Cambridge Urban Forest Master Plan

Task Force Meeting #10

March 28, 2019

REED HILDERBRAND

OUTREACH

FOREST RESILIENCY

CANOPY VALUATION

NEXT STEPS

Share responsibility for a healthy forest

How do we communicate the value of trees?

Cambridge Public Schools Curriculum

Kindergarten:

Exploring woodland and freshwater habitats through class-maintained terraria and aquaria.

Grade 1:

Animals and plants of the same kind share similar characteristics with others of the same kind but they are not exactly the same.

Grade 2: Plants and animals depend on other living things and their environment to grow, thrive, and survive.

Grade 3: Students plant and observe the growth of Wisconsin Fast Plants from seed to flower to seed. They also learn about bees and pollination.

WISCONSIN FAST PLANT SEED PACKET

Source: https://www.cpsd.us/departments/science/

Mass Audubon, STEM Preschool Teaching Unit

TREE-MENDOUS TREES
STEM Preschool Teaching Unit

Ages 2.9-5 years
www.massaudubon.org/education

Trees are found just about everywhere, so they are familiar to young children. Trees are kid friendly to explore, interesting to learn about, and easy to appreciate. This unit offers seven different investigations about trees.

1. Introduction to trees
2. What are the parts of a tree?
3. How are trees classified?
4. How does a tree grow? How does a tree make pinecones or acorns?
5. Why do leaves change color in the fall?
6. Who lives in trees?
7. How do trees help us?

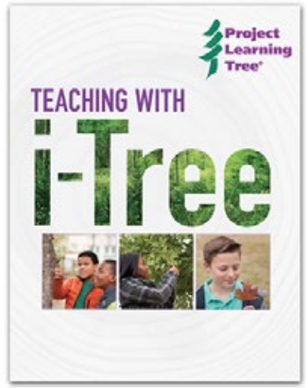
Source: https://www.massaudubon.org/content/download/13467/209564/file/PreKTeachingUnits-TREES.pdf

OUTREACH / EDUCATION

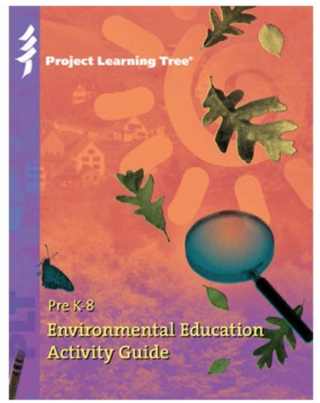
Utilize ready-made lesson content

Project Learning Tree (educational non-profit organization)

Project Learning Tree (PLT) is an award-winning environmental education program that provides ready-made lessons and activities for educators. PLT uses the forest as a "window to the world," helping young people gain an awareness and knowledge of the world around them and their place within it.[1]



TEACHING WITH I-TREE



PRE K-8 GUIDE

PLT's instructional materials for early childhood through grade 12 can be used with students in formal school settings and with youth in nonformal settings.[2]

K- GRADE 2 E-UNIT
TREMENDOUS SCIENCE

GRADES 3-5 E-UNIT
ENERGY IN ECOSYSTEMS

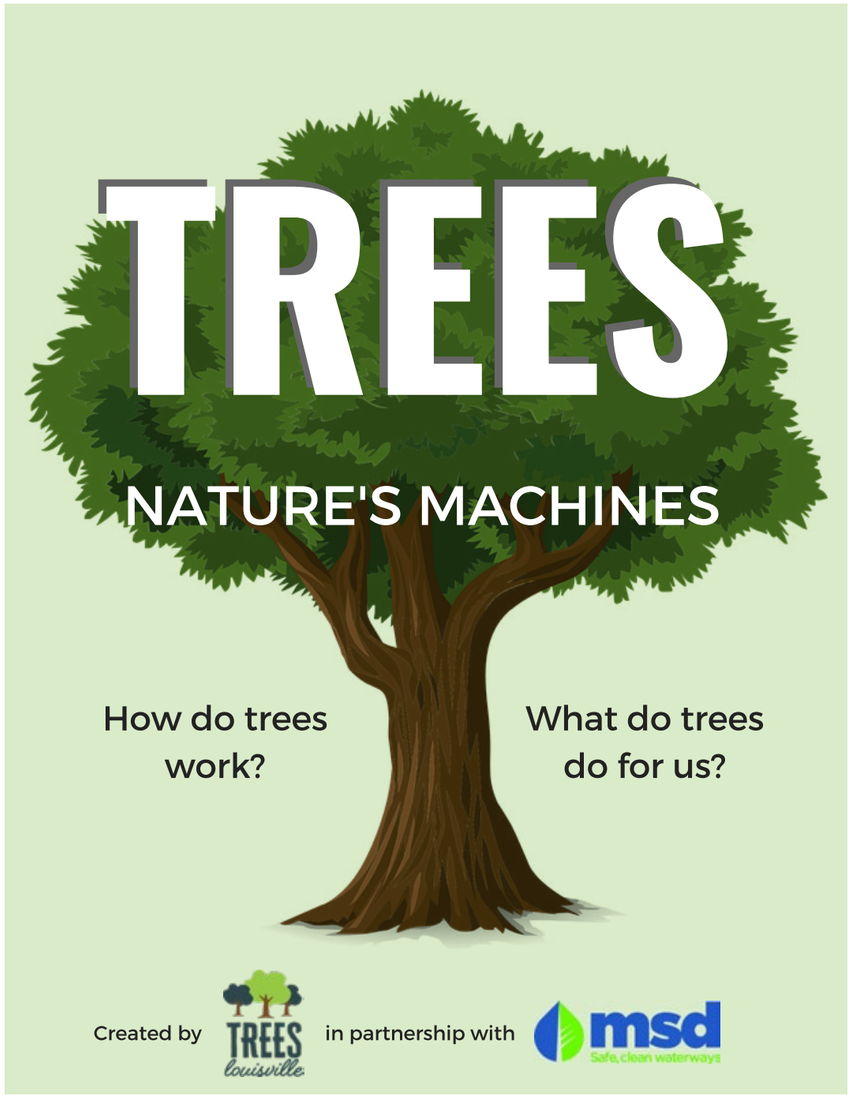
GRADES 6-8 E-UNIT
CARBON & CLIMATE

Sources: 1. Indiana Dept. of Natural Resources https://www.in.gov/dnr/forestry/5750.htm
2. Project Learning Tree https://www.plt.org/curriculum-offerings/elementary-middle/

Example of science curriculum unit on ecosystem services

Trees Louisville

Trees Louisville's science curriculum unit shows students how to calculate the ecosystem benefits of specific trees on campus or at home.



Steps to identifying tree benefits

1. Using your tree identification guide, determine the species of your tree.

2. Using your measuring tape, measure in inches the diameter of the tree at a point about 4 feet from ground level.

3. Calculate an estimate of the ecosystem benefits that this tree provides using the National Tree Benefit Calculator.

4. Share a write-up about the tree you measured, why you chose it and what its benefits mean to you.

5. Monitor the tree over the course of the year to observe any changes.

* Bonus! - Learn more about your tree using other online resources.

2

Source: https://treeslouisville.org/wp-content/uploads/2019/03/Trees_-Natures-Machines-01_19.pdf

OUTREACH / EDUCATION

Support citizen science projects

Air quality monitoring

COLORADO STATE UNIVERSITY

Source: https://www.nasa.gov/feature/new-citizen-science-projects-funded-for-earth-studies

AIR SENSOR TOOLBOX BY EPA

Source: https://www.citizenscience.gov/catalog/489/#

OUTREACH / EDUCATION

Organize tree tours for citizens to engage with trees

Tree Tours

Friends of the Urban Forest arranges walking and bicycling tours of the beautiful trees, parks, and natural spaces of

San Francisco.

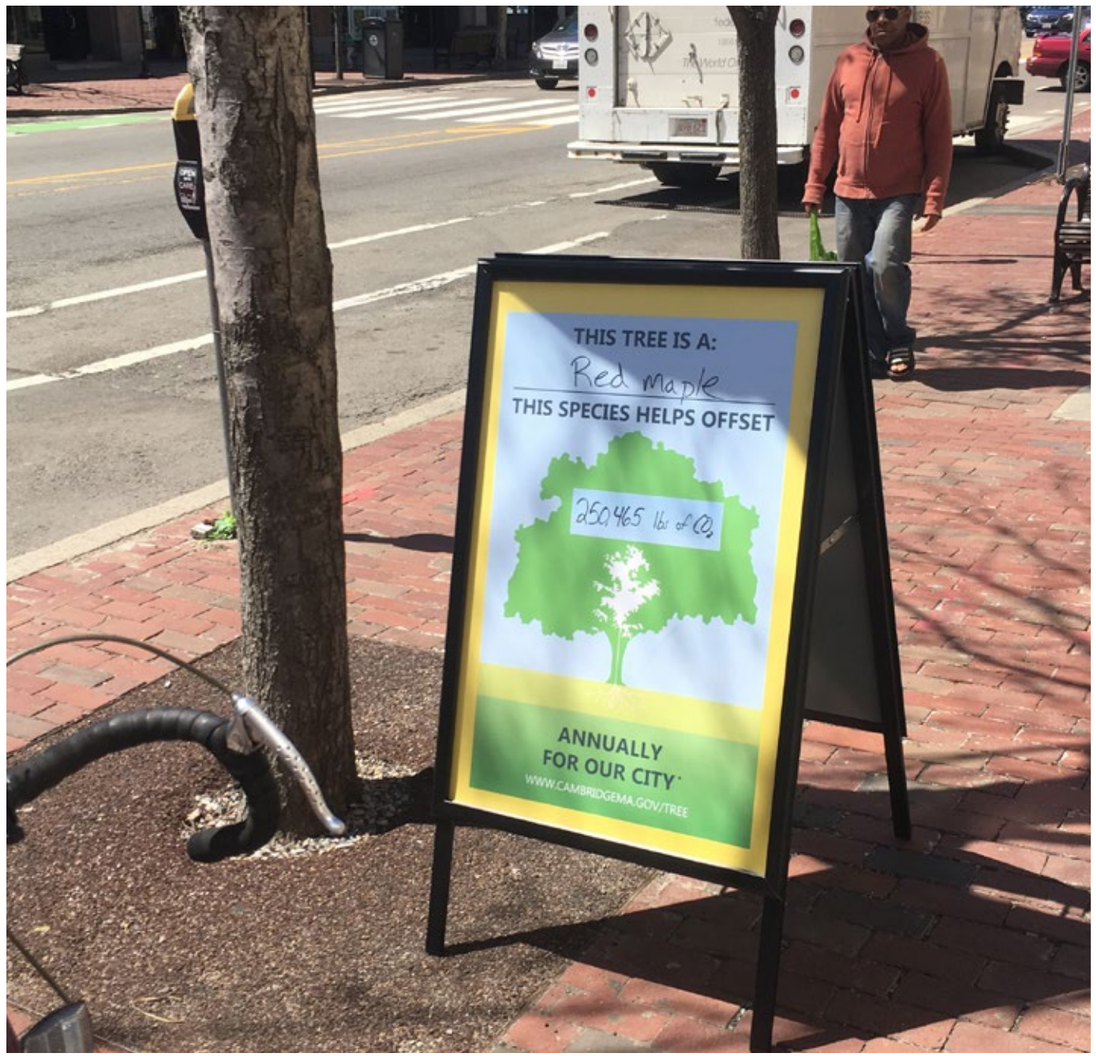
FRIENDS OF THE URBAN FOREST, SAN FRANCISCO

Source: https://www.fuf.net/programs-services/community-engagement-education/tree-tours/

OUTREACH / EDUCATION

Continue to publicize ecosystem benefits

Public Installations



CAMBRIDGE, MA

CHICAGO

Source: https://earthshare.typepad.com/.a/6a00e554936bef883401901e82100f970b-pi

Public Installations

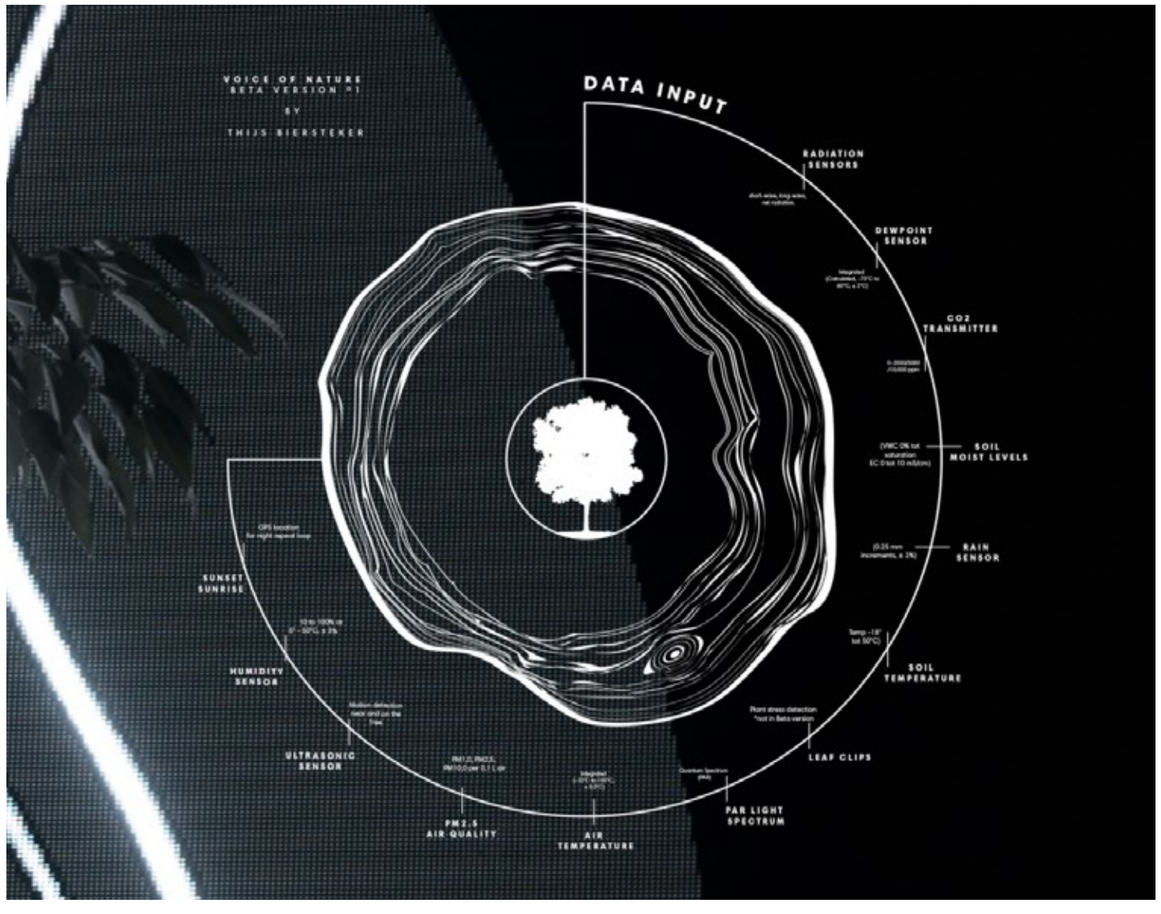
David Buckley Borden (design)
John Cronan (hand-painting)

"Shade Collection Box" for Teton Science Schools
A modest reminder of the ecological value of canopy trees. Simply made with a recycled box and paintbrush of your choice. Informational pamphlet on canopy trees' ecological services available inside box. Cash collections donated to Teton Science Schools' Field Education programs.

Public Installations

Voice of Nature by Thijs Biersteker

Sensors connected to a tree in Chengdu, China monitor environmental conditions such as CO2 level, temperature, moisture in the soil, and light level. This data then generates digital rings every second and document the tree's health in real time.

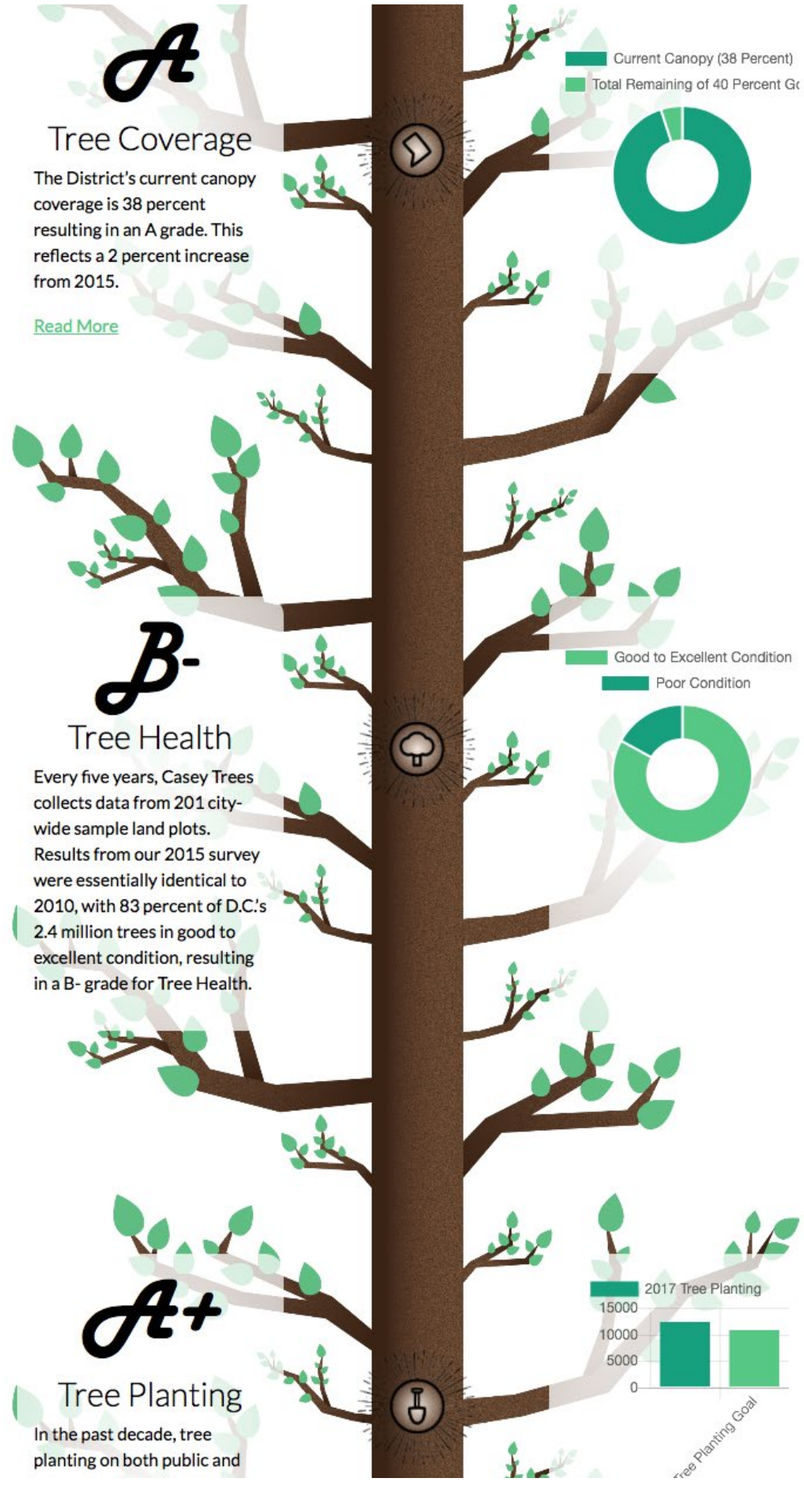


Source: https://motherboard.vice.com/en_us/article/59v4zd/this-tree-is-an-artwork-thijs-biersteker

OUTREACH / EDUCATION

Publish annual reports to give feedback on progress

Tree Report Card, Washington D.C.



Source: https://caseytreesdc.github.io/treereportcard/

OUTREACH / EDUCATION

Publish annual reports to give feedback on progress

Cambridge MA Annual Drinking Water Quality Report

How Is Your Water Purified?

The source waters of the Cambridge reservoir system undergo extensive treatment at the *Walter J. Sullivan Water Purification Facility* at Fresh Pond Reservation before drinking water is delivered to your home or business. The water is treated to exceed all state and federal drinking water standards.

(1) Pretreatment: The first steps in the treatment process combine preoxidation with ozone, coagulation and dissolved air flotation (DAF) to remove manganese, natural color, sediment and particles, algae, protozoa, viruses and bacteria.

(2) Ozone: Fine bubbles of ozone are dissolved into the water to kill bacteria, viruses, and protozoa.

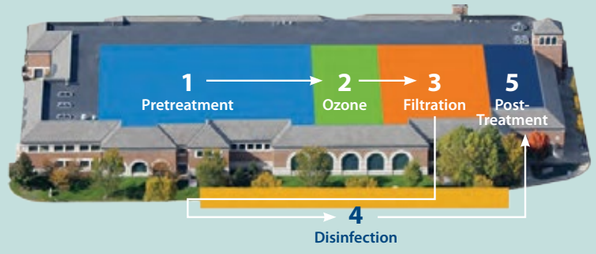
(3) Filtration: The water passes through granular activated carbon (GAC) to remove organic compounds. Filtration also acts as a "polishing step" to remove additional particles, color and protozoa.

(4) Disinfection: Chlorine is used to provide the second step of disinfection for redundancy in the overall process and monochloramine is added to maintain a disinfectant residual throughout the distribution system.

(5) Post Treatment: The pH of the water is adjusted for corrosion control and fluoride is added for dental health.

The Cambridge Water Department's state-certified laboratory continuously monitors the effectiveness of the treatment process and makes adjustments to the treatment to ensure the highest quality water.

Come see it for yourself! Timothy MacDonald, Director of Water Operations, leads tours of the City's beautiful treatment facility. Tours are scheduled for July 9, August 13, September 17, October 15, and November 5, and run from 6 p.m. to 7:30 p.m.



Did You Know?

- The City of Cambridge owns ~1,400 acres of watershed land outside the City limits
- Three of our watershed parcels are home to 11 different natural plant communities and over 160 individual native plant species
- The City has acquired 127 acres of land for water supply protection since 2012

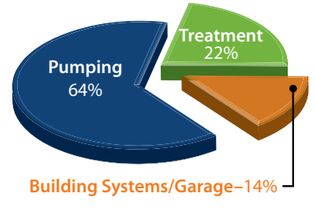
Go Green with Your Machine

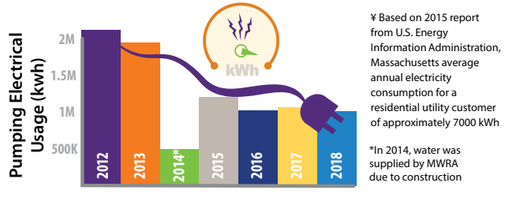
There are many ways you can save water while still getting clean clothes! Combine laundry to run only full loads, and check out the settings on your machine to select the right water levels and load selection. Also, by switching to an EPA WaterSense washing machine, you can save an average of 82 gallons per day, which adds up to around 30,000 gallons per year, enough to fill a Red Line train car! To learn more about EPA WaterSense, go to www.epa.gov/watersense

How Much Energy Does it Take?

- The Water Purification Facility (WPF) has the largest electrical usage for a single municipal facility in the City of Cambridge
- The WPF uses an average of 8 million kilowatt hours (kWh) of electricity per year, or enough to power over 1,000 homes¥
- At one time, pumping accounted for over 60% of the total energy use at the WPF. We have reduced that by over 50% since 2012!

We took a look in 2012 at how we use energy at the Water Purification Facility… and got right to work on reducing the "Biggest User", pumping!





¥ Based on 2015 report from U.S. Energy Information Administration, Massachusetts average annual electricity consumption for a residential utility customer of approximately 7000 kWh

*In 2014, water was supplied by MWRA due to construction

Where Does Your Water Come From?

Reservoirs

The Cambridge Water System extends across four towns and includes four bodies of water. The Hobbs Brook Upper Reservoir flows into the Hobbs Brook Lower Reservoir and connects with the Stony Brook Reservoir. The water then flows to the Fresh Pond Reservoir through an underground aqueduct. The Stony Brook Reservoir watershed extends from Weston north into the Town of Lincoln. The watershed for the Hobbs Brook Reservoirs includes areas of Waltham, Lexington, and Lincoln. The watershed for the Fresh Pond Reservoir is completely within the City of Cambridge. Storm drainage modifications were implemented to divert street runoff away from Fresh Pond Reservoir. The contributing watershed area is the first step in a multi-barrier program to protect our drinking water. The combined capacity of the Hobbs Brook and Stony Brook reservoir system is 3.1 billion gallons; an additional 1.3 billion gallons of water is stored in Fresh Pond Reservoir. Our water supply is backed up by interconnections to the Massachusetts Water Resources Authority (MWRA) system. For a more detailed map of our water sources and their protection areas please visit cambridgema.gov/water

Watershed Protection

As part of our ongoing commitment to protecting the water supply, we participated with the Massachusetts Department of Environmental Protection (MassDEP) in preparing a Source Water Assessment Program (SWAP) Report completed in 2003. The SWAP Report assesses the susceptibility of our public water supply and notes the key land use and protection issues, including: Zone A Land Uses, Residential Land Uses, Transportation Corridors, Hazardous Material Storage and Use, and Presence of Oil or Hazardous Materials Contamination Sites. A copy of the Cambridge SWAP Report can be found on the MassDEP website at mass.gov/eea/docs/dep/water/drinking/swap/nero/3049000.pdf or at the Cambridge Water Department.

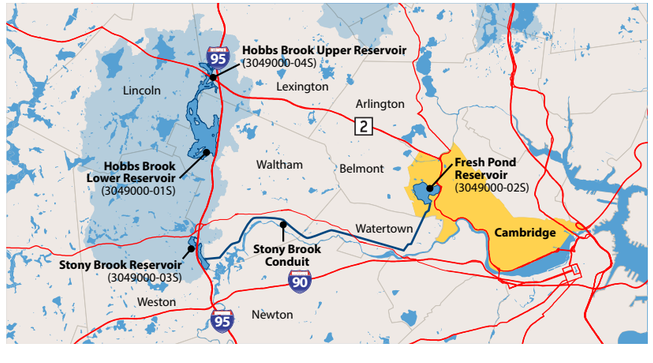
Because of the developed nature and types of land uses within the Cambridge watershed, our source waters are considered as having "high" susceptibility to contamination. Susceptibility is a measure of a water supply's *potential* to become contaminated due to land uses and activities within its recharge (watershed) area. If a source is susceptible to contamination, it does not necessarily mean the source has poor water quality. The Cambridge Water Department has taken the following actions to minimize contamination threats to our water supply:

- Work cooperatively with watershed towns on emergency response and stormwater management
- Placed spill kits at strategic points within the watershed
- Actively monitor source water quality throughout the watersheds, using the data to target source protection
- Work cooperatively with businesses in the watersheds to encourage source protection
- Adopted the Fresh Pond Master Plan, which includes long-term protection measures for the Fresh Pond Reservation
- Dedicated staff resources to inspections, public education, and coordination of source protection efforts

In 2011, the Watershed Division of the Cambridge Water Department updated its comprehensive Source Water Protection Program. The major components of the program to ensure a continuous supply of high quality water include:

1. **Extensive monitoring** – sampling and analysis of water chemistry and microbiology
2. **Hazardous materials emergency response planning** – to reduce the potential for contamination in the watershed
3. **Partnership development** – relationship-building with other parties in the watershed with common goals
4. **Proactive site review and monitoring** – to minimize potential impacts on the watershed from construction
5. **Stormwater management** – ensuring that Best Management Practices are implemented
6. **Community outreach** – public relations and education

For questions about our source water and our protection efforts, please contact Watershed Manager **David Kaplan** at dkaplan@cambridgema. gov or 617-349-4799.



You Can Save Money!

Rooftop receiving unit for daily readings from customers' meters.

The Water Department is updating the Automated Meter Reading (AMR) System for improved service. We are replacing the Meter Transmitting Units (MTUs) so we can provide actual (not estimated) water bill readings quarterly. The MTU is the device connected to your water meter that transmits meter readings to the Water Department. This "High Read" program notifies our customers soon after we detect unusually high water usage, which is typically caused by a leak. This notification allows property owners to make repairs quickly, saving you money and conserving water!

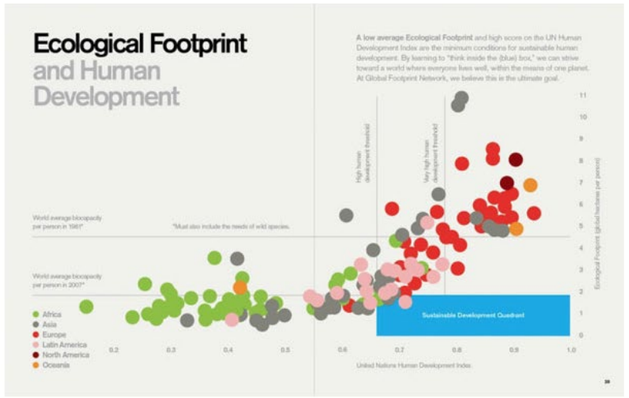
We need property owners to update their contact information so the Water Department can notify you as soon as a "High-Read" is detected. Please call Brian McCoy at 617-349-4737 or email him at HighReads@cambridgema.gov with your name, account number, phone number, mailing address, and email address.

Source: https://www.cambridgema.gov/Water/wateroperationsdivision/watertreatment/waterqualityreport

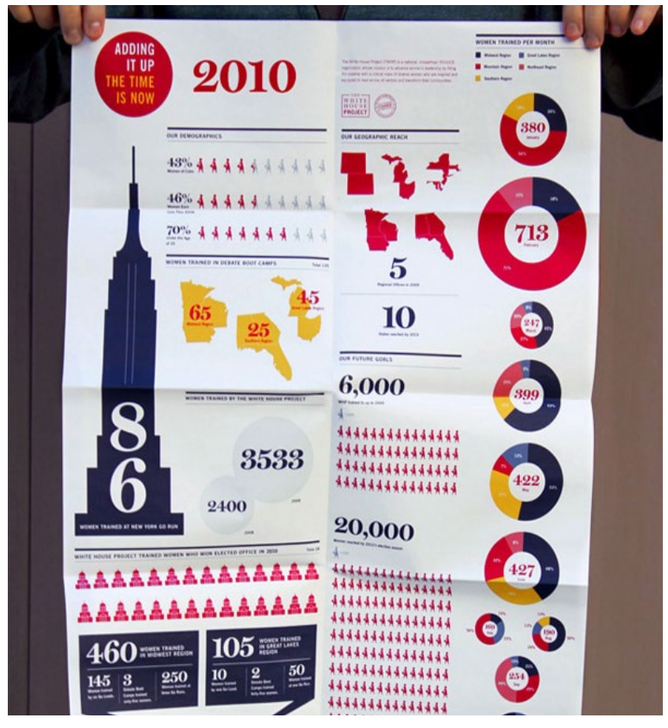
OUTREACH / EDUCATION

Publish annual reports to give feedback on progress

Other examples



GLOBAL FOOTRPRINT NETWORK
2010 ANNUAL REPORT



THE WHITE HOUSE PROJECT
2010 ANNUAL REPORT

POWER TO BE
2015 ANNUAL REPORT

How do we get people to take action?

Improve the online tree map to engage citizens

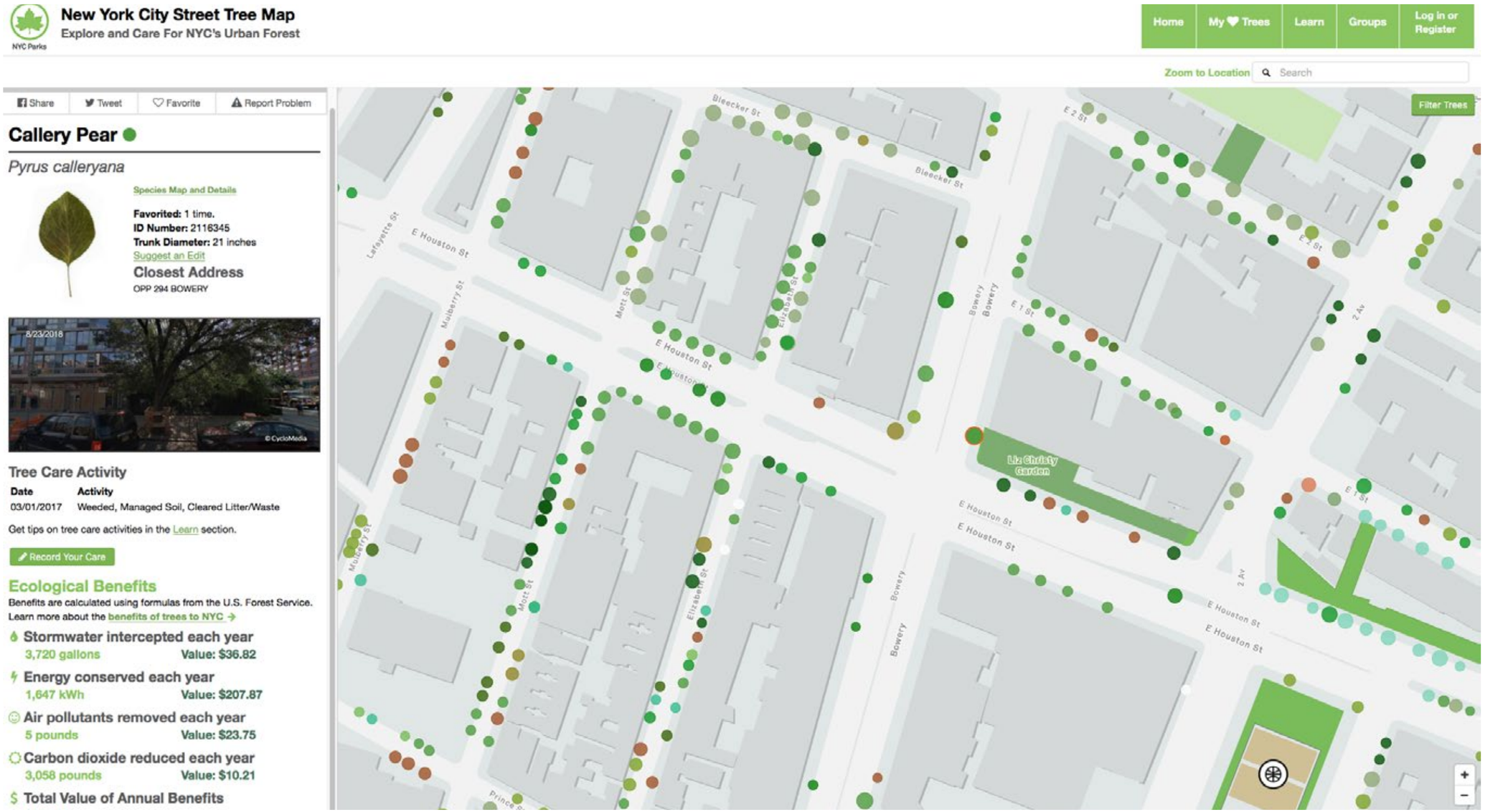
Tree health monitoring

TREE WALK CAMBRIDGE

OUTREACH / EDUCATION

Improve the online tree map to engage citizens

Tree health monitoring



NEW YORK CITY STREET TREE MAP

Support community tree planting efforts

Keep Indianapolis Beautiful

Community Forestry:

Residents can apply for tree planting, if they find at least 20 spots for trees in their neighborhood. Applicants need to form a small group and need to share with their neighbors and business owners to commit to tree preservation.

Urban Naturalists:

Employing young adults, providing them with job skills and professional development so they are prepared for impactful careers in environmental fields.

Source: https://www.kibi.org

Promote existing programs for citizens to take responsibility for trees

Adopt-a-Tree / Junior Forester

CAMBRIDGE JUNIOR FORESTER APPLICATION

I WOULD LIKE TO ADOPT A TREE

I UNDERSTAND IT IS MY RESPONSIBILITY TO :

1. **WEED AROUND THE BASE OF THE TREE**
   Pull weeds by hand and throw away.
2. **WATER THE TREE - FILL THE GATOR BAG ONCE A WEEK**
   Dpw will provide a 'gator bag' to hold 20 gallons of water
3. **MULCH OR ADD COMPOST TO THE SOIL**
   Apply 2 – 3 inches of mulch or compost to planting area.
   Not touching the trunk of the tree.
4. **PICK UP LITTER** – It is important to keep the tree well clean
5. **LET THE DPW KNOW IF THERE IS INJURY TO THE TREE.**
   617 349-4885

Name_____ Address_____

_____ _____

Email:_____ Phone # _____

Signatures:
Jr. Forester_____ Parent/Guardian_____

www.cambridgema.gov/tree Mail to: Dave Lefcourt, 147 Hampshire Street, Cambridge, MA 02139

How do you stem loss?

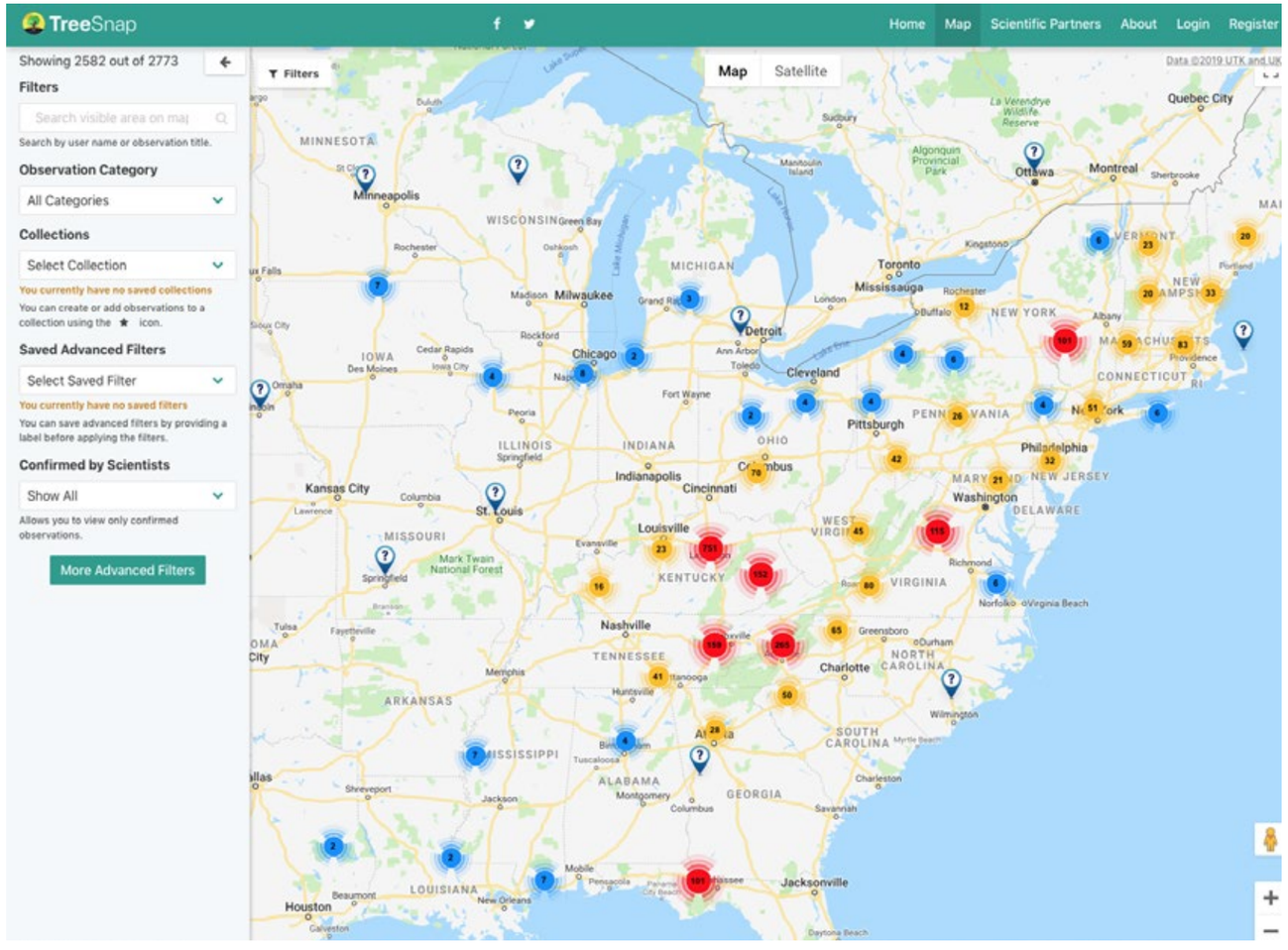
OUTREACH / EDUCATION

Engage with citizen science projects to protect threatened species

Tree Snap

Tree Snap enables foresters, landowners, and citizens to record the location of healthy trees of particular threatened species that scientists can then study for genetic diversity or breeding programs.

In the northeast, the species of concern are American chestnut, elm, ash, white oak, hemlock, and eastern larch.



Engage with citizen science projects to protect threatened species

Pest monitoring

This citizen science project provides a rare opportunity for the public to participate in real-world scientific research. Participants help to advance the understanding of bark and ambrosia beetles, which will help to protect forests and the species that depend on them.

BACKYARD BARK BEETLES,
UNIVERSITY OF FLORIDA/MICHIGAN STATE

SOD-blitzes inform and educate the community about Sudden Oak Death, get locals involved in detecting the disease, and produce detailed local maps of disease distribution. The map can then be used to identify those areas where the infestation may be mild enough to justify proactive management.

SUDDEN OAK DEATH (S.O.D.) BLITZ,
UNIVERSITY OF CALIFORNIA AT BERKELEY

Educate local businesses about dangers of pest outbreaks

Re: inspection of wood products

In 2008 the Asian Longhorn Beetle was found in Worcester, MA, presumably brought in through wood pallets.

The city lost 35,000 trees either killed by the beetle or felled by foresters looking to contain the infestation.

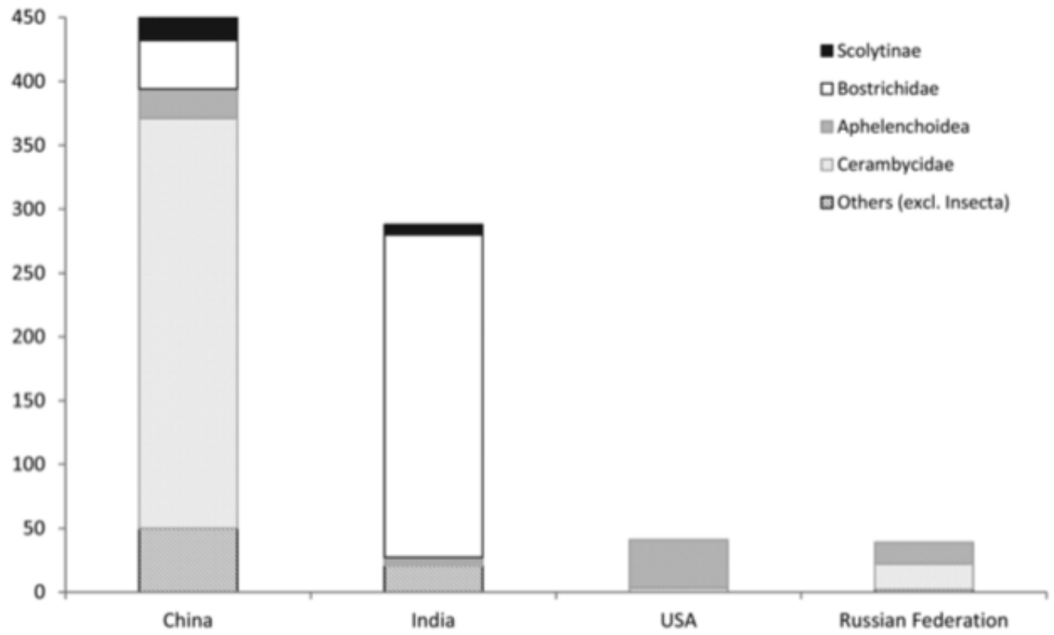
Businesses can help protect the forest by ensuring all wood products are pest free.

WORCESTER, MA

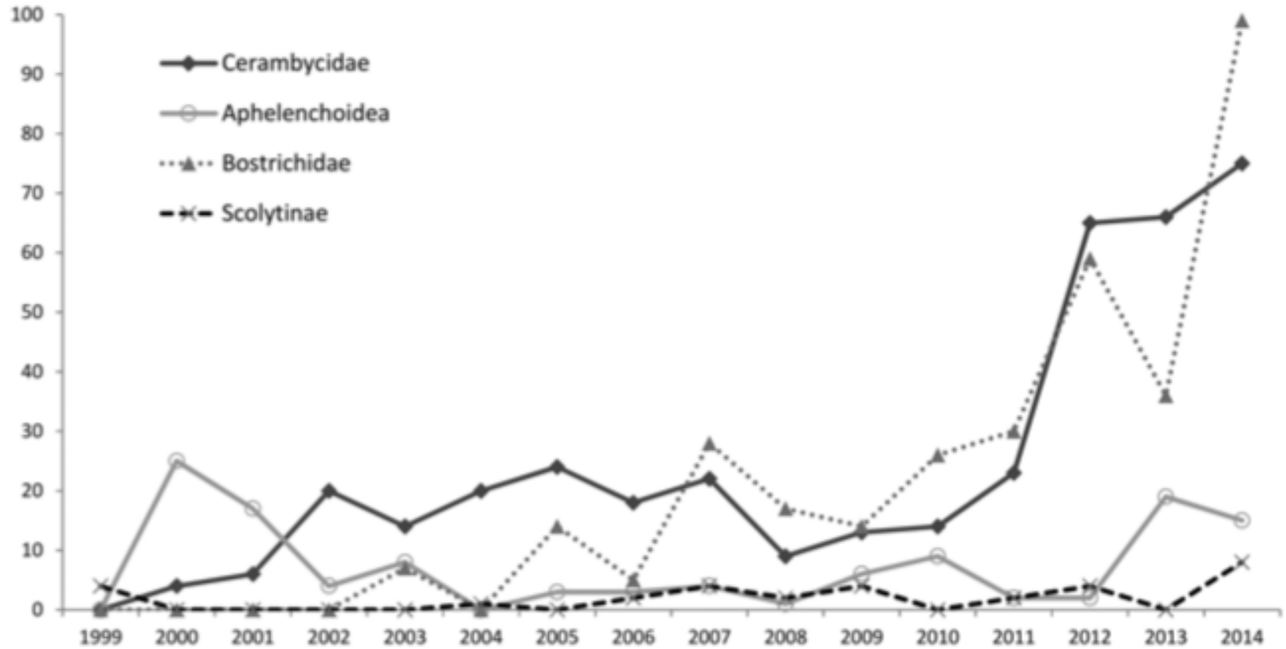
Source: https://www.telegram.com/news/20170109/beetle-infestation-to-claim-more-trees-in-worcester

Educate local businesses about dangers of pest outbreaks

Re: inspection of wood products



NUMBER OF INTERCEPTIONS OF HARMFUL ORGANISMS FOUND IN ASSOCIATION WITH WOOD PACKAGING IMPORTED TO THE EU BETWEEN 1999 AND 2014 FOR THE FOUR SOURCE COUNTRIES WITH THE MOST INTERCEPTIONS DIVIDED BY PEST ORGANISM TYPE.



ANNUAL NUMBER OF INTERCEPTIONS OF THE FOUR MOST IMPORTANT GROUPS OF HARMFUL ORGANISMS INTERCEPTED IN THE EU BETWEEN 1999 AND 2014 ON WPM ASSOCIATED WITH WORLDWIDE IMPORTS.

Source: Variation in Inspection Efficacy by Member States of Wood Packaging Material Entering the European Union

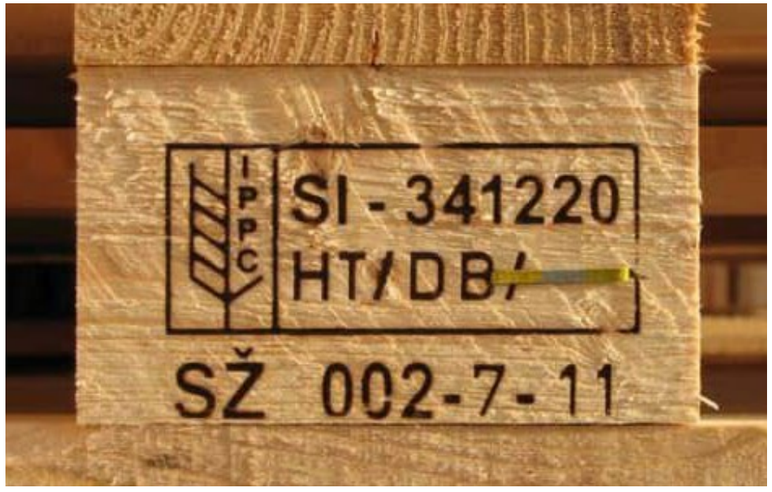
OUTREACH / EDUCATION

Educate local businesses about dangers of pest outbreaks

Re: inspection of wood products

ISPM 15 regulates wood packaging material in international trade.

The standard describes phytosanitary measures that reduce the risk of introduction and spread of quarantine pests associated with the movement in international trade of wood packaging material made from raw wood. Wood packaging material covered by this standard includes dunnage but excludes wood packaging made from wood processed in such a way that it is free from pests (e.g. plywood).



Source: https://www.ippc.int/static/media/files/publication/en/2016/06/ISPM_15_2013_En_2016-06-07.pdf

How do you grow canopy?

Publicize Back of Sidewalk Program at public events

Back of Sidewalk Program

The Back of Sidewalk tree planting program was designed to improve our urban forest through public/private tree planting partnerships. The term, Back of Sidewalk" refers to the edge of the sidewalk where public way meets private properties. In the case of this program, the City will plant trees along the back of sidewalk, (up to 20 feet off the public way) on private property of interested, eligible owners.

This program provides the city a means of planting trees where in the past either the sidewalk was too narrow or overhead utilities were in the way. This program will allow the city to plant trees in more desirable growing conditions, making it likely they will survive and thrive. A typical sidewalk tree faces harsher conditions along the curb (such as oil or salt from roadway runoff). Soil conditions at the back of sidewalk are generally more suitable for plant growth. The improved environment, larger rooting area, and lack of overhead competition will help ensure a healthier tree canopy in Cambridge.

Pedestrians benefit by this program when sidewalks widths are maintained. The narrow nature of sidewalks in Cambridge make it difficult to find appropriate places to plant new trees. A growing tree not only crowds the sidewalk, but its root system.

Source: https://www.cambridgema.gov/theworks/ourservices/urbanforestry/citystreeplantingprograms/backofsidewalk

Multi-agency partnerships for tree planting efforts

MA Greening Gateway Cities

- Multi-agency partnership among MA EEA, DCR, DOER, and DHCD and gateway cities (including Chelsea, Fall River, and Holyoke)
- Trees planted by DCR crews and local labor field crews, led by DCR foresters

Funding: State grant program funded with energy efficiency and state capital funds

GREENING
THE GATEWAY CITIES
MA Urban Canopy Project

Source: https://www.shieldsdesignstudio.com/news/greening-gateway-cities-0
https://www.mass.gov/service-details/greening-the-gateway-cities-program

OUTREACH / EDUCATION

Public and private partnerships for tree planting efforts

Green Tacoma Partnership

- Public-private partnership between City of Tacoma, Metro Parks Tacoma, Forterra, Citizens for a Healthy Bar, Pierce Conservation District and local businesses
- Connects stewardship groups through resources/trainings, and organizing public outreach

Funding: City of Tacoma, individual donations, corporate sponsorship. Forterra appears to be the nonprofit sponsor that houses the operations of the partnership and is likely the fiscal agent.

Source: https://forterra.org/subpage/green-tacoma-partnership-why

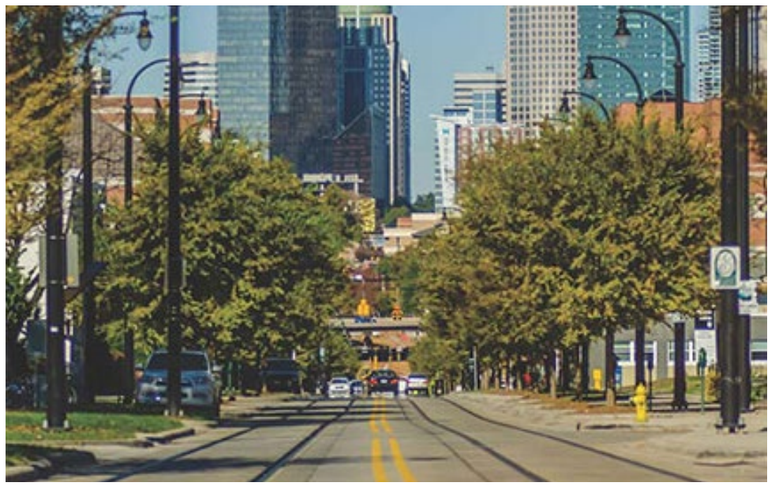
OUTREACH / EDUCATION

Carbon credits from tree plantings to meet carbon reduction goals

Trees Charlotte

- Two-year partnership with Greensboro-based Urban Offsets and higher ed (Davidson College, Duke, and Elon University)
- Creates carbon credits from tree plantings that are sold to higher education institutions seeking ways to meet carbon reduction goals (goal of 900 trees planted)

Funding: Trees Charlotte is a 501 c3 funded by City of Charlotte, individual donations, foundation support, corporate sponsorship. The carbon offset initiative in particular is a model where the City is paid for every tree it plants, universities with a commitment to neutralize their carbon impact pay.



Source: https://treescharlotte.org

OUTREACH / EDUCATION

Partnerships with institutions and organizations for educational opportunities

Tree Pittsburgh

- Public-private partnership between Tree Pittsburgh and Pennsylvania Urban and Community Forestry Council, Penn State University and conservation groups (Friends of the Riverfront, Western Pennsylvania Conservancy, Pittsburgh Parks Conservancy).

- Community tree plantings, Tree Tender volunteer program

- A variety of engaging classroom and field learning opportunities year-round. Tree Pittsburgh staff, ISA Certified Arborists, guest lecturers, or Heritage Nursery staff run all programs

Funding: Tree Pittsburgh is a registered 501(c)3 funded by individual donations, corporate matching gifts, corporate sponsorships.

Source: https://www.treepittsburgh.org

OUTREACH / EDUCATION
Recommendations

— Advocate for the value of trees in education curriculum

—Support citizen science projects

— Organize tree tours for citizens to engage with trees

— Continue to publicize ecosystem benefits of trees

— Support alternative education approaches, art installations

— Publish annual reports to give feedback on progress

— Improve the online tree map to engage citizens

— Promote existing City programs

— Educate local businesses about dangers of pest outbreaks

— Partnership outreach

OUTREACH

FOREST RESILIENCY

CANOPY VALUATION

NEXT STEPS

To maintain, plan, build, and sustain a healthy, connective, and resilient urban forest at a time when the urban forest is more important than ever before.

FOREST RESILIENCY
Analysis of City's current street tree list

Underwire trees

Latin Name	Common Name
Acer campestre	Hedge Maple
Acer griseum	Paperbark Maple
Amelanchier sp.	Serviceberry
Cercis canadensis	Eastern Redbud
Maackia amurensis	Amur maackia
Prunus 'Accolade'	Accolade cherry
Prunus sargentii	Sargent cherry
Prunus serrulata 'Kwanzan'	Kwanzan cherry
Prunus serrulata 'Snowgoose'	Snowgoose cherry
Prunus subhirtella 'Autumnalis'	Autumun cherry
Prunus x yedoensis 'Akebono'	Akebono cherry
Prunus x incarn 'Okame'	Okame cherry
Malus sp.	Crabapple sp.
Syringa reticulata	Japanese Lilac Tree

Trees with low condition ratings
Trees that exceed diversity target
Trees that have high susceptibility to climate risks

Canopy trees

Latin Name	Common Name
Acer x fremanii	Armstrong Red Maple
Acer rubrum	Red Maple
Betula nigra	River Birch
Carpinus caroliniana	Hornbeam
Celtis occidentalis	Hackberry
Cercidiphyllum japonicum	Katsuratree
Ginkgo biloba	Ginkgo
Gleditsia triacanthos	Honeylocust
Gymnocladus dioicus	Kentucky Coffeetree
Koelreuteria paniculata	Golden Raintree
Liriodendron tulipifera	Tuliptree
Liquidambar styraciflua	Sweetgum
Metasequoia glyptostroboides	Dawn Redwood
Nyssa sylvatica	Black Tupelo
Platanus x acerifolia	London Planetree
Pyrus sp.	Pear spp.
Quercus bicolor	Swamp White Oak
Quercus palustris	Pin Oak
Quercus rubra	Red Oak
Quercus velutina	Black Oak
Sophora japonica	Sophora
Tilia cordata	Littleleaf Linden
Tilia tomentosa	Silver Linden
Ulmus americana	American Elm
Ulmus sp.	Elm cultivars
Zelkova serrata	Zelkova

FOREST RESILIENCY

Snapshot of CUFMP tree database

NAME			CLIMATE RESILIENCY SCORE					ORIGIN		SIZE				TYPOLOGIES	
Genus	Species	Comm_Name	Flood score	Drought Score	Pest Score	Total score	RUST (Relative Urban Stress Tolerance)	Native	Non-native	Typical Range of Mature Crown Width	Small (Mature height less than 35 ft tall)	Medium (Mature height greater than 35 ft but less than 50 ft tall)	Large (Mature height greater than 50 ft tall)	CANOPY STREET TREES	UNDERWIRE STREET TREES
Abies	concolor	Fir-White	1	2	2	5.5			Yes	15-20'		X			
Acer	negundo	Boxelder	3	3	1	4.5	1.40	Yes		40-50'		X		X	
Acer	ginnala	Maple-Amur	1	2	1	6.5			Yes	15-25'	X				
Acer	nigrum	Maple-Black	1	2	1	6.5			Yes	40-50'			X		
Acer	platanoides	Maple-Crimson King Nc	1	3	1	5.5			Yes	30-45'			X		
Acer	x freemanii	Maple-Freeman	2	2	1	6			Yes	35-40'			X		
Acer	campestre	Maple-Hedge	1	3	1	5.5	4.14		Yes	25-35'	X				X
Acer	palmatum	Maple-Japanese	1	2	1	6.5			Yes	10-25'	X				
Acer	griseum	Maple-Paperbark	1	2	1	6.5			Yes	15-25'	X				
Acer	rubrum	Maple-Red	3	1	1	6.5	1.4	Yes		20-35'			X	X	
Acer	saccharinum	Maple-Silver	3	2	1	5.5	1.73	Yes		40-60'			X	X	
Acer	saccharum	Maple-Sugar	2	1	1	7	-0.72	Yes		30-50'			X		
Acer	tataricum	Maple-Tatarian	1	3	1	5.5			Yes	15-20'	X				
Acer	buergeranum	Maple-Trident	1	2	1	6.5	2.18		Yes	20-30'	X				X
Aesculus	glabra	Buckeye-Ohio	2	1	1	7	1.68		Yes	40-50'			X	X	
Aesculus	hippocastanum	Horsechestnut	2	2	1	6			Yes	40-50'			X		
Aesculus	x carnea	Horsechestnut-Red	2	2	1	6	0		Yes	30-40'		X			
Albizia	julibrissin	Mimosa	1	2	1	6.5			Yes	25-35'		X			
Alnus	glutinosa	Alder-Common	2	2	2	5	1.21		Yes	15-20'			X	X	
Amelanchier	x grandiflora	Serviceberry-Apple	2	2	3	4			Yes	15-25'	X				
Amelanchier	arborea	Serviceberry-Downy	2	1	3	5	0.72	Yes		10-20'	X				
Betula	pendula	Birch-European White	1	1	1	7.5			Yes	15-30'		X			
Betula	populifolia	Birch-Gray	1	1	1	7.5	1.43	Yes		10-20'		X		X	
Betula	papyrifera	Birch-Paper	2	1	1	7	2.95	Yes		25-50'			X	X	
Betula	nigra	Birch-River	2	2	1	6	3.03	Yes		40-60'			X	X	
Carpinus	caroliniana	Hornbeam-American	2	1	1	7	1.82	Yes		15-30'		X		X	
Carpinus	betulus	Hornbeam-European	2	3	3	3	0.12		Yes	35-40'		X			
Carya	tomentosa	Hickory-Mockernut	1	3	2	4.5	1.72	Yes		50-75'			X	X	

Species selection evaluation criteria

— Climate Resiliency Score

-pest/disease resiliency — 1 = low 2 = moderate 3 = high

-drought tolerance — 1 = low 2 = moderate 3= high

-flood tolerance — 0.5 = low 1 = moderate 1.5= high

Overall score ranges from 2.5 to 7.5

— Relative Urban Stress Tolerance (RUST) Score

-urban stress agents assessed: pH, hardiness, sun, insect/diseases, physiological/environmental, moisture, salt, texture, compaction

-the higher the score, the better the species is as a street tree

FOREST RESILIENCY
Database Sorting Criteria:

— Size
— Planting location
— Sun exposure
— Flooding tolerance
— Native or nonnative
— Soil type

FOREST RESILIENCY

Are there benefits to planting native vs. nonnative species in the city?

"Most published research demonstrates that the native status of trees and shrubs has little influence on biodiversity."[1]

—Linda Chalker-Scott, Ph.D., Extension Horticulturist and Associate Professor, Washington State University

"The dynamic nature of interactions among people, plants, and animals in today's world are producing novel ecological associations with unpredictable consequences for all parties concerned."[2]

—Peter Del Tredici, Ph.D., Senior Research Scientist Emeritus, Arnold Arboretum

1. Chalker-Scott, L. 2018. "Are Native Trees And Shrubs Better Choices For Wildlife In Home Landscapes?" Washington State University Extension Fact Sheet.
2. Del Tredici, P. 2007. The role of horticulture in a changing world. In: M. Conan and W. J. Kress (eds.), Botanical Progress, Horticultural Innovation, and Cultural Changes, pp. 259–264. Dumbarton Oaks, Washington DC.

See also: Chalker-Scott, L., "Nonnative, Noninvasive Woody Species Can Enhance Urban Landscape Biodiversity," Arboriculture & Urban Forestry 2015. 41(4): 173–186.

FOREST RESILIENCY

Are there benefits of planting native vs. nonnative species in the city?

— Certain genera support more wild life than others but there is little significant difference between native and non-native species

— Species diversity is important for a healthy, resilient forest.

— We should plant species proven to be well adapted to the urban environment

FOREST RESILIENCY
Species Diversity Criteria

No more than...

10%
SPECIES

20%
GENUS

Santamour, 1990: Urban foresters and municipal arborists should use the following guidelines for tree diversity within their areas of jurisdiction:

(1) plant no more than 10% of any species,

(2) no more than 20 % of any genus,

(3) no more than 30 % of any family.

Melbourne Urban Forest Diversity Guidelines, 2011: The urban Forest Diversity Guidelines recommend that by 2040

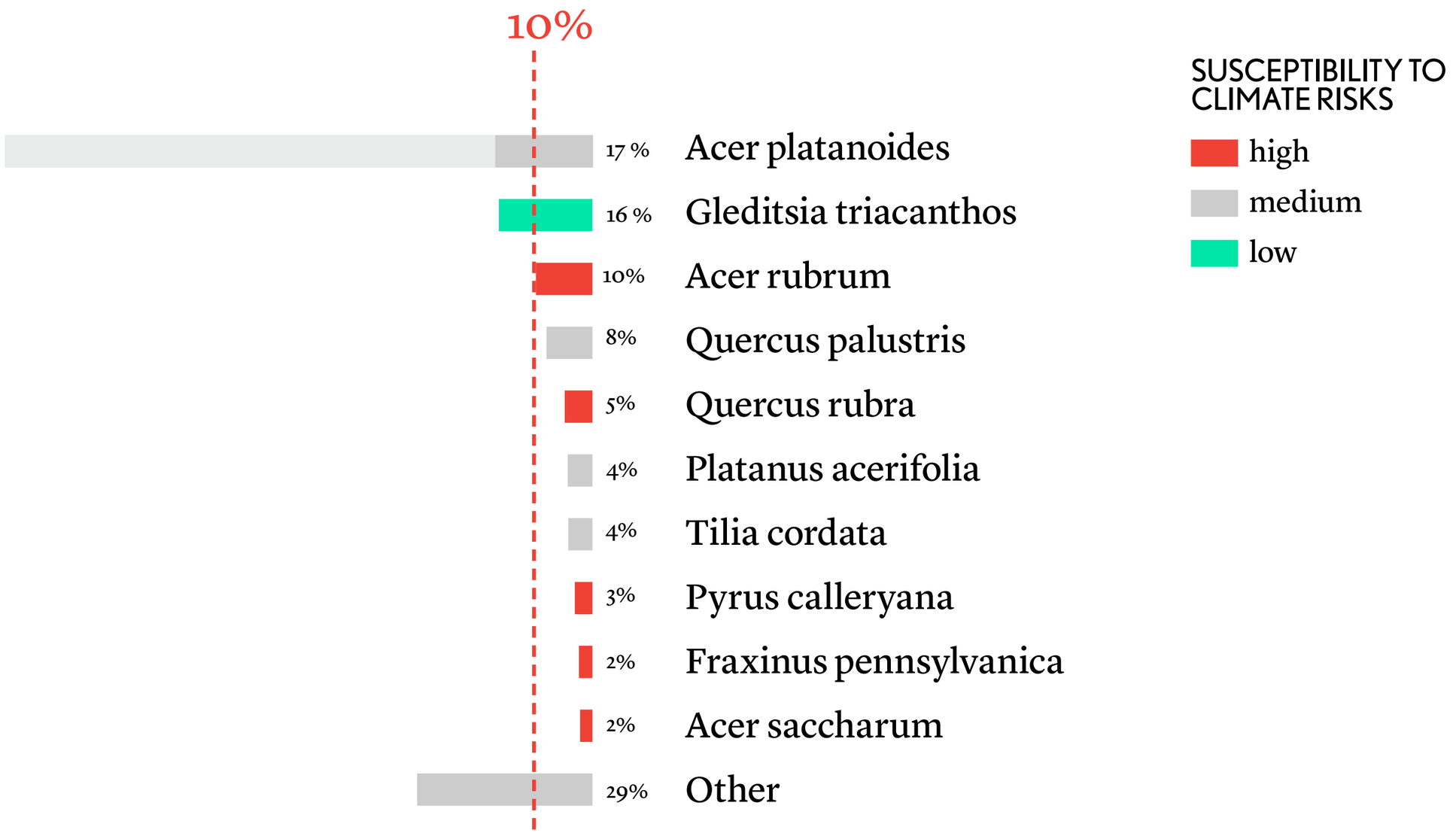
(1) no more than 5 percent of the forest is to be of any single species,

(2) no more than 10 percent is to be of any one genus,

(3) no more than 20 percent is to be of any one Family.

FOREST RESILIENCY

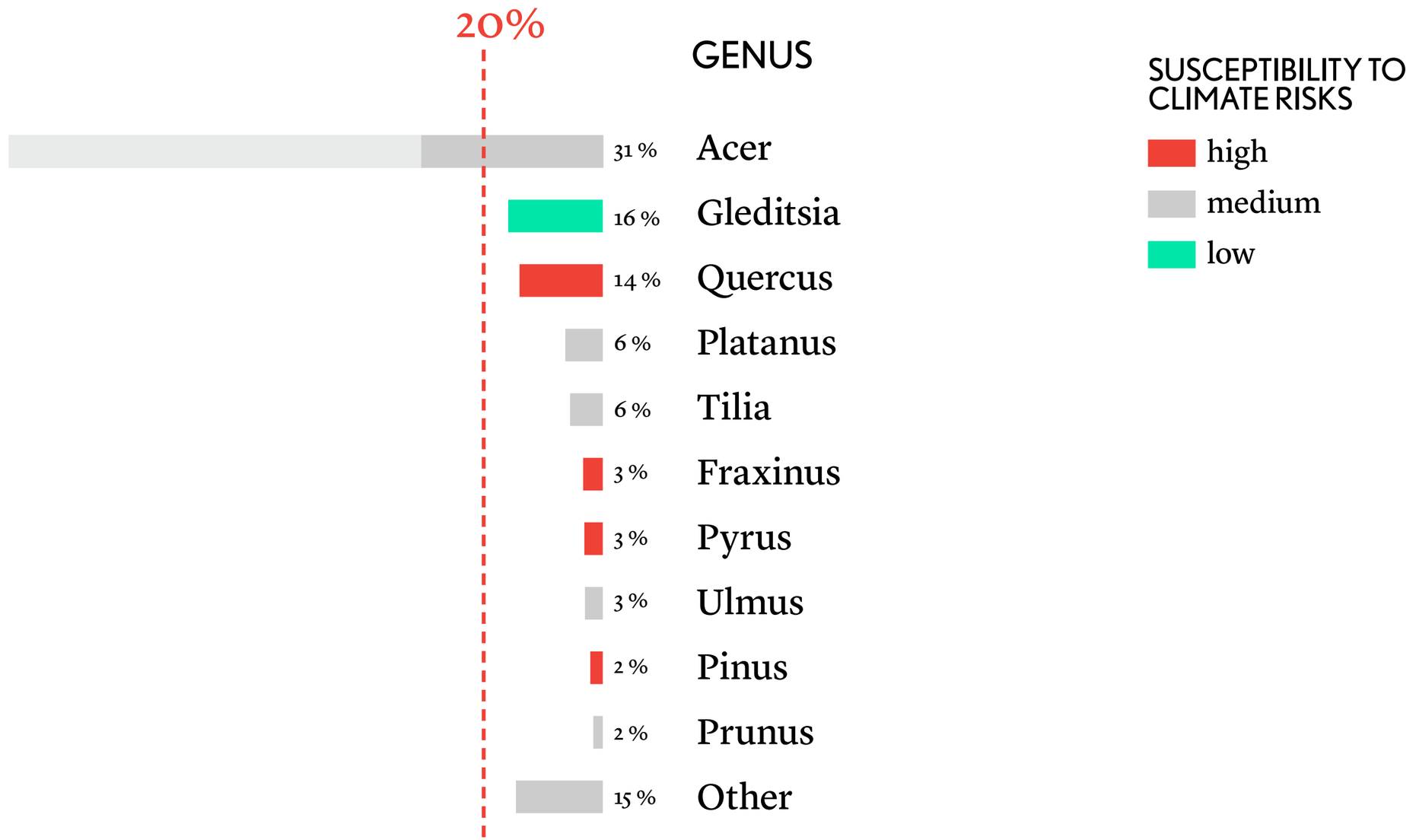
Existing species makeup of the urban forest is susceptible to climate risks of increased pests/diseases, drought and flooding



Source: 2018 CUFMP canopy analysis

FOREST RESILIENCY

Existing genus makeup of the urban forest is susceptible to climate risks of increased pests/diseases, drought and flooding



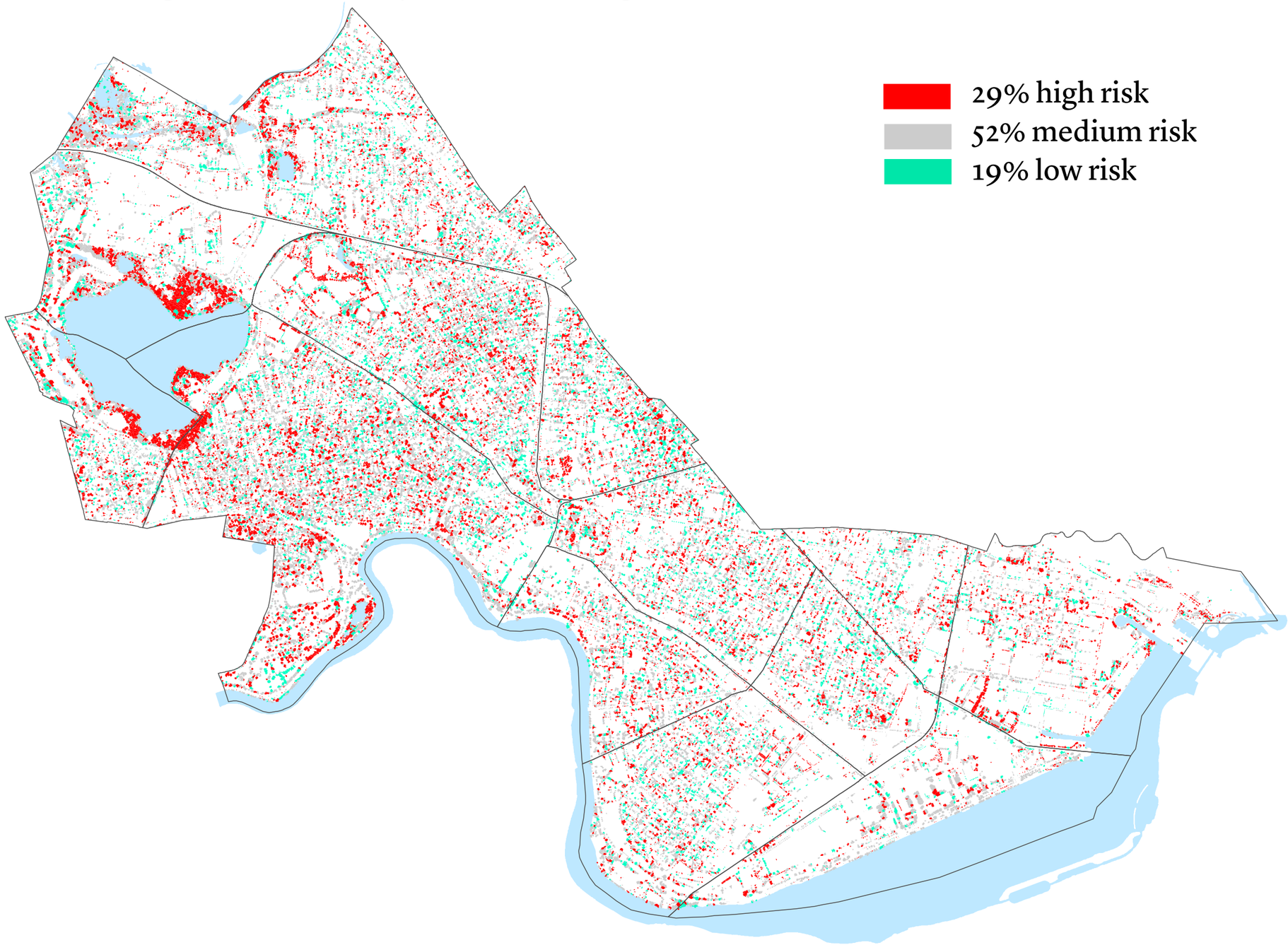
Source: 2018 CUFMP canopy analysis

FOREST RESILIENCY
Most climate resilient species

Latin Name	Common Name	Climate Score	% species	% genus
Juniperus virginiana	Eastern Redcedar	7		
Carpinus betulus	European Hornbeam	7		
Cotinus coggygria	Common Smoketree	7		
Sophora japonica	Japanese Pagodatree	7		
Sassafras albidum	Sassafras	6.5	less than 1%	
Eucommia ulmoides	Hardy Rubber Tree	6.5		
Parrotia persica	Persian Parrotia	6.5		
Ptelea trifoliata	Wafer Ash	6.5		
Ginkgo biloba	Ginkgo	6.5	1%	1%

FOREST RESILIENCY

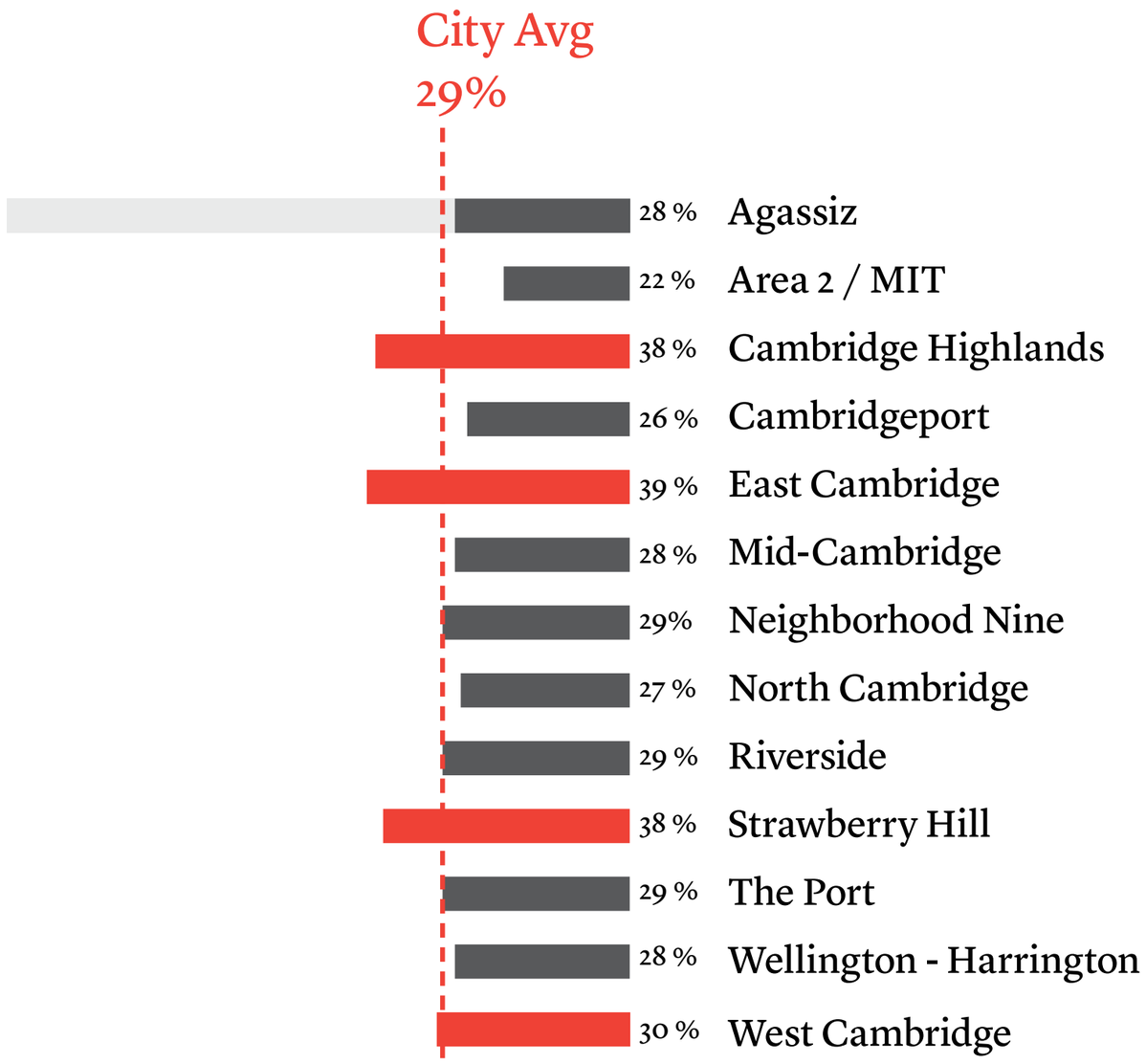
29% percent of the forest has high susceptibility to pest, drought and/or flood factors



29% high risk
52% medium risk
19% low risk

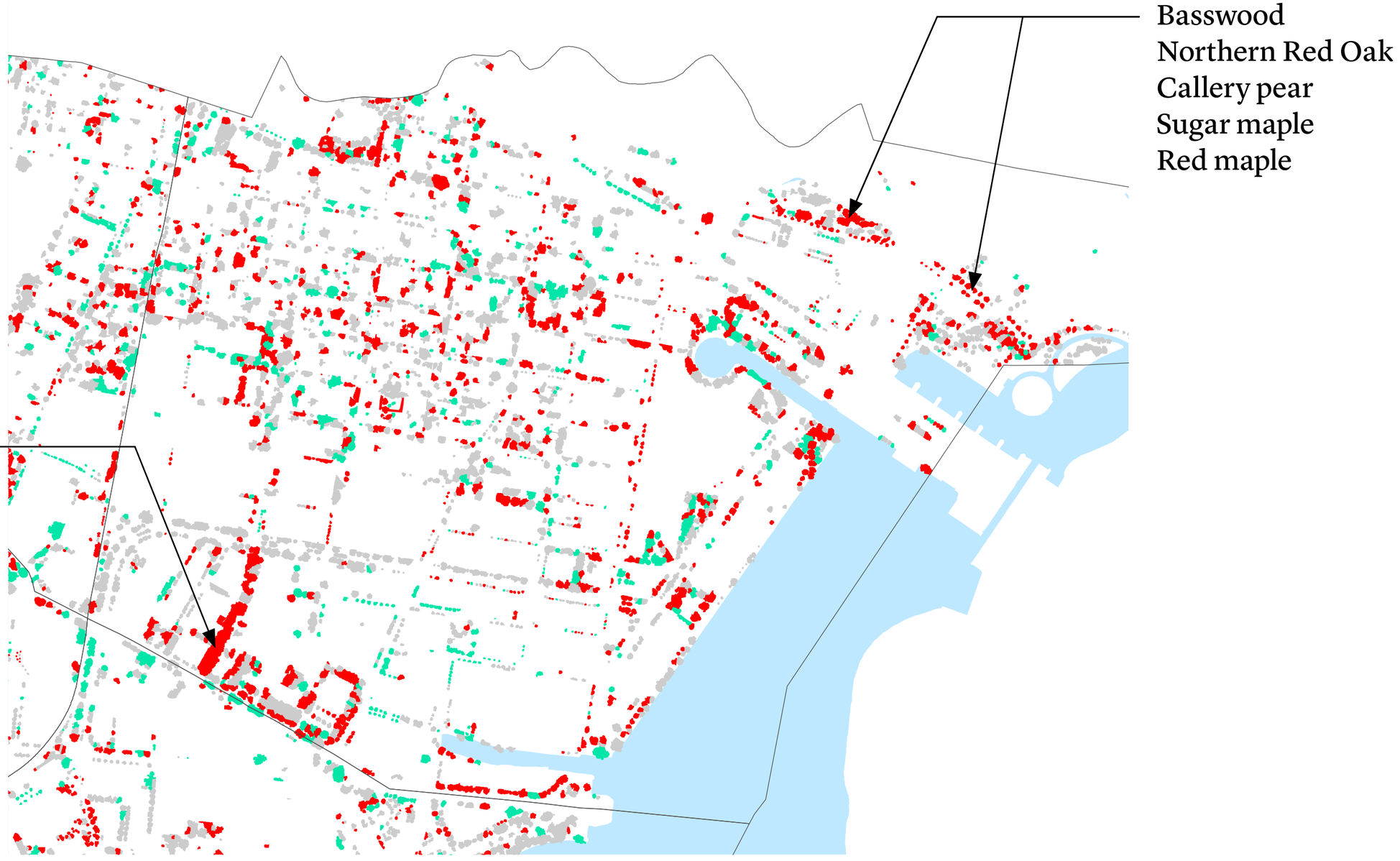
FOREST RESILIENCY

High risk species are generally spread evenly throughout Cambridge.



Source: 2018 CUFMP canopy analysis

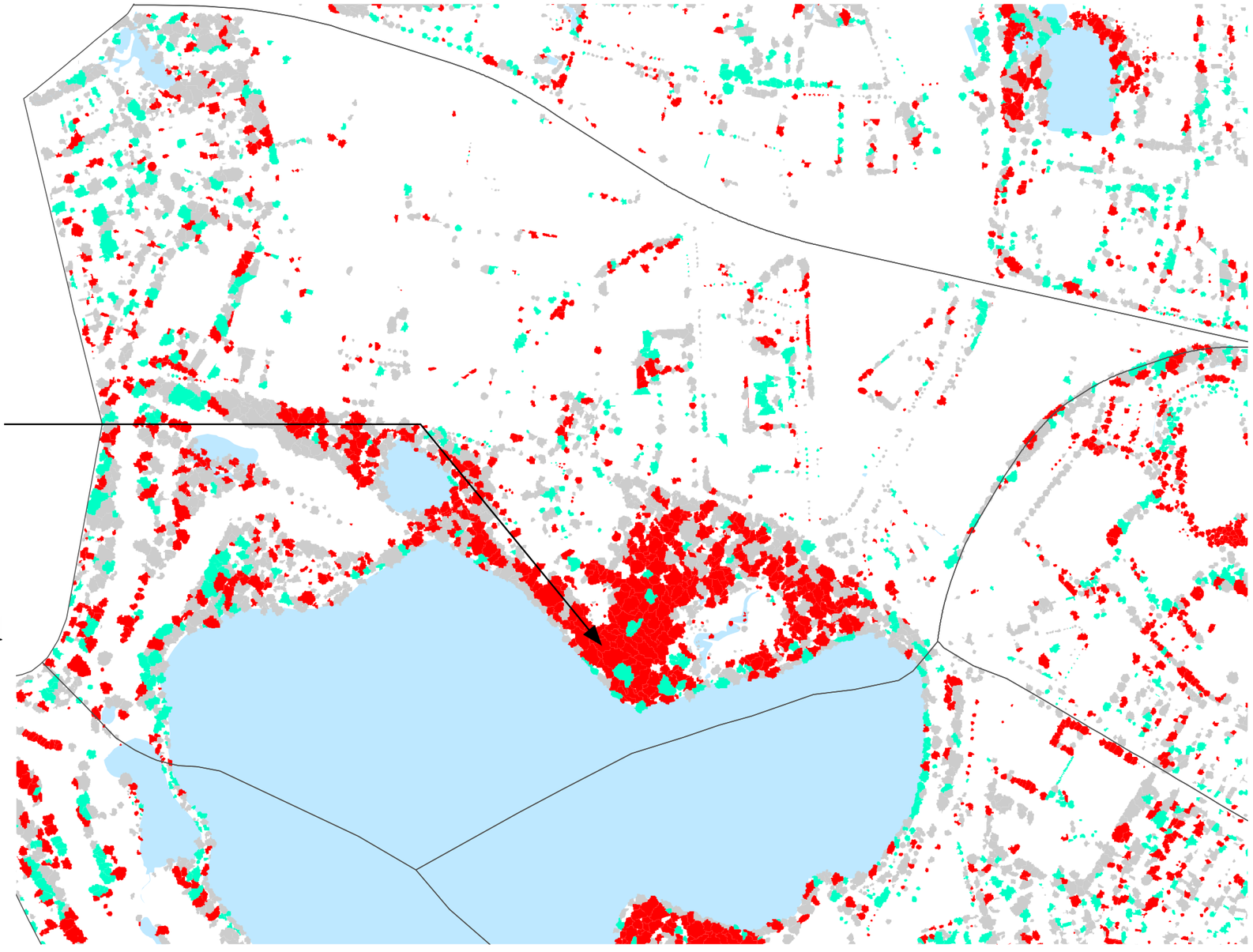
FOREST RESILIENCY
East Cambridge



Source: 2018 CUFMP canopy analysis

FOREST RESILIENCY
Cambridge Highlands

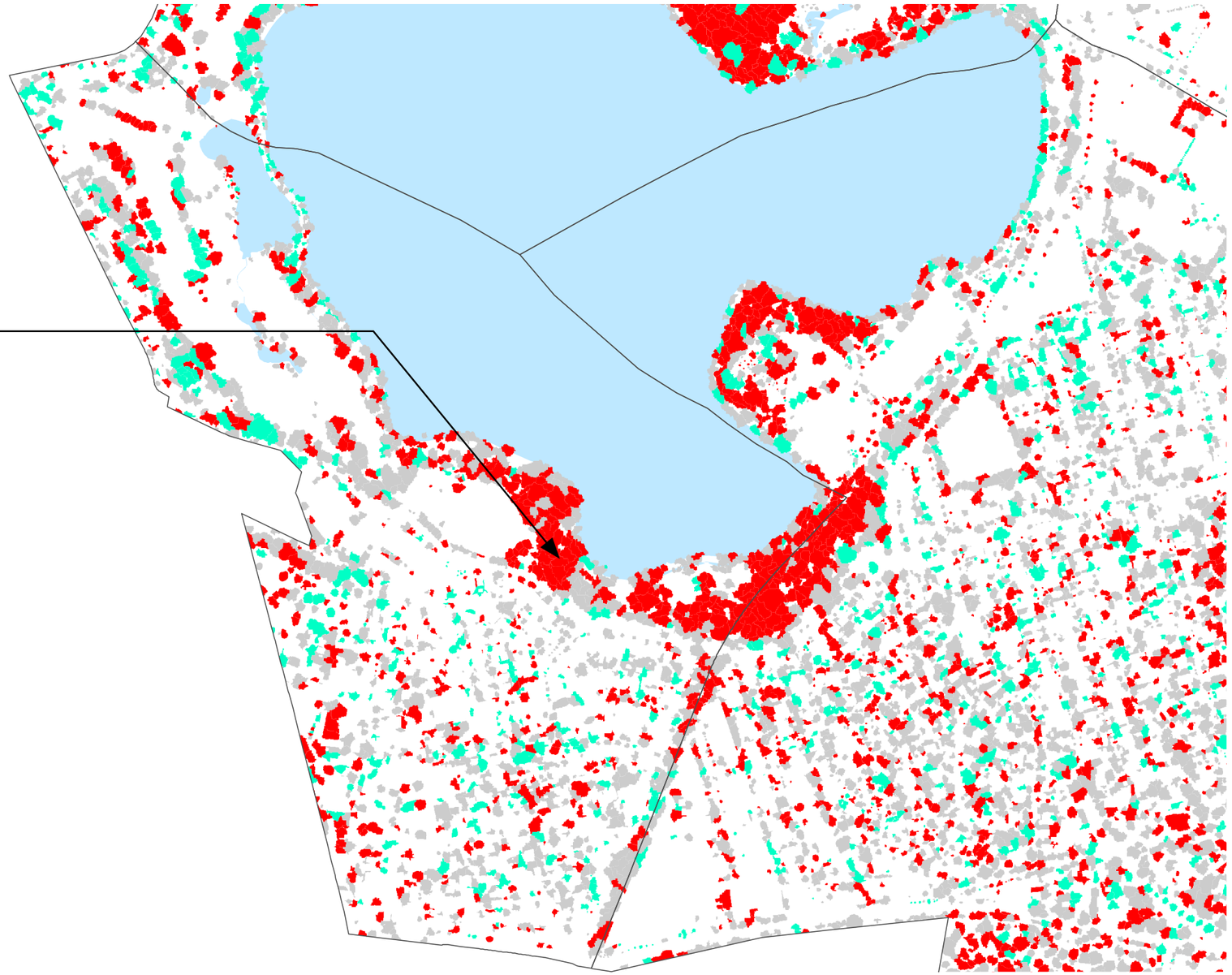
Northern Red Oak
Pine
Sugar maple
Eastern black oak
Green/White Ash
Flowering dogwood



Source: 2018 CUFMP canopy analysis

FOREST RESILIENCY
Strawberry Hill/West Cambridge

Northern Red Oak
Pine
Sugar maple
Eastern black oak
Green/White Ash
Flowering dogwood



Source: 2018 CUFMP canopy analysis

FOREST RESILIENCY

Given the susceptibility of the current forest, we should:

—Plant well-adapted species with a higher climate resiliency score

—Plant fewer species that already have met their proportion limits

—Diversify forest to the extent possible

FOREST RESILIENCY
Reduced existing species list

Underwire trees

Latin Name	Common Name
Acer campestre	Hedge Maple
Acer griseum	Paperbark Maple
Amelanchier sp.	Serviceberry
Cercis canadensis	Eastern Redbud
Maackia amurensis	Amur maackia
Syringa reticulata	Japanese Lilac Tree

Trees that exceed diversity target

Canopy trees

Latin Name	Common Name
Acer x fremanii	Armstrong Red Maple
Betula nigra	River Birch
Carpinus caroliniana	Hornbeam
Celtis occidentalis	Hackberry
Cercidiphyllum japonicum	Katsuratree
Ginkgo biloba	Ginkgo
Gleditsia triacanthos	Honeylocust
Gymnocladus dioicus	Kentucky Coffeetree
Koelreuteria paniculata	Golden Raintree
Liriodendron tulipifera	Tuliptree
Liquidambar styraciflua	Sweetgum
Metasequoia glptostroboides	Dawn Redwood
Nyssa sylvatica	Black Tupelo
Platanus x acerifolia	London Planetree
Quercus bicolor	Swamp White Oak
Quercus palustris	Pin Oak
Sophora japonica	Sophora
Tilia cordata	Littleleaf Linden
Tilia tomentosa	Silver Linden
Ulmus americana	American Elm
Ulmus sp.	Elm cultivars
Zelkova serrata	Zelkova

FOREST RESILIENCY
New recommended species

Underwire trees

Latin Name	Common Name
Ostrya virginiana	American Hop Hornbeam
Chionanthus retusus	Chinese Fringetree
Syringa pekinensis	Peking Lilac
Cornus x	Hybrid Dogwoods
Parrotia persica	Persian Parrotia

Canopy trees

Latin Name	Common Name
*Aesculus hippocastanum	Horsechestnut
*Aesculus flava	Yellow Buckeye
*Carya glabra	Pignut Hickory
*Carya ovata	Shagbark Hickory
Eucommia ulmoides	Hardy Rubber Tree
Taxodium distichum	Bald Cypress
Taxodium distichum var. imbricatum	Pond Cypress
Cryptomeria japonica ‘Yoshino’	Yoshino Cryptomeria
Quercus acutissima	Sawtooth Oak
Quercus dentata	Daimyo Oak
Quercus imbricaria	Shingle Oak
Quercus macrocarpa	Bur Oak
Quercus shumardii	Shumard Oak
Quercus texana	Nuttall Oak

*trees that drop nuts

FOREST RESILIENCY
New recommended species

Existing street trees list	26 GENERA	40 SPECIES
New street trees list	32 GENERA	46 SPECIES

FOREST RESILIENCY
Comparison with other cities' lists

Philadelpia street trees list	41 GENERA	70 SPECIES
New York street trees list	38 GENERA	75 SPECIES

OUTREACH

FOREST RESILIENCY

CANOPY VALUATION

NEXT STEPS

Value the forest as a public resource

The urban forest is a public resource and has **measurable value and impacts** everyone. It provides shade to cool our environment, gives scale and character to our streets, provides habitat for diverse species, improves our air quality, reduces stormwater impacts, and improves our health and well-being.

To shift the trend from increasing loss to sustainable growth, we must manage the urban forest as **urban infrastructure** (like water, sewer, power) investing for the long term, managing resources collectively, and understanding the value (ie., ecosystem services) of the canopy.

To balance the value of the forest with the complex needs of the city, we should focus on the performance of the **forest as a system** over the specific value of individual trees.

Urban Forest Benefits: Ecological, cultural and economic values

Table 5
Urban tree benefits reported in the 115 research papers on urban trees examined in this study.

Benefits	Discussed	Demonstrated
Social benefits	7	5
Making urban environment more pleasant to live, work and spend leisure time	3	2
Providing significant outdoor leisure/recreation opportunities	3	2
Providing nature in the city	1	1
Enhancing quality of urban life	5	3
Promoting environmental responsibility and ethics	1	–
Building stronger sense of community	1	–
Enhancing community's sense of social identity and self esteem	1	–
Providing settings for significant emotional and spiritual experiences	1	–
Providing opportunities for inner city children to experience nature	1	–
Economic benefits	28	27
Saving substantially on fuel expenditure	1	–
Increasing land value	3	3
Increasing property value	13	12
Increasing rental price	1	1
Increasing neighbouring property value	2	1
Reducing 'time on market' for selling property	1	1
Increasing property taxes	1	–
Increasing tourism revenue	1	–
Increasing business activity	1	–
Contributing to the economic vitality of the city	1	–
Providing annual returns on municipal investments	2	1
Alleviating the hardships of inner city living for low – income groups	1	–
Reducing expenditure on air pollution removal	7	6
Reducing expenditure on storm water infrastructure	4	3
Saving annual heating and cooling costs	2	2
Savings on electricity costs	1	1
Avoiding investment in new power supplies	3	2
Providing potential for future carbon offsetting trade	2	2

Ecosystem services	Discussed	Demonstrated
Carbon related ecosystem services	30	27
Storing/sequestering carbon	30	27
Air quality related ecosystem services	38	34
Producing oxygen	2	2
Filtering air	11	9
Removing ozone	18	16
Removing carbon monoxide	12	10
Removing sulphur dioxide	17	15
Removing nitrogen dioxide	15	14
Removing airborne particle matters/suspended particles	22	20
Removing dust	1	1
Reducing smog	3	3
Reducing carbon dioxide emissions	9	8
Storm water related ecosystem services	10	9
Reducing rate of storm water runoff	10	9
Reducing volume of storm water runoff	8	7
Reducing flooding damage	4	3
Reducing water quality problems	3	2
Recharging ground water	1	1
Energy related ecosystem services	20	18
Reducing annual energy use	14	11
Reducing summer time energy use	5	5
Reducing seasonal cooling energy	4	4
Reducing carbon dioxide emission from power plants	3	2
Habitat related ecosystem services	7	5
Providing habitat for wildlife	7	5
Enhancing biodiversity	1	–
Providing stability to urban ecosystems	1	–
Noise related ecosystem services	8	5
Reducing noise	8	5
Reducing apparent loudness	2	1
Micro climate related ecosystem services	25	25
Providing shade	16	16
Reducing solar radiation	4	4
Modifying microclimate	9	
Reducing relative humidity	1	1
Reducing air temperature	15	15
Reducing heat island effect	10	10
Reduction of glare/reflection	3	3
Controlling wind	6	6

Benefits	Discussed	Demonstrated
Health benefits	5	2
Fewer complications and faster recovery at hospital having windows with tree view	2	–
Reducing stress	3	–
Improving physical health	2	–
Creating relaxed psychological states	3	1
Averting premature death	1	1
Averting respiratory hospital admissions	1	1
Visual and aesthetic benefits	6	5
Providing a sense of place & identity	2	1
Creating seasonal interest by highlighting seasonal changes	1	1
Improving scenic quality	6	5
Providing privacy	2	2

Roy et al A systematic quantatitive review of urban tree benefits, costs, and assessment methods across cities in different climatic zones. Urban Forestry & Urban Greening 11 (202 p. 351-0363).

CANOPY VALUATION
Demonstrated tree benefits

Economic benefit:
Increased property value
Reduced expenditure on air pollution removal
Reduced expenditure on stormwater infrastructure
Saved investment in new power supplies
Reduced heating and cooling costs
Reduced time on housing market

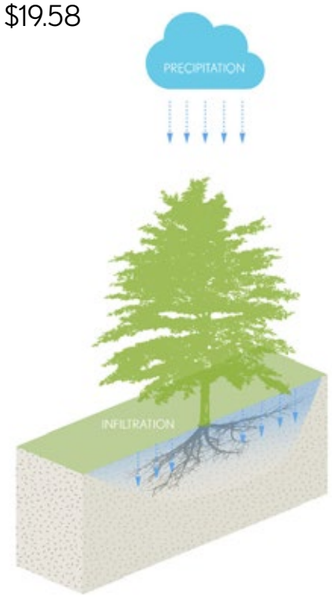
Quantifiable economic benefit through iTree

Social benefit:
Increased quality of life (stress relief- survey study)
Health benefit – averting respiratory hospital admissions and premature death
Improved scenic quality
Providing a sense of place and identity
Creating seasonal interest
Providing privacy

Ecosystem services
Carbon storage and sequestration
Air quality improvement
Stormwater attenuation (reducing rate and volume of stormwater runoff, improving water quality, recharging groundwater, minimizing flooding damage)
Energy conservation
Habitat preservation
Noise reduction
Microclimate amelioration (reducing heat island, glare and reflection)

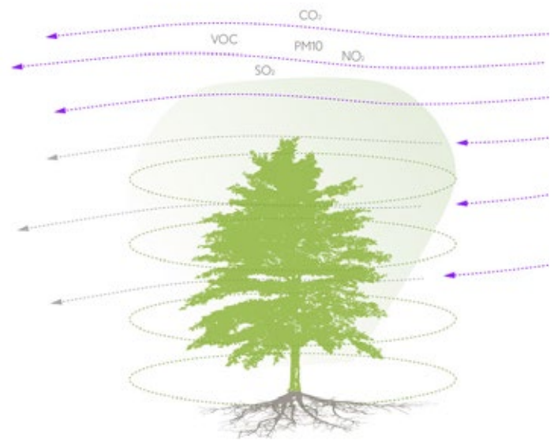
CANOPY VALUATION
Infrastructure Performance

STORMWATER
Stormwater: $19.58

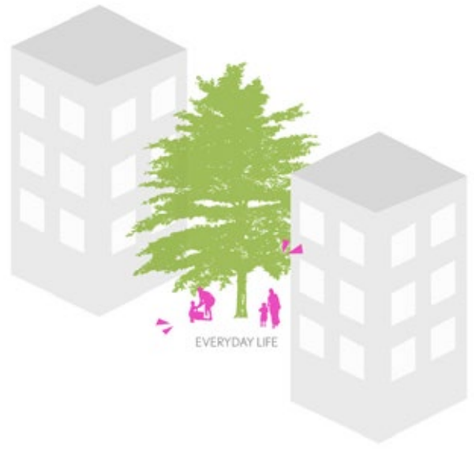


ENERGY SAVED
Energy: $65.91

CO_2 & AIR QUALITY
CO_2: $2.21
Air Quality: $12.81



PROPERTY VALUE
Add Value: $276.55



Ecosystem services for an average Pin Oak in Cambridge
Source: i-Tree Streets - Annual Savings for Average Pin Oak in Cambridge

CANOPY VALUATION

Several methods for valuing tree benefits

Methods for measuring benefit:

— top down aerial based approach (remote sensing, aerial photography) - iTree Canopy

— bottom up ground based assessment (individual trees, GIS based) - iTree Eco, CITYgreen

— specific areas of benefit (mathematical models) - iTree Hydro, Kleinfelder's Port modeling

Methods for measuring economic value:

— market prices, surrogate market approach, production function apporach, state preference approach, cost based valuation, cost benefit analysis

CANOPY VALUATION

iTree Eco analysis using Bartlett's 5% survey

— uses field data along with local hourly air pollution and meteorological data to quantify forest structure, environmental effects, and values

— benefits depend on tree structure and physiology (e.g. tree size, trunk diameter at breast height, leaf area, leaf biomass, evergreen vs. deciduous)

— inputs: dbh, species, condition, street tree/non street tree, land use

CANOPY VALUATION
iTree Eco Output

annual values ($)	one time value ($)
air pollution removal	carbon storage
avoided runoff (interception)	structural value
carbon sequestration	
energy savings (only for residential areas)	

Pollutants:

- ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, particulate matter 2.5 microns

Benefit Estimate (removal rate)

-hourly tree-canopy resistances for O_3, SO_2 and NO_2 based on canopy deposition models

-removal of CO and PM2.5 based on average measured values from literature, adjusted depending on leaf phenology and leaf area

Value Estimate ($)

-local change in pollution concentration with health effects (US EPA Benefits Mapping and Analysis Program)

Nowak, D.J. 1995. Trees pollute? A "TREE" explains it all. In: Proceedings of the 7th National Urban Forestry Conference. Washington, DC: American Forests: 28-30.

Benefit estimate (Avoided runoff through interception):

- based on rainfall interception by vegetation

-only preciptation by leaves is accounted for in this analysis

Value Estimate ($)

-$0.07 per ft^3

Benefit Estimate: Distance and direction of trees was not field collected so assumptions were made to determine this calculation:

Using the average tree in Cambridge (Norway Maple at 9.7 dbh) in fair condition in partial sun, southeast of a house, saves $11 in energy cost per year. 40% of the canopy in Cambridge falls on residential property, so if we assume the 9.7 dbh trees has a canopy spread of 25' diameter and 40% of the canopy provides benefits to homes, this would be $413,138 in energy savings per year.

Value Estimate ($): $149.48 per MWH and $15.64 MBTU saved

Benefit estimate (Carbon removal)

— Estimated by average diameter growth for the appropriate genera, diameter class and tree condition

— Value Estimate ($): $171 per ton

CANOPY VALUATION

iTree Eco Output - one time values

Carbon Storage

— Benefit estimate: estimates above-ground and below-ground parts of woody vegetation. Biomass for each tree calculated using literature/measured tree data

— Value Estimate ($): $171 per ton

Structural value

— value of the physical resource itself/replacement cost of a similar tree

— valuation from Council of Tree and Landscape Appraisers (1992) and includes loss of property value

CANOPY VALUATION

Using Bartlett's 5% survey to obtain a snapshot of the forest, the total value of the urban forest in 2018 is $136 million

ANNUAL VALUE	x20	x34.65**	AVERAGE	BENEFIT
POLLUTION REMOVAL	$704 K	$1.22 M	$962 K	36,500 LB/YR
CARBON SEQUESTRATION	$133 K	$230 K	$181.2 K	1050 TONS/YR
AVOIDED RUNOFF	$60K	$104 K	$83 K	1.22 MILLION CU FT/YR
ENERGY	$413 K	$413 K	$413 K	
TOTAL BENEFIT	$1.3 M	$1.97 M	$1.64 M	
BENEFIT PER ACRE			$1551	

ONE TIME VALUE	x20	x34.65**		BENEFIT
CARBON STORAGE	$4.9 M	$8.5M	$6.7M	105 TONS/YR
STRUCTURAL VALUE	$93.4 M	$161.8 M	$127.6 M	
TOTAL BENEFIT	$98.3 M	$170.3 M	$134.3 M	
BENEFIT PER ACRE			$127.2 M	

OVERALL VALUE $136 M

*per iTree ECO for air quality, stormwater, energy, carbon sequestration benefits

** Based on canopy ares: Bartlett's 5% survey stated that canopy covered 30.47, which when extrapolated to 100% underestimates current canopy cover. If we were to consider that the 5% survey was actually representative of the canopy area, we would multiply the iTree results by 34.66 to arrive to the 1056 acres today

Relative Tree Effects

Carbon storage equivalent to:

- amount of carbon emitted in Cambridge in 10 days (estimated 1.4 mil tons/yr)
- annual CO2 emissions from 20,400 cars
- emissions from 8,360 single-family homes

Nitrogen dioxide removal equivalent to:

- annual NO2 removal from 500 cars
- 220 single family houses

Sulfur dioxide removal equivalent to:

- annual SO2 emissions from 2,060 cars

*refer to Appendix I of itree Eco output for assumptions

CANOPY VALUATION
Demonstrated tree benefits

Economic benefit:
Increased property value
Reduced expenditure on air pollution removal
Reduced expenditure on stormwater infrastructure
Saved investment in new power supplies
Reduced heating and cooling costs
Reduced time on housing market

Social benefit:
Increased quality of life (stress relief- survey study)
Health benefit – averting respiratory hospital admissions and premature death
Improved scenic quality
Providing a sense of place and identity
Creating seasonal interest
Providing privacy

Ecosystem services
Carbon storage and sequestration
Air quality improvement
Stormwater attenuation (reducing rate and volume of stormwater runoff, improving water quality, recharging groundwater, minimizing flooding damage)
Energy conservation
Habitat preservation
Noise reduction
Microclimate amelioration (reducing heat island, glare and reflection)

Non-quantifiable benefit per iTree

CANOPY VALUATION
Physical Health and Mental Wellbeing

- Reduces urban heat island
- Improved air quality
- Lower risk of diseases and mortality rate
- Lower stress levels
- Better cognitive function in students
- Improved attention among children
- Enhanced performance in the workplace
- Lower risk of mental health disorders

Source: Wolf, K.L., S. Krueger, and M.A. Rozance. 2014. Stress, Wellness & Physiology - A Literature Review.
In: Green Cities: Good Health (www.greenhealth.washington.edu). College of the Environment, University of Washington.

— More parks within 500m of a home, the lower the children's BMI at age 18.[1]

— Researchers from Aarhus University in Denmark found that growing up near vegetation is associated with an up to 55 percent lower risk of mental health disorders in adulthood.[2]

1. Wolch, J., et al., Childhood obesity and proximity to urban parks and recreational resources: A longitudinal cohort study. Health & Place, 2011. 17: p. 207-214.
2. (Engemann, et al., Residential green space in childhood is associated with lower risk of psychiatric disorders from adolescence into adulthood. PNAS, 2019 116 (11) p. 5188-5193.

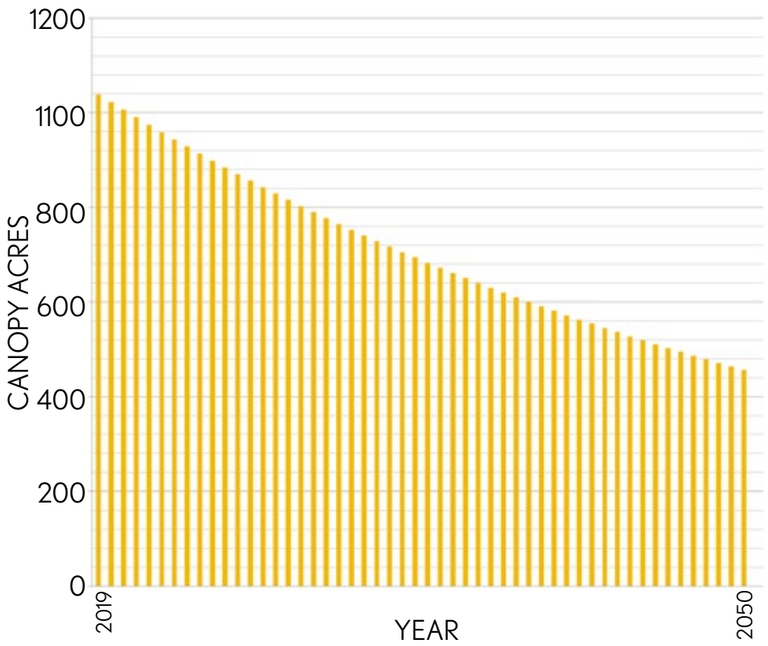
CANOPY VALUATION
Heat Island reduction

— Urban trees reduce air temperatures on summer days by 2-4F and cooling effect can be larger*

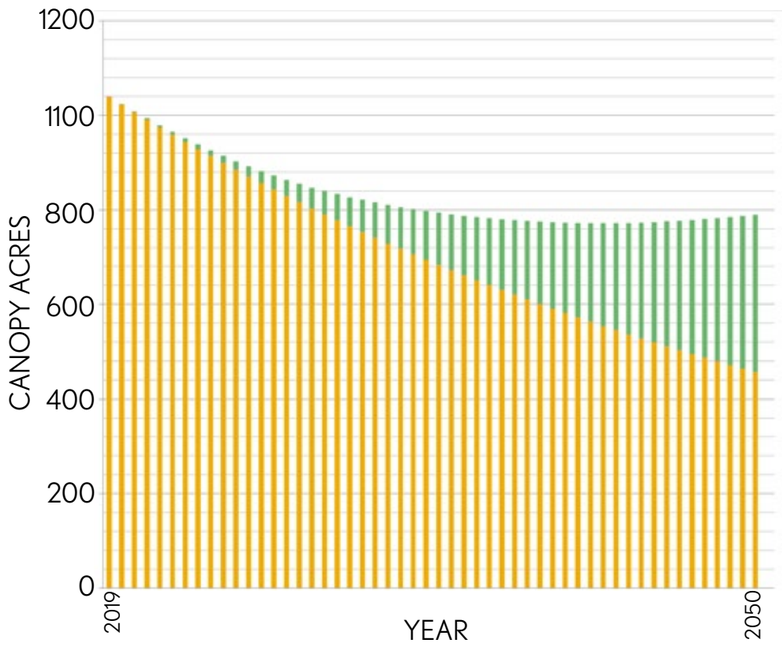
— Kleinfelder found 1% canopy increase results in 0.1 degree difference in ambient air temperature in a study for the Port neighborhood in Cambridge

*McDonald, R.I., et al., Planting Healthy Air: A global analysis of the role of urban trees in addressing particulate matter pollution and extreme heat. 2016, The Nature Conservancy: Arlington, VA.

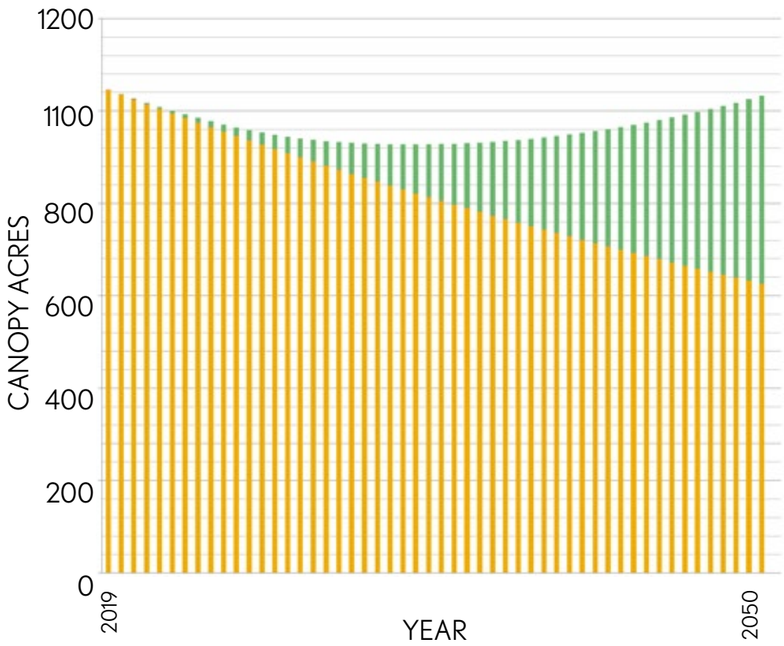
CANOPY VALUATION
Curbing Loss/Growing Canopy



Existing trend with current 400 tree planting rate



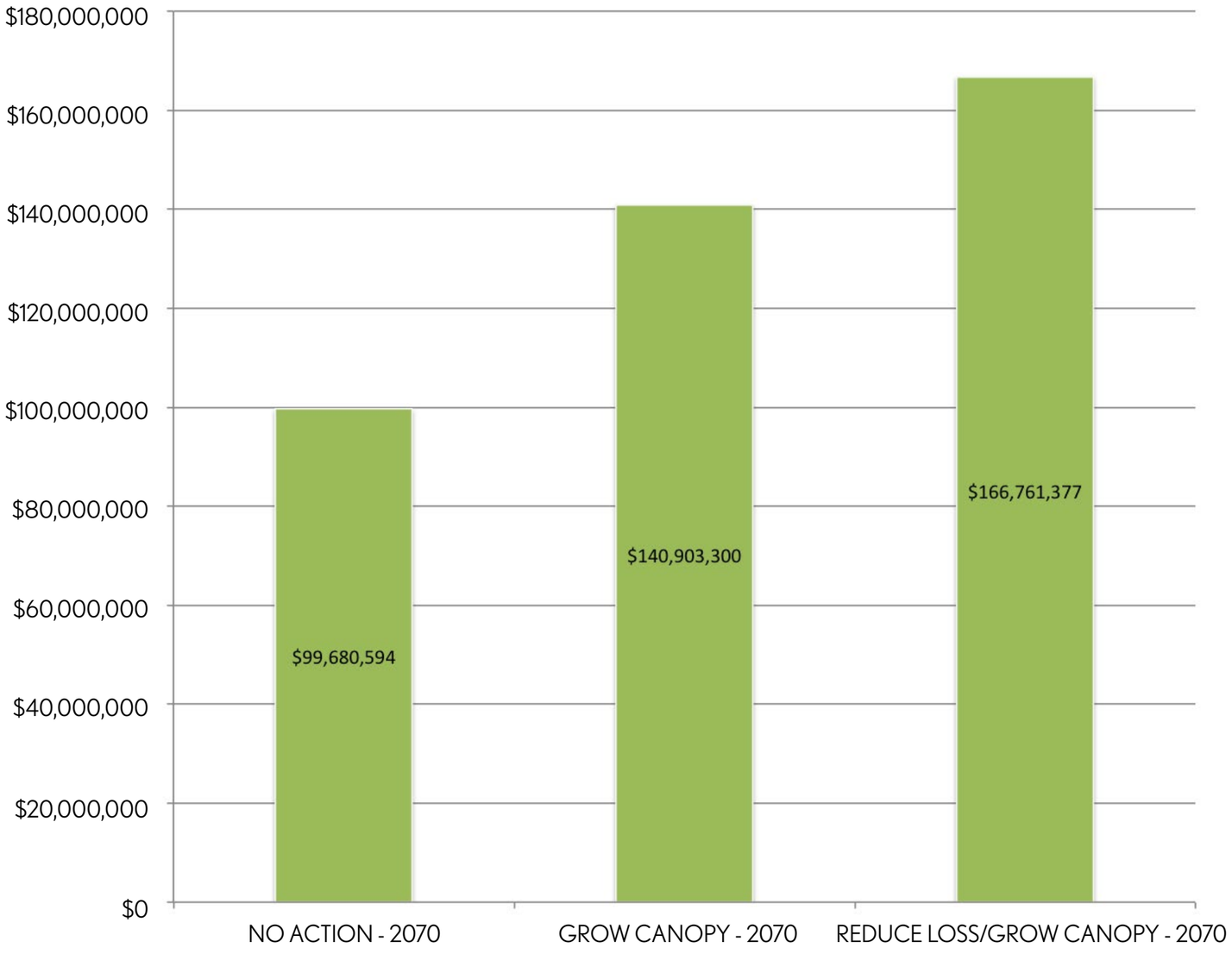
Plant 1,200 additional trees per year



Reduce Loss and Plant 1,200 additional trees per year

CANOPY VALUATION

Cumulative value of the forest under different canopy scenarios



*per iTree ECO for air quality, stormwater, energy, carbon sequestration, carbon storage and structural avlue

OUTREACH

FOREST RESILIENCY

CANOPY VALUATION

NEXT STEPS

Cambridge Urban Forest
Strategy Matrix

ACTION	in response to …	Policy 1 Enhance Current Tree Protection Ordinance	Policy 2 Formalize City Practices	Policy 3 Integrate Canopy Values into Planning and Zoning	Planning/Design 4 Leverage Envision Cambridge and CCPR planning studies	Planning/Design 5 Restrict Street Tree Planting to Only Suitable Areas	Planning/Design 6 Create New Typologies for Street Tree Planting	Planning/Design 7 Implement City-Wide Planting Plan to Focus Efforts	Planning/Design 8 Site New Parks/Open Spaces Strategically	Practices 9 Improve City Planting Practices	Practices 10 Improve City Maintenance and Care Practices	Practices 11 Implement Soils Management Program	Practices 12 Monitor Tree Canopy and Adapt	Outreach/Other 13 Invest in Educational Programs	Outreach/Other 14 Build Community Partnerships	Outreach/Other 15 Seek Alternative Green Strategies
Curb loss	Mature canopy decline	•													•	
	Land conversion	•		•	•							•			•	
	Residential removals	•		•										•	•	
	Poor tree condition	•	•	•		•				•	•	•		•	•	
	Narrow sidewalks			•		•										•
	Inadequate soil volume			•		•				•		•				
	Understanding the value of trees													•	•	
Grow canopy	Equity in distribution of canopy cover	•	•	•	•		•	•	•	•	•	•	•	•	•	
	Shading and cooling / pedestrian thermal comfort	•	•	•	•		•	•	•	•	•	•	•		•	
	Environmental quality / wellbeing and public health	•	•	•	•		•	•	•	•	•	•	•		•	•
	Ecological connectivity	•		•	•		•	•	•	•	•	•	•			•
	Diversity of forest composition						•	•		•			•			
	Disaster response preparedness				•			•		•			•	•	•	•

PUBLIC COMMENT

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TASK FORCE MEETING SCHEDULE

JUNE 12	Introduction
JUNE 28	RESEARCH: Regulation and Management
JULY 26	RESEARCH: Goal Setting
AUGUST 30	RESEARCH: Ongoing Analysis + Climate Modeling
SEPTEMBER 27	RESEARCH: Summary of Findings
OCTOBER 25	Cancelled
NOVEMBER 29	TESTING: Baseline Change Model
DECEMBER 20	DRAFT: Policy
JANUARY 31	DRAFT: Policy
FEBRUARY 28	DRAFT: Planning and Practice
MARCH 28	DRAFT: Outreach, Cost / Benefit
APRIL 25	DRAFT: Prioritization

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