

Tuesday, May 21, 2013

NEW ENGLAND NEWSPAPER OF THE YEAR

TELEGRAM & GAZETTE

Worcester's Trees After Longhorned Beetle Infestation

Trees under multiple threats

By Deborah Martin and John Rogan

AS I SEE IT

The May 9 story in the Telegram & Gazette about the continuing, successful battle against the Asian Longhorned Beetle infestation in Worcester is a reminder that the season of beetle inspections and sightings is upon us. The concern about ALB is not only

As we continue to monitor our urban forests for ALB, we should remember that tree losses occur every day as we grow and change our regional land cover.

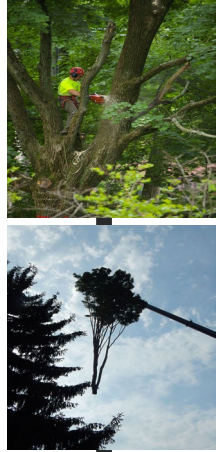


Dr. John Rogan *Clark University*
Dr. Nicholas Geron *Salem State University*

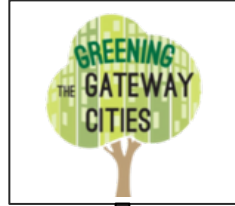


ston, Holden, Shrewsbury, and Such loss is pervasive, with no ing to tree cover as it typically part of A has been.

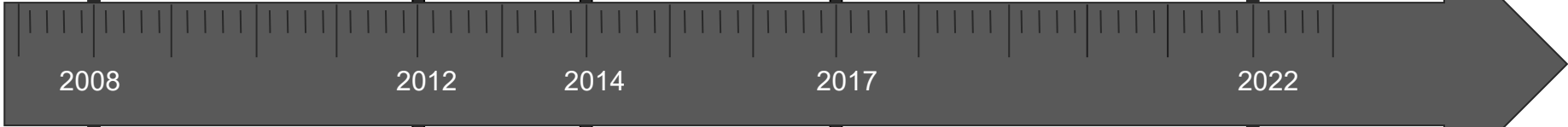
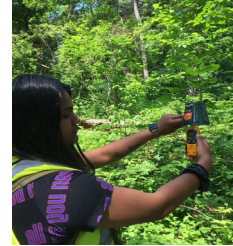
Worcester's Urban Forest: Past Observatory Research



HERO joins collaboration with USDA and DCR



HERO partners with GGC



2008

2012

2014

2017

2022

LB eradication program begins



HERO begins survey in LB study area



HERO studies juvenile tree health, air quality, and stewardship

Tree Benefits: Past HERO Research Contributions

Temperature impacts

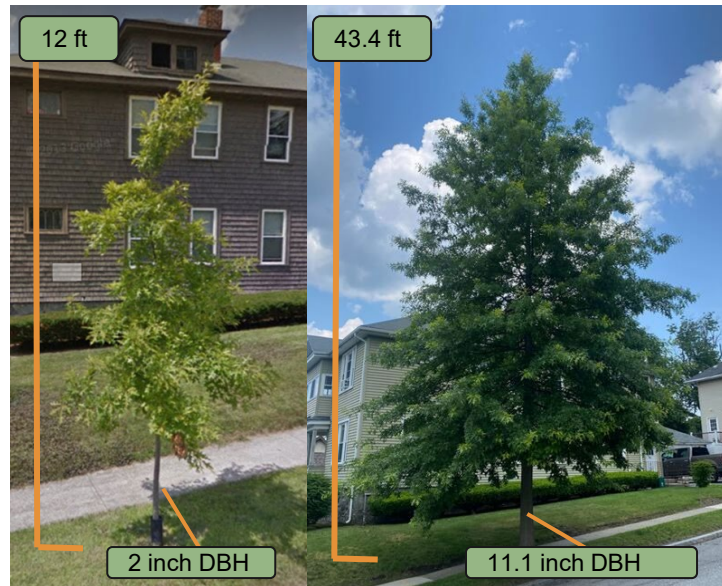
10% increase in impervious surface = 1.66 °C increase in land surface temperature
(Rogan et al., 2013)

Summer warm period was extended in tree canopy loss areas by 15 days
(Elmes et al., 2017)

Policy contributions

Adaptive capacity to address tree loss from LB is determined by relationships of individuals and organizations across scales
(Palmer et al., 2014)

State funding of tree stewardship can enhance tree survivorship
(Breger et al., 2019)



Pin Oak (*Quercus palustris*) planted by the DCR in 2011 on Dorothy Ave as photographed in 2014 and 2023

Economic benefits

Tree planting density of three trees per acre achieved the largest energy savings and \$1520 in total annual ecosystem savings from juvenile trees
(Moody et al., 2021)

Tree canopy density of 31% near a house results in \$1,891 increase of property value
(Wilkins et al., 2018)

Longhorned Beetle Related Tree Canopy Loss

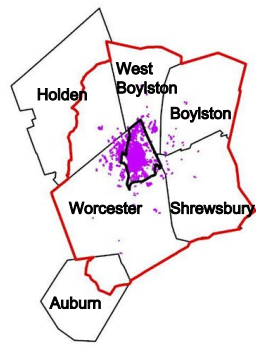
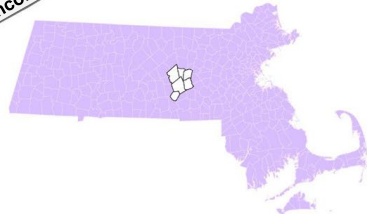
- LB Regulation Zone
- Tree Canopy Loss due to LB

Greendale

North Lincoln Street



0 0.25 0.5 1 Miles



Worcester Country Club

Mountain Street East

West Boylston St

Quinsigamond Community College

Burncoat St

Saint-Gobain

Lincoln Street

Burncoat

Great Brook Valley Area

Longhorned Beetle in Worcester, MA

- Longhorned Beetle (*A. glabripennis*) is native to China and Korea and prefers Maple species. First discovered in **Worcester in 2008** (Danko et al., 2016)
- Worcester's urban canopy is contiguous with the hardwood/maple forests of the Northeast. **Over 60% of the street trees in 2008 are Norway Maple** (Freilicher, 2008)
- **~34,196 trees removed** by the USDA working with the Department of Conservation and Recreation (MA) Oct 2014 (Danko et al., 2016)
- LB removal counted for 25% of tree loss between 2008 and 2010 (urban development was 47%) (Hostetler et al., 2013)

Replanting Worcester

- Planting over 30,000 trees by 2014
 - DCR Planted 17,000 trees on private property
 - City of Worcester and Worcester Tree Initiative Planted 13,000 trees on public land including streets
- Goals of replanting:
 - Not replicate mistakes of the past and plant increased **biodiversity** (Elmes et al., 2018)
 - **Replacement** of the trees lost to LB (Myers et al., 2023)



Photo: Worcester Telegram and Gazette in 2016

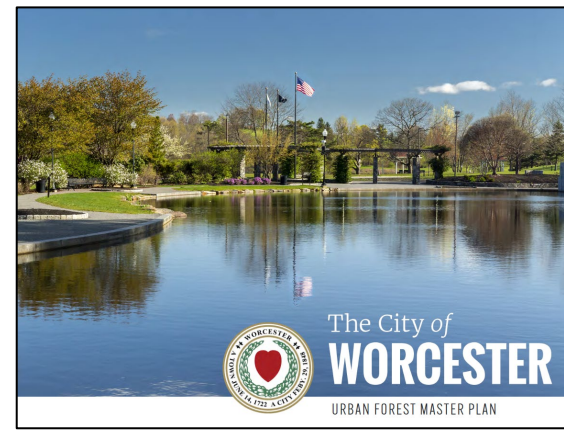
Example of Tree Planting



Red Oak Street Tree

Urban Forest Developments Post LB Outbreak

- Heightened awareness of benefits from trees and loss of street trees
- Established Green Worcester Advisory Committee and Urban Forest Committee
- Urban Forest Master Plan (*draft*)
 - 2005 and 2022 Street Tree Inventory



NEWS

Residents object to plans to cut 100 trees from Newton Square area for repaving project

[Cyrus Moulton](#) Telegram & Gazette

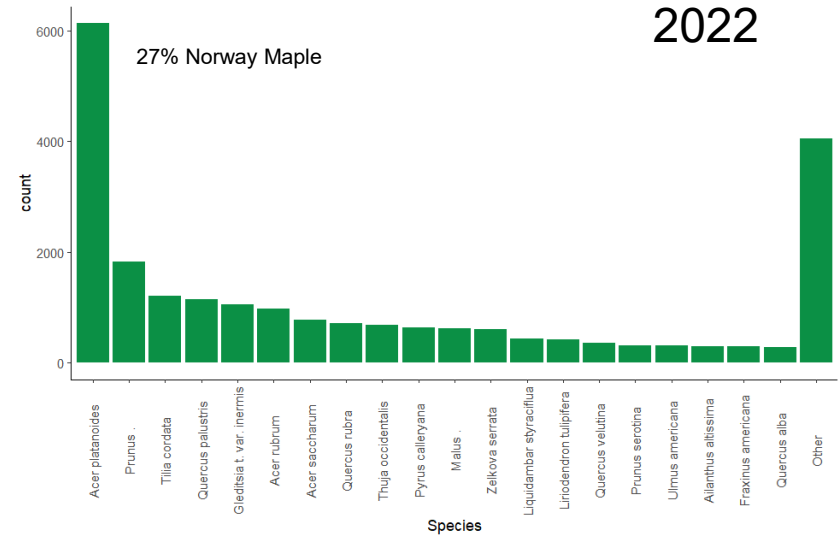
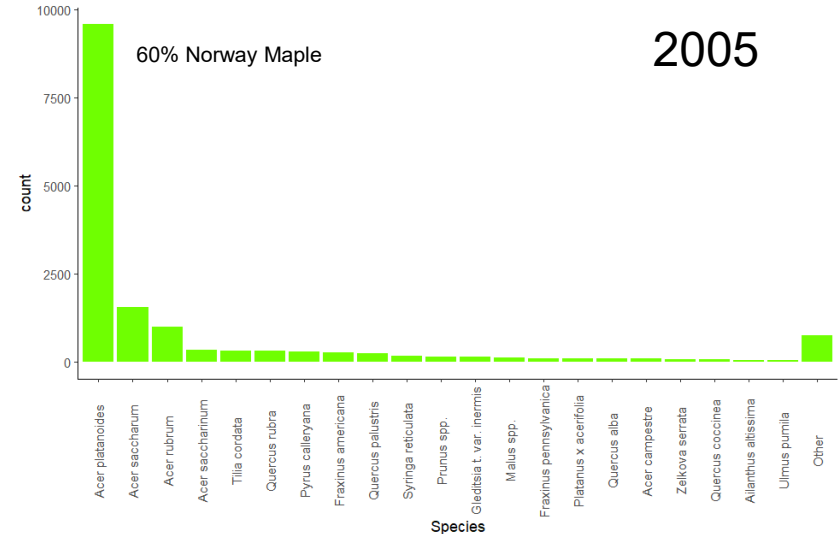
Published 9:10 a.m. ET June 17, 2021 | Updated 4:49 p.m. ET June 18, 2021



Pin Oak (*Quercus palustris*) planted by the DCR in 2011 on Dorothy Ave as photographed in 2014 and 2023

Worcester Street Tree Surveys

- **17,113 trees** in 2005 Street Tree Census by Davey Tree
- **22,943 trees** in 2022 Street Tree Census by Davey Tree
- Biggest changes in the Norway Maple *and* other maple genus species
- Large increase in ‘Other’



Worcester Street Tree Data

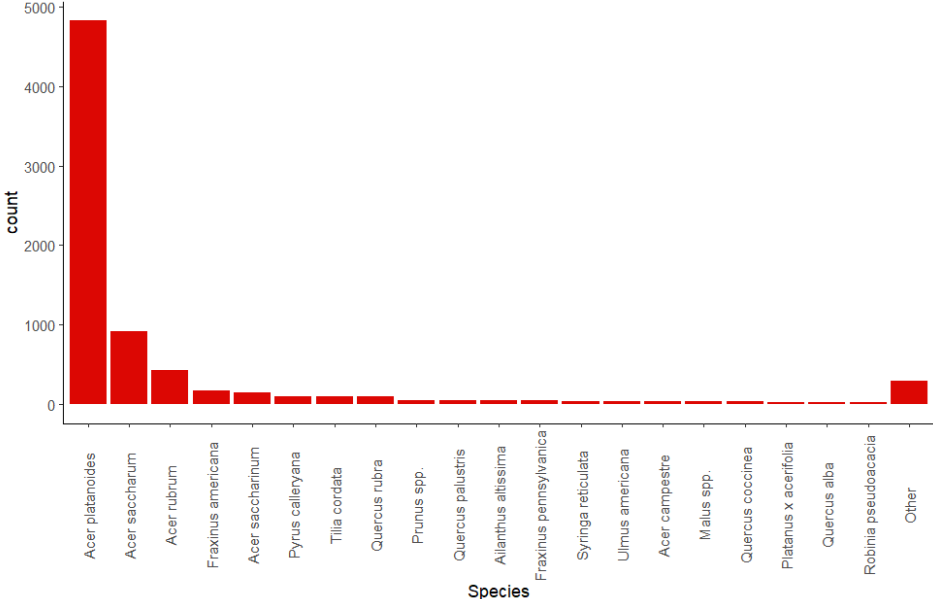
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Changes to Street Tree Population

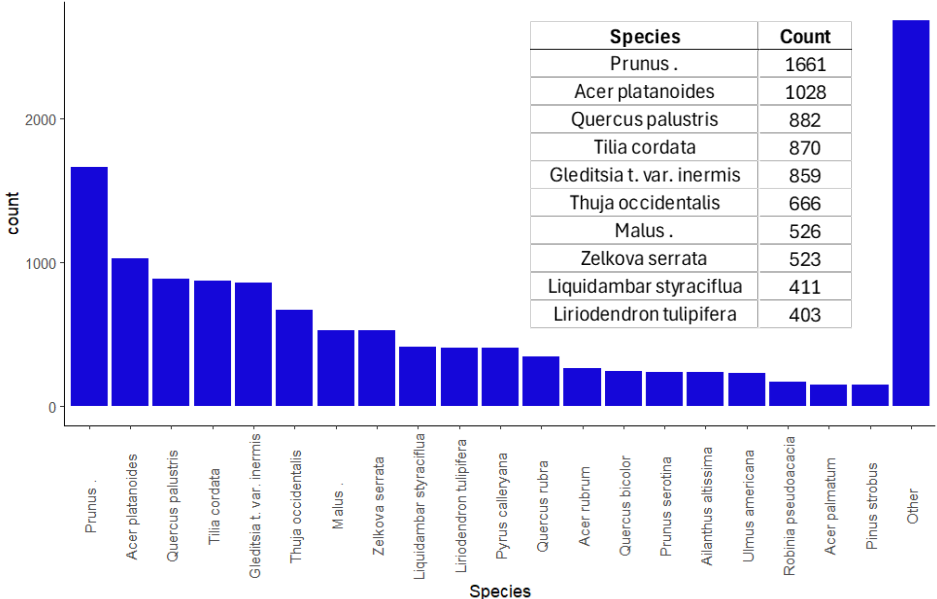
Tree Mortality

N = 7532 (44% of trees in 2005)



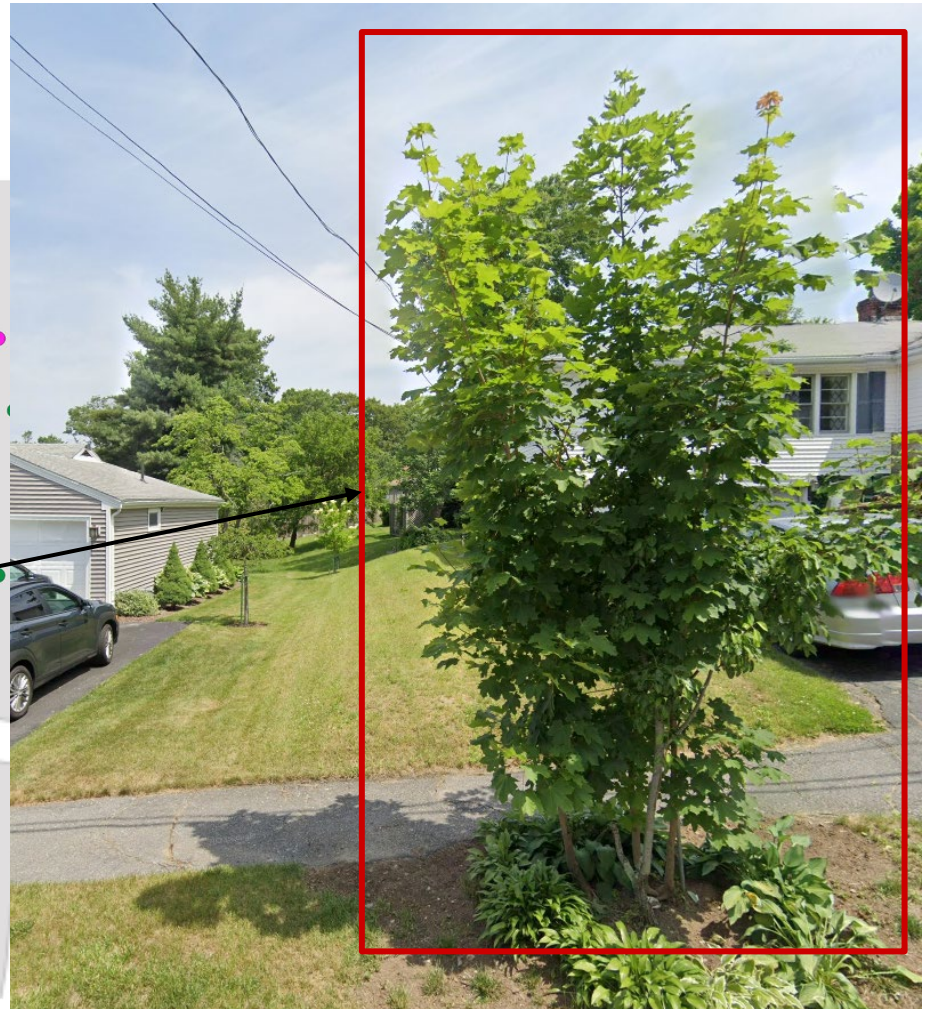
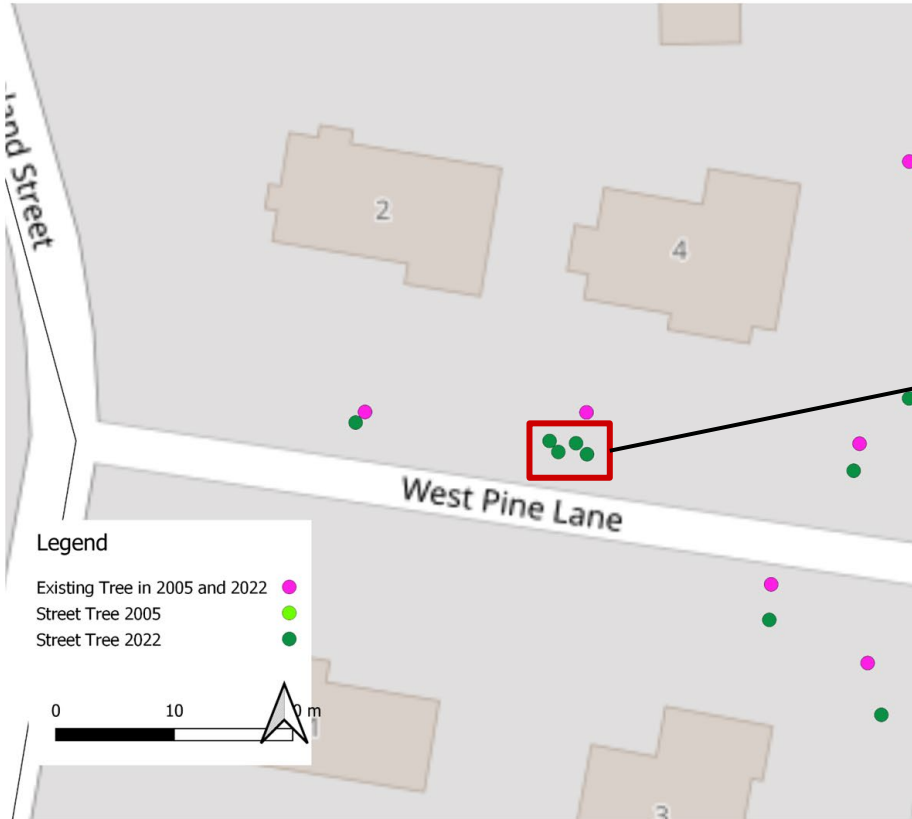
New Tree Planting

N = 12911 (56% of trees in 2022)



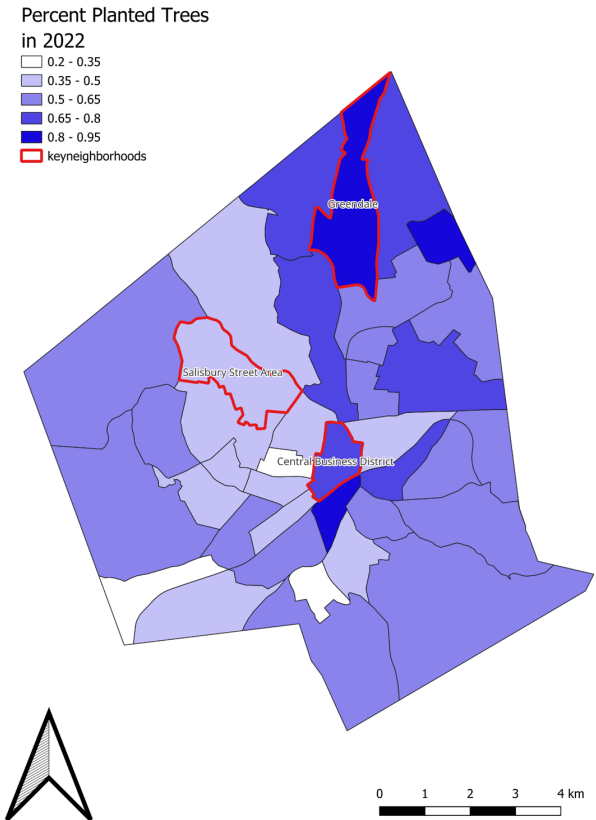
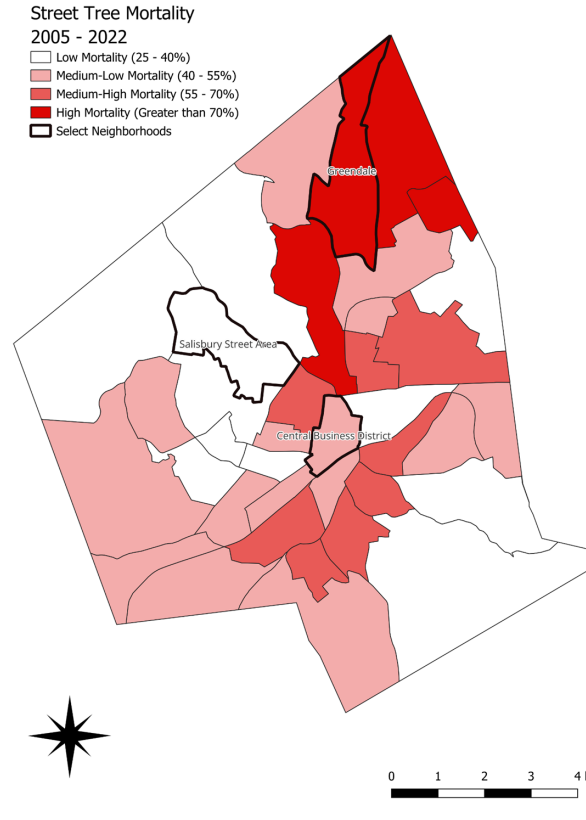
Resilience of Norway Maples

Zombie Trees!



Impact of LB on Worcester's Street Trees

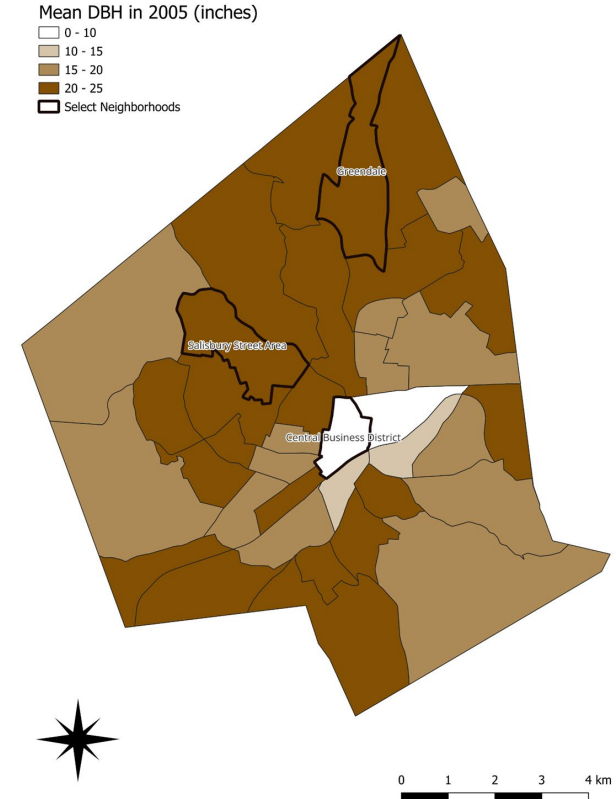
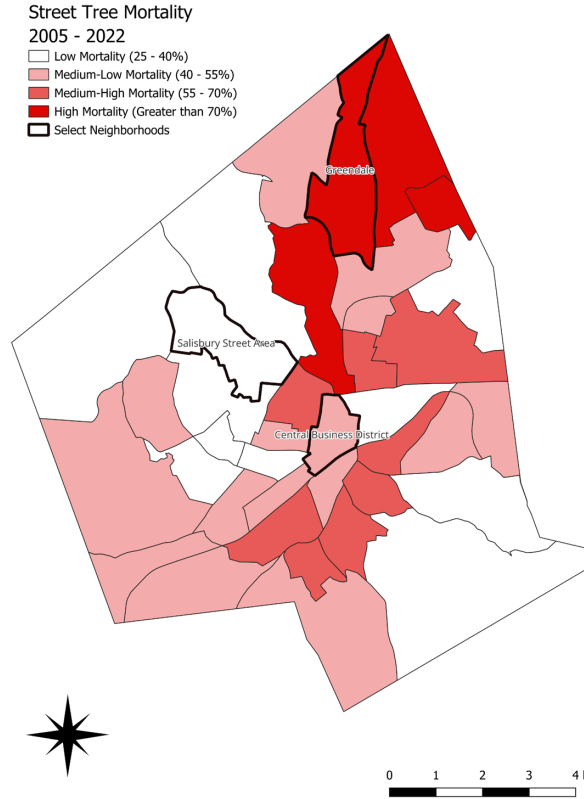
- Street tree mortality is concentrated around Greendale (LB infestation) and Central Business District
- Planting by neighborhood mirrors neighborhood tree mortality



Impact of LB on Worcester's Street Trees

Size of tree is very different in each area of high street tree mortality

- Central Business District is very small trees
- Greendale the trees were much larger.

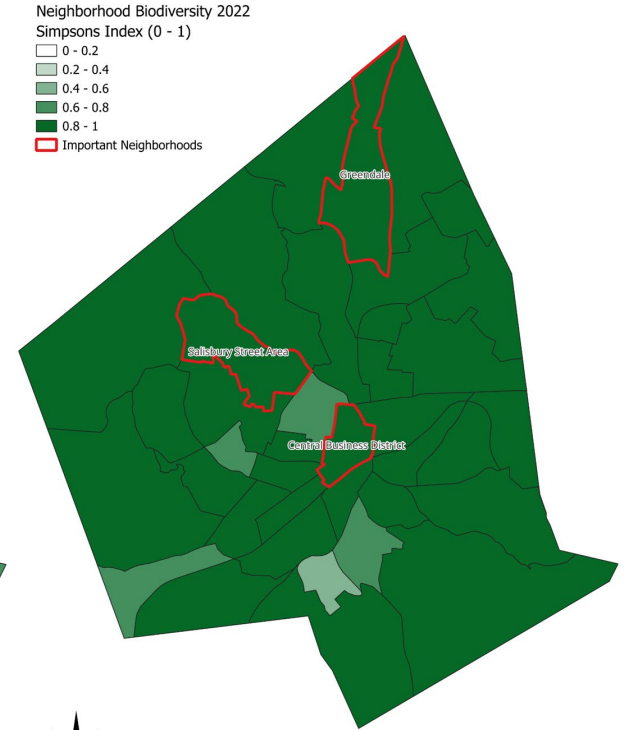
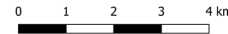
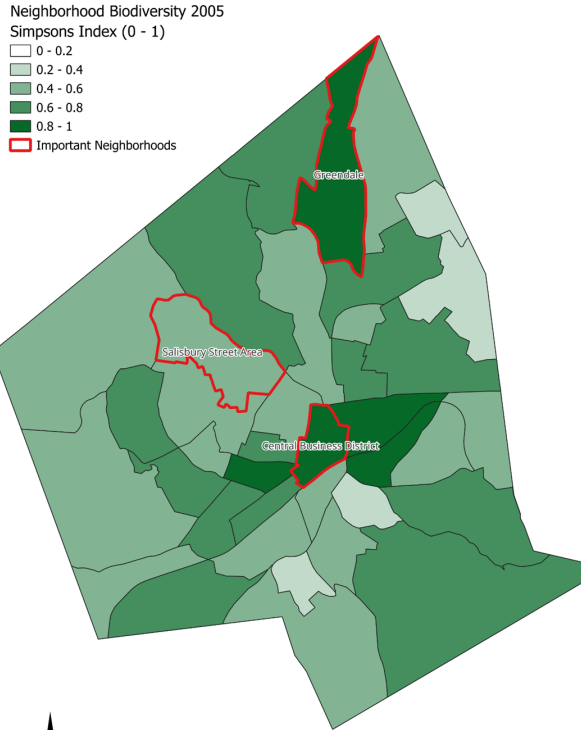


Biodiversity of Street Trees

Simpsons Index combines number of individuals and number of species present

Large increase across the city in biodiversity

Fulfills a goal of increasing the resilience of the urban forest to pests/invasive species

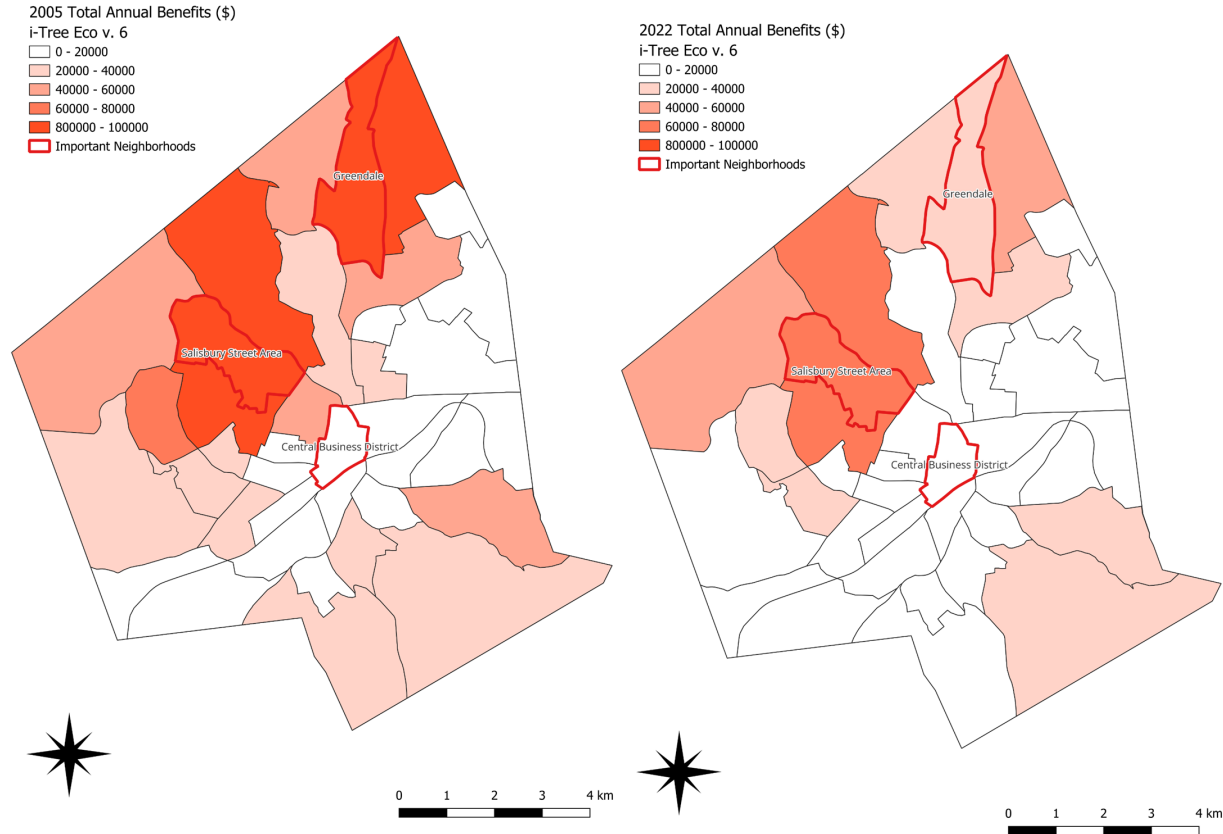


Flux of Total Annual Benefits from 2005 to 2022

Total annual benefits have declined since 2005 (likely due to smaller trees)

- \$1,410,854 in 2005
- \$689,733 in 2022

Distribution of ecosystem services has stayed largely consistent



Burncoat and Greendale Resident Perceptions of Tree Benefits

What are benefits of having trees on your property?

“It throws beautiful shade for my tenant ”

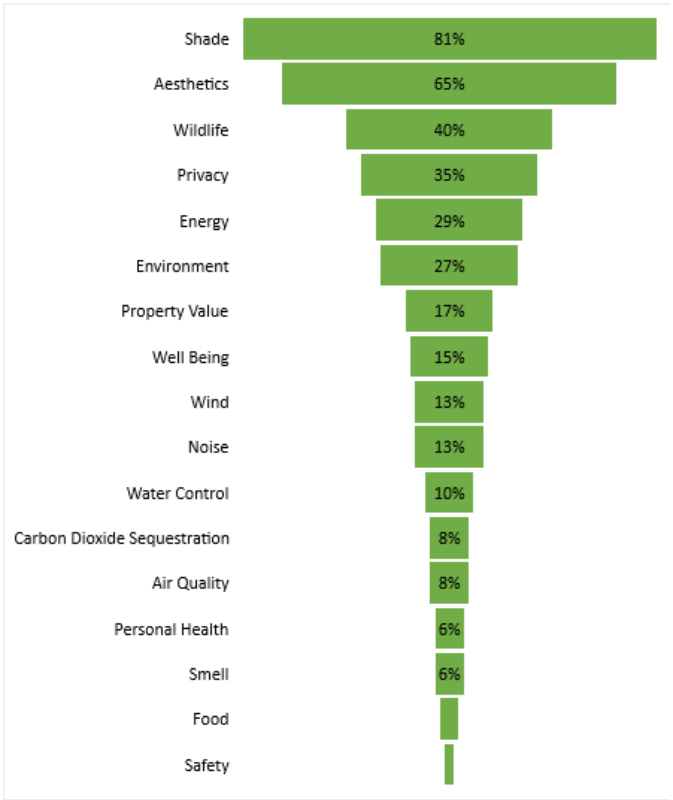
“I just find trees beautiful ”

“I like the birds and the birds like the trees”

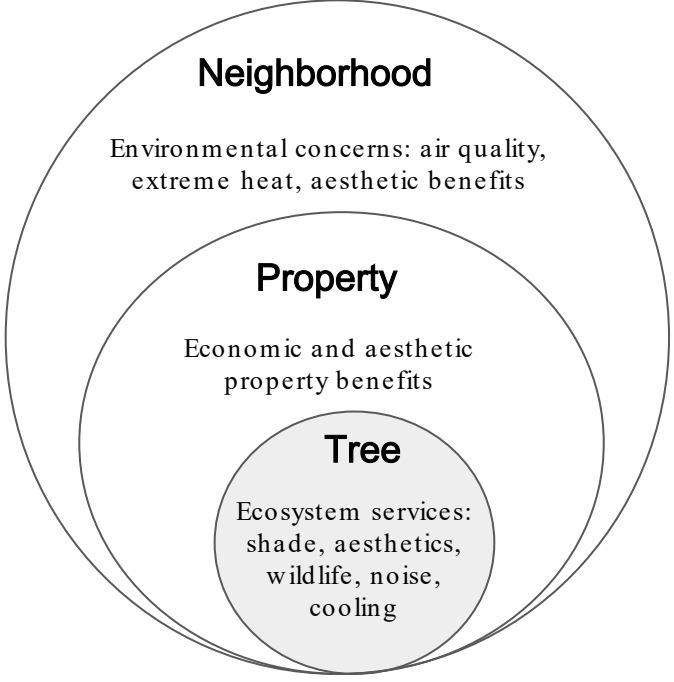
“I want a live fence . So I chose that arborvitae for the privacy”

“Every tree is worth 10 air conditioners ”

“By planting the trees closer to the road, we get people to slow down”



Tree Benefits by Scale



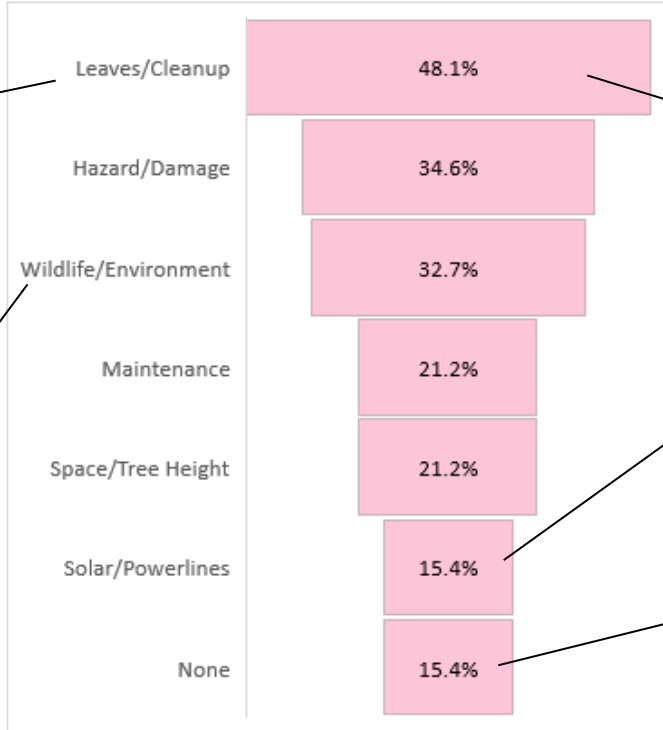
Burncoat and Greendale Resident Perceptions of Tree Challenges

What are the challenges of having trees on your property?

“We had two giant trees in the front, that, every **storm** would **drop limbs**, and we'd have to **drag them out of the street.**”

“**Squirrels** can climb up that tree and then **they can get into the gutter**. We've had some birds in the attic in this house”

“That big tree over there is **blocking the sun** and my pool by the time I get out of work every day.”



“The challenge is that all of the **leaves** and anything else that sheds from the tree ends up on the cushions of my patio furniture. It's like **you can never keep it clean.**”

“This one's starting to become concerning, 'cause **it's kinda half dead** and it's getting **closer to the power lines** and what not.”

“**There is no challenge**, because even taking care of a tree is relaxing.”

Common Barriers to Tree Stewardship

What difficulties have you encountered caring for your tree(s)?

“Raking the leaves was often a challenge”

Capability

59.6%

“I’m disabled now , unfortunately. And the maintenance is harder ”

No Barriers

32.7%

“I don't care . You know, so, so like I said, a labor of love ”

Interest

9.6%

“Definitely money . It costs money to do it”

Safety

7.7%

“We felt like the tree might hit us”

Pests

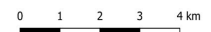
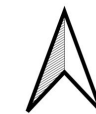
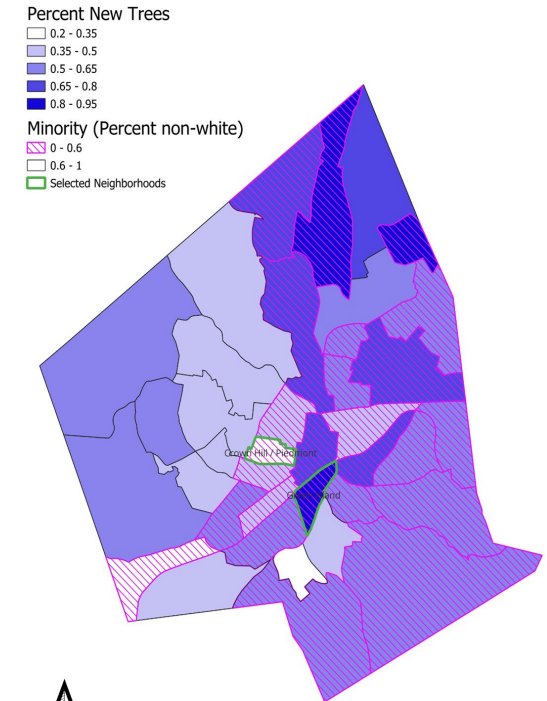
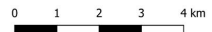
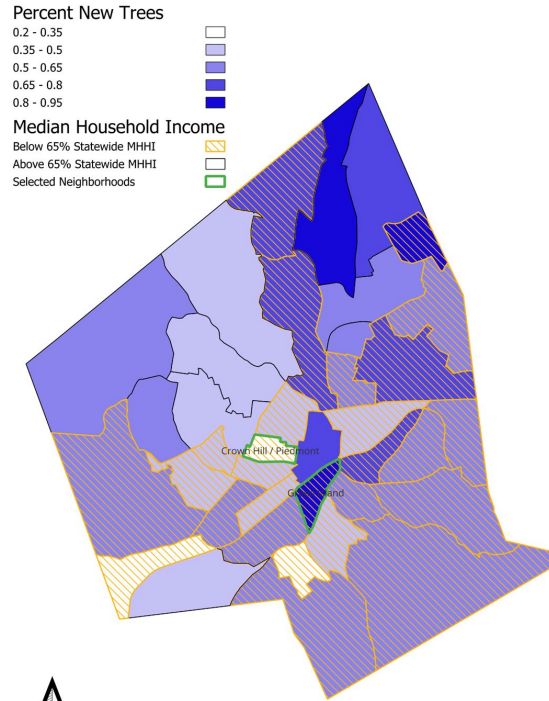
City Issues

Environmental Justice Implications

Piedmont is a residential neighborhood

Green Island is the home to the Worcester Red Sox and many other commercial venues.

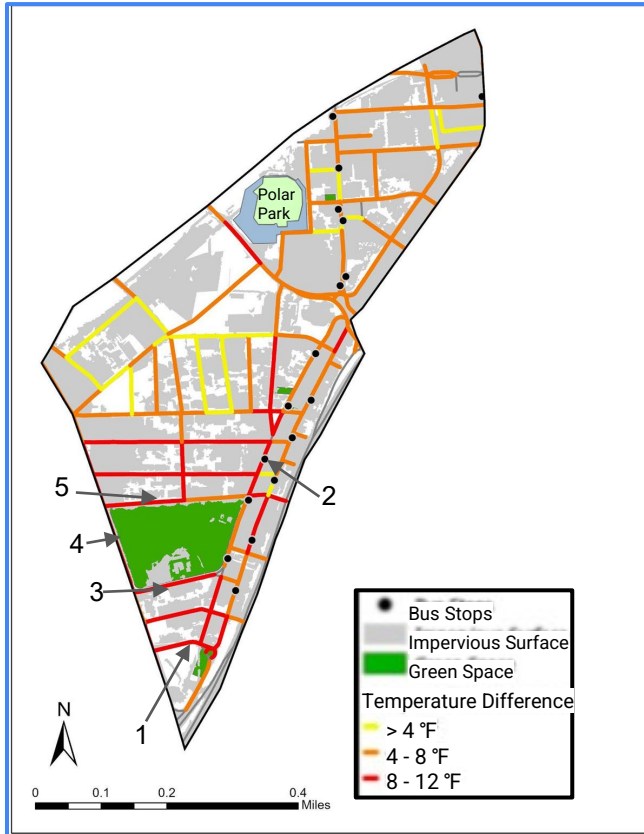
Commercial development goes hand in hand with new tree planting outside of LB impacted neighborhoods





Air Temperature

Temperature Difference from Worcester Airport by Street Segment



Hottest Sites by Temperature Difference:

1. Arwick Ave (+10.9°F)
2. Harding St (+10.7°F)
3. Canton St (+10.7°F)
4. Quinsigamond Ave (+10.4°F)
5. Sigel St (+10.2°F)

Honorable mention:

Ellsworth St (9.1°F)

Average: +6.2°F



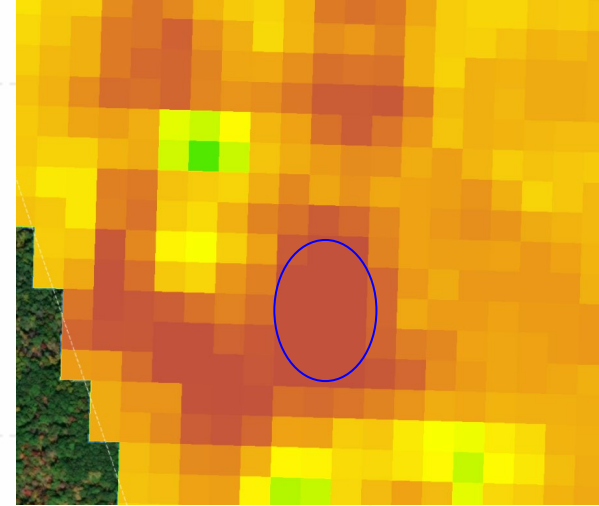
Tree Loss to Parking Lot Example



Site: Worcester State University
Satellite Resident Parking



5.14 acres of area deforested



Increase of 11° F from 2010
to 2020



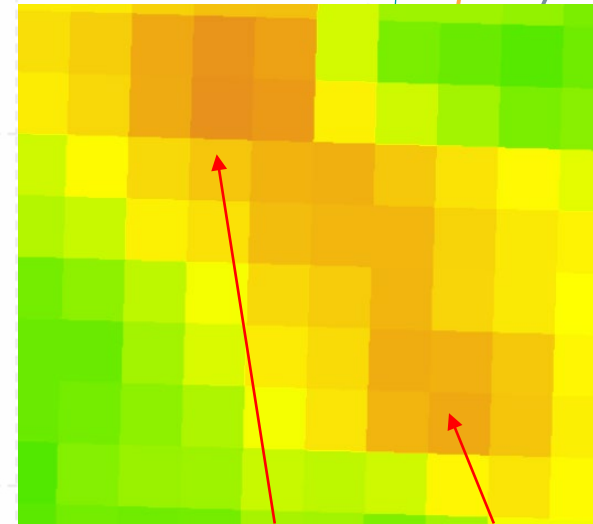
Tree Loss to Development Example



Site Names: Silver Linden Lane and Sourwood Circle



14.64 acres of deforested area

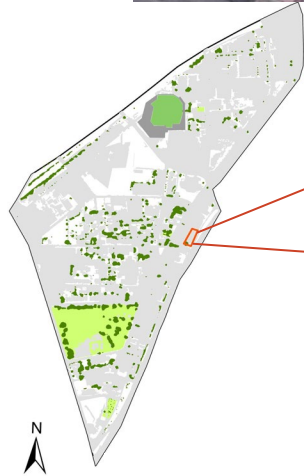


Increase by 10° F and 8.7° F from 2010 to 2020



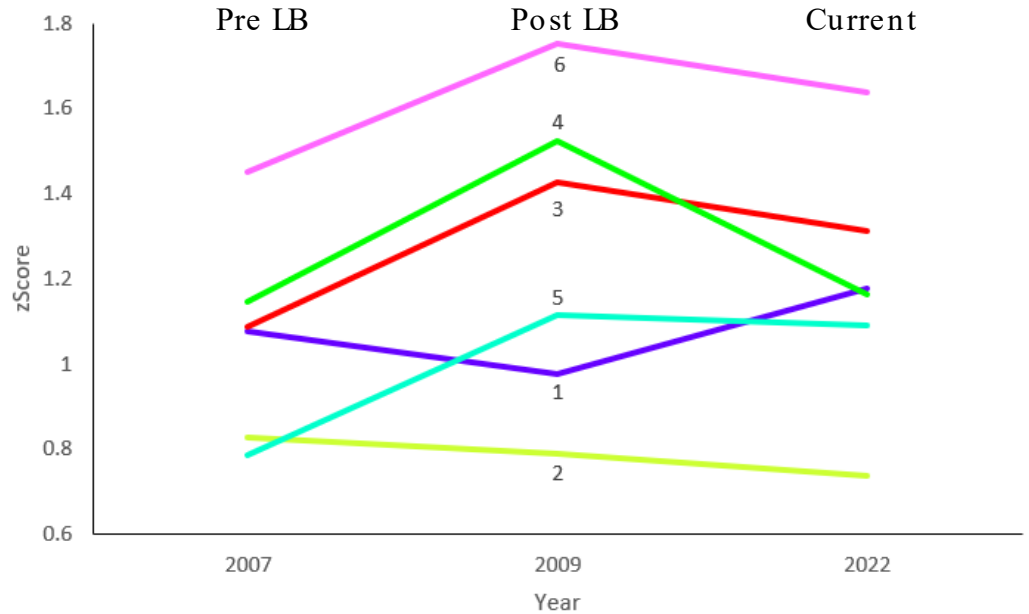
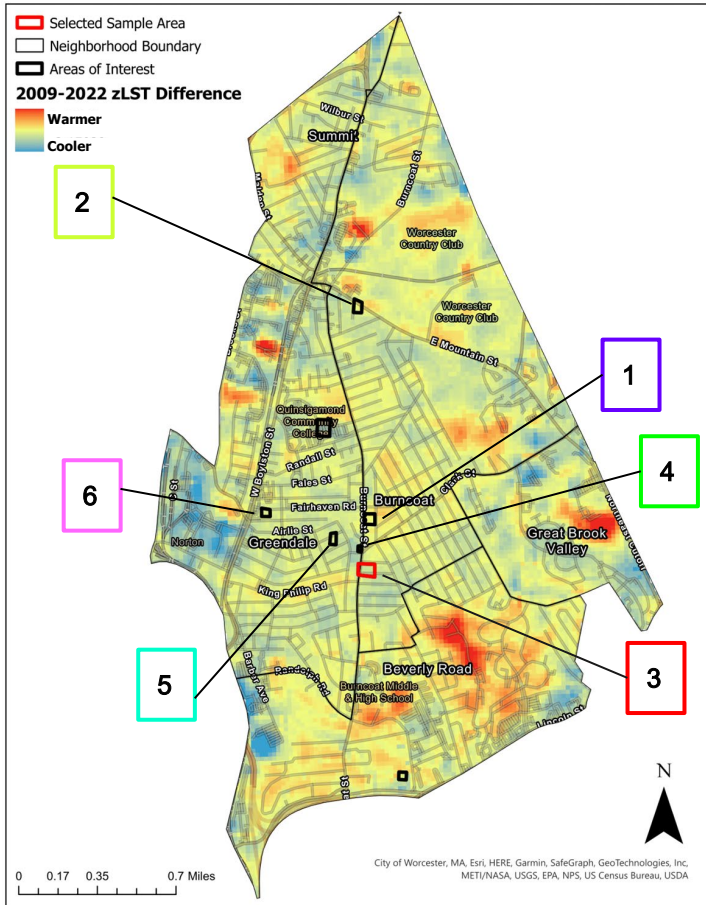
For every 0.411 acre of roof painted white and/or installed with solar panels and/or **tree canopy**, temperature decreases by 1° F

Miyawaki Forests:
McGrath Parking : 0.15 acres
Plumley Village: 0.23 acres



61 Millbury Street,
OSP Parking Lot
0.405 Acres

Tree Planting Impact on Surface Temperature



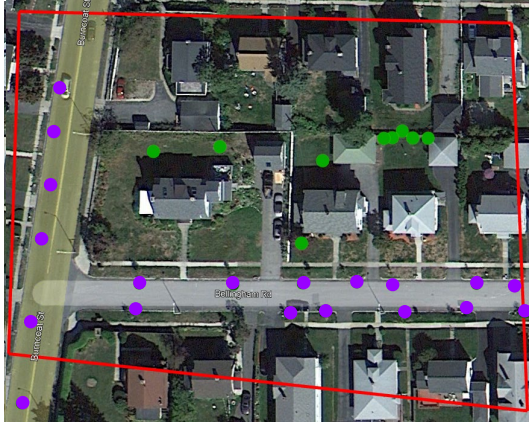
Residential areas with lots of removals get sharply warmer from 2007 -2009, slowly cool following replanting

Satellite Images of Selected Sample Area 3

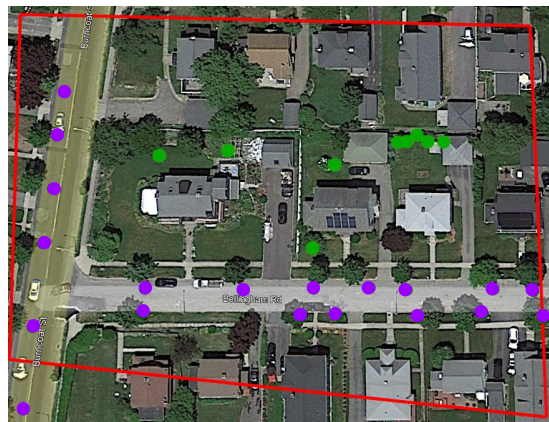
7/2007 Pre-LB



9/2010 - During Planting

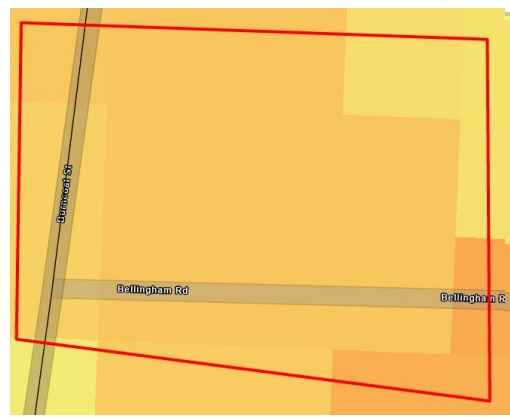


6/2022 - 13 years post LB

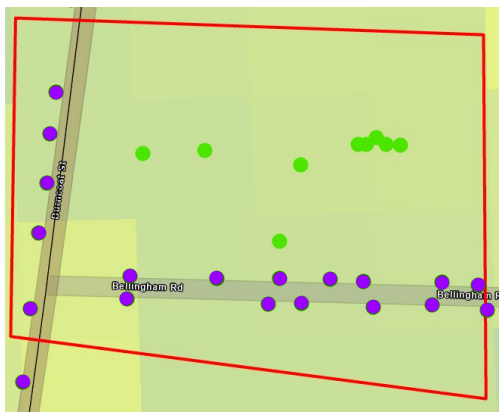


Land Surface Temperature (zLST) Difference

Between 2007 - 2009



Between 2009 - 2022



Warmer

Cooler

DCR Private Trees

WTI Street Trees

Discussion and Next Steps

1. Tree Planting is highest in neighborhoods with the most tree loss. More tree planting is needed in residential neighborhoods not impacted by LB
2. Tree Planting has increased biodiversity in every neighborhood making Worcester much more resilience to invasive pests/diseases
3. Worcester residents value the benefits that trees provide but more is needed to support residents who lack means/knowledge
4. Tree loss continues to dramatic impact on land surface temperature.



HERO Fellows Measuring a Street Tree in Green Island Neighborhood

Thank you!

- Mollie Freilicher, Colorado State Extension Program
- Dr. Deborah Martin, Clark University and HERO Professor
- HERO 2021 and HERO 2023 teams
 - Apple Gould-Schultz, Caleigh McLaren, Sarah Hughes, Madeline Regenye, David Henriques, Jason Andrews, Clio Bate, Aaron Richmond-Crosset, Adlai Nelson, Amritha Pai, Caleb Kluchman, Ksenia Smart, Ramón Colón, Tanner Honnef
- Margaret O'Leary and Margaret Ploomin, College of Holy Cross Environmental Studies majors in class of 2023
- Davey Tree Company



New Honey locust street trees
in the Central Business District