Greening the Gateway Cities

Human-Environment Regional Observatory (HERO)

July 11th, 2019

Novak Chen, Juliette Gale, Sadie Murray, Shannon Reault, Benjamin Ryan and Cindy Sellers
Meet the Research Team

Undergraduate Research Cohort
Novak Chen, Juliette Gale, Sadie Murray, Shannon Reault, Benjamin Ryan and Cindy Sellers

Graduate Mentors
Nicholas Geron and Marc Healy

Directors
Deborah Martin and John Rogan

From left to right: Sadie, Cindy, Juliette, Ben, Novak, Shannon
Outline

Introduction
- HERO Program
- Greening the Gateway Cities

Tree Survey
- Methods
- Results

Interview Response
- Framework
- Analysis

Conclusions
- Tree Survey
- Interview Response
The HERO Program: HERO’s 20th Year

Undergraduate-graduate-faculty experience researching human-environment relationships in Massachusetts

Current Research Focus:
- Urban tree health
- Tree stewardship and organizational networks

What We Do:
- Summer research
- Individual research projects during academic year

2014 HERO Fellow looking at an Asian Longhorned Beetle
2015 HERO Fellows Working in the HERO Lab
2017 HERO Fellows conducting field work
2018 HERO Fellows conducting an interview with Fall River community member
Greening the Gateway Cities Program (GGCP)

The goal of the GGCP is to increase tree canopy cover in Massachusetts' Gateway Cities to increase energy efficiency in urban residential areas.

Target Areas:

- Low tree canopy
- Old Housing Stock
- High Wind Speeds
- Large Renter Population
- Environmental Justice Neighborhoods
What is a “Gateway City”?

- Industrial urban centers
- Populations between 35,000 to 250,000
- Median household income and educational attainment below state average

Leominster

Pittsfield

Monument Square, Leominster Center

Park Square, Pittsfield Center
Characteristics of Leominster

Population: 41,823
Median Household Income: $57,610
Massachusetts: $74,167

Demographic Distribution:
- White: 83.3%
- Black or African American: 5.3%
- American Indian and Alaska Native: 0.1%
- Asian: 3%
- Two or more races: 3%
- Hispanic or Latino: 17.8%
- White alone, not Hispanic or Latino: 71.6%

Education:
- 25 years or older with BA or higher: 28.1%
Massachusetts: 42.1%

U.S. Census Bureau. (2018, July 1)
Characteristics of Pittsfield

**Population:** 42,533

**Median Household Income:** $46,871

**Massachusetts:** $74,167

**Demographic Distribution:**
- White: 87.4%
- Black or African American: 4.7%
- American Indian and Alaska Native: 0.4%
- Asian: 2%
- Two or more races: 3.5%
- Hispanic or Latino: 6%
- White alone, not Hispanic or Latino: 84.4%

**Education:**
- 25 years or older with BA or higher: 28.1%

**Massachusetts:** 42.1%

U.S. Census Bureau. (2018, July 1)
Leominster Tree Planting Locations

Total DCR Trees Planted: 1920 trees
First Plantings: Spring 2016
Trees Surveyed: 45.16% of planted
- Total: 867 trees
- Private: 436 trees
- Public: 431 trees

Canopy Cover
- Citywide: 64.22%
- Planting Zone: 38.43%

Impervious Surface
- Citywide: 17.09%
- Planting Zone: 47.06%
Pittsfield Tree Planting Locations

Total DCR Trees Planted: 1870 trees
First Plantings: Spring 2016

Trees Surveyed: 49.52% of trees planted
- **Total**: 926 trees
  - **Private**: 577 trees
  - **Public**: 349 trees

Canopy Cover
- **Citywide**: 56.80%
- **Planting Zone**: 27.16%

Impervious Surface
- **Citywide**: 13.23%
- **Planting Zone**: 48.56%
Research Questions

What are the biophysical factors and the social networks that influence tree health in the GGC program?

How does tree health in 2019 compare to previous HERO results?

**Tree Survey:**
- What is the survivorship of the trees planted in Leominster and Pittsfield?
- How does tree health compare across the two cities?
  - By genus
  - By location
  - By tree characteristics

**Interviews:**
- How do actors communicate amongst each other?
- How is tree stewardship approached and implemented?
- What are the discourses associated with the program?
Outline

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**Conclusions**
- Tree Survey
- Interview Response
Sampling Method

All GGC Trees in City

All Public Trees

Private Trees

# of Trees per Property

0 - 20%
20 Properties

21% - 40%
20 Properties

41% - 60%
20 Properties

61% - 80%
20 Properties

81% - 100%
20 Properties

Eastern Redbud

White Fir
Example of Sampling Method
Data Collection

Mortality
Vigor
Site Type
Land Use

American Elm
Western Red Cedar
Japanese Tree Lilac

Height
DBH
Width
Distance to Impervious

Roman. 2015
Resident came over and asked how trees were doing

Some bark damage
Mortality

Crabapple  Alive
Kentucky Coffee  Standing Dead
Kentucky Coffee  Removed
Tulip Tree  Stump

Unknown
Vigor

1 Healthy
2 Slightly Unhealthy
3 Moderately Unhealthy
4 Severely Unhealthy
5 Dead

Cornelian Cherry Dogwood
River Birch
Tulip Tree
Ware Oak
Japanese Snowbell
Site Type

European Hornbeam  Ware Oak  American Elm  Faser Fir  American Hornbeam

Front Yard  Back Yard  Sidewalk Planting Strip  Maintained Park  Other Maintained
Land Use

Single Family Residential
Attached/Detached

Multi-Family Residential

Maintained Park

Commercial

Institutional

Tulip Tree
Persian Ironwood
Black Gum
Japanese Tree Lilac
Sargent Crabapple
Genus distribution in Leominster and Pittsfield

(n = 1,793)

Top 10 Genera in Leominster and Pittsfield

- Acer: 138
- Quercus: 119
- Liriodendron: 97
- Carpinus: 92
- Liquidambar: 76
- Amelanchier: 70
- Gingko: 69
- Thuja: 67
- Malus: 66
- Cecidophyllum: 65

Number of Trees

Genus
Genus distribution in Leominster

(n = 867)
Genus distribution in Pittsfield

(n = 926)

Top 10 Genera in Pittsfield

- Acer: 101
- Quercus: 80
- Thuja: 60
- Ulmus: 58
- Ginkgo: 51
- Liquidambar: 47
- Carpinus: 46
- Cercidiphyllum: 45
- Amelanchier: 35
- Tilia: 34
Survivorship: All Trees

<table>
<thead>
<tr>
<th>Cities</th>
<th>Alive %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holyoke</td>
<td>78%</td>
</tr>
<tr>
<td>Chelsea</td>
<td>86%</td>
</tr>
<tr>
<td>Fall River</td>
<td>92%</td>
</tr>
<tr>
<td>Chicopee</td>
<td>92%</td>
</tr>
</tbody>
</table>
Survivorship: Leominster

- **Alive 100% (777)**
  - Healthy 1 (79.3% (616))
  - Slightly unhealthy 2 (12.9% (100))
  - Moderately unhealthy 3 (3.6% (28))
  - Severely unhealthy 4 (4.2% (33))

- Removed 6%
- Stump <1%
- Standing Dead 2%
- Unknown 2%
- Dead 90%
Survivorship: Pittsfield

- Alive: 100% (801)
- Removed: 3% (5)
- Stump: 5% (140)
- Standing Dead: 3% (5)
- Severely unhealthy: 5% (29)
- Moderately unhealthy: 3% (40)
- Slightly unhealthy: 10.5% (84)
- Healthy: 80.9% (648)

Survivorship percentages for Pittsfield.
Site Type Composition

Leominster

- Back Yard: 27%
- Front Yard: 24%
- Median: 6%
- Maintained Park: <1%
- Natural Area: 22%
- Other Maintained Landscaped Area: 20%
- Sidewalk Cutout: <1%
- Sidewalk Planting Strip: <1%
- Side Yard: <1%

Pittsfield

- Back Yard: 33%
- Front Yard: 16%
- Median: <1%
- Maintained Park: <1%
- Natural Area: 31%
- Other Maintained Landscaped Area: 19%
- Sidewalk Cutout: 1%
- Sidewalk Planting Strip: <1%
- Side Yard: <1%
Land Use Composition

Leominter

- Commercial: 1%
- Institutional: 5%
- Maintained Park: 11%
- Multi-Family Residential: 10%
- Single-Family Residential—Attached: 13%
- Single-Family Residential—Detached: 49%
- Vacant Lot: 3%

Pittsfield

- Commercial: 3%
- Institutional: 44%
- Maintained Park: 9%
- Multi-Family Residential: 9%
- Single-Family Residential—Attached: 20%
- Single-Family Residential—Detached: 15%
- Vacant Lot: 1%
Health by Site Type

Mortality

Vigor

<table>
<thead>
<tr>
<th>Site Type</th>
<th>Alive</th>
<th>Removed</th>
<th>Stump</th>
<th>Standing Dead</th>
<th>Unknown</th>
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</thead>
<tbody>
<tr>
<td>BY</td>
<td>534</td>
<td>385</td>
<td>459</td>
<td>54</td>
<td>12</td>
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<tr>
<td>FY</td>
<td>467</td>
<td>359</td>
<td>410</td>
<td>49</td>
<td>12</td>
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<tr>
<td>MP</td>
<td>328</td>
<td>385</td>
<td>459</td>
<td>54</td>
<td>12</td>
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<td>OM</td>
<td>49</td>
<td>12</td>
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<td>459</td>
<td>54</td>
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<td>1</td>
<td>2</td>
<td>3</td>
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<td>5</td>
</tr>
<tr>
<td>SP</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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</table>
Health by Land Use

Mortality

Vigor

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Alive</th>
<th>Removed</th>
<th>Stump</th>
<th>Standing Dead</th>
<th>Unknown</th>
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</thead>
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<tr>
<td>COMM</td>
<td>75</td>
<td>175</td>
<td>170</td>
<td>254</td>
<td>830</td>
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<tr>
<td>INST</td>
<td>278</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>MP</td>
<td>11</td>
<td>70</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>SFR-A</td>
<td>149</td>
<td>159</td>
<td></td>
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<tr>
<td>SFR-D</td>
<td>238</td>
<td>752</td>
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<tr>
<td>MFR</td>
<td>252</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Legend:
- Alive
- Removed
- Stump
- Standing Dead
- Unknown

Legend:
- 1
- 2
- 3
- 4
- 5
Health by Tree Type

Mortality

- Evergreen
  - Alive: 189
  - Removed: 1262
  - Stump: 342

- Shade
  - Alive: 168
  - Removed: 1140
  - Stump: 323

Vigor

- Evergreen
  - 1: 60%
  - 2: 65%
  - 3: 70%
  - 4: 75%
  - 5: 80%
  - Alive: 189
  - Removed: 1262
  - Stump: 342
  - Standing Dead: 1

- Shade
  - 1: 65%
  - 2: 70%
  - 3: 75%
  - 4: 80%
  - 5: 85%
  - Alive: 168
  - Removed: 1140
  - Stump: 323
  - Standing Dead: 2

- Fruit/Ornamental
  - 1: 70%
  - 2: 75%
  - 3: 80%
  - 4: 85%
  - 5: 90%
  - Alive: 60%
  - Removed: 65%
  - Stump: 70%
  - Standing Dead: 75%
  - Standing Dead: 80%

*p-value: 0.0028

*p-value: 0.0000
Health by Native Status

Mortality

- Native: Alive 996
- Non-native: Alive 780
- Hybrid / Unknown: Alive 17

Vigor

- Native: Alive 894
- Non-native: Alive 721
- Hybrid / Unknown: Alive 16

p-value: 0.1117

p-value: 0.0855
### Top 10 Most Planted Genera

<table>
<thead>
<tr>
<th>Genus</th>
<th>N</th>
<th>Survivorship</th>
<th>Mean Vigor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acer</td>
<td>137</td>
<td>89.1%</td>
<td>1.20</td>
</tr>
<tr>
<td>Quercus</td>
<td>119</td>
<td>89.1%</td>
<td>1.35</td>
</tr>
<tr>
<td>Liriodendron</td>
<td>97</td>
<td>82.5%</td>
<td>1.45</td>
</tr>
<tr>
<td>Carpinus</td>
<td>92</td>
<td>89.1%</td>
<td>1.68</td>
</tr>
<tr>
<td>Liquidambar</td>
<td>76</td>
<td>76.3%</td>
<td>1.98</td>
</tr>
<tr>
<td>Amelanchier</td>
<td>70</td>
<td>95.7%</td>
<td>1.36</td>
</tr>
<tr>
<td>Ginkgo</td>
<td>69</td>
<td>84.1%</td>
<td>1.32</td>
</tr>
<tr>
<td>Malus</td>
<td>66</td>
<td>95.5%</td>
<td>1.13</td>
</tr>
<tr>
<td>Thuja</td>
<td>66</td>
<td>81.8%</td>
<td>1.28</td>
</tr>
<tr>
<td>Cercidiphyllum</td>
<td>65</td>
<td>87.7%</td>
<td>1.24</td>
</tr>
</tbody>
</table>
Genera with a 100% Survival Rate

- Birch  
  \( n = 53 \)

- Cherry / Plum  
  \( n = 44 \)

- Yellowwood  
  \( n = 24 \)

- Witch-hazel  
  \( n = 19 \)

- Dawn redwood  
  \( n = 17 \)
Program-Wide Trees with Lowest Survivorship

Ironwood
76.9%
n=13

Sweetgum
76.3%
n=76

Tupelo
72.9%
n=59

Bald cypress
60.0%
n=25

Silverbell
22.2%
n=9
Distance to Impervious Surfaces (DIMPS) Vigor of Residential Trees

- DIMPS 0 - 5 ft.: 79
- DIMPS 5-10 ft.: 110
- DIMPS 10+ ft.: 640

Legend:
- Healthy (1)
- Slightly Healthy (2)
- Moderately Unhealthy (3)
- Severely Unhealthy (4)
- Standing Dead (5)

p-value: 0.0198
Impervious Surface Vigor of Non-Residential Trees

p-value: 0.1192
Impervious Surface Mortality of Maintained Areas and Street Trees

- Maintained Area: 532
- Street Trees: 359

p-value: 0.0012
Tree Survey Summary

**Survivorship**
- Higher in Leominster than Pittsfield
  - High number of unknowns in Pittsfield
- Genera planted in Leominster display more even distribution

**Location**
- Over 70% of land use residential in both cities
- Resident trees with DIMPS <5 feet have lower vigor
- Street trees have higher survivorship than other maintained trees

**Characteristics**
- Fruit/ornamental trees have significantly lower survivorship
- Shade trees have significantly higher vigor
- Native status not significant for mortality or vigor

Leominster DCR tree planting team
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Research Questions

What are the biophysical factors and the social networks that influence tree health in the GGC program?

How does tree health in 2019 compare to previous HERO results?

Interviews:

- How do actors communicate amongst each other?
- How is tree stewardship approached and implemented?
- What are the discourses associated with the program?
Data Collected

148 Property owners called
33 Scheduled property owner interviews

50 Interviews Conducted
  • 36 Residents
  • 5 Business
  • 3 Organizations
  • 5 City Officials
  • 1 DCR Forester

(Right): HERO Fellows Sadie and Shannon ask a resident about their tree preferences at their home in Pittsfield.

(Left): HERO Fellows Sadie and Ben interview the Leominster community partner at a farmers market in Fitchburg.
Organizations & Agencies Interviewed

Leominster
- Growing Places
- Leominster Mayor's Office

Pittsfield
- Berkshire Environmental Action Team (BEAT)
- City Departments:
  - Community Development
  - Public Utilities
  - Conservation Commission
  - Public Services
Interviewee vs. City Racial Demographics

<table>
<thead>
<tr>
<th>Race</th>
<th>Pittsfield Average</th>
<th>Pittsfield Interviewees</th>
<th>Leominster Average</th>
<th>Leominster Interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>80%</td>
<td>70%</td>
<td>90%</td>
<td>80%</td>
</tr>
<tr>
<td>Black</td>
<td>10%</td>
<td>20%</td>
<td>40%</td>
<td>30%</td>
</tr>
<tr>
<td>Asian</td>
<td>5%</td>
<td>10%</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>5%</td>
<td>10%</td>
<td>5%</td>
<td>10%</td>
</tr>
</tbody>
</table>
Interviewee Demographics Compared to City: Income, Age, Education

• Income level was disproportionately represented (55% over the median income in Leominster, 80-95% in Pittsfield)

• Interview participants disproportionately represented people over 65

• Interviewees were disproportionately educated for Leominster and Pittsfield
  • Leominster interviewees matched gateway city profile
  • Pittsfield interviewees did not
Policy Arrangement

Approach

Resources

- How resources are distributed led to differentiations in power
- The “how”

Rules of the Game

- Formal or informal procedures of implementation
- The “what” or the “when”

Actors

- Formal and informal actors who participate in policy decision making
- The “who”

Discourses

- A shared understanding of the world / the environment
- The “why”
Foresters plant and steward some trees

DCR

Community Partner

Housing Authority

Residents

Businesses

City

Marketing and community outreach

Supplies information and resources

Steward trees

Steward trees

Steward trees
Foresters plant and steward some trees

DCR

Community Partner

Marketing and community outreach

Housing Authority

Steward trees

Residents

Steward trees

City

Supplies information and resources

Businesses

Steward trees

“[people] which may not necessarily interact with city government, they’ll interact with the Spanish center and [... The Spanish American Center] pushes that stuff, all the information. And they’re so willing to do it and they’re good at it.” (Leominster City)
“So you know, and the mayor is just like never stops talking about this so everybody knows about the program because he just, he does two, he does a radio show every week and a TV show every week on local people and it's always in his book, "Don't forget to get your free tree!" and he's like holding it up to the screen, "free tree, call" you know "it's a 617 number but they're right in Leominster!" (Leominster City)
Foresters plant and steward some trees

So when you're on a landlord owned property, they're not there. So when you even get the tenant, they can't give permission to plant the tree, so then you have to reach the landlord [...] we want to focus on renters like rental property owners.” (Leominster Community Partner)

“There's a lot of other people that are not involved, who should be involved. Just thinking [...] there's not enough youth programs out here” (Resident)
“The DCR makes a flier that goes out, we'll take the flier and we'll make it a little more promotable, and we'll make it a little more accessible to the community. [...] we’re able to translate things into Spanish, and that’s a huge percentage of the population in Leominster, so it's really important that we do that for accessibility as well.” (Leominster Community Partner)
Foresters plant and steward some trees

- Community Partner
- Housing Authority
- Residents
- Businesses
- City
- DCR

Steward trees
Who has stewardship of GGC trees?

“The woman who does the flowers takes care of [the street trees]. She goes around and they have people on the weekends who do it, and take this water truck and go water trees and plants, and everything else.” (Leominster City)

“Businesses are usually not gonna take time out of the day to water the trees, so the DCR was doing it […] the DCR was able to—and this is specific to Leominster—but they were able to water the trees, because they had capacity to the first couple of years […] So in terms of maintenance, when they're able to do that, obviously it's the most effective. But, when they're not able to do that, it's really about then us also finding helpers in the community.” (Leominster Community Partner)

There’s one retired arborist who goes around and does it on his own for free, takes care of a lot of the younger city trees […] without him there's nobody really to do the follow-up. All these trees are going to need pruning. We're doing that in the in-between seasons, we're going around and checking on the trees. Pruning up, restaking, whatever needs to be done. But, when we're gone that's going to disappear.” (Pittsfield Foresters)

“I think [my neighbors] don't take trees ‘cause they're renters. And they don't really have yards.” (Resident)
How do actors take stewardship of GGC trees?

“I don’t really do anything [besides daily watering]. Because they're so young I thought it was better to just let them grow before I do any pruning or anything like that. Plus I'm not that confident in the pruning anything [...] I was gonna do probably more research or call [DCR] or find out what to do. I know it says it in the guide but still I don't want to just start clipping branches and I don't want to hurt the tree” (Resident)

“So that’s my concern is the public safety in terms of dead trees and pruning and take downs of pruning stuff. We just can’t keep up with it right now.” (Pittsfield City)

“The foresters don't have the capacity to water it, the people who live there are seniors and they don't have the ability to water it. So we were going to try to adopt those trees out to people who are able so they take care of a tree and then hopefully down the road we are going to get them be like this is our tree and do decorating contests stuff like that get people to connect to a certain tree.” (Leominster Community Partner)

“We gave them [DCR Foresters] office space! [...] every day when they get phone calls they can just go right to the neighborhood and check it out.” (Leominster City)
Why do actors take or not take *stewardship* of GGC trees?
### Discourse

<table>
<thead>
<tr>
<th>Statement</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;It's like the least I could do. Least I could do is try to help the environment, plant more trees. [...] it's like the people that have all the money you wish they would think like you did so they could help out the planet more doesn't quite work like that but.&quot;</td>
<td>(Resident)</td>
</tr>
<tr>
<td>&quot;I take care of my trees] because we need them. We need them for this [points to oxygen tank]!&quot;</td>
<td>(Resident)</td>
</tr>
<tr>
<td>&quot;I just feel, you know, trees man. You know, they were here before us humans [...] if God had that much desire to create these other things, then they need to be respected just the same way that us human beings should be respected.&quot;</td>
<td>(Resident)</td>
</tr>
<tr>
<td>&quot;I love trees for several different reasons, you know what I mean? Whether it's just to catch some shade, whether it's just to feel like, you know, I don't know, kind of country about things.&quot;</td>
<td>(Resident)</td>
</tr>
<tr>
<td>When the mayor was elected his philosophy [was] you never know who's coming into town. So our town has to be clean. [...] look really nice.</td>
<td>(Leominster City)</td>
</tr>
<tr>
<td>But it is well worth the time and money that he allowed us to spend. The trees alone [...] they're beautiful trees.</td>
<td>(Pittsfield City)</td>
</tr>
</tbody>
</table>

**Why do actors take or not take stewardship of GGC trees?**
What are the informal and formal rules of **stewardship** of GGC trees?

“**Water them** and **fertilize them**, put mulch around them. **They told us to water every week. According to the pamphlet** they said 15 gallons per week for the first year.”

(Resident)

“No one takes care of the trees. [**The housing authority**] **gets mad when residents try to take care of the trees.**”

(Resident)

“People love their trees. You know they’re mad when they can’t get tree. So we kept a list because they always told them “it will expand” so then we called those people back and said "you're in the area now" and you would have thought they won the lottery. Free trees!”

(Leominster City)
Benefits of the GGC Program

“Every single resident I have talked to for this program loves it [...] they love our foresters. One of the women I interviewed, she was like yeah one of my trees died over the winter, I didn’t even call them […] they came over and were like hey lets replace your tree, she didn’t have to do anything.”
(Leominster Community Partner)

“They're the best thing in the world, they're free!” (Resident)

Again the people that have been offered trees that could not normally afford trees. (Pittsfield City)
Challenges of the GGC Program

“One thing lacking in this program, the aftercare for the trees. It would be nice to get a follow-up program to take care of these trees. Cause right now the city has nobody to maintain the trees.” (Pittsfield Foresters)

“I think there’s never enough local awareness about these particular programs. I think, like I said, no matter what, there’s still gaps. You’re still not gonna be able to reach people [...] reaching people are always difficult. (Leominster Community Partner)

“An elder may not be able to [...] water the garden every day [...] Businesses are usually not gonna take time out of the day to water the trees, so the DCR was doing it.” (Leominster Community Partner)

“Leaves increase the cleanup as they grow. You can have branches that died and need to be taken down to prevent property damage. Definitely increases the care of your yard.” (Resident)
General Trends Across Both Cities

- Lack of funding and infrastructure outside of the GGC program
  - The DCR is the only active group
- Maintenance after DCR leaves?
  - Strong ties with community groups in Leominster
  - Pittsfield residents and officials specifically feel very disconnected
- Communication a consistent challenge
- Huge support for the program among city and residents
Outline

Introduction
- HERO Program
- Greening the Gateway Cities

Tree Survey
- Methods
- Results

Interview Response
- Framework
- Analysis

Conclusions
- Tree Survey
- Interview Response
What are the biophysical factors and the social networks that influence tree health in the GGC program?

**Tree Survey:**
- Breadth of tree genera can be associated with higher tree survivorship
- Tree vigor classes influenced by site location, mainly site type
- Distance to impervious surfaces has significant effects on tree vigor especially within 5 feet

**Interviews:**
- Cities and residents ask post-GGC tree maintenance questions
- Resources and rules shape perceptions about who acts and who can act
- Communication and stewardship could be enhanced with attention to: renters/landlords youth and unexpected actors
How does tree health in 2019 compare to previous HERO results?

Survivorship average is in line with survivorship results for 2017 and 2018

**Location**
- More trees in maintained parks than previous years, which had more residential and sidewalk trees

**Native Status**
- 2018, non-native trees have higher survivorship*
- 2019, native trees have higher survivorship

**Tree Type**
- 2018 ornamental/fruits highest survivorship*, 2019 evergreen highest survivorship*
- 2018 ornamental/fruits had better vigor, 2019 shade trees had lower vigor*

* Statistical test indicates significant findings
Recommendations

• Address concerns about maintenance once GGCP leaves
• Greater outreach to private rental property owners and underrepresented actors
• Have planting zone include both sides of street
• Breadth in genus distribution could foster diversity, minimize impacts of high individual genus mortality
Future Research Interests

- Historical urban canopy cover
- Residential tree survivorship in GGCP cities
- Landsat temperature time series
- Urban microclimate around GGCP trees
- City energy and canopy cover analysis
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Resident and Stakeholder Interviewees

Residents of Leominster and Pittsfield

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