Stakeholder Summit 2016

Human Environment Regional Observatory

July 14, 2016
Outline

- **Introduction**
  - Tree planting initiatives
  - HERO program

- **Tree Survey**
  - Data collection
  - Findings

- **Interview and Survey Response**
  - Data collection
  - Emerging themes

- **Summary and Future Directions**
Our Team

Members:
• 5 Clark undergraduate fellows
• 2 Clark graduate students
• 2 Professors

Activities:
• Attended training sessions
• Measured tree health
• Conducted interviews with residents and reviewed online surveys responses
• Assessed implications of all data

Rishi Singh, Eli Simonson, Tyler Anderson, Emma Freud, Savannah Sanford
Initial Goal:
Plant 30,000 trees to replace those that were cut in the ALB Quarantine Zone (Worcester, Boylston, West Boylston, Shrewsbury, Holden, and Auburn)

Organizations:
• The Massachusetts Department of Conservation and Recreation (DCR) assists communities and nonprofits to manage community trees and forest ecosystems
• The City of Worcester plants street trees in communities affected by ALB
• Worcester Tree Initiative (WTI) promotes urban forestry and stewardship in the City of Worcester and surrounding communities. Provide tree giveaways.
Benefits of Trees

- Energy
- Wildlife
- Property Value
- Community
- Air Quality
- Noise
The HERO Program

The Human Environment Regional Observatory program analyzes the causes and consequences of global environmental changes at local scales

**Past Research:**
- Beetle Impact
- Place Making
- Initial Tree Planting Assessment
- Resident Experience

**Current Research:**
- Tree Planting Assessment
- Resident Experience
- Street Tree
Study Objectives

1. Characterize the overall health and survivorship rates of juvenile trees planted by the DCR, mostly at residential homes

2. Characterize the overall health and survivorship rates of juvenile trees planted by the City on streets

3. Characterize residents’ experience with tree planting initiatives in Worcester (conducted by the DCR, WTI, and City)

HERO students planting a tree on Birch Street
Data Collection

Surveyed trees
- 318 DCR trees
  - (Planted Fall 2010 – Spring 2012)
- 539 street trees
  - (Planted Fall 2009 – Spring 2015)

Interviews
- 21 interviews

Surveys
- 34 and ongoing

Rishi Singh measuring the DBH of a tree in Main South
Research Questions

- What is the current survivorship of the planted trees?
- What is the current overall condition and composition of the planted trees?
- What are the residents’ experiences with the tree planting process?
- Who is participating in the planting process and what new areas should be prioritized?
Sampling Design

**DCR Sampling**
- Develop Dataset (17,000 points) →
  remove arborvitae species →
  randomized sample of 345 trees → 318 accessible

**Street Tree Sampling**
- Non-probabilistic convenience sample
- Blocks chosen from a list of WTI watered trees
- Created street tree transects → measured 539 juvenile trees along transects
DCR Sampling Design
Street Tree Transects

Burncoat Area

Columbus Park & Main South Area
2016 Study Area

Distribution of Full Sample by City/Town

- Holden, 3.92%
- Shrewsbury, 2.72%
- Auburn, 0.87%
- West Boylston, 5.23%
- Boylston, 6.43%
- Worcester DCR, 15.47%
- Worcester Street, 65.36%

Quarantine Zone

Street Tree Transects Collected 2016
DCR Yard Trees Collected 2016
**Tree Assessment Characteristics**

**Name(s):**
- Savannah Smith
- Rishi Singh
- Tyler Anderson

**Training:**

**Date:** 6/30/16

**Tree ID #:**

**Address:** 50 Coventry Rd

**Town:**

**Cross St.:** Bay State

**GPS Loc:**

**Site Type:**
- Sidewalk Cut-Out
- Sidewalk Grass Strip
- Front Yard
- Back Yard
- Median
- Park
- Parking Lot
- Natural Area

**Land Use:**
- Single-family
- Institutional
- Multi-family
- Maintained Park
- Commercial
- Natural Area
- Industrial
- Cemetery

**Species:** Oak

**DBH:** 2.08 in

**Height:** 14' 0"

**Width:** 11' 3"

**Date Planted:**

**Mortality Status:**
- Alive
- Standing Dead
- Removed/Missing
- Unknown

**Mortality Status Notes:**

**Crown Dieback:**
- 1-25%
- 26-50%
- 51-75%
- 75-100%

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-25%</td>
<td>3' 5'</td>
</tr>
<tr>
<td>26-50%</td>
<td>+ 15' 4'</td>
</tr>
</tbody>
</table>

**Crown Transparency:**
- 1-25%
- 26-50%
- 51-75%
- 75-100%

**Condition:**
- Good
- Fair
- Poor
- Critical

**Time to measure:**

---
Size Metrics

Height

DBH

Width

4.5 feet
Crown Dieback

1-25%

26-50%

51-75%

76-100%
Other Health Characteristics

Standing Dead

Basal Sprouting

Trunk Damage

Pest Damage
Overall Rating

Good

Fair

Poor

Critical
Investigating DCR Trees

• Species Composition of DCR Trees

• DCR Tree Survivorship
  • Native vs. Non-Native Survivorship
  • Shade vs. Ornamental Survivorship
  • Site Type Survivorship

• Species Specific Analysis
  • Species Specific Survivorship
  • Growth Analysis

• Tree Survey Multiple Year Comparison
  • Annual Average Mortality

Graduate student Arthur Elmes in the field
DCR Tree Species Composition

Percentage of Total Sample

Species Sampled 2016

Species Planted DCR
DCR Tree Species Composition

Species Planted DCR

Species Sampled 2016
DCR Tree Survivorship

Trees in Sample
(318)

Alive
71.38% (227)

Dead
28.62% (91)

Sampled Condition
(225)

Unknown Condition
(2)

Good
80%
(180)

Fair
17.78%
(40)

Poor
1.78%
(4)

Critical
0.44%
(1)
Survivorship Status: Native vs. Non-Native

<table>
<thead>
<tr>
<th></th>
<th>Native Species</th>
<th>Non-Native Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>N = 198</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Native</td>
<td>69%</td>
<td>75%</td>
</tr>
<tr>
<td>Vs.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Representation within DCR sample, 2016

- Native Species: 69%
  - Alive: 137
  - Dead: 61
- Non-Native Species: 75%
  - Alive: 90
  - Dead: 30
Survivorship Status: Shade vs. Ornamental

Shade

- Shade Trees: 70%
- Alive: 144
- Dead: 61

Ornamental

- Ornamental Trees: 73%
- Alive: 83
- Dead: 30

Representation within DCR sample, 2016

N = 205
Site Type Survivorship

- **Front Yard**
  - N = 170
  - 80% Alive

- **Back Yard**
  - N = 123
  - 66% Alive

- **Other**
  - N = 25
  - 64% Alive
Species Composition by Site Type

- Front Yard
- Back Yard
- Other
Species Specific Variables

- Survivorship by Species
- DBH Growth by Species

Graduate student Zhiwen Zhu examines basal sprouting in the field
Survivorship by Species
DBH Growth 2014-2016

- White Fir: 57%
- Littleleaf Linden: 60%
- Norway Spruce: 68%
- Swamp White Oak: 68%
- Blackgum: 70%
- White Oak: 73%
- Honeylocust: 76%
- Sargent Cherry: 77%
- Sweetgum: 80%
- Crabapple: 80%
- Japanese Stewardia: 89%
- Colorado Spruce: 99%
- White Pine: 104%
- Fringetree: 119%
- Larch: 140%
- Linden: 167%
- Pin Oak: 175%
- Beech: 208%
Multiple Year Comparison

- Trees sampled in 2014, 2015 & 2016 studies
  - 17 trees
- Trees sampled in 2015 & 2016 studies
  - 81 trees
- Trees sampled in 2014 & 2016 studies
  - 54 Trees
Speed of Juvenile Mortality
Average Annual Survivorship

- Trees split by observation year and planting year
- As trees become **older** and more established, **survivorship goes up**
Investigation of Street Trees

- Street Tree Composition
- Survivorship
- Condition
Street Tree Survivorship & Condition

Survivorship: 98%

- Alive: 528 (91%)
- Dead: 11 (2%)

Condition:
- Good: 489 (91%)
- Fair: 33 (6%)
- Critical: 8 (1.5%)
- Removed: 6 (1%)

Number of Trees:

0 100 200 300 400 500 600
2016 Tree Survey Summary

- DCR tree survivorship → 71.38%
  - 80% in good condition
  - Planted 2010-2012
- Street tree survivorship → 98%
  - 91% in good condition
  - Planted 2009-2015

Well performing trees

**Shade Trees**
- Pin Oak*
- Tulip Poplar*
- Linden spp.
- Honeylocust

* Good street tree species

**Ornamental Trees**
- Japanese Tree Lilac
- Dogwood spp.
- Cherry spp.

**Evergreen Trees**
- Colorado Spruce
- White Pine
- Serbian Spruce
Our goal was to characterize the various experiences residents were having as a result of the tree planting:

- Are residents happy with the overall success of the program?
- Have residents been caring for their trees?
- Are they aware of the vast range of services trees can provide?

**Survey**
- Online
- 34 respondents from the summer of 2016

**Interview**
- In-person
- 21 short (5-15 minutes) interviews
- Audio recording

Rishi Singh interviews a resident
Survey Methods

- Online survey links were sent out via postcards and through a flyer we left at houses when we surveyed trees
  - 200 postcards mailed to random DCR tree recipient addresses
  - Approximately 300 flyers left at random sample of tree addresses
- The survey consisted of 43 questions
  - Same questions as last year’s survey
  - 33 questions about the tree planting
  - 10 questions about more personal information (town, age, gender, etc.)
Interview Methods

• Random convenience sample

• Interviewed residents willing to talk when out measuring trees

• 5-15 minutes

• Audio recorded when possible

Emma Freud interviews two residents
1. How did you come to have this tree?
   • How did you hear about the (DCR or WTI) program?
   • How or why did you decide to get a tree?
   • How did you choose the species and location of your tree(s)?
   • If they have both DCR and WTI trees, ask:
     o How did you hear about both programs?
     o Which trees did you get first? DCR or WTI?
     o Why did you choose the species you chose for each program?

2. Tell me about the care of your tree:
   • Did you find it hard to care for your tree(s)?
   • Now that it is older, do you water it as much?
   • Do you or have you ever pruned your tree?
     o If yes, how often do you prune your tree?

3. Do you feel there has been a difference in your neighborhood as a result of the tree-planting effort?
   • Do you have a close relationship with your neighbors?
     o Do neighbors help each other out in caring for trees?
   • Are there any community replanting efforts? Tell me about them

4. Have tree-replanting efforts affected your environmental awareness? If so, how?
   • Do you talk about trees more often?
   • Do you discuss trees with your neighbors?

5. Have the tree-replanting efforts helped you to be more aware of environmental issues or groups?
   • WTI, Massachusetts Audubon, Tower Hill Botanical Garden, Greater Worcester Land Trust
   • Climate Change, weather, wildlife conservation
Demographics from Survey

- 33% Male
- 55% Female
- 12% Prefer not to specify
- Average Age: 52
- 94% White
- 26% Retired
Geographic Distribution of Survey Respondents

Study Area

# of Survey Participants
1 2 3 25 Quarantine Zone

West Boylston 9%
Boylston 6%
Shrewsbury 8%
Worcester 71%
Auburn 3%
Holden 3%
Worcester’s Need for Trees

Intact canopy on Whitmarsh Avenue located in the Burncoat neighborhood (2016).

“\textit{This was all canopy on Burncoat Street. It’s windier. It’s hotter.}”

Whitmarsh Avenue several years after ALB host removal. Located in the Burncoat neighborhood (2016).
How did you first find out about tree planting?

“trees were planted here before I moved in”
What Motivates Residents to Plant Trees?

- Aesthetics (34)
- Neighborhood & Community (29)
- Disaster Adaptation (15)
- Ecosystem services (9)

"Thought I would be losing a tree to ALB"

"We lost all the shade trees in the neighborhood. Without the trees, the backyard is unbearable in the summer and wind damage has increased"
Qualitative Themes

- Asian Longhorn Beetle
- Aesthetics
- Residential Stewardship
- Relationship with Stakeholders
- Neighborhood & Community
- Environmental Awareness
- Other:
  - 2008 Ice storm
  - Tree cutting

Interview & Survey questions
Aesthetics

- Aesthetics was seen as the most important factor in several survey answers, other than just “motivations”
  - Residents considered aesthetics when considering, species choice, neighborhood benefits, and improvements because of the replanting
- Aesthetics was also an important topic discussed by residents in the interviews

“...Looking **nice** and **colorful**.”

“...Helps with the **aesthetics** of the street.”

“I guess it was **aesthetic** at a certain level [...] with the kids and the dogs and everything I just wanted more **shade**.”
Residential Stewardship

- Austin (2002) did a study on partnership opportunities for neighborhood tree planting initiatives in Detroit, MI
  - She notes that “bringing nature closer” is a top-ranked motivation for volunteer involvement in tree planting initiatives

“[tree planting programs] make you more **conscious** of how to take care of things and be more **respectful** towards stuff. You know, it’s like a project for me. It makes me come out and **maintain**, and everybody always stops by in the neighborhood and are like ‘wow, those trees are getting big’, so there’s kinda like, a **pride factor** “
Residential Stewardship

“How often do you water your tree?”

- 3-4 times per week, 18%
- 1-2 times per week, 20%
- Rely on rainfall, 62%

“[The trees] were supposed to be watered regularly, but I just let nature take care of it.”

“So out of the 16 that were here there was 7 or 8 that were pretty much gone [due to] lack of water. And so we pulled those out.”
Ecosystem Services

- Ecosystem services were seldom mentioned by residents
- A few residents noted the benefits of shade, privacy, noise abatement, etc.

“We like the **privacy** part of it, I like the nature part of it. And eventually the **shade**”

"The re-plantings make the **air** better and improve **noise** reduction"
"I now have significant knowledge of the improvements to air quality, temperature control and addressing water erosion. I also benefit everyday in my own home by the beauty and improvements due to the planting of a number of trees. More importantly, the city is visibly a more pleasant place, even in the most difficult neighborhoods."

"I mean we had to replace our roof because we had no trees and the wind is really bad. And, we had water in our basement which we never had before. So definitely, yeah it has made us more aware of how important trees are."
Perceived Benefits of Trees

- Aesthetics: Most Important
- Improved air quality: Second Most Important
- Decreased wind exposure
- Increased wildlife
- Decreased temperature
- Improved neighborhood
- Lower electricity bill
- Increased privacy
- Erosion prevention
- Outdoor recreation
- Increased property value
- Change in safety
- Storm water catchment

Count

- Most Important
- Second Most Important
50% of residents considered their neighborhood to be active in the planting

A survey question asked residents how often they communicated with their neighbors; 93% reported positive interactions

“When we’ve had difficulties such as the ice storm that came between the discovery of the beetle in August and the removal in February, and a lot of trees were damaged and powerlines came down. The neighbors all came out and helped one another making sure things are safe.”

“...the neighborhood would be better if there was no people in it, you know. It’s too crowded around here, I’m gonna get out of here.”
50% of residents said that their neighbors had no influence on their tree care

Residents with planted trees may influence neighbors

“Well the neighbors that come in here say that they (trees) are beautiful.”

“Oh yes, well because once you came here I told all my neighbors and a lot of them got trees.”

“I tell a lot. Sitting here, people come out, when we are sitting, I show them that tree. That nice tree you put in for free! How could we go wrong?! Just the right kind of tree for the area too.”
Stakeholder Organizations

• Residents we interviewed seemed to be unaware of the differences between separate stakeholder organizations, often referring to them as “the beetle people”

• When asked “who provided you with the trees?” in the survey, 27 residents identified the organization that provided them with the trees, while 7 residents did not know

• Although several residents were unsure of where their tree came from, most residents had heard of the stakeholder organizations

TREE SOURCES

- WTI 53%
- DCR 26%
- Unsure 21%
“Whoever was running that program, I think the DCR”

“Not 100% sure whether it was one of the groups (DCR/WTI), it was the organization with the beetle.”

“Hmm probably not more aware of issues or organizations, well we’re aware of what your program does.”

"I think it’s a great thing that you guys have done. We are very very lucky to have the resources to do this replanting and as you can see in my yard I take great pride in my yard and it’s just an awesome addition to have these trees planted so it’s great"

“I see you guys around all the time. I think a lot of people around town are having you guys plant stuff and I think the word is getting around town, too.”
Environmental Awareness

- We asked if residents had become more aware of environmental groups or issues because of the replanting effort
  - 71% of online participants said yes
  - Residents from in person interviews focused more on becoming more environmentally aware in general, not becoming more aware of specific organizations
    - Many mentions of ALB and looking out for the beetle

“I don’t think it has made me more aware. I mean I’m aware of those things but I don’t think the tree planting made me more aware of it.”

“I’ve always been aware, so more aware, possibly, but I’m always kinda cautious because I really don’t like trees being cut down.”

“Yea I look at every tree for beetles. Now that I know what to look for I notice that right away.”
Prioritizing New Plantings

Why do we want to plant trees?
• Increase tree canopy for **ecosystem services**
• Allow as many people to enjoy the trees as possible to foster sense of **community**
• Increase access to trees (and nature) in lower income neighborhoods to create a more **environmentally just** landscape

i-Tree Landscape Weights
• Tree Stocking Level (33%)
• Population Density (33%)
• Percent Population Below Poverty Line (33%)

Map of Worcester, MA. Areas in purple show census block groups that could be prioritized for new plantings.
Summary & Recommendations

- Educate residents on ecosystem services
- Tree planting could be looked at as a **process of beautification**
  - Stewards have a **sense of purpose**
  - Vacant lots
- Continue planting initiatives and educational opportunities
- Continue stewardship programs
- Prioritize areas based on environmental justice concerns
Future Projects

- Engage in tree planting with the Main South community
- Explore disparities in street tree vs. yard tree survivorship
- Investigate relationships between tree mortality, socioeconomics, and biophysical geography
- Characterize the overall age and health of Worcester’s urban forest
Acknowledgements

Special thanks to:

Clark University and the O’Connor Fund

Principal Investigators
  • John Rogan
  • Deborah Martin

Managers
  • Arthur Elmes
  • Zhiwen Zhu

Our interviewees

Former HERO cohorts

Visiting lecturers

Staff Support
  • Brenda Nikas-Hayes
  • Pamela Dunkle
  • Rachel Levitt
  • Kayla Peterson
  • Michael Krikonis

DCR, especially Kathryn Aroian, Tim Barwise, and Mollie Freilicher

WTI, especially Ruth Seward, Derek Lirange, and Peggy Middaugh