

**Demographics, operational resources, and grants:
Exploring urban forest management program
outcomes at the municipal level in New York State**

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Demographics, operational resources, and grants: Exploring urban forest management program
outcomes at the municipal level in New York State

A Dissertation Presented

by

J. REBECCA HARGRAVE

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DEDICATION

To my husband, Christopher Sprague, and my children, James and Samuel Sprague.

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ABSTRACT

DEMOGRAPHICS, OPERATIONAL RESOURCES, AND GRANTS: EXPLORING URBAN FOREST MANAGEMENT PROGRAM OUTCOMES AT THE MUNICIPAL LEVEL IN NEW YORK STATE

FEBRUARY 2026

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Urban forests are managed for the collective good of the residents. Municipalities are the primary managers of a community's urban forest, and while individual trees may provide similar benefits and values from one community to the next, municipal capacity and resources vary greatly. This variation leads to differences in the types and scale of urban forest management services offered, which potentially affects the quality and quantity of that urban forest's benefits. An understanding of how and why municipal urban forest management programs differ, as well as the needs and barriers they face, is beneficial to governmental and not-for-profit organizations that aim to support urban forest management and amplify the benefits of trees. First, a systematic review of national, regional, state, and sub-state municipal urban forest management programs was performed to establish a baseline understanding of themes and trends pertaining to urban forest management characteristics, services, needs, barriers, and intentions. Second, a formal survey was disseminated to municipalities in New York State to ascertain the status of the state's

municipal urban forest management program, to identify differences among municipalities based on population size, affluence, and proximity to metropolitan areas, and to explore opportunities for program support. Third, a formal survey was conducted and combined with community characteristics data to formally explore the local characteristics and resources of successful and unsuccessful municipal applicants, as well as those that did not apply, to New York State's urban and community forestry grant program. Commonalities and trends among these three groups were identified to enhance our understanding of which communities are more likely to be awarded public urban forest management funds and why. All three chapters aim to enhance the knowledge of urban forest management support agencies and ultimately improve the condition and services of urban forest management programs across New York State, and to inform the global urban forestry sector more broadly.

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INTRODUCTION

Shade, energy savings, pollution reduction, wildlife habitat, stormwater runoff reduction, and improvements in mental and physical health and resident well-being, as well as increased property values and beauty, are just a few beneficial functions and values that trees provide (Coleman et al. 2022). To increase the quantity and quality of these benefits in and around the places where people live, trees should be maintained and managed as part of the larger urban forest.

Trees in the urban forest are managed by various entities. Homeowners with trees in their yards, business owners with trees in landscaping and parking lot islands, and school districts with trees flanking walkways and playgrounds, to name a few. However, the largest single manager of trees in an urban space is the municipality (city, village, or town), which often has a duty to manage the trees in its right-of-way (Hauer and Peterson 2016, Ordóñez et al. 2020). Municipal trees are also some of the most visible, with street trees prominent in downtown business districts and lining sidewalks throughout the community, and park trees contributing to greenspaces. Typically, the municipality is responsible for a small fraction of the urban forest in its greater community; however, it is often the only party actively managing the trees for the greater good of its residents (Miller et al. 2015).

Municipal urban forest management (MUFM) can be implemented in various ways, with no two communities adopting the same approach or providing the same services. Staff and services are dependent on municipal resources, budgets, and local needs and demands (Zhang and Zheng 2012), and barriers to adequate management abound (Driscoll et al. 2015).

Common services provided through MUFM include tree planting and early care, pruning, pest management, risk assessment, leaf and tree debris pick up, tree removal, and stump grinding (Ries et al. 2007, Miller et al. 2015). Resources used to deliver MUFM services can include arboriculture or urban forestry-trained employees, municipal staff, tree maintenance-related equipment, geospatial and inventory software, volunteers, elected officials, municipal budgets, grants, and donations (Harper et al. 2017). To ensure MUFM is on track, guidance documents and committees may be created and utilized to inform decisions. These can include tree inventories, tree-related ordinances, urban forest or greenspace management and work plans, and tree advisory boards (Stevenson et al. 2008).

The comprehensiveness of MUFM is measured in two main ways. The United States Department of Agriculture Forest Service (USDA FS), through the states, tracks specific urban forestry-related components, such as the presence of professional staff, a tree-related ordinance, an advocacy or advisory board, and an urban forest management plan (National Information Center for State and Private Forestry USDA FS 2022). Municipalities that have at least one of those four components are considered ‘Developing.’ If they have all four, they are considered ‘Managing.’ Another measure of comprehensiveness is through recognition and certification programs. Annual Tree City USA recognition requires a tree-related ordinance, a board or individual responsible for the trees, celebration of Arbor Day, and at least \$2 per capita in tree-related expenditures (Arbor Day Foundation 2024). SFI’s Urban and Community Forestry Sustainability Standard is a more complex certification with extensive and expansive criteria.

Community characteristics may play a role in the comprehensiveness of MUFM. Positive associations have been found between community demographics, such as population size and affluence, and MUFM comprehensiveness and canopy cover (Rines et al. 2011, O’Herrin and Shields 2016). Conversely, underserved and disadvantaged communities are also less likely to reap the benefits of urban forests and are more likely to have less urban tree canopy cover (Watkins and Gerrish 2018).

The primary source of funding for MUFM is the municipality’s budget (Hauer and Peterson 2016). Municipalities often cite the inadequacy of their tree-related budget as a barrier to providing MUFM services (Hargrave et al. 2024). Many communities rely on grants and other outside funds to augment their program and to provide basic services (Elmendorf et al. 2003). Additionally, population size and affluence are likewise linked to a municipality’s ability to obtain a grant (Kuhns et al. 2005, Ries et al. 2007). Research has shown that municipalities that earn Tree City USA recognition have more robust MUFM programs (Stevenson et al. 2008, Hargrave et al. 2024), which may facilitate the securing of tree-related grants, to the detriment of municipalities that are still in the formative phase of MUFM.

Motivations for this research stemmed from personal observations of municipal urban forest management in New York State. The entirety of New York State (NYS) is often erroneously defined by its largest city, New York. Whereas the state has hundreds of other cities, villages, and towns with urban forests, most of which are not nearly as large and complex, and vary greatly in terms of population size, affluence, and urban character. Like many states, NYS featured a dearth of available data pertaining to its urban forests, and substantial knowledge gaps existed in relation to the status of MUFM programs in the

majority of its communities. Descriptions of the status and needs of, as well as the barriers to, urban forest management across the state are invaluable to agencies working to support MUFM and generate beneficial outcomes, as well as to individual municipalities seeking to enhance their management programs.

The NYS Department of Environmental Conservation provides multiple urban forest management grants on a recurring basis. Trends in the lists of community grantees have been noted, and further exploration was warranted in relation to what these funded communities had in common and what prohibited non-funded communities from accessing these dollars.

Those knowledge gaps germinated these research objectives and questions:

- 1) To characterize the municipal urban forest management in the United States of America by:
 - a) Describing the status, priorities, needs, and barriers of urban forest management programs at the national, regional, state, and sub-state levels in the United States
 - b) Discussing potential knowledge gaps that can be most helpful for policy designers, program managers, and support organizations
- 2) To gain insights into the program status and needs of urban forest management at the municipal level in NYS by analyzing and describing:
 - a) The relationships between the community characteristics of population size and affluence and urban forest management program status, needs, and comprehensiveness.
 - b) The influence of a nearby metropolitan area on the urban forest management program in small municipalities.

- c) The status of NYS municipal urban forest management programs based on national measures.
- 3) To investigate the differences in characteristics and approaches between municipalities that were successful versus unsuccessful in their applications for NYSDEC Urban Forestry Grants over the past several rounds. Similarly, to explore the differences between municipalities that applied for UCF Grants compared to those that did not apply.
- a) How do NYS municipalities that receive UCF Grant funding differ from those that apply unsuccessfully, and from those that do not apply?
 - b) Are municipalities with specific characteristics that UCF Grants explicitly prioritize more likely to receive grant funding?
 - c) What barriers prevent NYS municipalities from applying for UCF Grants?

CHAPTER 1

Municipal Forest Program Management in the United States of America: A

Systematic Review

1.1 Introduction

Urban forests are the trees in our built communities. They grow along our streets, around our homes and businesses, and in our parks and greenspaces. Urban forests provide a multitude of environmental and social benefits. Trees reduce energy use by casting shade and buffering winds and can reduce urban heat island effects (Wolf et al. 2020). Canopies capture air pollutants and particulates and intercept rainwater (Roy et al. 2012). The presence of urban trees can reduce crime rates, encourage human physical activity, and provide places for recreation (Dwyer et al. 1992, Wolf et al. 2020). Trees can also reduce stress and improve health outcomes (Hazer et al. 2018, Wolf et al. 2020). These benefits are amplified when urban forests are managed (Dwyer et al. 2003), and that management primarily happens at the municipal level.

Municipal urban forest management programs are influenced by a complex network of local factors, including municipal budgets, political and resident support, dedicated personnel and volunteers, infrastructure and design considerations, income levels, relative location, and demographics (Stevenson et al. 2008, Zhang and Zheng 2012, Driscoll et al. 2015). As a result, local urban forestry programs offer a spectrum of services generating a range of outcomes. Understanding the interrelationship among influencing factors, program structures, and urban forest outcomes is critical to ensuring that local programs have the necessary resources and support. Information on the character of existing programs is also central to the effective design and implementation of technical assistance,

educational programs, and funding opportunities by agencies and organizations responsible for building and supporting municipal programs for urban forest management. This article reviews the scientific literature and selected technical documents that describe municipal urban forest management programs in the United States.

Urban forests themselves are highly variable in scale, ranging from the seven million trees that comprise the urban forest of New York City (Nowak and Greenfield 2018) to the many small urban forests, which may include only a few dozen trees (Miller et al. 2015). There is no national policy on how urban forests should be managed. A few states (Massachusetts, Connecticut, Rhode Island, New Hampshire, Vermont, and Maine) have legislation that requires municipalities to have a tree warden who is responsible for tree care, but the scope of their work varies. Other states have no such requirement (Ricard 2005a). Some urban forests are managed reactively by one designee, while others are closely and systematically planned and monitored by scores of urban forestry professionals and citizen scientists with sophisticated tools and software (Hauer and Peterson 2016, Roman et al. 2017). The extent of this management is initially determined by the citizens and elected officials of that place, either by recognizing the need to support regular tree maintenance and planting (Ricard 2005a) or as a response to an emergency or acute event (e.g., weather or invasive pest) (Miller et al. 2015, Harper et al. 2018).

The range of urban forest program services also varies by community. Smaller programs typically provide only basic services such as collecting yard waste or planting and pruning trees. More extensive programs might include pest monitoring and control, urban tree inventories, planting site assessment, and tree risk assessment (Kuser 2007, Hauer and Peterson 2016). Some municipalities have formal management plans and

scheduled operations based on comprehensive tree inventory data, while others only react to maintenance needs (Treiman and Gartner 2004, Driscoll et al. 2015). Management plans can include practices, policies, and timelines for planting and pruning trees. More comprehensive plans may include larger-scale considerations, such as the impacts of climate change on biodiversity (Fontaine and Larson 2016) and storm readiness (Kuehler et al. 2017). Communities without a proactive urban forest management plan may find themselves less able to respond quickly to critical issues, avail themselves of funding opportunities, or efficiently allocate resources.

There is significant variation associated with the position of “urban forest manager.” The municipal urban forest manager’s training and expertise also play a role in the quantity and quality of the services offered by that community (Miller and Bate 1978, Groninger et al. 2002, Ricard 2005*b*, Harper et al. 2017, O’Herrin et al. 2020). Some communities employ formally trained/educated urban foresters or city arborists who oversee planning and operational activities. These communities may also have crews of trained arborists and professionals who perform tree maintenance (Konijnendijk van den Bosch 2015, Hauer and Peterson 2016). In other, often smaller communities, the role of the urban forester may be essentially “assigned” to an individual who may have primary responsibilities elsewhere—typically in planning, parks and recreation, or the highway department (Schroeder et al. 2003). Many municipalities contract out the majority of their arboricultural work (Hauer and Peterson 2016, McBride 2017). Elected officials or volunteers may spearhead some community urban forestry programs, which may be limited in scope due to a lack of resources and skills (Groninger et al. 2002, Elmendorf et al. 2003, Elton et al. 2022). Communities may also feature shade tree committees, or tree boards,

that assist with policy creation or conduct volunteer maintenance and planting activities (Elmendorf et al. 2003, Harper et al. 2017, 2018, Hauer et al. 2018).

The United States Department of Agriculture Forest Service (USDA-FS) Urban and Community Forestry Program (UCFP) provides technical, financial, research, and educational services directly and through state Urban and Community Forestry (UCF) partners to municipalities and urban forestry organizations and agencies (USDA Forest Service 2020). State UCF programs are often housed within the agency responsible for natural resources monitoring and management. Most state-level programs provide technical and educational assistance to municipalities, coordinate volunteers and partnerships, and facilitate state urban and community forestry councils (Ries et al. 2007, Hauer and Johnson 2008*a*). In addition, many provide funding either as a pass-through from the USDA-FS UCFP, state dollars, or both (Hauer et al. 2008). The activities of the state UCF programs have been generally found to improve local urban forest outcomes (Hauer et al. 2011). Many states also have an urban forestry extension program supported by the USDA Cooperative Extension System, which delivers technical assistance and educational training to professionals and citizens (Gerhold 2007). Community urban forest managers and volunteers can access these resources to improve their urban forests (Hauer and Peterson 2016). Awareness of and access to government agencies and non-governmental organizations that provide education, technical assistance, and funding to communities have contributed to better urban forest program outcomes (Grado et al. 2006, 2013, Hauer et al. 2011, Elton et al. 2020).

To improve the development and progress of municipal urban forestry programs, fine-tune federal and state technical assistance, and develop effective educational programs,

researchers and statewide urban forest program managers have attempted to describe the characteristics of local urban forestry programs and their management needs. The assessment of the factors that influence urban forest management in the U.S. does not have a long history. The earliest journal articles and technical reports relating to urban forest management status and needs appeared in the 1970s. Cool, Kielbaso, and Myers' 1973 study explored the urban forestry needs of Michigan cities, and Miller and Bate published a similar survey of Wisconsin communities in 1978. In 1976, Ottman and Kielbaso released a technical report based on a 1974 nationwide survey of community-based municipal tree care programs. Urban forest management guidance documents also first appeared in this timeframe, including the 1978 USDA-FS *Urban Foresters Notebook*.

This article reviews the available research that describes the status, priorities, needs, and barriers of urban forest management programs at the national, regional, state, and sub-state levels in the United States. Though the breadth of urban forest program management research has increased over time, there is still a lack of available data, and critical knowledge gaps remain (Grabosky 2020). We reviewed articles both geographically and thematically, followed by analyses of those themes and a discussion of potential knowledge gaps that, when addressed, can be most helpful for policy designers, program managers, and support organizations.

1.2 Materials and Methods

1.2.1. Search Strategy

This article focuses on peer-reviewed journal articles with national, regional, state, and sub-state level urban forest program management-related data in the United States. Our literature search employed PRISMA and other accepted systematic review guidelines (Fink

2014, Page et al. 2021*b, a*). Major databases (i.e., Agricola and Web of Science) were searched using the phrases: “urban forest management” AND assessment; “urban forest management” AND needs; “urban forest management” AND barriers; “municipal tree” AND management; “urban and community forestry”; and “urban forestry program” to locate peer-reviewed journal articles. We also conducted those keyword searches directly in the online repositories of Arboriculture & Urban Forestry (previously Journal of Arboriculture), Arboricultural Journal, Cities and the Environment, Forest Science, Journal of Forestry, and Urban Forestry & Urban Greening. The USDA FS Treesearch website was also searched with those terms. Popular search engines (i.e., Google and Bing) were employed to locate national-level technical documents. Finally, literature cited lists of found articles and national-level technical reports were reviewed (backward chaining). Articles published through December 2021 were included.

Articles were considered for inclusion if they met the following criteria:

- 1) Described community urban forest program needs and barriers, municipal urban forest program components, perceptions of urban forestry by municipal managers, and factors affecting urban forest management. Articles that measured tree canopy cover or urban canopy structure and condition were excluded (e.g., (Gartner et al. 2002, Heynen and Lindsey 2003)).
- 2) Covered a geographic area larger than one municipality (i.e., metro-area, state, group of states, or national) and were part of the United States.
- 3) Relied upon a survey(s) or interviews with municipal officials, administrators, program employees, or key municipal volunteers. Some studies also linked available data (i.e., U.S. Census data, aerial imagery) with survey or interview data

to draw conclusions about management conditions. These studies were included. Surveys of residents or the general public were excluded (e.g., (Getz et al. 1982)). We also excluded articles that solely covered third-party urban forestry programs (e.g., (Berland et al. 2016)).

- 4) Examined or described how community conditions (i.e., size, relative location, demographics) affected responses and findings.
- 5) Sub-national articles had to be published in a peer-reviewed journal. Though technical reports add considerably to the urban forest program management body of knowledge, we decided to include them only at the national level and exclude them at other geographic levels in this review. Some state-level reports are not accessible due to the lack of available digital versions and/or distribution. Additionally, research reported in technical documents is conducted with varying degrees of rigor due to the needs of the agency and demands on the author's time and thus may not be comparable with peer-reviewed articles.

1.2.2. Search Results

Initial searching netted 1275 articles, including 466 duplicates. All 809 articles were reviewed for the criteria above; 46 met Criteria 1, 30 met Criteria 2, 18 met Criteria 3, and 17 met Criteria 4 and 5.

The literature cited lists in the 17 articles were reviewed, in alphabetical order, for additional journal articles and national-level technical reports (backward chaining). They contained a total of 414 citations. We found 11 additional peer-reviewed journal articles that met criteria 1 and 2, but only eight met criteria 3, 4, and 5. Five national-level technical reports were found. Numerous state technical reports were among the reference lists. The

references cited lists for the additional 11 journal articles and the five national technical reports were also reviewed, netting 158 additional references with two additional journal articles.

This process uncovered 32 studies: 27 peer-reviewed articles (national, regional, and state-level) and five national technical reports.

1.2.3. Coding Strategy

The identified articles were downloaded, stored, and organized in citation software (Zotero). Each paper was read by at least one author and coded for basic information using an Excel spreadsheet. Coded information included study structure (i.e., year published, authors, sample size, methods, and geographic area) and review data variables (i.e., community comparators, program components, knowledge and awareness topics, needs, barriers, and intentions).

1.3. Results

1.3.1. National-Level

Five studies were identified, in both peer-reviewed articles and technical reports, which provide nationwide information on the general state of urban forestry programs. Each of these studies was based on a national survey assessing the structure, services, and procedures of urban forest management programs across the U.S. These surveys were conducted in 1974–75 (Ottman and Kielbaso 1976), 1980 (Giedraitis and Kielbaso 1982, Kielbaso et al. 1982), 1986 (Kielbaso et al. 1988, Kielbaso 1990), 1993 (Tschantz and Sacamano 1994), and 2014 (Hauer and Peterson 2016) (Table 1.1). Many of the same questions were asked in the 1974, 1980, and 1986 surveys and were also included in the 2014 survey. The questions on the 1993 survey, however, are generally not directly

comparable to those on the prior surveys, though some were included in the 2014 survey to facilitate comparisons. Three other nationwide studies which use surveys to investigate specific topics of interest were also identified (Table 1.1). Below, we summarize the state of urban forestry management in U.S. cities and briefly describe the latest nationwide survey and the four focused studies with national scopes.

Table 1.1. Key details for national urban forest management articles and important technical reports, U.S. 1973–2021.

Author(s) and Year Published	Year of Data Collection	Sample Size	Citation
Ottman and Kielbaso 1976 *#	1974–75	$n = 991$	(Ottman and Kielbaso 1976)
Beatty and Heckman 1981	1977	$n = 72$	(Beatty and Heckman 1981)
Giedraitis and Kielbaso 1982 *#	1980	$n = 1534$	(Giedraitis and Kielbaso 1982)
Johnson 1982	unknown	$n = 12$	(Johnson 1982)
Kielbaso et al. 1982 #	1980	$n = 1534$	(Kielbaso et al. 1982)
Kielbaso et al. 1988 *#	1986	$n = 1062$	(Kielbaso et al. 1988)
Kielbaso 1990 #	1986	$n = 1062$	(Kielbaso 1990)
Tschantz and Sacamano 1994 *#	1993	$n = 419$	(Tschantz and Sacamano 1994)
Clark and Matheny 1998	unknown	$n = 25$	(Clark and Matheny 1998)
Hauer and Peterson 2016 *#	2014	$n = 667$	(Hauer and Peterson 2016)

* Indicates technical report (not found in scientific journals). # Iterative nationwide survey.

Although now almost a decade old, the Hauer and Peterson 2014 general survey provides the most up-to-date national picture of the state of urban forestry management in the U.S. The survey featured 109 questions (long form) covering eight topical sections (Hauer and Peterson 2016). Responses were collected from 667 communities ranging from 2500 to over one million residents. Analysis was presented by geographic region and population size. Results indicated that more than 90% of communities had or were developing a tree ordinance, 50% of the responding communities had an urban tree plan,

and 67% of the communities had partial or complete tree inventories. Approximately two-thirds of the communities were aware of their state UCF program, but only about half received financial or educational assistance, and about 40% received technical assistance. Eighty-one percent of respondents reported public funding of tree care, though the services provided varied considerably. Across all population sizes, 0.52% of the 2014 municipal budget was allocated to tree-related work, and communities between 25,000 and 49,999 residents spent the most per capita. Spending per tree was the highest in the Midwest, potentially attributed to the effects of the emerald ash borer (*Agrilus planipennis* Fairmaire) outbreak. Communities in the South spent more per tree than those in the West, Northeast, or Midwest. Communities with populations greater than 10,000 residents are more likely than municipalities with fewer than 10,000 residents to employ the American National Standards Institute (ANSI) A300 tree and shrub management standards to guide practices, 67% to 10% (Hauer and Peterson 2016).

In 1977, Beatty and Heckman (1981) asked program managers to complete a survey and to submit paper copies of their tree master plans, ordinances, and guidelines for planting and management documents for review. Seventy-two cities from across the country from a spectrum of population sizes responded. Findings conveyed administrative priorities, citizen demand for services, and social issues related to trees. Thirty percent of the responding cities reported having tree commissions, 42% did not know the number of trees in their urban forest, and 60% indicated the need for substantial budget increases to meet their operational requirements. Information pertaining to urban tree species composition (urban tolerant, weed trees, and native trees) and commonly reported tree problems were also included in this survey (Beatty and Heckman 1981).

Johnson (1982) explored the policy environment, institutional setting, program activities, and political environment in 12 large cities across the U.S. through interviews with each city's lead urban forester. Due to the limited scale of this method, the results only provide a snapshot of these cities' urban forest management issues. Findings included that successful programs were often housed within the public works department and had at least one well-trained staff member. Also, staff members focused much of their time on daily tree care rather than urban forest management and decision-making. Johnson determined that most programs were underfunded and lacked political and agency support.

Clark and Matheny (1998) sought to score urban forestry in larger cities relative to several dimensions of sustainability: knowledge or opinions of the existing tree resource (Vegetation Resource), interaction and cooperation with stakeholders and partners (Community Framework), and resource management practices (Resource Management). Based on 25 survey responses from larger cities spread across the country, they found no systematic relationship between scores and city population or area. The respondents' average score for the Vegetation Resource criteria was 53%, while Resource Management was 62%, and Community Framework was 64%. Specifically, 64% had a management plan, 60% knew the size of their street tree population, and 64% knew their urban tree canopy cover percentage. The article also reviewed the importance and involvement of constituent and community groups (Clark and Matheny 1998).

1.3.2. Regional-Level

Two papers described urban forest management conditions in specific regions of the United States. One focused on the Intermountain West, the other on the Southeast (Table 1.2).

Table 1.2. Key details for national and regional urban forest management articles, U.S. 1973–2021.

Region/States	Author(s) and Year Published	Year of Data Collection	Sample Size	Citation
Intermountain West: Arizona, California *, Colorado *, Idaho, Montana *, Nevada, New Mexico *, Oregon *, Utah, Washington *, Wyoming*	Kuhns 1998	1997	$n = 21$, 11 states	(Kuhns 1998)
Southeast: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia	Lewis and Boulahanis 2008	unknown	$n = 504$, 13 states	(Lewis and Boulahanis 2008)

* Portions of those states

Kuhns (1998) surveyed 21 state and federal urban and community forestry staff, extension educators, and utility arborists with responsibilities in an 11-state region to gather information on Intermountain West urban forests. Questions explored the quality, strengths, and weaknesses of local urban forests, as well as perspectives regarding the future, regional differences, research needs, and urban forest-related challenges. Shortcomings identified by the respondents included insufficient agency support and a lack of community awareness. Respondents generally described a region that was challenging for urban forest growth, with its harsh growing conditions and rapid population growth, though they also indicated that they remained hopeful for the future of urban forestry in the Intermountain West (Kuhns 1998).

As described in Lewis and Boulahanis's (2008) paper, mayors from 504 small towns (5000 to 25,000 residents) in 13 southeastern states were surveyed about tree maintenance, municipal organizational structure, community support, and the knowledge and characteristics of the mayor. Census data pertaining to education, affluence, and population were paired with the survey results. Ninety percent of communities performed routine maintenance (prune, mulch, fertilize, or remove trees). Sixty-one percent had conducted a

significant tree planting within the previous five years or planned one for the future. Only 66% of the responding mayors knew of their state urban forestry program. Dedicated staff was found in 59% of communities, and 49% had a tree-related ordinance. Most mayors understood that trees provided benefits, though the importance of tree maintenance was rated below many other city issues. A multivariate analysis concluded that the presence of a designated urban forest staff member, department, or budget was positively correlated with routine tree maintenance. The model also indicated that tree maintenance was correlated to the mayor's awareness of their state's urban forest program (Lewis and Boulahanis 2008).

1.3.3. State- and Sub-State Level

Twenty articles published between 1978 and 2019 described municipal urban forest program management conditions at a state or sub-state level (Table 1.3) within the U.S. These articles described the characteristics, needs, barriers, awareness, and/or intentions of municipal urban forest program management. Most focused on urban forest management conditions, and one reported on management outcomes (Hilbert et al. 2019). Other early publications provide information on initial statewide program outcomes or individual cities (i.e., Herberger (1984) (Herberger 1984) and Skiera (1978) (Skiera 1978)) but read more like popular articles promoting specific projects or status reports rather than research articles.

Table 1.3. Key details for twenty state and sub-state urban forest management articles, U.S. 1973–2021.

State/Region	Author(s) and Year Published	Year of Data Collection	Sample Size	Citation
Alabama	Zhang and Zheng 2012	2003	$n = 797$ respondents, 336 cities	(Zhang and Zheng 2012)
Florida	Hilbert et al. 2019	2014, 2015, 2018 #	$n = 43$	(Hilbert et al. 2019)
Illinois	Schroeder et al. 2003	1995, 1999#	$n = 636$	(Schroeder et al. 2003)
Massachusetts	Harper et al. 2017	2013	$n = 50$	(Harper et al. 2017)
Massachusetts	Rines et al. 2011	2006	$n = 143$	(Rines et al. 2011)
Massachusetts	Rines et al. 2010	2006	$n = 143$	(Rines et al. 2010)
Michigan	Cool et al. 1973	1970	$n = 141$	(Cool et al. 1973)
Mississippi	Grado et al. 2013	2011	$n = 159$	(Grado et al. 2013)
Mississippi	Grado et al. 2006	2004	$n = 163$	(Grado et al. 2006)
Missouri	Treiman and Gartner 2004	2003	$n = 387$	(Treiman and Gartner 2004)
New Jersey	Tate 1984	1983	$n = 329$	(Tate 1984)
Oregon	Ries et al. 2007	1992, 2004	$n = 123$	(Ries et al. 2007)
Oregon/Washington: Portland/Vancouver Metro Area	Driscoll et al. 2015	Unknown ~2014	$n = 96$	(Driscoll et al. 2015)
Pennsylvania	Reeder and Gerhold 1993	1991	$n = 988$ stage 1 survey, $n = 161$ stage 2 survey	(Reeder and Gerhold 1993)
Pennsylvania	Stevenson et al. 2008	2005	$n = 528$ respondents, 356 municipalities	(Stevenson et al. 2008)
Pennsylvania	Still et al. 1996	Unknown ~1994	$n \sim 101$ grant recipients, 51 unfunded, 332 non-applicants	(Still et al. 1996)
Pennsylvania: Northeast region	Elmendorf et al. 2003	2000	$n = 188$ stage 1 survey, 56 stage 2 survey, 12 focus group	(Elmendorf et al. 2003)
Texas	O'Herrin and Shields 2016	2012	$n = 79$	(O'Herrin and Shields 2016)
Utah	Kuhns et al. 2005	2002	$n = 138$	(Kuhns et al. 2005)
Wisconsin	Miller and Bate 1978	Unknown	$n \sim 42, 53$	(Miller and Bate 1978)

Indicates data collection was expanded and added to the original data set

Table 1.3 summarizes the characteristics of 20 articles with a state or sub-state scope. We have further grouped these articles into five categories based on the dimensions of the urban forestry programs. These categories are attributes (descriptors used to compare one municipality to another), components of urban forestry programs (services and activities provided by the municipality), awareness and knowledge of urban forestry concepts and assistance programs, needs of and barriers to urban forestry programs, and future intentions or priorities.

Some of the studies reviewed below focused in-depth on one topic, while others covered many topics. Those that were exemplary of the category or provided interesting comparative data were selected for inclusion and are presented in chronological order.

1.3.3.1. State and Sub-State Level Attributes

All of these investigations used at least one community attribute to compare municipalities within a state or sub-state region. Nineteen of the journal articles compared or categorized the communities in their state by resident population size. One intentionally surveyed small municipalities (Elmendorf et al. 2003), a second only surveyed communities with over 500 residents (Cool et al. 1973), and a third only those over 5000 (O'Herrin and Shields 2016). Most studies compared only one or two factors with urban forest program status; only one study, Zhang and Zheng (2012), delved deeply into conditions that describe differences among communities and potentially lead to better services by UCF support programs (Table 1.4).

Table 1.4. Categories of attributes found in state and sub-state studies, U.S. 1973–2021.

Comparator	Number of Studies	Citations
Community by population size (or density)	20	(Cool et al. 1973, Miller and Bate 1978, Tate 1984, Reeder and Gerhold 1993, Still et al. 1996, Elmendorf et al. 2003, Schroeder et al. 2003, Treiman and Gartner 2004, Kuhns et al. 2005, Grado et al. 2006, 2013, Ries et al. 2007, Stevenson et al. 2008, Rines et al. 2010, 2011, Zhang and Zheng 2012, Driscoll et al. 2015, O’Herrin and Shields 2016, Harper et al. 2017, Hilbert et al. 2019)
Urban forest program budget relative to program or outcomes	8	(Cool et al. 1973, Miller and Bate 1978, Treiman and Gartner 2004, Kuhns et al. 2005, Ries et al. 2007, Stevenson et al. 2008, Zhang and Zheng 2012, O’Herrin and Shields 2016)
Relative community location in the state or proximity to metropolitan areas	5	(Still et al. 1996, Treiman and Gartner 2004, Rines et al. 2010, 2011, Harper et al. 2017)
Community affluence	4	(Miller and Bate 1978, Rines et al. 2010, 2011, Zhang and Zheng 2012)
Education level of residents	3	(Rines et al. 2010, 2011, Zhang and Zheng 2012)
Race (% Caucasians)	1	(Zhang and Zheng 2012)
Poverty level of community	1	(Zhang and Zheng 2012)
Home Value	1	(Hilbert et al. 2019)
Housing Density	1	(Hilbert et al. 2019)

The earliest paper in this collection is Cool et al. (1973) which provides a fairly comprehensive comparison of key urban forestry program components in Michigan cities, including staffing, ordinances, beautification committee, planting, and inventory by municipal population, municipal budget, and forestry budget. Their survey found that urban forestry services and infrastructure increased as municipal and county population sizes increased. The authors also found that the education level of the manager increased as municipal forestry budgets and populations increased (Cool et al. 1973).

Miller and Bate (1978) examined the effects of community characteristics on urban forestry programs, the needs of communities without programs, and research directions anticipated to have the most significant benefits in Wisconsin. Municipalities were grouped by those with a program and those without a program. Municipalities with larger populations were more likely to have an urban forestry program, as were communities experiencing population growth. Community affluence and the presence of a college were each positively related to program existence in municipalities with more than 10,000 residents. Large programs also tended to have city foresters with more education or experience. Communities without programs primarily focused on elm (*Ulmus* spp.) replacement activities (Miller and Bate 1978).

Reeder and Gerhold (1993) found that while only 17% of municipalities in Pennsylvania had a street tree program in 1991, the breakdown by size was more complex. Seventy-seven percent of cities (n = 27), 30% of boroughs (n = 397), and 6% of townships (n = 564) had programs (Reeder and Gerhold 1993).

In Zhang and Zheng's (2012) Alabama study (Zhang and Zheng 2012), municipal officials (mayors, administrators, and council members) were surveyed for their perspectives on their community's urban forestry programs. The authors modeled nine variables to predict funding spent on planting, tree maintenance, tree debris removal, and tree removal. The variables included municipal population, percent white, education, median household income, and poverty rate. The authors also found that tree planting increased by 0.74% for every 1% increase in municipal population. The percentage of whites in a community was associated with higher levels of tree planting and funds available for removals, but the rate of high school graduates did not affect tree-related

funding. Household income strongly correlated with tree planting funding. For every 1% increase in household income, tree planting funds increased by 3.73%. Alternatively, high poverty levels had strong, negative correlations with urban tree programs.

1.3.3.2. State and Sub-State Level Components

All twenty studies reported on the services provided by community urban forest programs (Table 1.5). These studies generally included an abundance of questions regarding tree boards, ordinances, management plans, and staff. This is not surprising given that those factors are the main program components reported by states to the USDA-FS UCFP Community Accomplishment Reporting System (CARS) database (Rines et al. 2010, 2011) or the Staff, Ordinance, Advocacy, and Plan (SOAP) report (O'Herrin and Shields 2016). Eleven studies inquired whether a community had a forester or other individual in charge of municipal trees. This speaks to the perceived importance of having an individual responsible for a municipal urban forest program (Rines et al. 2010).

In this paper, the term tree board encompasses the variety of names used for tree advisory and advocacy commissions, committees, and boards directly linked to an individual municipality. Some communities also had non-municipal partner organizations that advocated for or advised on urban forestry issues. There is terminology overlap in the literature, but they are often called citizen advocacy groups, non-profit advocacy groups, or community organizations (Zhang and Zheng 2012, O'Herrin and Shields 2016, Harper et al. 2017).

Table 1.5. Categories of urban forest program components found in state and sub-state studies, U.S. 1973–2021.

Urban Forest Program Component	Number of Studies	Citations
Tree related ordinance (at least one)	16	(Cool et al. 1973, Miller and Bate 1978, Tate 1984, Reeder and Gerhold 1993, Still et al. 1996, Elmendorf et al. 2003, Schroeder et al. 2003, Treiman and Gartner 2004, Kuhns et al. 2005, Ries et al. 2007, Stevenson et al. 2008, Rines et al. 2010, 2011, Zhang and Zheng 2012, O’Herrin and Shields 2016, Hilbert et al. 2019)
Tree board/commission	15	(Cool et al. 1973, Tate 1984, Reeder and Gerhold 1993, Elmendorf et al. 2003, Schroeder et al. 2003, Treiman and Gartner 2004, Kuhns et al. 2005, Ries et al. 2007, Stevenson et al. 2008, Rines et al. 2010, 2011, Zhang and Zheng 2012, O’Herrin and Shields 2016, Harper et al. 2017, Hilbert et al. 2019)
Municipal staff who care for trees	14	(Cool et al. 1973, Miller and Bate 1978, Tate 1984, Reeder and Gerhold 1993, Elmendorf et al. 2003, Schroeder et al. 2003, Treiman and Gartner 2004, Kuhns et al. 2005, Grado et al. 2006, Ries et al. 2007, Rines et al. 2011, Zhang and Zheng 2012, O’Herrin and Shields 2016, Hilbert et al. 2019)
Tree inventory	14	(Cool et al. 1973, Tate 1984, Reeder and Gerhold 1993, Still et al. 1996, Elmendorf et al. 2003, Schroeder et al. 2003, Kuhns et al. 2005, Ries et al. 2007, Stevenson et al. 2008, Rines et al. 2010, 2011, Zhang and Zheng 2012, O’Herrin and Shields 2016, Hilbert et al. 2019)
Plant trees	13	(Cool et al. 1973, Miller and Bate 1978, Tate 1984, Reeder and Gerhold 1993, Still et al. 1996, Elmendorf et al. 2003, Schroeder et al. 2003, Kuhns et al. 2005, Grado et al. 2006, 2013, Ries et al. 2007, Rines et al. 2010, Zhang and Zheng 2012)
Conduct tree maintenance	12	(Miller and Bate 1978, Tate 1984, Reeder and Gerhold 1993, Elmendorf et al. 2003, Schroeder et al. 2003, Kuhns et al. 2005, Grado et al. 2006, 2013, Ries et al. 2007, Rines et al. 2010, Zhang and Zheng 2012, Harper et al. 2017)
Municipal forester (on staff or contracted)	11	[16,19,25,36,37,61–63,65,67,68]

Urban Forest Program Component	Number of Studies	Citations
Management plan	10	(Reeder and Gerhold 1993, Still et al. 1996, Elmendorf et al. 2003, Treiman and Gartner 2004, Kuhns et al. 2005, Ries et al. 2007, Stevenson et al. 2008, Rines et al. 2010, 2011, O'Herrin and Shields 2016)
Received urban forest grants	9	(Still et al. 1996, Schroeder et al. 2003, Treiman and Gartner 2004, Kuhns et al. 2005, Ries et al. 2007, Stevenson et al. 2008, Rines et al. 2011, Zhang and Zheng 2012, O'Herrin and Shields 2016)
Used volunteers	7	(Reeder and Gerhold 1993, Still et al. 1996, Elmendorf et al. 2003, Schroeder et al. 2003, Ries et al. 2007, Stevenson et al. 2008, Zhang and Zheng 2012)
Conducted public education on urban forest benefits	6	(Still et al. 1996, Elmendorf et al. 2003, Schroeder et al. 2003, Kuhns et al. 2005, Ries et al. 2007, Rines et al. 2010)
Employed or contracted individuals with International Society of Arboriculture (ISA) or Tree Care Industry Association (TCIA) certifications	6	(Elmendorf et al. 2003, Schroeder et al. 2003, Ries et al. 2007, Stevenson et al. 2008, Rines et al. 2011, Hilbert et al. 2019)
Celebrated Arbor Day	6	(Elmendorf et al. 2003, Kuhns et al. 2005, Grado et al. 2006, 2013, Ries et al. 2007, Stevenson et al. 2008)
Obtained Tree City USA status	3	(Stevenson et al. 2008, Rines et al. 2010, 2011)
Had a supporting or partnering non-profit group	3	(Zhang and Zheng 2012, O'Herrin and Shields 2016, Harper et al. 2017)

Tate (1984) reported on New Jersey municipal tree care agency budgets and services by community size. Three-quarters of cities had tree-related ordinances; however, many larger communities stated they needed revision. The prevalence of tree boards increased as community size decreased. Ten percent of cities with over 50,000 residents had a board compared to 75% of cities with under 5000 residents. Only a third of the municipalities had inventories. Cities had tree maintenance employees, but 70% hired contractors to fill

gaps. Funding and technical expertise were noted as barriers. Tree-related budgets, especially in larger communities, had decreased in the preceding five years (Tate 1984).

In 1991, 28% of Pennsylvania cities and boroughs reported having a tree management program. Of the municipalities with a tree care program, 57% had a tree commission, 73% had a tree-related ordinance, and 28% had an inventory. Additionally, 44% planted trees at least yearly, 7% planted trees only after trees were removed, and 5% not at all. The number of municipal tree staff was low, with 36% having one or more employees assigned to trees, though they may not have any formal training. Twenty-four percent employed or contracted a trained forester or arborist, and 6% had a full-time person in that position. Thirty-eight percent of municipalities reported having at least one trained employee or volunteer actively maintaining trees (Reeder and Gerhold 1993).

The combined 1995 and 1999 surveys of Illinois municipalities (Schroeder et al. 2003) collected data on all communities and compared small communities, fewer than 25,000 residents ($n = 579$), and large communities, greater than 25,000 residents ($n = 57$). They found that 8% of smaller communities had an urban forester compared with 72% of larger communities. Sixty percent of the respondents reported having staff assigned to tree care. Larger communities were more likely to have staff with a college or technical degree, ISA Certification, or other professional training. Sixty-one percent of larger communities had an ISA Certified Arborist or Certified Tree Worker on staff. In contrast, the person responsible for public tree management in 63% of smaller communities lacked formal training, with only seven percent holding an ISA Certification. Tree ordinances were also disproportionate, with 95% of larger communities and 32% of smaller communities confirming at least one. Twenty percent of all responding communities had a tree board,

20% had a tree inventory, and 11% had updated tree inventories. Between 45 and 65% of communities conducted cyclic pruning, performed pest control, recycled landscape waste, or provided tree-related education to the public. All of these services were conducted more frequently by larger communities.

Treiman and Gartner's (2004) 2003 survey of Missouri community officials found that 22% of communities had a "comprehensive tree ordinance," 54% reported an underfunded program, and 10% had a management plan. A full-time employee dedicated to urban forestry was found in 25% of the communities, but only seven percent had a full-time employee with a related four-year degree. The likelihood of a degreed, full-time employee increased with population size. Municipalities with full-time tree care employees were more likely to apply for cost-share programs (Treiman and Gartner 2004).

A 2004 survey in Oregon found that larger cities, with 25,000 residents or greater, were more likely than smaller communities, with 5000 residents or fewer, to have urban forest programs (73% versus 23%). Cities that received assistance from the state UCF program, versus those which did not, were more likely to have tree ordinances (81% vs. 57%), have a tree board (63% vs. 16%), plant trees (67% vs. 12%), or to be aware of Tree City USA (89% vs. 56%) (Ries et al. 2007).

Kuhns et al. (2005) characterized Utah's urban forest components and development status. While approximately 66% of responding communities had an urban forestry program on some level, 40% were only at the project (lowest) level and 8% at the sustained (highest) level. Communities under 1000 people only had project and formative (second lowest) levels. Of the significant urban forest program components, 54% had an employee in charge of municipal trees, 30% had a management plan, 57% had a tree ordinance, and

45% had an inventory. In general, rates of these components increased as community population size increased. Also, while only 23% had a tree board, many were interested in forming one. Arbor Day was celebrated by 26% of municipalities (Kuhns et al. 2005).

Massachusetts Tree Wardens, the local officials responsible for urban forests in Massachusetts, were surveyed in 2006 (Rines et al. 2011) on their CARS urban forestry program components: a management plan, professional staff, a tree-related ordinance or policy, or an advocacy or advisory organization. Ninety-nine percent of the 143 responding communities met at least one of the four CARS parameters. However, the Massachusetts Shade Tree law (MGL 87) serves as a functional municipal urban forestry ordinance, so in theory, all Massachusetts communities have that component. Twenty-seven percent reported meeting just one CARS parameter. Fifteen percent of communities met all four CARS parameters. Sixty-two percent had an inventory, 41% had an advocacy group, and 36% had a management plan. Thirty-seven percent reported they obtained a state grant. Grant funding rates increased as the community population increased. Communities with an advocacy group or qualified staff received more state funding than those without such support. Overall, there was a direct relationship between increasing funding levels and the number of CARS components that had been met (Rines et al. 2011).

In 2013, interviews with Massachusetts tree wardens uncovered trends in organizational structure, resources, services, and needs. There was an increase in funds as population sizes increased. Almost all interviewees (98%) conducted pest monitoring (Harper et al. 2017).

O'Herrin and Shields' (2016) survey of Texas communities with at least 5000 residents measured program components, expenses, and services received from the state

UCF. Program components included staff, ordinances, plans, inventories, and budgets. Smaller communities (5000 to 29,999) averaged 1.5 tree-related staff, while mega communities (greater than 500,000) averaged 28.8 staff. Overall, 58% of communities had a tree ordinance regarding the planting and maintenance of trees on public property, and 43% had an ordinance that required a tree board or staffing. Tree boards were found in 41% of responding cities, and 40% had a tree-related non-profit organization. Only 13% had a management plan, while 20% had an inventory of street trees, and 22% had an inventory of park trees. Per capita spending on urban forestry varied by community size. Smaller and mega communities spent \$7.10 and \$2.06 per resident, respectively, which equated to 0.62% and 0.08% percent of their city budgets. Texas has a relatively small state UCF program compared to its population. Nevertheless, 14% of responding communities had received financial assistance, 52% received technical assistance, and 49% received educational assistance (O'Herrin and Shields 2016).

Hilbert et al. (2019) paired Florida data from the 2014 National Survey (Hauer and Peterson 2016) with both U.S. Census data and aerial imagery to predict the effects of specific urban forestry program components and community characteristics on urban tree cover. They determined there was a negative relationship between housing density and urban tree cover and a positive relationship between heritage tree ordinances and urban tree cover. Their model concluded that 78% of responding cities had an ISA Certified Arborist on staff, 72% had a tree board, and 64% had an inventory (Hilbert et al. 2019).

1.3.3.3. State and Sub-State Level- Awareness, Knowledge, and Attitudes

A community's lack of awareness about the benefits of trees or urban forest maintenance can lead to poor program outcomes and support (Zhang and Zheng 2012).

Fourteen studies asked at least one question about the respondent's knowledge or awareness regarding urban forests, urban forest benefits, or state, federal, or non-profit assistance and support programs (see Table 1.6). Awareness or knowledge about a particular support organization does not indicate participation with that organization. However, municipal knowledge of urban forestry assistance programs indicates community connectivity and awareness of potentially helpful outreach programs (Zhang and Zheng 2012).

Additionally, this section includes nine surveys that assessed respondents' attitudes toward different urban forestry concepts or management components (Table 1.6). Understanding respondents' attitudes can lead to insights into the willingness of communities to undertake urban forestry projects. We assert that attitudes infer a degree of knowledge or awareness of these topics. State urban forestry support programs need to continually educate elected officials and the public regarding the benefits of trees and urban forests. Topics returning a low attitude rating may need more promotion or explanation to increase both knowledge and attitude of those topics.

Table 1.6. Categories of awareness, knowledge, or attitude questions found in state and sub-state studies, U.S. 1973–2021.

Awareness, Knowledge, or Attitude	Number of Studies	Citations
Awareness of state or federal assistance programs (technical, education, or financial)	9	(Tate 1984, Still et al. 1996, Schroeder et al. 2003, Grado et al. 2006, 2013, Ries et al. 2007, Stevenson et al. 2008, Zhang and Zheng 2012, O’Herrin and Shields 2016)
Awareness of state urban forestry council	4	(Tate 1984, Grado et al. 2006, 2013, Zhang and Zheng 2012)
Awareness of Arbor Day Foundation or Tree City USA	4	(Grado et al. 2006, 2013, Ries et al. 2007, Zhang and Zheng 2012)
Knowledge of urban forestry or the benefits of trees	7	(Elmendorf et al. 2003, Schroeder et al. 2003, Grado et al. 2006, 2013, Ries et al. 2007, Stevenson et al. 2008, Zhang and Zheng 2012)
Understanding of urban forestry	2	(Grado et al. 2006, 2013)
Knowledge of perceived tree condition	3	(Reeder and Gerhold 1993, Schroeder et al. 2003, Treiman and Gartner 2004)
Attitude towards urban forestry concepts or management components	9	(Still et al. 1996, Elmendorf et al. 2003, Schroeder et al. 2003, Treiman and Gartner 2004, Kuhns et al. 2005, Ries et al. 2007, Stevenson et al. 2008, Rines et al. 2010, Zhang and Zheng 2012)

Still et al. (1996) surveyed Pennsylvania communities and volunteer organizations that obtained, applied for but did not obtain, or did not apply for a tree planting grant between 1991 and 1993. The goal was to determine the success of those grants, compare attitudes toward the benefits of trees among the three groups, and gather community characteristics data. Municipalities already engaged in urban forestry practices (e.g., ordinance, inventory, or management plan) were “more willing and better prepared to apply for grant funds” and more likely to have obtained a grant. Thirty-seven percent of the grantees without a current inventory stated they were likely to conduct one, compared with four percent of the non-applicants without a current inventory. Non-applicant communities generally had smaller populations and greater forest cover in their counties. In comparison, grant applicants were

more likely to have higher populations and were more likely to be located near Philadelphia or Pittsburgh. Successfully funded communities also reported high amounts of public support, and that public support increased as a result of their tree planting project. Non-applicants reported much lower rates of public support (Still et al. 1996).

Awareness of support services and state and federal grants was an issue for smaller communities in Illinois (Schroeder et al. 2003). Larger communities were more likely to have applied for and been awarded grants. Many communities desired technical assistance on a variety of topics that included grant application assistance, assistance accessing a professional urban forester, employee and volunteer training, and assistance conducting an urban tree inventory.

Elmendorf et al. (2003) inquired about the personal attitudes of tree commission members toward urban forest management practices and paired it with a survey of municipal managers' execution of those practices in northeastern Pennsylvania (Elmendorf et al. 2003). Eighty-three percent of the commission members responded that tree inventories were necessary, but only 43% of municipalities had completed one. Tree plans were deemed necessary by 90% of commission members, but only 29% of municipalities had one. Ninety-three percent reported that street tree ordinances were important. Seventy-eight percent of municipalities had an ordinance, but 20% said they do not enforce it. Two tree commissioner focus groups were conducted to explore the differences between tree commission members' attitudes and municipal managers' practices. The resulting themes included a lack of volunteer time and energy, a lack of public and political support and understanding, the need for more assistance, poor organizational structure, governmental barriers, the need for more education, and a lack of funding (Elmendorf et al. 2003). The

study primarily included small towns, and the responding tree commissioners were volunteers. Additionally, there were few professional urban foresters or arborists in the area (northeastern Pennsylvania), and access to technical support was limited (Elmendorf et al. 2003).

To describe Mississippi municipal officials' understanding of urban forestry issues, Grado et al. (2006) sent a survey to all municipalities in 2004 (Grado et al. 2006) and again in 2011 (Grado et al. 2013). In 2004, 62% of municipalities were familiar with the concept of urban forestry. In the 2011 survey, 78% of community officials were familiar with urban forestry, though only 72% of smaller communities (less than 2000 residents) were familiar, compared with 97% of larger communities (greater than 10,000 residents). Awareness of other urban forestry concepts also increased between 2004 to 2011, including erosion reduction, wildlife habitat, recreation, and air quality. However, only 28% of respondents had an urban forestry program or project in 2011 compared to 31% in 2004. Also in 2011, few communities employed an urban forester or professional (12%), and even fewer planned to hire one in the future (2.5%). Additionally, the 2011 survey asked respondents about partnering organizations and funding. National Arbor Day Foundation, Mississippi Forestry Commission, the Mississippi State University Extension Service, and Earth Day each garnered over 50% awareness. Approximately 39% of respondents were aware of Tree City USA. Less than one-third of the responding communities were aware of tree planting and urban forestry funds that were available through the state. Again, the larger communities were considerably more aware of support agencies and funding opportunities than were smaller communities.

Stevenson et al. (2008) sought to determine if there was a difference in attitudes among three groups of Pennsylvania respondents (elected chief officials, public works administrators, and municipal solicitors), among the three scales of urban forestry programs (sustained, developing, and undeveloped), and whether population size affected attitudes. Sustained programs had the highest response rates. There were knowledge gaps among the three respondent groups, with solicitors reporting lower rates of awareness of management plans, inventories, and budget information than elected officials and public works administrators. There was also evidence that respondents in the same category (i.e., administrators) from the same community had differing knowledge about the services their community offered. This lack of agreement points to the complexity of using surveys to gather this data. Respondents from municipalities with sustained programs generally agreed to these statements at a higher rate than those from communities with developing programs, who in turn agreed at higher rates than those from communities with undeveloped programs. Similar trends were seen with statements on the importance of tree care practices and street tree pruning. Additionally, respondents were asked to rate the helpfulness of different sources of assistance, including the municipality's budget, grants, volunteers, technical assistance from the state Cooperative Extension System, and technical assistance from the state bureau of forestry. All sources of assistance were regarded as more helpful to communities with sustained programs than those with developing or undeveloped programs (Stevenson et al. 2008).

In Alabama, municipal officials (mayors, administrators, and council members) were more aware of trees' socioeconomic benefits than ecological benefits. Many municipal officials were unaware of their urban forestry funding levels or available funding and

technical assistance programs. While over two-thirds of the respondents were aware of the Alabama School of Forestry & Wildlife Science and American Forests, only about half knew of the USDA-FS. Less than one-third were aware of the Alabama Urban Forestry Association or National Arbor Day Foundation. Officials aware of local tree agencies and the Alabama Forestry Commission were from communities with higher tree program funding. Additionally, the respondent's opinions of whether they favored trees or not had little effect on the level of funds allocated to tree programs (Zhang and Zheng 2012).

1.3.3.4. State and Sub-State Level- Needs and Barriers

Thirteen of the statewide studies asked municipalities about the perceived program needs or barriers to proper management (Table 1.7). Many studies found similar answers to needs questions and barriers questions, and often a question could be read as either defining a need or a barrier. An example of a need is “more public support,” while the barrier is “lack of public support.” Therefore, needs and barriers have been combined in this paper.

The most frequently asked needs and barriers questions pertained to educational training and technical assistance, with eleven studies having at least one question regarding these two connected topics. Educational training and technical assistance questions not only relate to needs and barriers but also to knowledge and awareness of urban forestry topics and services.

Table 1.7. Categories of Needs and Barriers found in state and sub-state studies, U.S. 1973–2021.

Need or Barrier	Number of Surveys	Citations
Training and technical assistance	11	(Miller and Bate 1978, Tate 1984, Reeder and Gerhold 1993, Elmendorf et al. 2003, Schroeder et al. 2003, Kuhns et al. 2005, Ries et al. 2007, Stevenson et al. 2008, Zhang and Zheng 2012, Driscoll et al. 2015, Harper et al. 2017)
Political support	7	(Miller and Bate 1978, Elmendorf et al. 2003, Kuhns et al. 2005, Grado et al. 2006, 2013, Stevenson et al. 2008, Driscoll et al. 2015)
Sufficient funds	7	(Tate 1984, Elmendorf et al. 2003, Kuhns et al. 2005, Grado et al. 2006, 2013, Stevenson et al. 2008, Driscoll et al. 2015)
Grant writing or fund development	6	(Reeder and Gerhold 1993, Schroeder et al. 2003, Kuhns et al. 2005, Grado et al. 2006, 2013, Zhang and Zheng 2012)
Public support	5	(Elmendorf et al. 2003, Kuhns et al. 2005, Grado et al. 2006, 2013, Stevenson et al. 2008, Driscoll et al. 2015)
Lack of municipal staff or limitations on staff	5	(Elmendorf et al. 2003, Kuhns et al. 2005, Grado et al. 2006, 2013, Stevenson et al. 2008, Driscoll et al. 2015)
Canopy condition concerns	5	(Miller and Bate 1978, Schroeder et al. 2003, Kuhns et al. 2005, Ries et al. 2007, Driscoll et al. 2015)
Urban forestry program creation	4	(Reeder and Gerhold 1993, Grado et al. 2006, 2013, Ries et al. 2007)
Community outreach	3	(Elmendorf et al. 2003, Kuhns et al. 2005, Driscoll et al. 2015)
Ordinance development	3	(Reeder and Gerhold 1993, Schroeder et al. 2003, Kuhns et al. 2005)
Management plan creation	2	(Elmendorf et al. 2003, Driscoll et al. 2015)
Maintenance concerns	2	(Stevenson et al. 2008, Driscoll et al. 2015)

In 2004 and again in 2011, Mississippi municipal officials listed lack of funding, budget restrictions, and staff limitations as their top three most significant barriers and needs. Respondents from mid-sized communities, between 2000 and 10,000 inhabitants, rated these obstacles more highly than the smaller (<2000) and larger (>10,000) communities in both 2004 and 2011 (Grado et al. 2006, 2013).

In addition to identifying program components, tree-related budgets, and program development level, Kuhns et al. (2005) looked at the support, strengths and weaknesses, and training and information needs of Utah communities (Kuhns et al. 2005). Twenty-one percent of the respondents reported weak support from the community, and 13% reported weak support from town officials and staff. Overall, 80% of the respondents felt they had at least some support from their citizens, officials, and employees. Dedicated funds (public and private) were present in 64% of represented communities. Average tree budget levels were relatively low at \$2.58 per capita. Communities with fewer than 500 residents reported the highest at \$6.26 per person, and the largest communities, with over 50,000 residents, reported \$2.40 per person. The smallest communities relied more on grants and donations than the larger communities. The communities with the lowest per capita spending were in the 1000 to 3000 and 3000 to 10,000 population categories, with \$1.35 and \$1.08, respectively.

In Stevenson et al. (2008), Pennsylvania officials (elected officials, public works administrators, and solicitors) were asked to rate the importance of barriers to starting or improving a street tree program. “Insufficient funding” received the highest rating, with 86% of all three respondent groups considering it an important barrier. “Personnel lacking” rated 70%, “inadequate equipment” rated 67%, and “low public support” followed close behind with 62% (Stevenson et al. 2008).

Municipal officials and program managers were surveyed to understand the potential of an urban forestry initiative in the Portland, Oregon, and Vancouver, Washington region by Driscoll et al. (2015). The survey results indicated a significant demand for expanding local urban forestry programs, with 49% of community officials and 67% of program

managers responding that they were “interested.” Thirty-nine percent of respondents ranked sustainable funding as their greatest community need. Increased political support and community outreach and education garnered 20% and 11%, respectively. Respondents also ranked barriers. Insufficient funding ranked the highest with 41%, low public support and interest earned 14%, a history of conflicts surrounding urban trees was 12%, and lack of political support was 12% (Driscoll et al. 2015).

1.3.3.5. State and Sub-State Level- Future Intentions or Priorities

Understanding what municipalities prioritize and intend to do is important to urban forestry agencies in order to project education and technical assistance needs. Also, communities with defined intentions may have more budget funds dedicated to tree-related activities. For example, municipalities with tree planting plans for the next five years have been found to have substantially more funds for planting, maintenance, debris removal, and tree removal (Zhang and Zheng 2012). Eight studies had at least one priority or intention question, but only two studies asked more than three such questions: Driscoll et al. (2015) with ten (Driscoll et al. 2015) and Stevenson et al. (2008) with eight (Stevenson et al. 2008) (Table 1.8).

Table 1.8. Categories of intentions and priorities found in state and sub-state studies, U.S. 1973–2021.

Future Intention or Priority	Number of Studies	Citations
Hire an urban forester or ISA Certified Arborist	4	(Grado et al. 2006, 2013, Stevenson et al. 2008, Driscoll et al. 2015)
Create or revise a management plan	3	(Still et al. 1996, Stevenson et al. 2008, Driscoll et al. 2015)
Develop an ordinance	3	(Still et al. 1996, Stevenson et al. 2008, Driscoll et al. 2015)
Complete an inventory	3	(Still et al. 1996, Stevenson et al. 2008, Driscoll et al. 2015)
Create an urban forestry program	3	(Grado et al. 2006, 2013, Ries et al. 2007)
Gain Tree City USA status	2	(Stevenson et al. 2008, Driscoll et al. 2015)
Celebrate Arbor Day	2	(Stevenson et al. 2008, Driscoll et al. 2015)
Establish a tree board	2	(Stevenson et al. 2008, Driscoll et al. 2015)
Conduct community education	1	(Driscoll et al. 2015)
Increase program budget to \$2 per capita (Tree City USA standard)	1	(Stevenson et al. 2008)
Reach urban tree canopy cover goals	1	(Driscoll et al. 2015)
Conduct tree plantings	1	(Zhang and Zheng 2012)
Increase community recreation	1	(Driscoll et al. 2015)

Rines et al. (2010) asked Massachusetts Tree Wardens to rate their current priorities. Ninety-six percent prioritized (high or moderate priority) removing hazardous trees, and 63% prioritized work inspections, but only 31% prioritized public education and outreach, and 28% prioritized addressing policy issues. Tree planting and preventative maintenance each garnered 49% prioritization. Tree wardens also rated the importance of urban forestry performance parameters, including CARS criteria and inter-department communication. Eighty-eight percent “agreed” or “strongly agreed” with inter-departmental communication’s importance, 67% with the need for qualified staff, and 57% with the need for management plans. Many tree wardens who “highly agreed” with a parameter came from a community that met that parameter (Rines et al. 2010).

Often questions do not include a timeframe for implementation or do not separate current/ongoing practices from new initiatives. However, Stevenson et al. (2008) did ask

Pennsylvania respondents whether a component currently existed and the likelihood of adding it within three years. Of the public works administrators who responded to the survey, 28% reported having a management plan, and 43% reported it was likely to be added. Sixty-four percent reported the existence of an ordinance, with 19% projecting that they would create one in the future. In municipalities between 10,001 and 20,000 people, 37% already had Tree City USA status, while 17% indicated a desire to obtain that status (Stevenson et al. 2008).

In addition to asking about needs and barriers, the Portland, Oregon, and Vancouver, Washington survey explored management priorities. When asked for their highest priority, 30% of the respondents indicated increased community education, followed by the creation or revision of a management plan with 18% and the creation or revision of tree ordinances with 16%. These “highest priorities” were followed by obtaining Tree City USA status, inventory completion, achieving urban tree canopy cover goals, hiring an urban forester or ISA Certified Arborist, increasing recreational opportunities, and Arbor Day observance, all with less than 10%. No respondent chose the creation of a tree board as their highest management priority (Driscoll et al. 2015).

1.4. Discussion

Associations among urban forest program components (i.e., ordinances, staff, and tree planting programs) and community size, location, or resources are found across articles at all geographic levels. Communities with higher-level urban forest management programs were more likely to have professional staff and apply for grant funds (Still et al. 1996). Officials aware of local tree agencies and their state’s urban and community forestry

program (UCF), and thus with access to technical support, are more likely to be from communities with higher tree program funding (Zhang and Zheng 2012).

Educational needs were queried in a few studies. Half of the Massachusetts Tree Wardens interviewed in 2013 indicated they needed opportunities for training and continuing education (Harper et al. 2017), as well as 77% of Utah municipal respondents in 2002 (Kuhns et al. 2005). Central themes were safety, pests, inventories, tree selection and planting, and hazard assessment (Kuhns et al. 2005, Harper et al. 2017). The need for training related to insect and disease identification and arboriculture practices was reported by Miller and Bate (1978) (Miller and Bate 1978). Other studies indicated that municipalities were interested in technical assistance pertaining to writing management plans, crafting ordinances, and conducting inventories, as well as cost-share information, developing program funding, and increasing program support (Reeder and Gerhold 1993, Kuhns et al. 2005, Driscoll et al. 2015). Driscoll et al. (2015) highlighted the dire need for public and political support, which can be achieved through public education regarding the benefits of trees and targeted messaging for elected officials (Driscoll et al. 2015).

Where communities source their information is important. In Utah, 57% of the communities responded that they consult a local nursery or tree care business, and 53% used the Utah Cooperative Extension system. The state forestry agency was only used by 36% of communities (Kuhns et al. 2005). In rural Pennsylvania, professional urban foresters or arborists were few in number; thus, access to local technical support may be limited in similar locales (Elmendorf et al. 2003).

The smallest communities relied more on grants and donations than the larger communities in order to manage their urban forests (Kuhns et al. 2005). While these key

themes are prevalent, each state's urban and community forestry program (UCF) differs based on the needs of that state and the type of services the state provides (O'Herrin and Shields 2016). To successfully support urban forestry in their state, each UCF program staff should thoroughly understand their municipalities' status and management factors (Wall et al. 2006). Annual USDA-FS UCFP CARS reporting can provide the number of communities with management plans, ordinances, staff, and tree boards, but that is still only part of the picture. Additionally, limited data and varying sampling methods and analyses make intra- and inter-state evaluations difficult.

National periodic surveys can provide trend data on many urban forestry management-related topics. However, these surveys are infrequently conducted (Hauer and Peterson 2016) and are at such a scale that often only regional results are available. A complete report comparing the data among the 1974, 1980, 1986, 1993, and 2014 results has yet to be published. Though details relating to funding sources, budgets, expenditures, and whether communities use systematic or reactive management are included in an International Society of Arboriculture 2015 Conference paper (Hauer and Peterson 2015). Data on the findings related to street tree diversity (Ma et al. 2020) and risk management (Koeser et al. 2016) were also published. Additionally, with low sample sizes, the Johnson (1982) and Clark and Matheny (1998) studies were limited in scale and only provided a snapshot of urban forestry conditions across the country within selected parameters (Johnson 1982, Clark and Matheny 1998).

There are only 20 state and sub-state articles and two regional articles in the scientific literature spanning 48 years. Thirteen states have at least one state-level urban forest program management analysis (AL, FL, IL, MA, MI, MS, MO, NJ, OR, PA, TX, UT, and

WI). Three states have sub-state data focusing on a major urban complex or portion of the state (OR/WA and PA). This leaves 36 states unrepresented at the state level in the peer-reviewed literature. Additionally, no studies were found for U.S. territories or protectorates. See Figure 1.1.

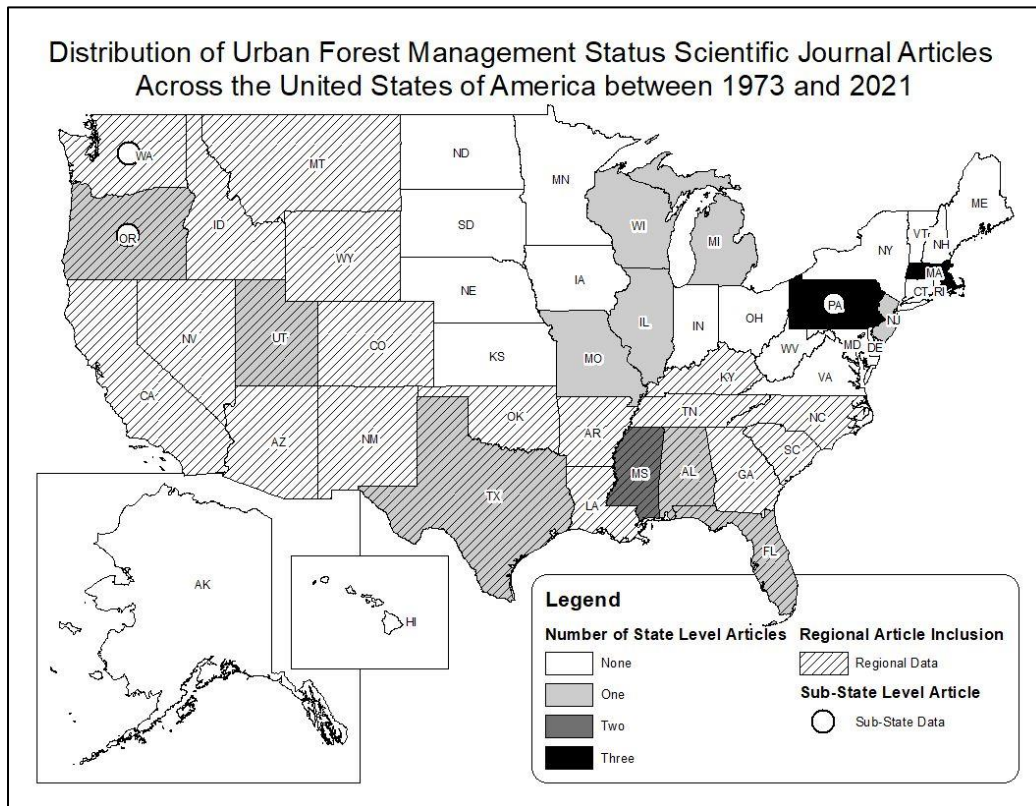


Figure 1.1. Map of States with Regional, State, and Sub-State Journal Articles.

Only a few states have multiple studies in the scientific literature (Figure 1.1), and only two have thoroughly presented comparison data: Mississippi and Oregon. This lack of replication was also noted in the Ordóñez et al. (2019) review of global urban forest governance and decision-making journal articles, which included twelve of the U.S. studies we reviewed (Ordóñez et al. 2019). Mississippi's trend data found that community leaders were more aware of the concept of urban forestry, with 78% aware in 2011 versus 62% in

2004, and related urban forest benefits, with 42%–47% in 2004 versus 52%–56% in 2011. However, community leader awareness of different urban forestry support organizations and funding sources was lower in 2011 than in 2004 (Grado et al. 2013). These results suggest that communities may have heard of the benefits of urban trees, but they did not know how to access resources to support their local programs and projects. Grado et al. (2013) also noted that funding and staffing were the most significant barriers and needs for all sizes of Mississippi communities in 2004 and 2011, indicating that these challenges remained significant (Grado et al. 2013).

Ries et al.'s 2004 survey replicated many questions from a 1992 survey of Oregon cities completed by the Oregon Department of Forestry and a 1994 survey conducted through Portland State University (Ries et al. 2007). Key measurements increased across the board. Tree planting and care programs increased from 26% in 1992 to 37% in 2004. The incidence of tree ordinances grew from 46% of cities in 1992 to 62% in 2004. Inventories increased from 46% to 56%. Cities participating in Tree City USA grew from 8% in 1992 to 15% in 2004. The perceived importance of tree-related outcomes also changed between 1992 and 2004. In 1992, the top three tree-related values were “Promote business development,” “Improve community appearance,” and “Increase community infrastructure value.” The 2004 survey results found that “Improve community appearance” had moved into the number one slot, “Promote business development” had dropped to number three, and “Decrease hazards from trees” had moved from number nine in 1992 to number two. This may reflect an increased awareness of tree condition and risk as well as a potential reaction to a significant ice storm that had recently affected the state (Ries et al. 2007).

Treiman and Gartner's (2004) 2003 survey of community officials in Missouri was at least partially replicated in 2011, and the results were presented in a short technical document (Treiman et al. 2012). The 2011 survey found increases in the percentage of communities with an ordinance, with an inventory, that conducted maintenance, performed tree planting, and removed hazardous trees. The document outlined many of the questions asked in the survey but only provided a brief summary of the results (Treiman et al. 2012).

Cool et al.'s 1970 Michigan data (Cool et al. 1973) appears to have asked municipalities to reflect on the previous few years for questions relating to staffing, contractors, and planting. Neither details on these questions nor a thorough comparison of their results were presented in the paper.

Table 1.9. State and sub-state urban forest management studies methodology summary, U.S. 1973–2021.

Survey Methodology	Respondent Group	Frequency	Study
Surveys	Municipal Officials	7	(Still et al. 1996, Kuhns et al. 2005, Grado et al. 2006, 2013, Ries et al. 2007, Zhang and Zheng 2012, O’Herrin and Shields 2016)
	Municipal Officials and Tree Board Chairs/Members	1	(Reeder and Gerhold 1993)
	Municipal Officials and Program Managers	3	(Miller and Bate 1978, Stevenson et al. 2008, Driscoll et al. 2015)
	Program Managers	4	(Schroeder et al. 2003, Treiman and Gartner 2004, Rines et al. 2010, 2011)
	Municipal Survey, respondents unclear	2	(Cool et al. 1973, Tate 1984)
	Subset of National Survey Data	1	(Hilbert et al. 2019)
Interviews	Program Managers	1	(Harper et al. 2017)
Mixed Methods	Survey of Municipal Managers and Tree Board Members followed by Focus Group with Tree Board Members	1	(Elmendorf et al. 2003)

Temporal differences across the papers highlight changing management foci. Johnson’s (1985) article reflected on the Dutch elm disease origins of urban forestry programs and the costs of fighting that disease (Johnson 1982). Many communities had Dutch elm disease-specific ordinances and management concerns and often had larger budgets to accommodate responding to the disease (Kuser 2007, Hauer and Peterson 2015, Harper et al. 2017). With the onset of the emerald ash borer, communities are seeing significant impacts on the composition of their forests as well as their municipal budgets. Some communities reacted to this pest by adding specific budget lines related to emerald ash borer (Hauer and Peterson 2015, 2016) and amending planting lists.

Many authors reported response biases. Clark and Matheny (1998) felt there was self-selection in that communities with positive feelings about urban forests were more likely to respond, and the communities they surveyed were not chosen at random but rather deliberately selected from a list of cities with known urban forestry programs (Clark and Matheny 1998). Stevenson et al. (2008) also found higher response rates from municipalities with more developed urban forestry programs (Stevenson et al. 2008). Rines et al. (2011) noted that responding communities in Massachusetts tended to have larger and denser populations with higher median incomes (Rines et al. 2011). Authors of a related study similarly noted that cities which responded to their survey were more likely to have professional staff, tree-related ordinances, and tree boards (Koeser et al. 2021).

Additionally, the state-level studies explored slightly different urban forest program management aspects or used different methods and question formats (Table 1.9), limiting the ability to compare the results (O'Herrin and Shields 2016, Ordóñez et al. 2019). For example, two Pennsylvania studies, Reeder and Gerhold (1993) and Stevenson et al. (2008), asked a few of the same basic questions about the presence of a tree commission, a tree ordinance, and an inventory (Reeder and Gerhold 1993, Stevenson et al. 2008). However, Stevenson et al. (2008) explored differences in knowledge and attitude based on respondent type, program development, and population size, while Reeder and Gerhold (1993) did not divide their results similarly; as such, only limited comparisons between the results of the two studies is possible. Some studies asked communities to rank needs and barriers by those most pressing (Driscoll et al. 2015). Others asked communities to provide the degree to which each was identified on a scale of 1 to 5 (Grado et al. 2006, 2013, Stevenson et al. 2008). The results of these two types of questions, while similar in some

ways, are ultimately difficult to compare. Additionally, only a few studies used advanced or multivariate data analyses to identify relationships between municipal attributes and urban forest management program components and needs.

1.5. Conclusions

The collection of studies presented here provides insight into programs and management needs. Their results indicate that communities have different urban forestry management needs depending on their size, income levels, staffing, location, residents' expectations, and the forest's size and composition. Some common themes across the reviewed studies include that the number of urban forestry programs is increasing, larger communities are more likely to have an urban forestry program and have urban forestry staff, and communities that are predominantly white or of higher income are more likely to have an urban forestry program. Many municipalities have at least one tree-related ordinance, but few municipalities have a tree inventory, and fewer still have a management plan. Communities report that they need more public and political support and urban forest management funding and that there is an overall lack of trained urban forest managers. Communities with staff and a budget generally have more advanced urban forestry programs. Additionally, awareness of statewide urban forestry assistance programs is moderate to low and inconsistent between respondent types. The proximity of a community to an urban area seems to affect local urban forest services and support. Communities with more advanced programs are more aware of statewide support programs and are more likely to receive grants.

Substantial shortcomings exist in the available studies. Nationally collected data can provide status updates on a wide range of urban forest management aspects and is suitable

for reporting on the National Urban and Community Forestry Council goals. However, the infrequency of data collecting results in substantial lapses in information availability. There are also few data points per state, making it difficult to draw more detailed conclusions regarding local trends in most areas.

There is a shortage of state-level data on urban forest program management in the scientific literature. No data was found for thirty-six states, and 48 states do not have trend data in scientific journals. While more states have technical reports, many are out-of-date, inaccessible, or completely unavailable. The creation of a centralized, accessible repository for state technical reports and data from academic studies could help maintain data and facilitate comparability across time and studies.

Also, some data collected through urban forest program management analyses are directly comparable, while others are not due to different data collection methods, question formats, or presentation of results. Furthermore, only five of the reviewed state-level studies gathered data in the last decade.

Only one study provided considerable insight into how local demographics may affect an urban forestry program, and few studies use modeling or multivariate data analyses. Studies such as these may be able to help sort out the root causes of poorly performing programs.

Detailed information on the educational needs of municipal staff was only present in a few studies. Additionally, most state-level papers only provided details regarding urban forest program components' current or past status, with less than half of the studies asking whether managers plan to continue or commence urban forestry services in the future. This

presents a gap in understanding where communities are heading, which is key information for agencies designing technical and educational assistance and grant programs.

This review has underscored the dearth of studies cataloging local urban forestry programs, supports, and knowledge within and across states while highlighting such studies' value. State UCFs and urban forestry agencies work to develop and deliver the technical, educational, and financial support their municipalities need. Therefore, these agencies need to have timely, comprehensive analyses of the current local urban forest programs and resources, as well as an understanding of future program goals. Local managers need data to gauge their progress and consider management hurdles. More scientific literature on urban forest management programs is needed at all geographic levels. Those studies should include examinations of a wide range of program aspects, including the program status, needs, and time-bound future intentions. Such studies are critical to the continued spread and improvement of local urban forestry programs in the United States.

CHAPTER 2

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

2.1 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. 2022), 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 2019a). 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 2023a). 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 2023b).

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 2022a). 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.

2.2. Methods

2.2.1. 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 2.1 Figure 2.1).

2.2.2. 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 2.2). 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 2.1).

Table 2.1. USDA ERS Urban Influence Codes and Merged Urban Influence Groups	
Urban Influence Codes	New Urban Influence Groups
<u>Metropolitan counties</u>	Large Metro:
1 In large metro area of 1+ million residents	Small Communities in large metro area counties (UIC 1). n=98
2 In small metro area of less than 1 million residents	Small Metro:
<u>Nonmetropolitan counties</u>	Small Communities in Small Metro Area Counties (UIC 2). n=65
3 Micropolitan area adjacent to large metro area	Adjacent Large:
4 Noncore adjacent to large metro area	Small Communities in Counties Adjacent to Large Metro Area Counties (UIC 3 and 4). n=38
5 Micropolitan area adjacent to small metro area	Small Micro:
6 Noncore adjacent to small metro area and contains a town of at least 2,500 residents	Small Communities in Micropolitan Area Counties (UIC 5 and 8). n=20
7 Noncore adjacent to small metro area and does not contain a town of at least 2,500 residents	Adjacent Small:
8 Micropolitan area not adjacent to a metro area	Small Communities in Counties Adjacent to Small Metro and Micropolitan Area Counties (UIC 6, 7, and 9). n=27
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	

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 2.1 and Appendix 2.1 Figure S2.1).

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 2.3) and awareness and participation in NYSDEC programs (eight questions, i.e., Table 2.4). 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 2025). 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.

2.2.3. 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.

2.3. Results and Discussion

2.3.1. 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 2.2, Table S2.1). A subset of questions (see Appendix 2.3) 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%.

2.3.2. 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 2.2 contains the breakdown of municipalities with and without street tree programs by category.

Table 2.2 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.

2.3.3. Statewide Results

2.3.3.1. 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 2.3a).

Table 2.3a Affirmative Responses to Comprehensiveness Questions by Community Category (%)							
Question	Statewide	Small Community	Medium Community	Large Community	Low MHI	Middle MHI	High MHI
Has Maintenance Staff [#]	84	80	95	100	87	80	89
Has Certified Staff	18	13	20	62	21	10	30
Use Certified Contractors	79	72	95	100	75	73	95
Plants Trees [^]	77	73	85	100	71	76	84
Conducts Planting Assessments	76	71	85	100	75	80	71
Has a Tree-Related Ordinance [#]	69	62	87	92	68	64	78
Systematic Maintenance Practices	55	53	66	64	57	54	58
Has an Inventory [#]	43	36	61	82	40	43	48
Assesses at least some Trees for Risk Periodically ^{*^}	62	66	32	62	62	61	62
Has a Management Plan [#]	19	15	35	33	18	17	27
Conducts Public Education ^{*^}	33	30	43	45	18	28	62
Celebrates Arbor Day ^{**}	63	57	78	92	58	59	77
Tree City USA Recognized ^{**^}	45	36	63	92	35	45	56
Has a Tree Board ^{**^}	47	42	64	55	35	47	60
Uses Volunteers	59	54	70	89	53	57	73
Has an Extremely Sufficient or Sufficient Budget [*]	28	29	25	27	21	30	25
[#] Statistically significant difference between all three population categories.							
[*] Statistically significant difference between all three MHI categories.							
[^] Statistically significant difference between at least two UIGs.							

Table 2.3b Affirmative Responses to Comprehensiveness Questions by Community Category (%)						
Question	Statewide	Large Metro	Adj. Large	Small Metro	Small Micro	Adj. Small
Has Maintenance Staff [#]	84	85	76	74	63	90
Has Certified Staff	18	17	1	15	33	1
Use Certified Contractors	79	81	43	70	83	50
Plants Trees [^]	77	86	67	56	71	78
Conducts Planting Assessments	76	65	100	61	60	100
Has a Tree-Related Ordinance [#]	69	71	47	56	57	56
Systematic Maintenance Practices	55	64	50	45	38	33
Has an Inventory [#]	43	40	25	27	37	30
Assesses at least some Trees for Risk Periodically ^{* ^}	62	70	57	61	83	75
Has a Management Plan [#]	19	20	13	7	1	33
Conducts Public Education ^{* ^}	33	46	17	21	25	13
Celebrates Arbor Day ^{#*}	63	66	48	52	50	56
Tree City USA Recognized ^{#** ^}	45	46	26	24	33	37
Has a Tree Board ^{#** ^}	47	55	33	31	25	44
Uses Volunteers	59	52	61	50	50	75
Has an Extremely Sufficient or Sufficient Budget [*]	28	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.						

2.3.3.2. 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 2.3a).

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 2.3a). 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 2.3a).

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 2.3a). 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).

2.3.3.3. 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 2.3a). 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 2.2).

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.’

2.3.3.4. 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 2.4).

Table 2.4a. Awareness (%) and Participation (%) in NYSDEC Urban Forest Programs							
Question	Statewide	Small Community	Medium Community	Large Community	Low MHI	Middle MHI	High MHI
Aware of Educational Program*	57	53	59	100	37	63	69
Aware of Technical Assistance Program*	55	52	56	100	41	60	64
Aware of Grants Program**	61	54	78	100	43	65	77
Aware of ReLeaf Committees**	46	37	69	90	31	49	59
Participated in Educational Program**	25	18	38	70	14	27	35
Participated in Technical Assistance Program#	23	17	30	70	18	20	35
Participated in Grants Program^	36	26	59	80	29	34	47
Participated in ReLeaf Committees#^	16	10	31	60	14	14	24
#Statistically significant difference between all three population categories.							
*Statistically significant difference between all three MHI categories.							
^Statistically significant difference between at least two UIGs.							

Table 2.4b. Awareness (%) and Participation (%) in NYSDEC Urban Forest Programs						
Question	Statewide	Large Metro	Adj. Large	Small Metro	Small Micro	Adj. Small
Aware of Educational Program*	57	62	39	52	67	22
Aware of Technical Assistance Program*	55	57	39	53	50	44
Aware of Grants Program**	61	66	39	49	67	33
Aware of ReLeaf Committees**	46	54	26	28	33	11
Participated in Educational Program**	25	19	14	21	40	1
Participated in Technical Assistance Program#	23	19	9	21	20	13
Participated in Grants Program^	36	27	23	24	50	25
Participated in ReLeaf Committees#^	16	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.						

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 2.1). 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.

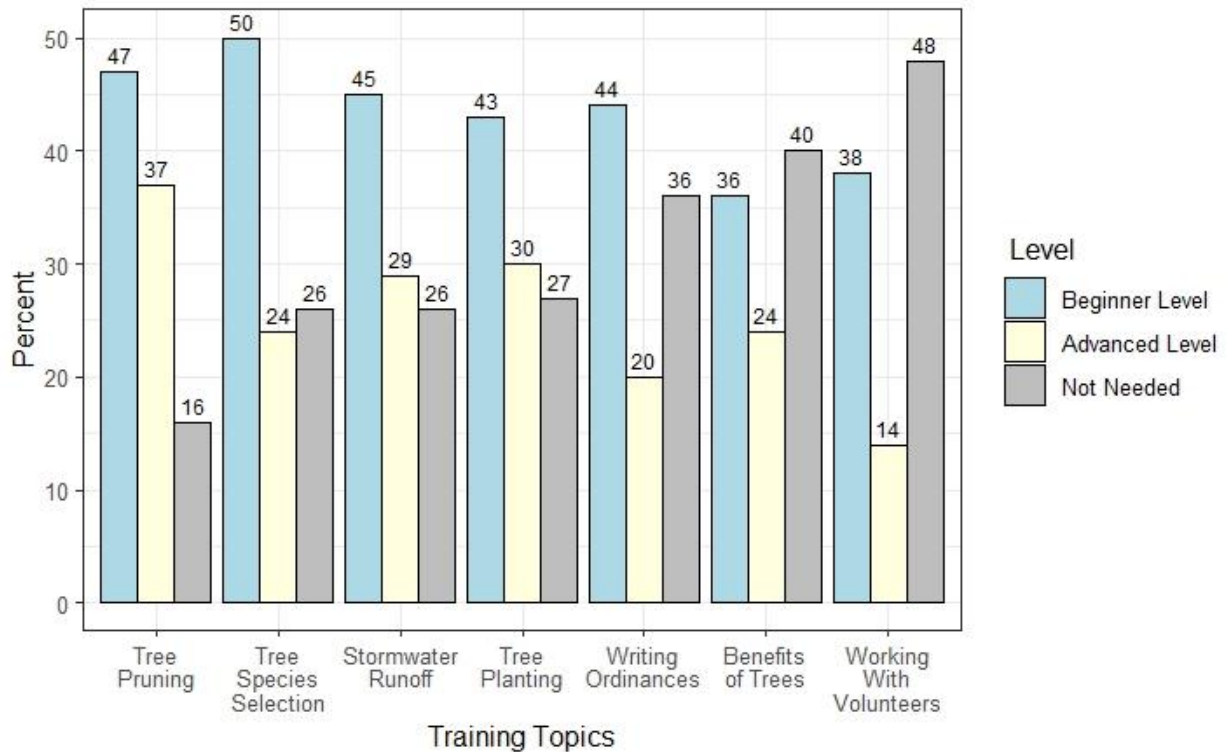


Figure 2.1. Requested Level of Urban Forest Management Training for Municipal Employees by Topic

2.3.3.5. *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 2.2). 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).

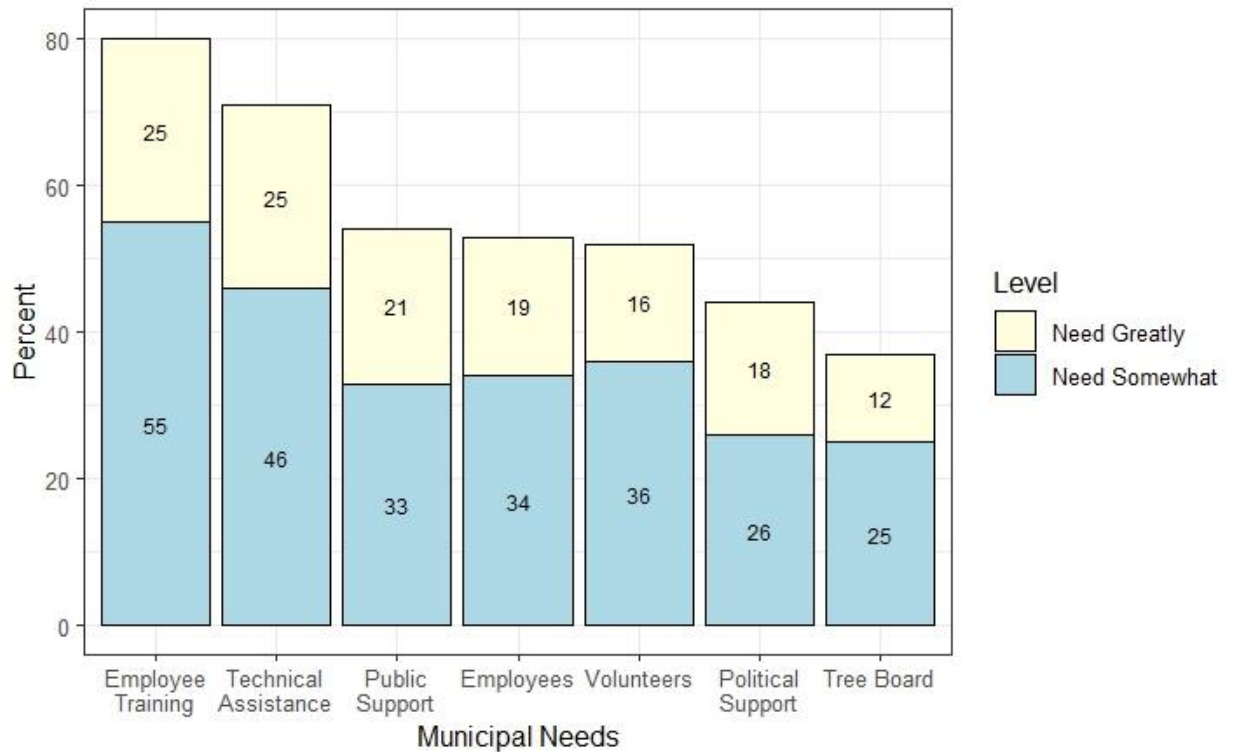


Figure 2.2. Level of Urban Forest Program Needs Identified by NYS Municipalities

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.

2.3.4. Category Summaries

2.3.4.1. 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 2.3a).

2.3.4.1.1. Large Communities

As a group, Large Communities had the highest rate (%) of affirmative (‘yes’) responses for comprehensiveness questions (Table 2.3a). 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 2.3a). Additionally, they had the highest mean per capita tree budget of \$7.15 (Table 2.2). 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 2.4a).

2.3.4.1.2. 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 2.3a). 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 2.2).

2.3.4.1.3. 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 2.3a), 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 2.2). Only 28% of Small Communities received a tree-related grant in the previous ten years.

2.3.4.2. 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 S2.2 in Appendix 2.1 for a breakdown of communities in each MHI category by population size).

2.3.4.2.1. 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 2.3a). They were also more aware of and more likely to have participated in NYSDEC urban forestry-related programs (Table 2.4a).

As household income increased, so did per capita tree budgets (Table 2.2). 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.

2.3.4.2.2. 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 2.3a.) 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 2.2). 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 a NYSDEC grant in the future.

2.3.4.2.3. 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 2.3a). While awareness of and participation in NYSDEC programs was low for all MHI categories, Low MHI Communities had the lowest levels (Table 2.4a). The per capita tree-related budget for Low MHI communities was \$4.49 – over \$2.00 below the statewide average (Table 2.2).

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 2.2). 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.

2.3.4.3.1. 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 2.3b). Large Metro indicated the highest awareness of NYSDEC programs and the second-highest participation (Table 2.4b).

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 2.2) and the highest population among the Small Communities surveyed.

2.3.4.3.2. 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 2.3b). 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 2.2) 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 2.4b).

2.3.4.3.1.3. 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 2.3b). 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 2.2).

2.3.4.3.1.4. 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 2.3b). 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 2.4b) 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 2.2).

2.3.4.3.1.5. 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 2.3b). 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 2.4b). 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 2.2).

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 2.3), Large Communities, followed by Medium Communities and High MHI Communities, have the most comprehensive urban forest management programs (Table 2.5). 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 2.5. 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
Mean	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 2.5). 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 (Tables 2.3a and 2.3b).

Adjacent Small Communities were the most rural but had the second highest UIG comprehensiveness average (Table 2.5). 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 2.4b). 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 2.5). 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 2.5). 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 2.4b). 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 2.3b and 2.5). 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.

2.3.5.1. 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 2.3a 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.

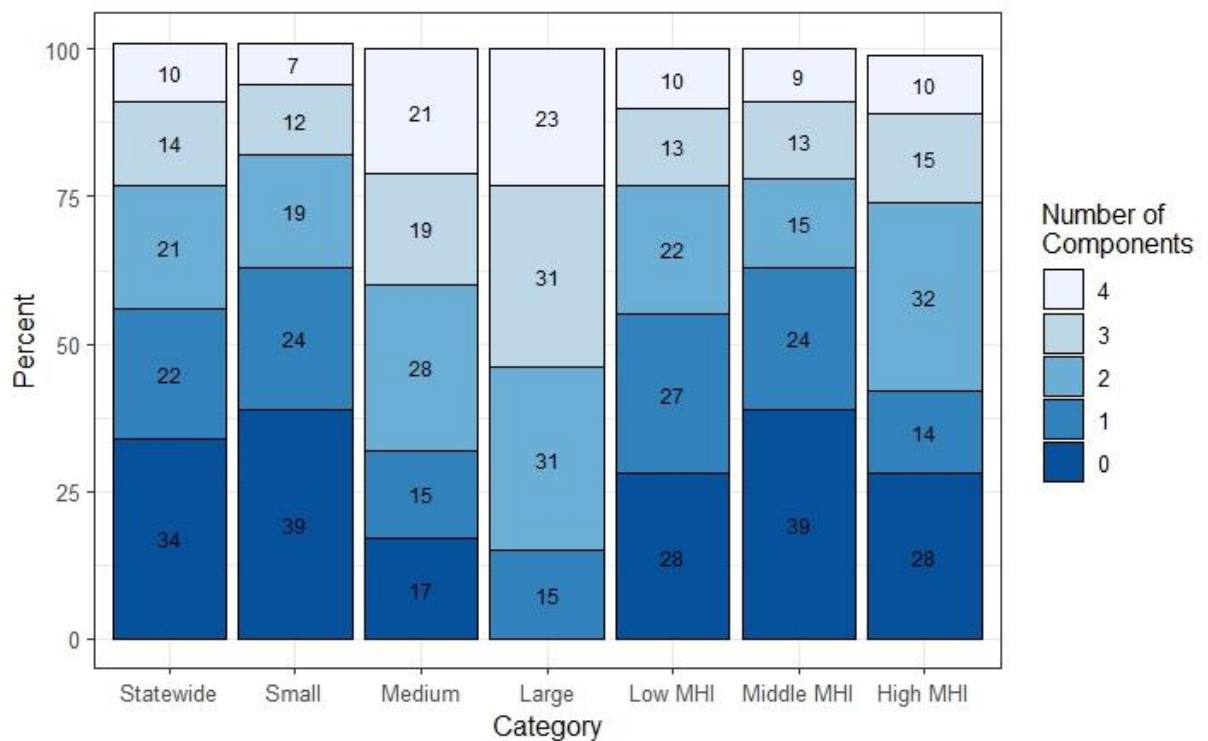


Figure 2.3. Percentage of New York Communities with USDA FS Urban Forest Management Components by Municipal Category. There is a statistically significant difference between Small and Medium, and Small and Large communities.

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 2023c). 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.

2.4. 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 2.1: Supplemental Table and Figures

Table S2.1: 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

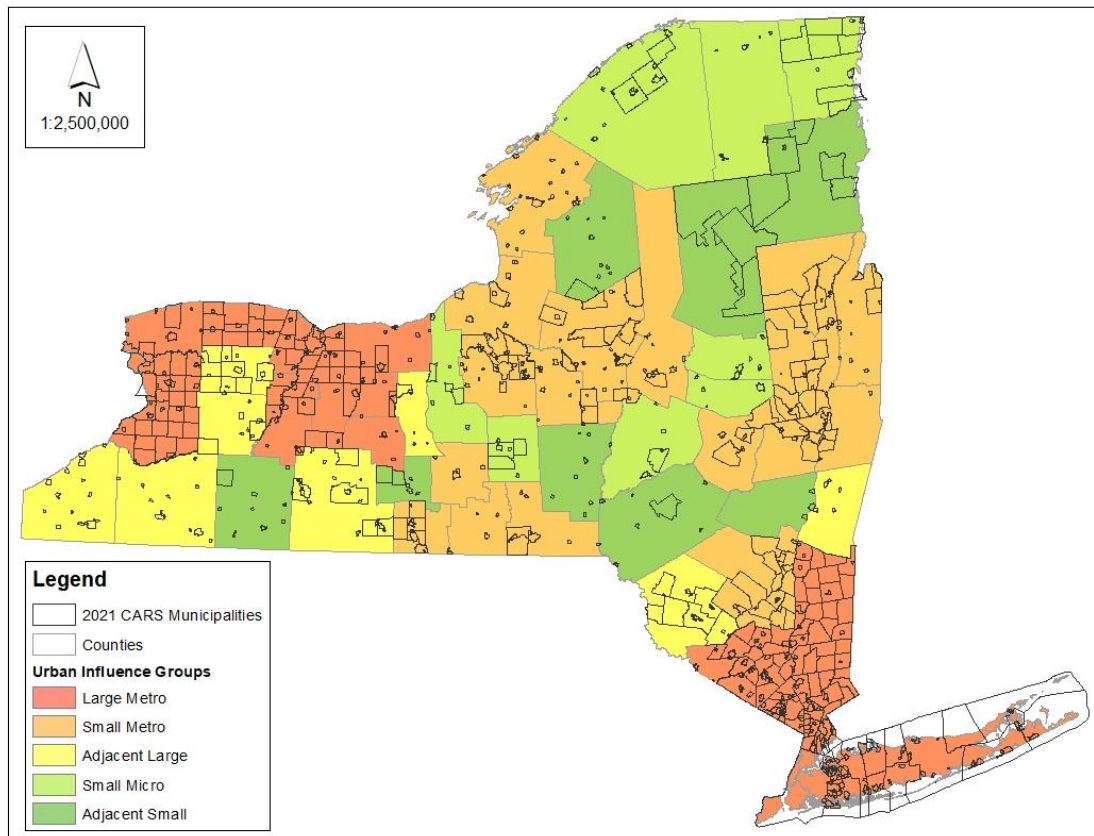


Figure S2.1: CARS Municipalities and County-Level Urban Influence Groups

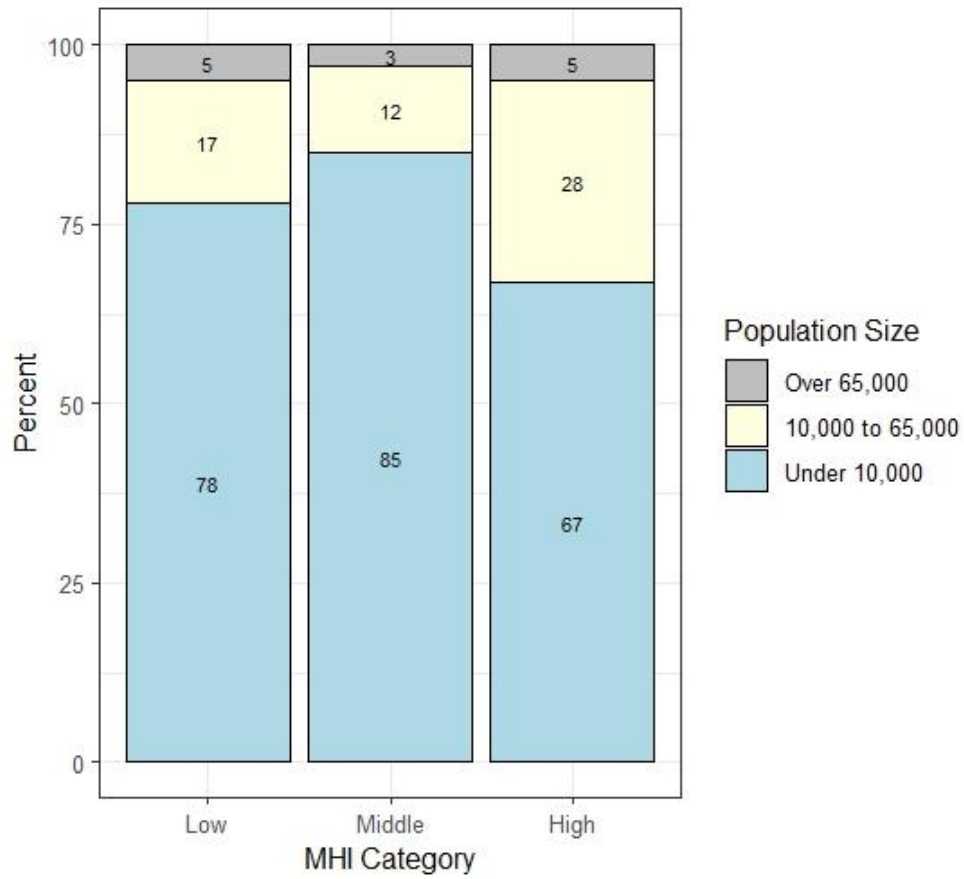


Figure S2.2: Percentage of NYS Municipalities in each MHI Category by Population Size

Appendix 2.2: 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

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 2.3: 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

CHAPTER 3

An examination of municipal resources and grant success in New York State, USA

3.1. Introduction

Urban forests are part of the public good. They provide environmental, social, and economic benefits (Coleman et al. 2022), and unlike most other infrastructure, they appreciate as they age. Many municipalities are tasked with planting and maintaining the trees in their rights-of-way (Zhang et al. 2009), as they are for installing and maintaining streets, water and sewer systems, and other public infrastructure. In many municipalities, the management of trees and urban green spaces falls well behind other funding priorities, such as social services, streets, and water infrastructure (Warren et al. 2023). As such, municipalities often do not have sufficient funds to allocate towards improving their urban forest, even though the benefits of these forests significantly outweigh the costs (Hauer and Peterson 2016).

Local urban forest management programs vary greatly from one community to another due to differences in municipal resources and characteristics (Treiman and Gartner 2004, 2005, Harper et al. 2017). While some municipalities have relatively comprehensive programs that include formal management plans, tree inventories, staff, volunteers, ordinances, and provide proactive services, other municipalities may only engage with trees reactively, such as after a storm or natural disaster (Ries et al. 2007, Rines et al. 2011, Koeser et al. 2016). Funding has been identified as a barrier to effective urban forest management in numerous studies in North America (Wirtz et al. 2021, Hargrave et al. 2024). Wirtz et al. (2021) found that financial resources were ranked as the top urban forest governance success factor among urban forestry, planning, and greening experts in Canada.

A community's financial resources may derive from multiple sources, including taxes and user charges (e.g., water and sewer), fees, bonds, donations, and grants (Government Finance Officers Association 2025). Municipalities rely on grants to fund a spectrum of operations from essential services (Levin 2015) to special projects (Hendrick 1998), as well as a range of activities that may include urban forest management (Gibbons and Ryan 2015). Grants may be an important and effective means of support at the local level (Mehiriz 2016).

The grants can originate from a variety of sources, such as non-profits, foundations, and the government (Hauer et al. 2011), and are often competitive. Federal and state agencies are a substantial source of grant funding for urban forestry-related projects. Federal and state urban forestry grants may fund an array of projects, including planting, tree maintenance and removal, pest management, the initiation and maintenance of an urban tree inventory, management plans, and public education (Hauer and Johnson 2008*b*, Cambell et al. 2017). Additionally, research has found that municipal urban forest management capacity is directly correlated with federal and state funding (Hauer and Johnson 2008*b*, Hauer et al. 2011).

While numerous municipalities across the US have received grants, there are urban forest and greenspace disparities among municipalities based on resources and municipal characteristics (Hauer and Johnson 2008*b*, Hauer and Peterson 2016). Evidence from several studies suggests a positive correlation between affluence and urban canopy cover (Gerrish and Watkins 2018), and the presence of race-based inequity and public urban canopy cover (Watkins and Gerrish 2018). Additionally, smaller and medium-sized communities often have fewer administrative and contract management resources, which

Collins et al. (2015) identified as a barrier to successfully obtaining urban forestry-related grants. Surveys of municipalities in New York, Oregon, and Utah found that the likelihood of receiving a grant increased with municipal size (Kuhns et al. 2005, Ries et al. 2007, Hargrave et al. 2024). Since urban forest management grants are widely regarded as substantially affecting urban forestry program budgets at the local level (Hauer and Peterson 2016), recently, states like California, Minnesota, and New York designed grant criteria to help improve the odds that underserved municipalities will receive them (CAL FIRE 2021, MN DNR 2023, NYSDEC 2023).

3.1.1. Urban Forestry in New York State

New York State (NYS) occupies an area of 141,306 km² (54,559 mi²) and has a population of more than 20 million individuals (US Census Bureau 2025). There are 1527 municipalities in NYS, and about half are believed to have incorporated areas with trees that may be considered a managed urban forest. This includes municipalities from New York City, with a population of 8.8 million people, to villages with populations of less than 200 people (DiNapoli 2021). The state has over 264 million urban trees, which provide over \$1 billion in annual ecosystem benefits and values (Nowak and Greenfield 2018). The economic impact of urban forests in New York State in 2018 was estimated to be \$3,515,000,000, accounting for 33,913 full- and part-time jobs (Parajuli et al. 2022).

The NYS Department of Environmental Conservation Urban and Community Forestry Program (NYSDEC UCF) facilitates both pass-through grants funded by the United States Department of Agriculture Forest Service Urban and Community Forestry Program, as well as state-funded and hybrid-funded grants (NYSDEC 2025). One of

NYSDEC's state-funded grants is the Urban and Community Forestry Grant (UCF Grant), underwritten by the Environmental Protection Fund, which aims to "help start, plan and advance strong, self-sustainable UCF programs which enhance the quality of life for all New Yorkers" (NYSDEC 2023). Typically, the grant funds tree planting, tree maintenance, inventories, and management plans, and occasionally public education. Municipalities, non-profit partners, and agencies that advance urban forest management are eligible to apply. In relation to the application, municipalities are divided into two groups (large and small) as the funding legislation requires at least \$500,000 to be allocated to large municipalities (population 65,000 or more) (NYS Senate-Assembly 2023). The 26 large municipalities are identified in the Requests for Applications (RFA) appendix.

RFAs are released alongside workshops that provide technical assistance to guide municipalities through the process and answer questions. Project requirements and scoring guides are included in the RFAs to ensure that applicants understand how they can earn points on their submissions (NYSDEC 2025). Applications are scored and rank-ordered by a panel of NYSDEC employees. Funds are disseminated according to the ranked order until they are exhausted, with worthy projects routinely going unfunded due to resource limitations (G. VanDuyne, personal communication, March 2023).

To advantage municipalities with projects in or benefiting state-designated underprivileged municipalities, applications for such projects were awarded additional points compared to those without. These state designations are either 'potential environmental justice area' (PEJA, census blocks) or a 'disadvantaged community' (DAC, census tracts), depending on the year. Also, applicants who documented environmental, social, or economic need were awarded additional points in some rounds.

In addition to supporting underprivileged municipalities, these grants also supported those that exhibited a commitment to urban forest management by awarding points for criteria that demonstrated that commitment. This included being a Tree City USA-recognized community and receiving application guidance from an International Society of Arboriculture (ISA) Certified Arborist.

This study aims to illuminate the differences in characteristics and approaches between municipalities that were successful versus unsuccessful in their applications for UCF Grants over the past several rounds. Similarly, attributes of municipalities that applied for UCF Grants will be compared to those that did not apply. In particular, this paper seeks to address the following three research questions:

- 1) How do NYS municipalities that receive UCF Grant funding differ from those that apply unsuccessfully, and from those that do not apply?
- 2) Are municipalities with specific characteristics that UCF Grants explicitly prioritize more likely to receive grant funding?
- 3) What barriers prevent NYS municipalities from applying for UCF Grants?

3.2. Methods

NYS Municipalities that applied to a NYSDEC UCF Grant in 2016 (Round 13), 2018 (Round 14), 2019 (Round 15), and/or 2023 (Round 16), and a control group of non-applicant municipalities were selected for inclusion in this two-part analysis. First, we conducted an online survey of municipalities to gather information about urban forest management resources, grant experiences, and opinions. Second, we analyzed US Census data and NYS municipal categorization for success rate trends.

3.2.1. Survey- Part 1

To identify municipalities for the online survey examining municipal resources and experiences with the NYSDEC UCF Grant, in 2022, we obtained grant application records from 2016 (Round 13), 2018 (Round 14), and 2019 (Round 15) and identified all successful and unsuccessful municipal applicants. Although NYSDEC allows other agencies and non-profits to apply for the UCF Grants, we were only interested in municipalities and removed non-municipal applications from consideration. Over the three rounds, the applicant's status was categorized as either 'successful' or 'unsuccessful'. The total number of successful or unsuccessful proposals is not used. Instead, municipalities were categorized as 'Successful' if they had at least one funded application in any of the three grant rounds ($n = 85$) and 'Unsuccessful' if they applied in at least one round but had no funded applications ($n = 94$).

To compare the municipalities that applied to one or more of the studied UCF Grants rounds, a group of municipalities that applied to none of the studied rounds was constructed. This “Did Not Apply” group is made up of 91 municipalities, which were randomly selected from a list of municipalities that reported having managed urban forests in a 2021 NYS urban forest program management survey, but didn't appear in the applicant lists for the UCF Grant in 2016, 2018, or 2019 (Hargrave et al. 2024).

In May 2023, all 270 municipalities in the study sample were sent surveys requesting details regarding their experiences with the NYSDEC UCF Grant program over the 2016, 2018, and 2019 grant years. The timing was intentional as applications for the

next round were due later in 2023, and we wanted to capture the applicants' thoughts on their previous application(s) while they were working on their current application.

The three electronic surveys (Successful, Non-granted, and Did Not Apply) were deployed through Qualtrics (Qualtrics 2023) via email, one to each group. In accordance with Dillman et al. (2019), a reminder email was sent nine days after the initial email, and a final reminder was sent seven days later.

The surveys employed skip logic, whereby respondents were directed to different sets of questions based on their responses. The Successful survey had up to 36 questions, the Unsuccessful survey had up to 20 questions, and the Did Not Apply survey had up to 16 questions (see Appendix 3.2). The NYSDEC provided email contacts for the Successful and Unsuccessful groups. Emails for the Did Not Apply group were obtained from the aforementioned survey. The emails for all three groups were verified via municipal websites and other public records.

The surveys inquired about staffing, tree board, and partner organization status, the use of a grant writer, whether they celebrated Arbor Day, whether they were recognized as a Tree City USA, and about their municipal tree-related budget. Municipalities that applied were asked about who wrote the application. Successful municipalities were asked a series of questions about the execution and success of their funded projects, and why they believed they had been successful. Unsuccessful applicants were asked why they thought they were unsuccessful, whether they met with NYSDEC staff to debrief, and if they were able to conduct the project without the grant funding. Municipalities in the Unsuccessful and Did Not Apply groups were asked what resources they thought they needed in order to be successful. Did Not Apply municipalities were also asked if they were aware of the grant

program and why they did not apply. All municipalities were asked about their future NYSDEC application plans. We calculated each municipality's per capita tree-related budget using the 2022 budgeted amount they provided and 2022 US Census population figures (US Census Bureau 2022*b, c*). Median household income was also gleaned from the 2022 US Census. The response rates were: 34 of 94 (36%) Successful applicants, 28 of 85 (33%) Unsuccessful applicants, and 31 of 91 (34%) Did Not Apply municipalities.

3.2.2. Municipal Characteristics - Part 2

To assess the relationship between municipal characteristics and the ability to secure a NYSDEC UCF Grant, we analyzed US Census data and the presence of a PEJA census block or DAC census track for our three municipal categories (Successful, Unsuccessful, Did Not Apply). To augment the data, the 2023 UCF Grant (Round 16) applicants were collated in the same manner as outlined in Part 1 and included in the analysis. Subsequently, all municipalities identified as applicants in 2016, 2018, 2019, and 2023, and those in the Did Not Apply (2016-2019) group, regardless of their response to the survey, were included in the Part 2 analysis. Four of the Did Not Apply municipalities applied for a 2023 grant; thus, that sample size dropped to 87. Successful had 104 municipalities and Unsuccessful had 96, resulting in a combined total of 287. The breakdown of Successful and Unsuccessful applications by year is in Appendix 3.1 Table S3.1.

Data regarding municipal characteristics that included population and median household income (MHI) were obtained from the US Census 5-Year Estimates for 2016, 2018, 2019, and 2023 (US Census Bureau 2016*a, b*, 2018*a, b*, 2019*a, b*, 2023*a, b*). A shapefile containing NYS PEJA census tracks was downloaded from the NYS GIS

Clearinghouse (NYSDEC 2021) and overlaid on shapefiles containing NYS towns, villages, and cities. Municipalities included in this research that contained a portion of a PEJA within their boundaries were marked as PEJA communities in our dataset. The RFAs in 2016, 2018, and 2019 inquired whether the project would impact or benefit a PEJA. In 2023, NYS switched to the DAC designation. The DAC list was obtained from NYS, and municipalities containing a DAC track were recorded (NYS 2024).

Annual and four-round mean values were processed, and summary statistics (e.g., mean, frequency) and statistical significance tests were calculated in R (R Core Team 2025). Fisher's exact test, linear regression, and multinomial logistic regression analyses were used to evaluate the statistical significance of results by municipal characteristics or resources using an alpha value of 0.05. For qualitative analyses, the open-ended answers were coded and tallied using Excel.

3.3. Results

3.3.1. Survey- Part I

The Successful group had a greater mean population, a higher percentage with a PEJA, a lower MHI, and a lower 2022 per capita budget than the Unsuccessful group. Did Not Apply municipalities were the smallest, with the lowest MHI and per capita tree budgets. They had the lowest share with a PEJA (Table 3.1). Unsuccessful applicants had the highest per capita tree-related budget at \$8.56 per person.

Table 3.1. Community Characteristics, Services, and Resources for Responding Municipalities by Category (Part 1: 2016, 2018, and 2019 UCF Rounds)

Community Characteristic	Successful (n=34)	Unsuccessful (n=28)	Did Not Apply (n=31)
Population Mean (median) ^b	30,950 (11,276)	18,518 (4,947)	4,072 (2,243)
Median Household Income	\$71,635	\$73,842	\$68,284
Percent with PEJA ^b	69%	54%	36%
Average municipal tree-care-related budget in 2022	\$6.26	\$8.56	\$5.80
Question	Successful (%)	Unsuccessful (%)	Did Not Apply (%)
Has your community celebrated Arbor Day in the past five years? ^{abc}	97	76	47
Has your community been recognized as a Tree City USA in the past five years? ^{ab}	91	58	34
Is there at least one municipal employee with a degree in a tree-care-related field (arboriculture, urban forestry, horticulture, forestry, etc.)? ^b	36	16	7
Is there at least one municipal employee with an International Society of Arboriculture (ISA) or Tree Care Industry Association (TCIA) certification? ^b	32	20	7
Does your municipality have a tree board, advisory committee, or similar municipal committee that assists with tree oversight? ^{bc}	78	72	40
Does your municipality partner with a non-profit on tree-related issues? ^b	39	23	14
Does your municipality employ or contract with a grant writer?	56	56	47
Has your municipality applied for a NYS Urban Forestry Council Grant in the last five years?	46	60	0
Do you plan to apply for a NYSDEC Urban and Community Forestry Grant in the future?	90	58	41
Do you plan to apply for this coming round (summer of 2023) of NYSDEC Urban and Community Forestry grants? ^b	60	42	21

^a Statistically significant difference between Successful and Unsuccessful

^b Statistically significant difference between Successful and Did Not Apply

^c Statistically significant difference between Unsuccessful and Did Not Apply

Successful municipalities were statistically more likely to celebrate Arbor Day and have been recognized as a Tree City USA (91%) than both Unsuccessful and Did Not Apply (Table 3.1). They were also more likely to have an employee with a tree-care-related degree and an industry-certified employee (32%). Successful municipalities were more likely to have a tree board and a partner agency than the other two groups. There was no difference in the use of a grant writer between Successful and Unsuccessful municipalities.

Successful and Unsuccessful applicants were asked to select the type of person who authored their grant application from a list of possibilities, or to write in a response, and they could select more than one choice (Table 3.2). While none of the rates were statistically different between the groups, Successful applicants were more likely to report having used a municipal grant writer and/or an ISA Certified Arborist. Interestingly, no municipalities from either group contracted with an arborist to write the application; as such, the ISA Certified Arborist author was likely an employee or volunteer.

Table 3.2. Grant Application Authors for Successful and Unsuccessful Applicants, percent

Who wrote your grant application?	Successful (%)	Unsuccessful (%)
Municipal grant writer	21	12
Other municipal employee	33	38
Contract professional grant writer	9	12
Contract arborist	0	0
ISA Certified Arborist	15	4
Volunteer	21	19
Elected official	12	12
Other	6	8

Successful applicants were asked ‘How significant or insignificant of an impact do urban forest grants have on your municipal urban forestry program, during the years you have had grant funding?’ Ninety-four percent responded that grant funding was ‘extremely significant’ or ‘somewhat significant’ (57% and 37%, respectively). Only 3% reported ‘neither significant nor insignificant’ and 3% reported ‘somewhat insignificant.’

Successful applicants were also asked two open-ended questions: ‘Why do you think your municipality was successful in obtaining a grant?’ and ‘What municipal resources did your municipality have that may have given it an advantage?’ Communities attributed their success to having good projects (24%), well-written applications (21%),

excellent staff (14%), and being a high-needs community (14%). They considered having grant writing staff (26%), good staff support (26%), dedicated volunteers (14%), good political support (11%), and past project success (11%) as being beneficial.

Unsuccessful applicants were asked to select why they thought their project was unsuccessful from a list of options or to fill in a response. Fifty-four percent indicated they did not know why they were unsuccessful. Fifteen percent thought it might be because their project lacked sufficient quality, and 12% indicated a lack of TCUSA status. Four percent felt their unsuccess was due to not having an ISA Certified Arborist review their application. ‘Other’ responses referenced a lack of staff or grant writers and issues preparing or submitting the application.

Applicants who were not funded were offered a meeting with the NYSDEC UCF staff to review their proposals. Thirty-five percent of the Unsuccessful respondents took advantage of that review, 35% did not, and the remaining were unsure. All of those who met with the NYSDEC staff found it to be helpful.

Even though their NYSDEC UCF Grant application was unfunded, 23% were still able to complete their project. They all indicated they used internal funds versus additional outside dollars, and 67% of these were able to execute the project at its original scale, while the other 33% scaled their projects down.

Did Not Apply municipalities were asked if they were aware of the NYSDEC UCF Grants program before receiving notice of the survey; only 43% responded affirmatively (Table 3.3). They were then asked why they hadn’t applied for a NYSDEC UCF Grant in the past; 23% responded that they ‘didn’t have someone to write the grant’, 19% ‘didn’t know where to get help with the application’, and 16% ‘didn’t have staff to manage the

grant' (Table 3.3). Unlike the Successful and Unsuccessful groups, this group did indicate the need for political and/or public support, though at low levels. 'Other' responses included a lack of time and a lack of matching dollars (as required by some of the project types). While others indicated they had access to other sources of funds. One respondent lamented that they didn't apply since they were not part of an underserved community, implying that they did not think it was worth the time to apply.

Table 3.3. Reasons Did Not Apply Municipalities Selected for Not Applying (%)

Reason	Percent
Unaware of the grants program	57
I don't know	23
Didn't have someone to write the grant	23
Didn't know where to get help with the application	19
Didn't have staff to manage the grant	16
Didn't have a worthy tree project	13
Didn't have employees to implement the grant	13
Didn't have the political support necessary to do the project	6
Didn't have the topical expertise	3
A lack of local tree experts/contractors who could help	3
Didn't have the public support necessary to do the project	3
Didn't want to use the NYS grant portal	0
Other	13

Unsuccessful and Did Not Apply municipalities were asked which resources they felt they would need in order to successfully apply for a NYSDEC Urban and Community Forestry grant in the future (Table 3.4). Both groups' highest response was that they needed technical assistance (46% Unsuccessful and 35% Did Not Apply). Unsuccessful municipalities indicated that the second and third most needed resources were employee training (31%) and staff to implement the project (27%). Did Not Apply municipalities reported needing assistance identifying a project (32%) and a grants manager (26%). Political support (12%), volunteer training (11%), and public support (5%) had the lowest

average response rates among these groups. ‘Other’ responses echoed the need for staff and for more substantial projects.

Table 3.4. Resources Needed to Successfully Receive a NYSDEC UCF Grant by Group (%)

Resource	Unsuccessful %	Did Not Apply %	Combined Average %
Technical assistance	46	35	40
Staff to implement the project	27	35	32
Assistance in identifying a worthy project	19	32	26
Grants manager	23	26	25
Educational assistance for employees to ensure quality grant outcomes	31	19	25
Local tree-care expertise to assist with our project	19	23	21
Political support	8	16	12
Educational assistance for volunteers to ensure quality grant outcomes	12	10	11
Public support	0	10	5
Other	15	10	12

3.3.1.1. Scoring Points

NYSDEC UCF attempts to elevate application scores for projects benefiting PEJAs by awarding them extra scoring points. Responding Successful municipalities were more likely to contain a PEJA, compared with Unsuccessful and significantly more likely than Did Not Apply (Table 3.1), suggesting that this criterion is working.

In addition to receiving points for the grant projects conducted in or benefiting a PEJA, municipalities could receive points for being a recognized TCUSA municipality or by having an ISA Certified Arborist provide professional guidance on the proposal. To infer the impact of these extra points on success, we analyzed responses to related responses. Ninety-one percent of Successful municipalities were recognized by TCUSA compared

with only 58% of Unsuccessful and 34% of Did Not Apply (Table 3.1). Additionally, 32% of Successful respondents indicated that they had ISA- or TCIA-certified employees compared with only 20% of Unsuccessful and 7% of Did Not Apply respondents (Table 3.1), and more Successful respondents used an ISA Certified Arborist to help author their application (Table 3.2). These results suggest that the extra points had a positive effect on the scores of municipalities with these attributes.

Additionally, municipalities were asked to address local environmental, social, and/or economic needs in their proposals; those with documented needs received more points than those without. Economic need can reveal itself in a municipality's median household income and per capita tree budget. Overall, we found that Unsuccessful respondents were more affluent and had greater per capita tree-related budgets than Successful respondents (Table 3.1); as such, municipalities with greater affluence likely presented as having less need and received fewer points.

3.3.1.2. 'Successful' Grant Project Outcomes

Successful applicants were asked a series of questions about the success of their projects based on the type of project they conducted, tree planting (36%), tree inventory (39%), management plan (33%), or maintenance project (24%); one-third of the municipalities had combination projects, and as such the percentages sum to over 100%. All of them indicated they completed their projects on time, with 87% meeting all their goals, and 13% meeting most of their goals. When asked who carried out the projects, 79% used municipal staff, 55% used community volunteers, 52% used professional contractors, 52% used ISA

Certified Arborists (which is required for the tree inventory and management plan projects), 36% used community partners, and 18% used elected officials.

Eighty-three percent of the municipalities that planted trees reported that those trees were cared for (watered, mulched, etc.) after the project. Additionally, all relayed a survival rate of at least 75%, and 80% reported a survival rate of at least 90%

Of the municipalities that conducted an inventory, 92% agreed that it had been useful, and 8% replied that the inventory was ‘somewhat’ useful. In addition to the municipalities that conducted an inventory, those that conducted tree maintenance were also asked if they had updated their inventory since the project’s completion. In total, 67% indicated that the inventory had been kept up to date. Those without updated inventories selected ‘lack of staff time’ (85%), ‘lack of staff training’ (57%), and ‘no funds to subscribe to the software’ (42%) as the reasons.

Management plans were reported to be useful by 82% of the municipalities that wrote one, with the other 18% reporting they were somewhat useful; none reported that the plans were not useful. Of those that elaborated on the usefulness of their plans, 50% obtained additional grants, 38% conducted successful planting efforts, 38% improved maintenance and reduced risk, and 25% improved their tree-related budget and budget planning.

They were asked about the obstacles they encountered while executing their projects. The responses varied by the type of project. However, the main themes related to limitations on public gatherings during COVID-19 (i.e., volunteer events or public meetings) (27%), a lack of contractors (15%), a lack of staff time to dedicate to the project (12%), and a lack of employee skills or equipment (6%). Many indicated they had no

obstacles. Interestingly, none chose ‘lack of political support’ or noted that it was an obstacle.

3.3.2. Municipal Characteristics- Part 2

The community characteristics data for all the municipalities that were Successful at least once across the 2016, 2018, 2019, and 2023 UCF grant rounds, those that were never successful (Unsuccessful), and the remaining Did Not Apply are compiled in Table 3.5. Successful municipalities were, on average, larger, more likely to contain a PEJA/DAC (72%), and had a statistically significantly lower MHI than Unsuccessful municipalities.

Table 3.5. Community Characteristics for all Successful, Unsuccessful, and Did Not Apply Municipalities (Part 2: 2016, 2018, 2019, and 2023 UCF Rounds)

Community Characteristic	All (n=287)	Successful (n=104)	Unsuccessful (n=96)	Did Not Apply (n=87)
Population Mean (Median)* ^{bc}	51,327 (6,713)	106,783 (13,088)	33,960 (9,674)	4,199 (1,930)
Median Household Income* ^{abc}	\$61,572	\$64,292	\$69,561	\$56,241
Percentage that contains a PEJA/DAC ^{bc}	60%	72%	63%	42%

*Population mean and median, and MHI are the averages of the 2016, 2018, 2019, and 2023 values.

^a Statistically significant difference between Successful and Unsuccessful

^b Statistically significant difference between Successful and Did Not Apply

^c Statistically Significant between Unsuccessful and Did Not Apply

However, when the years are parsed, the trends for Successful and Unsuccessful relate a different picture (Figure 3.1). In 2023, Successful municipalities are smaller in population and have a higher MHI. Additionally, while the percentage of PEJA/DAC municipalities in the Successful group was higher in 2016 ($p = 0.024$) and 2018, the rate dropped below that of the Unsuccessful group in 2019 and 2023, but only slightly. The DAC percentages (2023) were noticeably lower than the PEJA percentages (2016, 2018, and 2019). This is due, at least in part, to differences between PEJA and DAC criteria. Of

the 159 municipalities with a PEJA in this study, only 83 contained a DAC. Furthermore, 12 additional municipalities without a PEJA contained a DAC, for a total of 95.

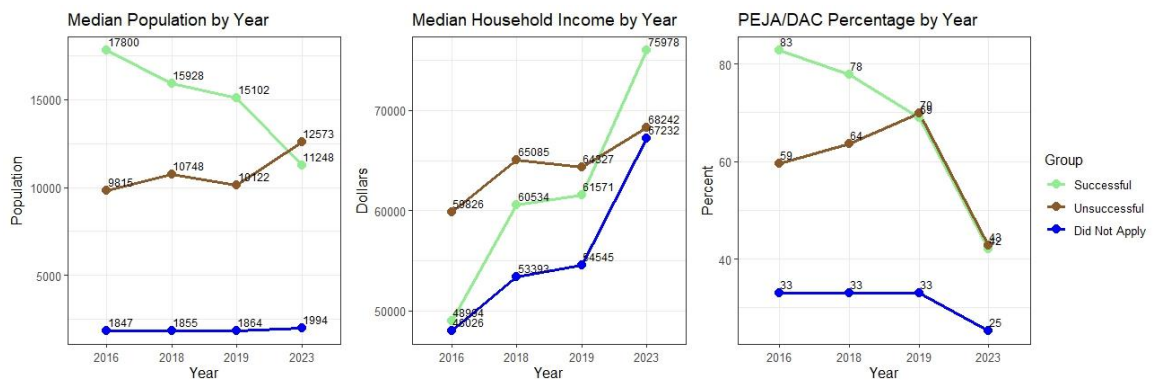


Figure 3.1: Community Characteristics of Median Population, Median Household Income, and PEJA/DAC by Grant Year for Successful, Unsuccessful, and Did Not Apply Municipalities

3.4. Discussion

There are significant differences in the characteristics and resources among the three groups of municipalities. On average, Unsuccessful municipalities were more affluent and had a higher per capita tree budget (Table 3.1). Affluence shifted in the 2023 grant round, where we found that Successful municipalities had higher affluence (Fig. 3.1), despite the potential points lower-income municipalities can earn in the scoring system. Data from future grant cycles will help elucidate whether 2023 was an outlier or indicative of a new trend.

On average, and for the 2016 and 2018 grant rounds, awarding points for project PEJA/DAC status appeared effective. However, since the values for both the Successful and Unsuccessful applicants were essentially equal in 2019 and 2023, there was no advantage (Fig. 3.1). There were other federal and state grants aimed at underserved communities in 2023, which might have affected application rates of municipalities with a

DAC in that year, but not in 2019. Regardless, this suggests that if NYS wishes to continue its past level of focus on awarding grants to underserved communities, the point level would need to be modified to further favor DAC applications.

NYSDEC provides scoring guides that furnish the point value of each criterion, helping applicants understand how their proposals will be evaluated. The scoring guides can either encourage or discourage municipalities from applying, depending on whether they see themselves and their potential project(s) reflected in the criteria (i.e., being a Tree City USA or a project in a PEJA/DAC). Some municipalities responded that they did not apply because they felt they could not compete since their municipalities were not underprivileged. However, the maximum point benefit for that criterion was 5% or less of the total score in each round. Although fewer of the Did Not Apply municipalities contained a PEJA/DAC (42%), not all of the Successful municipalities did either (72%), indicating that it is possible for municipalities without projects benefiting PEJA/DACs to be funded (Table 3.5).

The additional points for TCUSA recognition and ISA Certified Arborist review are correlated with funding. However, being recognized as a TCUSA community requires the municipality to meet four urban forest management standards (celebrating Arbor Day, establishing a tree committee/board, composing a tree ordinance, and a tree-related budget of at least \$2 per resident) (Arbor Day Foundation 2024) and is known to correlate with urban forest management comprehensiveness (Stevenson et al. 2008, Hargrave et al. 2024). Therefore, TCUSA recognition may convey grant writing success due to the urban forest management exhibited by those municipalities.

Being able to access certified employees or volunteers willing to review projects appears to ease the financial and time-related burdens of obtaining this professional guidance from outside contractors, as well as offering the benefit of having experts with institutional knowledge directly contributing to the application. Some Unsuccessful applicants recognized they lacked Certified Arborist guidance on their proposal and that it might have contributed to their poor performance.

Similarly, Did Not Apply municipalities were significantly less likely (40%) to have a tree board than both Successful (78%) and Unsuccessful (72%). This would suggest that these municipalities have less robust urban forest management programs. They also had less grant writing capacity and either less interest in submitting an application or less awareness of tree-related grants (Tables 3.1 and 3.3) than both Successful and Unsuccessful municipalities. Still et al. (1996) found a similar correlation, in that applicant communities in Pennsylvania (both funded and unfunded) were more likely to have an ordinance, inventory, or tree management plan than non-applicants, and 85% of funded communities had at least one of those components, compared with 20% of non-applicants.

Whether grant success for municipalities in NYS is due to the points they can accrue or the theoretically more robust urban forest management that is already in place is unknown. We did not have access to the breakdown of each applicant's score and could not test whether a change in the score for these criteria would have changed the outcome of the application. This would be an interesting topic for future research.

Unsuccessful applicants reported that they felt they were unsuccessful due to a lack of a grant writer, while Successful applicants felt that having a grant writer assisted them in obtaining a grant successfully. However, it is important to note that both Successful and

Unsuccessful municipalities reported having equal grant writer access (56% each). When it came to the author of the NYSDEC UCF applications, only 24% of Unsuccessful respondents reported using either a municipal or contract grant writer, compared with 30% of Successful applicants. Unsuccessful respondents had a higher proportion of contract versus municipal-employed grant writers. It is plausible that in-house grant writers with greater municipal familiarity are more successful than contract grant writers.

Municipal calls for political support and public support are often highlighted in statewide surveys, as well (Treiman and Gartner 2004, 2005). However, in this survey, none of the Successful respondents listed the lack of political or public support as an obstacle to completing their grant projects. Additionally, only 12% of Unsuccessful and Did Not Apply municipalities indicated that they needed political support in order to have a successful application, and only 5% of that combined group indicated they needed public support for success (Table 3.4). This may suggest that elected officials and the public are supportive of their municipalities seeking grants for tree-related projects, but that their support is necessary for other facets of urban forest management.

There were a few common barriers reported by Unsuccessful and Did Not Apply. Technical and educational assistance was touted as a needed resource by both groups. These critical resources were also identified in other needs assessments (Zhang and Zheng 2012, Driscoll et al. 2015, Harper et al. 2017, Hargrave et al. 2022). Both groups also expressed a desire for increased capacity, explicitly for staff to manage grants and carry out tree-related projects. Additionally, 26% reported that they wanted assistance identifying worthy grant projects. This may be related to both the need for educational assistance and the need for staff – someone with knowledge about the trees and the capacity to turn that

knowledge into a suitable project. The primary reason the Did Not Apply group gave for not applying was that they were unaware of the grants. Secondary reasons referred to grant writing and capacity. The Did Not Apply municipalities were the smallest and least affluent, which suggests they have less capacity than larger municipalities and may be less connected to urban forest management support.

Lastly, over the four rounds of the UCF Grant studied here, there were only 200 municipal applicants, and only 104 of which were successful (Appendix 3.1 Table 3.2). NYSDEC UCF believes there are approximately 750 municipalities with a managed urban forest. Outreach and support by NYSDEC staff and partner agencies may increase awareness, municipal capacity, and lead to more applications. \

3.5. Conclusion

This study provides valuable insights into the attributes that contribute to successful NYSDEC UCF Grant applications. Municipalities with established urban forest management practices are more likely to receive a grant than those without. Being recognized as a Tree City USA community, celebrating Arbor Day, and having a tree board demonstrate, at a minimum, a basic commitment to urban forest management, and correlates with application success.

NYS's efforts to reward municipalities in need and those with a documented commitment to urban forest management with additional points in the scoring process appear to aid in making underserved communities more competitive for UCF Grant dollars. Community involvement in Tree City USA, interactions with an ISA Certified Arborist, documenting economic need, and having the project located in or benefiting a PEJA were correlated with higher rates of grant success.

However, when parsing the data by grant year, we found mixed results for disadvantaged and lower-affluent municipalities. This suggests that the scoring system may need to be adjusted if the state wants to continue to elevate scores for municipalities that meet those criteria.

Access to grant writers was reported as a barrier by all three categories, although the rates of grant writers were the same for both Successful and Unsuccessful applicants. Surprisingly, public and political support were not listed as barriers, which is encouraging. Still, municipalities expressed the need for more technical and educational support. Enhancing support for municipalities without robust urban forestry programs may increase access to these grants.

Grants are an important portion of municipal tree budgets in NYS. The NYSDEC UCF Grants are being awarded to municipalities with documented urban forest management practices, and historically, to those with lower incomes and projects that benefit environmental justice areas. Nevertheless, many municipalities were unable to successfully obtain one of these grants. Enhancing current educational and technical assistance levels may increase the likelihood of additional underserved municipalities receiving grants and lead to improved urban forest management outcomes across the state.

Appendix 3.1. Supplemental Tables

Table S3.1: Breakdown of Applications and Awards for the Previous Four Rounds
(all municipal and non-municipal applicants)

Year	2016	2018	2019	2023
Total Awarded	\$2,225K	\$2,240K	\$2,033K	\$3,541K
Maximum Request (Large/Small Municipalities)	\$75,000/ \$50,000	\$75,000/ \$50,000	\$75,000/ \$50,000	\$100,000/ \$75,000
Total Funded	50	54	48	50
Total Applicants	157	103	114	75
Percentage Funded	32%	52%	42%	67%
Number of Projects in Large Municipalities Funded	18	20	6	15
Number of Projects in Small Municipalities Funded	32	34	42	35
Number of Municipalities Funded	29	36	45	38
Number of Municipalities Not Funded	79	33	63	21

Table S3.2: Municipal Application Rates Over the Four Grant Rounds*

Municipal Application Rates					
Total	Freq.	Successful #	Freq.	Unsuccessful #	Freq.
Once	104	Once	70	Once	98
Twice	56	Twice	24	Twice	37
Thrice	32	Thrice	10	Thrice	8
Four times	8	Four times	0	Four times	0
Total	200	Total	104	Total	143
Application Outcome Breakdown					
Only Successful	Freq.	Mixed Success	Freq.	Only Unsuccessful	Freq.
Successful Once	39	Succ. Once & UnSucc. Once	19	Unsuccessful Once	65
Successful Twice	12	Succ. Once & UnSucc. Twice	10	Unsuccessful Twice	25
Successful Thrice	6	Succ. Once & UnSucc. Thrice	2	Unsuccessful Thrice	6
		Succ. Twice & UnSucc. Once	10		
		Succ. Twice & UnSucc. Twice	2		
		Succ. Thrice & UnSucc. Once	4		
Total	57	Total	47	Total	96

*As described in Part 1.

#1Includes duplication, see Mixed Success column.

Appendix 3.2. Survey Questions

A.3.2.1 Successful Applicant Survey

The Urban and Community Forestry Grant Survey assesses municipal access to and participation in the New York State Department of Environmental Conservation Urban and Community Forestry Program (NYSDEC UCF) grant program. The survey is being conducted by a University of Massachusetts Ph.D. student in conjunction with the NYSDEC UFC.

Our records indicate that your municipality has received at least one NYSDEC UCF grant during the previous three rounds (2016, 2018 or 2019).

We ask that someone familiar with the execution of your most recent grant complete these questions. If they are not available, please have someone familiar with your community's trees respond to the survey.

Thank you for helping us improve urban forests in New York State.

Please tell us a little about your community.

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 in the past five years?

- ☐ Yes
 - ☐ No
 - ☐ I don't know
-

Is there at least one municipal employee with a degree in a tree-care-related field (arboriculture, urban forestry, horticulture, forestry, etc.)?

- ☐ Yes
- ☐ No
- ☐ I don't know

Is there at least one municipal employee with an International Society of Arboriculture (ISA) or Tree Care Industry Association (TCIA) certification?

- ☐ Yes
- ☐ No
- ☐ I don't know
-

Does your municipality have a tree board, advisory committee, or similar municipal committee that assists with tree oversight?

- ☐ Yes
- ☐ No
- ☐ I don't know
-

Does your municipality partner with a non-profit on tree related issues?

- ☐ Yes
- ☐ No
- ☐ I don't know
-

Display this question:

If Does your municipality partner with a non-profit on tree related issues? = Yes

If yes, what is the name of that non-profit?

Does your municipality employ or contract with a grants writer?

- ☐ Yes
- ☐ No
- ☐ I don't know
-

Has your municipality applied for a NYS Urban Forestry Council Grant (to assist with becoming a Tree City USA community or to augment Tree City USA status) in the last five years?

- ☐ Yes
- ☐ No
- ☐ I don't know
-

What was your municipal tree-care related budget in 2022?

Who wrote your municipality's most recent NYSDEC Urban and Community Forestry grant application? Select all that apply.

- ☐ Municipal grant writer
- ☐ Municipal employee
- ☐ Contract professional grant writer
- ☐ Contract arborist
- ☐ ISA Certified Arborist
- ☐ Volunteer
- ☐ Elected official
- ☐ Other

-

Thinking of your most recent successful application:
What type of grant did you obtain? Select all that apply.

- ☐ Tree Planting
 - ☐ Tree Inventory
 - ☐ Management Plan
 - ☐ Tree Maintenance
-

Did you complete the project in the grant allotted timeframe?

- ☐ No- We did not complete the project
 - ☐ No- We needed an extension to complete the project
 - ☐ Yes- We completed the project on time
-

How successful or unsuccessful were you at meeting the goals of your project?

- ☐ Unsuccessful- we did not meet any of our project goals
 - ☐ Somewhat successful- we met a few of our project goals
 - ☐ Somewhat successful- we met most of our project goals
 - ☐ Successful- we met all our project goals
-

Did your local NYSDEC urban forester require remediation or corrections before signing off on the completion of the grant?

- ☐ Yes
 - ☐ No
 - ☐ I don't know
-

Who carried out the tasks specified in the grant application? Select all that apply

☐

Municipal staff

☐

Community volunteers

☐

Professional contractors

☐

Elected officials

☐

Community partners

☐

ISA Certified Arborists

☐

Other _____

Display this question:

If Thinking of your most recent successful application: What type of grant did you obtain? Select al... = Tree Planting

What obstacles did you encounter when completing the planting project? Select all that apply.

- ☐ There was limited availability of suitable planting stock
 - ☐ The cost of planting stock increased between proposal and implementation
 - ☐ There were few planting contractors in the area
 - ☐ We did not have enough volunteers to execute the plantings as planned
 - ☐ The weather did not cooperate (either too dry or too wet)
 - ☐ There were COVID restrictions on public gatherings/interactions
 - ☐ We had COVID-related materials shortages
 - ☐ We had COVID- related staffing shortages
 - ☐ The quality of planting stock caused survivability issues
 - ☐ There was a lack of political support to implement the project
 - ☐ There was a lack of public support to implement the project
 - ☐ Other _____
 - ☐ None- everything went as planned
-

Display this question:

If Thinking of your most recent successful application: What type of grant did you obtain? Select all... = Tree Inventory

What obstacles did you encounter when completing the inventory? Select all that apply.

- ☐ There were few professional contractors available to implement the inventory
 - ☐ Municipal staff was unable to spend enough time on the project
 - ☐ We had technical issues with inventory software or data
 - ☐ There were COVID-related barriers to holding outreach or press events
 - ☐ There was a lack of political support to implement the project
 - ☐ There was a lack of public support to implement the project
 - ☐ Other _____
 - ☐ None- everything went as planned
-

Display this question:

If Thinking of your most recent successful application: What type of grant did you obtain? Select al... = Management Plan

What obstacles did you encounter when completing the management plan? Select all that apply

☐

There were few professional contractors available to develop the management plan

☐

Municipal staff was unable to spend enough time on the project

☐

There were COVID-related barriers to holding outreach or press events

☐

There was a lack of political support to implement the project

☐

There was a lack of public support to implement the project

☐

Other _____

☐

None- everything went as planned

Display this question:

If Thinking of your most recent successful application: What type of grant did you obtain? Select al... = Tree Maintenance

What obstacles did you encounter when completing the maintenance project? Select all that apply.

- ☐ There was a lack of trained arboriculture professionals/contractors available to do the work
- ☐ There was a lack of volunteers available to do the work
- ☐ Our municipal employees lacked pruning and maintenance skills
- ☐ The municipality lacked the proper pruning and maintenance equipment
- ☐ The municipality experienced significant equipment breakdowns or lack of availability (to rent)
- ☐ We were unable to schedule maintenance tasks efficiently
- ☐ There were COVID-related barriers to holding outreach or press events
- ☐ There was a lack of political support to implement the project
- ☐ There was a lack of public support to implement the project
- ☐ Other _____
- ☐ None- everything went as planned

Display this question:

If Thinking of your most recent successful application: What type of grant did you obtain? Select al... = Tree Planting

After the completion of the planting project, were the planted trees cared for (watered, mulched, and stakes removed)?

- ☐ Yes
- ☐ Somewhat
- ☐ No

Display this question:

If Thinking of your most recent successful application: What type of grant did you obtain? Select al... = Tree Planting

Approximately what percentage of the trees you planted are still alive?

Display this question:

If Thinking of your most recent successful application: What type of grant did you obtain? Select al... = Tree Inventory

Has the inventory been useful?

- ☐ Yes
- ☐ Somewhat
- ☐ No

Display this question:

If Thinking of your most recent successful application: What type of grant did you obtain? Select al... = Tree Inventory

Has the inventory been kept up to date?

- ☐ Yes
- ☐ Somewhat
- ☐ No

Display this question:

If Has the inventory been kept up to date? != Yes
And Thinking of your most recent successful application: What type of grant did you obtain? Select al... = Tree Inventory

If not yes, why not? Select all that apply.

- ☐ Lack of staff or staff time
- ☐ Lack of staff training
- ☐ No funds to subscribe to the software
- ☐ Other _____

Display this question:

If Thinking of your most recent successful application: What type of grant did you obtain? Select al... = Management Plan

Has the management plan been useful?

- ☐ Yes
- ☐ Somewhat
- ☐ No
-

Display this question:

If Thinking of your most recent successful application: What type of grant did you obtain? Select al... = Management Plan

Please elaborate on your municipality's use of the management plan.

Display this question:

If Thinking of your most recent successful application: What type of grant did you obtain? Select al... = Tree Maintenance

After your maintenance grant, was your tree inventory updated?

- ☐ Yes
- ☐ No
-

Display this question:

If After your maintenance grant, was your tree inventory updated? = No

If no, why not?

- ☐ Lack of staff or staff time
- ☐ Lack of staff training
- ☐ No funds to subscribe to the inventory software
- ☐ Other

-

Display this question:

If Thinking of your most recent successful application: What type of grant did you obtain? Select al... = Tree Inventory

Or Thinking of your most recent successful application: What type of grant did you obtain? Select al... = Tree Maintenance

What software do you use to manage your inventory?

How significant or insignificant of an impact do urban forest grants have on your municipal urban forestry program, during the years you have grant funding?

- ☐ Extremely Significant
- ☐ Significant
- ☐ Neither Significant or Insignificant
- ☐ Insignificant
- ☐ Extremely Insignificant

Why do you think your municipality was successful obtaining a NYSDEC Urban and Community Forestry grant?

What municipal resources did your municipality have that may have given it an advantage over communities that didn't receive a grant?

Do you plan to apply for a NYSDEC Urban and Community Forestry Grant in the future?

- ☐ Yes
- ☐ No
- ☐ I don't know

Do you plan to apply for this coming round (summer of 2023) of NYSDEC Urban and Community Forestry grants?

- ☐ Yes
- ☐ No
- ☐ I don't know

Display this question:

If Do you plan to apply for this coming round (summer of 2023) of NYSDEC Urban and Community Forestr... = Yes

If Yes- May we contact you after the grants are announced to get your feedback on this year's process?

- ☐ Yes
- ☐ No

Display this question:

If If Yes- May we contact you after the grants are announced to get your feedback on this year's pro... = Yes

Thank you. Please provide the best contact's name and their email.

A.3.2.2. Unsuccessful Applicant Survey

The Urban and Community Forestry Grant Survey assesses municipal access to and participation in the New York State Department of Environmental Conservation Urban and Community Forestry Program (NYSDEC UCF) grant program. The survey is being conducted by a University of Massachusetts Ph.D. student in conjunction with the NYSDEC UFC.

Our records indicate that your municipality applied for but did not receive a NYSDEC UCF grant during one the previous three rounds (2016, 2018 or 2019). We ask that someone familiar with your most recent grant application complete these questions. If they are not available, please have someone familiar with your community's trees respond to the questions.

Thank you for helping us improve urban forests in New York State.

Please tell us a little about your community.

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 in the past five years?

- ☐ Yes
 - ☐ No
 - ☐ I don't know
-

Is there at least one municipal employee with a degree in a tree-care-related field (arboriculture, urban forestry, horticulture, forestry, etc.)?

- ☐ Yes
 - ☐ No
 - ☐ I don't know
-

Is there at least one municipal employee with an International Society of Arboriculture (ISA) or Tree Care Industry Association (TCIA) certification?

- ☐ Yes
 - ☐ No
 - ☐ I don't know
-

Does your municipality have a tree board, advisory committee, or similar municipal committee that assists with tree oversight?

- ☐ Yes
 - ☐ No
 - ☐ I don't know
-

Does your municipality partner with a non-profit on tree related issues?

- ☐ Yes
 - ☐ No
 - ☐ I don't know
-

Display this question:

If Does your municipality partner with a non-profit on tree related issues? = Yes

If yes, what is the name of that non-profit?

Does your municipality employ or contract with a grants writer?

- ☐ Yes
- ☐ No
- ☐ I don't know

Has your municipality applied for a NYS Urban Forestry Council Grant (to assist with becoming a Tree City USA community or to augment Tree City USA status) in the last five years?

- ☐ Yes
- ☐ No
- ☐ I don't know

What was your municipal tree-care related budget in 2022?

Who wrote your municipality's most recent NYSDEC Urban and Community Forestry grant application? Select all that apply.

☐

Municipal grant writer

☐

Municipal employee

☐

Contract professional grant writer

☐

Contract arborist

☐

ISA Certified Arborist

☐

Volunteer

☐

Elected official

☐

Other _____

Why do you think your municipality was unsuccessful? Select all that apply.

- ☐ The scale of the project too large
- ☐ The scale of the project too small
- ☐ There was a lack of qualified contractors to execute the project
- ☐ There was a lack of qualified staff to execute the project
- ☐ We were not a Tree City USA
- ☐ We did not have an ISA Arborist participate in the project
- ☐ We did not have an ISA Arborist review our project
- ☐ The proposal wasn't of high enough quality
- ☐ I don't know
- ☐ Other _____

After the rejection, did someone from your municipality meet with NYSDEC Urban and Community Forestry staff to learn how to improve your proposal?

- ☐ Yes
 - ☐ No
 - ☐ I don't know
-

Display this question:

If After the rejection, did someone from your municipality meet with NYSDEC Urban and Community Fore... = Yes

If yes, did they find it helpful?

☐ Yes

☐ No

Did you complete the project even though you didn't get a grant?

☐ No

☐ Yes, we applied for funds from another entity

☐ Yes, we figured out how to do it on our own

Display this question:

If Did you complete the project even though you didn't get a grant? != No

If yes, was it at the original scale?

☐ No, we had to scale it down

☐ No, we were able to expand it

☐ Yes, it was at the original scale

Which of these resources do you think your municipality needs to have in order to successfully apply for a NYSDEC Urban and Community Forestry grant in the future? Select all that apply.

- ☐ Grants manager
- ☐ Technical assistance on implementing a tree planting, inventory, management plan or maintenance project
- ☐ Staff to implement the tree project
- ☐ Assistance identifying a worthy tree project
- ☐ Educational assistance for employees to ensure quality grant outcomes
- ☐ Educational assistance for volunteers to ensure quality grant outcomes
- ☐ Political support
- ☐ Public support
- ☐ Local tree-care expertise to assist with our project
- ☐ Other _____

Do you plan to apply for a NYSDEC Urban and Community Forestry Grant in the future?

- ☐ Yes
- ☐ No
- ☐ I don't know

Do you plan to apply for this coming round (summer of 2023) of NYSDEC Urban and Community Forestry grants?

- ☐ Yes
- ☐ No
- ☐ I don't know

Display this question:

If Do you plan to apply for this coming round (summer of 2023) of NYSDEC Urban and Community Forestr... = Yes

If Yes- May we contact you after the grants are announced to get your feedback on this year's process?

- ☐ Yes
- ☐ No

Display this question:

If If Yes- May we contact you after the grants are announced to get your feedback on this year's pro... = Yes

Thank you. Please provide the best contact's name and their email.

A.3.3.3. Did Not Apply Survey

The Urban and Community Forestry Grant Survey assesses municipal access to and participation in the New York State Department of Environmental Conservation Urban and Community Forestry Program (NYSDEC UCF) grant program. The survey is being conducted by a University of Massachusetts Ph.D. student in conjunction with the NYSDEC UFC.

Our records indicate that your municipality did not apply for a NYSDEC UCF grant during the previous three rounds (2016, 2018 or 2019). We ask that someone familiar with your municipality's street tree or urban forest program complete these questions.

Thank you for helping us improve urban forests in New York State.

Please tell us a little about your community.

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 in the past five years?

- ☐ Yes
 - ☐ No
 - ☐ I don't know
-

Is there at least one municipal employee with a degree in a tree-care related field (arboriculture, urban forestry, horticulture, forestry, etc.)?

- ☐ Yes
 - ☐ No
 - ☐ I don't know
-

Is there at least one municipal employee with an International Society of Arboriculture (ISA) or Tree Care Industry Association (TCIA) certification?

- ☐ Yes
- ☐ No
- ☐ I don't know
-

Does your municipality have a tree board, advisory committee, or similar municipal committee that assists with tree oversight?

- ☐ Yes
- ☐ No
- ☐ I don't know
-

Does your municipality partner with a non-profit on tree related issues?

- ☐ Yes
- ☐ No
- ☐ I don't know
-

Display this question:

If Does your municipality partner with a non-profit on tree related issues? = Yes

If yes, what is the name of that non-profit?

Does your municipality employ or contract with a grants writer?

- ☐ Yes
- ☐ No
- ☐ I don't know
-

Has your municipality applied for a NYS Urban Forestry Council Grant (to assist with becoming a Tree City USA community or to augment Tree City USA status) in the last five years?

- ☐ Yes
 - ☐ No
 - ☐ I don't know
-

What was your municipal tree-care related budget in 2022?

Before receiving this survey request, were you aware of the NYSDEC Urban and Community Forestry grant program?

- ☐ Yes
 - ☐ No
-

Why didn't your municipality apply for a NYSDEC Urban and Community Forestry grant in the past? Select all that apply.

- ☐ The municipality was unaware of the grants program
 - ☐ The municipality didn't know where to get help with the application
 - ☐ The municipality didn't have someone to write the grant
 - ☐ The municipality didn't want to use the NYS Grants Gateway
 - ☐ The municipality didn't have a worthy tree project
 - ☐ The municipality didn't have staff to manage the grant
 - ☐ The municipality didn't have the topical expertise
 - ☐ The municipality didn't have employees to implement the grant
 - ☐ There were no local tree experts/contractors who could help us
 - ☐ The municipality didn't have the political support necessary to do the project
 - ☐ The municipality didn't have the public support necessary to do the project
 - ☐ I don't know
 - ☐ Other _____
-

Which of these resources do you think your municipality needs in order to successfully apply for a NYSDEC Urban and Community Forestry grant in the future? Select all that apply.

- ☐ Grants manager
- ☐ Technical assistance on implementing a tree planting, inventory, management plan or maintenance project
- ☐ Staff to implement the tree project
- ☐ Assistance identifying a worthy tree project
- ☐ Educational assistance for employees to ensure quality grant outcomes
- ☐ Educational assistance for volunteers to ensure quality grant outcomes
- ☐ Political support
- ☐ Public support
- ☐ Local tree-care expertise to assist with our project
- ☐ Other _____

Do you plan to apply for a NYSDEC Urban and Community Forestry Grant in the future?

- ☐ Yes
- ☐ No
- ☐ I don't know

Do you plan to apply for this coming round (summer of 2023) of NYSDEC Urban and Community Forestry grants?

- ☐ Yes
 - ☐ No
 - ☐ I don't know
-

Display this question:

If Do you plan to apply for this coming round (summer of 2023) of NYSDEC Urban and Community Forestr... = Yes

If Yes- May we contact you after the grants are announced to get your feedback on this year's process?

☐ Yes

☐ No

Display this question:

If If Yes- May we contact you after the grants are announced to get your feedback on this year's pro... = Yes

Thank you. Please provide the best contact's name and their email.

CONCLUSION

The literature review, Chapter 1, collated results from surveys conducted in states across the US that gathered data on municipal urban forest management (MUFGM). These surveys grouped municipal respondents by various attributes, including community population, affluence, tree-related budget scale, proximity to metropolitan areas, and resident demographics. Connections between these attributes and urban forest management components, such as tree ordinances, tree advisory committees, the presence of staff, inventories, and management, were identified, as well as assessments of knowledge and attitudes of the individuals responsible for implementing the management.

These data revealed that few municipalities have an inventory of their trees, and even fewer have a formal management plan, regardless of the state. Larger communities and more affluent communities are more likely to formally manage their urban forest, as well as those with urban forestry staff and a tree-related budget. In general, awareness of municipal urban forest-related education and support programs is low among municipalities, and this awareness is also inconsistent across different category groups. However, municipalities with more robust programs are more aware of those supports. Municipalities with more robust programs are also more likely to receive grants.

To determine how NYS MUFGM compared with other states, a survey akin to some of those found in Chapter 1 was deployed (Chapter 2). Data analyzed from 314 municipal respondents found NYS to be similar to the national trends, with higher-affluence municipalities and those with greater populations being more likely to have a tree inventory and management plan, and to have more components of comprehensive management (professional staff, tree-related ordinance, tree advisory board, and management plan).

NYS also has relatively low rates of awareness of and participation in urban forestry education and support programs. Those that participated in those programs had more comprehensiveness components than those that did not participate.

These results suggest that there is an opportunity for support agencies to make an impact on MUFG in NYS and other states across the country, and that support targeted to municipalities by category may be beneficial in addressing deficiencies specific to the group. However, Chapter 2 suggests that there should be additional nuance as to how communities are categorized when providing these support and grant programs. Often, municipalities are categorized by either population size or affluence, yet additional criteria should also be considered.

Currently, NYS classifies municipalities as either large (with more than 65,000 residents) or small (with fewer than 65,000 residents) for their NYS Department of Environmental Conservation Urban and Community Forestry (NYSDEC UCF) grants. Having only two groups fails to recognize the vast differences among municipalities in the small category, which has a vastly greater number of designees. Many ‘small’ municipalities with populations above 10,000 residents are more akin to ‘large’ municipalities than to those with populations below 10,000 people and grouping them as ‘small’ municipalities may be detrimental to communities of all sizes. Additionally, investigations into the geographic proximity of municipalities with fewer than 10,000 residents to metropolitan areas revealed even greater variation in MUFG programs. Furthermore, the examination of the affluence categories revealed the largest gap in attributes among all the categories, with the high-affluence municipalities rating significantly higher than the medium- and low-affluence categories. This could indicate

that identifying needs and potential support by affluence category, compared to size, may be more appropriate

However, NYS municipalities, regardless of municipality population size, affluence, or metropolitan proximity, reported a universal need for urban forest-related educational and technical support, as well as funding. Funding was especially noted as being inadequate, with few municipalities in any category reporting having a sufficient tree-related budget. When asked about needs, many respondents relayed budget-related concerns. Grants are crucial for many municipalities to deliver essential services and expand their initiatives. More than a third of the respondents had received an urban forestry-related grant in the previous ten years, and the majority of those grants were from the NYSDEC UCF program.

The importance of grants to MUFM in NYS, and especially those offered by the NYSDEC UCF program, was the subject of Chapter 3. The NYSDEC UCF grant program aims to help municipalities reach their urban forest management targets through direct funding of initiatives; however, not all municipalities have the same ability to secure grants due to varying resources and characteristics. We found significant differences in attributes among the municipalities that received, did not receive, and did not apply for grants. Overall, unsuccessful applicant municipalities had higher affluence and greater tree-related budgets. This aligns with one of the NYS's intentions to support disadvantaged communities, which generally have lower affluence and tree-related budgets.

Access to professional grant writing services has long been considered a barrier to obtaining grants. Surprisingly, both successful and unsuccessful applicants had equal access to grant writers, though those that did not apply had a lower rate. Furthermore,

successful municipalities were more likely to have had ISA Certified Arborists assist with the application.

Additionally, municipalities that were recognized as Tree City USA (TCUSA) were more likely to receive a grant. This recognition results in additional points being awarded to municipalities points on their NYSDEC UCF grant applications, resulting in a higher probability of obtaining an award. However, being TCUSA recognized also portends that the municipality conducts MUFM at least on a basic level and may demonstrate that they prioritize such management. Likewise, they are likely to score well on other application questions relating to their ability to conduct and manage a grant.

Astoundingly, only 200 of the more than 1500 municipalities in NYS believed to have managed urban forests applied for a NYSDEC UCF grant over the four rounds evaluated by the study, and only 104 of them received a grant, with 24 of them receiving grants in multiple rounds. Many municipalities that hadn't applied for one of these grants reported that they were unaware of them. This aligns with the findings in the statewide survey, where only 61% of NYS communities with urban forests were aware of these grants, and only 36% reported they applied for one. Many of the non-applicant municipalities indicated that they most needed assistance writing the grant, the grant process, or managing the grant, in addition to needing help identifying projects and staff to implement the grant.

These calls for employee training and technical assistance echo the findings in Chapter 2. Municipalities recognize that they can do more but lack the necessary tools and knowledge. There is an opportunity for support agencies to develop and expand assistance programs for municipalities, either one-on-one or targeted to groups of similar

communities, to fill the knowledge and skill gaps. Additionally, TCUSA recognition appears to be an entrance to more robust urban forest management. Support programs that facilitate recurring TCUSA recognition in municipalities may serve as a catalyst for a community to solidify the importance of urban forest management in their annual work and lead to expanded MUFG objectives.

By enhancing existing educational and technical assistance opportunities, we can increase the likelihood that municipalities of all sizes, affluences, and advantages may be more likely to conduct more comprehensive urban forest management with more robust programs, services, and outcomes. Ultimately, this will result in expanded urban forest benefits and values to the residents who live amongst the trees.

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