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Influence of Community Characteristics on Urban Forest Management Programs in New York State

US state and federal urban forest management agencies endeavor to support municipal forestry programs. However, the variation in programs within and among states may complicate support delivery. Municipal programs are often categorized by population size and community affluence to identify common characteristics and needs and facilitate support. To describe local urban forest management programs in New York State, a survey of municipalities gathered information on urban forest management program components, intentions, and needs. In addition to examining the contributions of population size and affluence, this study also evaluated the influence of metropolitan areas on programs in small municipalities and compared all community categorizations using national program standards. The survey revealed that a high percentage of municipalities plant and maintain trees. Nearly half of municipalities have tree inventories and street tree advisory boards, and a low percentage have an urban forest management plan. Almost all reported needing technical and educational assistance. Larger communities were more likely to have a comprehensive urban forest management program than medium-sized communities, and medium communities were more likely than small communities. Communities with high median household income (MHI) were more likely to have comprehensive urban forestry management programs than less affluent communities. However, low MHI and middle MHI communities had equivalent programs. Small municipalities in counties with large metropolitan areas possessed attributes similar to larger municipalities, compared to small communities in counties without these areas. This may indicate that proximity to a large metropolis has the potential to provide a small community with additional resources. These results suggest that smaller and less affluent communities, especially those outside counties containing large metropolitan areas, need more urban forest management assistance than larger and more affluent communities. However, all survey respondents indicated the need for support.

Keywords

urban forest management, municipal, affluence, urban influence codes, technical assistance

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1. INTRODUCTION

Urban forests, which include street, park, and private trees, and trees in conservation areas, are found in communities of all sizes, from large metropolitan cities to small rural villages. These forests provide many tangible and intangible benefits, such as energy savings, improved air quality and ecosystem benefits, economic stimulation, stormwater management, mental and physical health improvements, and aesthetic beauty (Roy et al. 2012, Mei et al. 2021, Coleman et al. 2022). However, urban forests also require maintenance and investment and generate ecosystem disservices (Roman et al. 2021). In order to maximize and sustain benefits and minimize costs, urban forests must be managed (Clark et al. 1997, Dwyer et al. 2003, Roman et al. 2021).

In most of the United States, municipalities (cities, villages, and towns) are the primary managers of urban forests. The urban forest management program components, needs, and intentions vary among these municipalities depending on financial resources, social, community, and political support, and local expertise. There is sparse insight into how community characteristics affect municipal urban forest management components, needs, and intentions in the United States. Periodic national surveys provide regional information on municipal programs (Hauer and Peterson 2016). However, only thirteen states have a statewide examination of municipal programs in the scientific literature (Hargrave et al. 2023), though more data are available in technical reports. These investigations revealed considerable variation among services, needs, and priorities. Communities of 5,000 or fewer residents in Texas had the greatest per capita tree care budget (O'Herrin and Shields 2016), whereas in Utah, the largest communities (10,000 to 50,000 and greater than 50,000 residents) had the highest tree care budget per person (Kuhns et al. 2005). Additionally, tree-related ordinances were found in 73% of Pennsylvania communities (Reeder and Gerhold 1993) and only 38% of Illinois communities (Schroeder et al. 2003).

Researchers often categorize communities by population size (Ries et al. 2007, O'Herrin and Shields 2016, Harper et al. 2017) or community affluence (Rines et al. 2011, Zhang and Zheng 2012) when describing local urban forest management programs. A few studies have explored the connection between the proximity to densely populated urban areas and local urban forest management (Still et al. 1996, Treiman and Gartner 2004, Rines et al. 2010), though not many have thoroughly examined whether small communities have similar urban forest management programs regardless of their proximity to a large urban area. Small municipalities in close proximity to large urban areas may have access to resources in neighboring communities, such as trained staff or other urban forestry expertise available from tree commissions or community-based volunteer groups (USDA ERS 2019*a*). At the same time, rural small communities are more geographically isolated from urban forestry experts and partners (Elmendorf et al. 2003).

Urban forestry support organizations (e.g., United States Department of Agriculture (USDA) Forest Service, state natural resource management agencies, land grant universities, and non-profit organizations) strive to improve urban forest outcomes by bolstering local urban forest management. These organizations use findings from investigations into municipal urban forest management initiatives to inform programs and services (Ries et al. 2007, Grado et al. 2013).

Communities participating in support programs tend to have more comprehensive urban forest management programs than non-participating communities (Ries et al. 2007, Zhang and Zheng 2012). It is beneficial to understand which communities avail themselves of federal and state-led urban forestry initiatives and the barriers they may face regarding accessing these programs.

The USDA Forest Service Urban and Community Forestry Program (UCFP) is a federal program that provides technical, educational, and financial assistance to US states, territories, partners, and communities (USDA Forest Service n.d.). The program aggregates state-level urban forest management data through the Community Accomplishment Reporting System (CARS) database to monitor the investments and inform future urban forestry programming and support. In addition to other metrics, the presence of four foundational urban forestry components is recorded: professional staff, an advocacy or advisory group, a tree care ordinance, and an urban forest management plan (National Information Center for State and Private Forestry USDA FS 2022). Communities may be classified as 'Developing' if they have at least one urban forestry management component and 'Managing' if they have all four components.

Another indication of the level of urban forest management in a municipality is Tree City USA recognition. To obtain that recognition, communities must have a designated department or tree board, a tree-care ordinance, celebrate Arbor Day with a mayoral proclamation, and support a tree-related budget of at least $2 per person (Arbor Day Foundation 2023*a*). This annual recognition indicates that a community has the foundation of an urban forest management program. Many communities strive for this mark every year, motivating them to invest in their urban forests. In 2022, 3,574 US communities were recognized, containing 48% of the nation's population (Arbor Day Foundation 2023*b*).

With a population of 20.2 million individuals, New York State (NYS) ranks as the fourth most populous state in the US (US Census Bureau 2022). Despite its large and diverse population and geography, a formal statewide assessment of municipal forest management programs has not been conducted. Consequently, a comprehensive understanding of NYS municipal urban forest management programs' status, needs, or aims does not exist. The New York State Department of Environmental Conservation's Urban and Community Forestry Program (NYSDEC) is tasked with assisting NYS communities with urban forest management. The NYS Urban Forestry Council is the advisory committee to NYSDEC and assists municipal urban forestry efforts across the state. Both organizations are interested in understanding local urban forest management programs to improve the delivery of support efforts and ultimately improve the management of urban forests across the state.

This paper highlights the results of a statewide survey conducted in 2021 designed to gain insights into the program status and needs of urban forest management at the municipal level in NYS. We present an analysis of: (1) the relationships between the community characteristics of population size and affluence and urban forest management program status, needs, and comprehensiveness; (2) the influence of a nearby metropolitan area on the urban forest management program in small municipalities; and (3) the status of NYS municipal urban forest management programs based on national measures.

2. METHODS

2.1. Study Area

This survey evaluated municipal urban forest management programs in NYS cities, towns, and villages. In addition to the five boroughs of New York City, NYS features 57 counties containing 1530 municipalities, including 933 towns, 535 villages, and 62 cities (NYS Division of Local Government Services 2018). New York City is the largest city in the state, with more than 8 million residents. The other cities in the state have 3,000 to 300,000 residents. Town populations range from less than 50 to more than 750,000 residents. Villages have populations that range from fewer than 20 to more than 50,000 residents, though 93% of the villages in NY have populations below 2,500 people (NYS Division of Local Government Services 2018). NYS also has hundreds of hamlets, which are unincorporated population centers in towns. Hamlets have no separate governing body or municipal structure and, as such, were excluded from this study. Virtually all villages and cities have consolidated community centers, and while not necessarily "urban," they are places one can refer to as having an urban forest. However, not all towns have populated centers and may not consider themselves to have an urban forest. Additionally, while they may have urban forests, some places do not have managed street trees. For this study, we used the management of street trees as the proxy for urban forest management. We defined street trees as those typically found in tree lawns (boulevards) or tree pits along street rights-of-way within the municipality, not those found growing naturally along highway rights-of-way.

Like analogous departments in other states, the NYSDEC maintains a list of municipalities (cities, towns, and villages) that currently have or have the potential to initiate an urban forest management program. Those municipalities' urban forest management program components are tracked and reported in the USDA Forest Service UCFP CARS database. Each year, NYSDEC staff update the CARS database based on their interactions with municipalities, which includes documenting grant or Tree City USA application assistance, technical advice, educational support, and staff or volunteer training. Many communities on the NYS CARS list have numerous recorded interactions, while others have no recorded contact.

We used the NYS 2020-2021 CARS list containing 786 municipalities as the basis for our survey contact list. We dropped several that no longer existed due to municipal consolidation and added three towns known (by the NYSDEC) to have street trees. The final number of municipalities on the contact list totaled 782 (62 cities, 462 villages, and 258 towns) (Appendix 4 Figure 1).

2.2. Data Collection

Informed by other statewide and national urban forestry survey initiatives [(Grado et al. (2013), Hauer and Peterson (2016), O'Herrin and Shields (2016), Treiman and Gartner (2004), and Zhang and Zheng (2012)], an online survey (Qualtrics, Provost, UT) was developed. It contained 67 open-ended and closed-answer questions divided into 16 sections (Appendix 1). We utilized skip logic, so representatives from municipalities with more complex urban forest management programs had more questions to answer. Only the first question, inquiring if the municipality had a street tree program, required an answer from every respondent. Additionally, many of the

questions offered 'I Don't Know' as an option, as we found during pre-testing that many respondents were unfamiliar with the entire scope of their municipality's urban forest management program. We dropped the 'I Don't Know' responses from this analysis. As such, many questions have different response counts.

Questions inquired about staff and contractors, urban forest program services (e.g., planting and maintenance), guiding documents (e.g., inventories and ordinances), public education, partners, funding, support program participation, training needs, and program needs.

Responses were partitioned by population size, affluence, and proximity to an urban area. We sorted municipalities into three categories: Large Communities, with over 65,000 residents, n= 22; Medium Communities, with 10,000 - 65,000 residents, n= 164; and Small Communities, with fewer than 10,000 residents, n= 595 (US Census Bureau 2010). The NYSDEC grant program uses a population of 65,000 residents as the cut-off between large and small communities, and those communities apply to separate allocations of funds. In accordance with other state-wide urban forestry surveys (Kuhns et al. 2005, Grado et al. 2013), we added a division at 10,000 residents to gain more insight into the differences between medium-sized and small communities.

Median household income (MHI) for each municipality from the 2020 US Census was used as the affluence metric (US Census Bureau 2020). The mean MHI was $69,940 and ranged from $24,164 to the Census maximum of $250,000. To examine the differences among low, moderate, and high MHI communities, we organized the municipal MHI values into three groups based on quartiles of MHI values. The first quartile, labeled 'Low MHI,' was comprised of communities with a municipal MHI of less than $48,389 (n= 78). The second and third quartiles, grouped as 'Middle MHI,' had municipal MHIs between $48,389 and $81,282 (n= 156). The fourth quartile, labeled 'High MHI,' were communities with a municipal MHI above $81,282 (n= 78). Two communities did not have a reported MHI due to their low population and were excluded from relevant analyses.

To measure urban influence, we used the 2013 Urban Influence Codes (UIC) developed by the USDA Economic Research Service (USDA ERS 2019*b*). These codes classify counties as metropolitan or nonmetropolitan based on the population size of their largest metro area and proximity to metropolitan/micropolitan areas. The 12-part scheme facilitates the analysis of trends in non-metro areas related to population density and urban influence (USDA ERS 2019*a*) (Table 1).

Table 1. USDA ERS Urban Influence Codes and Merged Urban Influence Groups

Urban Influence Codes	New Urban Influence Groups
Metropolitan counties 1 In large metro area of 1+ million residents 2 In small metro area of less than 1 million residents Nonmetropolitan counties 3 Micropolitan area adjacent to large metro area 4 Noncore adjacent to large metro area 5 Micropolitan area adjacent to small metro area 6 Noncore adjacent to small metro area and contains a town of at least 2,500 residents 7 Noncore adjacent to small metro area and does not contain a town of at least 2,500 residents 8 Micropolitan area not adjacent to a metro area 9 Noncore adjacent to micro area and contains a town of at least 2,500 residents 10 Noncore adjacent to micro area and does not contain a town of at least 2,500 residents 11 Noncore not adjacent to metro or micro area and contains a town of at least 2,500 residents 12 Noncore not adjacent	Large Metro: Small Communities in large metro area counties (UIC 1). n=98 Small Metro: Small Communities in Small Metro Area Counties (UIC 2). n=65 Adjacent Large: Small Communities in Counties Adjacent to Large Metro Area Counties (UIC 3 and 4). n=38 Small Micro: Small Communities in Micropolitan Area Counties (UIC 5 and 8). n=20 Adjacent Small: Small Communities in Counties Adjacent to Small Metro and Micropolitan Area Counties (UIC 6, 7, and 9). n=27

Small Communities, our target category, were found in counties assigned codes 1-9. Due to the low numbers of Small Communities in some UICs, we aggregated the UICs into new urban influence groups (UIGs) (Table 1 and Appendix 4 Figure S1).

To typify municipalities by category, information on municipal urban forest management spending was collected, as was information in two key areas: comprehensiveness of urban forest management components (16 questions, i.e., Table 3) and awareness and participation in NYSDEC programs (eight questions, i.e., Table 4). The percentage of affirmative (yes) responses or the most comprehensive management level was included; higher percentages indicated more comprehensive management. We aligned responses with the USDA Forest Service UCFP and Tree City USA recognition standards as measures of program comprehensiveness.

Summary statistics (e.g., mean, frequency) were calculated to describe communities statewide and by their municipal characteristics (population, affluence, and urban influence) in R (Wickham et al. 2019, R Core Team 2022). We performed Chi-squared, linear regression, and multinomial logistic regression analyses to evaluate the statistical significance of results by municipal characteristics using an alpha value of 0.05. For qualitative analyses, the open-ended answers were downloaded and coded using Excel, and the frequency of the codes was calculated in R.

2.3. Survey Deployment

A contact was identified for each municipality based on NYSDEC CARS data, publicly available municipal information, and direct outreach. Correspondences were addressed specifically to that contact. Program staff (i.e., city arborist) and administrators (i.e., department commissioners) were prioritized as contacts; mayors, town supervisors, clerks, or street tree advisory board

chairpersons were contacted if the community had no obvious program or staff with urban forestry-related responsibilities. A mailing address was available for all but one of the 782 municipalities, and emails were obtained for 766 contacts.

3. RESULTS AND DISCUSSION

3.1. Survey Response

In November 2021, the electronic survey was disseminated via email to 766 communities. In accordance with Dillman et al. (2019), a reminder email was sent eight days later, followed by a final email notice one week later, yielding 250 usable responses. Approximately one month after the final reminder, we mailed a postcard to the 536 municipalities that did not respond or progress through the survey (i.e., answered three or fewer questions). This included the 15 municipalities without email addresses, bringing the total contact list to 781. The postcards resulted in an additional eleven responses for 261 total usable responses – a 33% response rate.

To check for nonresponse bias, 10% of the nonresponse communities (53) were randomly chosen proportionally from among the three population categories to receive a follow-up phone call (Vaske 2019) (Appendix 2, Table S1). A subset of questions (see Appendix 3) was presented to these communities to determine if their responses significantly differed from those that responded to the email prompts. The difference in the percentage of communities with a street tree program that responded to the initial survey compared to those with a street tree program that responded to the nonresponse survey was not statistically significant ($p= 0.2$).

Results from the nonresponse bias sample were added to the 261 responses, bringing the total number to 314 and a resulting response rate of 41%.

3.2. Municipal Program Status

Of the 314 communities that responded to the survey, 72% indicated that they had a street tree program, and 26% indicated that they did not, with the remaining 2% replying that they had street trees but that they were managed by another entity (e.g., the county). We grouped the latter two categories as ‘municipalities without street tree programs.’ Table 2 contains the breakdown of municipalities with and without street tree programs by category.

Table 2. Population, Median Household Income, and Per Capita Tree-Related Budget by Category

Category	Sample Size	Percent of Total	Mean Population	Mean MHI	Per Capita Tree Budget
Statewide	314	100	40,777	$69,940	--
With Street Trees	227	72	54,814	$69,694	$6.63
Without Street Trees	87	28	4,152	$70,599	--
Small Community (Pop. < 10,000)	248	80	3,045	$67,774*	$6.57
Medium Community (Pop. 10,000 to 65,000)	53	17	23,973	$78,567*	$6.72
Large Community (Pop. > 65,000)	13	4	829,102	$75,067	$7.15
Low MHI (<$48,389)	78	25	15,087	$40,572	$4.49#
Middle MHI ($48,389 to $81,282)	156	50	61,965	$61,735	$6.21#
High MHI (>$81,282)	78	25	24,988	$115,720	$10.46#
Large Metro	98	43	4173	$85,434	$9.01
Adjacent Large	38	17	1777	$54,084	$6.12
Small Metro	65	30	2983	$59,093	$2.90
Small Micro	20	5	2671	$58,551	$9.43
Adjacent Small	27	7	1477	$52,319	$5.41

*Significant difference between Small & Medium Community MHI.

#Statistically significant difference between Low MHI & High MHI communities, and Middle MHI & High MHI communities.

If a community indicated they did not have a street tree program, they were asked no further questions, and the survey ended; all following results summarize the 72% of the respondents who replied in the affirmative when asked if they had a street tree program.

3.3. Statewide Results

3.3.1. Staff and Contractors

Typically, communities need an employee to carry out urban forest management. Eighty-one percent of communities with a street tree program noted that they had a designated employee responsible for street trees, and 8% contracted that role out. Titles for the designated employee varied, with the top five keywords being ‘Department of Public Works’ (21%), ‘Superintendent’ (21%), ‘Highway’ (7%), ‘Supervisor’ (4%), and ‘Arborist’ (3%). The department that housed this employee also favored non-forestry names, with only 18% of municipalities indicating that they had an ‘urban forestry’ or similar department. Fifty-seven percent of communities indicated that their street tree program was within the purview of ‘Public Works,’ 14% indicated ‘Highway,’ and the remaining 11% were divided among ‘Parks and Recreation’ (4%), ‘Planning’ (2%), or ‘Other’ (6%).

Eighty-two percent of communities indicated that they employed staff who conduct tree maintenance. Eighteen percent of communities conveyed that they employed staff with certifications from the International Society of Arboriculture (ISA) or Tree Care Industry Association (TCIA). Eighty-five percent of communities stated they had hired contractors to conduct tree maintenance, planting, or inventory within the previous five years (Table 3).

Table 3. Affirmative Responses to Comprehensiveness Questions by Community Category (%)

Question	Statewide	Small Community	Medium Community	Large Community	Low MHI	Middle MHI	High MHI	Large Metro	Adj. Large	Small Metro	Small Micro	Adj. Small
Has Maintenance Staff#	84	80	95	100	87	80	89	85	76	74	63	90
Has Certified Staff	18	13	20	62	21	10	30	17	1	15	33	1
Use Certified Contractors	79	72	95	100	75	73	95	81	43	70	83	50
Plants Trees^	77	73	85	100	71	76	84	86	67	56	71	78
Conducts Planting Assessments	76	71	85	100	75	80	71	65	100	61	60	100
Has a Tree-Related Ordinance#	69	62	87	92	68	64	78	71	47	56	57	56
Systematic Maintenance Practices	55	53	66	64	57	54	58	64	50	45	38	33
Has an Inventory#	43	36	61	82	40	43	48	40	25	27	37	30
Assesses at least some Trees for Risk Periodically*^	62	66	32	62	62	61	62	70	57	61	83	75
Has a Management Plan#	19	15	35	33	18	17	27	20	13	7	1	33
Conducts Public Education*^	33	30	43	45	18	28	62	46	17	21	25	13
Celebrates Arbor Day#*	63	57	78	92	58	59	77	66	48	52	50	56
Tree City USA Recognized#*^	45	36	63	92	35	45	56	46	26	24	33	37
Has a Tree Board#*^	47	42	64	55	35	47	60	55	33	31	25	44
Uses Volunteers	59	54	70	89	53	57	73	52	61	50	50	75
Has an Extremely Sufficient or Sufficient Budget*	28	29	25	27	21	30	25	34	23	21	33	50

#Statistically significant difference between all three population categories.

*Statistically significant difference between all three MHI categories.

^Statistically significant difference between at least two UIGs.

3.3.2. Planting, Stewardship, and Engagement

Municipalities can provide many different urban forest management program services and components. Ninety-eight percent of communities specified that they had maintained (pruned or removed) their street trees in the previous five years, and 77% had planted trees, with similar percentages planning to maintain (95%) and plant (78%) in the future. Only 69% reported a tree-related ordinance (which authorizes municipalities to maintain street trees, protect private trees, and/or control species planted in the right-of-way (Miller et al. 2015)) with 17% planning to write their first or additional tree-related ordinance in the next five years (Table 3).

While most communities maintained and planted trees, only 43% had a street tree inventory, with another 18% planning to initiate an inventory within five years. Only 19% indicated that they had an urban forest management plan, and another 11% were in the process of writing one (Table 3). Communities without plans were asked if they intended to commence writing one in the next five years, and 22% of these responded affirmatively.

Educating the public on the benefits of trees and celebrating trees are ways to generate public and political support for urban forest management programs. When asked if the community conducted public education, only 32% indicated that they did. Arbor Day was celebrated in 63% of the communities at least once in the previous five years. When asked if they plan to celebrate Arbor Day in the future, 66% of communities indicated 'yes,' and 25% replied 'maybe.' Only 45% of New York communities reported receiving annual Tree City USA recognition at least once in the previous five years. However, 55% of communities plan to apply for Tree City USA recognition in the future, and another 21% indicated 'maybe,' suggesting the potential for growth in this area (Table 3).

Municipalities use a variety of commissions, committees, and boards to bolster the work of elected officials and employees. A street tree advisory board (tree board) provides input on matters concerning the municipality's trees (Harper et al. 2018). Tree boards can be called tree commissions or committees, or the work can fall under beautification, parks and recreation, or planning committees. Municipalities were asked if they had an advisory group, such as a tree board, and 47% replied that they did (Table 3). Only 5% of communities without a tree board planned to create one in the next five years.

The components and needs identified in NYS municipalities differ somewhat from those identified by similar surveys in Massachusetts and Illinois. Massachusetts communities have more management plans but similar levels of inventories and tree boards (Rines et al. 2011). Illinois had lower rates of tree inventories and tree boards than New York but higher rates of public education (Schroeder et al. 2003).

3.3.3. Funding and Support

Survey participants rated the sufficiency of their urban forest budget from 'Extremely Insufficient' to 'Extremely Sufficient.' Overall, 28% of respondents selected 'Extremely Sufficient' or 'Sufficient,' with nearly twice as many respondents (44%) indicating 'Insufficient' or 'Extremely Insufficient' (Table 3). The remaining 28% were in between. The mean per capita

tree-related budget for responding NYS communities in 2019 was $8.76, ranging from $0.00 to $64.33 (Table 2).

Grant funding may play an essential role in many municipal tree care budgets (Elmendorf et al. 2003). Thirty-eight percent of New York communities indicated that they received a grant within the previous ten years. Communities that received a grant were asked about the source of those funds, and 94% identified the NYSDEC, followed by the NYS Urban Forestry Council (43%), a private grant source (42%), the USDA Forest Service (12%), or another NYS Agency (9%). All respondents with street tree programs were asked if they plan to apply for the NYSDEC grant in the future, and 38% responded 'Yes.'

3.3.4. Education and Training

The NYSDEC provides educational and technical assistance and administers an urban forest management grants program. They also coordinate the regional ReLeaf committees, which are comprised of local urban forest stakeholders, and conduct urban forestry education and outreach work(NYSDEC n.d.). When asked about awareness and participation in state-led urban forest management programs, around half of the communities with street tree programs indicated they were aware of existing programs; however, less than half of those availed themselves of that support (Table 4).

Table 4. Awareness (%) and Participation (%) in NYSDEC Urban Forest Programs

Question	Statewide	Small Community	Medium Community	Large Community	Low MHI	Middle MHI	High MHI	Large Metro	Adj. Large	Small Metro	Small Micro	Adj. Small
Aware of Educational Program*	57	53	59	100	37	63	69	62	39	52	67	22
Aware of Technical Assistance Program*	55	52	56	100	41	60	64	57	39	53	50	44
Aware of Grants Program#*	61	54	78	100	43	65	77	66	39	49	67	33
Aware of ReLeaf Committees#*	46	37	69	90	31	49	59	54	26	28	33	11
Participated in Educational Program#*	25	18	38	70	14	27	35	19	14	21	40	1
Participated in Technical Assistance Program#	23	17	30	70	18	20	35	19	9	21	20	13
Participated in Grants Program^	36	26	59	80	29	34	47	27	23	24	50	25
Participated in ReLeaf Committees#^	16	10	31	60	14	14	24	15	1	8	20	1

#Statistically significant difference between all three population categories.

*Statistically significant difference between all three MHI categories.

^Statistically significant difference between at least two UIGs.

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Since many municipal employees do not have a formal background in urban forestry (Hauer and Peterson 2016), we asked municipalities to indicate which educational topics and level of training (i.e., beginner or advanced) would be beneficial. 'Tree Species Selection' had the highest beginner-level training response (50%), and 'Tree Pruning' was the top advanced-level topic (37%) (Figure 1). Additionally, 51% of municipalities indicated that they provided or encouraged tree-related training for their employees, and another 25% indicated that they plan to do so in the next five years.

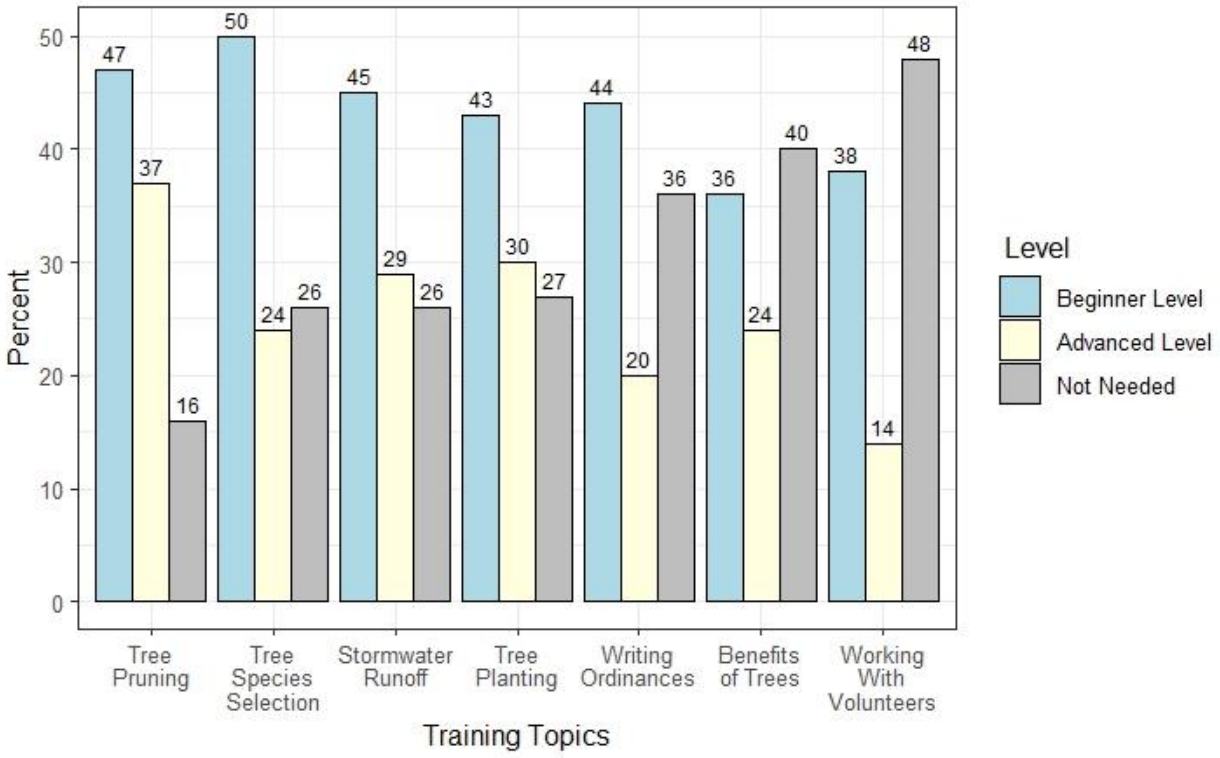

Figure 1. Requested Level of Urban Forest Management Training for Municipal Employees by Topic

3.3.5. Municipal Needs

Municipalities were asked an open-ended question about their greatest urban forest management need. The top five themes were 'funds' (28%), 'planting' (11%), 'removing and replacing dead and dying trees' (8%), 'staff' (8%), and 'increased maintenance' (7%). Respondents were also asked about seven commonly expressed needs (Kuhns et al. 2005, Schroeder et al. 2006, Stevenson et al. 2008, Driscoll et al. 2015) (Figure 2). Of these, 'Employee Training' was most readily identified as being greatly or somewhat needed (80%), followed by 'Technical Assistance' (70%). The municipal needs ratings were consistent across community attributes (size, income, and urban proximity).

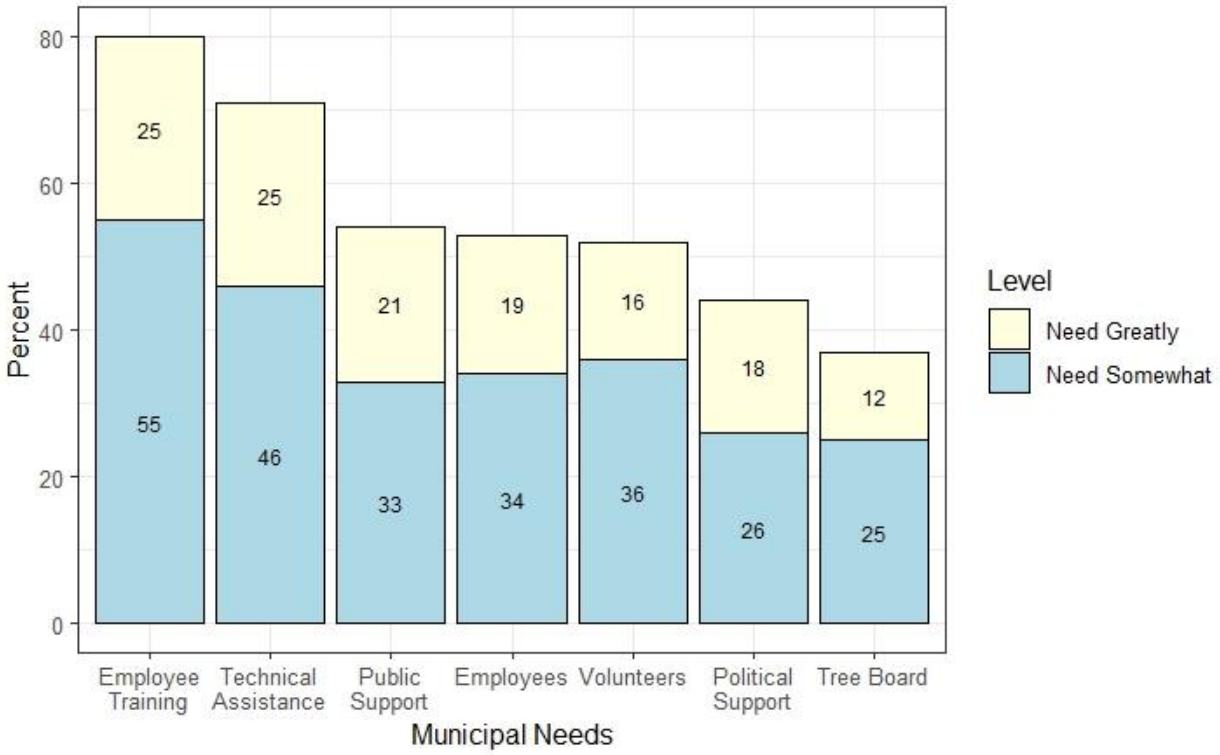

Figure 2. Level of Urban Forest Program Needs Identified by NYS Municipalities

These findings were similar to results from Alabama, Oregon, and Pennsylvania (Elmendorf et al. 2003, Stevenson et al. 2008, Zhang and Zheng 2012, Driscoll et al. 2015). Other frequently identified needs based on responses to open-ended questions included planting, tree removal and replacement, increased maintenance, inventories, grants, and assistance with educating the public. While recognized as a need, municipalities responded that they did not intend to hire additional staff, and many indicated they did not have the necessary funds or support.

3.4. Category Summaries

3.4.1. Population Size

Comparing municipalities by municipal size, 100% of Large Communities, 85% of Medium Communities, and 68% of Small Communities responded that they had street tree programs. The percentage of affirmative responses to the comprehensiveness questions increased with population size (Table 3).

Large Communities

As a group, Large Communities had the highest rate (%) of affirmative (‘yes’) responses for comprehensiveness questions (Table 3). Large Communities were more likely to have a distinct, dedicated urban forestry (or similar) department, employ in-house municipal tree maintenance staff, and use urban forestry-related contractors. Additionally, those staff/contractors were more

likely to have ISA or TCIA certification. These findings align with conclusions from the latest national survey of municipalities (Hauer and Peterson 2016).

Large Communities indicated that they were more likely to have planted trees in the past five years and that they planned to do so in the future. They were more likely to plant trees annually in concert with a site assessment, and it was more likely that a tree inventory informed those plantings. Compared to Medium or Small communities, there was a greater likelihood of having already conducted an urban tree inventory. Large Communities most frequently reported having management plans and tree-related ordinances. In the event that these were not present, Large Communities would be most likely to generate these items in the future. Large Communities identified as being the most likely to conduct urban forestry-related public education, celebrate Arbor Day, and participate as a TCUSA.

When rating the sufficiency of their tree-related budget, Large Communities selected 'Sufficient' or 'Insufficient' (avoiding the extremes, as identified in Table 3). Additionally, they had the highest mean per capita tree budget of $7.15 (Table 2). Sixty-seven percent of Large Communities identified as having received a tree-related grant in the previous ten years. The likelihood of obtaining a grant from the NYSDEC, a private grant source, or the USDA Forest Service was highest for Large Communities, and they were generally more aware of and more likely to participate in NYSDEC programs (Table 4).

Medium Communities

Medium-sized municipalities, with 10,000 to 65,000 residents, were closer to most of the comprehensiveness percentages of Large Communities than Small Communities (Table 3). Medium Communities reported the highest intentions of composing a new tree-related ordinance and had a higher rate of tree boards. Additionally, 65% of these communities received a tree-related grant in the previous ten years and were most likely to receive a NYS Urban Forestry Council grant. Medium Communities' mean per capita tree budget was $6.72, $0.15 higher than Small Communities but $0.43 lower than Large (Table 2).

Small Communities

Small Communities, with under 10,000 residents, were the least likely to have a street tree program. They were less likely to conduct public education about urban forestry, engage in urban tree planting (Table 3), and most likely to plant trees only every few years. While some Small Communities responded that they may celebrate Arbor Day in the future, they were the only category with municipalities reporting that they did not plan to celebrate Arbor Day in the future; all Large and Medium Communities responded 'yes' or 'maybe.'

Small Communities had the highest rate of 'Extremely Insufficient' responses in relation to their tree-related budget (15%). Small Communities had a mean per capita tree budget of $6.57 – slightly below the statewide average of $6.63 (Table 2). Only 28% of Small Communities received a tree-related grant in the previous ten years.

3.4.2. Affluence and Median Household Income (MHI)

Middle MHI Communities were less likely to have an urban forestry program, with 81% of Low, 68% of Middle, and 74% of High MHI Communities reporting affirmatively to the initial question asking respondents if they managed street trees (see Figure 2 in Appendix 4 for a breakdown of communities in each MHI category by population size).

High Median Household Income Communities

High MHI (above $81,282) Communities were more likely than Middle MHI ($48,389 to $81,282) and Low MHI (below $48,389) Communities to have urban forest management program components (Table 3). They were also more aware of and more likely to have participated in NYSDEC urban forestry-related programs (Table 4).

As household income increased, so did per capita tree budgets (Table 2). The per capita tree-related budget for High MHI Communities was $10.46, $3.83 greater than the statewide average. High MHI Communities were (slightly) more likely to have received a tree-related grant in the previous ten years, and they had the highest likelihood of both receiving a grant from the NYSDEC and expecting to apply for an NYSDEC grant in the future.

Middle Median Household Income Communities

Middle MHI Communities ($48,389 - $81,282) did not necessarily have more comprehensive urban forest management programs than Low MHI Communities (under $48,389) (Table 3.) Middle MHI Communities were the least likely to have an urban forest management plan or a tree-related ordinance. Communities in Middle MHI were most likely to report plans to conduct an inventory in the future. Conversely, they were the least likely to have a management plan or intend to create a tree board.

With a per capita annual tree care budget of $6.21, Middle MHI was $0.42 lower than the statewide average (Table 2). This group was the least likely to have received a grant in the previous ten years (30%). They were also less likely than High or Low MHI communities to have received a grant from the NYSDEC but more likely to have received one from the NYS Urban Forestry Council, the US Forest Service, or a private grant source. They also identified as being the most likely to apply for an NYSDEC grant in the future.

Low Median Household Income Communities

Surprisingly, communities in the Low MHI category (less than $48,389) had the highest likelihood of both having a street tree program (81%) and having an urban forestry department (20%). However, Low MHI Communities had the lowest likelihood of affirmative responses overall, including being the least likely to educate the public on the benefits of trees, celebrate Arbor Day, be Tree City USA recognized, use volunteers, or have a Tree Board (Table 3). While awareness of and participation in NYSDEC programs was low for all MHI categories, Low MHI Communities had the lowest levels (Table 4). The per capita tree-related budget for Low MHI communities was $4.49 – over $2.00 below the statewide average (Table 2).

3.4.3. Small Municipality Urban Influence Groups

The population, MHI, and per capita budget of Small Communities varied in each Urban Influence Group (Table 2). Small Communities in Large Metro counties had double the average population and an MHI $25,000 higher than those in other UIGs. When examining the street tree program status of Small Communities by UIG, approximately 75% of the municipalities in Large Metro, Adjacent Large, and Small Metro responded that they had a program, compared to only 40% in Small Micro and Adjacent Small.

UIG Large Metro

Small communities in large metropolitan counties (Large Metro) had the most questions with the highest affirmative (percent yes) responses, including having planted trees, an inventory, and an ordinance. They also had the highest likelihood of engaging in public education, Arbor Day celebration, and TCUSA recognition (Table 3). Large Metro indicated the highest awareness of NYSDEC programs and the second-highest participation (Table 4).

Large Metro communities had the second-highest per capita tree budget at $9.01. This aligns with the fact that Large Metro features the highest median household income (Table 2) and the highest population among the Small Communities surveyed.

UIG Adjacent Large

As a group, Small Communities in counties adjacent to large metro areas (Adjacent Large) had few areas where they excelled over other UIGs (Table 3). These communities assessed planting sites, reported the greatest likelihood of receiving an NYSDEC grant or NYS Urban Forestry Council grant, and had the greatest likelihood of applying for a future NYSDEC grant. These communities are the least likely to have an inventory or a tree-related ordinance and the least likely to employ or contract ISA or TCIA-certified professionals. Few Adjacent Large Communities educate the public on the benefits of trees or are TCUSA recognized, and they are the least likely to celebrate Arbor Day.

Adjacent Large Communities feature the second lowest median household income and population of the Small Community categories (Table 2) and indicated less overall urban forestry-related need than communities in other categories. They are least likely to have received a grant or be aware of or participate in technical assistance programs from the NYSDEC (Table 4).

UIG Small Metro

Like the Adjacent Large group, the Small Metro group (small communities in counties adjacent to large metro counties) had few questions with higher affirmative responses than other categories (Table 3). However, this group of communities was most likely to collaborate with stakeholders or avail themselves of NYSDEC technical assistance. Those in the Small Metro group reported being the least likely to plant trees, to be TCUSA recognized, to seek TCUSA recognition in the future, or to use volunteers. They reported the second-lowest grant success rate

and identified as the least likely to apply for grants in the future. Small Metro Communities were most likely to indicate an insufficient tree budget, which is logical given that they had the lowest per capita tree budget of any categorization ($2.90). Oddly, Small Metro has the second highest MHI and population compared to the other Small Community UIGs (Table 2).

UIG Small Micro

Small Micro Communities (small communities in counties with a micropolitan area) had a high percentage of inventories and were most likely to employ or contract ISA or TCIA-certified arborists (Table 3). They also supported employee training at a percentage well above their peers (86%). However, they were the least likely to have a tree board, a management plan, and in-house staff to maintain trees. Interestingly, despite their low rates of tree boards, the expressed need for a tree board was the lowest of the UIGs.

Small Micro was the most likely to have received a grant in the previous ten years and be aware of and participate in NYSDEC programs (Table 4) but was least likely to obtain NYSDEC grants relative to other UIGs. Additionally, they had the highest per capita tree budget at $9.43 per person (Table 2).

UIG Adjacent Small

Adjacent Small Communities (small communities in counties adjacent to small metro or micropolitan area counties) had a balance between high and low positive responses to the comprehensiveness questions (Table 3). All Adjacent Small communities reported having an employee responsible for street trees, 90% had municipal employees caring for trees, and 75% utilized volunteers. Among the Small Communities in the UIGs, they had the highest rates of management plans. They were, however, least likely to educate the public about the benefits of trees, employ ISA or TCIA-certified staff or contractors, or support employee training. Adjacent Small had the lowest overall awareness and participation rates in NYSDEC programs (Table 4). However, they had the second highest rate of successful grant obtainment (33%), the vast majority of which were awarded from the NYSDEC.

Adjacent Small Communities were the most likely to indicate that their tree budgets were ‘Sufficient’ even though they had the second lowest per capita budget level ($5.41). These communities had the lowest mean population and MHI of the Small Community UIGs (Table 2).

3.5. Program Component Comprehensiveness

There are many ways to measure the comprehensiveness of a community’s urban forest management program. Using our comprehensiveness measure (the 16 questions summarized in Table 3), Large Communities, followed by Medium Communities and High MHI Communities, have the most comprehensive urban forest management programs (Table 5). Interestingly, the Middle MHI and Low MHI comprehensiveness scores were much closer to each other than expected. Our findings that Large Communities have more comprehensive urban forestry programs than Small Communities and that higher MHI communities are more comprehensive than lower MHI Communities mirror findings in other states. Larger communities were more

likely to have affirmative responses to analogous survey questions than smaller communities in Illinois and Utah (Schroeder et al. 2003, Kuhns et al. 2005). Less affluent communities in Alabama were determined to have underperforming tree programs (Zhang and Zheng 2012). The relationship between municipality population and per capita tree budgets in Texas was contrapositive to those of NYS, with smaller communities spending $7.10 and the largest communities only $2.06 per person (O'Herrin and Shields 2016).

Table 5. Average Comprehensiveness Rating (%) and Ranking

	Statewide	Small Community	Medium Community	Large Community	Low MHI	Middle MHI	High MHI	Large Metro	Adj. Large	Small Metro	Small Micro	Adj. Small
Average	53%	49%	63%	75%	50%	52%	62%	56%	43%	42%	46%	51%
Group Rank	--	3rd	2nd	1st	3rd	2nd	1st	1st	4th	5th	3rd	2nd
Overall Rank	--	8th	2nd	1st	7th	5th	3rd	4th	10th	11th	9th	6th

Examining the Small Community UIGs, Large Metro had the most comprehensive urban forest management programs in the small municipality analysis (Table 5). In many ways, they are more like Medium or Large Communities with similar rates of staff with urban forestry-related responsibilities, past and future tree planting, tree-related ordinances, tree boards, and awareness of NYSDEC programs. Their average per capita budget was higher than Large Communities and the statewide average. Additionally, Large Metro affirmative response rates were at least 10% higher than the Small Communities in other UIG categories for many questions (Table 3).

Adjacent Small Communities were the most rural but had the second highest UIG comprehensiveness average (Table 5). However, they did have many low-rated responses to questions about their future intentions, potentially indicating they do not want to make or forecast future urban forestry-related commitments. Despite having the second lowest urban forestry-related budget per capita, they reported the highest combined 'Sufficient' rate of any categorization. The complacency with their tree budget may be linked to a dearth of certified or educated staff and contractors; it may also directly relate to a lack of public education and awareness of and participation in urban forestry-related support programs (Table 4). They may not be aware of the status of their trees and the potential of their urban forest, or they may be operating at capacity and do not foresee the ability to expand.

Small Micro Communities had rates of successfully obtaining grants and awareness of and participation in NYSDEC programs comparable to those of Medium and Large Communities. As a group, they fell into the middle of the UIG comprehensiveness ranking (Table 5). Small Micro communities had the highest rates of training employees of any UIG categorization and had a per capita urban forestry budget second only to High MHI communities. Given the high rate of employee training, it was surprising that many Small Micro communities indicated that they need to train employees. This group also indicated that they require technical assistance. This may be a case where they are aware of the possibilities and the areas that need improvement.

Adjacent Large was second to last in its comprehensiveness score and 13 percentage points lower than Large Metro, which was unexpected given its community's proximity to larger urban centers (Table 5). Despite having the lowest likelihood of many components, they reported less need than the other Small Communities. This group had little awareness of NYSDEC programs and the lowest participation levels in those programs (Table 4). Like the group Adjacent Small, they may not be aware of the possibilities or merely do what they can with their resources.

Lastly, Small Metro communities had the lowest positive responses to the comprehensiveness questions, the lowest per capita tree budget, and the highest indication of need (Tables 3 and 5). Given that they are in counties with metropolitan areas and have the second highest MHI of the UIGs, their 'least comprehensive' status was unexpected. However, with their highly reported needs, they may recognize the shortcomings of their urban forest management program.

3.5.1. National Measures of Comprehensiveness

We aligned our results with the four components (criteria) used by the USDA Forest Service UCFP for 'Developing' and 'Managing' communities. While 84% of communities that manage street trees in NYS employed staff responsible for their street trees, we did not ask municipalities to identify whether their staff met the USDA FS definition. Fifteen percent of communities employ ISA or TCIA-certified staff, but individuals can be deemed a "professional" in many ways, including via formal education, experience, or some combination thereof. Forty-seven percent of communities reported having a tree board, and 69% of municipalities identified at least one tree-related ordinance. However, only 19% stated they had a management plan.

Based on these results, 10% of communities meet the 'Managing' classification (see Figure 3 for the percentage breakdown of the number of components statewide by size and MHI category). Surprisingly, 34% of the communities that indicated managing street trees reported no components. Massachusetts has a similar level of 'Managing' communities with 15%, but higher levels of communities with 1, 2, or 3 components, and fewer than 1% of communities with no components compared to 34% in New York (Rines et al. 2011). Unexpectedly, Middle MHI had lower levels of components than Low MHI. This finding and the high number of communities without a component provide support targets for the NYSDEC.

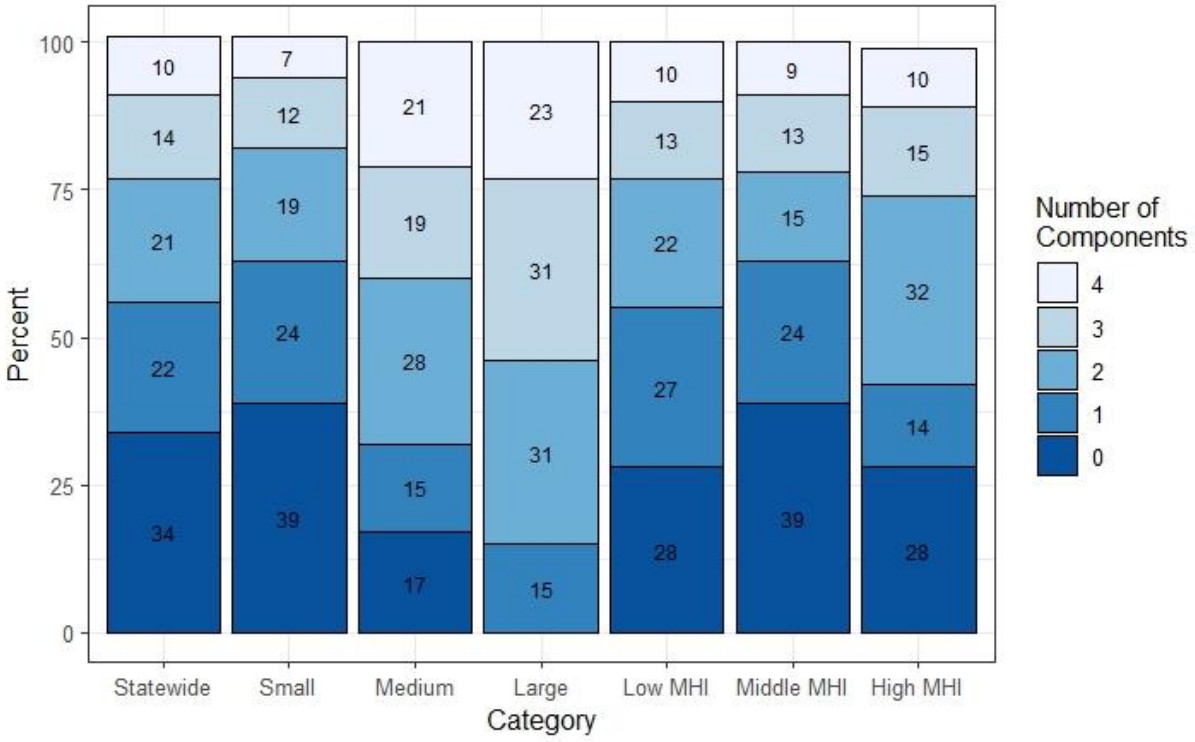

Figure 3. Percentage of New York Communities with USDA FS Urban Forest Management Components by Municipal Category. There is a statistically significant difference between Small and Medium, and Small and Large communities.

Additionally, the per capita 2019 tree care budget for 'Managing' communities in NYS ranged from $0.18 to $21.97, with a mean of $7.40. This value is higher than the statewide mean of $6.63, which may indicate that communities with greater tree-related funding are more likely to achieve 'Managing' status. However, the difference is not statistically significant.

NYS municipalities that were aware of the NYSDEC urban forestry support programs were more likely (statistically significant) to have two or more CARS components. Communities that were unaware were likely to have only one or none. While communities in all categories expressed the need for technical and educational assistance, lower-income and smaller communities were the least likely to know of and participate in NYSDEC programs. Given the titles and departments of the employees responsible for the urban forestry management programs, we can assume some may not be aware of these educational opportunities as trees are not their primary responsibility. As the lead statewide agency, it is incumbent upon NYSDEC to determine the best way to communicate with individual municipalities – and their affiliated employees – to improve access to and awareness of urban forestry-related events and resources.

According to Arbor Day Foundation, 11% of NYS communities were recognized as a Tree City USA community in 2022 (Arbor Day Foundation 2023*c*). The NYSDEC and NYS Urban Forestry Council would like to increase this number. Forty-five percent of responding communities that manage street trees reported recent TCUSA recognition. Based on the survey responses, an additional 10 to 20% of communities meet one of the four criteria. The criterion with the lowest percentage is the presence of a tree board or urban forestry department (55%).

Additionally, only 2% of communities indicated a desire to constitute one. Small, Low MHI, and Middle MHI communities have the fewest tree boards; thus, helping those communities establish and sustain a tree board may boost TCUSA recognition applications.

4. CONCLUSION

New York State urban forest management programs vary greatly at the municipal level. Most communities were interested in planting, maintaining, and assessing trees and expressed interest in tree-related celebrations, such as Arbor Day.

Large Communities and High MHI Communities indicated that they were most likely to have an inventory, a management plan, and a local tree ordinance; they were also most likely to celebrate Arbor Day and be recognized as a TCUSA by the Arbor Day Foundation. Conversely, communities with the lowest per capita tree budgets are less likely to have those components. Developing targeted support programs to reach different types of municipalities (low-income versus high-income, urban proximity) may increase the likelihood of component adoption.

NYSDEC's breakpoint of 65,000 residents for their grant program funding categories may be worthy of reconsideration. Medium Communities are more akin to Large Communities than Small Communities, though they are routinely pooled with small communities. Adding affluence and urban proximity considerations may be more meaningful than considering population size alone. Not wanting to over-complicate the division of grant funds, it might be easier to weigh the applications of lower MHI communities and those from disadvantaged UIG categories.

Communities of all types reported the need for urban forestry-related funds, employee training, technical assistance, and additional employees. Around 50% of NYS communities were aware of NYSDEC programs, but only a third or fewer participated. Those that were aware had significantly more USDA FS CARS components. This indicates a substantial opportunity to provide meaningful educational and technical assistance to those communities. Additionally, understanding the resources and support NYS communities utilize during the grant obtainment process may shed more light on how likely a community is to receive funds.

Though NYSDEC and NYS Urban Forestry Council can use these results to target their programs and help municipalities within NYS elevate their urban forest outcomes, findings from this study also have broader relevance and applicability. Urban forest support organizations at the state and federal levels looking to identify and address the needs of their municipalities to further local urban forest goals should consider many factors that support or hinder the growth of management programs and recognize that a "one-size-fits-all" standard of categorization, such as size or affluence, may not best describe all municipalities.

APPENDICES

Appendix 1: Complete Survey

NYS Municipal Urban Forest Management Survey

New York State has hundreds of municipalities that manage street trees as part of their community's urban forest. Each of these municipalities provides a different mix of services and has different needs. The results will identify gaps and generate recommendations for urban forestry support programs in New York State.

This survey will be asking about the current and future status of your municipality's street tree management program.

Street trees are defined as trees typically found in tree lawns (boulevards) or tree pits along street rights-of-way within the municipality.

Urban forests are all the trees within a municipality, including street trees, park trees, private trees, and trees in conservation areas.

NYS Municipal Urban Forest Management Survey

Does your municipality have publicly owned and maintained street trees?
Street trees are often found between the sidewalk and curb or other right-of-way areas. This does not include naturally occurring ROW trees along rural roads.
Maintenance can include pruning, pest management, planting, removal, and other activities.

- ○ Yes
- ○ No
- ○ Yes, but they are managed by the county, state, or another municipality, not by us

Skip To: End of Survey If Does your municipality have publicly owned and maintained street trees? Street trees are often fo... != Yes

Is there a municipal employee who is responsible for street trees?

- ○ Yes
- ○ No
- ○ No, but that role is contracted out

Display This Question:
If Is there a municipal employee who is responsible for street trees? = Yes

What is the title of the municipal employee who is primarily responsible for the street trees?

_____

Display This Question:
If Is there a municipal employee who is responsible for street trees? = Yes

Is that person housed in a department or division dedicated to street trees or urban forestry?
Examples: Department of Urban Forestry or Division of Forestry

- ○ Yes
- ○ No

Display This Question:
If Is that person housed in a department or division dedicated to street trees or urban forestry? Ex... = No

If no, which department best aligns with where that person is housed?

- ○ Public Works
- ○ Highways
- ○ Parks and Recreation
- ○ Planning
- ○ Other _____

Are you the person who is primarily responsible for your municipality's street trees?

- ○ Yes
- ○ No

Display This Question:
If Are you the person who is primarily responsible for your municipality's street trees? = No

What is your municipal job title?

_____

Has your municipality planted street trees within the last five years?

- ○ Yes
- ○ No
- ○ I don't know

Does your municipality plan to plant street trees in the next five years?
Either by continuing a planting program/project or starting a new one.

- ○ Yes
- ○ Maybe
- ○ No
- ○ I don't know

Display This Question:
If Has your municipality planted street trees within the last five years? = Yes

Which statement best describes the level of tree planting in your municipality?

- ○ Tree planting happens every few years.
- ○ Tree planting occurs on an annual basis.
- ○ Tree planting is annual and is informed by a tree inventory.
- ○ Tree planting is annual, informed by a tree inventory, and sufficient enough to meet tree canopy targets.

Display This Question:
If Has your municipality planted street trees within the last five years? = Yes

Does your municipality typically select and plant trees with or without a planting site assessment?

- ○ Trees are planted without a planting site assessment.
- ○ Tree species are selected after a planting site assessment.
- ○ I don't know.

Has your municipality maintained (pruned, removed, etc.) street trees within the last five years?

- ○ Yes
- ○ No
- ○ I don't know

Does your municipality plan to continue or start maintaining street trees in the next five years?

- ○ Yes
- ○ Maybe
- ○ No
- ○ I don't know

Display This Question:
If Has your municipality maintained (pruned, removed, etc.) street trees within the last five years? = Yes

Which statement best describes the level of tree maintenance that occurs in a typical year?

- ○ Street trees are maintained on a request/reactive basis. There is no systematic pruning.
- ○ Some trees are systematically pruned, or there is periodic pruning based on need.
- ○ All street trees are systematically maintained on a cycle longer than five years.
- ○ All street trees are maintained on a five-year or shorter cycle.

Does your municipality have a street tree inventory?

- ○ Yes
- ○ No
- ○ I don't know

Display This Question:
If Does your municipality have a street tree inventory? != Yes

Does your municipality plan to begin inventorying your street trees in the next five years?

- ○ Yes
- ○ Maybe
- ○ No
- ○ I don't know

Display This Question:
If Does your municipality have a street tree inventory? = Yes

Does your municipality have these inventory components?

	Yes	No
A sample-based or partial inventory of publicly owned trees.	○	○
A complete inventory of publicly owned trees.	○	○
A sample-based or partial inventory of privately owned trees.	○	○
The inventory is included in citywide GIS.	○	○

Display This Question:
If Does your municipality have a street tree inventory? = Yes

How current is that inventory?

- ○ Ongoing- A portion of the municipality is inventoried every year or two on a rotation.
- ○ The inventory was completed very recently and does not yet need an update.
- ○ The inventory was completed less than ten years ago and has not been updated.
- ○ The inventory was completed more than ten years ago and has not been updated.

Does your municipality assess trees for risk?
Risk assessments (hazard tree assessments) rate the likelihood of a tree or tree part impacting a target (person, property, or service) and the potential consequences of that impact.

- ○ Yes
- ○ No
- ○ I don't know

Does your municipality plan to start or continue assessing trees for risk during the next five years?

- ○ Yes
- ○ Maybe
- ○ No
- ○ I don't know

Display This Question:
If Does your municipality assess trees for risk?Risk assessments (hazard tree assessments) rate the... = Yes

Which statement best describes your municipality's tree risk assessment program?

- ○ Risk assessments occur only by request/as needed.
- ○ A portion of the municipal trees is periodically assessed for risk.
- ○ All municipal trees are periodically assessed for risk.

Does your municipality have a tree canopy cover goal?
Tree canopy cover refers to the percent of the municipality that is covered by trees, both public and private. Usually, this is expressed as a percent.

- ○ Yes
- ○ No
- ○ A tree canopy goal is in development
- ○ I don't know

Does your municipality have a community-wide canopy cover inventory?

- ○ Yes
- ○ No
- ○ I don't know

Does your municipality have an urban forest management plan?

- ○ Yes
- ○ No
- ○ An urban forest management plan is currently being written
- ○ I don't know

Display This Question:
If Does your municipality have an urban forest management plan? != Yes

Does your municipality plan to complete a management plan during the next five years?

- ○ Yes
- ○ Maybe
- ○ No
- ○ I don't know

Display This Question:
If Does your municipality have an urban forest management plan? = Yes

Which statements describes the urban forest management plan?

	Yes	No
A management plan exists but has yet to be implemented.	○	○
A management plan exists but has not been updated in 10 or more years.	○	○
The management plan exists but is limited in scope and implementation.	○	○
A comprehensive plan is in place and is implemented.	○	○
The plan includes adaptive management mechanisms.	○	○
The plan is currently being written.	○	○

Does your community have a tree-related ordinance?

- ○ Yes
- ○ No
- ○ I don't know

Does your municipality plan to create its first or an additional tree-related ordinance in the next five years?

- ○ Yes
- ○ Maybe
- ○ No
- ○ I don't know

Display This Question:
If Does your community have a tree-related ordinance? = Yes

Which statement best describes your community's tree protection policy/ordinance?
Tree protection ordinances can refer to protecting trees from construction damage, or preserving large or historic trees, or similar.

- ○ There is no tree protection ordinance.
- ○ Policies are in place to protect public trees, but there is little enforcement.
- ○ Policies are in place to protect public trees, with enforcement.
- ○ Policies are in place to protect public and private trees, with enforcement.
- ○ Policies are in place to protect public and private trees, with enforcement, and are supported by significant deterrents (i.e., fines).

In a typical year, does your municipality educate the public on the importance or benefits of urban trees?

Examples include: run newspaper articles, posts to social media, booths at events, and conduct community events.

- Yes
- No
- I don't know

Has your community celebrated Arbor Day in the past five years?

- Yes
- No
- I don't know

Will your community continue or begin celebrating Arbor Day during the next five years?

- Yes
- Maybe
- No
- I don't know

Has your community been recognized as a Tree City USA within the last five years?

- Yes
- No
- I don't know

Do you plan to apply for Tree City USA status in the next five years?
Either as a continuing or a new applicant.

- Yes
- Maybe
- No
- I don't know

Does your community have a tree commission, tree board, or similar that provides guidance to your urban forest /street tree program?

- Yes
- No
- I don't know

Display This Question:
If Does your community have a tree commission, tree board, or similar that provides guidance to your... != Yes

Are there plans to establish a tree commission, tree board, or similar in the next five years?

- Yes
- Maybe
- No
- I don't know

Does your municipality have staff who conduct street tree maintenance?
Maintenance could include pruning, pest control, removal, etc.

- Yes
- No
- I don't know

Display This Question:
If Does your municipality have staff who conduct street tree maintenance? Maintenance could include... != Yes

Does your municipality plan to hire tree maintenance staff within the next five years?

- Yes
- Maybe
- No
- I don't know

Within the last five years, has your municipality hired contractors to assist with tree maintenance, planting, or inventory?

- Yes
- No
- I don't know

Do staff or contractors have International Society of Arboriculture (ISA) or Tree Care Industry Association (TCIA) certifications?

	Yes	No	I don't know	Not Applicable
Staff	○	○	○	○
Contractors	○	○	○	○

In the past five years, have volunteers assisted with tree planting, maintenance, inventory or public education?

- Yes
- No
- I don't know

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Within the last five years, has your municipality partnered with a non-profit or advocacy group on municipal tree-related issues?

- ○ Yes
- ○ No
- ○ I don't know

Street trees are part of a larger urban forest which can include park trees, trees in municipal-owned conservancy areas, privately owned yard and business park trees, and any other trees inside the municipality's boundaries. Does your municipality collaborate with stakeholders to improve the condition of the shared urban forest?

- ○ Yes
- ○ No
- ○ I don't know

Which of these statements best represents your municipality's level of funding for the management of all trees under the purview of the municipality.
This can include street trees, park trees, and trees in conservancy areas and other green spaces.

- ○ Extremely sufficient
- ○ Sufficient
- ○ Neither sufficient nor insufficient
- ○ Insufficient
- ○ Extremely insufficient

Which of these statements describe the budgeted street tree funding in your municipality?

	Yes	No
No money is separately budgeted for tree projects.	○	○
Money is budgeted for tree planting.	○	○
Money is budgeted for routine pruning and removals.	○	○
Money is budgeted for pest control and/or plant health care.	○	○

For 2019, what was the total amount spent on municipal tree-related services and employees?
Please answer in whole numbers.

_____

Has your community received urban forest related grants funds within the last 10 years?

- ○ Yes
- ○ No
- ○ I don't know

Display This Question:
If Has your community received urban forest related grants funds within the last 10 years? = Yes

From which of the following did the grant(s) originate?

	Yes	No
NYS Department of Environmental Conservation Urban and Community Forestry Program	○	○
NYS Urban Forestry Council	○	○
Other NYS Agency	○	○
US Forest Service	○	○
Private Source	○	○
Other	○	○

Are you aware of these NYS Department of Environmental Conservation (NYSDEC) Urban and Community Forestry Program components?

	Aware	Unaware
Technical Assistance	○	○
Educational Assistance	○	○
Grants Program	○	○
ReLeaf Committees	○	○

Has your municipality participated in any NYSDEC Urban and Community Forestry Program components?

	Yes	No
Technical Assistance	○	○
Educational Assistance	○	○
Grants Program	○	○
ReLeaf Committees	○	○

Does your community plan to apply for a NYSDEC Urban and Community Forestry Program Grant within the next five years?

- ○ Yes
- ○ Maybe
- ○ No
- ○ I don't know

How familiar are you with the NYS Urban Forestry Council?

- ○ Familiar
- ○ Somewhat Familiar
- ○ Not Familiar

How familiar are you with Cornell University Cooperative Extension?

- ○ Familiar
- ○ Somewhat Familiar
- ○ Not Familiar

Do you encourage or provide tree-related training for your employees?

- ○ Yes.
- ○ No, but we plan to within the next five years.
- ○ No, and we have no plans to within the next five years.
- ○ No, we have no employees.
- ○ I don't know.

Display This Question:
If Do you encourage or provide tree-related training for your employees? = Yes.
Or Do you encourage or provide tree-related training for your employees? = No, but we plan to within the next five years.

Would you like employee training on these topics? If yes, what level?

	No, not needed	Yes, beginner level	Yes, advanced level
Tree planting	○	○	○
Tree species selection	○	○	○
Tree pruning	○	○	○
Working with volunteers	○	○	○
Writing tree ordinances	○	○	○
Benefits of trees	○	○	○
Using trees to mitigate stormwater runoff	○	○	○
Other	○	○	○

Do you encourage or provide tree-related training for your volunteers?

- ○ Yes.
- ○ No, but we plan to within the next five years.
- ○ No, and we have no plans to within the next five years.
- ○ No, we have no volunteers.
- ○ I don't know.

Display This Question:
If Do you encourage or provide tree-related training for your volunteers? = Yes.
Or Do you encourage or provide tree-related training for your volunteers? = No, but we plan to within the next five years.

Would you like volunteer training on these topics? If yes, what level?

	No, not needed	Yes, beginner level	Yes, advanced level
Tree planting	○	○	○
Tree species selection	○	○	○
Tree pruning	○	○	○
Working with volunteers	○	○	○
Writing tree ordinances	○	○	○
Benefits of trees	○	○	○
Using trees to mitigate stormwater runoff	○	○	○
Other	○	○	○

What is your community's greatest urban forest management need?

_____

Which of these needs apply to your urban forest management program, and at what level?

	Already Have (no need)	Need Somewhat	Need Greatly	Not Necessary (no need)
Political Support	○	○	○	○
Public Support	○	○	○	○
Municipal Employees	○	○	○	○
Training for Existing Employees	○	○	○	○
Tree Board/Tree Commission	○	○	○	○
Volunteers	○	○	○	○
Technical Assistance	○	○	○	○

What are the greatest issues your municipality faces regarding urban forest management, and in your opinion, what could be done to solve them?

_____

Appendix 2: Nonresponse Table

Table S1: Breakdown of Initial Response and Nonresponse Sample with Response Rate by Municipality Size

Municipal Population	**Complete Contact List (Percent of total)**	**Initial Response (Percent of total)**	**Percent of Initial Response with a Street Tree Program**	**Nonresponse Survey* (Percent of total)**	**Percent of Nonresponse Survey with a Street Tree Program**	**Combined Response (Percent Response)**
Under 10,000	594 (76%)	210 (80%)	70%	38 (72%)	57%	248 (80%)
10,000 to 65,000	165 (21%)	39 (15%)	87%	14 (26%)	77%	53 (17%)
Over 65,000	22 (3%)	12 (5%)	100%	1 (2%)	100%	13 (4%)
Total	781	261	74%	53	64%	314
*10% of Non-Response Municipalities						

Appendix 3: Nonresponse Survey

NYS Municipal Urban Forest Management Survey

New York State has hundreds of municipalities that manage street trees as part of their community's urban forest. Each of these municipalities provides a different mix of services and has a different set of needs. The results will identify gaps and generate recommendations to urban forestry support programs in New York State.

This survey will be asking about the current and future status of your municipality's street tree management program.

Street trees are defined as trees typically found in tree lawns (boulevards) or tree pits along street rights-of-way within the municipality.

Urban forests are all the trees within a municipality, including street trees, park trees, private trees, and trees in conservation areas.

What is the name of your municipality?
Please include whether it is a city, village or town (i.e., City of Albany)

_____

Does your municipality have publicly owned and maintained street trees?
Street trees are often found between the sidewalk and curb or other right-of-way areas. This does not include naturally occurring ROW trees along rural roads.
Maintenance can include pruning, pest management, planting, removal, and other activities.

- ○ Yes
- ○ No
- ○ Yes, but they are managed by the county, state, or another municipality, not by us

Skip To: End of Survey If Does your municipality have publicly owned and maintained street trees? Street trees are often fo... != Yes

Is there a municipal employee who is responsible for street trees?

- ○ Yes
- ○ No
- ○ No, but that role is contracted out

Display This Question:
If Is there a municipal employee who is responsible for street trees? = Yes

What is the title of the municipal employee who is primarily responsible for the street trees?

_____

Display This Question:
If Is there a municipal employee who is responsible for street trees? = Yes

Is that person housed in a department or division dedicated to street trees or urban forestry?
Examples: Department of Urban Forestry or Division of Forestry

- Yes
- No

Display This Question:
If Is that person housed in a department or division dedicated to street trees or urban forestry? Ex... = No

If no, which department best aligns with where that person is housed?

- Public Works
- Highways
- Parks and Recreation
- Planning
- Other _____

Has your municipality planted street trees within the last five years?

- Yes
- No
- I don't know

Has your municipality maintained (pruned, removed, etc.) street trees within the last five years?

- Yes
- No
- I don't know

Does your municipality have a street tree inventory?

- Yes
- No
- I don't know

Does your municipality have an urban forest management plan?

- Yes
- No
- An urban forest management plan is currently being written
- I don't know

Does your community have a tree-related ordinance?

- Yes
- No
- I don't know

Has your community celebrated Arbor Day in the past five years?

- ○ Yes
- ○ No
- ○ I don't know

Has your community been recognized as a Tree City USA within the last five years?

- ○ Yes
- ○ No
- ○ I don't know

Does your community have a tree commission, tree board, or similar that provides guidance to your urban forest /street tree program?

- ○ Yes
- ○ No
- ○ I don't know

Does your municipality have staff who conduct street tree maintenance?
Maintenance could include pruning, pest control, removal, etc.

- ○ Yes
- ○ No
- ○ I don't know

Has your community received urban forest related grants funds within the last 10 years?

- ○ Yes
- ○ No
- ○ I don't know

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Appendix 4: Supplemental Figures

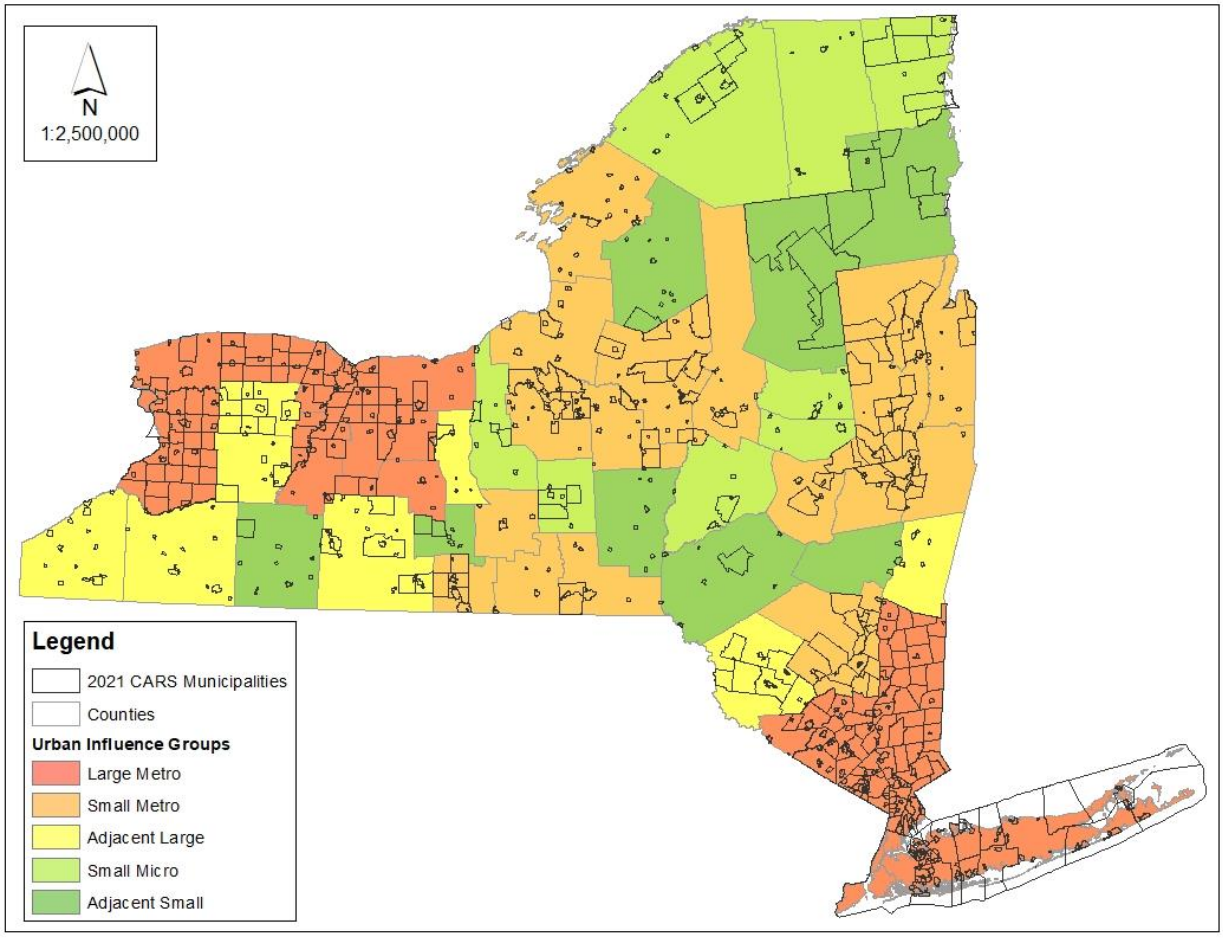

Figure S1: CARS Municipalities and County-Level Urban Influence Groups

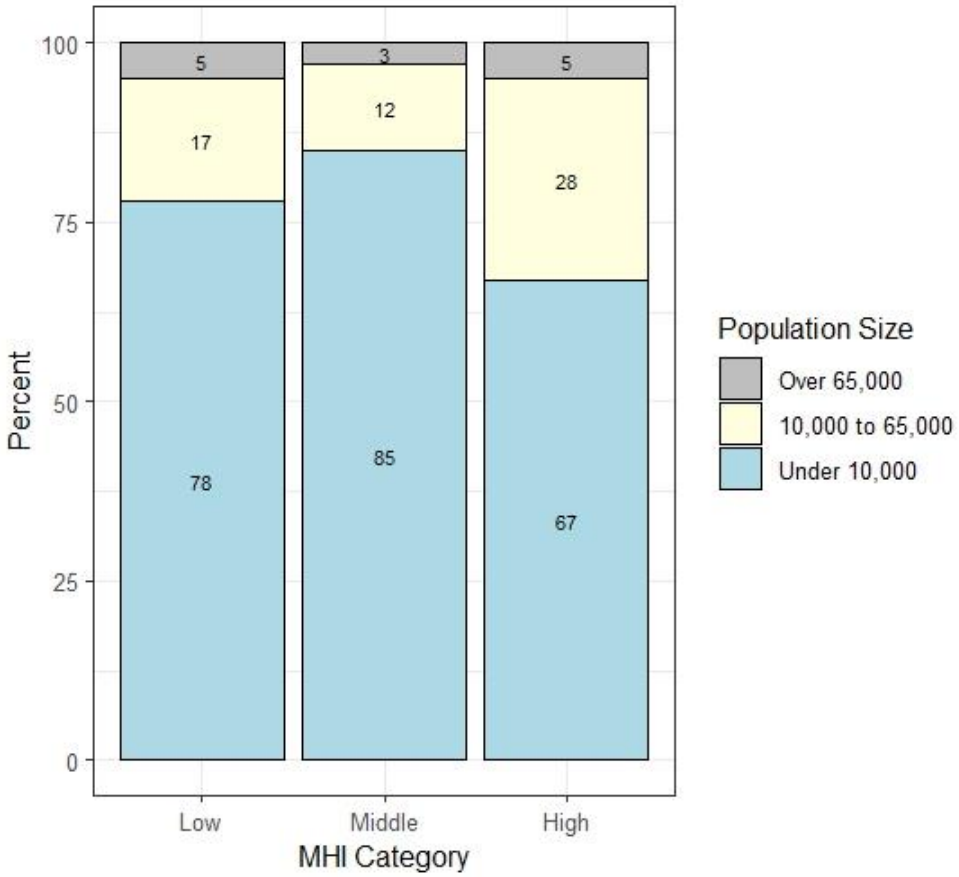

Figure S2: Percentage of NYS Municipalities in each MHI Category by Population Size

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