Greening the Gateway Cities

Human-Environment Regional Observatory (HERO)

July 12th, 2018

Laura Cohen, Rachel Corcoran-Adams,
Elizabeth Lohr, Rowan Moody, Andy Pagan, Yeannet Ruiz

Meet the Research Team

Undergraduate Research Cohort

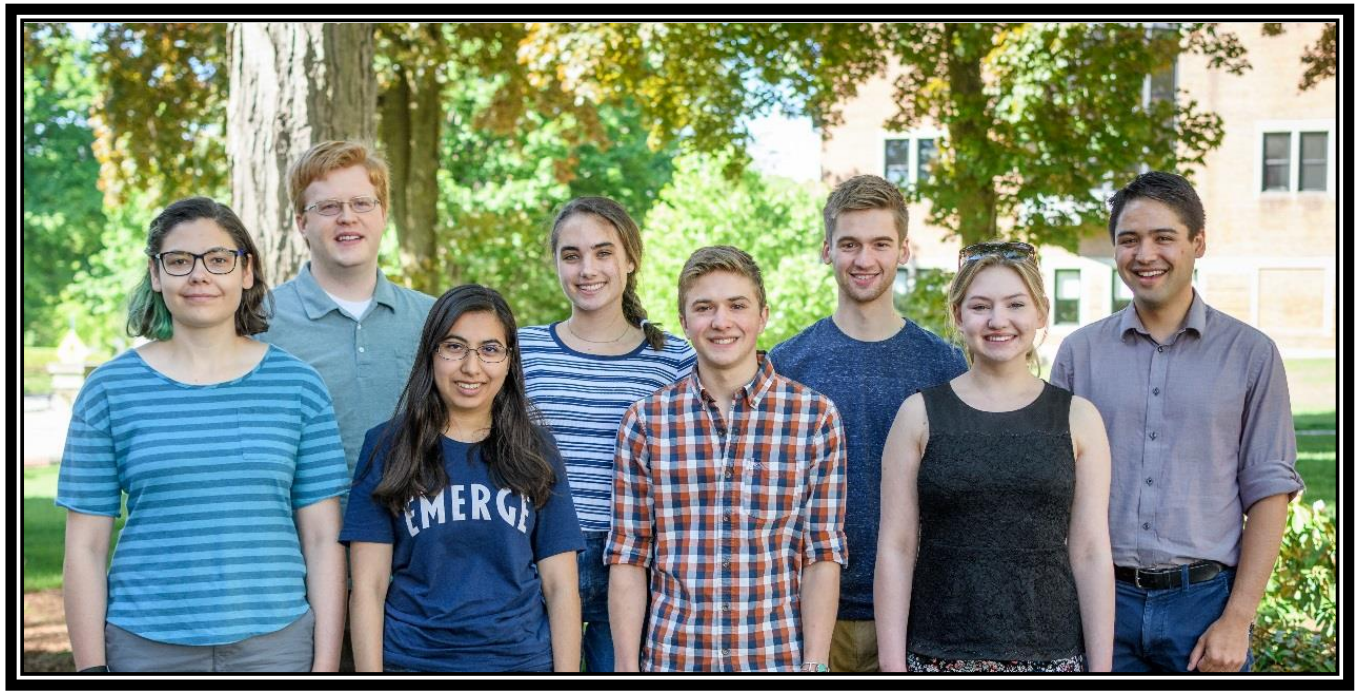
Laura Cohen, Rachel Corcoran-Adams, Elizabeth Lohr, Rowan Moody, Andy Pagan, and Yeannet Ruiz

Graduate Mentors

Nick Geron and Marc Healy

Directors

Deborah Martin and John Rogan



Front Row from left: Elizabeth, Yeannet, Rowan, and Laura
Back Row from left: Marc, Rachel, Andy, and Nick

Outline

Introduction

HERO program
Greening the Gateway Cities

Tree Survey

Data collection
Vigor & Survivorship

Interview Response

Data collection
Program progress & place-making

Summary of Findings & Future Research

Survivorship of species
Interview responses

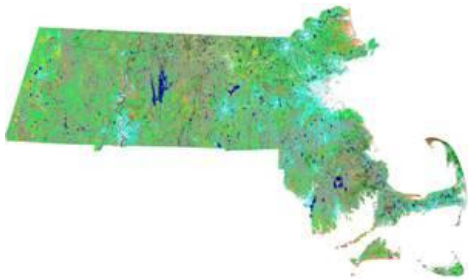
Human-Environment Regional Observatory Undergraduate Research (HERO)

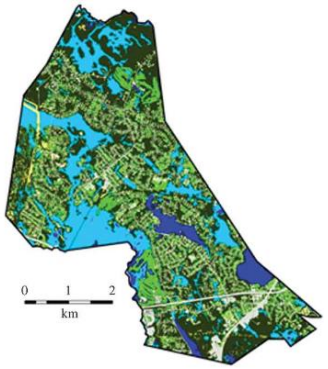
Past Research Focus (1999-2015):

- Land Use Modeling
- Asian Longhorned Beetle Impacts
- Place Making Assessment

Current Research Focus (2016-Present):

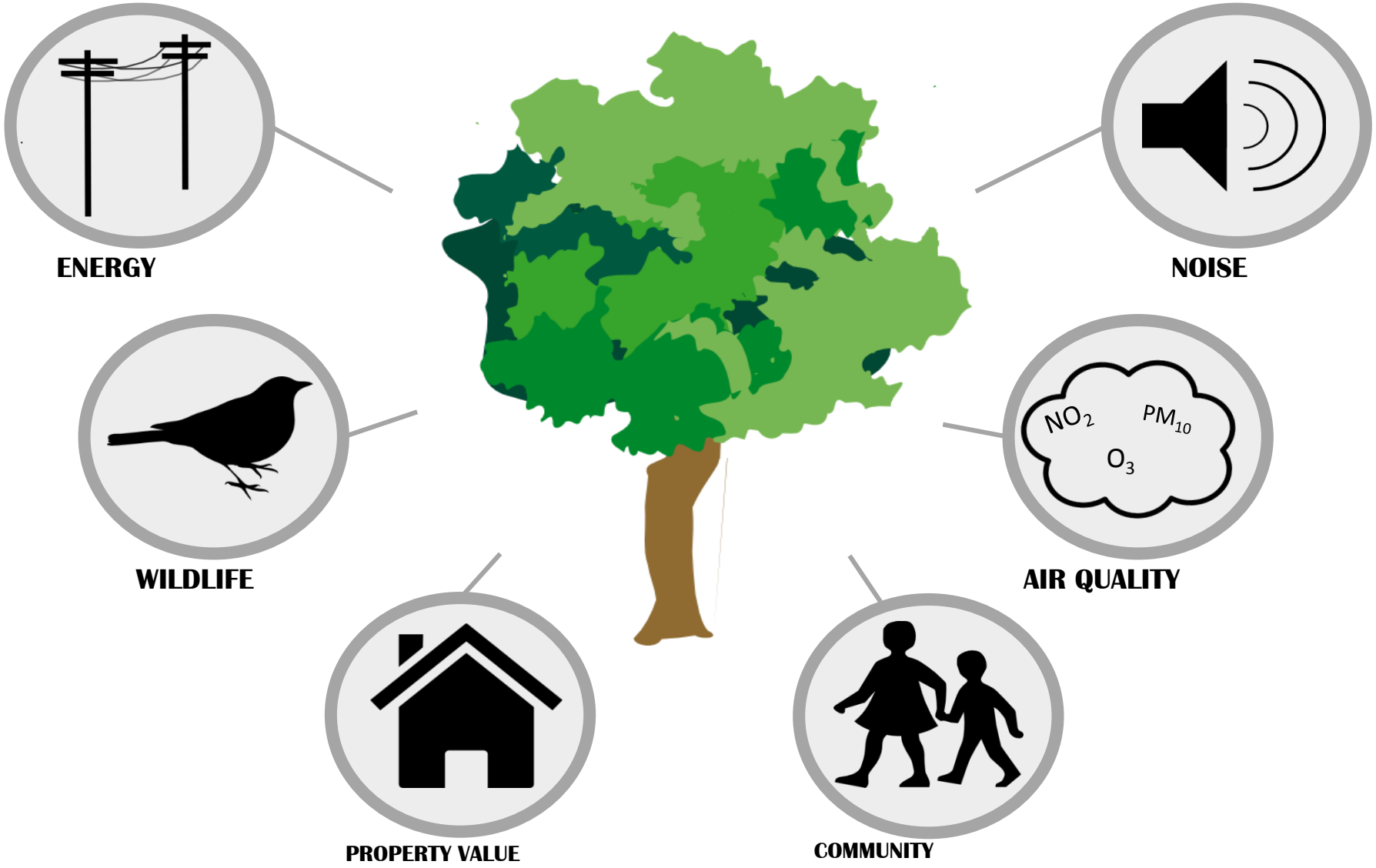
- Urban Greening Initiatives
- Planting Program Process
  - Resident Experience
  - Policy Implementation





1999 2005 2012 2017

Benefits of Trees

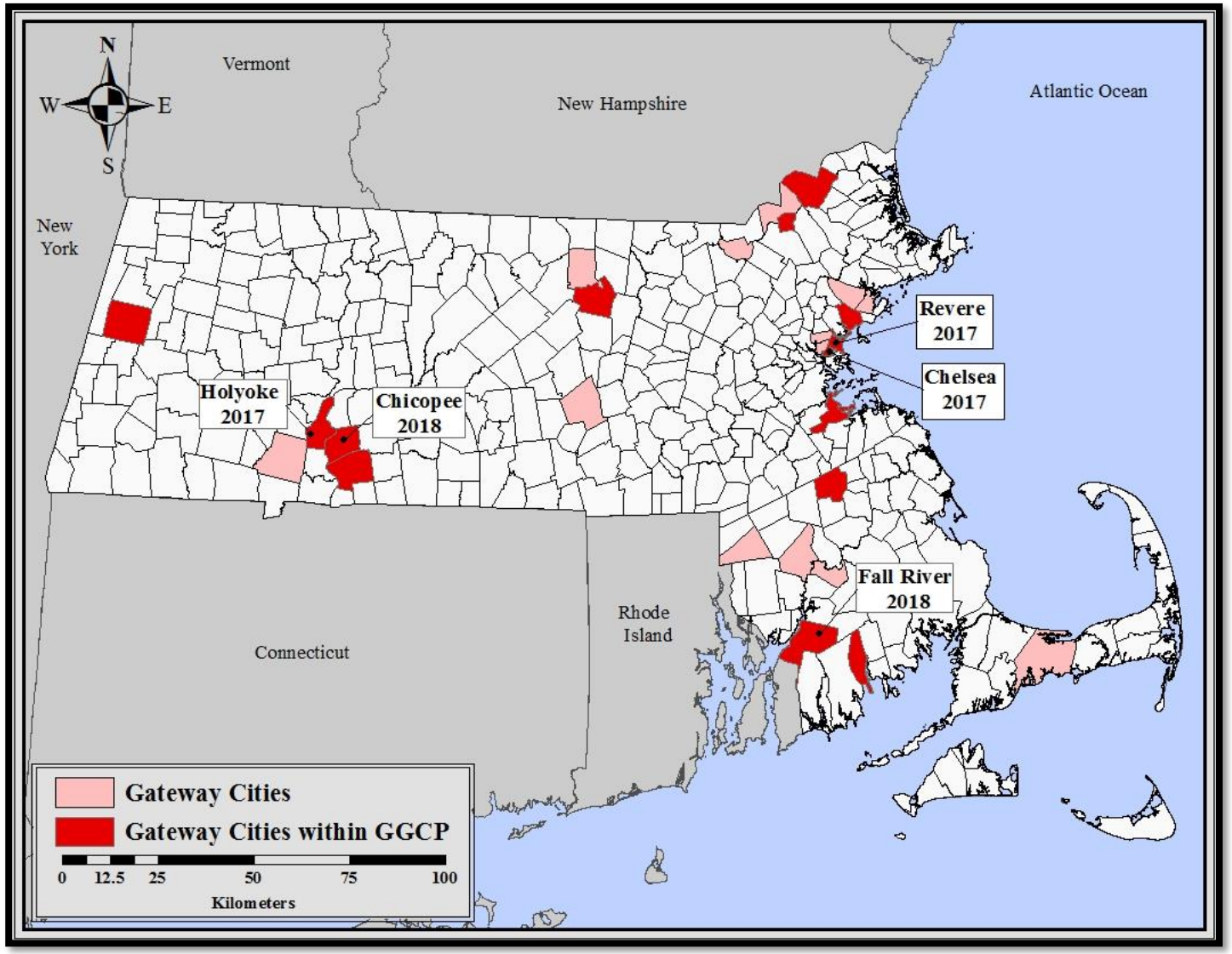


Greening the Gateway Cities Program (GGCP)

Background:
This program is designed to bring energy efficiency and other benefits of a tree canopy to Massachusetts' Gateway Cities. So far, over 8,000 trees have been planted throughout 13 Gateway Cities.

Goal:
To reduce energy costs by expanding tree canopy in the Gateway Cities.

Planting zone criteria:
- Low tree canopy
- Older housing stock
- High wind speeds
- Large renter population



dcr Massachusetts

GREENING THE GATEWAY CITIES

What is a “Gateway City”?

Former industrial cities targeted for redevelopment efforts that have a population between 35,000 and 250,000, with a household income below the state average and an average education (Bachelor’s or above) below the state average. These urban centers anchor regional economies around the state face social and economic challenges, while retaining many assets with unrealized potential.

Chicopee

Strahan, D

Fall River

Belanger, M. N.

Characteristics of Chicopee

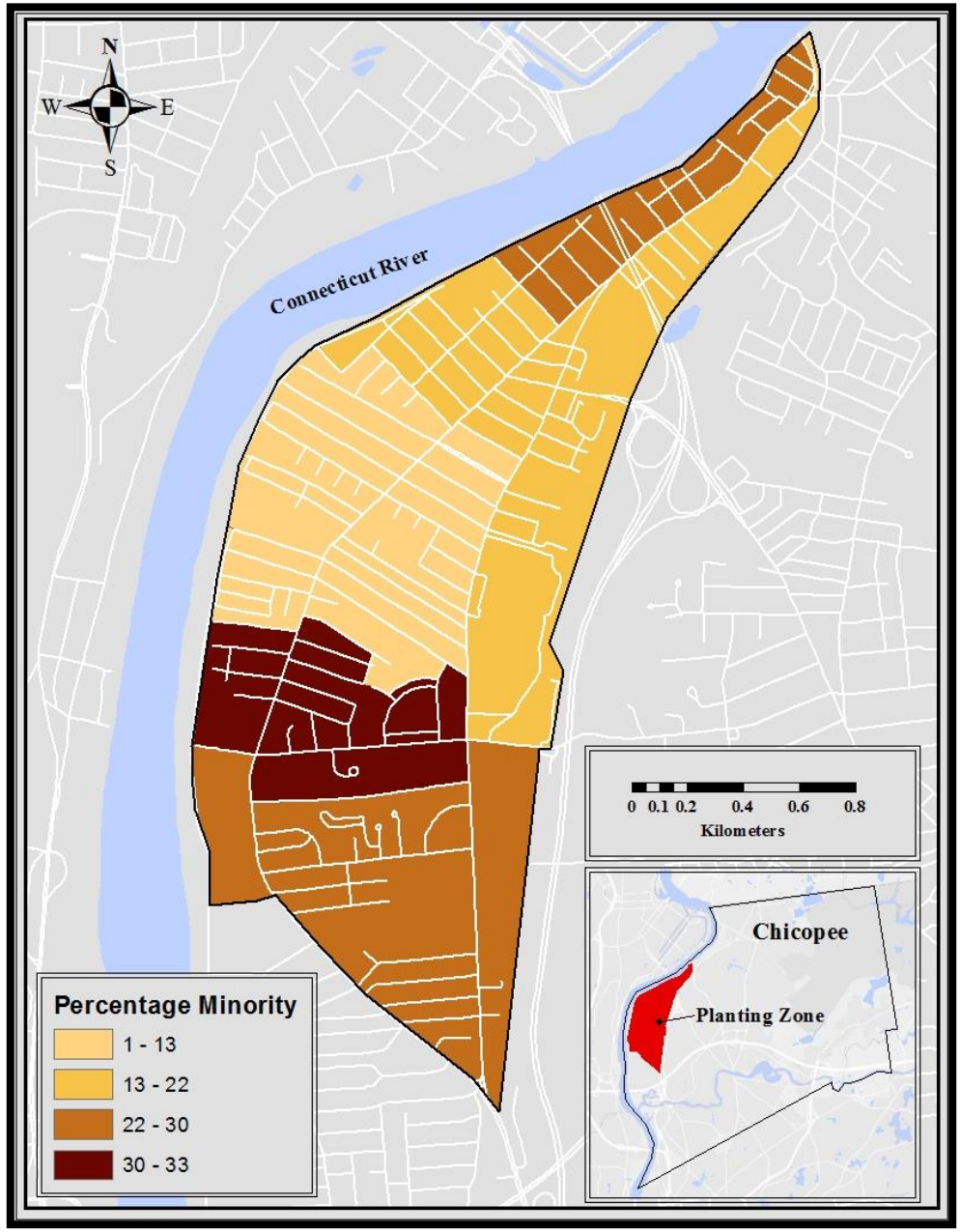
Population*: 55,991

Median Household Income*: $49,005
Massachusetts: $79,054

Families below Poverty Line (%)*: 14.5%
Massachusetts: 10.4%

Population Demographic Distribution:**
White 85.8%, Hispanic 14.8%, Foreign-born 9.3%, Black 3.5%, and Asian 1.5%

Education*:
>25 years old with BA 18.1%
Massachusetts: 41.2%
>25 years old with HS degree or higher 85.3%
Massachusetts: 90.1%



*U.S. Census Bureau. (2017, July 1)
** Mosakowski Institute; Brown, John C.; Krahe, Joe; Philbrick, Sarah. (2016)

Characteristics of Fall River

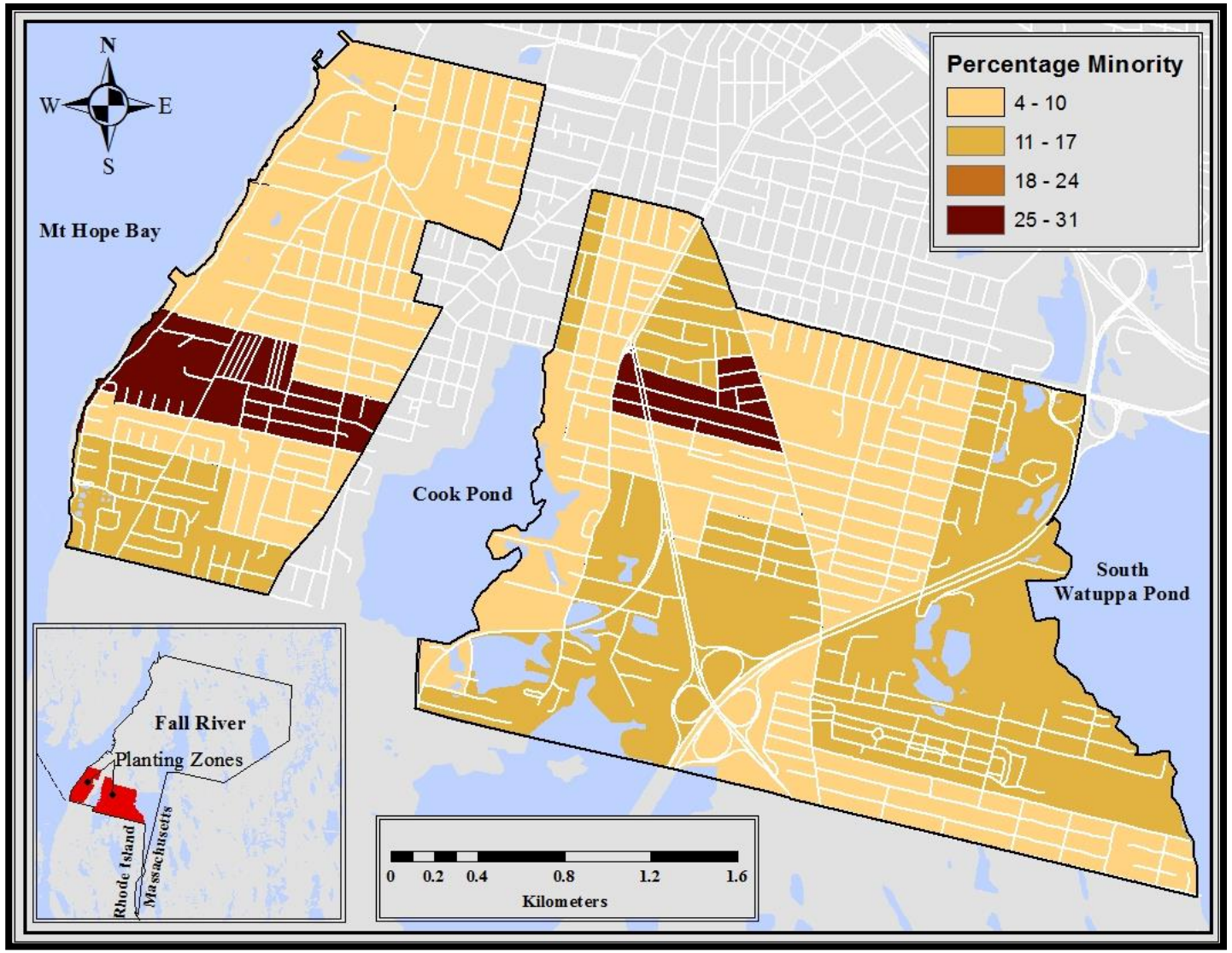
Population*: 88,930

Median Household Income*: $36,798
Massachusetts: $79,054

Families below Poverty Line (%)*: 22.0%
Massachusetts: 10.4%

Population Demographic Distribution:**
White 87.3%, Foreign-born 19.0%, Hispanic 7.4%, Black 3.6%, and Asian 2.3%

Education*: >25 years old with BA 14.4%
Massachusetts: 41.2%
>25 years old with HS degree or higher 72.1%
Massachusetts: 90.1%



*U.S. Census Bureau. (2017, July 1)
** Mosakowski Institute; Brown, John C.; Krahe, Joe; Philbrick, Sarah. (2016)

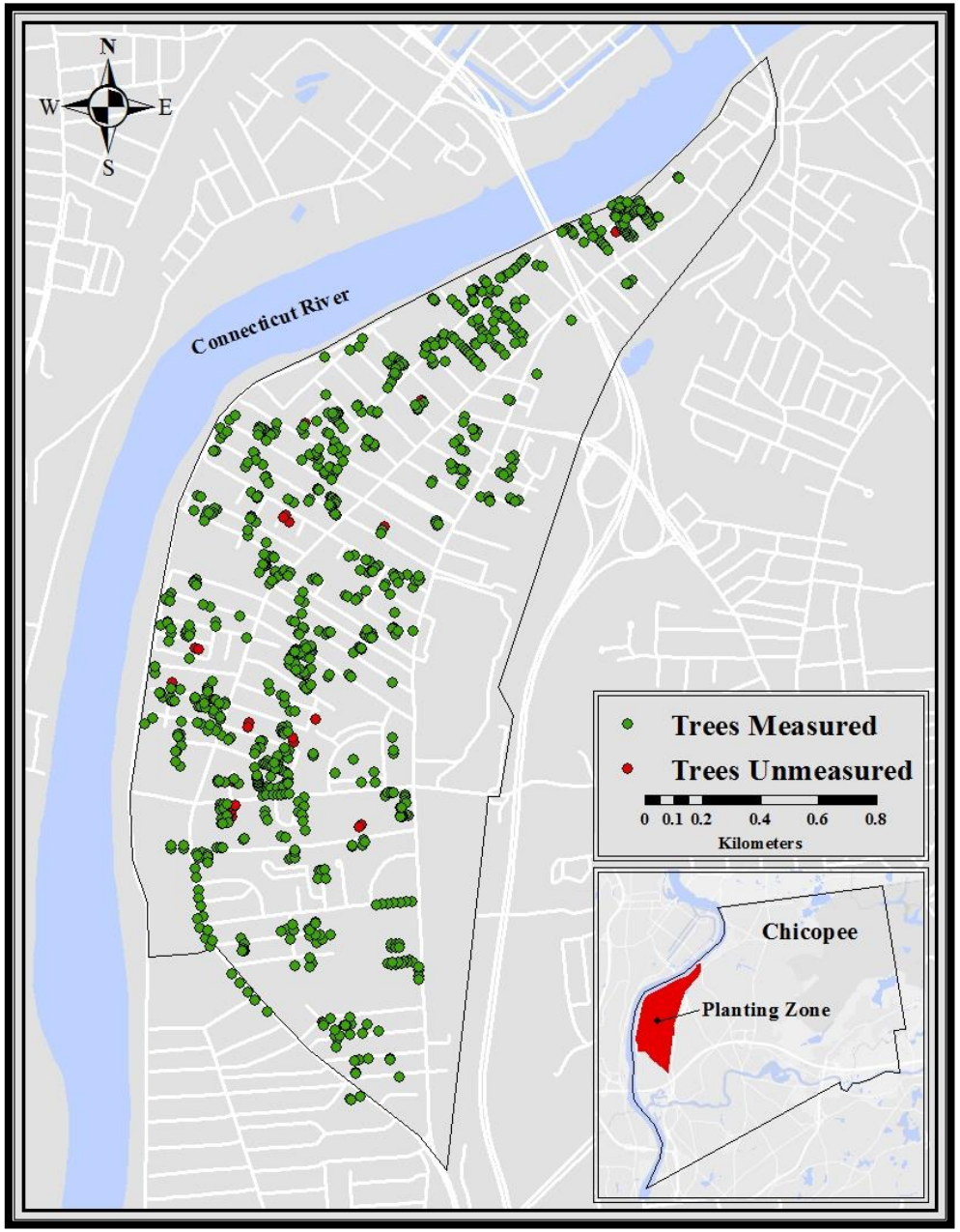
Chicopee Tree Planting Locations

Total DCR Trees Planted: 951

Trees Surveyed: 922 (97% surveyed)
Private Trees: 232
Public Trees: 690

City Canopy Cover: 34.8%
Planting Zone Canopy Cover: 23.7%

City Impervious Surface: 29.9%
Planting Zone Impervious Surface: 47.0%



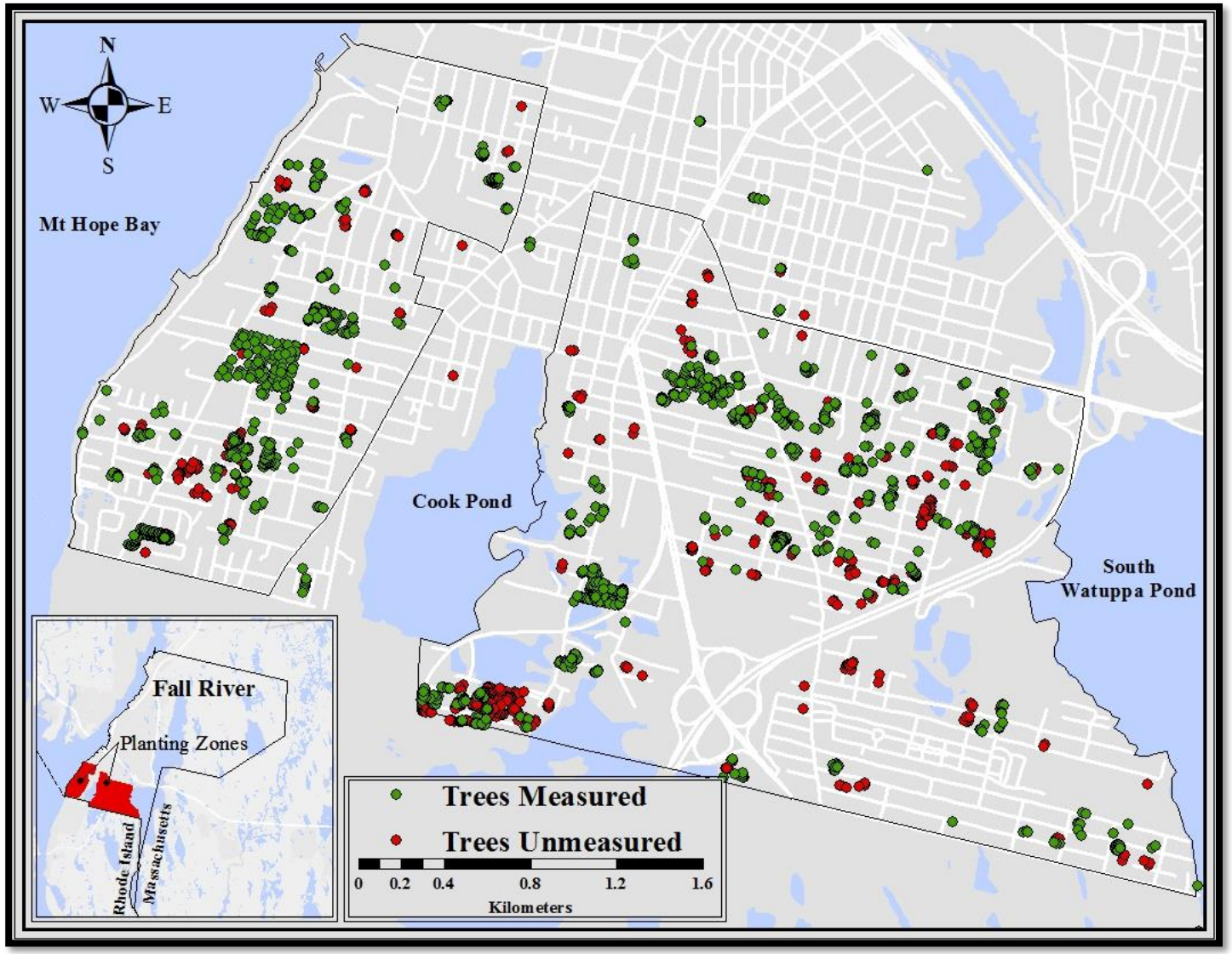
Fall River Tree Planting Locations

Total DCR trees planted: 1,988

Trees Surveyed: 1,349 (68% surveyed)
Private Trees: 564
Public Trees: 785

City Canopy Cover: 55.9%
Planting Zone Canopy Cover: 23.8%

City Impervious Surface: 18.5%
Planting Zone Impervious Surface: 44.7%



Research Questions

What factors influence tree vigor and survivorship?

- What is the current survivorship for the tree plantings in Chicopee and Fall River, MA?
- How does tree health compare across the two cities?
    - By species
    - By land use
    - By site type

What factors influence sense of place for organizational actors and residents?

- How has the GGCP in Fall River and Chicopee influenced the place identity of:
    - Organizational actors
    - Residents
- How have interactions between organizations and residents shaped the place-making process?
- What policy implications arise out of these analyses?
- How does the GGCP intersect with stakeholder goals and efforts?

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Tree Assessment Characteristics: Vigor (1-5)

1 - Healthy

2 - Slightly unhealthy

3 - Moderately unhealthy

4 - Severely unhealthy

5 - Dead

Tree Assessment Characteristics: Site Type

Front yard

Back yard

Maintained park

Sidewalk cutout

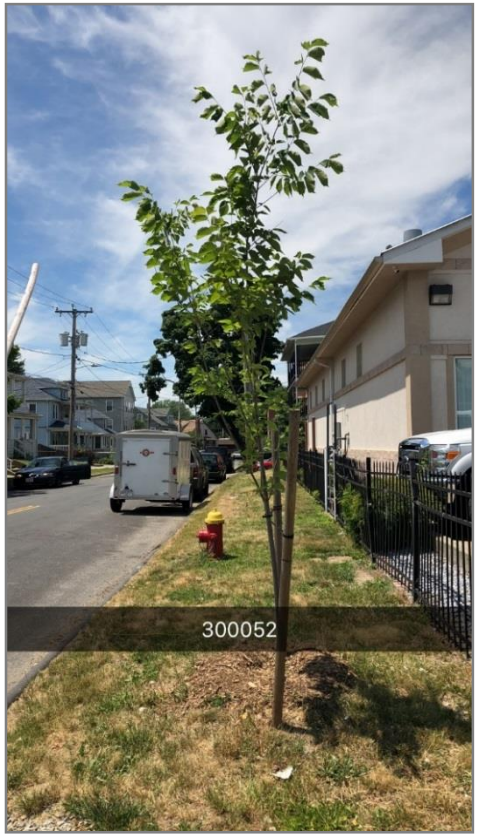
Sidewalk strip

Tree Assessment Characteristics: Area Land Use

Single-family residential (SFR-A/D)

Multi-family residential (MFR)

Maintained park



Commercial

Institutional

Tree Assessment Characteristics: Other Indicators

Basal sprouting

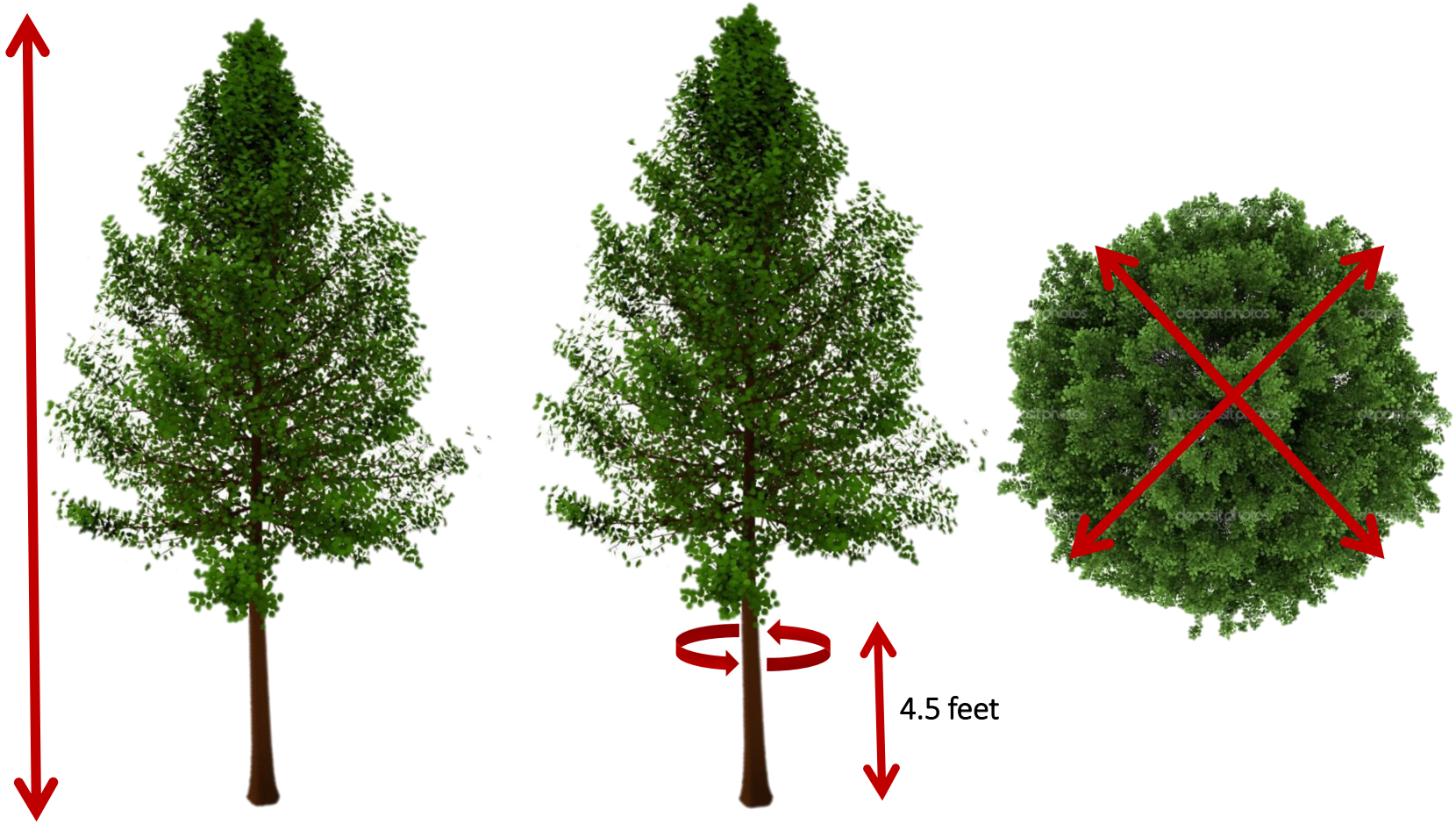
Insect damage

Trunk damage

Branch damage

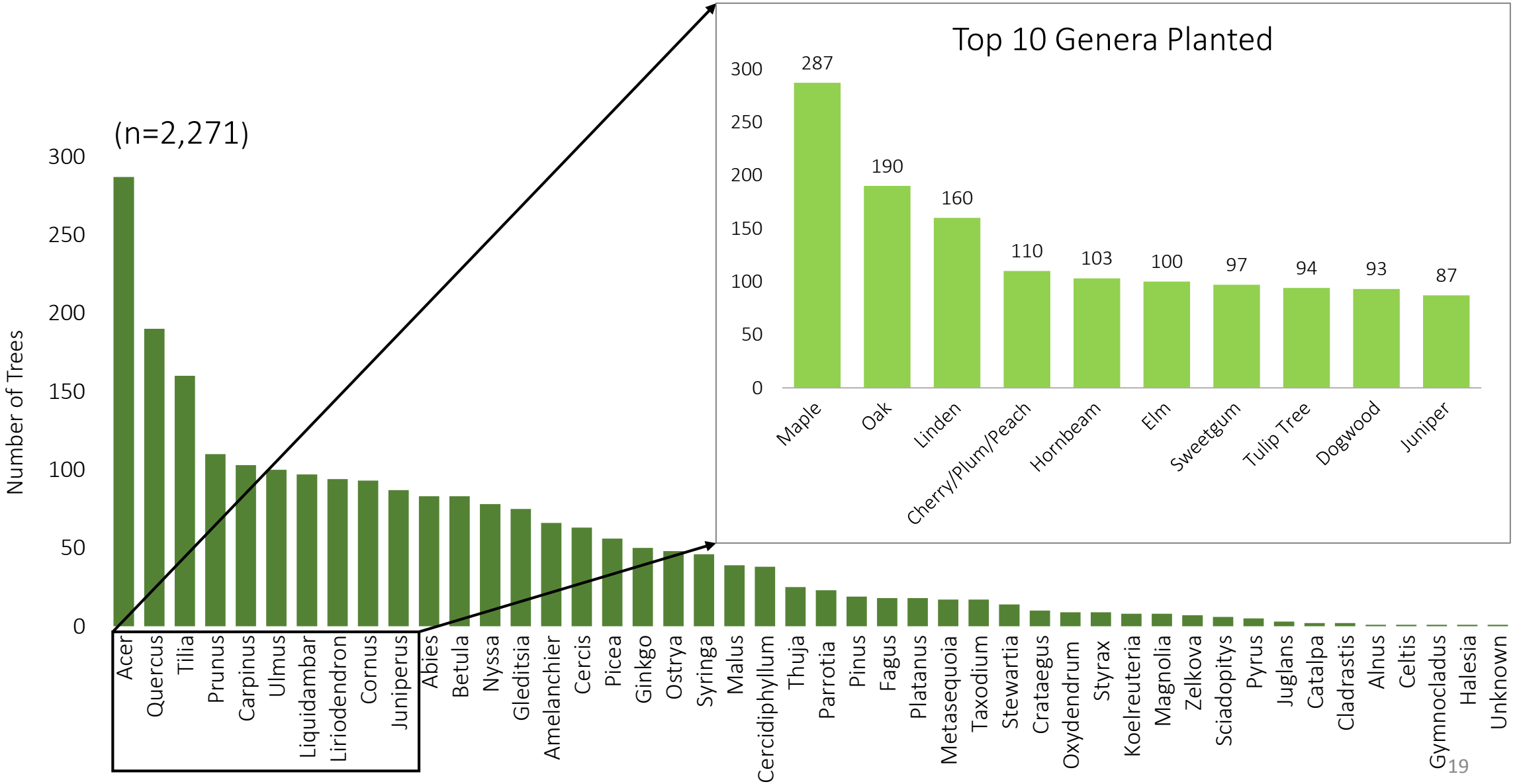
Other

Size Metrics



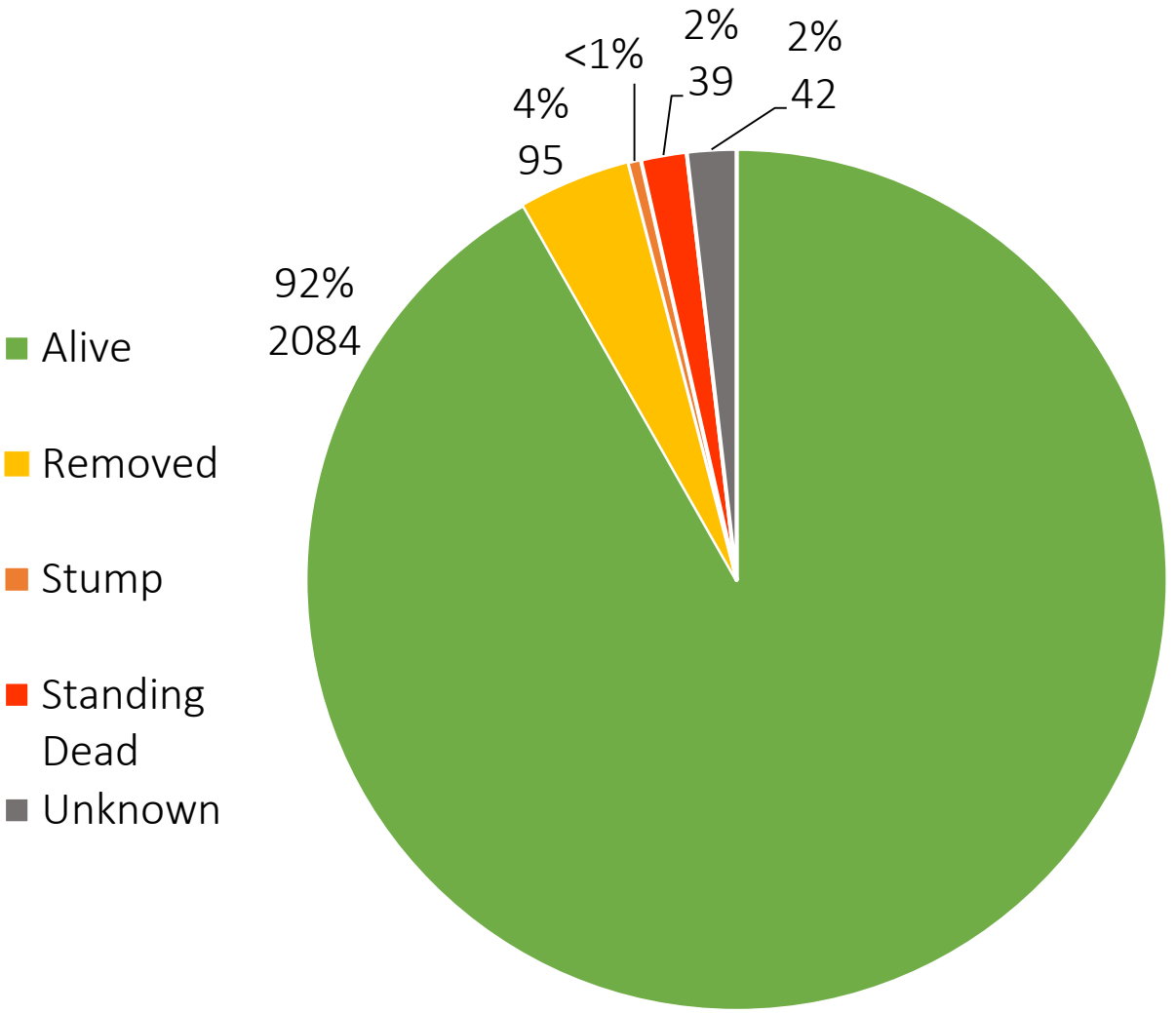
Height DBH Width

Genus Composition: All Trees

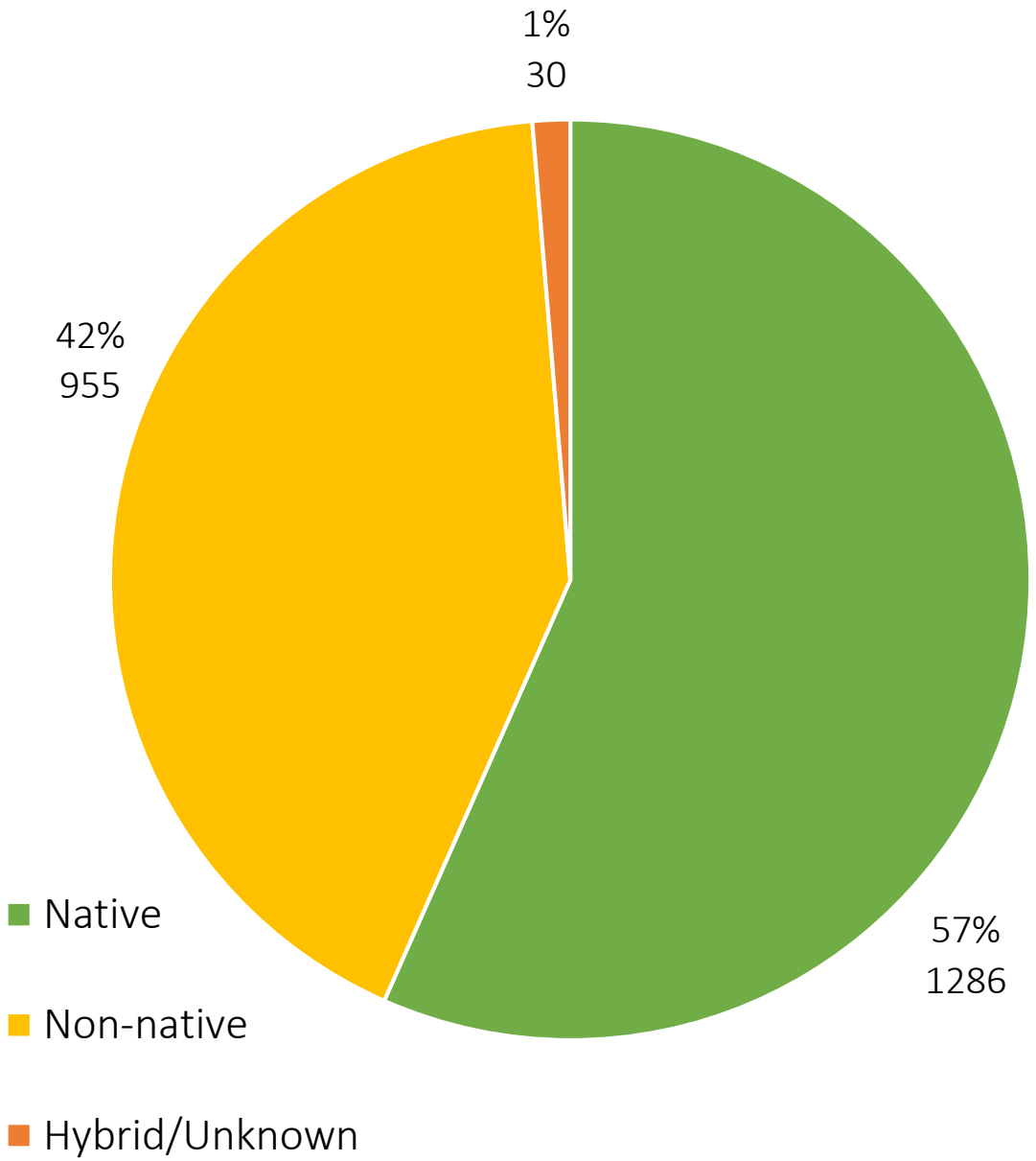


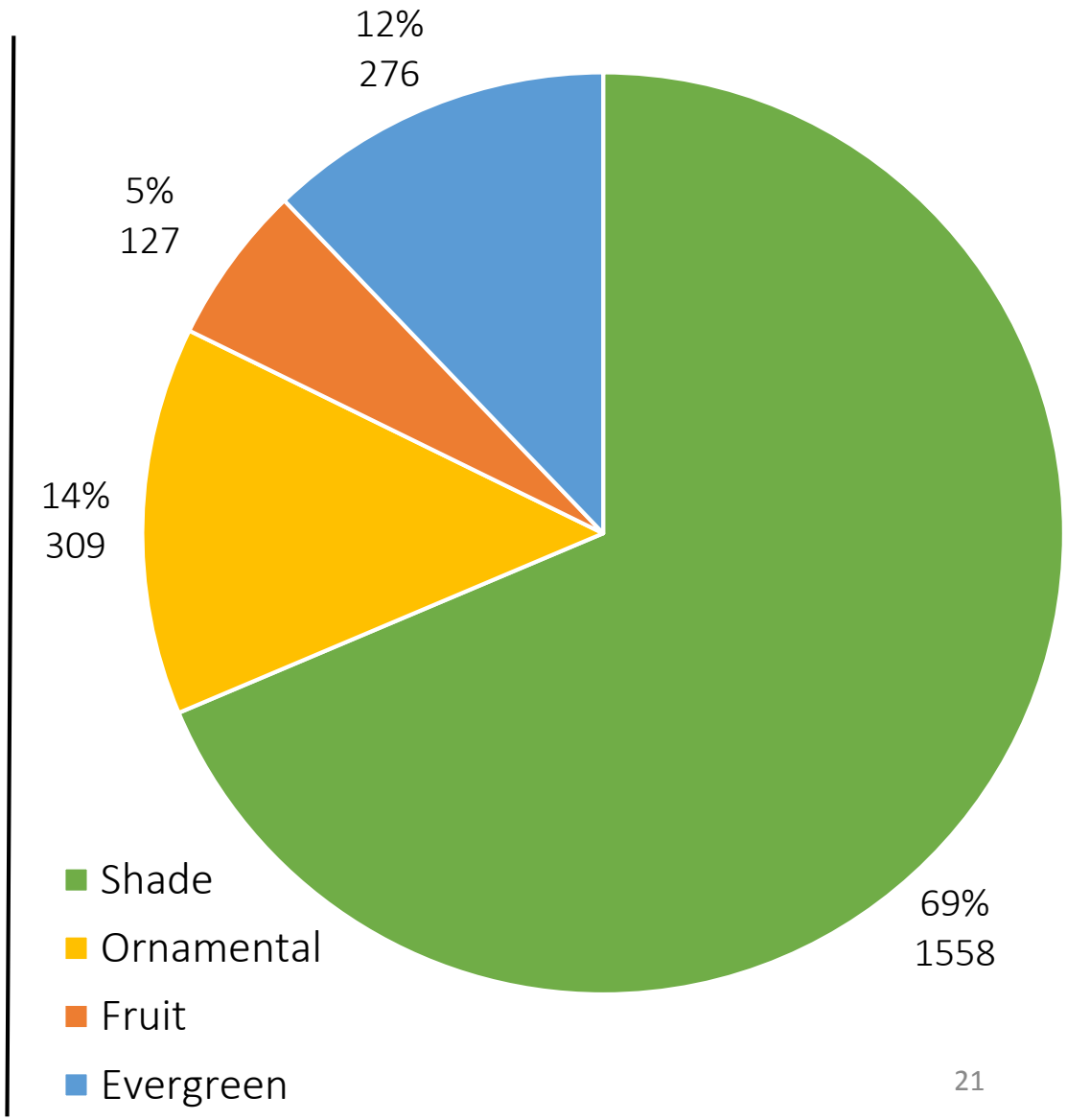
Survivorship: All Trees

HERO Fellow Rowan Moody hugs a tree

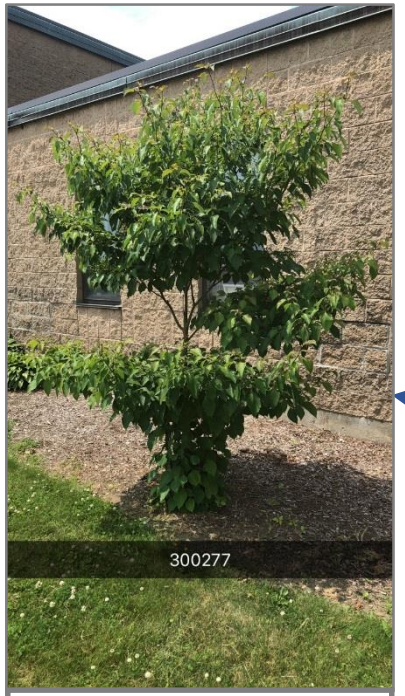


Species Attribute Composition: All Trees

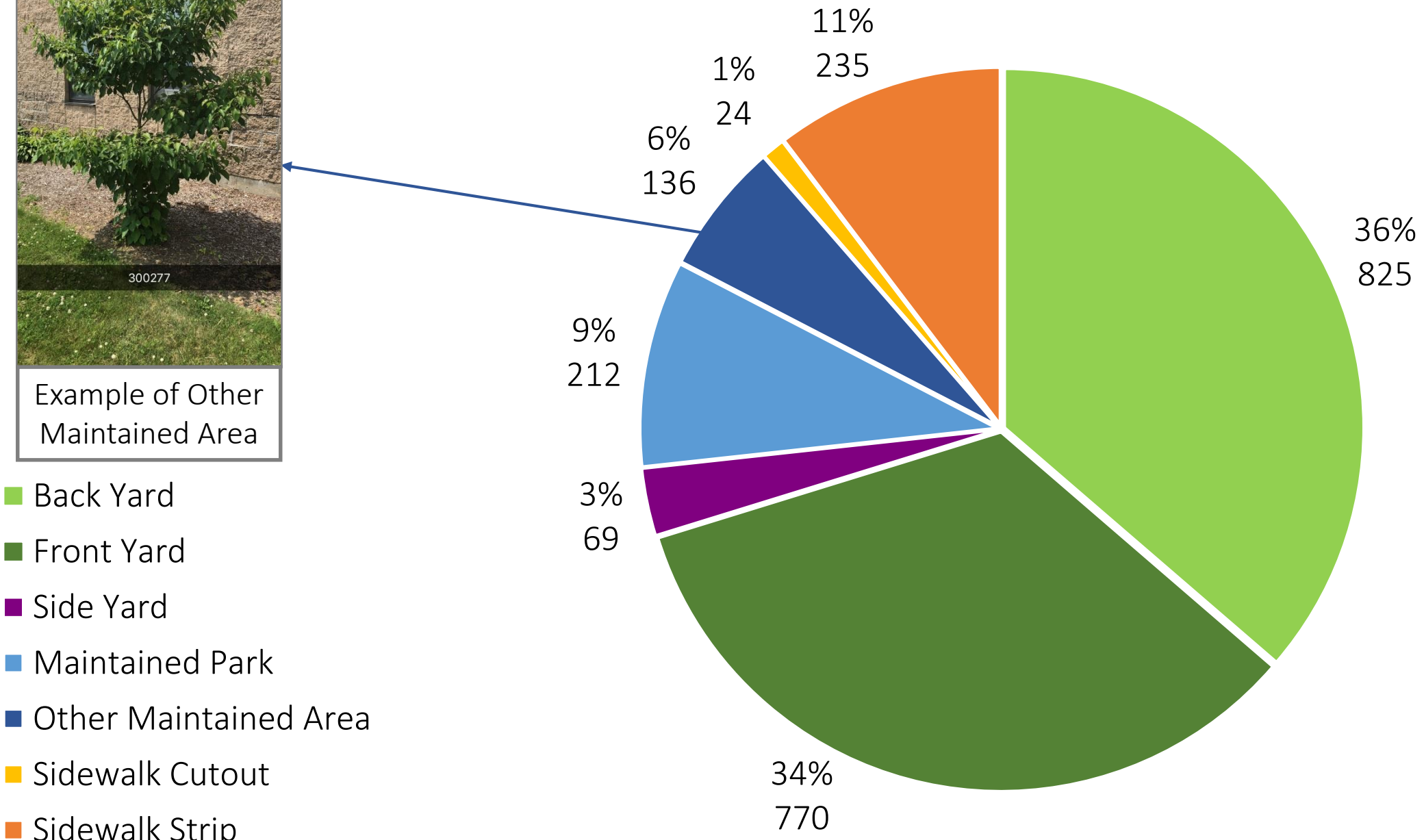




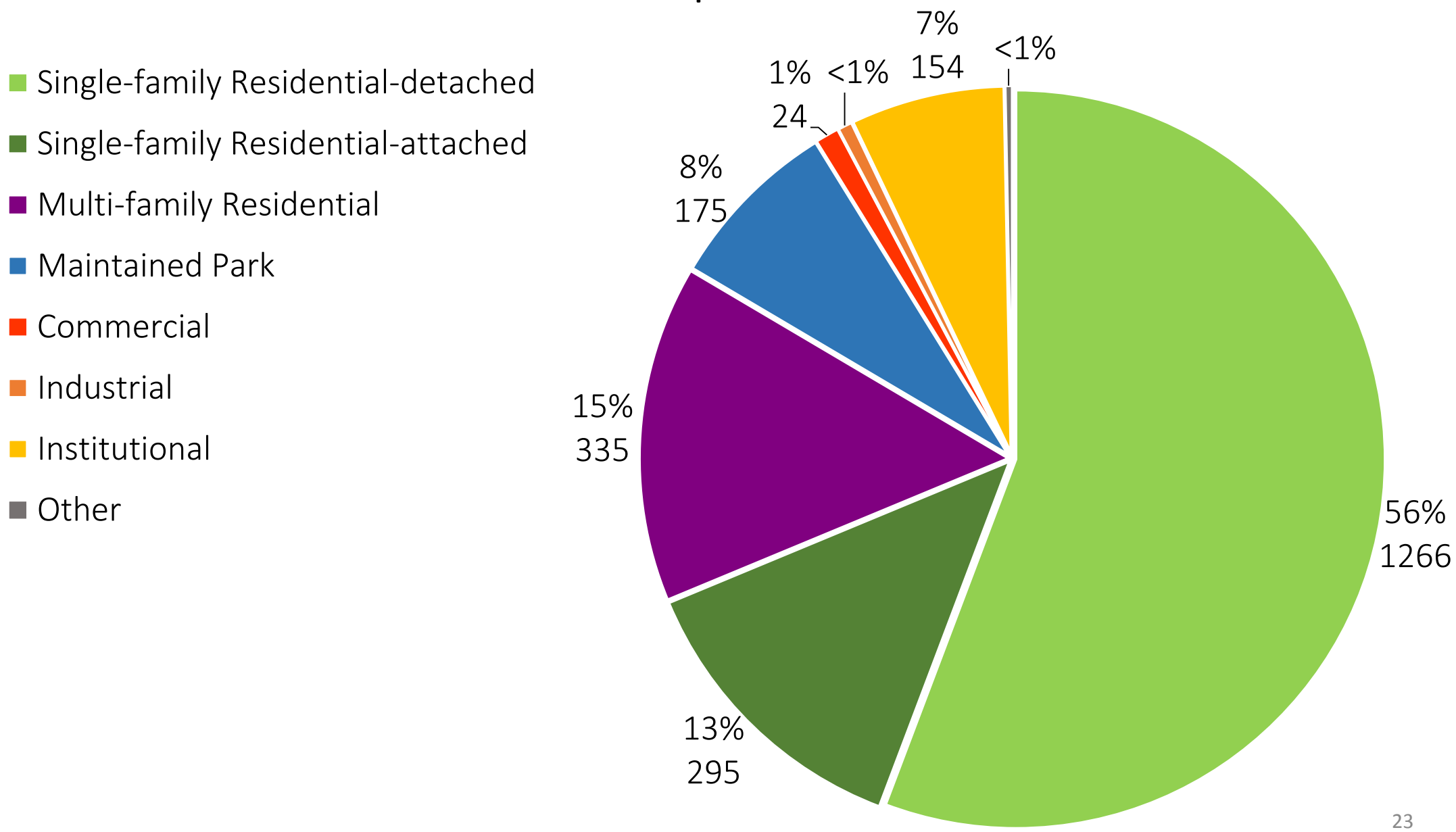
Site Type Composition: All Trees



Example of Other Maintained Area

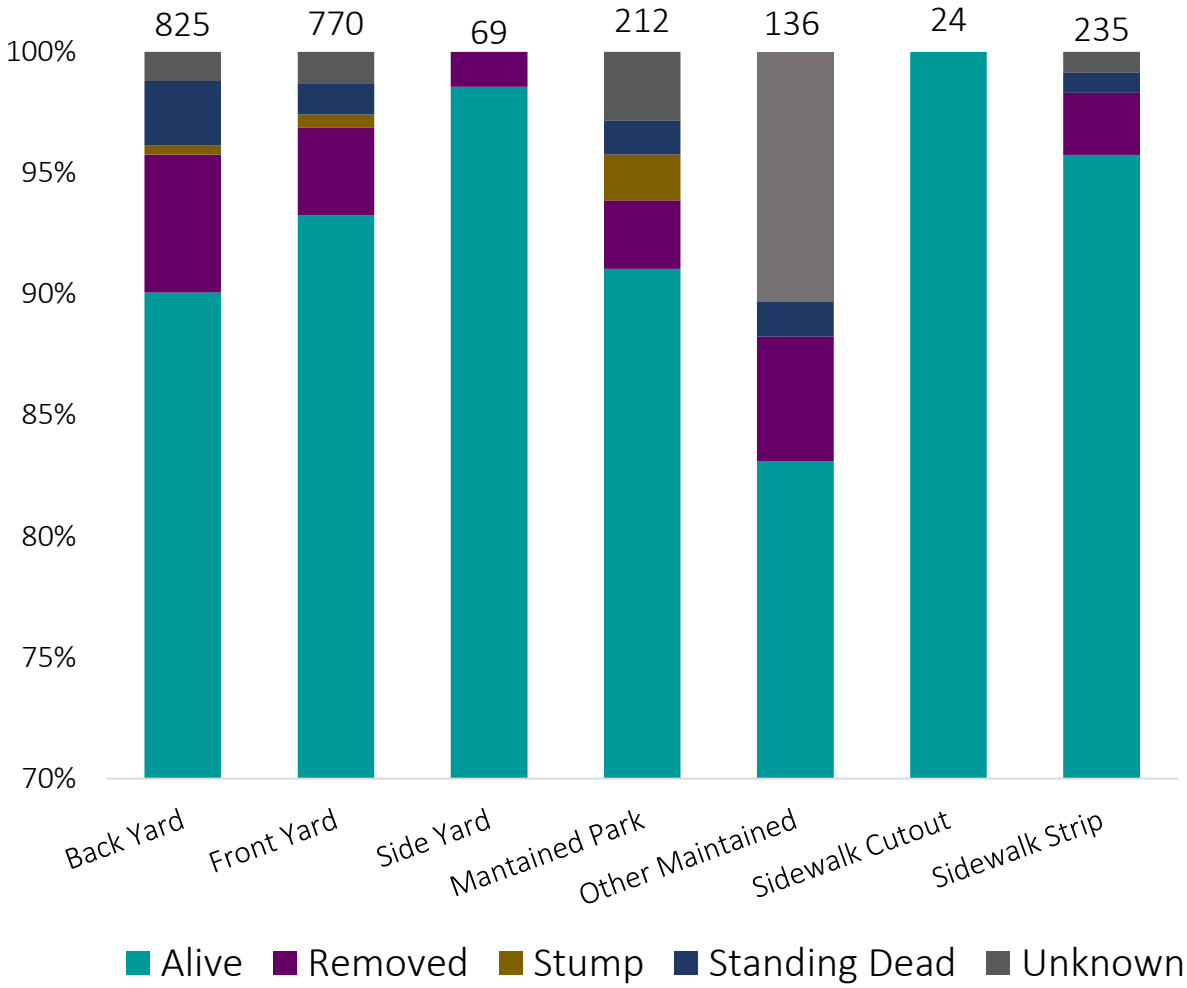


Land Use Composition: All Trees

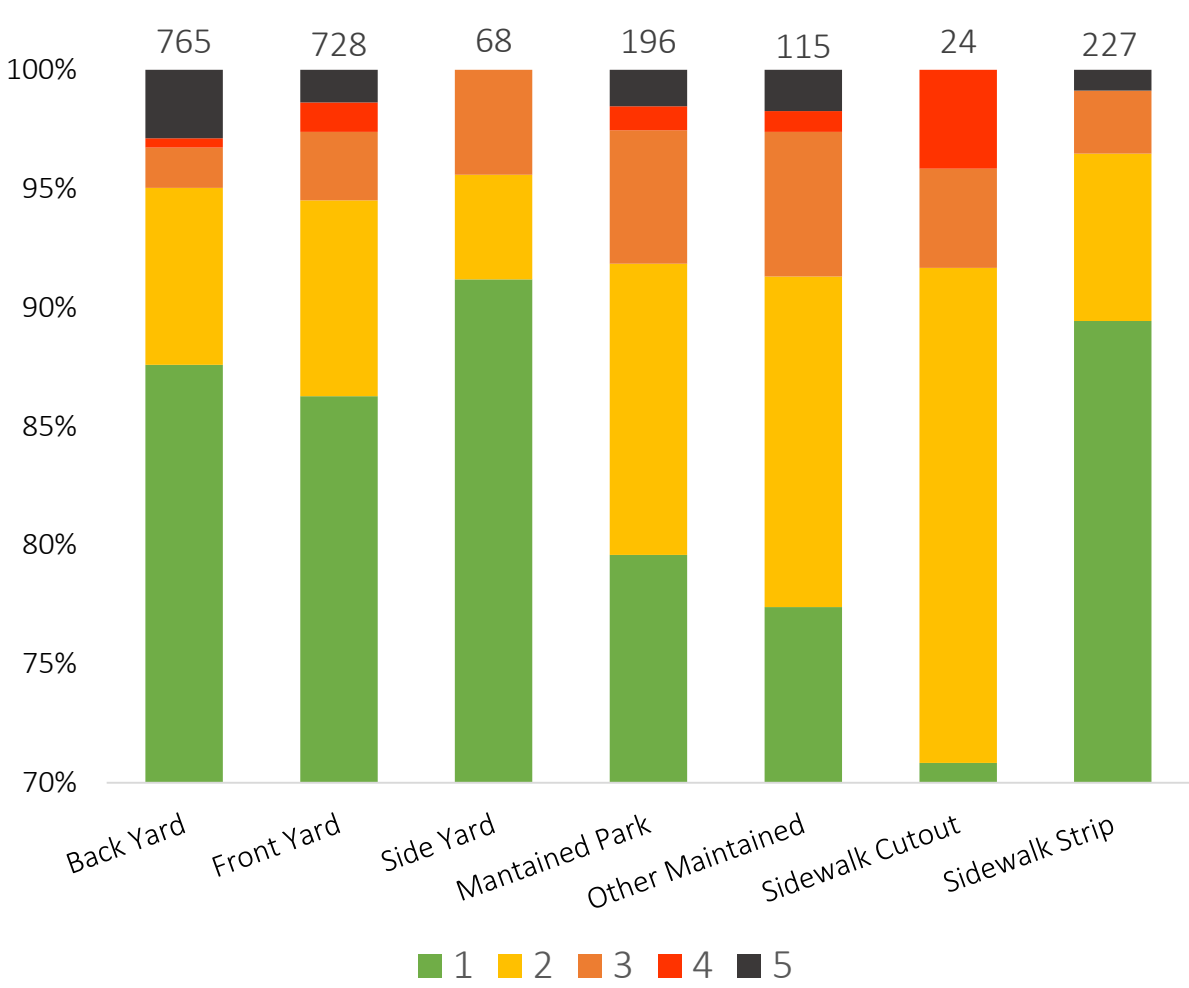


Health by Site Type: All Trees

Mortality n=2,271

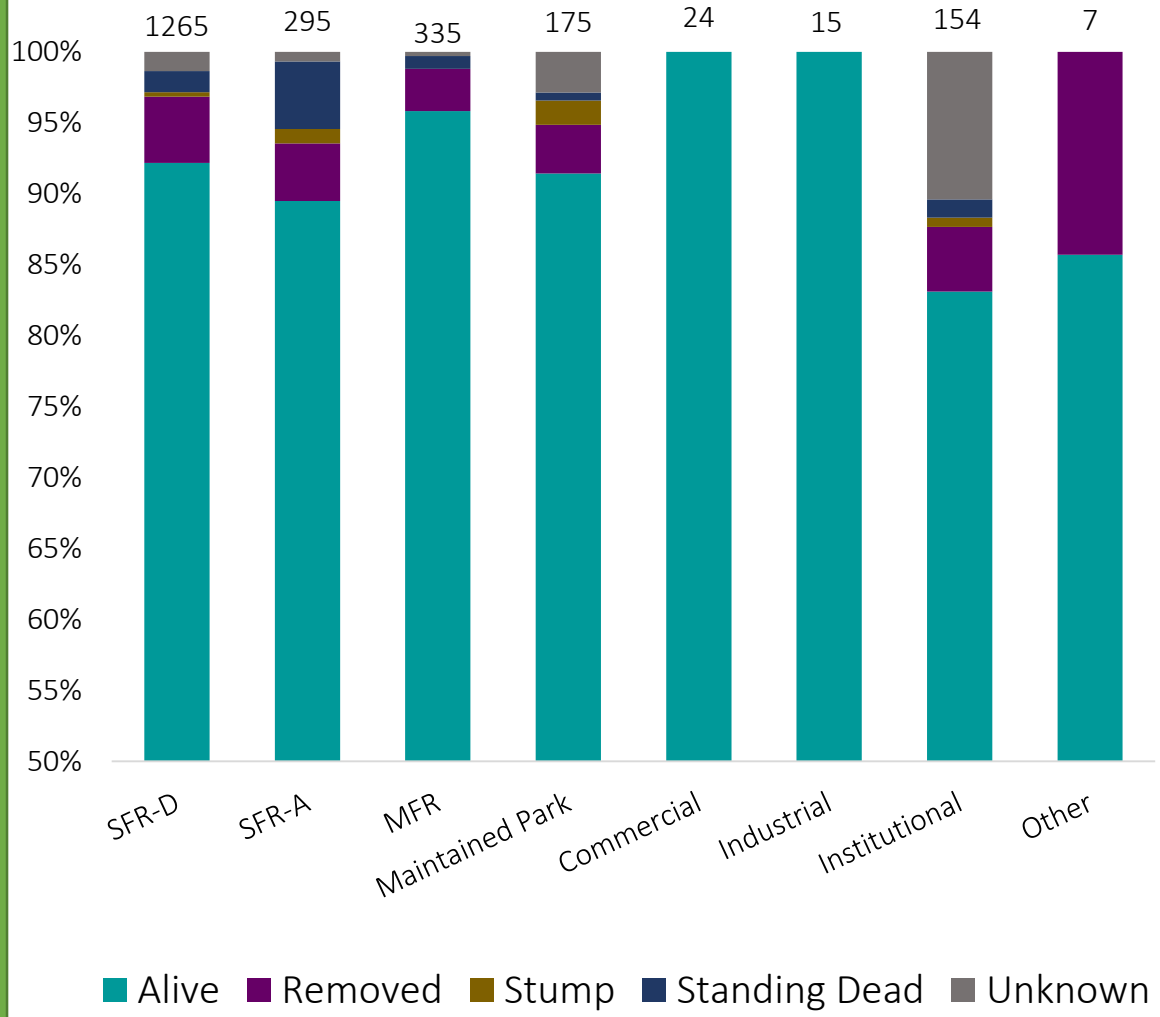


Vigor n=2,123

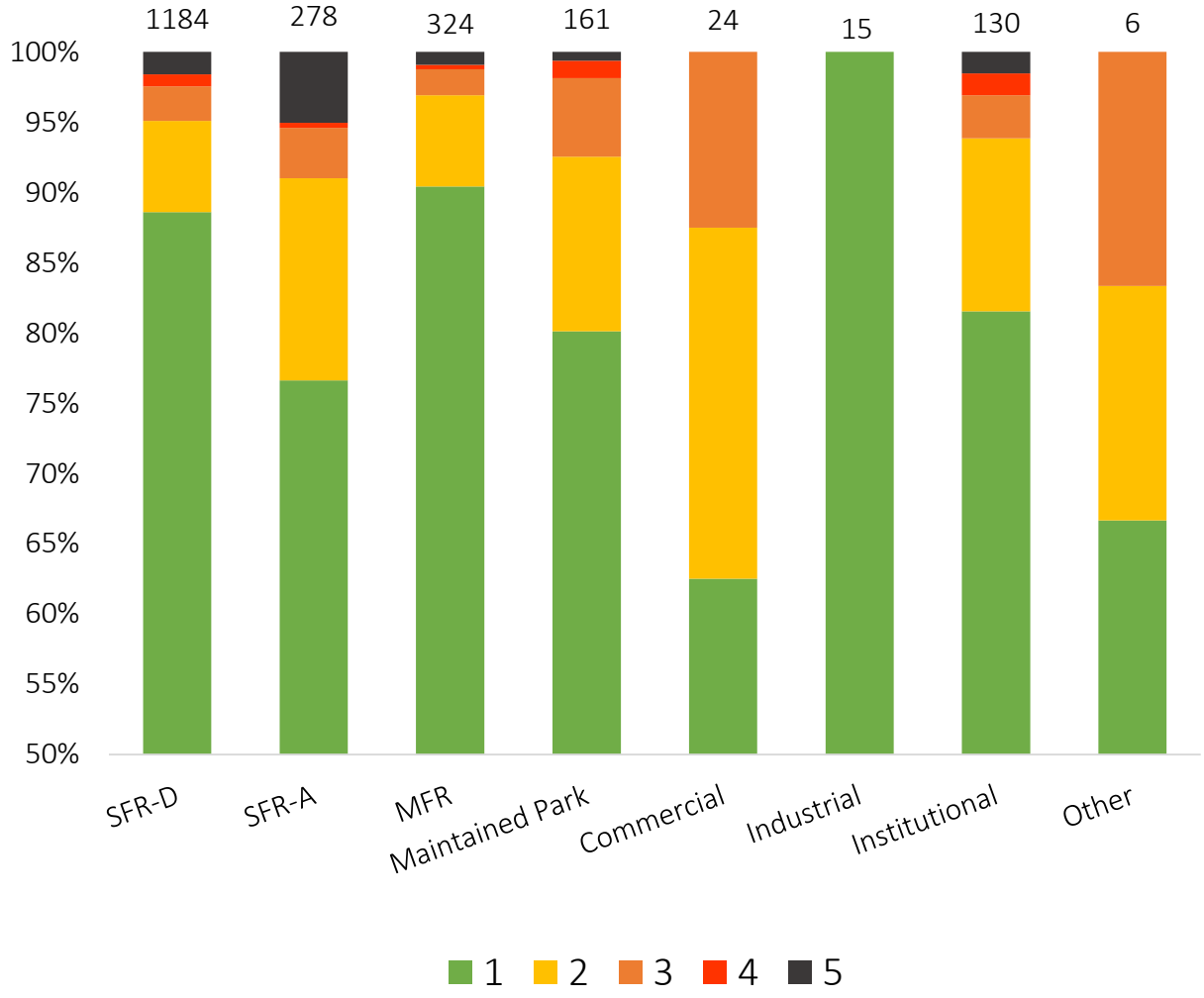


Health by Land Use: All Trees

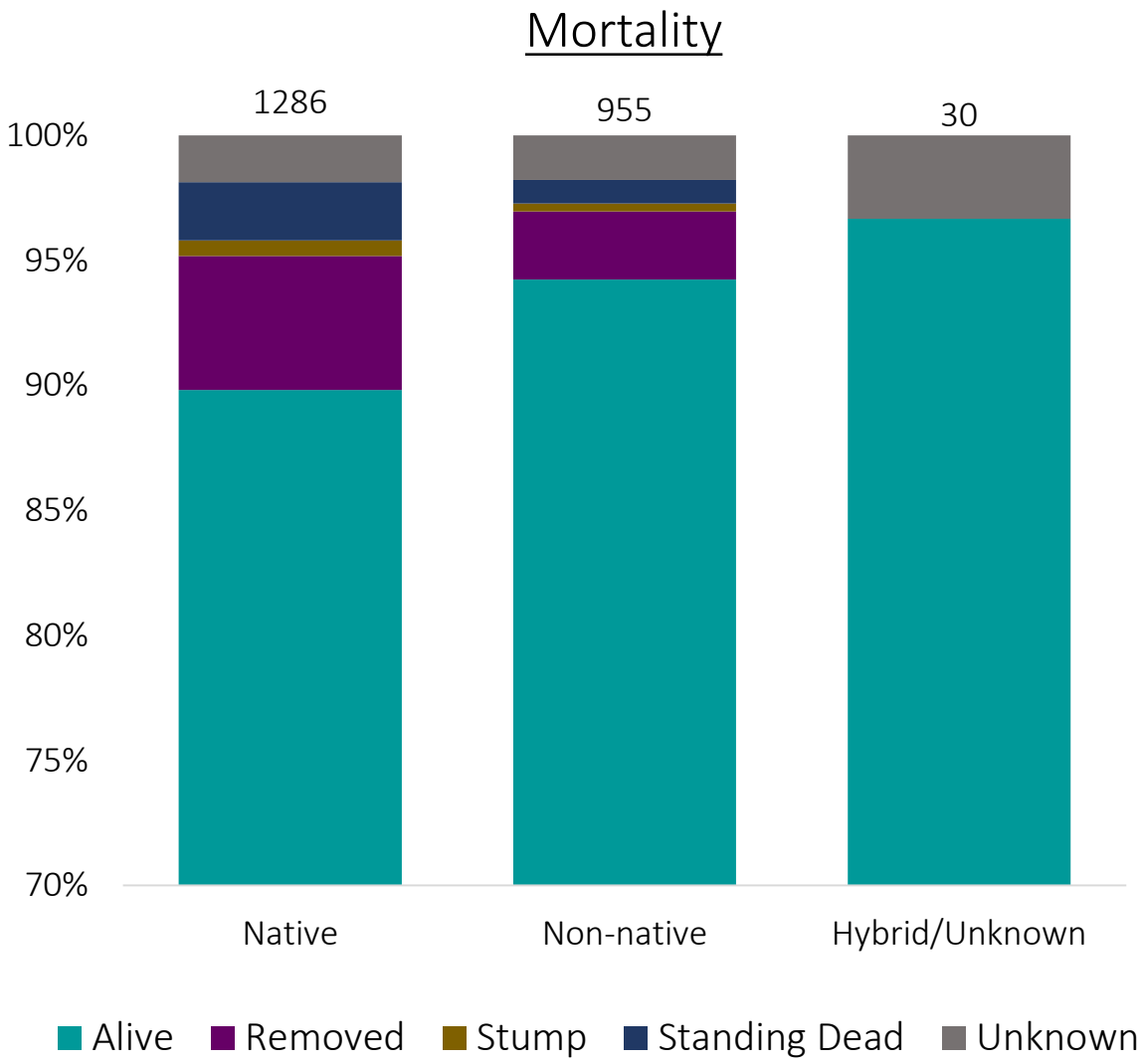
Mortality



Vigor



Health by Native Status: All Trees



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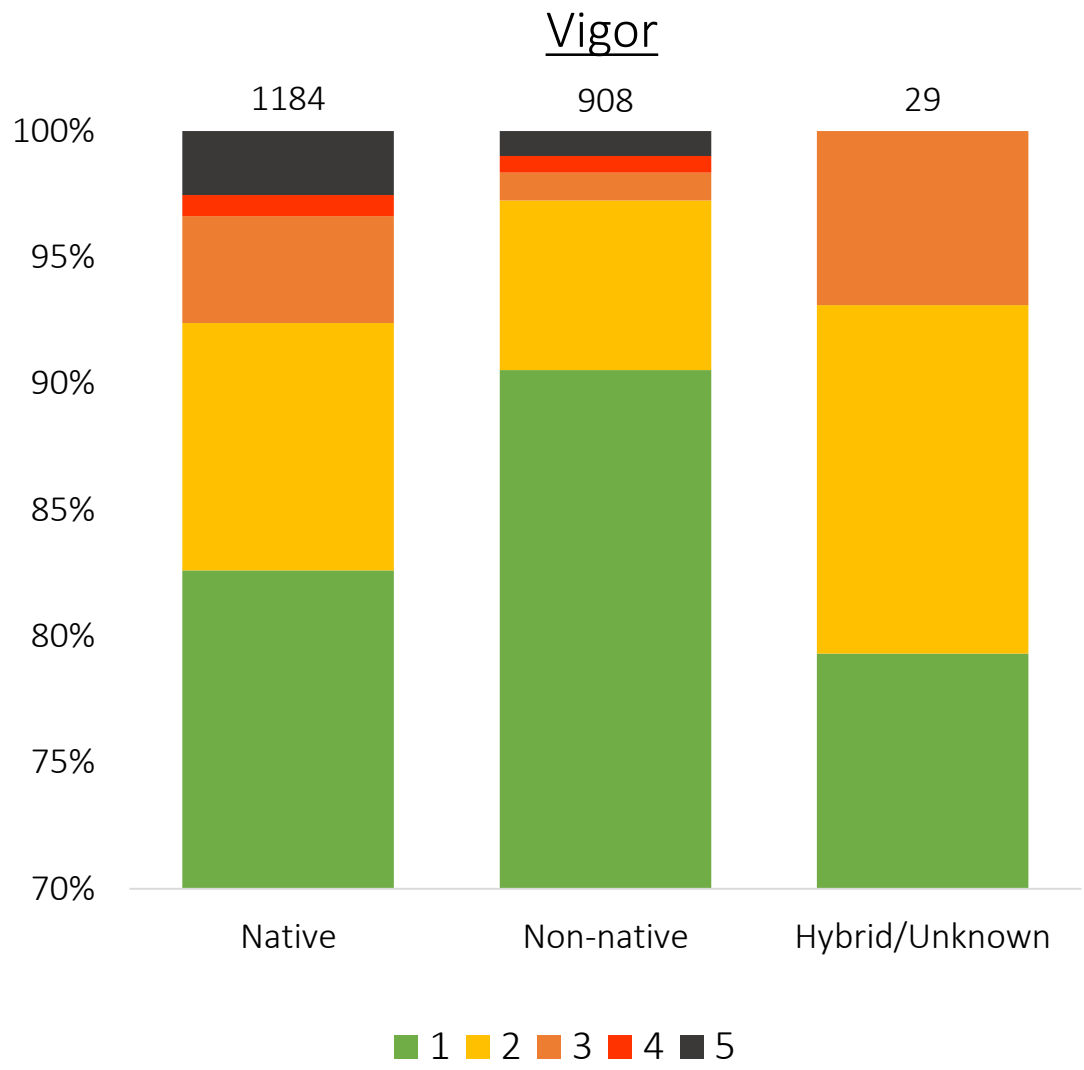
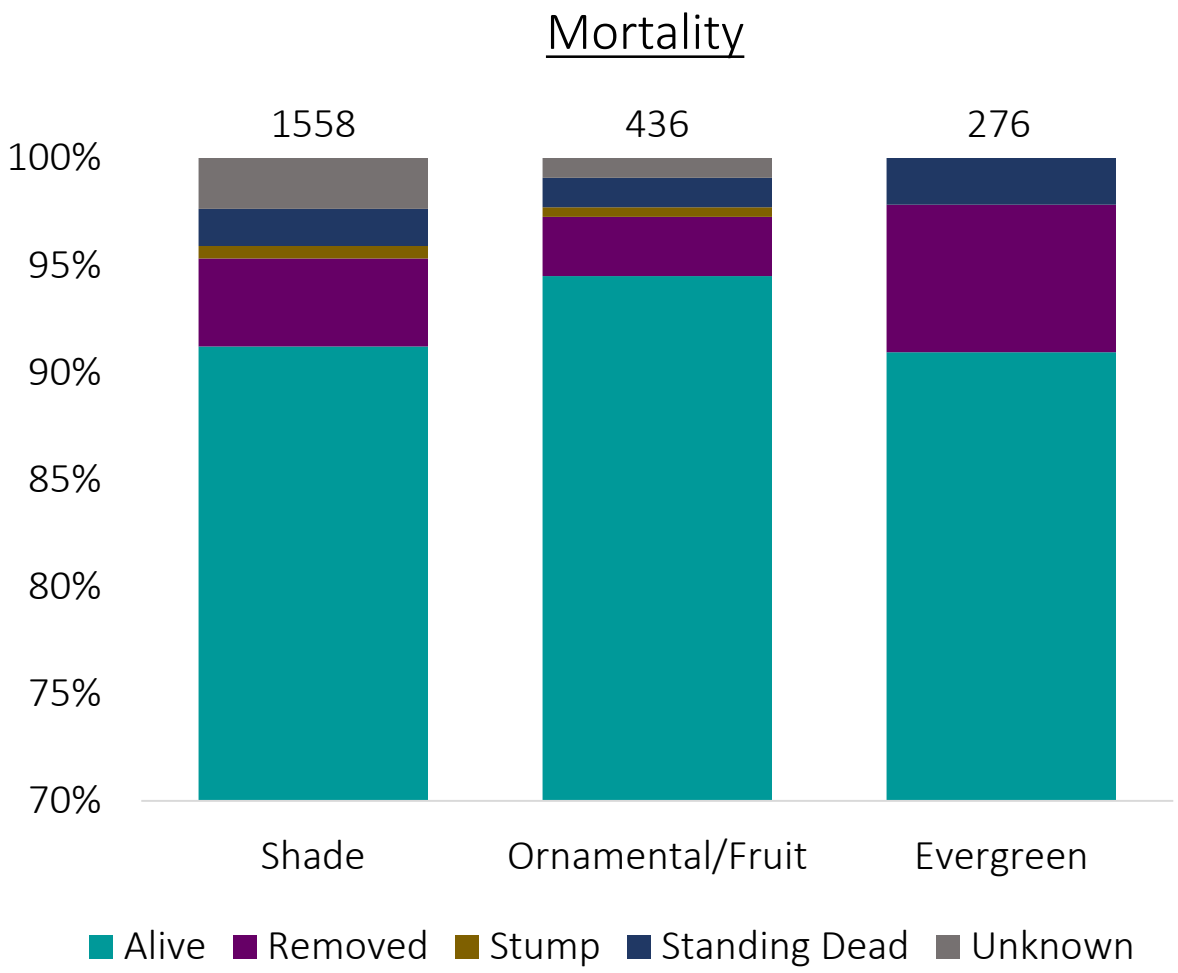


p<0.0001

Health by Species Type: All Trees



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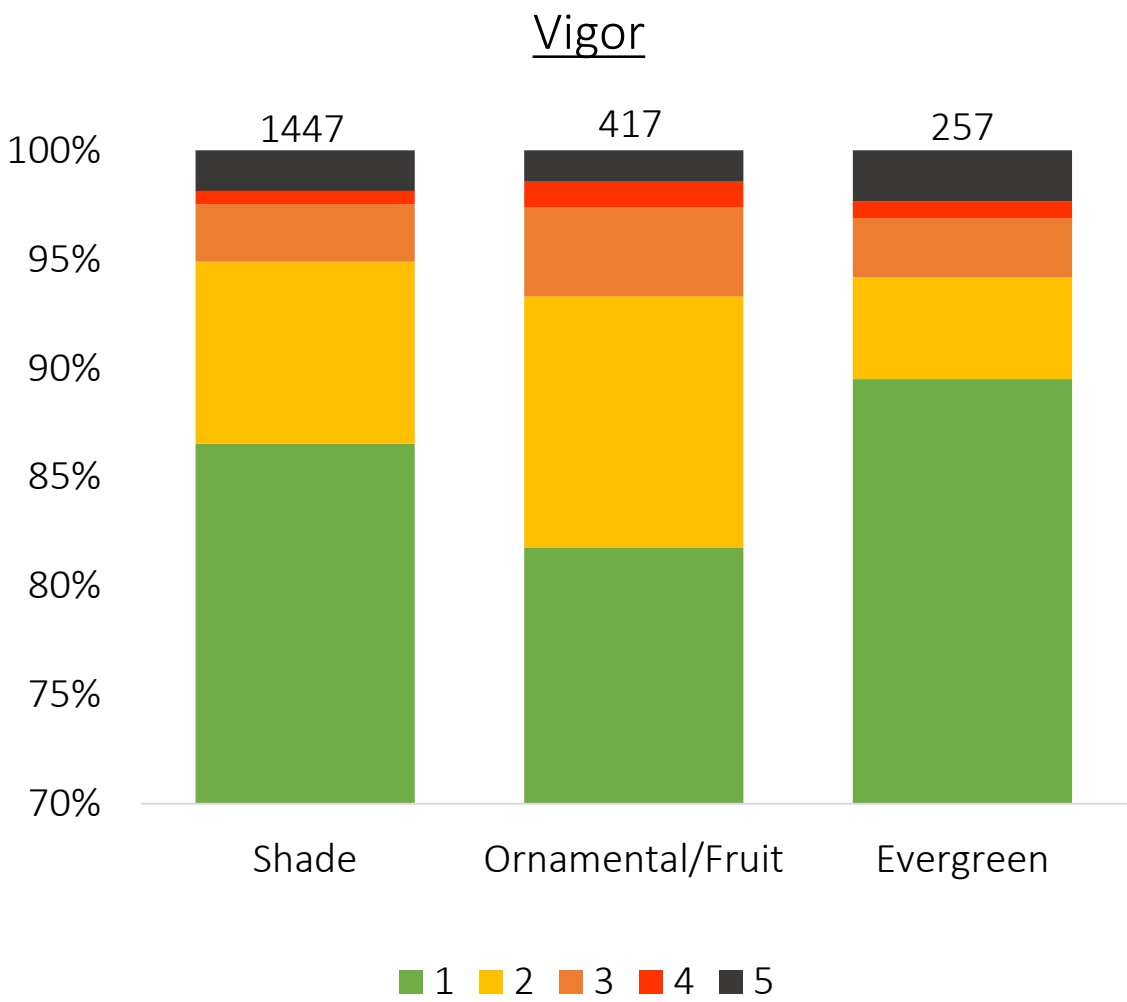


p=0.0659

Top 10 Species with 100% Survivorship

European Hornbeam n=45

Persian Ironwood n=23

Apple (common) n=20

Paperbark Maple n=19

London Planetree n=18

Cornelian Cherry Dogwood n=17

Norway Spruce n=16

White Fir n=14

White Spruce n=13

Peach n=13

Lowest Species for Survivorship: All Trees

Dawn Redwood
n=17 : 40%

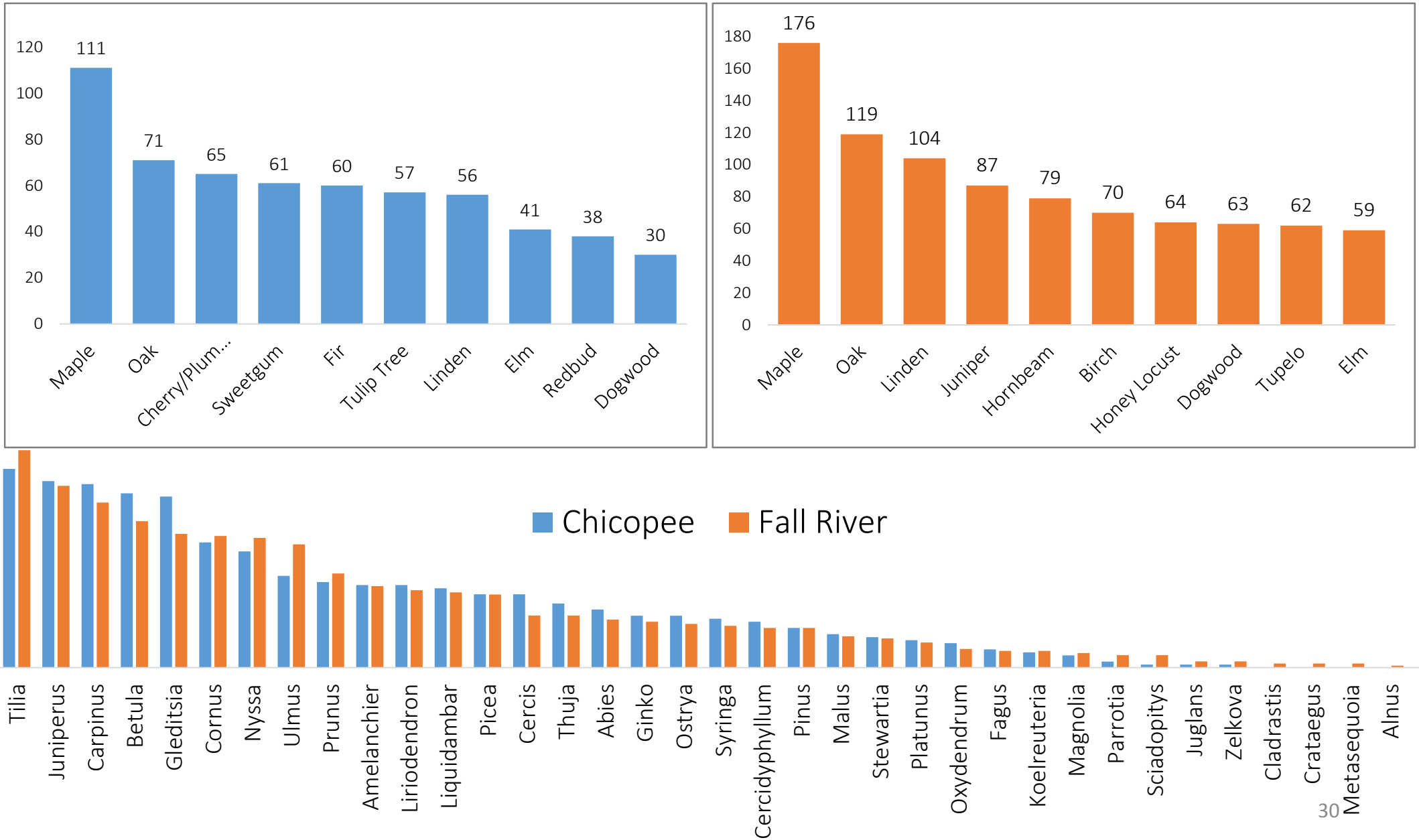
Swamp white Oak
n=18 : 66%

White Oak
n=18 : 72%

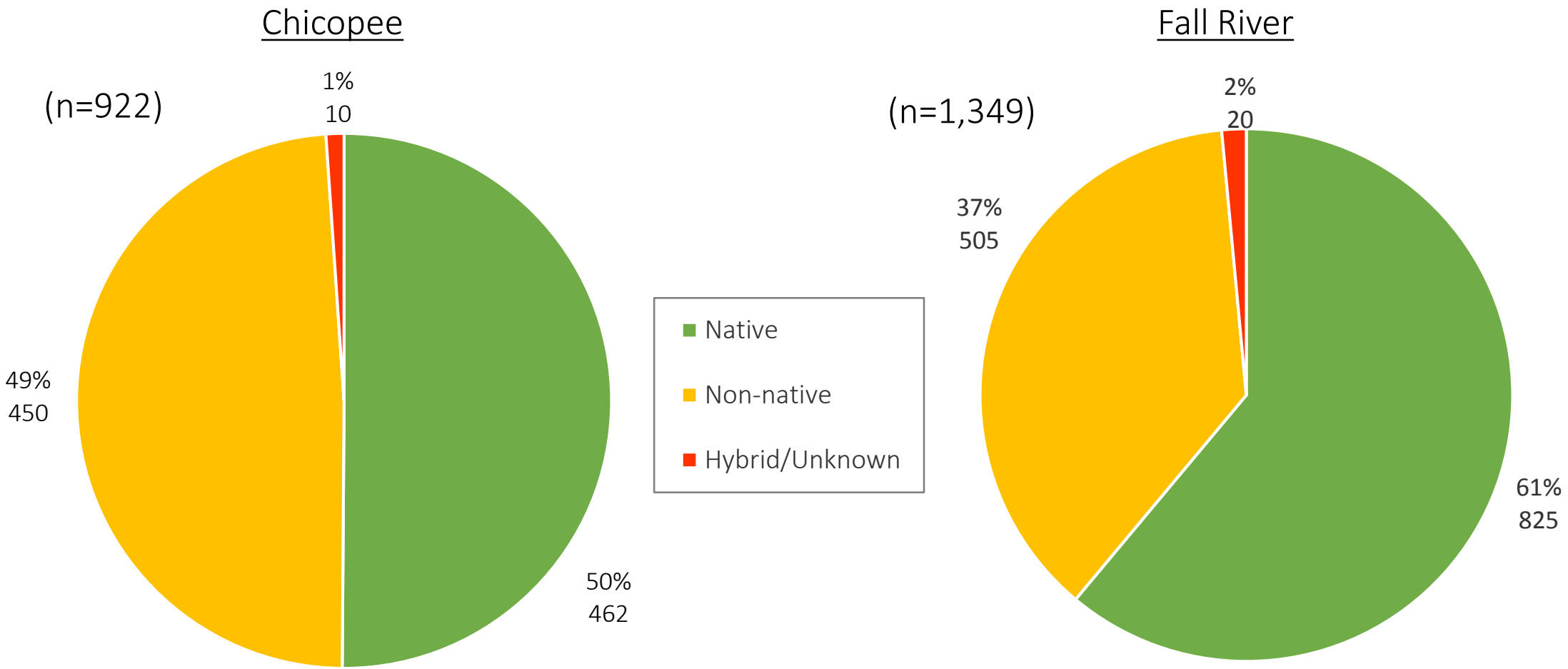
Black Gum
n=78 : 74%

Austrian Pine
n=8 : 75%

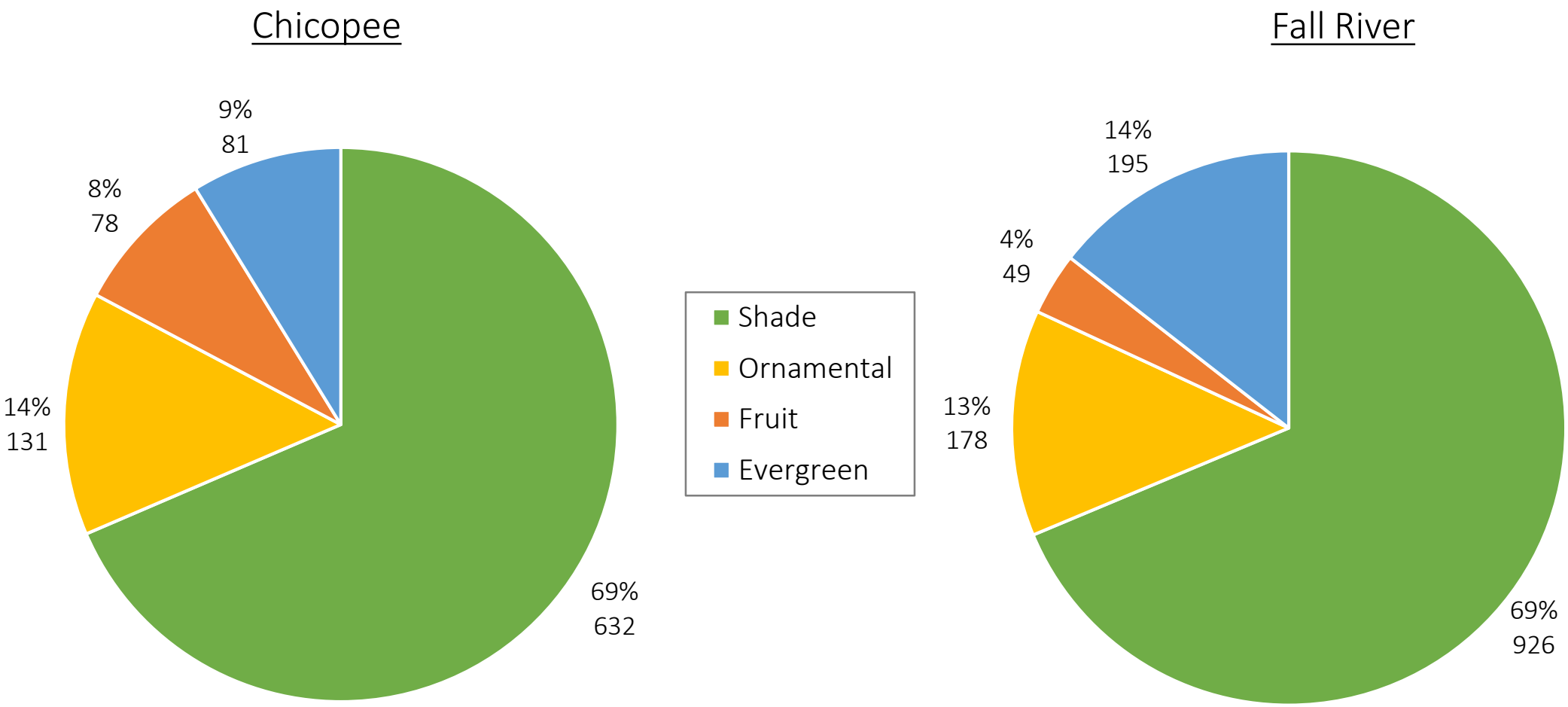
Genus Composition: Comparison Between Cities



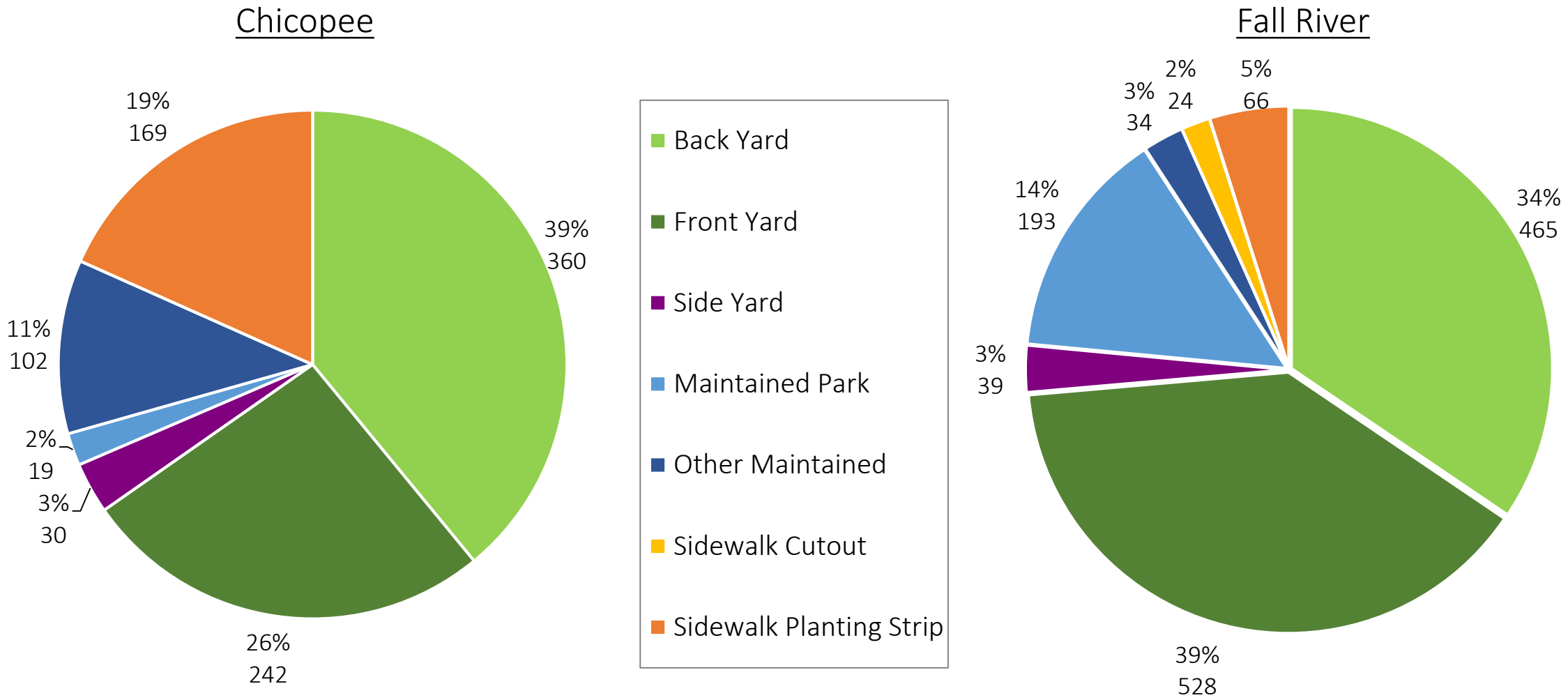
Native Comparison: Composition Between Cities



Tree Type: Composition Between Cities

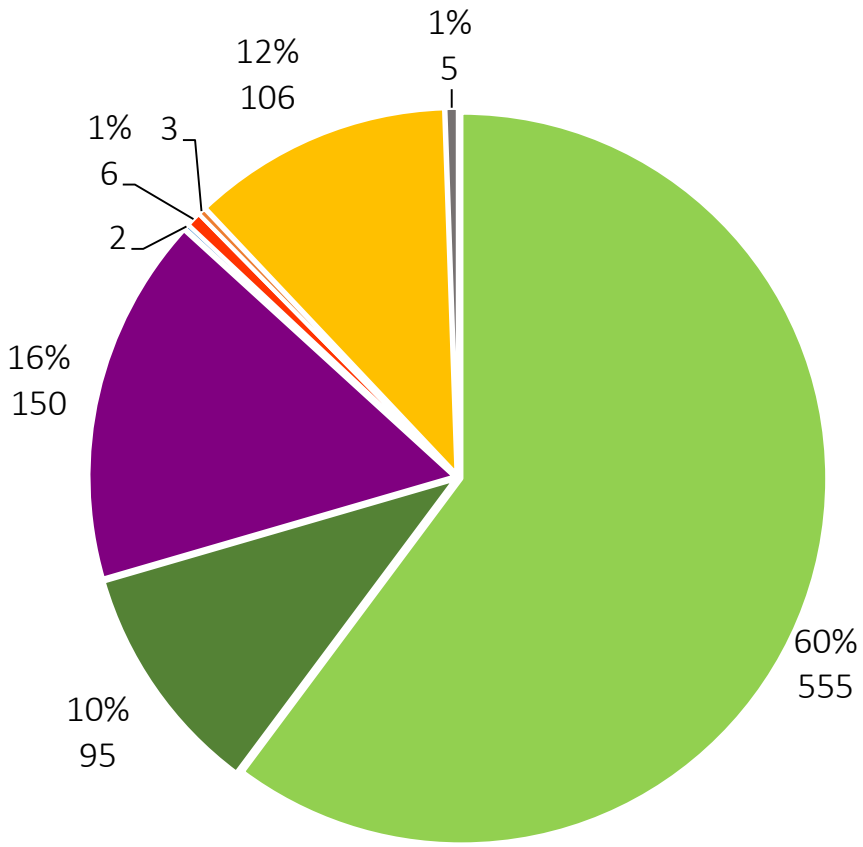


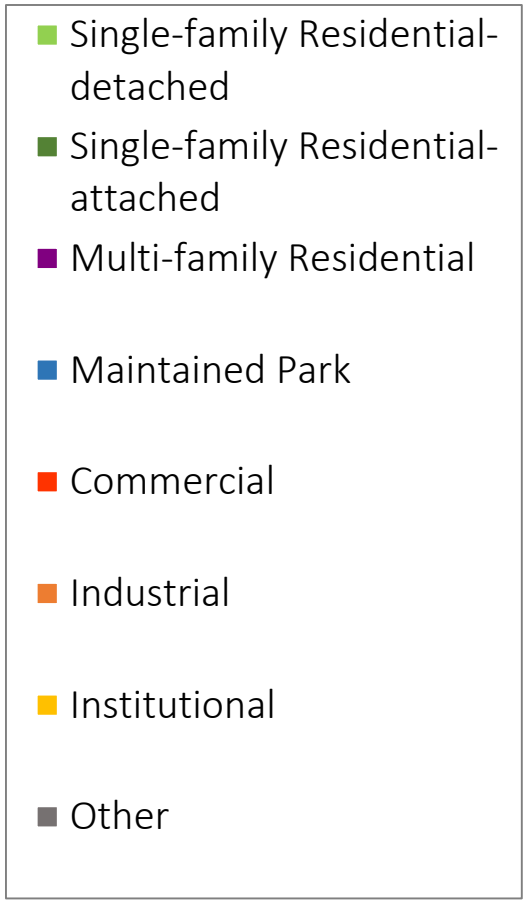
Site Type: Composition Between Cities



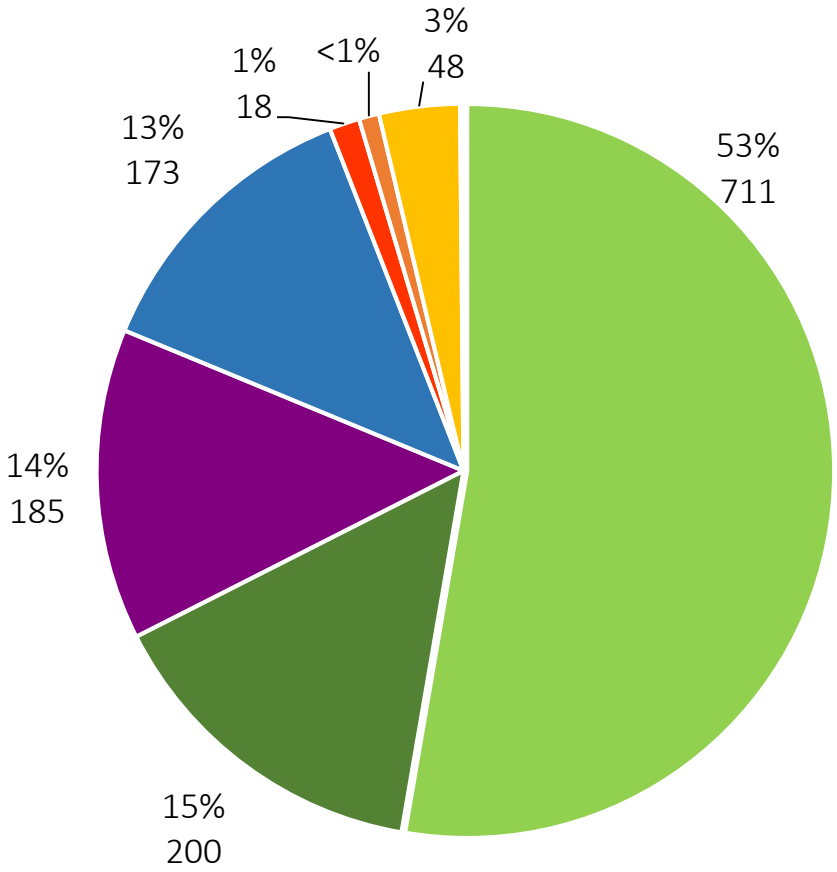
Land Use: Composition Between Cities

Chicopee

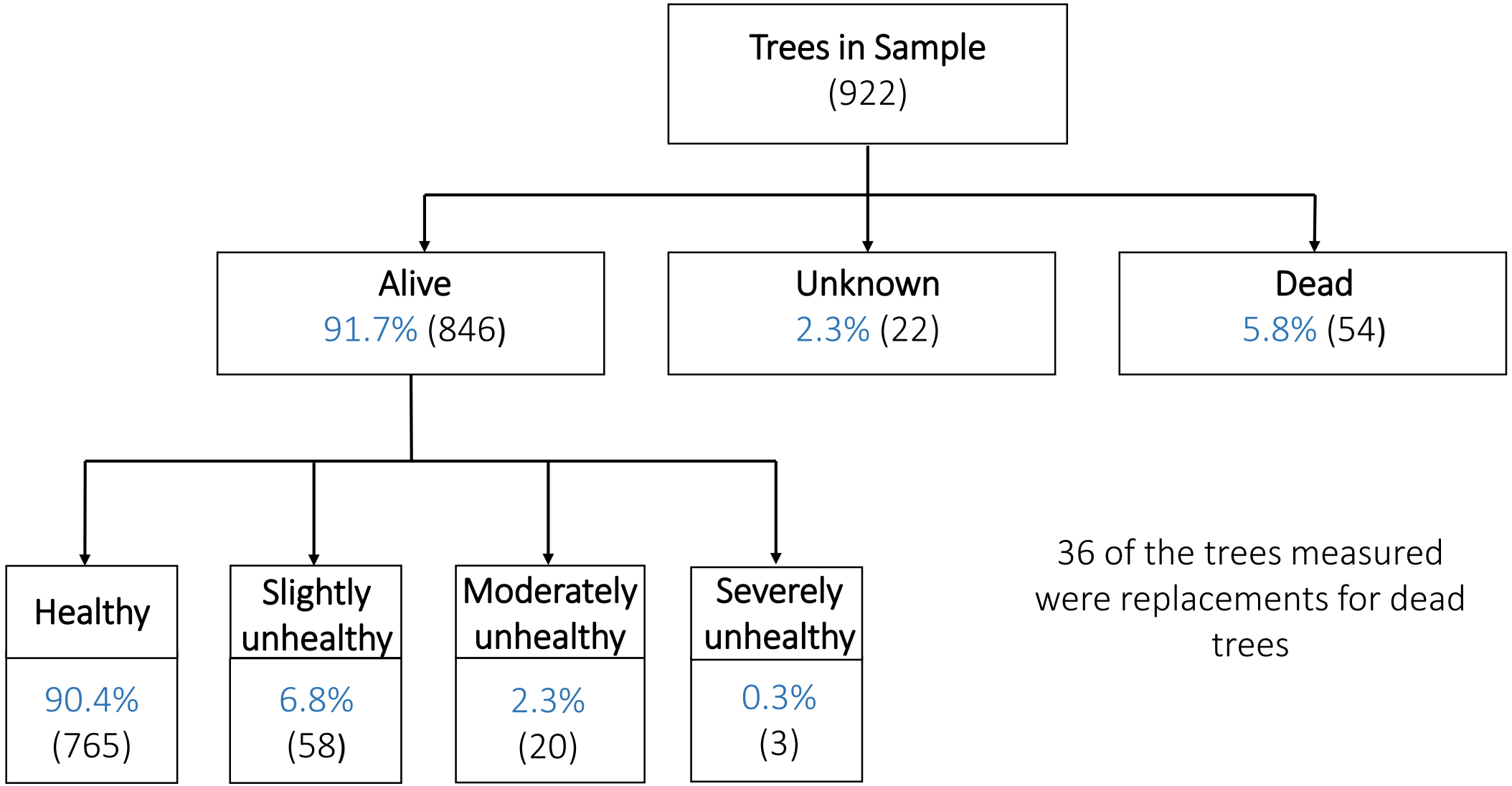




Fall River

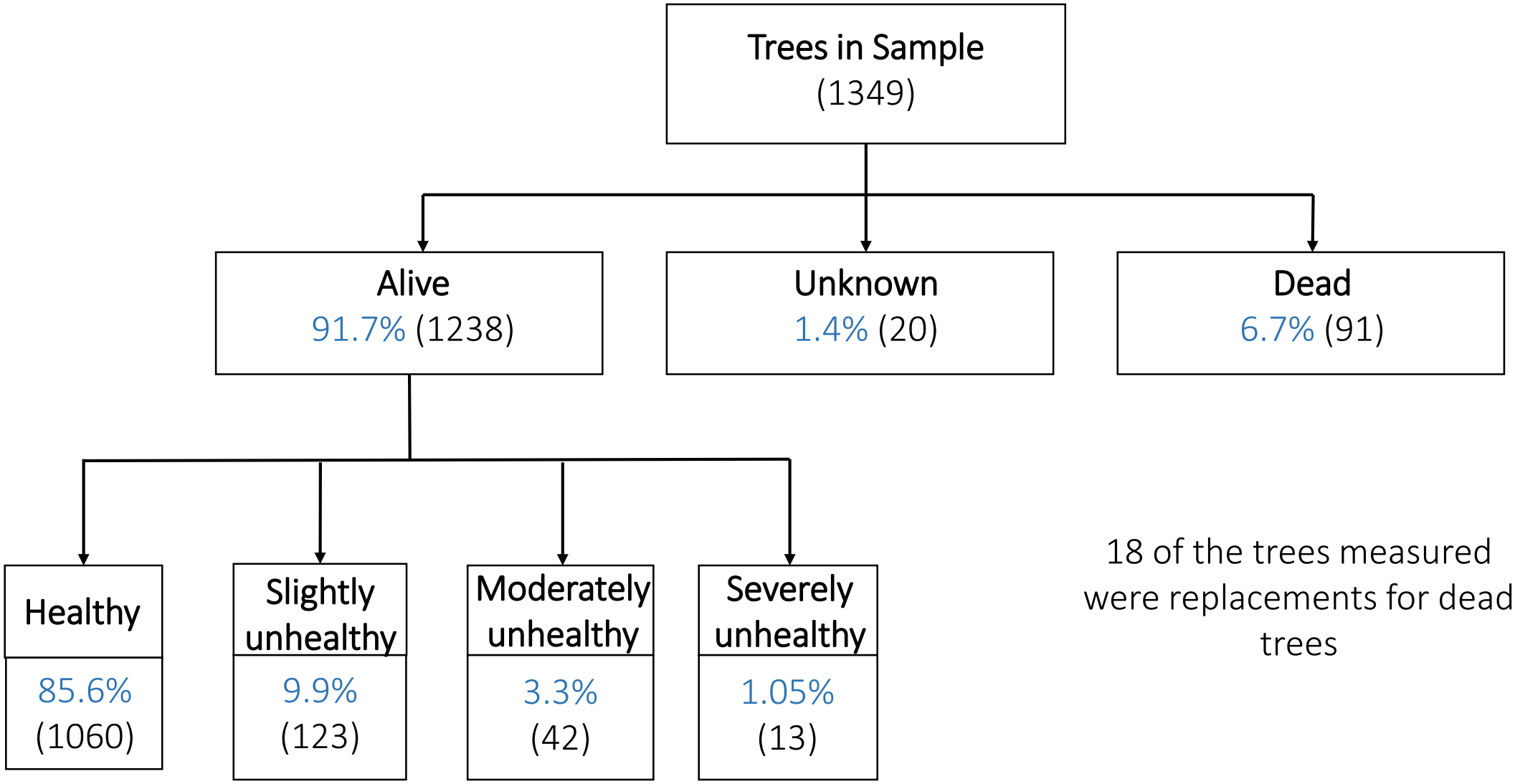


Chicopee Tree Survivorship



36 of the trees measured were replacements for dead trees

Fall River Tree Survivorship



18 of the trees measured were replacements for dead trees

Most Common Species Planted: Vigor & Survivorship in Chicopee

Sweetgum
95% : n=61
Mean vigor=1.35

Tulip tree
79% : n=57
Mean vigor=1.49

Littleleaf Linden
93% : n=46
Mean vigor=1.12

American Elm
95% : n=41
Mean vigor=1.15

Eastern Redbud
86% : n=38
Mean vigor=1.05

Species with Lowest Survivorship: Chicopee

Dawn Redwood
53% : n=15

European Beech
62% : n=8

White Oak
75% : n=12

Black Gum
75% : n=16

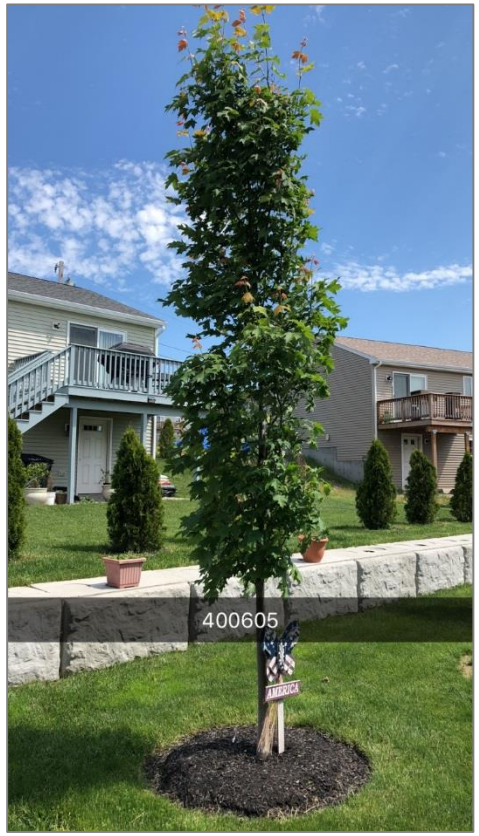
Tulip Tree
79% : n=57

Most Common Species Planted: Vigor & Survivorship in Fall River

Littleleaf Linden
93% : n=104
Mean vigor=1.14

Eastern Red Cedar
87% : n=87
Mean vigor=1.08

Red Maple
98% : n=76
Mean vigor=1.14



Freeman Maple
100% : n=74
Mean vigor=1.05

Pin Oak
89% : n=67
Mean vigor=1.18

Species with Lowest Survivorship: Fall River

Swamp White Oak
44% : n=9

Red Oak
66% : n=6

White Oak
66% : n=6

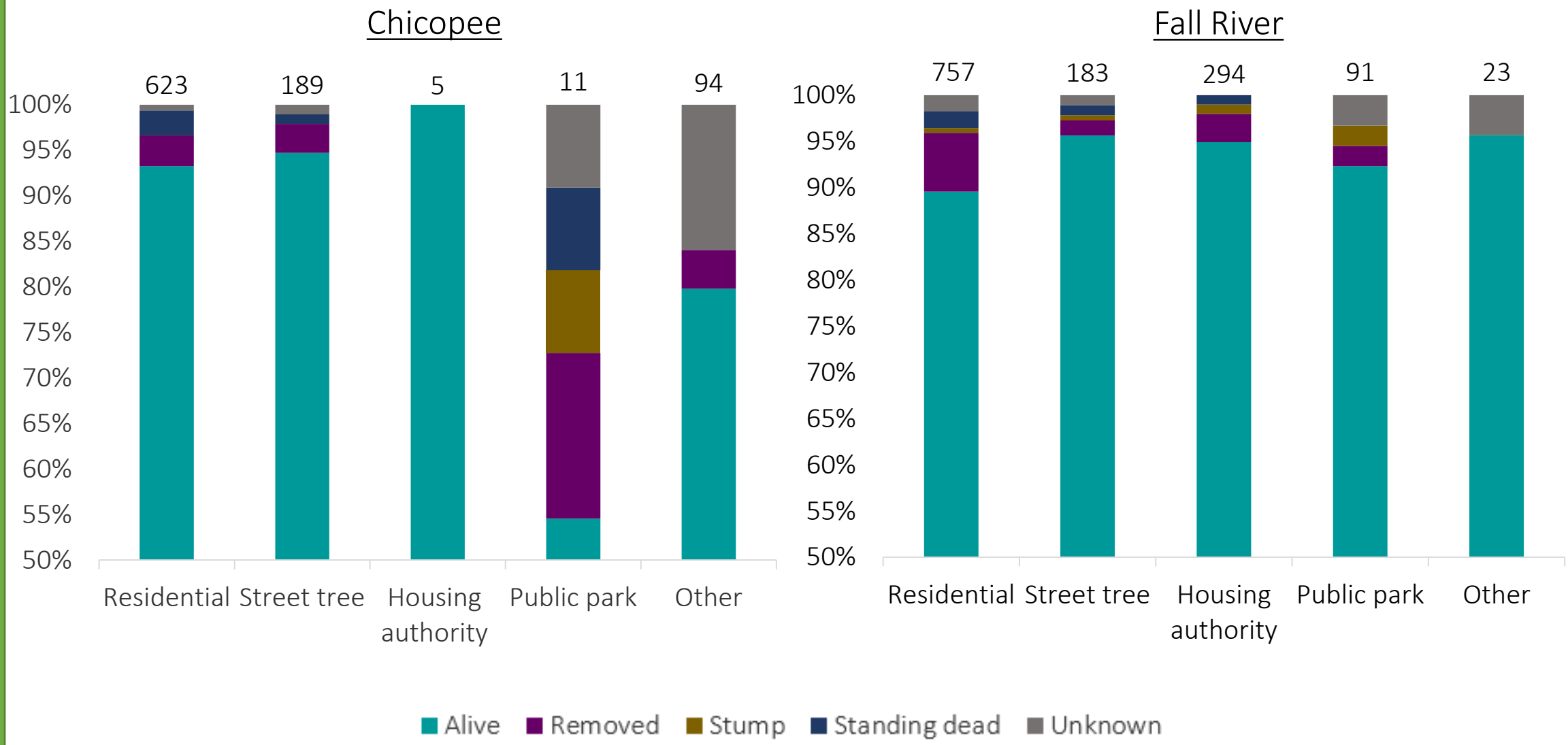
Black Gum
74% : n=61

Scarlet Oak
77% : n=9

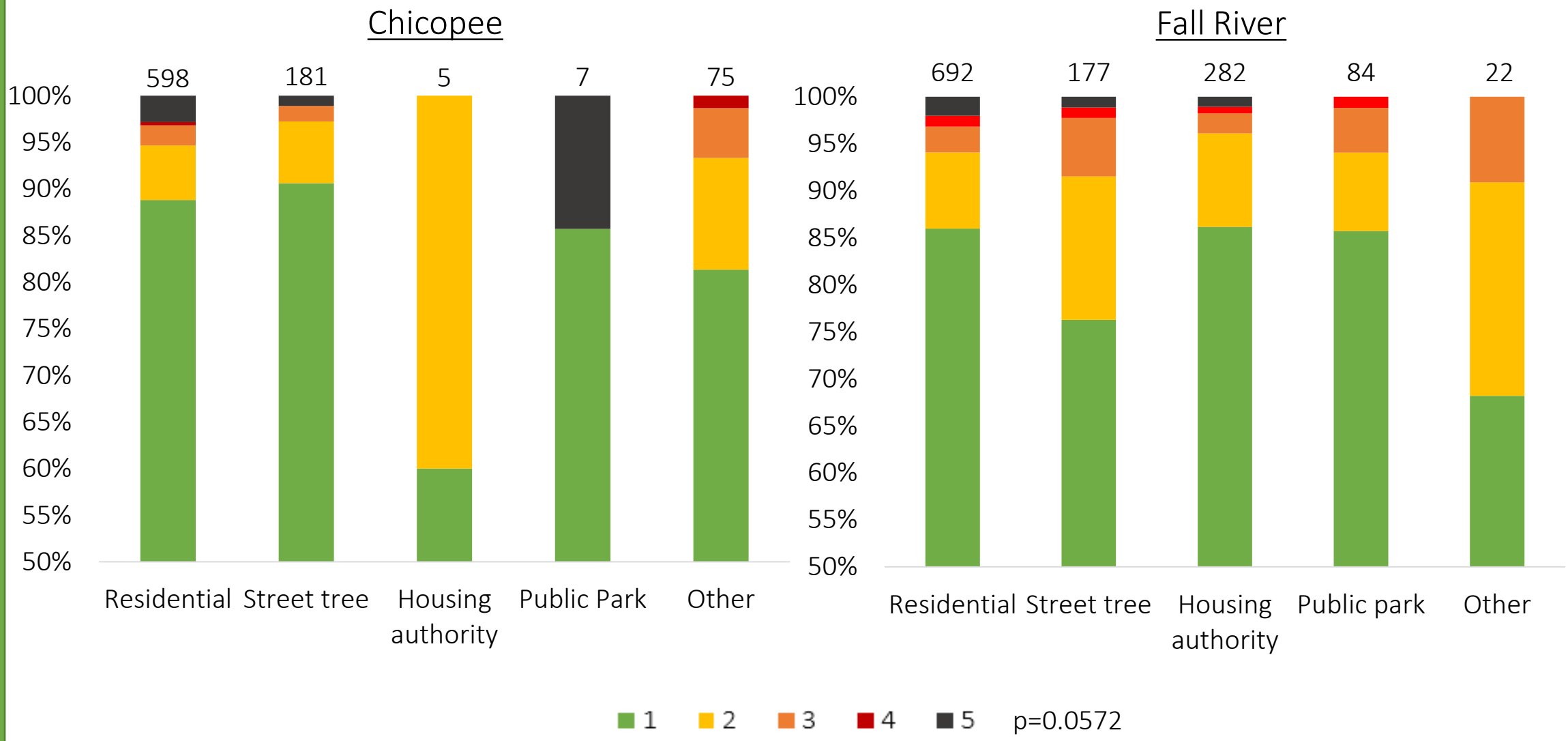
Ownership Types

	Street Trees	Private Trees	Housing Authorities	Maintained Parks
Stewardship responsibility	Maintained by the DCR and/or Department of Public Works (or equivalent)	Maintained by private residents or institutions	Maintained by on-site housing authority maintenance crews and/or DCR	Maintained by the Department of Public Works (or equivalent)
Size	Generally a larger caliper stem at planting (2.0-2.5 in)	Generally a smaller caliper stem at planting (1.5-2.0 in)	Generally a larger caliper stem at planting (~2.5 in)	Generally a larger caliper stem at planting (~2.5 in)
Stresses	Include traffic, vandalism & lower quality soil. Road salt/sand.	Include damage from landscaping & infrequent watering	Include damage from landscaping & infrequent watering, in addition to vandalism	Include damage from landscaping & infrequent watering, in addition to vandalism

Mortality Comparison: Ownership



Vigor Comparison: Ownership



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Survivorship of species
Interview responses

Interview Research Questions

What factors influence sense of place for organizational actors and residents?

- How has the GGCP in Fall River and Chicopee influenced the place identity of:
  - Organizational actors
  - Residents
- How have interactions between organizations and residents shaped the place-making process?
- What policy implications arise out of these analyses?
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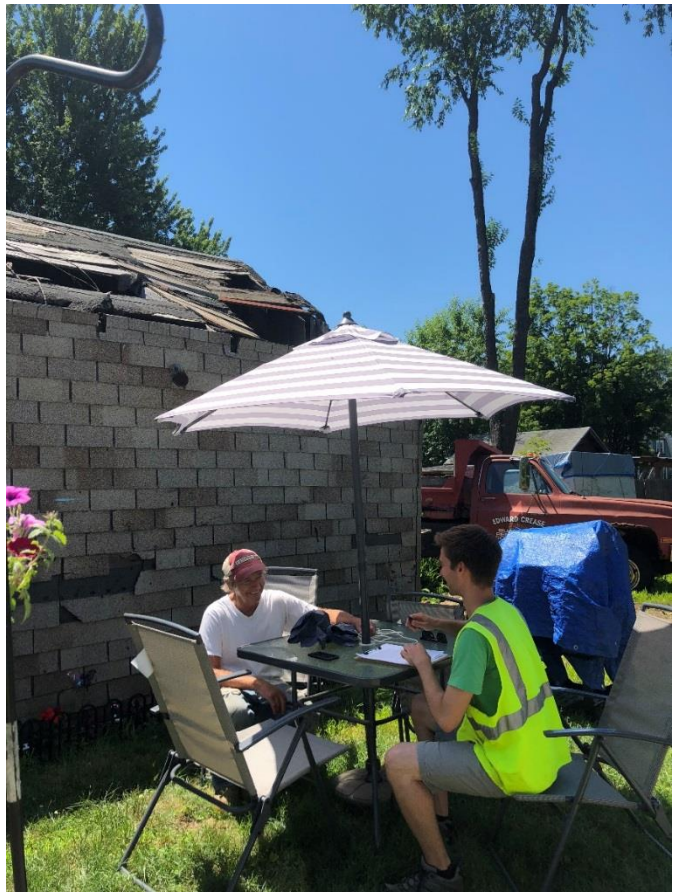


HERO Fellow Andy Pagan interviews resident

Data Collected

- 161 Residents called
- 28 Residents agreed to interviews

- 41 Interviews conducted:
  - 35 Homeowners (residents)
  - 5 Organizational representatives
  - 1 City official

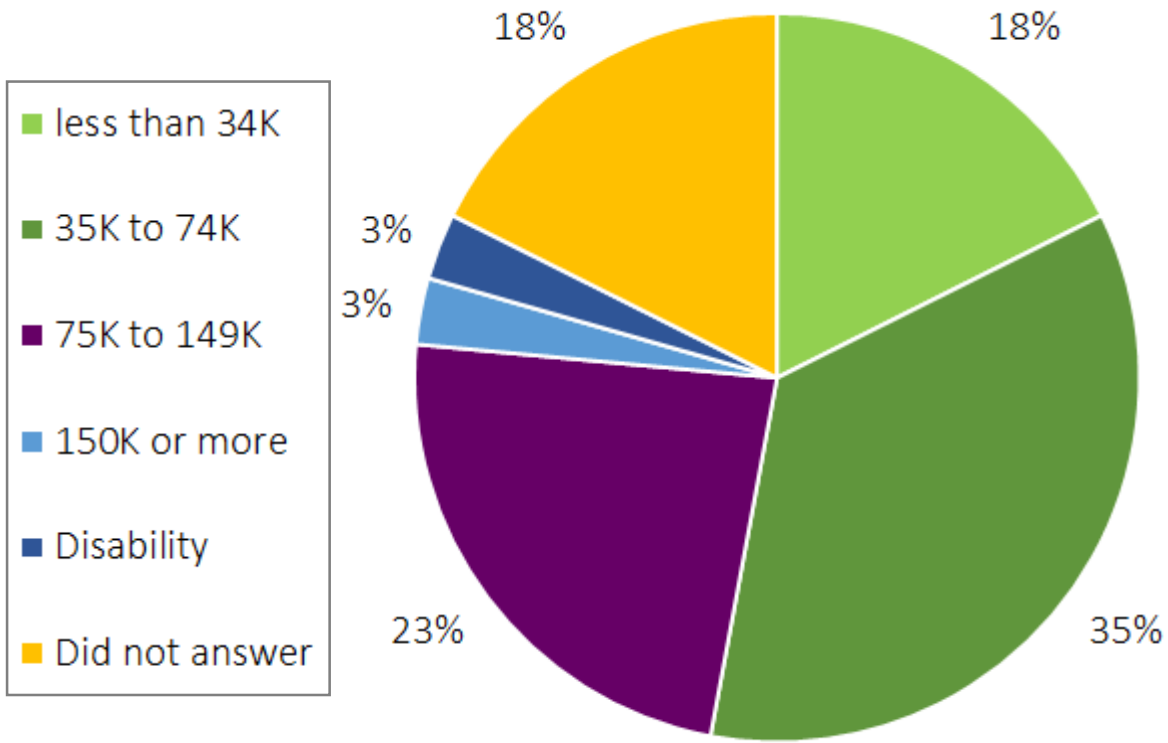
Nodes

Name	Sources	References
Budget	15	37
Communication	32	126
Effects	31	115
Influential People	7	16
Network_Relationships	26	56
Ownership_Responsibilities	31	119
Participation_Reasons	24	62
Stewardship_Tree Care	33	110
Suggestions	23	55

- Interviews transcribed
- Data coded and organized into themes (nodes)
  - 9 main nodes

Chicopee and Fall River Interviewee Demographics

Household Income



Age
- Under 65: 57%
- Over 65: 43%

Living Arrangements
- Homeowner: 91%
- Rent-Controlled: 6%
- 1 or 2 person: 63%
- 3 people or higher: 37%

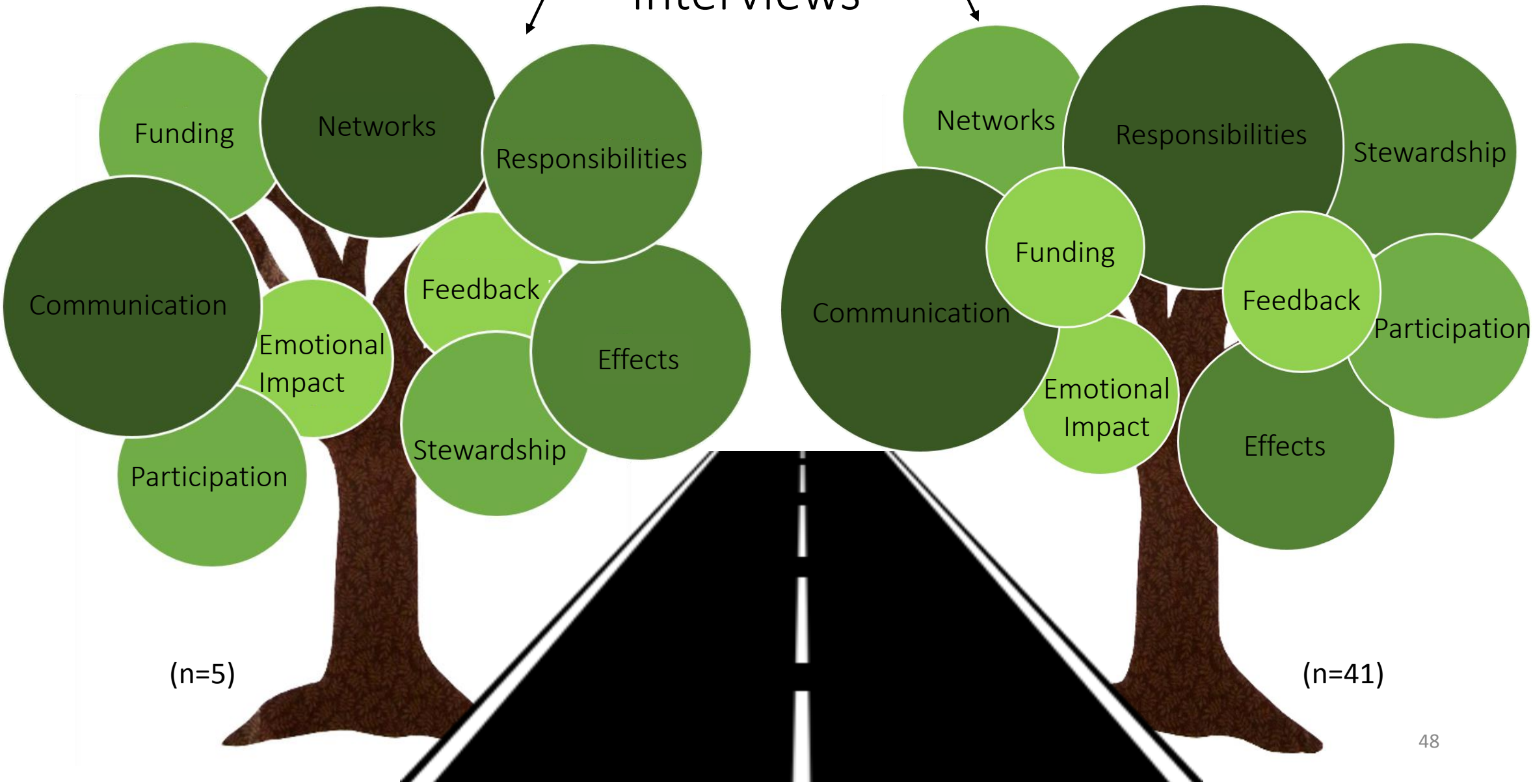
Education
- High School Degree or lower: 49%
- Trade and/or Associates Degree: 16%
- Bachelors Degree or higher: 35%

Gender
- Female: 53%
- Male: 44%
- Unknown: 3%

Language Spoken at home
- English: 76%
- Spanish: 10%
- Portuguese: 7%
- Other: 6%

Race/Ethnicity
- White: 80%
- Black: 6%
- Hispanic: 11%
- Other: 3%

Organizational vs. Residential Interviews



(n=5)

(n=41)

Organizations Interviewed

Chicopee

- Valley Opportunity Council
- City Planning Department

Fall River

- Fall River Street Tree Planting Program (FRSTPP)

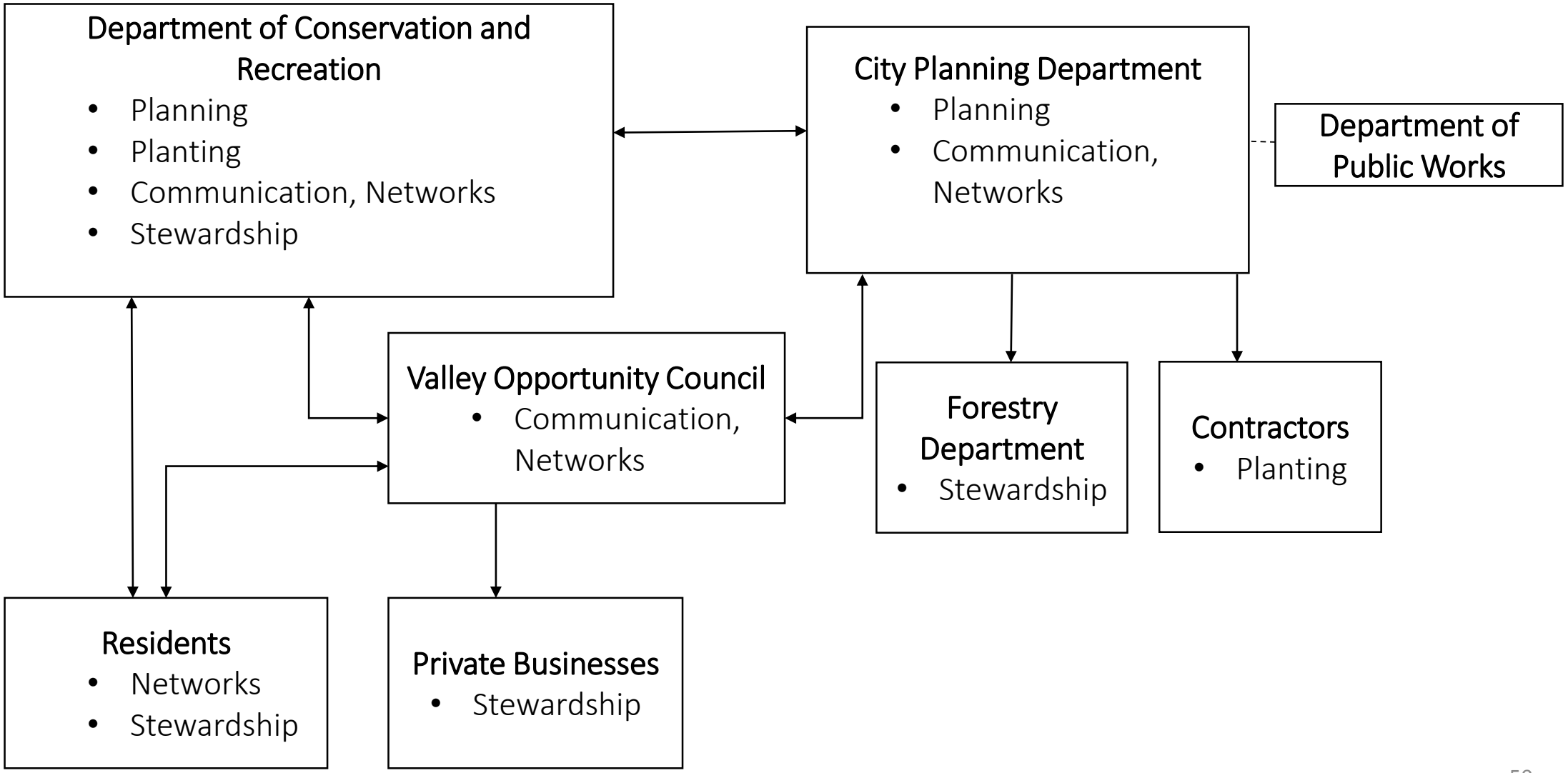
CITY of CHICOPEE
Crossroads of New England

Fall River Street Tree Planting Program, Inc.

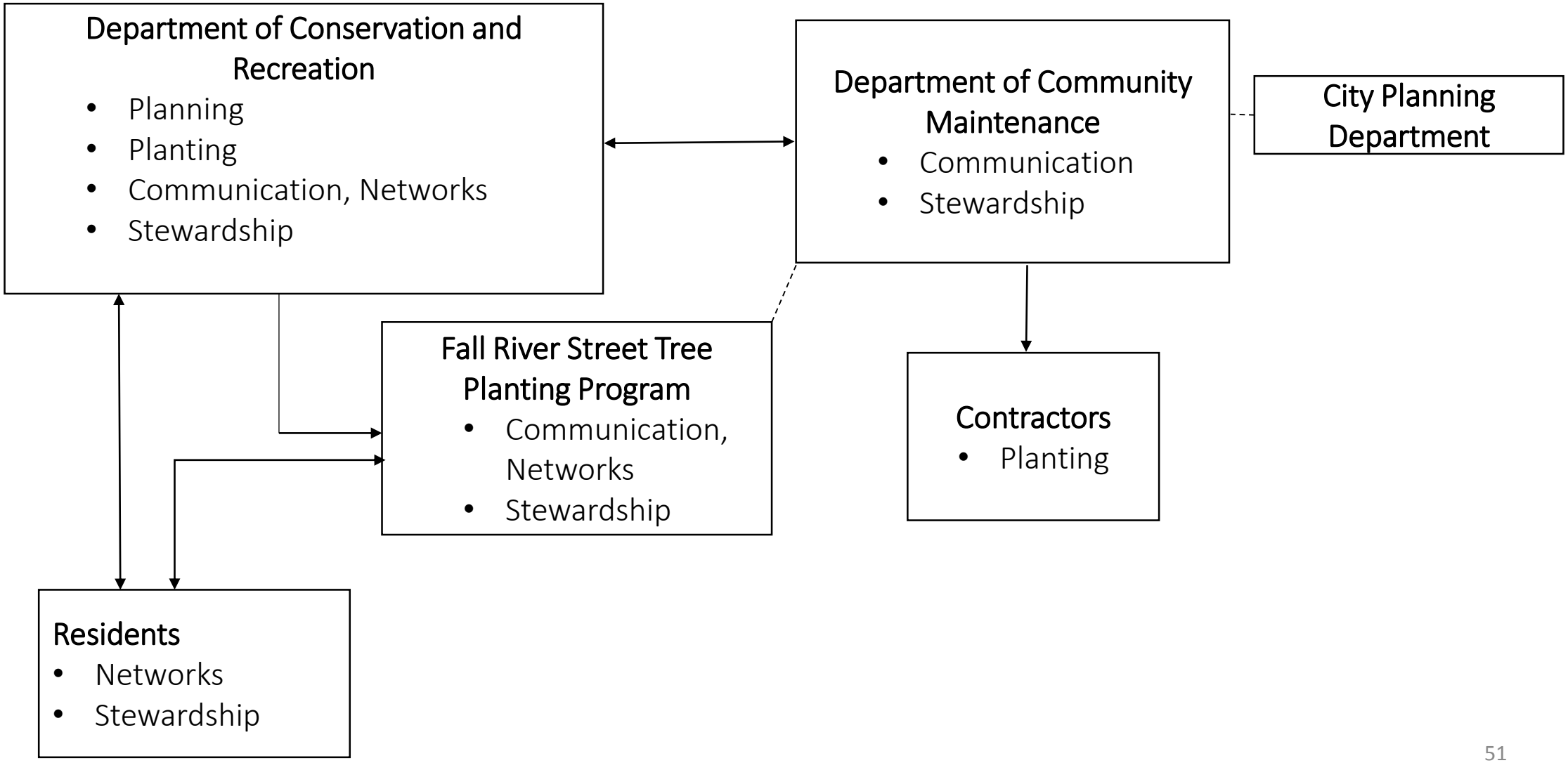
VALLEY OPPORTUNITY COUNCIL

Rowan Moody and Elizabeth Lohr interviewing FRSTPP member & part-time DCR planter

Networks and Actions in Chicopee



Networks and Actions in Fall River



Participation

What are reasons for organizations to participate in GGCP?

"We are invested in the community and invested in creating opportunities making it a good place to live in for people to make sure that they have their needs met."

"Increasing energy efficiency at home and the overall air quality of the community."

"It is simply improving the conditions of the neighborhood and increasing tree canopy."

Why do residents participate in the GGC program?

"I thought that my property was pretty barren and I just- I miss trees, I'm used to having trees, so I was more than thrilled, I was very happy."

"I mean, if you were to go out and buy 7 trees, imagine how much that would cost. I think it's wonderful that it is a free program for the people that are interested."

"Well, I always liked trees, I think that they are good for the environment. Also, for privacy purpose that's more or less it. I always liked trees and it beautifies the property. I figured it was an opportunity to get it."

Networks

How do organizations network with one another?

"I think it is a very strong partnership, we create events together."

"Mary Ann [Wordell] actually worked quite hard to get it established, oh you know, there was some book keeping and stuff that needed to be done, so she did some work with that."

"Our local government is the town offices and city office. Also, it includes the mayor, planning department, and park and recreational department those are the primary."

How do trees connect residents to networks?

"These five houses here, these neighbors stick together. He's got trees in his yard, he got some in his yard, the guy across the street got some in his yard. So we're like affiliated like a little organization here with the trees, you know?"

"Through our neighborhood association, we found out about the, ah, you know free trees being given away, so that's how, we got involved."

"I got involved in the program from my neighbor... So I asked the neighbor, I says, 'Those trees must have been expensive, no?' He says 'No, the city's providing them.' Then this [other] guy seen my trees, he asked me the same question, 'How much do these trees go for?' 'I got them for free.' He goes, 'Wow, heck you got his number?'"

Communication

How do organizations communicate with partners and residents?

"DCR approached us [City official] and said we would like to bring the Greening the Gateway Cities Program to Chicopee."

"Changing people's perception about the value of trees."

"There has been really good outreach and educating the public on the benefits of street trees, and how they are taken care of, why they are so important."

How do residents and the DCR communicate?

"Through Mary Ann…she came to our neighborhood meeting. We have a neighbor meeting once a month she explained to everyone about the free trees you can get."

"Word of mouth means everything."

"The DCR gave me information. I call the DCR whenever I have questions, and they come by to help out and share information."

Responsibilities

How are organizations responsible for the stewardship of trees planted?

"We recognized the planning, community development and the forestry department; we really did not have an understanding of the extent of our urban forest."

"Ensuring that we were planting the right species the right cultivar in the right place."

Who do residents think should be responsible for planted trees?

"For the trees in front of my property, the biggest or most important person is going to be me to take care of them…I'm here everyday and I can see if there is anything happening to them."

"This is a request program…so why request them if you're not going to take care of them?...I think it should be the [responsibility of the] individual person and if it's in the city or parks then the community and local government."

"The city should be taking care of them. Not the person that's got the house across from that tree. The city should be taking care of them."

Effects

What will be the effects of trees in the community?

"3 or 4 degrees of cooling."

"It makes a nice living space for people, it provides shade, and improves the quality of the air."

"We try to plant trees in the city, to help people be aware of how trees benefit the community, the proper way to plant trees.

What do residents think are the effects of trees?

"I just think it beautifies the neighborhood…I mean for me, it's just the aesthetics of it."

"So hopefully when the trees goes up and kind of creates a shade, I mean it lowers my bill, so. That's my goal, as much as I want to enjoy the beauty of it."

"I think it's healthier having the greenery and the trees."

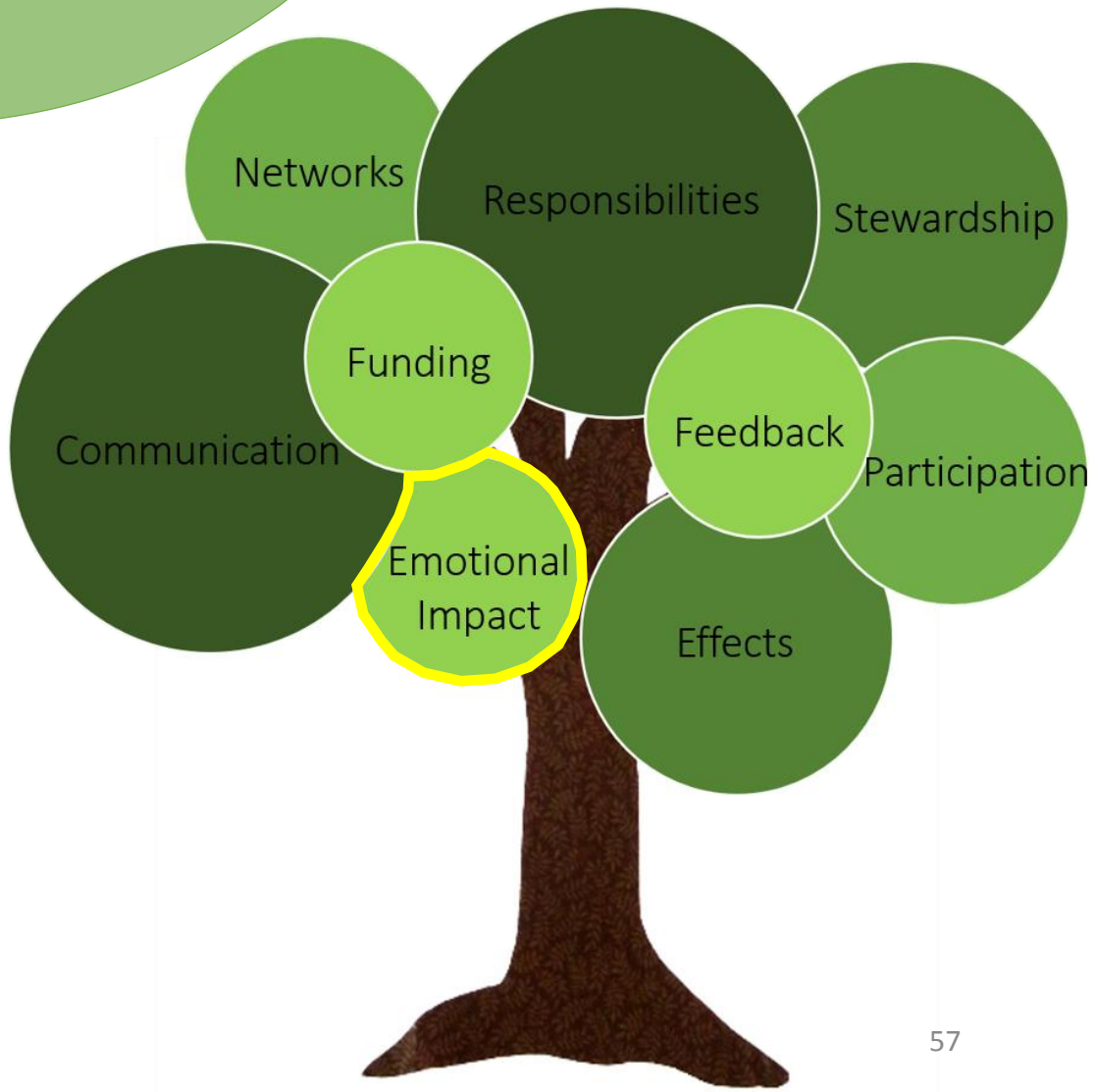
Effects

What characteristics do residents attribute to trees? (e.g. emotions, nostalgia)

"She loved the little tree because I decorate it – Everybody loved it. I was SO afraid that first year, two years, that somebody was gonna… come and take it, it was so darling. It was so cute… I used to talk to it!

"It made me happier! I don't know about anybody else I can't really speak for them. I enjoy seeing trees being planted, I don't know if it's because of my age, I've seen trees grow all my life but I enjoy it I think it's a good thing."

"I see a lot of the younger generation going into the park which wasn't happening before. And I see the ones with their little kids now going into the park, and that's a great thing. I did that with my kid, you know what I'm sayin'?"



Stewardship

How do residents care for the trees?

"I water in the morning, and water when the sun comes down. Two times a day. I give them probably about three to five gallons each."

"I asked them…if that could be sprayed, cause I thought I had read online that even fir trees can get gypsy moths…I think that was a big mistake on my part…but the fruit tree did very well!"

"I don't water my trees. Nature does that"

Challenges

What are the challenges that organizations face?

"There will be few residents who are opposed and are really scared of trees for whatever experience."

"People's perception of leaves is that they are bad and they're not!"

"If it gets on the neighbor property I have to cut it down because it gets in the way."

What challenges make residents hesitant to get trees?

"I wanted smaller trees, so future storms wouldn't cause problems."

"I think the reluctance for trees is the leaves, people don't want to rake the leaves."

"I said, 'Well I really don't want trees because I can't take care of it.'…I don't want leaves in my gutters and stuff like that, I wanted my property very simple for me to take care of. I'm 83 years old, so I-- and that's quite far down, that's 170 feet. So that would mean my carrying a bucket of water to go down there. So it's not possible for me to go down there."

Feedback

What feedback do residents offer?

"I think there needs to be more outreach of the program. So many people ask me about the trees but they have never heard of the GGCP. If more people knew, many of them would participate."

"I think it would be great if they left a note or called when they check the trees."

"I mean, you visit ever, you know, once a year, check up on people, like Rachel and her little crew maybe come by once a year. That'd be nice, this is nice. You know, that way I know I'm doing something right. I mean, I could be doing something wrong forever, and not get a result. So a follow-up visit once a year, to me is a good idea."

Interview Summary

Stewardship Roles

- Organizational actors (DCR, VOC, FRSTPP): Primary stewards for public trees
- Residents and Property Owners (commercial, industrial, etc.): Care for private trees

Residents credit trees with:

- Beautification
- Cooling
- Increase property value
- Health benefits
- Emotion and nostalgia

Organizations:

- Perceive the same benefits as residents
- Added broader community outlook

HERO Graduate Advisor Nick Geron talks to resident [upper window]

Residents receive trees and enjoy benefits while facilitating GGCP presence

Introduction

HERO program
Greening the Gateway Cities

Tree Survey

Data collection
Vigor & Survivorship

Interview Response

Data collection
Program progress & place-making

Summary of Findings & Future Research

Survivorship of species
Interview responses

Tree Measurement Comparisons: All Cities

Year Surveyed	City [DCR trees]	Percent Alive	Mean DBH (In.)	Mean Height (ft.)	Mean Crown Width (ft.)	Mean Vigor	Number of Street Trees (surveyed)	Number of Trees (surveyed)
2018	Fall River [1,988]	92	1.48	10.46	5.14	1.26	177	1349
	Chicopee [951]	92	1.22	10.13	5.16	1.22	181	922
2017	Holyoke	78	2.25	11.8	6.04	1.72	515	842
	Chelsea	86	2.17	13.4	6.87	1.78	373	432
	Revere	94	1.68	11.5	5.48	1.51	116	116

Summary of Findings

Tree Vigor & Survivorship

- Composition and survivability was consistent across both Chicopee & Fall River
- Planting conditions with clear definitions of ownership had better tree vigor & survivorship
- Native trees had significantly lower vigor & survivorship than non-native trees
- Ornamental & fruit trees had significantly higher survivorship than shade & evergreen trees

Program Progress & Place-making

- GGCP creates networks and lines of communication between state, city agencies, and residents
- Communication regarding trees foster new lines of communication & may influence future programs
- Both residents and organizations wish to continue to see the expansion of GGCP

Observations & Recommendations

- High survivorship in commonly planted species
- Large proportion of shade trees planted
- Residents are eager for more DCR engagement
    - Tree care notes & annual check-ins
    - Increase visual presence in community

Future Research Goals

Tree Vigor & Survivorship

- Continue surveying trees to monitor patterns in tree vigor, survivorship, and stewardship
- Model the ecosystem services that the future canopies will provide
- Assess vulnerability of tree species in planting program

Program Progress & Place-making

- Conduct more interviews to get a more demographically representative sample
- Better understand all lines of communication between actors, especially government actors
- Understand why people choose not to participate in the program and how to strengthen partnerships with local grassroots organizations

Acknowledgements

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Resident & Stakeholder interviewees

Residents of Chicopee & Fall River

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Lara Roman

CLARK UNIVERSITY

HERO

The HERO team at a Fall River residence

Thank you.

References

Belanger, M. N. (2007, September 29). Downtown Fall River in 2007. Retrieved July 9, 2018, from https://commons.wikimedia.org/wiki/File:Downtown_Fall_River.jpg#filehistory

Chicopee, MA | Official Website. (n.d.). Retrieved July 9, 2018, from http://www.chicopeema.gov/

Keeney, S. (n.d.). Fall River, MA. Retrieved July 10, 2018, from https://www.pinterest.com/pin/629378116646178634
Chicopee, MA | Official Website. (n.d.). Retrieved July 9, 2018, from http://www.chicopeema.gov/

Mosakowski Institute; Brown, John C.; Krahe, Joe; and Philbrick, Sarah, "Data Profiles of Massachusetts Gateway Cities" (2016). *Mosakowski Institute for Public Enterprise*. 58. http://commons.clarku.edu/mosakowskiinstitute/58

Strahan, D. (2018, February 4). Church of the Holy Name of Jesus, Chicopee, Mass. Retrieved July 7, 2018, from http://lostnewengland.com/category/massachusetts/chicopee-massachusetts/

U.S. Census Bureau. (2017, July 1) Population estimates: 2017 (QuickFacts) Retrieved from http://www.census.gov/quickfacts/fact/table/chicopeecitymassachusetts,ma/PST045217

Name: RCA

Name: RM

TreeID: 100713

Date Planted: 10/4/2015

Resident Name: John Doe

Address: 25 Nowhere St.

City: Chicopee

Name: EL

Experience Level: N I E

Sector ID: 104

Speies: Oxydendrum arboreum

Resient Tel: 999 - 999 - 9999

Comments: trunk and insect damage

Date Measured: 6/20/2018

Site Type: Front Yard

Land Use: Multi-family Residential

Mortality: (A) SD R S U

Basal Sprouts: yes

DBH1: 2.4 @ height: 4'6"

DBH2: @ height:

DBH3: @ height:

DBH4: @ height:

DBH5: @ height:

DBH6: @ height:

Height: 15 ft 6 in

Width 1: 5 ft 2 in

Width 2: 6 ft 3

Vigor Class: 1 (2) 3 4 5

Dist. to impervious 1: 2 ft 5 i

Time to Measure (min):

Dist. to impervious 2: 3 ft 2 i

Notes for Supervisory Review: