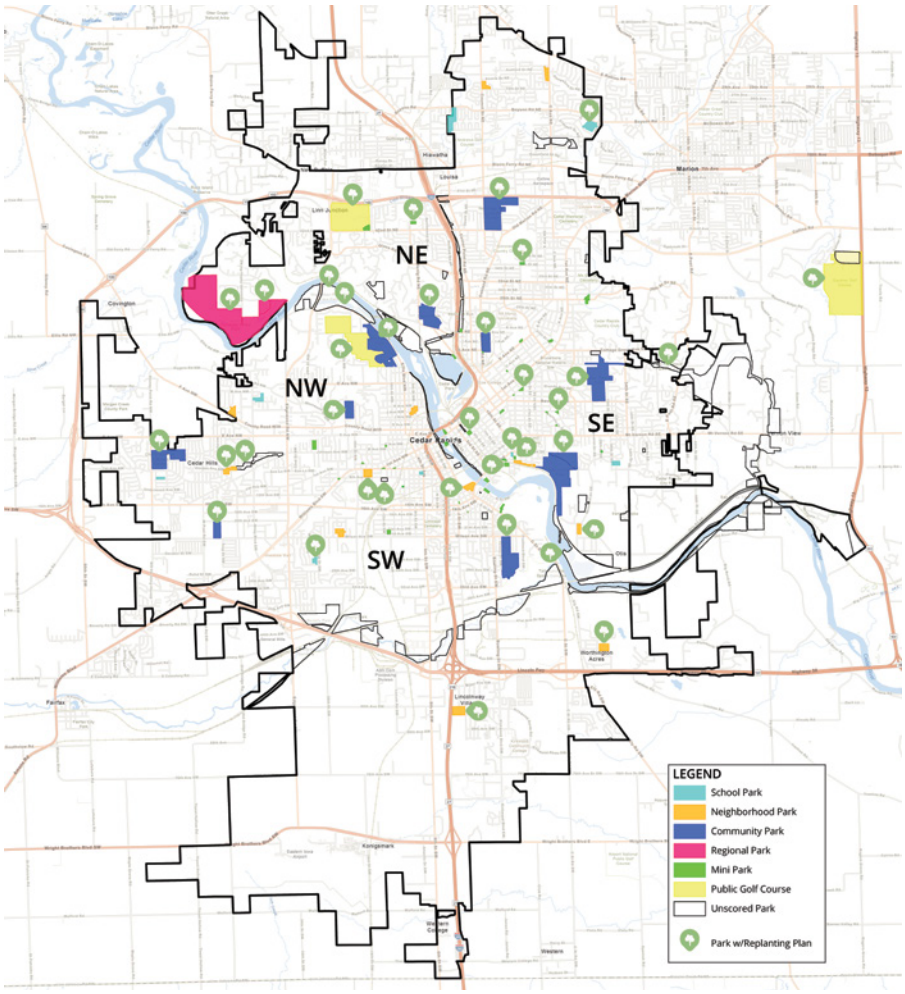
Natural Resource and Unimproved Park Areas

A number of large City-owned properties are designated as "unimproved," which means that they have been left in a largely natural condition and are mostly not tended to. As such, they often make a big contribution to the canopy at little cost, but their untended status puts them at some risk. Most have yet to be properly cleaned out since the derecho, and some are crawling with invasive species.

For most Cedar Rapidians, these out-of-sight properties are out of mind. The fact that few people visit them makes them a low priority. But the health of the regional ecosystem demands that, eventually, an effort is made to clean out excessive deadwood and manage invasive species. Like along the City's recreational trails, areas of these properties that lack tree cover could also serve as good locations for seedling groves.

Mini Parks

These 36 remaining City properties currently serve little to no real purpose, but they can still be used to grow the canopy. Many of these are leftover triangles, caused by the way the street grid shifts in places to parallel the Cedar River. They are called 'parks' but do not in most cases function as such. In several locations, the triangle is simply too small or too surrounded by busy roads to be a welcoming space for people. But while they may not be great for people, they are perfect locations for more trees. Many were planted prior to the derecho and should be returned to that condition. Others have been treated as gateways into neighborhoods and include neighborhood signage and ornamental plantings. Those too should be returned to service as such, but also planted more heavily with Superior native trees.



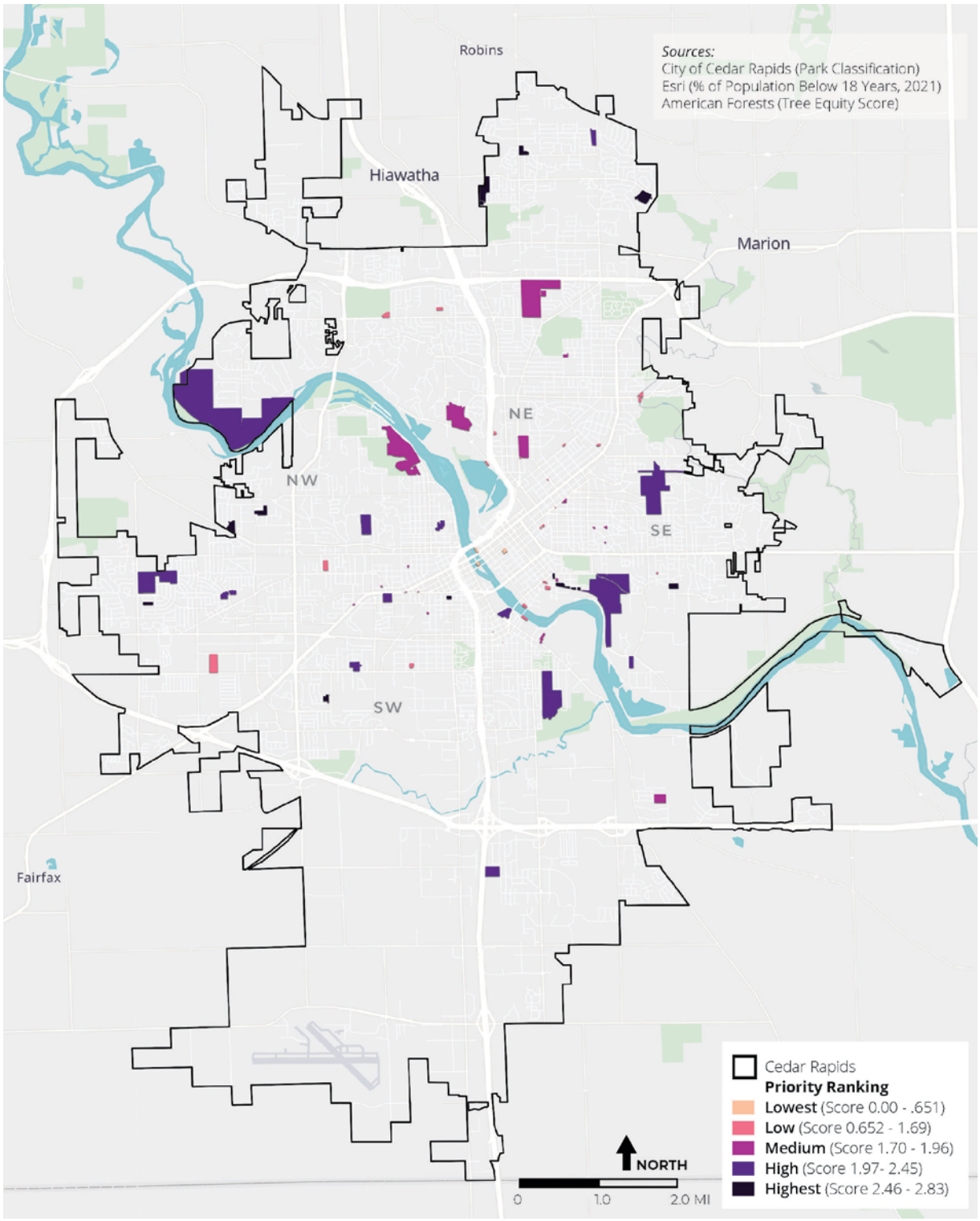
Parks by classification

Invasive Species Control

Aside from replanting our trees, one of the most labor-intensive efforts to arise out of the 2020 derecho is the control of invasive species. As the mature trees in our wooded areas fell, woodland floors were disturbed and sunlight streamed in where it had not before. Under these conditions, many of the invasive species now common to Iowa woodlands, were given a chance to take on a more dominant role in those ecosystems.

Invasive species are defined by Merriam-Webster as "a non-native organism growing and dispersing easily, usually to the detriment of native species and ecosystems." In the Cedar Rapids area, species such as bush honeysuckle, European buckthorn, garlic mustard, oriental bittersweet, and multiflora rose are likely to out-compete young or newly planted native trees and shrubs and will require dedicated effort to control. It is imperative that control methods are used while the invasive species are still young since fighting them once established can prove to be an overwhelming—if not impossible—task.

Identification and recommended control methods are provided for each of the species mentioned, along with many others, in the Iowa DNR Forestry Invasive Species Guide available in print or online at the following link: iowadnr.gov/Portals/idnr/uploads/forestry/invasive-species-guide.pdf



Priority ranking of parks.

Park Planting Priority

As with street trees, one of the responsibilities of this plan is to determine which of the City's parks get replanted first. Because there are only 97 park properties in Cedar Rapids—as opposed to literally thousands of street segments—the method for establishing a proper order can be less complicated. In this process, the criteria to keep in mind can be limited to three: Park Classification, Tree Equity Score, and Percent Population below 18 Years Old.

- **Park Classification**: With the goal of determining their impact and usefulness, Cedar Rapids' high priority parks can be classified as either Mini, School, Neighborhood, Community, or Regional in increasing size of service radius. Due to their accessibility to nearby residential areas, smaller school and neighborhood parks have a greater impact on people's daily quality of life, and should be prioritized above community parks, which should in turn be prioritized above regional parks. Mini Parks warrant a place in the scoring due to their location and visibility within the community, despite their diminutive size.
- **Tree Equity Score:** Tree Equity Score is used in the Park Planting Prioritization in the same way it is used in the Street Prioritization; to incorporate important canopy coverage, climate, and socio-economic variables into the overall analysis.
- **Percent Population below 18 years within 0.5 miles:** Here the goal is to prioritize the replanting of parks that are most likely to be used by local children. Actual use data is not available, so this factor measures the percentage population under 18 within a ten-minute-walk radius.

Geographical Distribution:

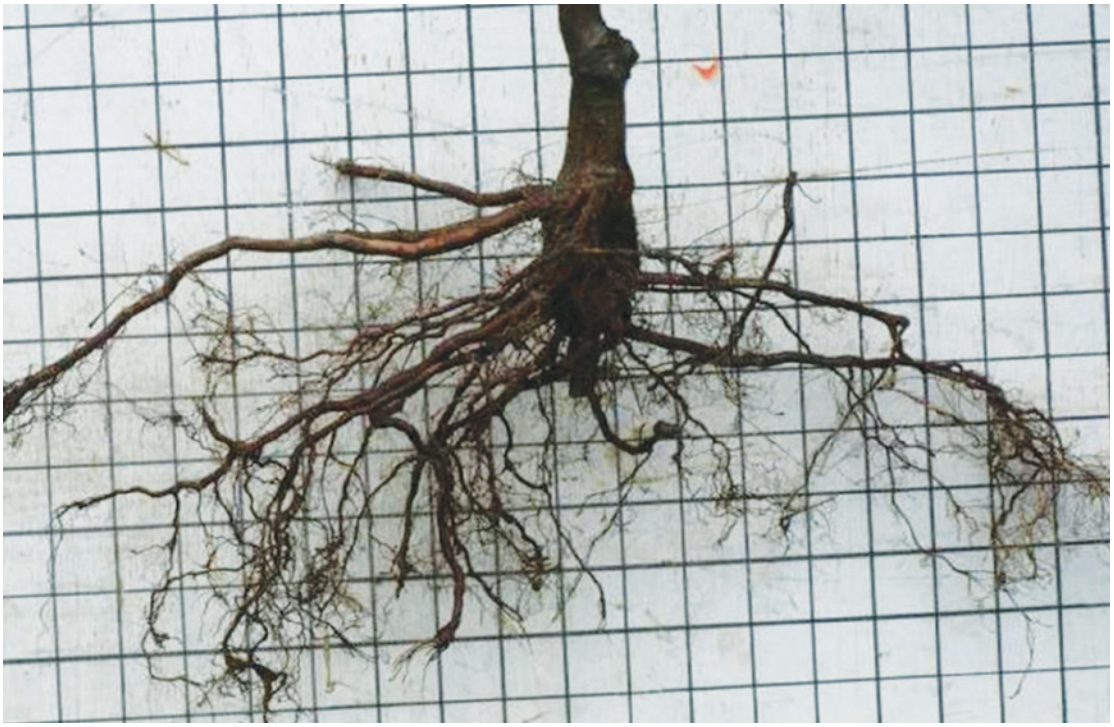
Though not a factor in the prioritization, the geographical distribution of the City's parks is an important tool for staging the replanting effort. Most people know the city as having four quadrants: NE, NW, SE, and SW. The Parks and Recreation department employs four park maintenance crews, one for each quadrant. Each crew maintains all the parks within its assigned quadrant throughout the year. Organizing the work of these crews effectively requires that the park prioritization be sorted by quadrant, so that each crew can maintain steady pace. Distributing the effort in this way also makes the most efficient use of the City's watering equipment, which is likewise organized by quadrant.

Combining the first three factors above leads to a straightforward method for creating a timeline for park replanting. School and neighborhood parks within each quadrant are improved before community parks which are improved before regional parks. Finally, those parks in areas with a lower Tree Equity Score will be planted sooner rather than later.

Remaining Properties

Left out of the prioritization in the Appendix are Recreational Trails, Natural Resource and Unimproved Park Areas, and Special Use Parks. These should be treated as follows:

- The City's major recreational trails should be prioritized for the planting of seedlings obtained through this plan's proposed Great Seedling Campaign. This planting should begin downtown and radiate outward, which means that it will start along the Cedar Valley Nature Trail.
- Reforestation should take place in the City's natural resource areas and unimproved park areas as time and resources allow, and should be part of an overall management plan that removes invasive species prior to planting.
- Special Use Parks such as the Tuma Soccer Complex and Tait Cummins Softball Complex should be replanted as soon as time and resources allow. Where space permits, these parks should be planted with more trees than were lost to maximize desired shade.



The Gravel Bed Nursery

The City has recently created a gravel bed nursery in Jones Park, principally to hold young trees temporarily as they await planting. Gravel bed nurseries are in many ways superior to traditional potted-tree nurseries: bare-root stock is cheaper to produce, easier to transport, and contains substantially more root mass than potted trees. If planted at the right time—a narrower window than with potted trees—bare-root trees are more likely to thrive. The City has no desire to become its own tree supplier, but it should continue to explore options to enlarge this nursery, from which it could potentially source more and more of its trees.

Bare root trees before and after 12 weeks in a gravel bed nursery.

Photographs from *A Guide to the Construction and Management of Community Gravel Beds*, Gary Johnson - University of Minnesota, Department of Forest Resources

The Park Trees Plan

Summarizing the previous pages, an aggressive strategy for quickly replanting Cedar Rapids' parks includes the following steps:

The Right Species
Trees will be selected from the ReLeaf Tree List. No imported species will be planted where a native tree will thrive; exceptions will be made only when the desired plant stock is simply not available. Small species may be planted due to spatial constraints or for picturesque effect, but most trees planted will be larger species.

Citywide Diversity
The City will adhere to the 10-20-30 rule regarding the percentage use of any one species, genus, or family of trees it plants in streets and parks. For the time being, this means planting no maple trees.

Plant Young and Protect
Park trees will be planted as saplings typically around 1-inch caliper and carefully protected by stakes. Park plans should include groves of seedlings, typically at the edges of existing tree stands and along shared property lines.

Plant in Groups
Rather than standalone monuments, most park trees will be planted as groups in groves, stands, and allées, close enough together that their roots can eventually touch. Many of these groups will be of a single species (or similar-appearing species).

Inventory, Track, Water & Prune
In an expansion of past practice, all park trees will be entered into an improved City database applying asset management best practices, assigned a watering and inspection schedule, and pruned as necessary.

Soft Landings
Park plans will look for opportunities to plant an understory of native shrubs, perennials, and/or groundcover beneath trees. Recommended species include ninebark, goldenrod, and wild geranium.

Firmer Edges
Park plans will endeavor to plant trees at their perimeters, either as street trees along sidewalks or as borders along adjacent private properties.

Tree-Lined Paths
Park plans will endeavor to line existing paths with allées of same-species (or similar-appearing) trees on both sides.

Shaded Activities
Park plans will endeavor to locate trees to shade activities that benefit from summer cooling.

Seedling Groves
Where appropriate, park plans will locate new groves of native seedlings along edges of existing tree stands and along shared property lines. Seedlings will also be planted in large number as practical along unshaded segments of the City's four recreational trails, beginning downtown and working outwards.

Edible Landscape
Park plans will identify the location of current or potential future community gardens and will encourage the planting of groves of food-producing seedlings adjacent to such gardens as they are created.

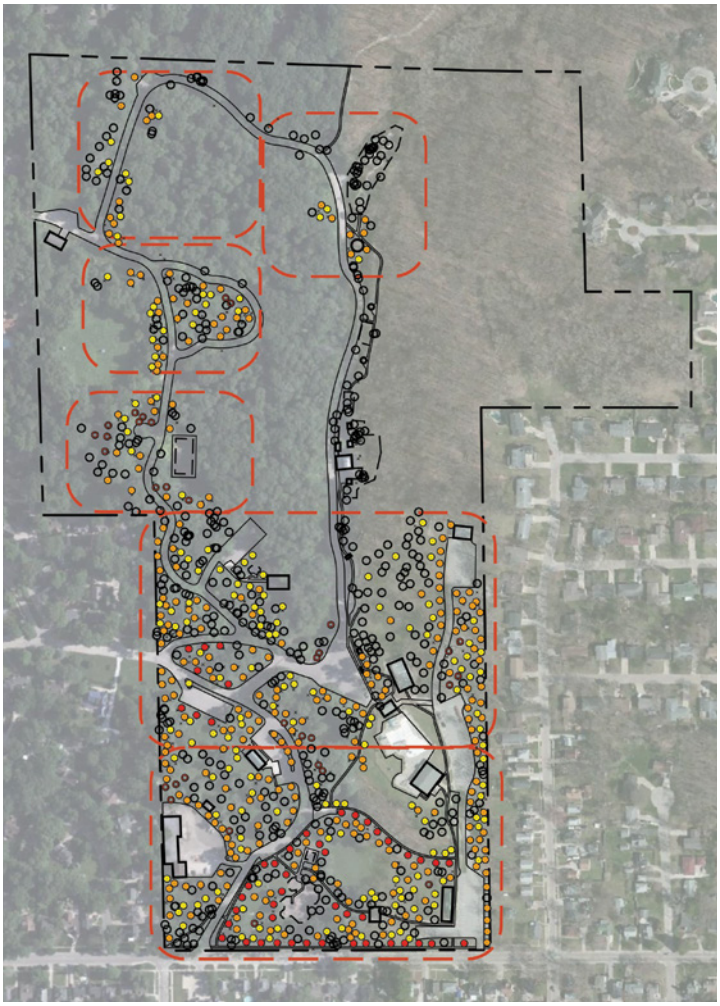
Replanting Priority
Replanting of parks will occur in each quadrant in the order listed in the Appendix, based on Park Classification, Tree Equity Score and Percent Population Under 18 within .05 miles.

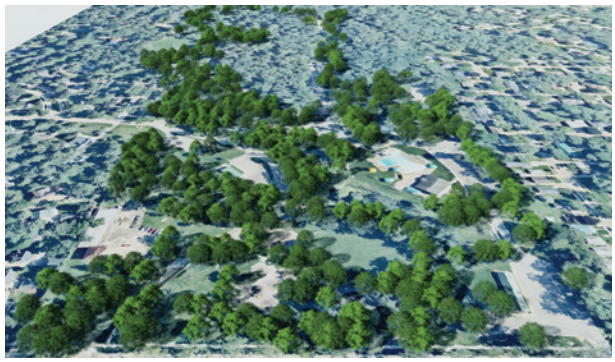
Natural Resource and Unimproved Park Areas Strategy
The City will pursue a strategy to eradicate oriental bittersweet, garlic mustard, and other major invasives from its woodlands and unimproved park areas and begin to populate open areas of those properties with seedlings as they become available.

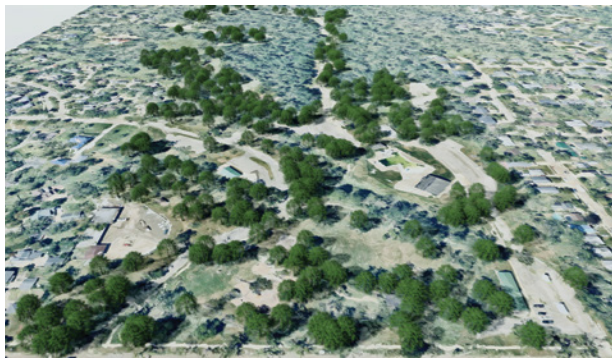
Special Use Parks
Park properties so designated will be slated to receive replacement trees—and supplementary trees as fit—when all higher priority planting is complete.

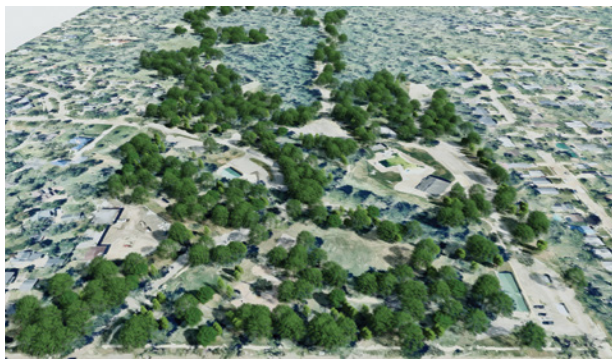
38 Plans for 97 Properties

The city of Cedar Rapids identified 38 of its parks as in need of detailed planting plans subsequent to the derecho. Designs for these parks are included in this plan's Appendix. Bever Park and Daniels Park are presented here as an example of the approach described on the previous pages.

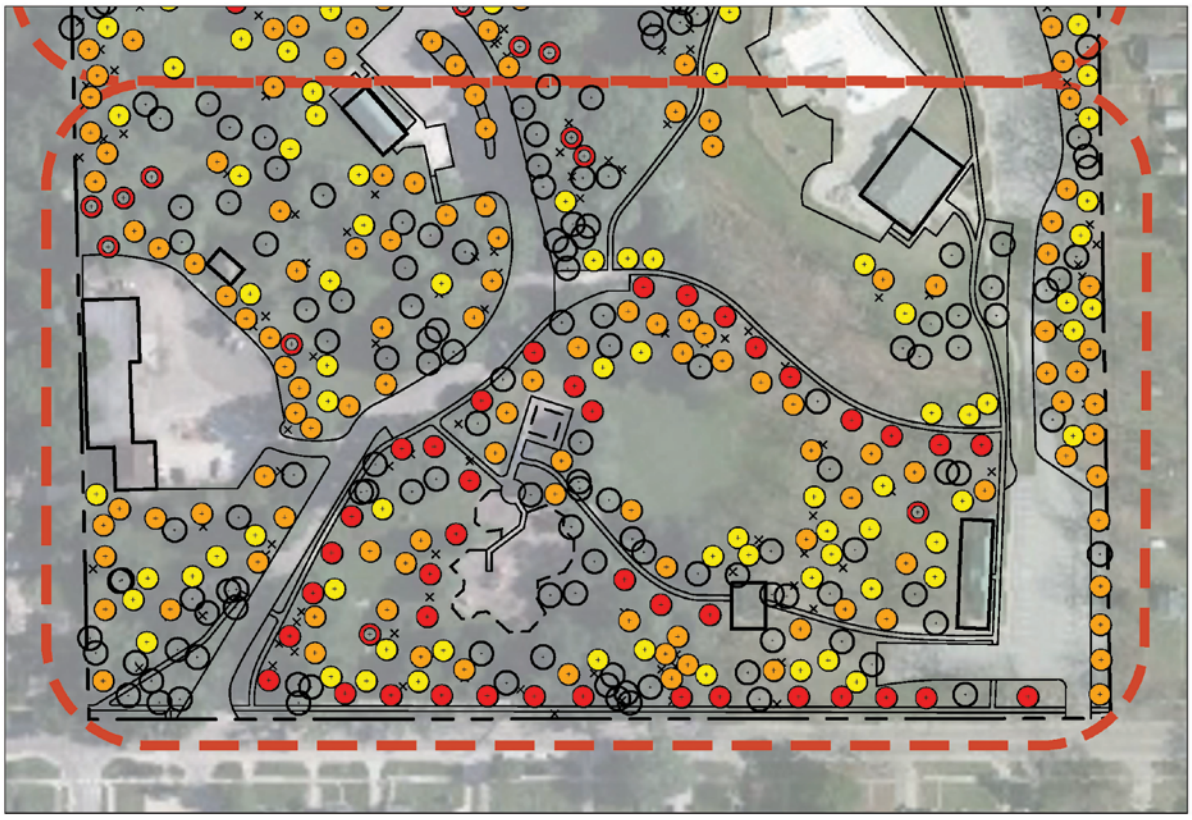








Left: Phased replanting plan for Bever Park. **Top:** Pre-derecho tree cover. **Middle:** Day after the derecho. **Bottom:** Replanted condition after 10 years **Adjacent Page:** Bever Park Replanting Plan enlargement with more detail .



LEGEND

- NEW TREE (PLANTED) - 31
- NEW TREE 1-2 YR
- NEW TREE 3-7 YR
- NEW TREE 8-10 YR
- EXISTING TREE TO REMAIN
- TREE REMOVED - 322

SCALE: 1"=150'

0' 75' 150' 300'

REPLANTING SUMMARY

TIMEFRAME (YR.)	QTY.	EST. COST ($)	SIZE
1-2	48	24,420	1.5" cal
3-7	270	155,100	1.5" cal
8-10	162	106,700	1.5" cal

SITE AND SPECIES SELECTION NOTES

Bever Park is comprised of large oak trees in groves on rolling hillsides. There was significant loss of tree quantity, but the character of the old oaks persisted with the remaining trees.

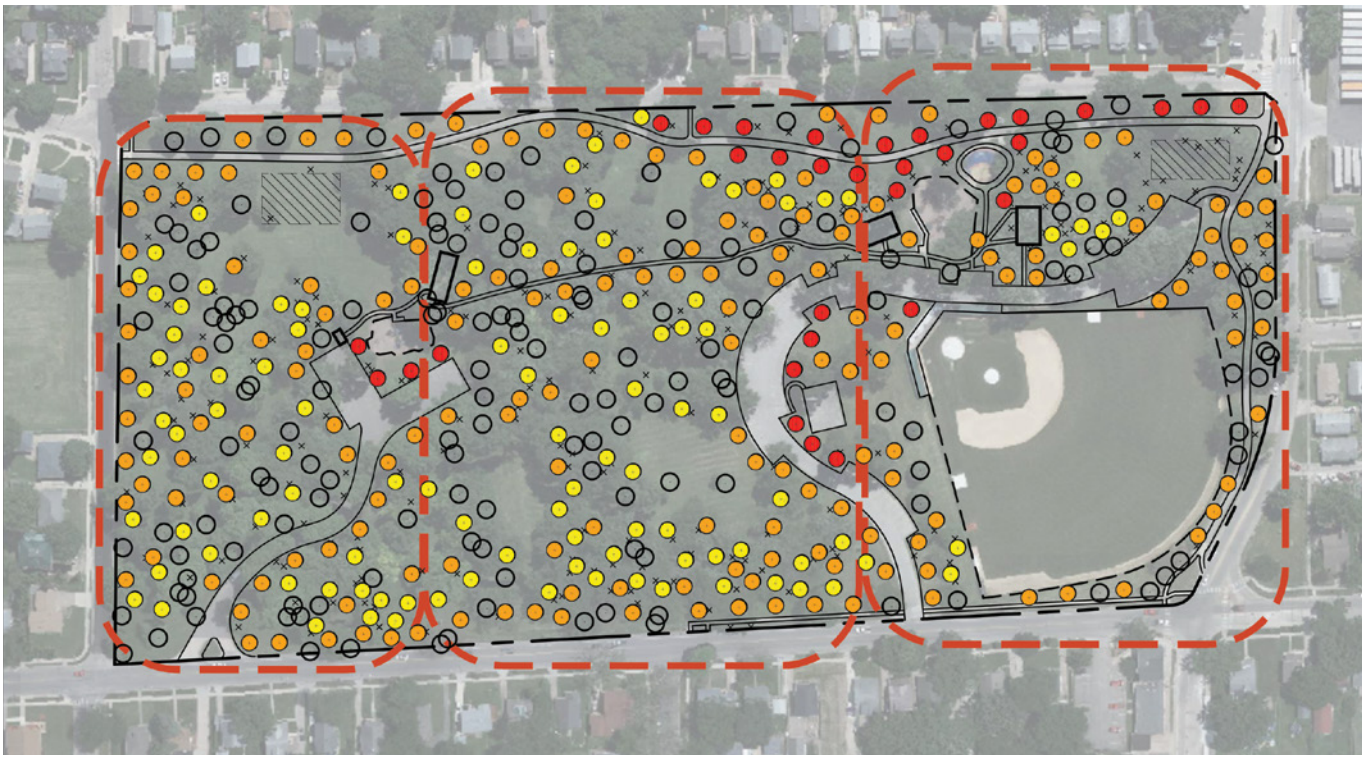
Reforestation will help to reinforce the remaining tree groves and provide age diversity for the future of a healthy tree canopy.

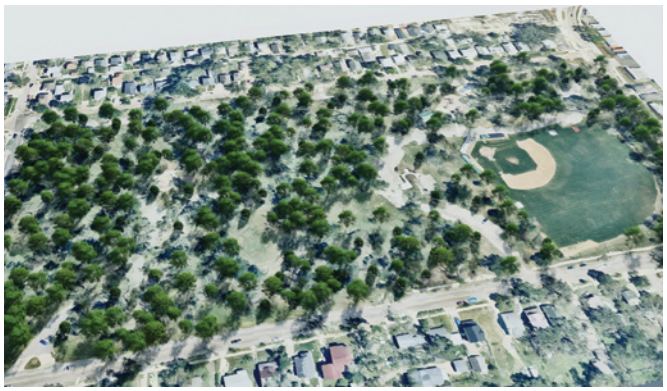
Replanting Diagram
BEVER PARK - LOWER SOUTH

ReLeaf CEDAR RAPIDS

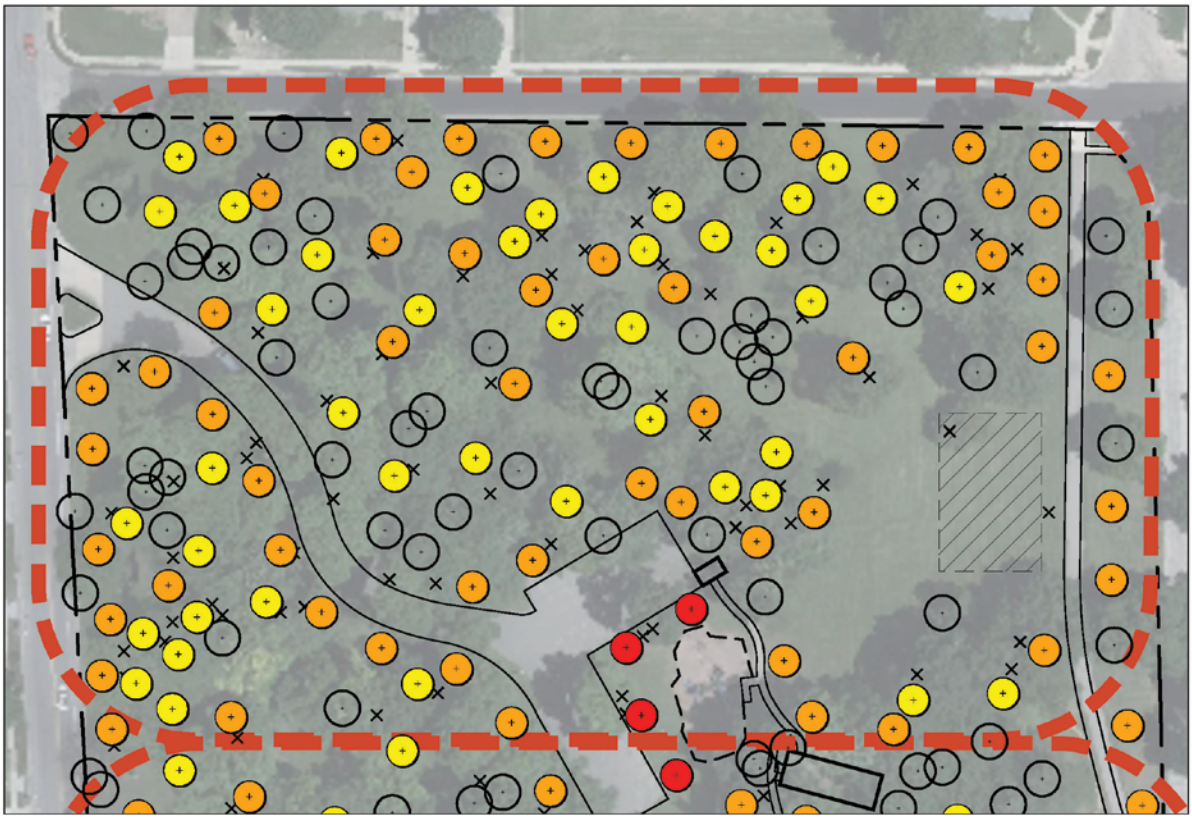
Cedar Rapids, Iowa

12-01-2021





Top: Phased replanting plan for Daniels Park. **Above Left:** Pre-derecho. **Above Right:** Day after the derecho. **Bottom:** Replanted condition after 10 years. **Adjacent Page:** Daniels Park replanting plan enlargement with more detail .



LEGEND

- NEW TREE (PLANTED) - n/a
- NEW TREE 1-2 YR
- NEW TREE 3-7 YR
- NEW TREE 8-10 YR
- EXISTING TREE TO REMAIN
- TREE REMOVED - 226
- POTENTIAL COMMUNITY GARDEN

SCALE: 1"=100'

0' 25' 50' 100' 200'

REPLANTING SUMMARY

TIMEFRAME (YR.)	QTY.	EST. COST ($)	SIZE
1-2	32	16,280	1" cal
3-7	180	103,400	1" cal
8-10	108	71,130	1" cal

SITE AND SPECIES SELECTION NOTES

Although Daniels Park lost more than half of the old-growth trees that resided within, the park has managed to sustain its character through the remaining oak groves and the space they fill together. The splash pad area, however, was noticeably impacted.

The replanting phases will focus on enhancing the integrity of the remaining oaks and other assorted trees throughout the park in order to provide age diversity.

Replanting Diagram

DANIELS PARK - NORTH

ReLeaf CEDAR RAPIDS

Cedar Rapids, Iowa

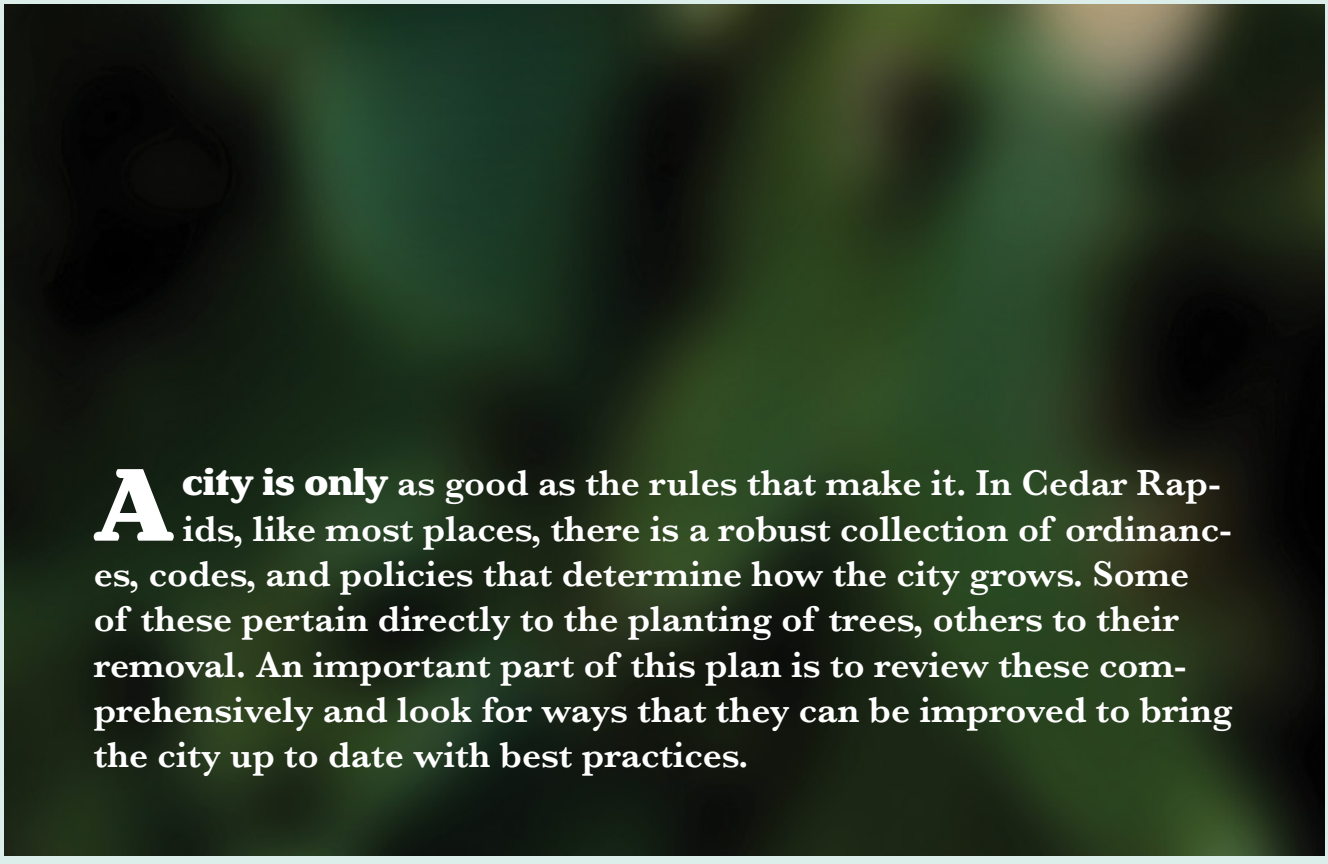
11-30-2021

ReLeaf
CEDAR RAPIDS

City Ordinances and Policies

11

"Whether we and our politicians know it or not, Nature is party to all our deals and decisions, and she has more votes, a longer memory, and a sterner sense of justice than we do." - Wendell Berry



A city is only as good as the rules that make it. In Cedar Rapids, like most places, there is a robust collection of ordinances, codes, and policies that determine how the city grows. Some of these pertain directly to the planting of trees, others to their removal. An important part of this plan is to review these comprehensively and look for ways that they can be improved to bring the city up to date with best practices.

A review of existing codes and policies unearthed the following items that should be changed if our ReLeaf goals are to be met:

- The Zoning Ordinance's requirements for street trees.
- The Zoning Ordinance's requirements for parking lot trees.
- The Zoning Ordinance's requirements around tree removal.
- City policy around the survival of developer-planted trees.
- City policy around bringing recently-planted properties back into compliance with their approved site plans.
- City policy and the limitations of state law around the burial of overhead wires.

These are addressed in turn on the pages that follow. It is important to note that the adoption of this plan does not automatically enact the code and policy changes described here. Each is likely to stir up some controversy, mostly for the simple reason that planting more trees costs more money. This plan's adoption can't be girdled with the mandate that these rules be changed immediately. Rather, adoption of this plan means that the City will, before long, create and bring to Council for approval some version of each of the items described below. It can be reasonably hoped that a Council that supports this plan will support these changes.

The Zoning Ordinance on Street Trees

Some areas of the city have no street trees at all because the City had no tree requirement at the time they were built. It is clear throughout Cedar Rapids and the U.S. as a whole that, because they don't benefit much from new saplings, homebuilders and developers will plant street trees in the number required and no more. Because the value of these trees to residents and to the City only accrues over time—typically once the developer has moved on—the City needs to set a standard now that will maximize public benefits down the road. The City's current standard falls short. Both in terms of ecosystem benefits (like heat-island mitigation) and economic benefits (like improved property values), an important threshold is crossed when a street and its sidewalks receive a continuous canopy of shade. This is typically achieved by planting trees about 30 feet apart, a standard found in other cities. In contrast, Cedar Rapids' Zoning Ordinance requires one tree per 40 feet of frontage.

The proposal to require trees at a 30 foot rather than 40 foot spacing will increase costs for developers and the additional cost is likely to meet resistance. This doesn't change the fact that the current ordinances are creating neighborhoods with substandard tree cover that will fail to achieve the climatic or economic outcomes of properly planted places.

Policy Recommendation

For this reason, this plan recommends modifying the Zoning Ordinance's 40-foot rule to 30-feet and requiring large-species trees from the plan's tree list except under utilities, where a 20-foot minimum spacing of smaller-species trees would be the rule.

The Zoning Ordinance on Parking Lot Trees

When it comes to limiting heat islands, reducing stormwater pollution, and absorbing CO_2, there is almost nowhere that large trees can be more impactful than in new parking lots. The Zoning Ordinance acknowledges this impact by requiring trees in landscape islands, but not enough to provide good canopy on most lots.

Practically applied, the current Ordinance results in one tree being planted for about every 3,000 square feet of surface area, which is perhaps three times the area of a large, mature tree. Moreover, because these trees are planted in small landscape islands, they often fail to grow large. These standalone trees are also more vulnerable to windstorms.

A path to a better outcome can be found in the Ordinance's requirement for larger lots, which says that every other double row of parking must be split down the middle with a landscape strip 10 feet wide. This design allows trees to spread their roots and intertwine. Unfortunately, the code places these strips 134 feet apart from each other—centered in planting strips separated by two 62-foot parking bays (see image at top, right). It also does not require the trees to be spaced close enough together within the strips so that their canopies will eventually touch at maturity.

Reforming this aspect of the zoning ordinance in a way that is not overly burdensome on developers would focus on the main challenge that parking lot islands present to property owners: snowplowing. Plows find it difficult to work their way around tree islands without damaging them, and are especially challenged by end-caps, the little islands that wrap around the final parking spaces in each row. Plowing is much easier when the tree strips sit just between parking aisles, but not at the end of each row.

A possible compromise solution is shown at right. It requires more trees and provides more shade, but does so in a way that simplifies plowing. Rather than placing tree strips with end caps between each pair of bays, it places tree strips without end caps between every single bay. To provide proper shade, this solution includes a tree for every 27 linear feet of strip, to align with every third parking space.

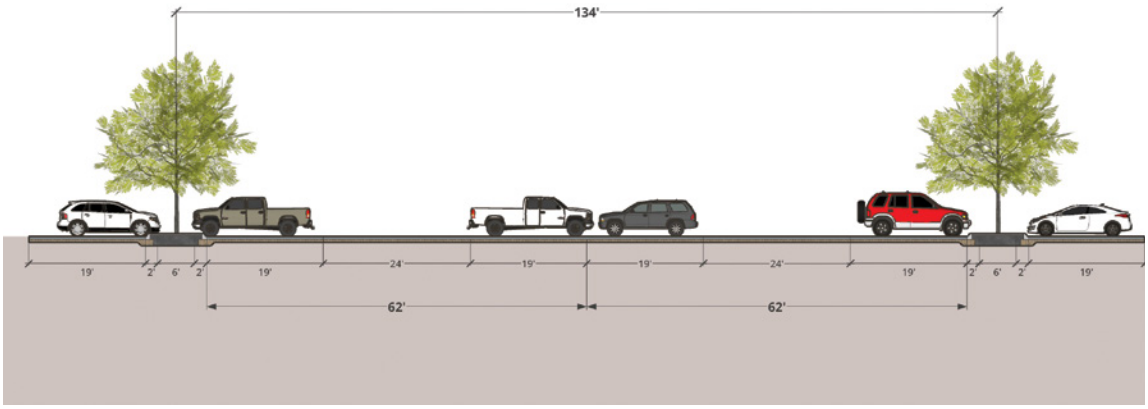
Worth observing is that, since car bumpers can overhang these tree strips slightly, the typical 62-foot wide parking bay can be reduced to 58 feet, which helps to compensate for the space required by the extra tree strips. Narrowing the tree strips by one foot results in the parking lots being no less spatially efficient than before.

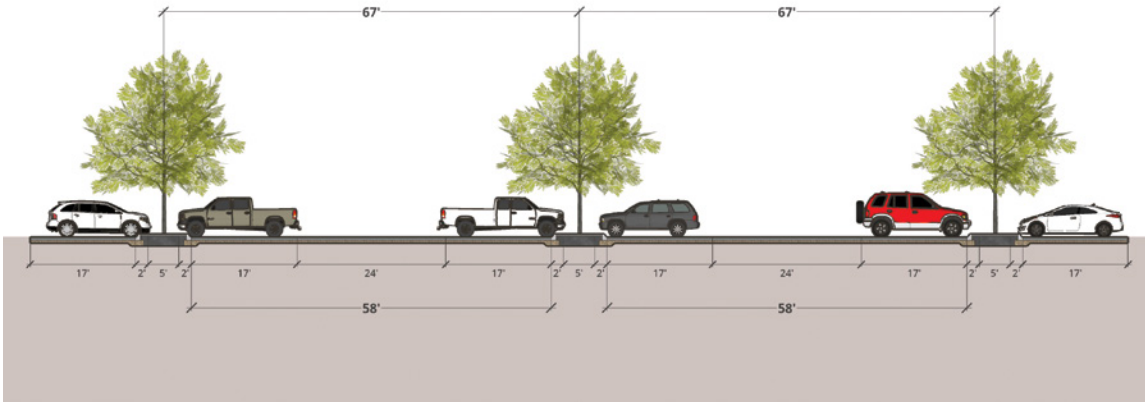
This is not the only solution for providing better shade in parking lots, and others should be considered as well, including beefing up the number of trees at parking lot perimeters. As with street trees, this plan proposes that the Ordinance be changed to result in more trees being planted, likely at greater cost. This change is needed to properly shade parking lots, one of the places where new canopy can provide the biggest payoff to the City and its residents.

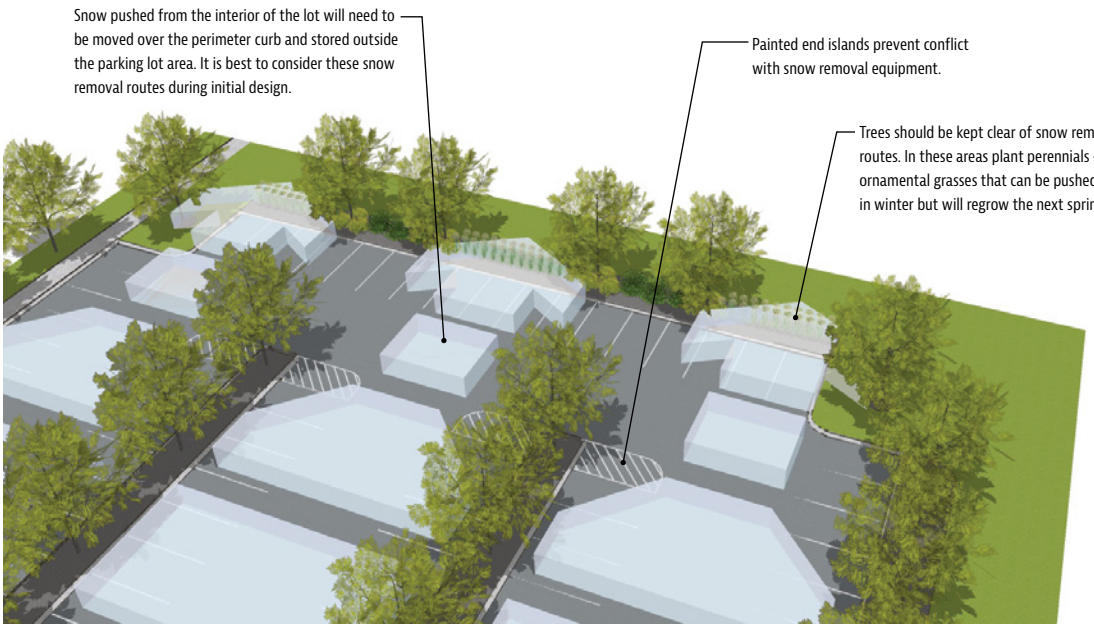
This change is needed to properly shade parking lots, one of the places where new canopy can provide the biggest payoff to the City and its residents.

Policy Recommendation

Proposals such as the one suggested above be studied in order to determine a proper replacement to the current parking lot tree requirement; a replacement that results in a considerably higher percentage of pavement being shaded.







Top: Existing parking lot landscape strip requirement. Trees will never completely shade the pavement. **Middle:** Proposed parking lot landscape strip requirement will result in more evenly shaded parking lots. **Bottom:** Eliminating end islands at landscape strips will simplify snow removal operations. Planting plans should accommodate pathways for moving snow outside the parking lot to reduce damage to perimeter trees.

The Zoning Ordinance on Tree Mitigation and Tree Preservation

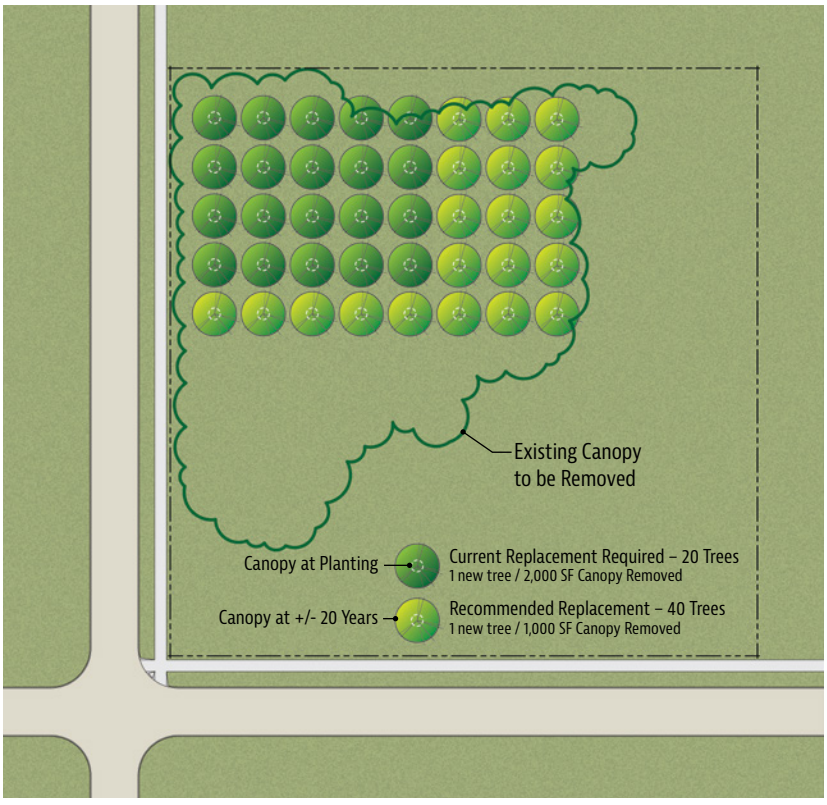
The City's Zoning doesn't stop developers from pulling down either tree canopy or specimen trees. Instead, like in most cities, it requires that removed canopy and trees be replaced according to certain ratios. In the current code, these requirements appear in two sections, Tree Mitigation and Tree Preservation, that can be confusing in their overlap, especially as they simultaneously address both canopy cover and individual trees. These requirements are also less stringent than can be found in other cities and should be strengthened as an indication of the City's commitment to ReLeaf.

That said, the current Code considers trees with trunks as narrow as 5 inches to be "significant," which seems a stretch. Such a tree may provide important canopy—worth preserving in its own right—but would not qualify as a specimen in most places. A higher threshold of 10 inches is recommended, in the context of more persuasive replacement ratios.

Currently, the code requires developers to plant new trees to replace either removed canopy or removed trees, depending on the presence of specimens. A simpler method would require the replacement of canopy, with bonus replacement for the destruction of specimens. Specifically:

CANOPY: The current code requires that destroyed canopy be replaced at a ratio of one tree per 2,000 square feet of area, which assumes that each new tree will achieve a canopy diameter of 50 feet. This far exceeds the mature width achieved by most trees on the City's tree list, and also ignores the fact that smaller trees provide about one tenth the canopy mass of larger trees. A rule aimed at the goal of true replacement would require one new tree for each 1,000 square feet of canopy removed and require that this tree be one of the species noted as Superior or Allowed in this plan's tree list.

SPECIMENS: The goal of surveying and calling out significant specimen trees is to discourage their destruction with measures that actually convince people to design around them. The current ratios are hardly convincing, for example allowing a developer to replace a towering two-foot-thick colossus with two diminutive 1.5-inch-caliper saplings. Other cities' codes are more demanding and suggest a proper one-for-one replacement of caliper inches



This plan recommends doubling the number of trees required to replace removed stands of canopy.

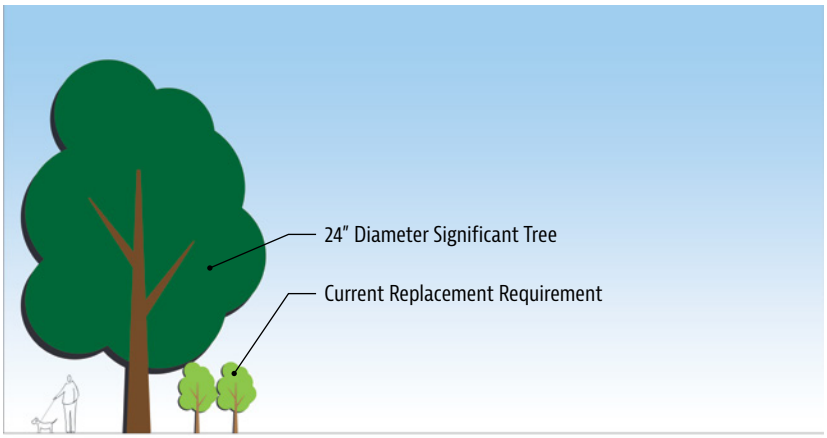
lost. This ratio ignores the fact that trunk volume and tree height actually increase as the square of the diameter—a tree with twice the trunk width is about four times as big—but it at least creates an incentive to save majestic trees.

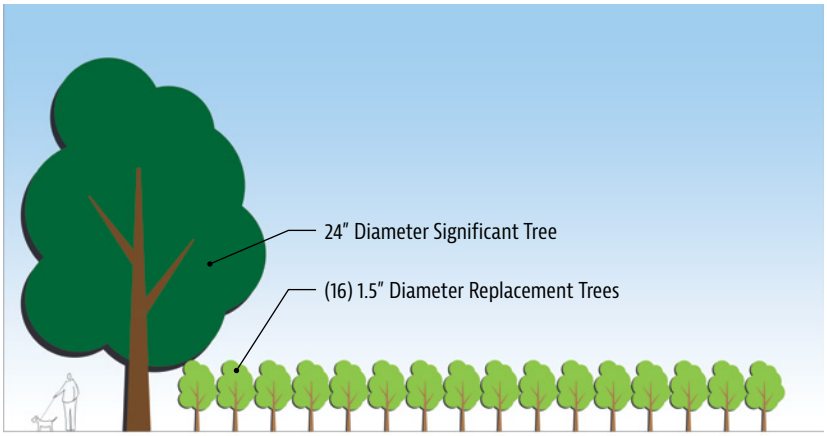
SURVEYS: Currently, site surveys of significant specimen trees are required at the discretion of City staff. Enlarging the definition of "significant" tree to those of diameter 10 inches or greater makes it reasonable to require all developers to complete specimen tree surveys prior to creating a site plan.

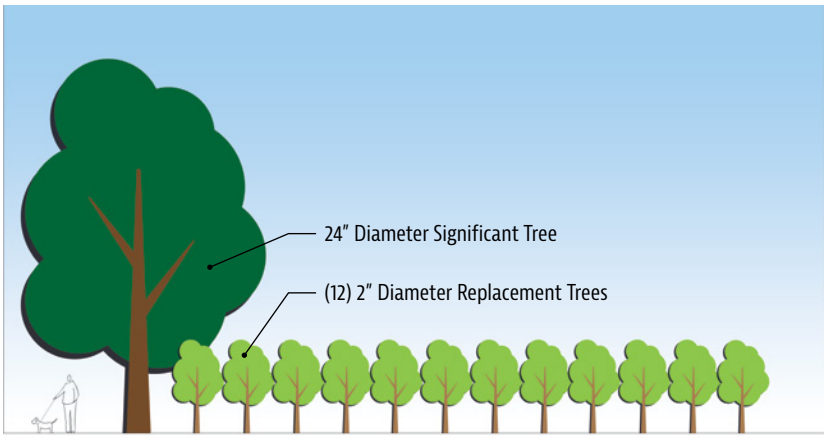
OFF SITE: As is currently the case, developers may find that they simply do not have room on site to properly plant and maintain the replacement trees required and should be allowed to instead pay for the City to plant trees elsewhere.

Policy Recommendation

Summarizing the above, this plan recommends consolidating the City Code's Tree Mitigation and Tree Preservation sections into a single section that requires one new City-approved large-species tree for each 1,000 square feet of canopy destroyed and additional such trees in a number and size that replaces the caliper inches of all destroyed significant specimens, with "significant" defined as a trunk diameter of 10 inches or more.







Top: The existing significant tree replacement ratio hardly dissuades the removal of mature trees. **Middle:** The recommended significant tree replacement ratio of replacing the total removed caliper inches could be accomplished by planting more smaller caliper trees, as shown here. **Bottom:** ...or by planting fewer large-caliper trees, as illustrated here. In either case, the combined total caliper inches equal those of the removed significant tree.

Developer Die-Offs

It has been observed that when property developers plant trees to meet their site plan requirements, these trees have a much worse survival record than trees planted by the City or its contractors. Enforcing best practices during planting is near impossible, and identifying dead trees one year out, demanding their replacement, and checking back on the new trees a year later is inefficient for both the City and the developer. It is much cheaper and more effective to get it right the first time.

One key factor here is that City-planted trees are purchased with survival warranties from their nurseries, while most developer planted trees are not.

Policy Recommendation

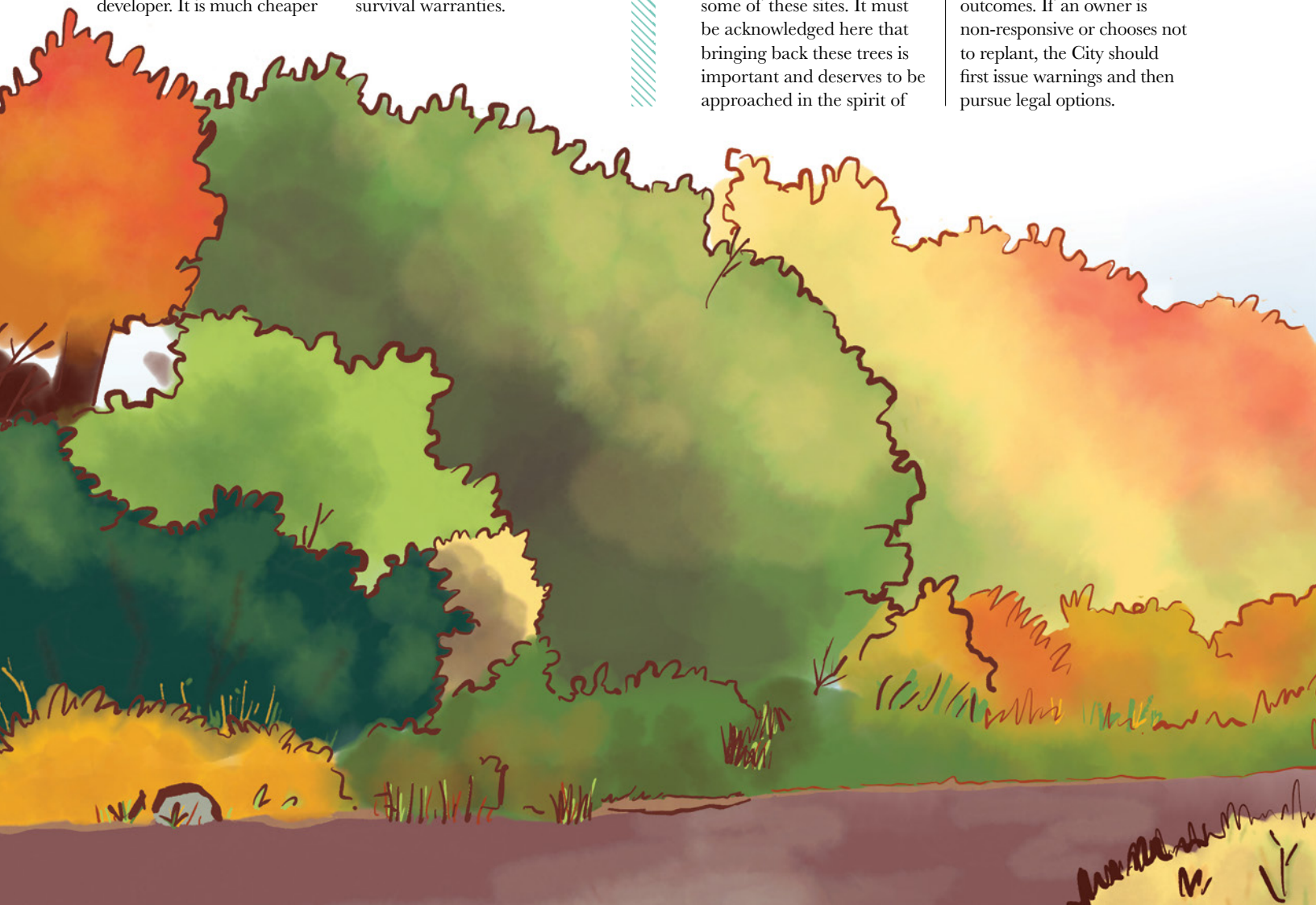
This plan asks that the City require developers to purchase and plant only trees that come with two-year survival warranties.

Post-Derecho Site Plan Compliance

The derecho added another twist to the issue of tree requirements: a number of recently-built developments lost trees in the storm. These properties are now "out of compliance" with their approved site plans. Sympathy for peoples' struggle for recovery, coupled with overburdened City staff, has led to a delay in replanting on some of these sites. It must be acknowledged here that bringing back these trees is important and deserves to be approached in the spirit of collaboration with a friendly but firm hand.

Policy Recommendation

In acting upon this plan, one of the defined tasks of City staff should be to create a standardized process of identifying non-compliant properties, reaching out to property owners, requesting replanting, and inspecting outcomes. If an owner is non-responsive or chooses not to replant, the City should first issue warnings and then pursue legal options.



Communications Wires

Periodically, the electric utility invests in burying a power line, and these investments should trigger a plan to plant large trees. However, at this time, a new challenge rears its head: communications wires. When an electric wire is expensively buried, the communications wires should also go underground. Unfortunately, State law currently prohibits municipalities from requiring this to happen. As Cedar Rapids lobbies the state house, gaining greater jurisdiction over utilities in the right of way will be an important measure to pursue.

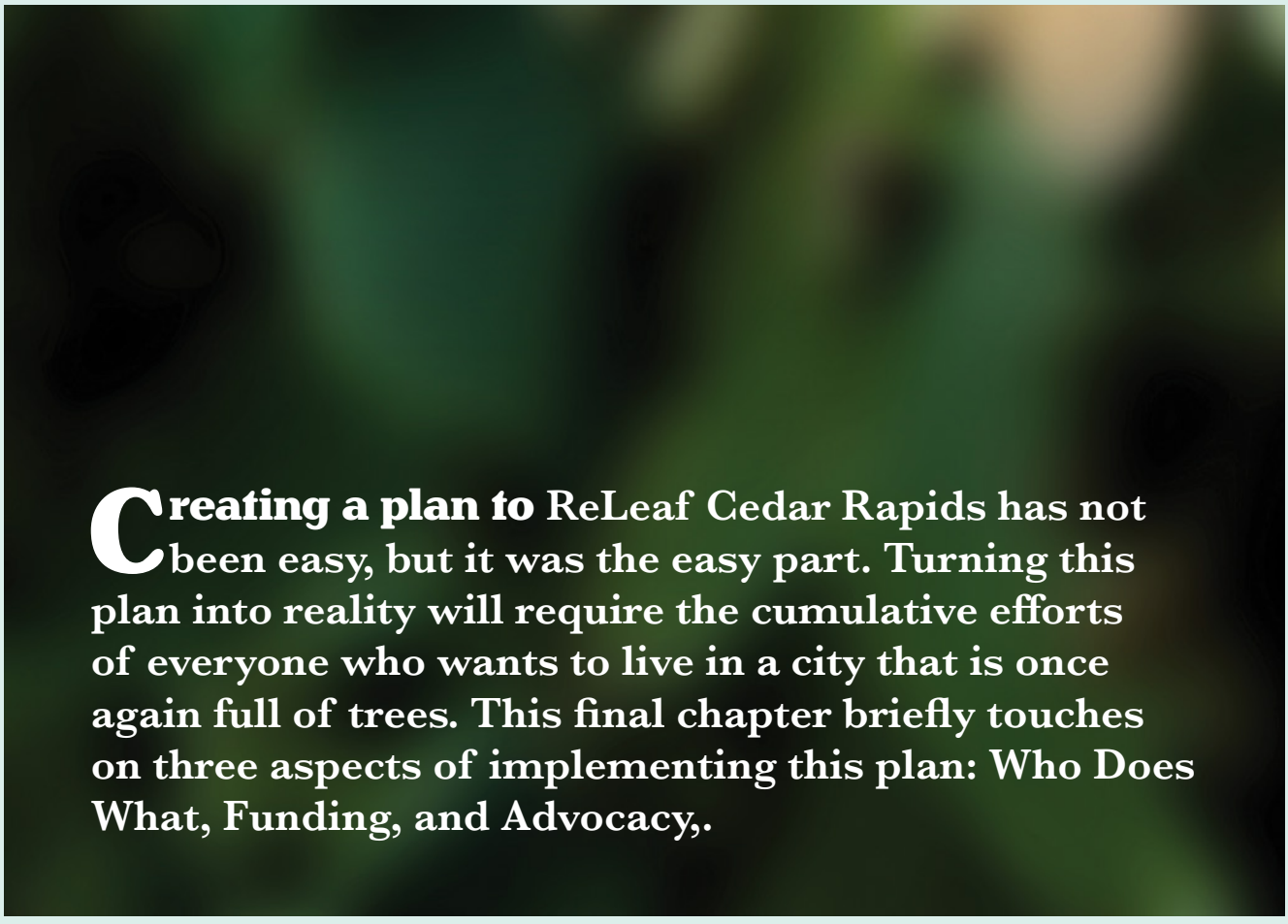
Policy Recommendation

When such power is granted, the City should then create an ordinance requiring that, when electrical wires are placed underground, communications wires must be buried as well.

ReLeaf CEDAR RAPIDS

Implementation: From Words to Action

12



Creating a plan to ReLeaf Cedar Rapids has not been easy, but it was the easy part. Turning this plan into reality will require the cumulative efforts of everyone who wants to live in a city that is once again full of trees. This final chapter briefly touches on three aspects of implementing this plan: Who Does What, Funding, and Advocacy,.

Who Does What?

We all have a role to play. What you can do depends on who you are. The main players in bringing back our canopy are listed below, each with a mention of their current role and how they can implement this plan.

City Council

In Cedar Rapids, the City Council is empowered to allocate funds, to create and change laws, and to establish policies. This plan asks a lot of City Council. It asks Council to officially adopt the plan, which enables the plan to then direct staff activity around its measures. It asks Council to fund the plan, establishing the City's financial commitment to purchase plant material, put it in the ground, and help it grow. It asks Council to initiate an effort to change laws discussed in Chapter 11 regarding street tree planting, parking lot design, tree removal, and street specifications. It asks Council to change policies around developer-planted trees, site plan compliance, and the burial of communications wires, discussed in Chapter 9.

City Staff

What City Council supports, City staff implements. The following departments deal directly in some way with the City's tree canopy and have a significant role turning ReLeaf into reality:

- Community Development, which includes Planning, oversees the Zoning Code, and would preside over the zoning changes discussed in Chapter 9.

- Development Services is the City's interface with the real estate development community, the private-sector land developers and other builders who grow the city. It implements the Zoning Code and reviews the plans put forward by builders. It is also the department that would reach out to property owners to ensure that they have brought derecho-damaged landscapes back into compliance with their permitted plans.

- Forestry is not a City department, but rather a division of Parks & Recreation that focuses just on trees. . . and not just trees in parks, but also on streets. Forestry maintains the City's tree list—to be replaced by the ReLeaf Tree List in this plan—and employs the experts who oversee the City's tree planting and tree-care efforts. Although it often makes use of private contractors, Forestry oversees the ongoing creation and maintenance of the Cedar Rapids canopy, including maintaining the database that will include every street and park tree. It is also the main interface between the public and public trees. If you have any questions or concerns about a particular street tree or park tree in your neighborhood, they are the place to start, and can be found online at: cedar-rapids.org/residents/parks_and_recreation/forestry.php

- Parks and Recreation, in addition to housing Forestry, manages more than 4000 acres of City land, including large areas of undeveloped reserve land as well as 97 formally named parks, golf courses, sports facilities, historic properties, greenhouses, trails, and other properties, while offering more than 1,500 recreation programs each year. Just as it has been instrumental in the creation of this plan, Parks & Recreation is the City department that is charged with implementing the ongoing ReLeaf effort and pushing it forward.

- Public Works is the City department that builds and maintains all of Cedar Rapids' infrastructure, including its streets, bridges, and stormwater systems.

It includes the engineering departments focused on traffic, construction, and utilities. Public Works' specific role in this plan is to review and help implement the recommended changes to street standards around tree placement, including both more tree-sustaining planting beds in urban sidewalks and more frequent tree spacing throughout the city.

Trees Forever

Founded in 1989, Trees Forever is a nonprofit with a central focus across Iowa and Illinois and a strong national presence. Since its inception, Trees Forever has partnered with the City of Cedar Rapids and built a reputation for collaboration across all sectors. For these reasons, Trees Forever was asked to lead the creation of this plan.

Most communities do not have a local organization focused intently on maintaining and growing a robust urban canopy, but Cedar Rapids does, and Trees Forever has stepped up to the challenge and will play a significant role in the replanting and care of our trees, both public and private. For the next decade at least, the ReLeaf effort will be at the heart of the organization's local work.

Trees Forever has also agreed to lead fundraising efforts for ReLeaf Cedar Rapids in partnership with city leaders. Donations of any size will help plant trees for today and future generations, and Trees Forever has promised to manage the recognition of donors for the replanting of public spaces. For more on supporting the ReLeaf effort, go to: treesforever.org/releaf.

Through its Growing Futures and TreeKeepers programs, Trees Forever will plant and water a large portion of the city's trees, as it already does today. It will continue to organize tree adoptions and education programs, as it serves as the main interface between the City of Cedar Rapids and all the private organizations and individuals that want to lend a hand in the ReLeaf effort. Want to get involved with ReLeaf? Your first stop is treesforever.org.

As it drives the entire ReLeaf effort forward, Trees Forever's additional tasks are enumerated on the final pages of the Yard Tree Plan (page 57), the Institutional Tree Plan (page 64), and the Street Tree Plan (page 81).

Growing Futures

Growing Futures is a teen-focused employment program that also happens to plant, stake, mulch, water, and give the first pruning to a vast segment of the city's street trees. A program of Trees Forever, its goal is to build a generation of young people who are committed to the natural environment and their community. Students who participate in the program are able to develop job skills and build their resumes as they learn about urban forestry, green careers, first aid training, and even conflict resolution. Although it is a non-profit program, Trees Forever pays Growing Futures team members as it serves as the City's principal street tree contractor. The ReLeaf effort represents an opportunity to grow this program, potentially offering healthy, productive jobs to every teenager with an interest in making their city more beautiful.

TreeKeepers and Volunteers

More than two hundred residents of Cedar Rapids have been trained by Trees Forever and its partners to be official TreeKeepers, adept at planting and caring for trees around the city. TreeKeepers are volunteers who lead corporate planting events and also lend a hand when a local resident or organization needs help planting a yard tree. Growing this program will be an important part of the ReLeaf effort.

To become a TreeKeeper, or to ask one for help, just log on to: treesforever.org/treekeepers.

ReLeaf Partners

As this plan moves into implementation, the collaboration created between the City and Trees Forever will be referred to collectively as ReLeaf Partners.

Private Nurseries and Other Tree Sellers

Private nurseries, landscape companies, garden centers, and other suppliers of plant material have a huge role to play in the ReLeaf effort. As discussed in Chapter 7, they are under no obligation to source their trees from the ReLeaf Tree List, but they will be celebrated with official ReLeaf Certification for doing so. Whatever their status, tree sellers can also participate in two other recommended programs:

- The sale of ReLeaf Approved trees and native ground covers; and
- The distribution of seedling 6-packs, to be handed out for free to willing tree purchasers.

Nurseries that grow trees from seed will also be central to this effort and can begin now to germinate large quantities of seedlings from the "Superior" section of the ReLeaf Tree List, with confidence that demand for them will be strong.

Nonprofits, Service Clubs, and Neighborhood Groups

Local organizations, both formal and informal, are encouraged to join the ReLeaf effort, either by leading projects, hosting educational sessions, lending a hand with volunteer efforts, or helping with fundraising. There are already many nonprofits actively involved in planting efforts, natural area restoration, and education that can help ReLeaf. These include but are not limited to Indian Creek Nature Center, Monarch Research Project, Iowa Natural Heritage Foundation, and the Iowa Departement of Natural Resources (DNR). Organizations like garden clubs, scouts, and service-clubs from Rotary to Lions, are stepping up to help with ongoing reforestation projects or to create their own.

Youngsters replanting our legacy of trees after the derecho, Fall of 2021.

Photograph by Trees Forever

Private Developers

The community of developers in the Cedar Rapids area can participate in ReLeaf in a number of ways. The first would be to unilaterally choose to plant more trees in their projects, in order to make those projects more successful and valuable. Those who plan to build and hold their properties will find their costs recouped powerfully over time, due to the impact of trees on real estate value. Those that build to sell would likely not recover their full investment but could use the commitment to ReLeaf as a marketing strategy to perhaps sell their properties more quickly. This plan does not consider identifying developments, like tree nurseries, as "ReLeaf Certified," but such an approach would merit consideration if proposed by developers.

Second, the main way that developers can help the ReLeaf effort would be, quite simply, to not fight the denser tree-planting Zoning Code changes that this plan asks City Council to enact. It must be acknowledged that these changes represent an additional cost to builders, one that will ultimately translate into a slightly higher short-term cost to their renters and buyers, albeit with long-term benefits. To that observation, it's worth responding that requiring any trees at all creates an additional cost to builders. At a certain point, the City decided that having trees was important. This plan asserts that having the right number of trees is important, that the current standard does not achieve that outcome, and that a higher standard is needed for the good of the community into the future. It is hoped that developers will not stand in the way of this essential evolution.

Corporations and Institutions with Land

As discussed in the Institutional Tree Plan, all local organizations can participate in the ReLeaf effort in a number of ways, listed below. But those with property, particularly green property, can lead by example, planting both saplings and seedlings in potentially large numbers. Those with large properties are asked to form a partnership with Trees Forever, and many already have. Institutions that are land-rich but cash poor, that need help funding replanting, should continue to communicate that need to Trees Forever, who will work to locate possible sponsors.

Among the largest institutions with land in Cedar Rapids are its school districts. Given the powerful data surrounding tree cover and student performance, it is hoped that they will prioritize the planting of trees surrounding all school buildings. It is also hoped that, as with certain parks, private sponsors will want to contribute funds towards making schoolyard canopies even more robust.

All Corporations

Independent of whether a company has land, it can contribute to the ReLeaf process with money, volunteers, or both. Trees Forever and its TreeKeepers stand ready to help corporations organize planting days to build both the tree canopy and company morale.

Homeowners

If your yard has room for a tree or several, and this plan has inspired you to do your part, start to fill it with trees. Consider planting a tree each year until it's full. Plant deciduous shade trees to the south and west, evergreens to the north. Be sure to look for trees from the ReLeaf Tree List. Think about planting native understory plants and groundcovers (not grass) to provide soft landings for the caterpillars that will keep your trees full of birds. Consider if a grove of seedlings might fit. Encourage your neighbors to do the same. If you live on a street without trees, petition your neighbors to join the Neighborwoods program (pages 72-74). Create your own piece of the Homegrown National Park. For help, give Trees Forever a call.

All Residents

Anyone can support the ReLeaf effort at: treesforever.org/releaf. But you can do more. Becoming a TreeKeeper is fun and easy. For teenagers, Growing Futures is accepting applications right now.

If you like it, share this plan with your friends and neighbors, either online or hard copy. Extra copies can be ordered at forestry@cedar-rapids.org, or by calling 319-286-5566.

Funding

ReLeaf Cedar Rapids is an ambitious and aggressive 10-year plan that requires significant human and financial resources to implement fully. The average annual cost per year to implement the ReLeaf Cedar Rapids plan is $3.7 million, for a total of $37 million.

The City of Cedar Rapids has committed $1 million dollars per year for the next 10 years to the effort. The remaining $27 million will be raised through additional public and private sources. Trees Forever, in partnership with the City, is working to raise private funds through a campaign steering committee led by co-chairs John and Dyan Smith and Mary Quass.

We are grateful to the numerous corporate and individual donors who rushed to offer financial assistance after the storm. Their investments allowed us to lay the groundwork for this historic recovery plan that will benefit countless residents and visitors for generations to come.

You are invited to make a personal or corporate contribution to ReLeaf Cedar Rapids. For more information, visit treesforever.org/reLeaf.

ReLeaf Cedar Rapids Project Budget 2022-2032*

Community Planting, Outreach & Education..... $7 million

- Trees and Planting Support
- Education & Volunteer Coordination
- Program Administration

Public Trees..... $30 million

- Street Trees
- Park Trees
- Program Administration

Total Project Cost Over 10 Years..... $37 million

*Detailed budget may be found in the Appendix

Carbon Credits: A Funding Stream

Due to concerns about climate change, it is likely that a wide variety of programs intended to fight global warming will be making grants for tree planting, including from the Federal Government. ReLeaf Partners will pursue these opportunities as they are made public. One innovative program, carbon credits, is already supporting Trees Forever's work in Iowa.

Corporations are encouraged and often rewarded for purchasing "carbon offsets" as a means to mitigate their carbon emissions elsewhere. In late 2021, Trees Forever sold its first bundle of these credits. By certifying 1,800 trees, they were able to generate a cash flow of more than $120,000 over the next decade.

In Trees Forever's initial transaction, each tree generated about $75 in carbon credits. Trees with larger canopies earn more credits—another reason to plant big species.

Working together, the City of Cedar Rapids and Trees Forever will map the location and monitor the health of every tree planted on streets and in City parks through this plan and could sell the resulting offsets. The earnings could then be rolled back into executing the plan, lessening the burden on local government and benefactors. This effort could potentially reduce the cost of this effort by 20 percent or more.

Advocacy

The success of the ReLeaf effort will depend on keeping it in the forefront of people's awareness. With each passing day, the derecho becomes a more distant memory. Even worse, the City's denuded parks and streetscapes, so diminished from what they once were, seem more and more normal. We get used to them and lose the motivation for change. A concerted and ongoing campaign of advocacy and education is needed to keep our eye on the ball. Such a campaign should include, at a minimum, the following initiatives. All should be budgeted as a part of this plan.

ReLeaf Plan Magazine

This plan itself was created to be a mass-produced and easy-to-read magazine distributed far and wide. With an initial print run of 1,500 copies, and future printings as supplies run low, this magazine should be provided free of charge to anybody who requests one.

Dedicated Website

Linked to the Trees Forever homepage but accessible on its own, a ReLeaf Cedar Rapids website should be maintained as a central communications portal and access point around which all ReLeaf information, news, events, programs, resources, and fundraising should be organized. It should prominently display this plan, not only as a single pdf, but as a searchable and nested series of webpages. Most people who access this plan will use this channel, so it should be as attractive and easy to use as possible.

Arbor Day and Earth Day events

April 29, 2022 will be our nation's 150th Arbor Day. One million trees were planted across the U.S. in the first coast-to-coast Arbor Day celebration, mostly by schoolchildren. Sadly, the holiday no longer commands the national attention it once did. But, in Cedar Rapids, it remains an important day and can become more so. As part of the ReLeaf effort, Trees Forever should reach out to every elementary, middle, and high school in the city to spur interest and participation around an annual Arbor Day tree-planting event. At a reasonable cost, each class of students at each school could plant one schoolyard sapling each year, instructed by TreeKeeper volunteers or Growing Futures interns. If manpower is a limitation, this effort could be spread across a full week, beginning with Earth Day on April 22nd. As was understood 150 years ago, there is likely no other activity more impactful to the future of a nation's canopy than children putting trees into the soil.

Elementary and Middle School Curriculum

Planting a tree with a TreeKeeper is a great start, but there is so much more that trees can teach our school-age children. The derecho story offers a convenient and compelling window through which schools can frame a variety of subjects including meteorology, climate change, ecology, and, of course, forestry. Trees Forever should reach out to local educators with the goal of creating one or several class segments for different ages around the derecho and the ReLeaf process. Particularly the early chapters of this plan offer ample teachable material. This effort should be spearheaded by educators who understand the mechanics of creating classroom materials, but Trees Forever should initiate it with a solicitation of interest.

Our Woodland Legacy Symposium Updates and Awards

Trees Forever's Our Woodland Legacy Symposium is an important annual event that brings together a large segment of Cedar Rapids' citizens and leaders around their shared stewardship of the natural and built environment. For each year of this plan's implementation, the schedule should include a comprehensive and honest report on performance towards plan goals and milestones. Additionally, the symposium is an ideal venue for celebrating ReLeaf heroes with awards for their efforts. For example, one avid supporter, one Growing Futures employee, and one TreeKeeper could be honored for exemplary service. Perhaps one park could be honored for an exceptional replanting. Like the Oscars or Emmys, the "Leafys" could address a variety of categories and add a little buzz to the often unheralded work of derecho recovery.

Commemorating the Derecho

The derecho was an historic and record-breaking event. Never has a windstorm so powerfully impacted the city, and not since the 2008 flood has Cedar Rapids had to bounce back from such a traumatic event.

A memorial is an opportunity to commemorate both the storm and the tremendous outpouring of volunteerism and generosity that followed.

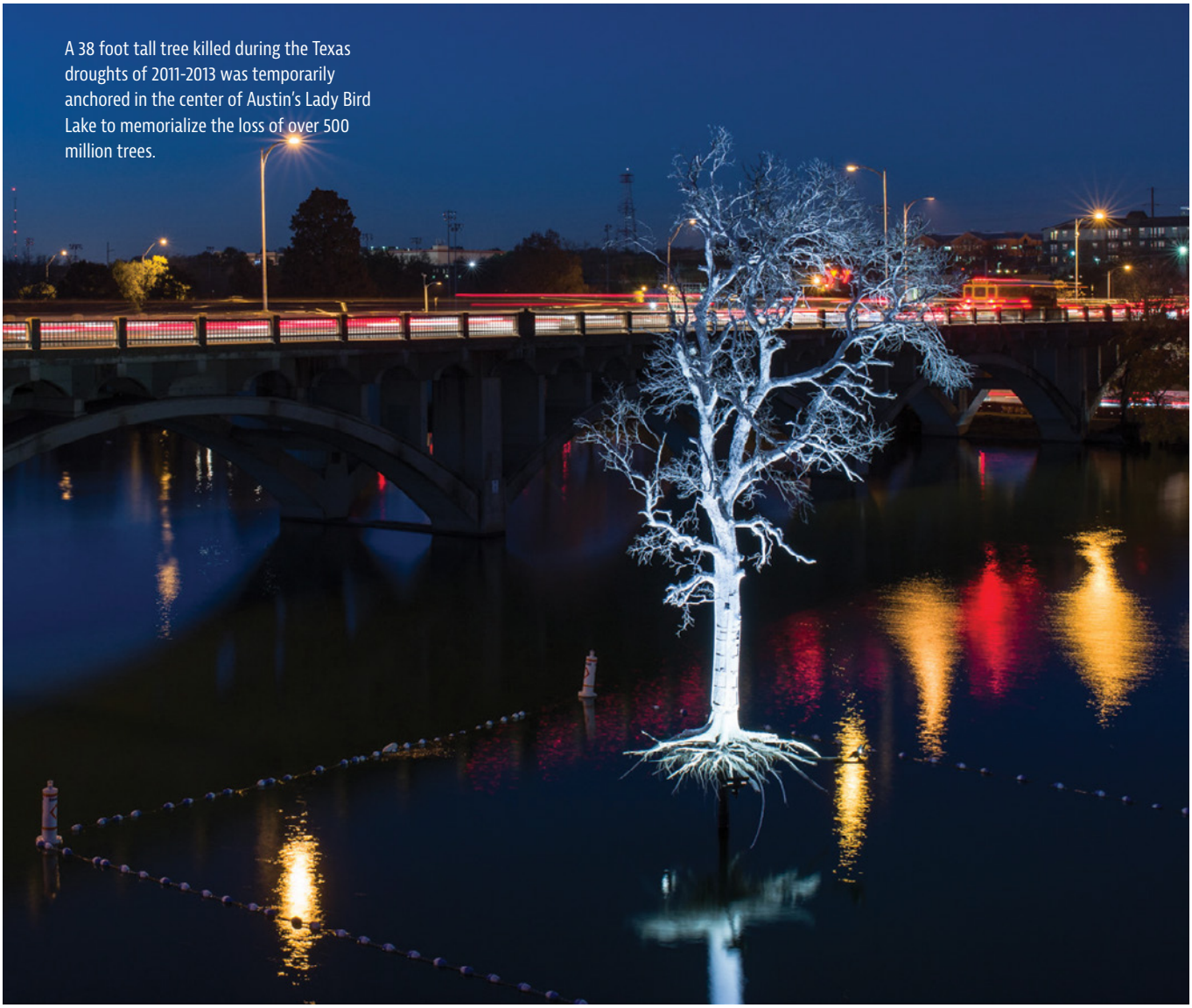
Powerful monuments come about in many ways, including juried competitions or commissioning a known artist. These methods and others could be explored as plans begin to materialize. No matter its origins, artwork must be durable and resilient—like Cedar Rapids itself—embodying the spirit of the city, celebrating its residents, and reflecting the unique beauty of a landscape in rebirth and recovery.

Recognition of Donors: A Legacy of Trees

Private generosity is key to the success of ReLeaf. The legacy and spirit of philanthropy are well known in this community, and what could be more important than growing a legacy of trees for future generations? As has happened on many an occasion, private individuals, families, and corporations have stepped forward to help, whatever the cause. This spirit of giving has created and will continue to ensure a high quality of life in Cedar Rapids.

Such gifts of time, talent, and treasure are bestowed sincerely, unmotivated by recognition. Even so, the Campaign Steering Committee has plans to standardize an attractive marker that celebrates major contributors in the places they make beautiful.

Donors to ReLeaf Cedar Rapids will be recognized in a number of ways throughout this campaign. This includes a list of contributors to be published at intervals of the fundraising effort and at the campaign's conclusion. Contributors of lead gifts will, at their discretion, be recognized with site-specific markers in key reforested locations such as parks. These opportunities will be offered on a first-come, first-selected basis to encourage early support.



A 38 foot tall tree killed during the Texas droughts of 2011-2013 was temporarily anchored in the center of Austin's Lady Bird Lake to memorialize the loss of over 500 million trees.

Photograph by Donald Mason

Students at Cedar River Academy plant a tree with Mayor Brad Hart to commemorate Arbor Day. The planting was delayed from the original April date due to the Covid pandemic.

Photograph by Trees Forever

It's Time to Plant the Future

Cedar Rapids cares about its trees; that much was made obvious by the many citizens and stakeholders who provided guidance and feedback to this plan. ReLeaf Cedar Rapids was shaped by the stories people shared: stories of sadness for trees lost, gratitude for trees still standing, and a commitment to replant. This plan will guide tree planting and care for a full decade into the future. While the price tag may seem steep, it is a fraction of the value it will create, a prudent investment in rebuilding the living green infrastructure on which we all depend.

The City of Cedar Rapids and Trees Forever will work together with community leaders and citizens to raise private dollars to match and exceed the $10 million committed by the City. To ensure proper stewardship of funds going forward, ReLeaf Partners will collaborate closely with its oversight committee, planning annual budgets together.

This community has worked hard to recover from disaster after disaster. The derecho forced us all to come to terms with how much we love and need our trees. We can and will replant, and now we have a comprehensive blueprint to follow. Generations from now, Cedar Rapidians will perhaps not remember this plan. But the beauty, healthfulness, and resilience of their city will be the outcome of this generation's commitment to acting on its vision.

Notes to Plan Text

1. .....Jonnes, Jill. Urban Forests: A Natural History of Trees in the American Cityscape. New York, NY, Penguin Publishing Group, 2016. XV.

2. .....The Gazette. Derecho 8/10/20. Cedar Rapids, IA, The Gazette, 2020. 7.

3.....Ibid.

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“The tears have been shed; the landscape reshaped... but the hole in our hearts has not been filled. Now is the time to draw the community together to replace our tree canopy and build new dreams...for us all.”

-Mary Quass, ReLeaf Cedar Rapids Campaign Co-Chair

ReLeaf Cedar Rapids is a collaboration between
Trees Forever and the City of Cedar Rapids to replant
the trees lost to the August 2020 derecho.

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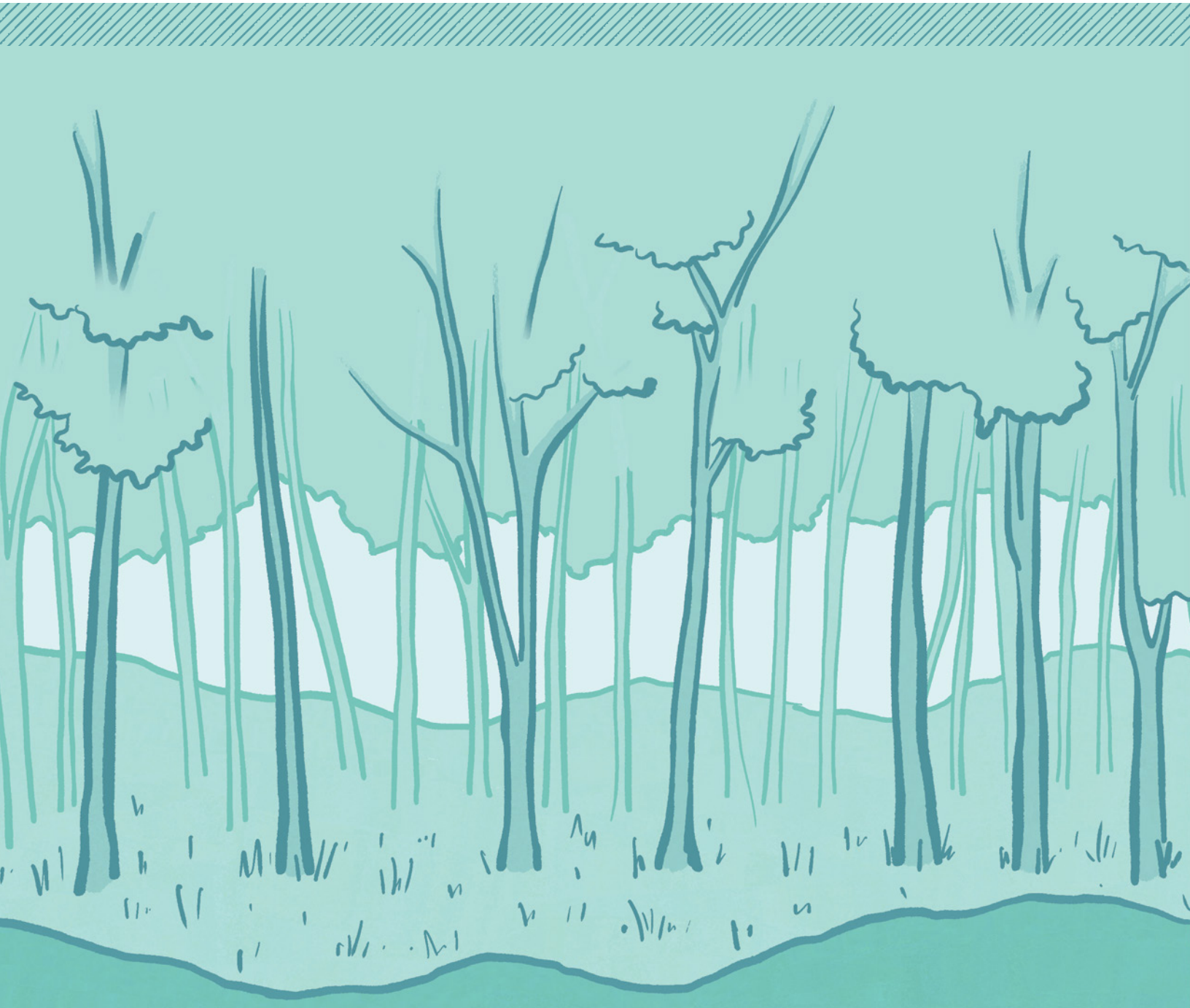

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