Untapped Common Ground:

The Care of Forested Natural Areas in American Cities

Natural Areas Conservancy

THE TRUST FOR PUBLIC LAND

Yale SCHOOL OF FORESTRY & ENVIRONMENTAL STUDIES

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COVER
Photo courtesy of Green Seattle Partnership, Amy Scarfone

BACK COVER
Coastal Maritime Forest in New York, NY
Photo by New York City Department of Parks and Recreation

Created in 2012, the Natural Areas Conservancy is a non-profit organization devoted to restoring and conserving New York City's 20,000 acres of forests and wetlands in close partnership with the New York City Department of Parks and Recreation. In 2018, the Natural Areas Conservancy released NYC's first ever *Forest Management Framework for New York City*. Informed by extensive research, the framework is a 25-year roadmap for the management of NYC's forested natural areas.

The Trust for Public Land is a national leader in urban park development. Their signature Ten Minute Walk campaign, Center for City Park Excellence, and Climate Smart Cities Program all represent successful national advocacy and metric-driven reporting for urban quality of life through healthy ecosystems.

The oldest established school of forestry in the U.S., Yale School of Forestry and Environmental Studies has been a leading academic institution in urban systems, forest management, and social and ecological sciences. Recently, Yale FES has committed to focusing on urbanization as a focal topic in their strategic plan.

Contents

Inwood Hill Park, New York, NY.
Photo by Natural Areas Conservancy

Executive Summary

Natural areas account for 84% of urban parkland. Despite representing the largest concentration of nature in cities, natural areas often go unnoticed, underused, under resourced and unprotected. Organizations across the United States have been pioneering approaches to enhance and conserve urban forested natural areas locally, but these efforts have never been summarized at a national scale. In 2018, the Natural Areas Conservancy, The Trust for Public Land, and the Yale School of Forestry & Environmental Studies completed the first ever survey of organizations that manage the nation's urban forested natural areas. **We heard from representatives from 125 organizations, in 111 cities, across 40 states.** This report presents an overview of the state of urban forested natural areas management across the nation. Findings include:

- Urban forested natural areas are critical places to improve the quality of life for city residents but need management intervention to thrive and sustain.
- Invasive species removal is both the most commonly conducted management activity and the top challenge organizations face.
- Respondents collaborate locally, however less than half participate in a regional or national network.
- There are opportunities to strengthen connections with the fields of public health, urban planning, and climate resilience.

Urban forested natural areas play a vital role in improving the quality of life for hundreds of millions of Americans. However, these places have limited formal protection from city development and stressors and cannot take care of themselves; they need management and continued investment. This report provides an inspiring first look at how organizations across America are protecting and restoring their cities' forested natural areas. In section one of this report, we describe urban forested natural areas and the benefits they provide. Section two outlines our recommendations for expanded investment, collaboration, and policy support. Section three summarizes the answers we received to our survey questions and provides our reflections to these answers.

We hope to encourage local and federal agencies, non-profits, researchers, and funders to increase their focus on urban forests. A coordinated effort is necessary to ensure that high-quality nature is available to residents of cities now and for generations to come.

Section 1:

The Importance of Urban Forested Natural Areas

Residents enjoying a walk in Inwood Hill Park, New York, NY.

Photo by Richard Hallett

What Are Urban Forested Natural Areas?

The term “urban forest” refers to all trees within a city, including street trees, landscaped trees, private property, and forested natural areas. “Forested natural areas” are distinct from street and park trees in their size, biodiversity, composition, and how they’re managed. They connect us to place with historical native habitats and are the “woods” in cities. Forested natural areas are more than a collection of trees. These areas support plant and animal communities from the soil underfoot to the leaves in the top of the forest canopy. As time passes, dead leaves and wood break down to enrich the soil, and in healthy forests young seedlings are ready to replace aging trees. Enter an urban natural area, and you will feel the difference. The air is cooler, the smells are fresh and the city sounds seem further away. Urban forested natural areas are less evenly distributed across the landscape, yet they often include the most numerous and valuable urban forest resources. For example, **in New York City, forested natural areas make up 5.5% of the city land area and contain approximately 70% of the total number of trees.**[1]

Examples of Urban Forested Natural Areas

Indianapolis, IN.
Photo by Indianapolis Department of Public Works, Engineering, Land Stewardship

Jacksonville, FL.
Photo by Sarah Tobing

Minneapolis, MN.
Photo by Marcia Holmberg

New York, NY.
Photo by Natural Areas Conservancy

Forested Natural Areas Are a Critical Resource for Cities

Urban Nature Has Never Been More Important for People. . . Equity Matters

Most Americans now live in metropolitan areas[2] and spend less time in nature than ever before.[3] Safe access to urban nature is critical for city dwellers. This is especially true for low-income individuals, who are less able to travel to experience nature outside of cities. In New York City, 50% of park users reported experiencing nature ONLY in NYC Parkland.[4]

Forests in Cities Are a Climate Solution

Extreme heat kills more people each year in the U.S. than flooding, storms and sea level rise combined.[5] Urban forests are one of the most effective ways to reduce the impacts of the Urban Heat Island[6] and moderate rising temperatures. Forests can also save energy by reducing air conditioning needs by 30%.[7]

Forests mitigate the impacts of climate change by absorbing carbon dioxide, storing carbon in their wood and leaves and stabilizing carbon stored in the soil. According to the UN, forests and agricultural lands globally can capture more than 30% of existing carbon in the atmosphere;[8] urban forests are a part of this solution.[9]

Forests in Cities Support Life for More Than Just People

Many cities owe their locations to unique and diverse natural landscapes. Proximity to rivers, lakes, oceans, abundant forests, and rich soils led to opportunities for agriculture, transportation, and trade. As cities developed in these biologically complex areas, local biodiversity and habitat was lost. Remnant patches of intact forests contain the natural history and native legacy of local ecosystems. These spaces provide homes for the variety of plants and animals that inhabit cities with us, and corridors for any migrating plants and animals passing through.

Natural Areas in Cities are a BIG Resource

84% of urban parkland—1.7 million acres, larger than the state of Delaware—in the U.S. is comprised of natural areas.[10] Natural areas are the largest concentrations of urban parkland, and represent a huge opportunity to increase the quality of life for hundreds of millions of Americans. However, these areas are often not recognized as critical urban infrastructure that need formal protection and long term investment.

Kubota Gardens, Seattle, WA.
Photo by Amy Scarfone

Urban Forested Natural Areas Require Ongoing Care and Investment

Like all types of parkland, forested natural areas require care to ensure the provision of ecological, economic, and social benefits. Common forest stressors, including fragmentation, dumping, and invasive species, are magnified in urban settings. These decrease both the quality of visitor experience and the health of the forests themselves. Effective management of forested natural areas includes the removal of invasive species, building and maintaining trails, improving soil, and planting tree seedlings. Management can be implemented by trained staff or volunteers. Conserving and managing these places provides green jobs, while volunteerism has been shown to strengthen community cohesion.

Threats to Healthy Urban Forests

Deserted homeless camp at Woollens Gardens Nature Preserve, Indianapolis, IN.
Photo by Indianapolis Department of Public Works, Engineering, Land Stewardship

Invasive species inhibit healthy native forests, New York, NY.
Photo by Natural Areas Conservancy

Unmarked trails can lead to erosion, and also can feel less safe and enjoyable to experience, Indianapolis, IN.
Photo by Indianapolis Department of Public Works, Engineering, Land Stewardship

Dumping of trash and misuse can degrade forest conditions and make them less enjoyable to experience, New York, NY.
Photo by Natural Areas Conservancy

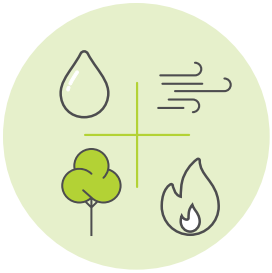
National Survey Contributes to Understanding of Urban Forested Natural Areas

Urban Forested Natural Areas

Make Cities More Livable

Urban forested natural areas play an important role in ensuring city dwellers are happy and healthy.

- After walks in nature, people self-report reductions in anger, fatigue, anxiety, and sadness, and report an increase in feelings of energy.[11]
- Forests muffle noise pollution, provide an escape from hectic city life, and replace mechanical sounds with those of nature.
- Forests provide nature-based opportunities for environmental education, which can lead to long lasting conservation mindsets.[12]
- Forests can provide opportunities to volunteer and recreate with neighbors, which can lead to improved social ties and sense of community.[13]



Contribute to Climate Change Solutions

Urban forested natural areas play an important role in tempering the negative impacts of climate change.

- Trees play a critical role during heavy rain storms by absorbing water and slowing its velocity. This decreases flooding, reduces soil loss, and helps prevent property damage.[14]
- Cities are on average 2.4°F warmer than surrounding rural areas. Properly selected and planted trees can reduce outside surface temperatures and larger patches of forest can have a greater impact on city temperature reduction than isolated trees.[15]
- Trees can absorb a wide range of airborne pollutants and capture carbon dioxide in the Earth's atmosphere.[16] Forests sequester carbon and store it in leaves, wood, roots, and soil. Forested natural areas can hold the greatest number of trees[17] and carbon stocks within cities.

Provide Ecological Benefits

Urban forested natural areas play an important role in maintaining biodiversity and supporting healthy environments.

- Forested natural areas often contain and provide for the greatest amount of native biodiversity in cities.[17]
- Large forest patches can support local genetic diversity that can be important for ensuring adaptation of plants and animals in the future.[18]
- Cities are often located in biologically rich areas, and forested natural areas are examples of the local natural history in an otherwise built environment.

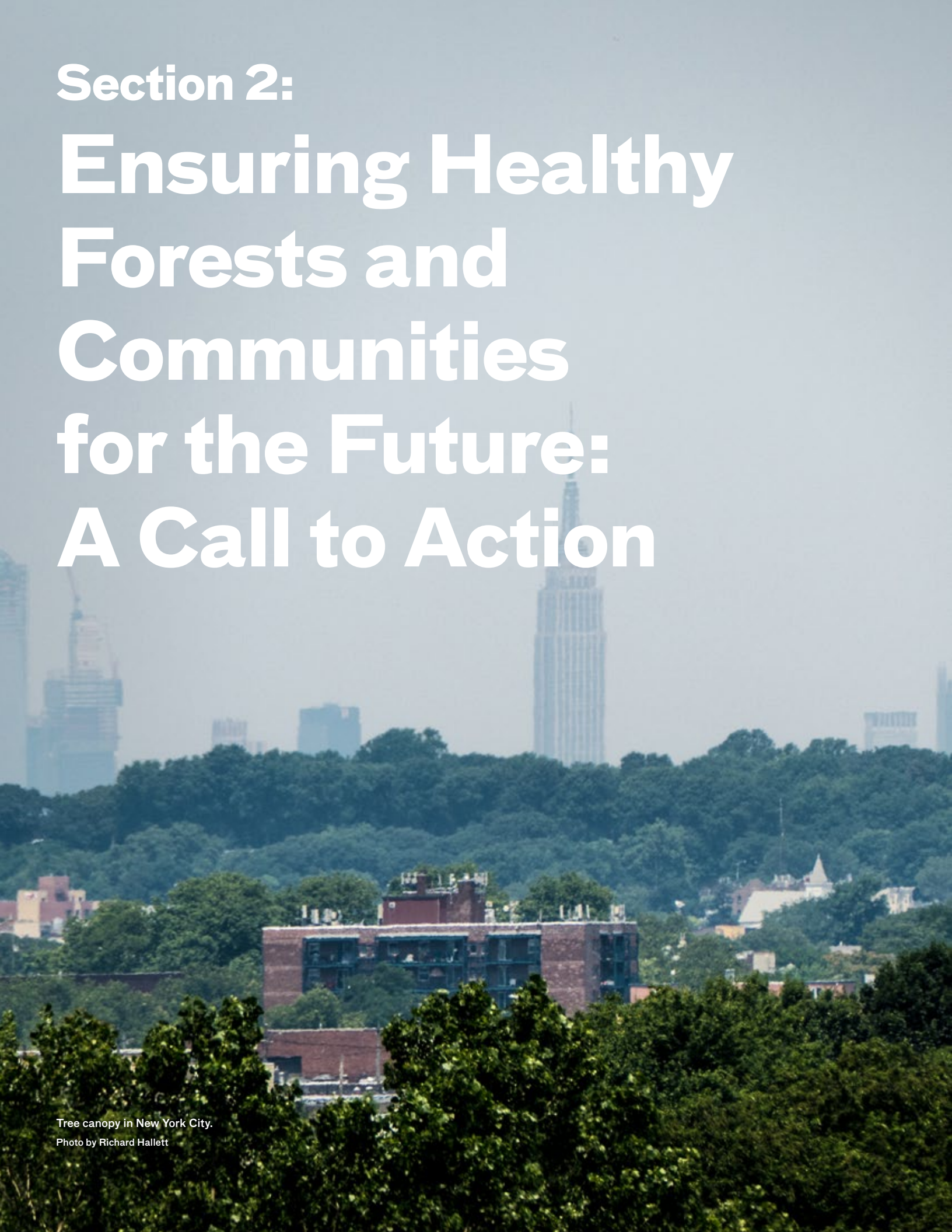
Survey Highlights

- 76% of survey respondents have guiding documents that highlight the importance of managing forests to improve quality of life for city residents.
- Social data is less frequently used than ecological data when prioritizing where and how to work.
- The majority of survey respondents listed climate change stressors as an important ecological challenges, yet less than half consider climate change in their decision making.
- Only 30% of respondents apply climate change projection data to their work and just half of respondents know how their forest is changing over time.
- Native species conservation and biodiversity protection are top management considerations among respondents.
- Invasive species management is the most commonly conducted management activity and is the top ranked ecological challenge.

See section three for all survey results.

Section 2:

Ensuring Healthy Forests and Communities for the Future: A Call to Action



Tree canopy in New York City.
Photo by Richard Hallett

We Each Have a Role to Play

A sharper focus on managing and supporting forested natural areas is essential to ensuring healthy urban communities for the future. Success will require investment and interest from practitioners, federal agencies, researchers, and the philanthropic community.

Urban forested natural areas must be recognized as regional and national resources that help to create not only vibrant cities, but a vibrant nation. No single city or organization can address all the challenges urban forested natural areas face. Strong partnerships based on common goals will lead to increased awareness of this critical resource, and will contribute to more effective management both locally and nationally.

Green Seattle Partnership.
Photo by Jim Avery Cheasty

Based on the survey results described in section three, we call on the the entities listed below to modify or expand their efforts in the following ways:

- **Practitioners** should revisit the assumptions and information that underlie their work to ensure that their efforts are achieving both social and ecological goals.
- **Federal Agencies and NGOs** that work nationally on forest management and conservation should expand their efforts to connect practitioners across the nation. The National Urban and Community Forestry Advisory Council (NUCFAC) should expand their support of management and research.
- **Researchers** should deepen their relationships with practitioners to answer scientific questions that will advance the management of this resource through understanding of ecological, social, and governing processes.
- **The Philanthropic Community** should catalyze innovation in the care and management of forested natural areas. Creating funding opportunities for management, monitoring, engagement, and research that focus on sustaining and caring for forested natural areas will help to ensure healthy cities and communities in the future.
- **Mayors and Chief Resiliency Officers** should invest in tree planting and forest management to mitigate extreme heat, capture and store carbon, and improve quality of life for residents. Forested natural areas should be incorporated into city resiliency or climate action plans.

Action Steps

Strengthen Communities by Investing in Forests

The benefits of forests on human health and well-being are well documented.[23] However, the information used to develop local urban forest management programs is limited. We must do a better job of including and integrating social and ecological factors, including public health, into decision-making and local programs and initiatives.

Recommendations

- Improve access to and awareness of forested natural areas near low-income communities, where people may be less able to experience nature outside of cities.
- Make forested natural areas more accessible and safer by providing maps, well-marked trails, and easy points of entry.
- Cultivate green jobs and develop training opportunities for local residents.
- Solicit input from community members about how they are using their local forests.

Promote Forests as a Climate Solution

Forested natural areas are the largest concentration of trees in cities, contributing to moderating extreme temperatures and storing carbon. While trees are known to help reduce the negative impacts of climate change, including heat stress, forests themselves are susceptible to climate stressors. Forward thinking and adaptive planning will be required to maintain and enhance benefits from local healthy forests.

Recommendations

- Add management of forested natural areas to city resiliency plans.
- Prioritize forest management in areas that are the most socially and ecologically vulnerable to the impacts of climate change.
- Increase funding and partnerships to understand rates of forest change through long-term monitoring at site, city, and national scales that can be compared to regional and global measures of forest change.

Discovery Park, Seattle, WA.
Photo by Andy Watson

Native species ready to plant, Seattle, WA.
Photo by Andy Watson

Improve Availability of Data and its Utility for Decision Making

Practitioners are on the front line of transforming forested natural areas in cities. Having data that can be used to describe baseline conditions, change over time, and successful management outcomes leads to more effective interventions. Cooperation is needed to learn more about how local, regional, and national datasets have been used to inform decision making, and to understand the barriers that exist for the application of these data.

Recommendations

- Create a repository for case studies, datasets, and outcomes specific to urban forested natural areas.
- Adopt common metrics for evaluating forest condition and provide training and technical support for cities.
- Determine the most useful datasets and approaches that can be leveraged into common methodologies across cities.
- Expand or modify existing tools designed for urban forestry (e.g., urban tree canopy assessments, i-Tree, Vibrant Cities Lab) to include relevant applications for urban forested natural areas that have unique management needs compared to other types of urban trees.

Increase Investment

More dedicated funding is required to manage and maintain urban forested natural areas.

Recommendations

- Develop communication tools and marketing campaigns to improve awareness of forested natural areas.
- Develop local partnerships to advocate locally for increased natural areas investment.
- Increase the budget for urban and community forestry nationally. Allocate a portion of that funding specifically for natural areas management.
- Use resilience funding to support forest management.
- Provide funding for local management efforts beyond budgets for planting new trees.

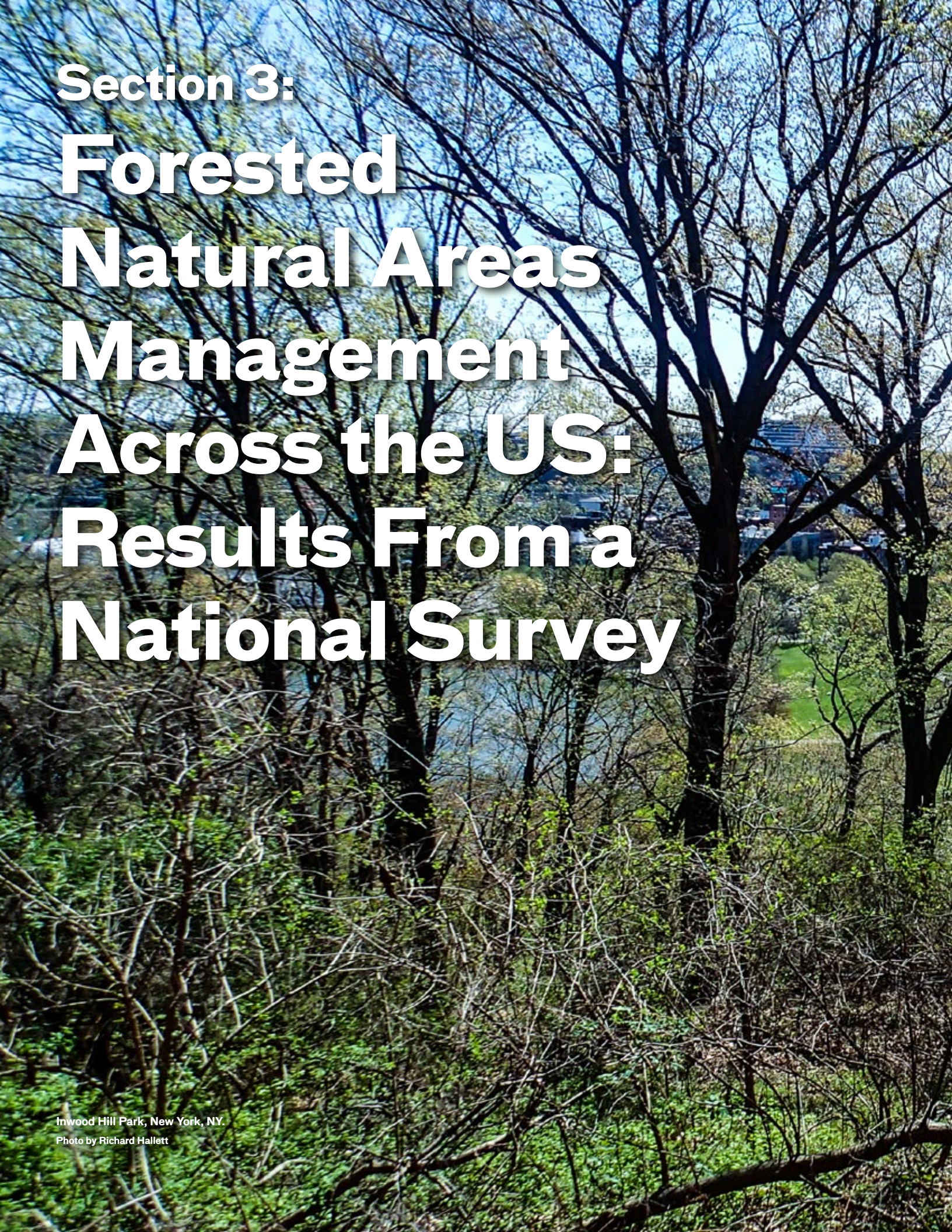
Strengthen Partnerships Locally, Regionally, and Nationally

Stronger partnerships and broader recognition of this topic could lead to improved policy, greater awareness, and more effective management.

Recommendations

- Use a shared language and nomenclature to communicate the value and needs for management of urban forested natural areas, as distinct from other types of city trees.
- Manage for the long-term and coordinate planning between organizations.
- Develop and share best practices, with an eye toward developing a nationally recognized field of forest management and policy specific to forested natural areas.
- Hold local, state, or national convenings to bring cities together to share case studies and discuss best practices.

Interlaken Park, Seattle, WA.
Photo by Andrea Mojzak



Section 3:
Forested Natural Areas Management Across the US: Results From a National Survey

Inwood Hill Park, New York, NY.
Photo by Richard Hallett

Why a National Survey?

Working together, the Natural Areas Conservancy, The Trust for Public Land, and Yale University conducted a survey of organizations working to restore and manage forested natural areas across the United States. We believe that urban forested natural areas can play an important role in creating sustainable cities. **The goal of this survey is to provide an in depth look at how and why forested natural areas are managed. The results will serve to both inform local efforts and strengthen a policy agenda.**

Forested natural area in Alley Pond Park, Queens, NY.
Photo by Natural Areas Conservancy

Survey Overview

To understand how urban forested natural areas are managed across the US, we solicited responses from public agencies and non-profit groups in cities or metro-regions with populations greater than 50,000 people. We asked a series of questions to understand how cities perceive and manage their forested natural areas. Our questions explored the following themes:

- Why are organizations managing forested areas and what factors guide their management?
- How are forested natural areas managed?
- What metrics are being used to measure success and evaluate change?

We hope that the results will provide local and national leaders with valuable information that allows them to deepen their impact, strengthen partnerships, and elevate awareness of their important efforts.

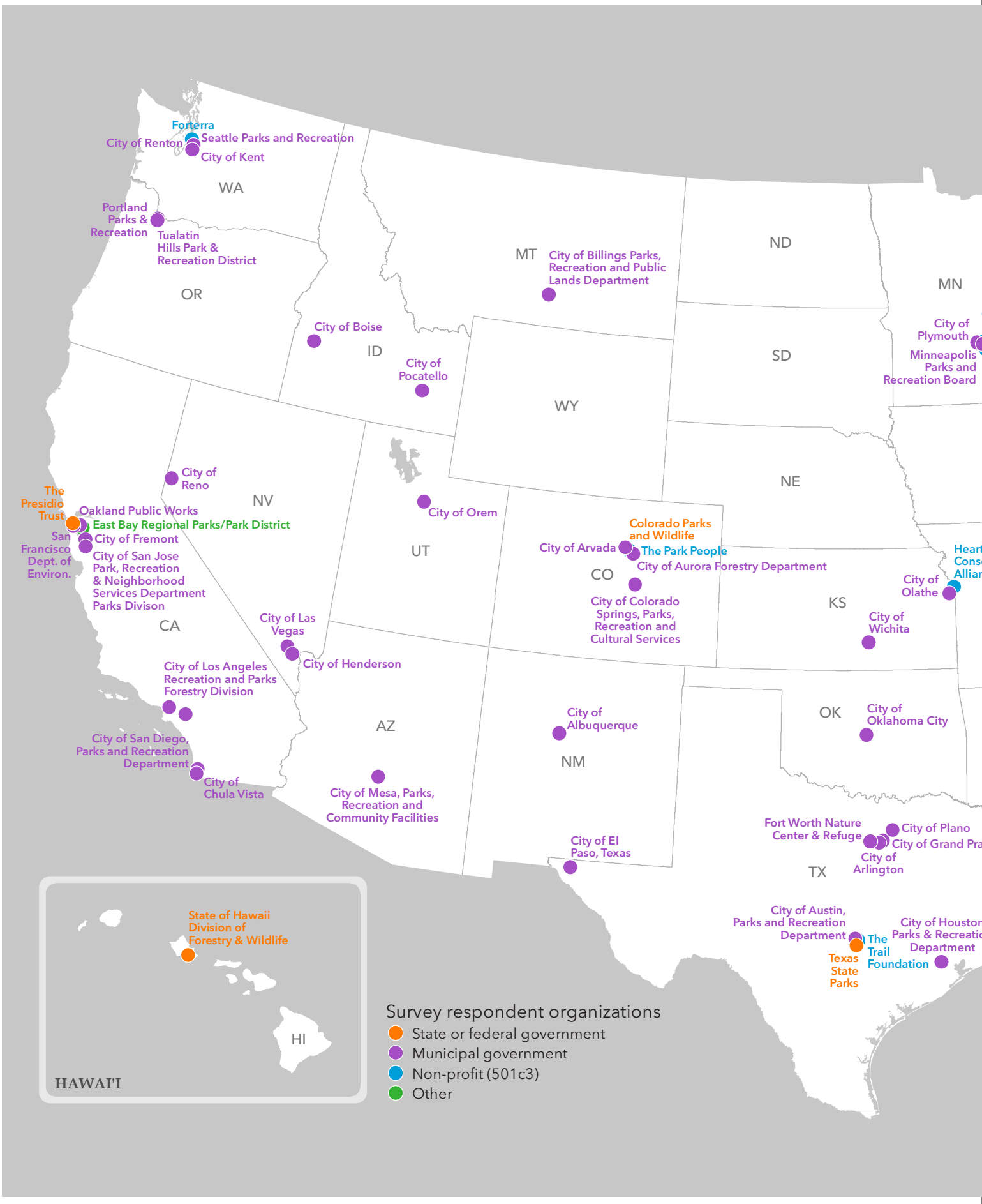
Participating Organizations

A total of 125 organizations completed the survey. All responses were collected using an online survey tool asking questions with multiple choice, open ended, and rating scale responses. The survey was conducted from April–June, 2018. Responses were solicited primarily by email. In this report, we have excluded incomplete results and results from organizations who do not work in forested natural areas. See the Appendix for a list of the organizations that completed the survey and excluded responses. One response per organization was collected.

The majority of our respondents were municipal agencies (66%), followed by non-profit organizations (16%), state or federal governments (8%), and the remaining 10% were from other types of organizations.

Volunteers in a forested natural area in Albuquerque, NM.
Photo by City of Albuquerque Open Space Division

Volunteers plant native trees in a city park in Seattle, WA.
Photo by Amy Scarfone


Forterra
City of Renton
Seattle Parks and Recreation
City of Kent
WA
Portland Parks & Recreation
Tualatin Hills Park & Recreation District
OR
MT
City of Billings Parks, Recreation and Public Lands Department
ND
MN
City of Boise
ID
City of Pocatello
SD
City of Plymouth
Minneapolis Parks and Recreation Board
WY
NE
City of Reno
NV
The Presidio Trust
Oakland Public Works
East Bay Regional Parks/Park District
San Francisco Dept. of Environ.
City of Fremont
City of San Jose Park, Recreation & Neighborhood Services Department Parks Divison
CA
City of Orem
UT
Colorado Parks and Wildlife
City of Arvada
The Park People
City of Aurora Forestry Department
CO
City of Colorado Springs, Parks, Recreation and Cultural Services
KS
City of Olathe
City of Wichita
City of Las Vegas
City of Henderson
City of Los Angeles Recreation and Parks Forestry Division
City of San Diego, Parks and Recreation Department
City of Chula Vista
AZ
City of Albuquerque
NM
City of Mesa, Parks, Recreation and Community Facilities
OK
City of Oklahoma City
City of El Paso, Texas
Fort Worth Nature Center & Refuge
City of Plano
City of Grand Pra
City of Arlington
TX
City of Austin, Parks and Recreation Department
The Trail Foundation
Texas State Parks
City of Houston Parks & Recreatio Department
State of Hawaii Division of Forestry & Wildlife
HI
HAWAI'I
Survey respondent organizations
State or federal government
Municipal government
Non-profit (501c3)
Other

125 organizations, in 111 cities, representing 40 states completed the first ever national survey of urban forested natural areas.

Do You Have a Guiding Statement?

The majority of respondents manage urban forested natural areas to enhance forest condition and quality of life for local residents.

76% of respondents have a guiding statement for the management of their forested natural areas. Statements focused on sustaining ecological health, providing environmental benefits, and the importance of forests to local communities. Of the 27 respondents that did not have a guiding statement, 24 were municipal agencies, meaning one out of three municipal agencies did not report a formal guiding statement.

Examples:

"... We seek to inspire people of all backgrounds to discover, explore, and cherish this place. We believe that by helping others to develop their personal relationships with the river, we will continue to cultivate dedicated advocates, stewards, and visitors of this park."
Mississippi Park Connection, Minneapolis, MN

"... Grow and sustain a healthy and resilient community forest to enrich the lives of our citizens and create a lasting, innovative and vibrant community for all to enjoy."
City of Boise, Boise, ID

"... Protect the natural and open spaces of northeastern Illinois and the surrounding region to ensure cleaner air and water, protect natural habitats and wildlife, and help balance and enrich our lives."
Openlands, Chicago, IL

"... Natural Resources Division enhances the ecological integrity of Cleveland Metroparks natural resources through adaptive ecosystem management based on sound, applied research and monitoring."
Cleveland MetroParks, Cleveland, OH

The most common words used in mission and vision statements.

Cheasty Greenspace, Seattle, WA.
Photo by Jim Avery

Do You Have a Plan that Informs Decision Making?

Half of all respondents had a management plan that informed where and how work is performed.

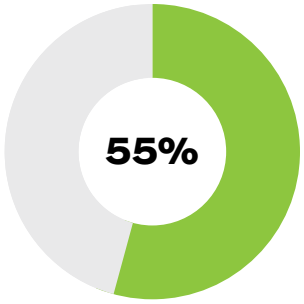
Summary of Management Plans

Management plans communicate the importance of a program or initiative, prioritize where and how to work, articulate budget decisions, and evaluate effectiveness. Municipal agencies are less likely than non-profit organizations to have a formal plan for managing urban forested natural areas.

Titles of Urban Forest Management Plans from Selected Cities

- Urban Forestry and Landscape Master Plan—Metropolitan Nashville (Nashville, TN 2016)
- Parkland Forest Management Framework—Philadelphia Parks & Recreation (Philadelphia, PA 2013)
- Community Forestry Strategic Management Plan—City of Boise (Boise, ID 2015)
- 20-year Strategic Plan—Green Seattle Partnership (Seattle, WA 2006)
- Bosque Action Plan: Rio Grande Valley State Park—City of Albuquerque Parks and General Services (Albuquerque NM, 1993)

Do you have a management plan for forested natural areas that influences decision making?



Before and after forest management in Seattle, WA.
Photo by Hannah Letinich

What Factors Guide Your Decision Making?

Conservation of native species, plant biodiversity, and public safety are the top factors that respondents consider when deciding where and how to work.

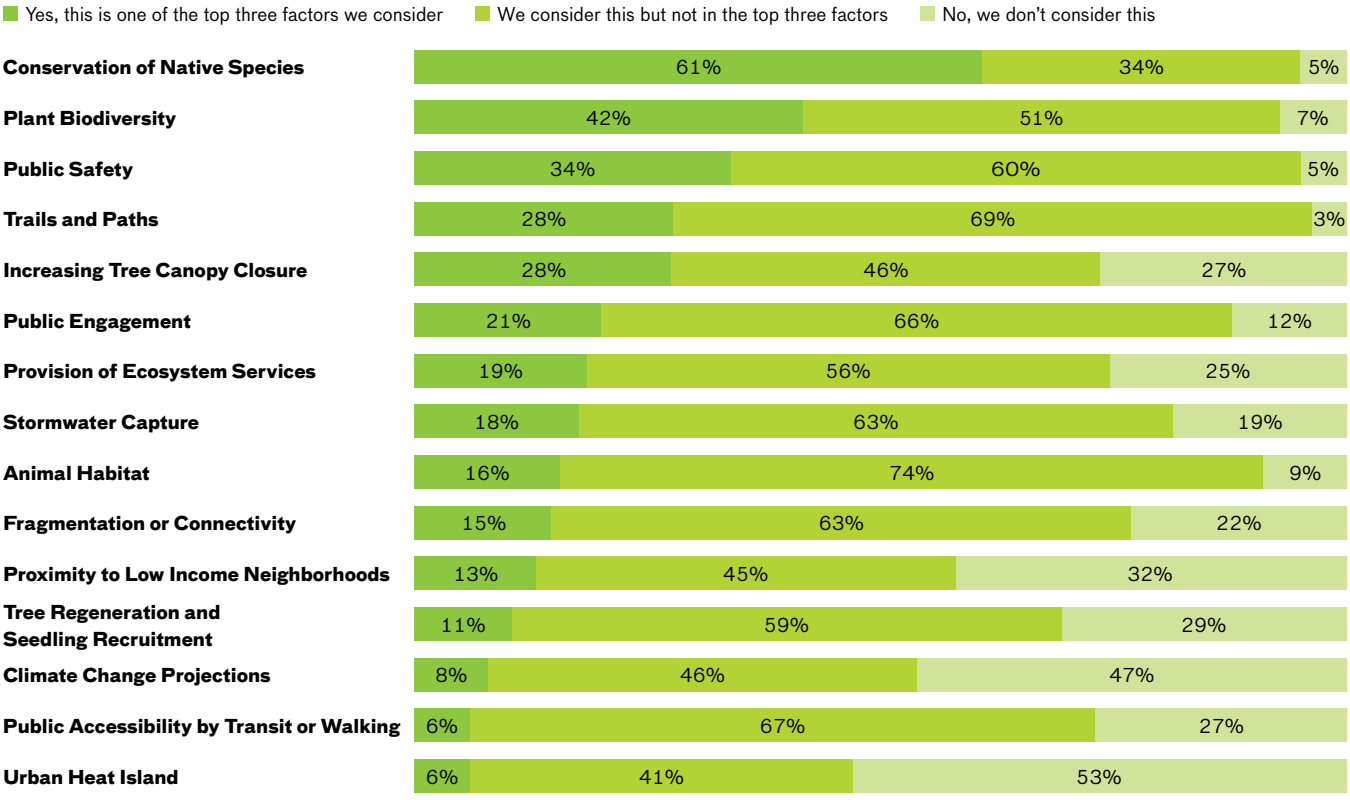
Summary of Factors Considered

Conservation of native species was the only factor to be considered in the top three factors by a majority of respondents (61%). Impacts of urban heat island, climate change projections, and proximity to low-income neighborhoods were the factors that were the least commonly considered by respondents overall.

Van Cortlandt Park, New York, NY.
Photo by Natural Areas Conservancy

What Factors Do You Consider in Decision Making?

The proportion of factors considered in decision making by responding organizations. Each organization ranked the importance of the factors and the top three factors are shown.



Reflections

- Native species support healthy forest functions, and their conservation in urban systems is paramount to the management and maintenance of forested natural areas.
- Given the stated importance of improving the quality of life for city residents, critical societal issues, including climate change and heat reduction, must be more broadly incorporated into decision making.
- Some organizations listed proximity to low income communities and climate change projections as primary factors. There may be opportunities to learn from organizations that focus on less commonly considered but still important issues, and how to incorporate them into the management of forested natural areas.

Student intern collecting data in New York, NY.
Photo by Natural Areas Conservancy

What Ecological and Social Information is Available and Used for Forest Management?

Most respondents use some ecological or social baseline data to inform decision making, but there is little consistency in the types and availability of information used.

Overview of the Types of Information Reported

- Maps of designated conservation areas, spatial maps of vegetation types, and high-resolution tree canopy maps provide information about where forested natural areas are located.
- Data about herbaceous and understory composition, tree seedling regeneration patterns, and forest structure and composition provide information about the type, trajectory, and quality of forested natural areas.
- Ecosystem service measures, including i-Tree, allow practitioners to evaluate the economic and societal benefits of forested natural areas.
- Pests, pathogens, and climate change projections are stressors that compromise the health and condition of the forest.
- Demographic and visitation data provide insight into how humans use forested natural areas.
- Proximity to public transit and perceptions of safety are factors that influence usership of forested natural areas.
- Rates of asthma and obesity can correlate with reduced access to nature, and should be considered when prioritizing human health and well being as a part of forest management.

High quality forest in Indianapolis, IN.
Photo by Indianapolis Department of Public Works, Engineering, Land Stewardship

Summary of Available Ecological Baseline Information

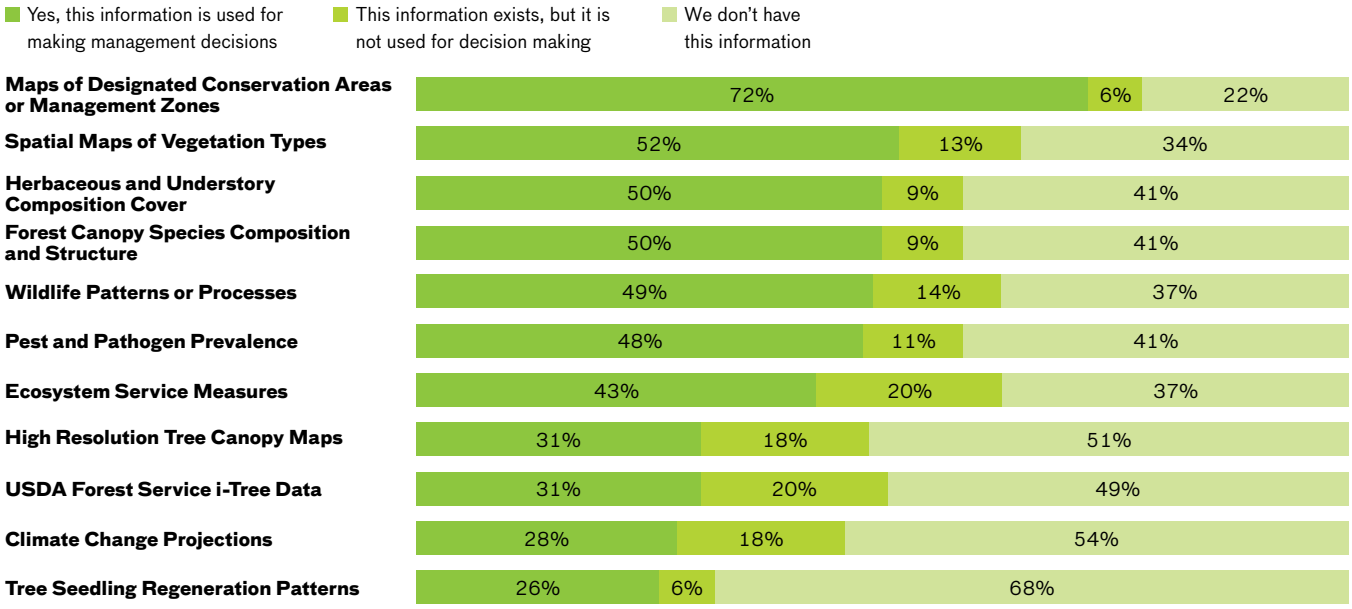
Maps of conservation zones are the most used and the most readily available type of data. The data that are least used and least available include tree seedling regeneration patterns and climate change projections. In some cases, data were available, but not used for decision making. For example, of the organizations that had access to climate change projection data, tree canopy maps, or USDA Forest Service i-Tree data, about 40% did not use them in decision making.

Reflections

- There is variation in the types of ecological data available, suggesting that, despite common goals, different types of data are used to inform management decisions in urban forested natural areas.
- Climate change and pests are top threats to the future health of forests, but less than half of respondents are using data to inform management of such threats.
- Organizations appear to be more likely to use information that is collected locally, such as management zones and species composition. Landscape-level datasets, such as i-Tree or high-resolution canopy maps, may not be intended for or easily applied to inform management.

Ecological Baseline

Proportion of respondents that have each type of ecological baseline data available and use them for decision making.



Fire-maintained sandhill community in the wildland urban interface in Jacksonville, FL.

Photo by Sarah Tobing

Summary of Social Information Available

In comparison to ecological data, social data are less commonly available and are less frequently used in prioritizing where and how to conduct management activities. Measures of human health and well-being are the least commonly available, and when available, are least used for decision-making.

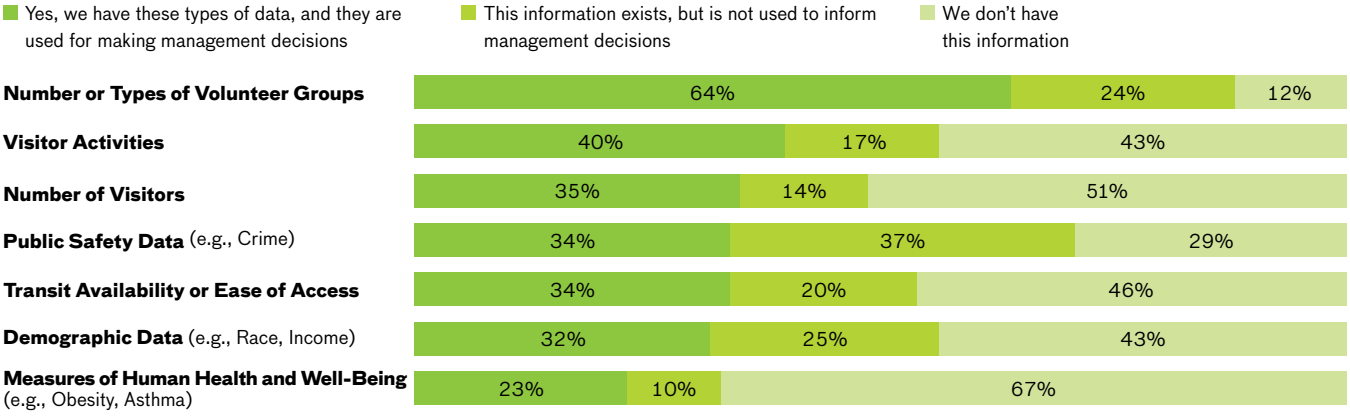
Public programming in Inwood Hill Park, New York, NY.
Photo by Natural Areas Conservancy

Reflections

- Volunteerism is the primary social metric used by decision makers. Volunteering has been linked to increased community cohesion and sense of place. However, data about volunteerism don't serve as a proxy for other forms of social engagement.
- Incorporating information about human health and community demographics would positively change how local urban forested natural areas management occurs, and could strengthen the relationship between local land managers and park users.
- The lack of available data on the number of visitors and visitor activities show an enormous opportunity to build new knowledge on how and why people are using (or not using) this resource.

Social Baseline

Proportion of respondents that have each type of social baseline data available and use them for decision making.

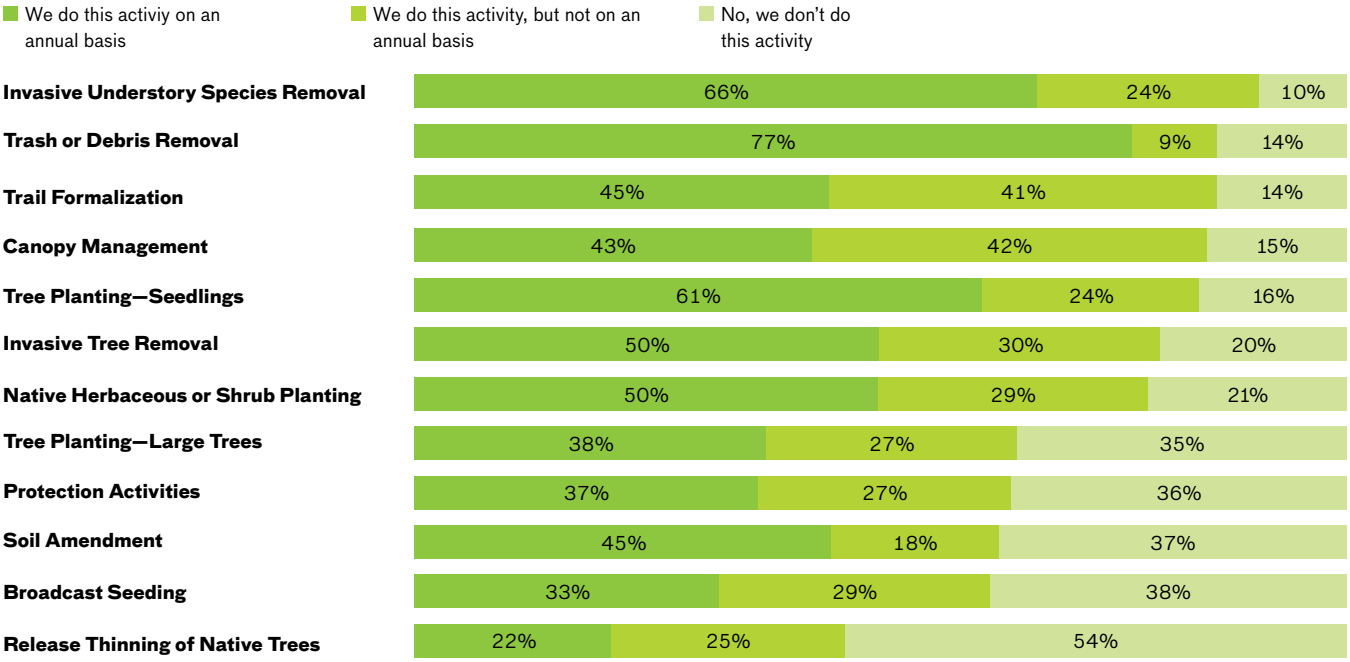


What Management Activities Do You Conduct?

The most commonly conducted management activity by respondents is invasive species removal.

Types and Frequency of Management Activities

Proportion of respondents that conduct each management activity



Summary of Management Activities

Approximately 70% of respondents have been managing forested natural areas for more than 20 years and 32% for more than 50 years. The majority (>90%) of respondents conduct at least 5 different types of management activities. Invasive understory species removal is practiced by 90% of respondents, and trash and debris removal is the most common type of annual activity. Release thinning of native trees, general conservation activities (e.g., fencing), and broadcast seeding are less commonly conducted management activities.

Reflections

- Cities would benefit from regularly updating and sharing best management practices for commonly conducted management activities.
- Both trash and invasive species are more significant problems in fragmented urban landscapes than in rural forests. Preventing and suppressing these threats in areas where they currently do not exist or exist with low severity could be an important long-term management strategy to ensure that interventions can lead to reductions in these threats over time.
- More practitioners should consider adapting silvicultural practices developed in rural forests, such as release thinning, to expand the toolbox of management interventions and support natural regeneration.

Do You Participate in Public Engagement?

Almost all organizations caring for urban forested natural areas engage the public as a part of their management program.

Summary of Public Engagement Activities

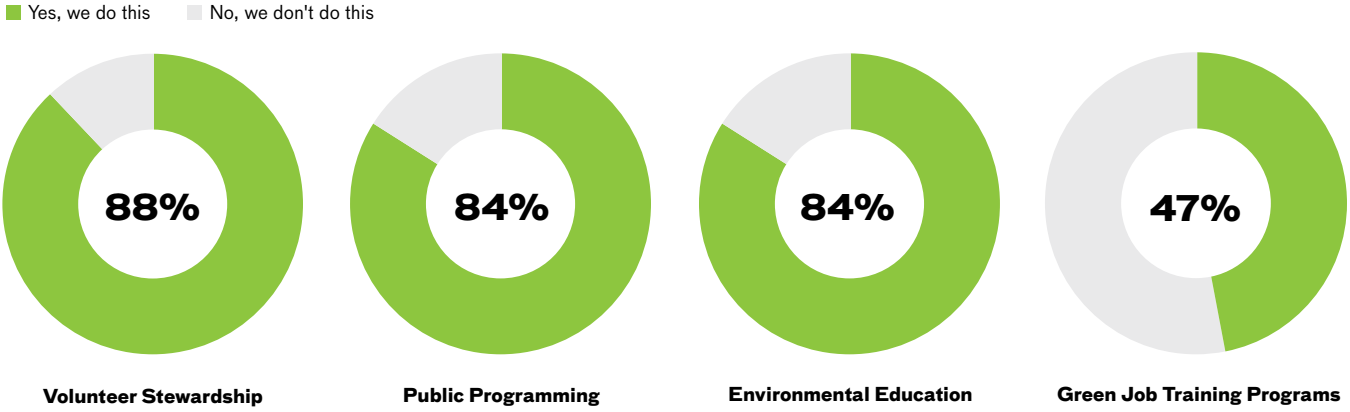
Volunteer stewardship, public programming, and environmental education are commonly conducted activities. However, less than half of respondents participated in green jobs training programs.

Reflections

- Organizations could benefit from peer-to-peer learning about the successes of each other's public engagement activities.
- Expanding green job training programs should be a priority. The opportunity to train future local conservationists and land managers within cities could have positive ecological, economic, and social benefits to the community.

Public Engagement Interventions

Proportion of respondents that conduct each form of public engagement



Communicating the need for public support for forest management in Seattle, WA.

Photo by Roger Hubsite

Do You Monitor Your Efforts?

Just over half of respondents reported using data on the success of their management interventions to inform decision making.

Summary of Specific Monitoring Activities

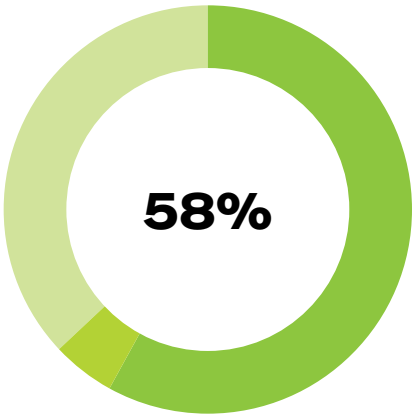
Monitoring data can show the success or failure of management interventions. 82% of respondents monitor their invasive species removal activities. Monitoring of trash and debris removal and tree seedling plantings are the second most monitored activities.

Reflections

- Almost all organizations reported collecting monitoring data for the management activities they conduct, but just over half of respondents listed using these types of data for decision making. There is an opportunity to strengthen and advance adaptive management, using monitoring results to inform future restoration and management efforts.
- There are a limited number of reports on the success of management interventions in peer-reviewed or publicly available literature. Local managers hold important data, but more synthesis and reporting on the effectiveness of management activities is needed.
- Combining and comparing common monitoring data across cities would make it easier to identify regional and national patterns and to advance best practices.

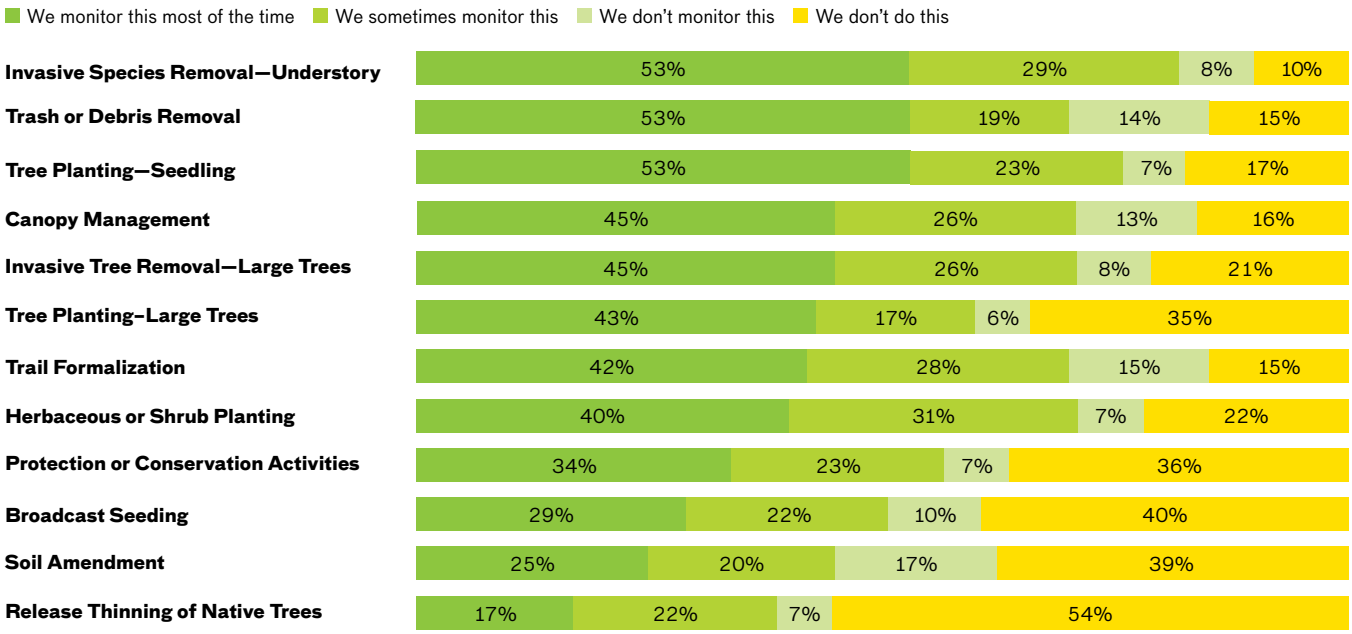
Success of Management Interventions

Proportion of respondents that use monitoring data to inform decision making generally



Monitoring Specific Activities

Proportion of respondents that monitor specific management activities



Before Management, Seattle, WA.
Photo by Lisa Cieko

After Management, Seattle, WA.
Photo by Lisa Cieko

How Do You Report Success?

The most commonly reported measure of success is acres of area managed. Few organizations report on forest condition.

Summary of Reporting Metrics

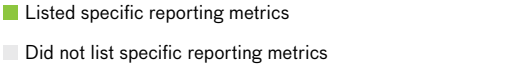
Over half of respondents (64%) report using metrics of success specific to the management of forested natural areas. Although the most common metric is the number of acres managed or maintained, less than half (47%) of organizations that list measures use this metric.

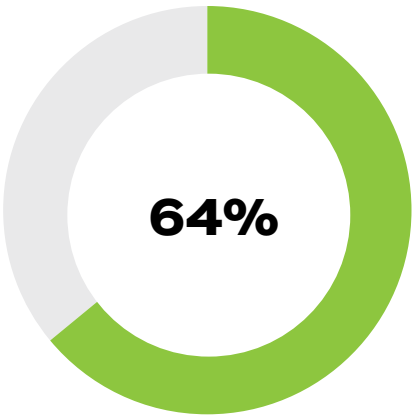
Reflections

- Although all organizations reported conducting management activities, only two thirds of organizations report having metrics to track their efforts This gap in reporting could be due to forest management activities not being well understood in the strategic planning of the organization.
- Reporting on the acres managed or maintained can encapsulate many types of management activities. However, some areas could require more intensive and/or repeated management over longer periods of time, which may not be evident in such reporting.
- In spite of being reported as top factors in decision making, few organizations report collecting measures of forest condition. Most cities are failing to document the impact of their efforts on changes in forest condition.

Does your organization have any reporting metrics specific to forested natural areas?

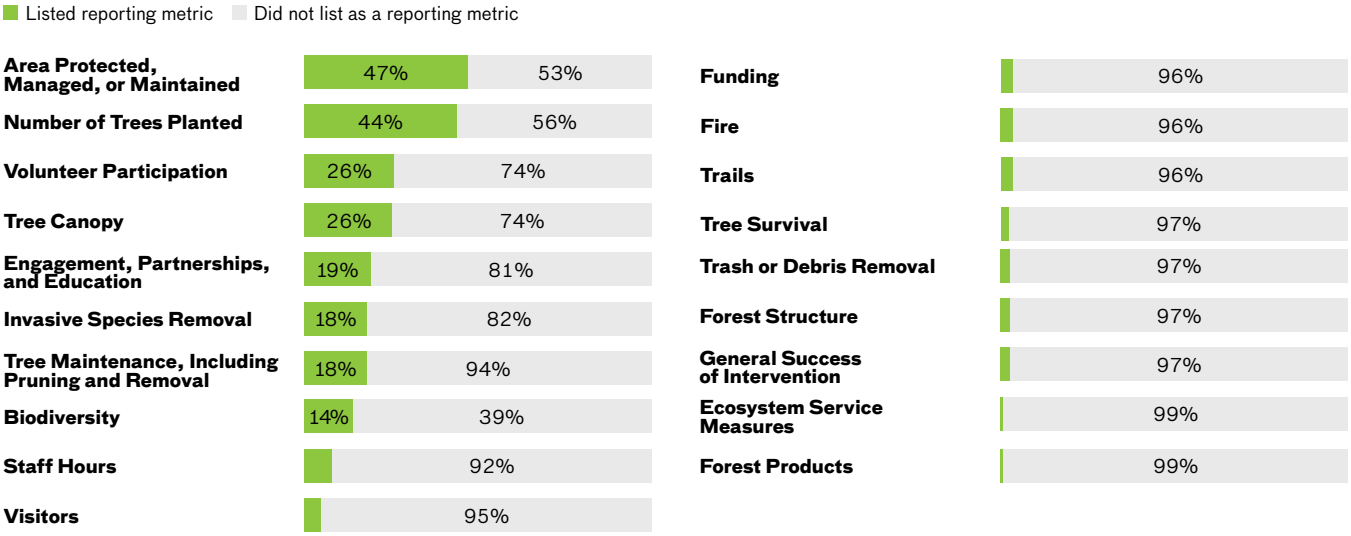
Proportion of respondents that listed each reporting metric





Reporting Metrics Listed

Proportion of respondents that use various reporting metrics



Are You Measuring Change in Forest Condition Over Time?

Measures of change over time show the trajectory and rate at which a forest is changing. Most organizations do not have long-term monitoring data that are used to inform decision making.

Summary of Measures of Change Over Time

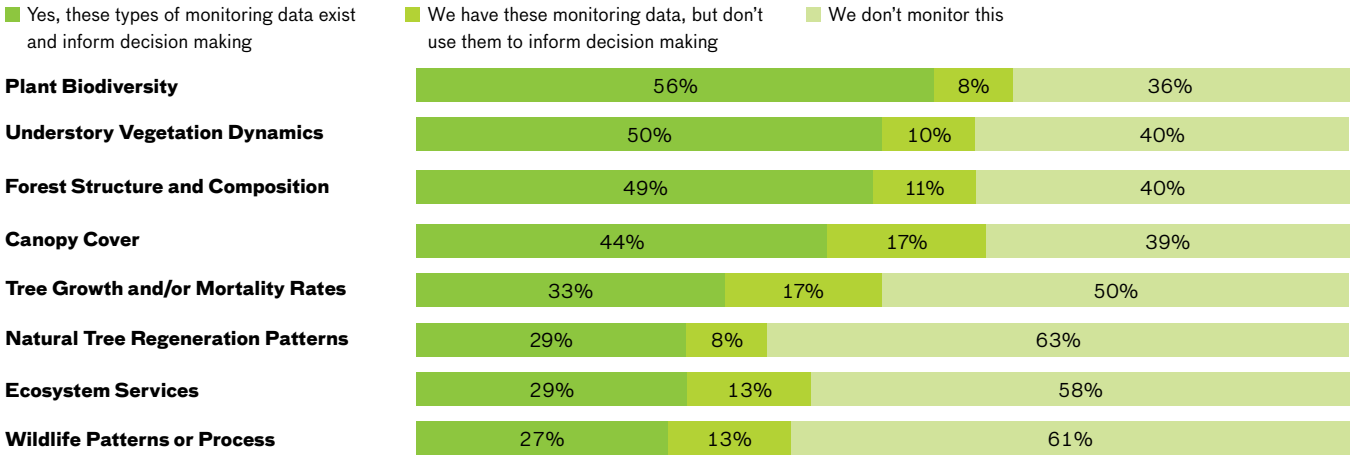
Knowing how a forest is changing over time provides important information on threats and how to best manage for the future. Approximately half of all respondents reported making decisions based on at least one type of the following long-term vegetation monitoring metrics: plant biodiversity (56%), understory vegetation dynamics (50%), or forest structure and composition (49%). Tree regeneration, ecosystem services, and wildlife patterns were the least common types of data used for decision making. Of the respondents that reported having access to long term measures of change for tree canopy and tree growth, approximately 30% did not use it to inform decision making.

Reflections

- Forests are comprised of long-lived species and canopy trees are replaced slowly, meaning that threats can go undetected until the impacts are pronounced. Early detection requires long-term monitoring, which can lead to timely interventions that prevent costly and slow-to-recover degradation.
- There is an opportunity to use these data to identify common trajectories and drivers of change across cities. This information would facilitate a more nuanced approach to prioritizing the type of management interventions that practitioners employ.

Monitoring Change Over Time

Proportion of respondents that had these types of data on change



What Are the Most Important Challenges in the Management of Urban Forested Natural Areas?

Limited staff, lack of financial resources, and invasive species are the primary challenges reported to achieving healthy forests in cities.

Summary of Challenges

We asked organizations to list the importance of the organizational and ecological challenges they face in their management of forested natural areas. The top organizational challenge is limited funding or staff. 94% of respondents listed resource constraints as important or very important. Limited data was ranked the next most important organizational challenge, with 77% of organizations listing it as important or very important to achieving their goals. Uncertainty in management approach was considered to be the least important of the listed challenges, yet 56% of all respondents still considered it important or very important.

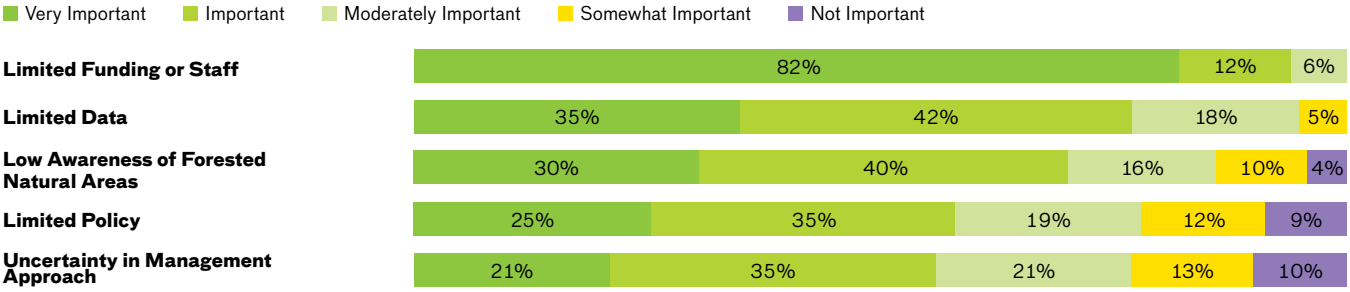
Invasive species were ranked as the most important ecological challenge to achieving healthy forests, with 94% of respondents listing them as very important or important. All other ecological factors were similar in how organizations ranked their importance, with more than 60% of respondents ranking them very important or important.

Reflections

- Ten percent or less of all organizations reported that any given challenge was not important. This demonstrates that practitioners face overlapping challenges, and it is likely that these challenges interact with one another.
- Invasive species are common in cities, and their negative impacts are especially pertinent to the conservation of native species. While eradication may not always be possible, a clear priority is finding the most effective ways to limit their spread.
- The organizations that manage urban forested natural areas need more engaging and powerful ways to communicate the value of their work. Raising awareness can lead to increased resources and more effective management.
- 77% of respondents claim limited data is an important challenge. Closing this gap and advancing programs requires learning what datasets would be most useful but don't exist, and what local datasets exist but need application tools. Decision makers and practitioners must be directly involved with the production of datasets to ensure they are useful.

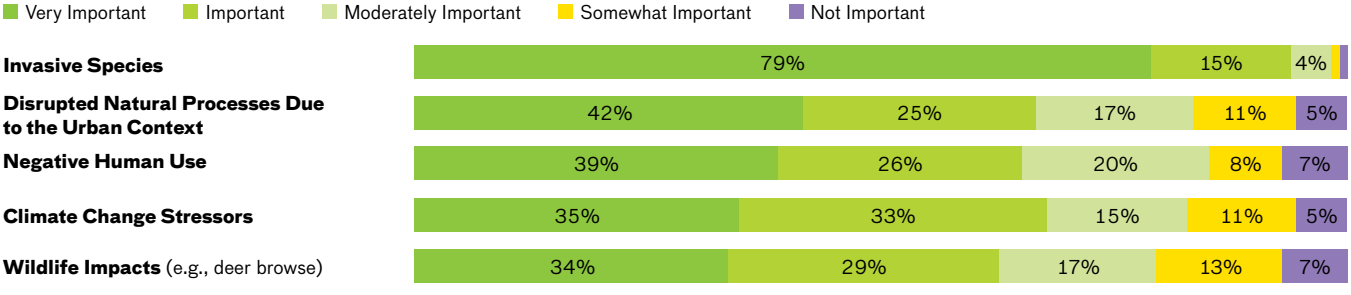
Organizational Challenges

The relative importance rank of organizational challenges reported by participating organizations.



Ecological Challenges

The relative importance of ecological challenges reported by participating organizations.



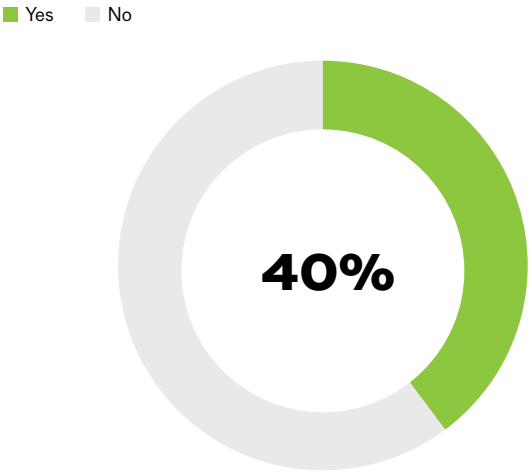
Are You Part of a Regional or National Network?

Formal networks for urban forested natural areas are not common. However, shared challenges and management strategies highlight an opportunity to raise awareness and broaden communication between decision makers across local, regional, and national scales.

Summary of Networks

Less than half (40%) of organizations listed being part of a regional or national network focused on the management of urban forested natural areas. Of the networks listed, the majority were regional, with little overlap between cities; no network was listed more than twice.

Is your organization part of a regional or national network that focuses on management of forested natural areas?



Reflections

- Collaborations and informal networks support best practices at local scales, but opportunities to share findings across organizations or cities are not evident.
- Sharing information across regional or national networks is time intensive. Doing so should carry clear incentives, such as improved management practices and increased funding. Existing organizations that work nationally could play a role in facilitating communication between regions and municipalities.
- Local organizations hold a lot of information, including monitoring and best practices. Leveraging this information in an effective way could help strengthen local, regional, and even global conservation efforts.
- Given the increase in national and global attention on sustaining urban greenspace and planting trees, it is critical that the knowledge cities already have on managing and sustaining urban forests is communicated to help inform large-scale and long-term programs and to help cultivate networks.

Who Do You Work With?

Strong local partnerships exist, and the key roles that organizations play shift for management and monitoring activities.

Summary of Partners in Management

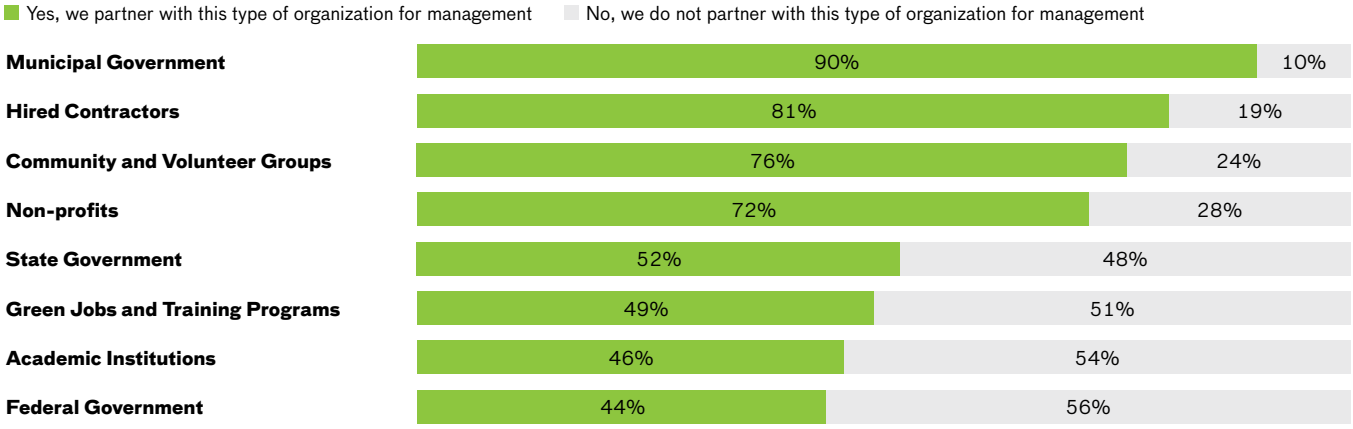
The most common partners in management were municipal governments, followed by hired contractors and community volunteer groups. The federal government was the least common partner for management.

Summary of Partners in Monitoring

Working with other organizations to monitor the forest was less common than management partnership. The most common partners for implementing monitoring were non-profit groups, followed by academic institutions and volunteer community groups. The federal government and green jobs and training programs were the least common partners for conducting monitoring.

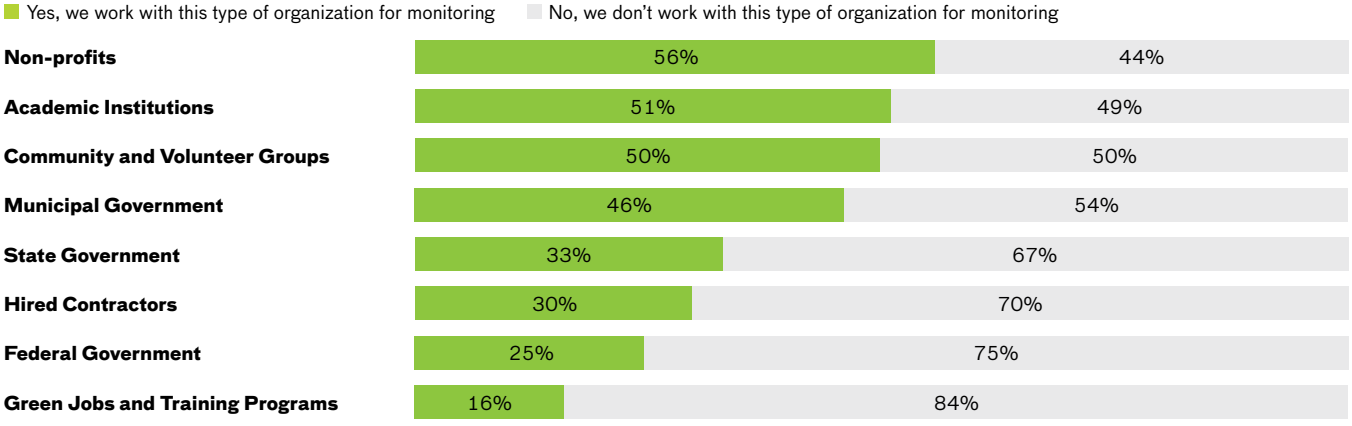
Management

Proportion of respondents that reported working with partners in each type of organization to manage their urban forested natural areas.



Monitoring

Proportion of organizations that reported working with partners of each organization to conduct monitoring in forested natural areas.



Reflections

- Municipal governments are the primary land owners and governing bodies of forested natural areas. Partnerships that can expand local government expertise and resources are critical to managing urban forested natural areas sustainably.

- Non-governmental organizations play an important role in monitoring. Public-private partnerships can provide accountability and insight into the effectiveness of municipal management efforts.

- The federal government is not a common partner for monitoring or management. There is an opportunity for federal agencies that work in similar types of forests in rural areas to provide guidance or oversight across many cities.

- Not all organizations are the same, and they do not share or need the same types of partnerships. The majority of our respondents were municipal governments (66%) or non-profit groups (16%), and the types of organizations and their priorities will play a key role in how and why they engage with other organizations.

Mechanical equipment used to manage forested natural areas.

Photo by Indianapolis Department of Public Works, Engineering, Land Stewardship

Student interns walking to collect data in a city park, New York, NY.

Photo by Natural Areas Conservancy

Appendix

Riverdale Park, New York, NY.
Photo by Natural Areas Conservancy

Appendix

Survey Respondents

State	City	Organization	Type of Organization	Department Specific to the Management of Forested Natural Areas	Title of Survey Respondant	Response Included in Summary Results	What is the Largest Scale Your Organization Works?
AL	Montgomery	City of Montgomery	Municipal Government	Urban Forestry	Urban Forester	TRUE	We work across an entire city.
AZ	Mesa	City of Mesa, Parks, Recreation and Community Facilities	Municipal Government	None Listed	ASA III	FALSE	We work across an entire city.
CA	Chino Hills	City of Chino Hills	Municipal Government	Public Works	Landscape Inspector II	TRUE	We work across an entire city.
CA	Fremont	City of Fremont	Municipal Government	Community Services / Parks Division	Parks Superintendent	TRUE	We work across an entire city.
CA	San Francisco	The Presidio Trust	State or Federal Government	Landscape Stewardship: Forestry Program	Forest Manager	TRUE	We work in a single park or property.
CA	San Diego	City of San Diego, Parks and Recreation Department	Municipal Government	We have multiple Departments	Deputy Director	TRUE	We work across an entire city.
CA	Oakland	Oakland Public Works	Municipal Government	Parks and Tree Services	Tree Supervisor II	TRUE	We work across an entire city.
CA	Chula Vista	City of Chula Vista	Municipal Government	Urban Forestry and Open Space Division	City Forester & Open Space Manager	FALSE	We work across an entire city.
CA	Oakland	East Bay Regional Park District	Other	Fire Department, Stewardship	Resource Analyst/ Ecologist	TRUE	We work in multiple cities in different metro regions.
CO	Aurora	City of Aurora Forestry Department	Municipal Government	Parks/Forestry; Parks / Open Space	Forestry Superintendent	TRUE	We work across an entire city.
CO	Arvada	City of Arvada	Municipal Government	Parks / Forestry Open Space	City Forester and Open Space Manager	TRUE	We work across an entire city.
CO	Colorado Springs	City of Colorado Springs, Parks, Recreation and Cultural Services	Municipal Government	City Forestry	Interim City Forester	TRUE	We work across an entire city.
CO	Denver	The Park People	Non-Profit	None listed	Executive Director	FALSE	We work across an entire city.
CO	Denver	Colorado Parks and Wildlife	State or Federal Government	None listed	Forest Management Coordinator	TRUE	We work in multiple parks/ properties.
CT	Greenwich	Greenwich Land Trust	Non-Profit	None listed	Conservation and Outreach Director	TRUE	We work in multiple parks/ properties.
CT	Monroe	Town of Monroe	Municipal Government	None listed	Ranger and Tree Warden	TRUE	We work across an entire city.
CT	New Haven	City of New Haven, New Haven Parks	Municipal Government	None listed	Park Rangger	FALSE	We work across an entire city.
CT	New Haven	Regional Water Authority	Other	Real Estate/Forestry	Real Estate Manager	TRUE	Other
DC	Washington	D.C. Department of Energy & Environment	State or Federal Government	Natural Resources Administration	Tree Policy Coordinator	TRUE	We work across an entire city.
FL	St. Petersburg	The City of St. Petersburg	Municipal Government	Parks and Recreation	Natural and Cultural Areas Manager	TRUE	We work across an entire city.
FL	Tampa	City of Tampa—Parks and Recreation	Municipal Government	P&R Urban Forestry Division	Urban Forestry Manager	TRUE	We work across an entire city.

State	City	Organization	Type of Organization	Department Specific to the Management of Forested Natural Areas	Title of Survey Respondant	Response Included in Summary Results	What is the Largest Scale Your Organization Works?
FL	Miami	City of Miami Parks and Recreation Department	Municipal Government	Natural Areas	Park Naturalist	TRUE	We work across an entire city.
FL	Miami	Miami-Dade County	Other	Environmentally Endangered Lands Program	Environmental Resources Project Supevisor	TRUE	We work in multiple cities in different metro regions.
FL	Palatka	St. Johns River Water Management District	State Or Federal Government	Land Resources	Land Resource Specialist	TRUE	We work in multiple cities in different metro regions.
GA	Atlanta	Trees Atlanta	Non-Profit	Forest Restoration	Forest Restoration Manager	TRUE	We work across many cities within one metro region.
GA	Gwinnett County	Gwinnett County Parks and Recreation	Municipal Government	Natural and Cultural Resource Management	Deputy Department Director	TRUE	We work in multiple parks/ properties.
HI	Honolulu	State of Hawaii Division of Forestry & Wildlife	State Or Federal Government	DOFAW,vas above	Hawaii Urban & community forester	TRUE	Other
ID	Boise	City of Boise	Municipal Government	Community Forestry - Parks & Recreation	City Forester	TRUE	We work across an entire city.
ID	Pocatello	City of Pocatello	Municipal Government	Parks (street trees/parks); Environmental: Some Natural Areas; Streets: Natural Areas That Take Stormwater	Science & Environment Division Manager	TRUE	We work across an entire city.
IL	Chicago	Openlands	Non-Profit	Land Preservation	Restoration Ecologist	TRUE	We work across many cities within one metro region.
IL	40+ municipalities in Cook County	The Forest Preserves of Cook County	Municipal Government	Resource Management	Resource Specialist	TRUE	We work across many cities within one metro region.
IL	Chicago	Chicago Park District	Municipal Government	Natural Resources	Assistant Director of Landscape - Natural Areas	TRUE	We work across an entire city.
IL	Lisle	The Morton Arboretum	Non-Profit	Natural Resources	Forest Pest Outreach Coordinator	TRUE	We work in a single park or property.
IN	Indianapolis	Indianapolis Department of Public Works, Engineering, Land Stewardship (and Department of Parks and Recreation)	Municipal Government	DPW Engineering, Land Stewardship	Senior ecologist	TRUE	We work across an entire city.
KS	Wichita	City of Wichita	Municipal Government	Park and Recreation Department/Forestry Section	City Arborist	TRUE	We work across an entire city.
KS	Olathe	City of Olathe	Municipal Government	Park & Recreation / Parks & Grounds	City Arborist	TRUE	We work across an entire city.
KY	Louisville	Louisville Parks and Recreation	Municipal Government	Natural Areas Division	Parks Administrator	TRUE	We work in multiple parks/ properties.
LA	New Orleans	Audubon Nature Institute, Audubon Louisiana Nature Center, Freeport McMoRan-Audubon Species Survival Center, and Audubon Wilderness Park.	Non-Profit	Trees Department	Operations Project Manager	TRUE	We work across an entire city.

State	City	Organization	Type of Organization	Department Specific to the Management of Forested Natural Areas	Title of Survey Respondant	Response Included in Summary Results	What is the Largest Scale Your Organization Works?
LA	New Orleans	The Dept. of Parks and Parkways, City of New Orleans	Municipal Government	Dept. of Parks and Parkways	Planner	TRUE	We work across an entire city.
LA	Louisiana	Louisiana Department of Wildlife and Fisheries	State Or Federal Government	Louisiana Natural Heritage Program Natural Areas Registry	Biologist Program Manager	TRUE	We work in multiple cities in different metro regions.
MA	Boston	Rose Kennedy Greenway Conservancy	Non-Profit	None listed	Director of Horticulture	FALSE	We work in a single park or property.
MA	Brockton	City of Brockton	Municipal Government	None listed	Specialized Secretary	TRUE	We work in a single park or property.
MD	Bowie	City of Bowie	Municipal Government	Parks & Grounds	Community Forester	TRUE	We work across an entire city.
MD	Baltimore City	Baltimore City Recreation and Parks	Municipal Government	Urban Forestry—Integrated Vegetation Management Unit	Ecological Conservation Specialist	TRUE	We work across an entire city.
MD	Baltimore	Baltimore City Department of Recreation and Parks	Municipal Government	BCRP—Parks Division and Urban Forestry	TreeBaltimore	TRUE	We work across an entire city.
MD	Baltimore	Baltimore City Department of Recreation and Parks.	Municipal Government	TreeBaltimore	Urban and Community Forester	TRUE	We work across an entire city.
MD	Frederick	The City of Frederick	Municipal Government	Sustainability/Dept of Public Works	Sustainability Manager	TRUE	We work at a watershed scale.
ME	Portland	Maine Department of Agruculture, Conservation,and Forestry—Maine Forest Service	State Or Federal Government	Forest Policy and Management	Urban Forestry Program Coordinator	TRUE	We work in multiple cities in different metro regions.
MI	Ann Arbor	Legacy Land Conservancy	Non-Profit	Stewardship Department	Land Steward	TRUE	We work in multiple parks/ properties.
MI	Novi	City of Novi	Municipal Government	Public Services/Forestry	Forestry Asset Manager	TRUE	We work across an entire city.
MN	Plymouth	City of Plymouth	Municipal Government	Park Maintenance & Forestry	City Forester	TRUE	We work across an entire city.
MN	St Paul	Great River Greening	Non-Profit	None listed	Project Manager / Ecologist	TRUE	We work in multiple cities in different metro regions.
MN	Minneapolis	Minneapolis Parks and Recreation Board	Municipal Government	Environmental Management	Assistant Superintendent for Environmental Stewardship	TRUE	We work at a watershed scale.
MN	Minneapolis	Mississippi Park Connection and the National Park Service	Non-Profit	Volunteer Habitat Restoration Team	Environmental Stewardship and Volunteer Manager	TRUE	We work in multiple cities in different metro regions.
MO	St. Peters	City of St. Peters	Municipal Government	None listed	ROW Forestry Foreman	TRUE	We work across an entire city.
MO	Kansas City	Heartland Conservation Alliance	Non-Profit	Conservation Program and Education & Outreach Program	Project Manager	TRUE	We work at a watershed scale.
MO	St. Louis	Forest Park Forever, Inc.	State or Federal Government	Louisiana Natural Heritage Program Natural Areas Registry	Biologist Program Manager	TRUE	We work in multiple cities in different metro regions.

State	City	Organization	Type of Organization	Department Specific to the Management of Forested Natural Areas	Title of Survey Respondant	Response Included in Summary Results	What is the Largest Scale Your Organization Works?
MT	Billings	City of Billings Parks, Recreation and Public Lands Department	Municipal Government	PRPL Department / Forestry Division	City Forester/ Natural Resources Supervisor	TRUE	We work across an entire city.
NC	Raleigh	City of Raleigh North Carolina	Municipal Government	Multiple Departments	Urban Forester	TRUE	We work across an entire city.
NH	Nashua	The City of Nashua	Municipal Government	DPW Parks and Recreation	Park & Rec Suoerintendent / Tree Warden	TRUE	We work across an entire city.
NJ	City of Plainfield	The City of Plainfield, New Jersey	Municipal Government	Parks & Grounds	Community Forester	TRUE	We work across an entire city.
NJ	Mount Laurel	Hickory Knoll Homeowner Association	Other	Private Landscaping Company	Mrs.	TRUE	We work at a watershed scale.
NJ	Long Branch	City of Long Branch, Monmouth County, NJ	Municipal Government	None listed	Parks Supervisor	TRUE	We work across an entire city.
NJ	Morristown	Morristown Shade Tree Commission	Other	Town Arborist	Chairperson Morristown STC	TRUE	We work across an entire city.
NJ	Jersey City	Liberty State Park	State or Federal Government	Nature Center and Maintenance	Resource Interpretive Specialist	TRUE	We work in a single park or property.
NJ	Hamilton NJ	Hamilton Township, Mercer County	Municipal Government	Plannign and DPW	Township Planner	TRUE	We work across an entire city.
NJ	Chester Twp	Gracie & Harrigan Consulting Foresters, Inc.	Other	None listed	Senior Associate	TRUE	We work across many cities within one metro region.
NJ	Woodbine	Borough of Woodbine	Municipal Government	None listed	Mayor	TRUE	We work across an entire city.
NJ	Multiple	• NJ Department of Environmental Protection • NJ Forest Service • Urban and Community Forestry Program	State or Federal Government	We do not actively mangae natural forest area	Urban and Community Forestry Coordinator	TRUE	Other
NJ	Edgewater Park Twp	Edgewater Park Enviornmental Advisory Shade Tree Committee	Municipal Government	None listed	Former Chairwoman, Shade Tree Committee	FALSE	We work across an entire city.
NM	Albuquerque	City of Albuquerque	Municipal Government	Open Space Division	Forestry Supervisor	TRUE	We work across an entire city.
NV	Henderson	City of Henderson	Municipal Government	Public Works	Municipal Forester	FALSE	We work in multiple parks/ properties.
NV	Reno	City of Reno	Municipal Government	Parks and Urban Forestry	Urban Forester	TRUE	We work across an entire city.
NV	Las Vegas	City of Las Vegas	Municipal Government	Operations and Maintenance	Urban Forester	TRUE	We work across an entire city.
NY	Buffalo	Erie County Parks, Recreation & Forestry	Municipal Government	None listed	Erie County Forester	TRUE	We work across many cities within one metro region.

State	City	Organization	Type of Organization	Department Specific to the Management of Forested Natural Areas	Title of Survey Respondant	Response Included in Summary Results	What is the Largest Scale Your Organization Works?
NY	New York City/ Woodhaven	NYC Parks and The Forest Park Trust, Inc.	Other	Landscpe Crew	Landscape Projects Coordinator, Forest & Highland Parks	TRUE	We work in multiple parks/ properties.
NY	New York City	New York Restoration Project	Non-Profit	Operations	Director, Northern Manhattan Parks	TRUE	We work across an entire city.
NY	New York City/ Bronx	The New York Botanical Garden	Non-Profit	Horticulture	Director of the Thain Family Forest	TRUE	We work in a single park or property.
NY	Yonkers	City of Yonkers	Municipal Government	shade tree	city arborist	TRUE	We work across an entire city.
NY	New York City	New York City Department of Parks & Recreation	Municipal Government	Natural Resources Group/ Forestry, Horticulture and Natural Resources	Senior Manager for Restoration Field Operations	TRUE	We work across an entire city.
NY	Syracuse	Syracuse Department of Parks	Municipal Government	Forestry Division	City Arborist	TRUE	We work across an entire city.
NY	New York City/ Staten Island	New York City Parks & Staten Island Greenbelt	Municipal Government	GNRT	Director of Natural Resources	TRUE	We work in multiple parks/ properties.
OH	Zanesville	Muskingum Valley Park District	Other	None listed	Executive Director	TRUE	Other
OH	Columbus	Columbus & Franklin County Metro Parks	Municipal Government	Resource Management	Restoration Ecologist	TRUE	We work in multiple cities in different metro regions.
OH	Youngstown	City of Youngstown Parks and Recreation	Municipal Government	None listed	Director	FALSE	We work across an entire city.
OH	Chillicothe	The City of Chillicothe Parks and Recreation Department and Tree Commission	Municipal Government	None listed	Parks and Recreation Director city of Chillicothe	FALSE	We work across an entire city.
OH	Columbus	City of Columbus, Maintenance department, Forestry Section	Municipal Government	Forestry Section	City Forester	TRUE	We work across an entire city.
OH	Cleveland	Cleveland Metroparks, Natural Resources & Forestry Divisions	Other	Natural Resources (Natural Areas) & Forestry (Urban/"Park') Divisions (2)	Director, Natural Resources Division	TRUE	Other
OH	Toledo	Metroparks Toledo	Other	Natural Resources	Director of Natural Resources	TRUE	We work across many cities within one metro region.
OH	Cincinnati	Cincinnati Park Board	Municipal Government	Natural Resource Management Section	Natural Resource Manager	TRUE	We work across an entire city.
OH	Springfield	City of Springfield	Municipal Government	City Forestry	Forestry Supervisor	TRUE	We work across an entire city.
OK	Oklahoma City	City of Oklahoma City	Municipal Government	Parks and Recreation	Unit Operations Supervisor	TRUE	We work across an entire city.
OR	Beaverton	Tualatin Hills Park & Recreation District	Municipal government	Nature & Trails Department	Superintendent of Natural Resources	TRUE	We work across an entire city.

State	City	Organization	Type of Organization	Department Specific to the Management of Forested Natural Areas	Title of Survey Respondant	Response Included in Summary Results	What is the Largest Scale Your Organization Works?
PA	Pittsburgh	Tree Pittsburgh	Non-profit	Tree Care and Reforestation	Director of Tree Care and Reforestation	TRUE	We work across an entire city.
PA	Philadelphia	Fairmount Park Conservancy	Non-profit	None listed	Project Manager	TRUE	We work at a watershed scale.
TN	Nashville	Metro Government of Nashville and Davidson Co.	Municipal government	Greenways	Urban Forestry Program Manager	TRUE	Other
TX	Grand Prairie	City of Grand Prairie	Municipal government	Parks, Arts and Recreation	Horticulturist/ Arborist	TRUE	We work across an entire city.
TX	Plano	City of Plano	Other	Private Landscaping Company	Mrs.	TRUE	We work at a watershed scale.
TX	Austin	The Trail Foundation	Non-profit	None listed	Project and Creative Director	TRUE	We work in multiple parks/ properties.
TX	El Paso	City of El Paso	Municipal government	None listed	City Arborist	FALSE	We work across an entire city.
TX	Arlington	City of Arlington	Municipal government	Forestry and Beautification Division	Forester	TRUE	We work across an entire city.
TX	Austin	Texas State Parks	State or federal government	None listed	Special Assistant to State Parks Director	TRUE	Other
TX	Austin	City of Austin, Parks and Recreation Department, Urban Forestry unit	Municipal government	Natural Resources Division	Horticulturist Supervisor	TRUE	We work across an entire city.
TX	Fort Worth	Fort Worth Nature Center & Refuge	Municipal government	Fort Worth Nature Center & Refuge	Natural Resource Specialist	TRUE	We work in a single park or property.
TX	Houston	City of Houston Parks & Recreation Department	Municipal government	Greenspace Management	Natural Resources Manager	TRUE	We work across an entire city.
UT	Orem	City of Orem	Municipal government	None listed	Urban Forester	FALSE	We work in multiple parks/ properties.
VA	Roanoke	City of Roanoke Parks Division	Municipal government	Parks and Recreation/ Parks Division/Urban Forestry Section	Parks Manager	TRUE	We work across an entire city.
VA	Onancock	Onancock Tree Board	Municipal government	None listed	Chairman, Onancock Tree Board	FALSE	We work across an entire city.
VA	Newport News	Newport News Green Foundation	Non-profit	None listed	Executive Director	TRUE	We work across an entire city.
VA	Arlington	Arlington County	Municipal government	Parks and Natural Resources	Urban Forest Manager	TRUE	We work across an entire city.
VA	Lexington	City of Lexington, Public Works Department	Municipal government	Public Works	City Arborist	TRUE	We work across an entire city.
VA	Charlottesville	The City of Charlottesville Parks and Rec.	Municipal government	Parks Dvision	Urban Forester	TRUE	Other
VA	Reston	Reston Association	Other	Parks and Rec. Dept/ Natural Areas	Sr. Environmental Resource Manager	TRUE	We work in multiple parks/ properties.

State	City	Organization	Type of Organization	Department Specific to the Management of Forested Natural Areas	Title of Survey Respondant	Response Included in Summary Results	What is the Largest Scale Your Organization Works?
WA	Renton	City of Renton Washington/ Community Services Department/Parks Planning and Natural Resources Division/ Urban Forestry Program	Municipal government	Community Services/ Parks Planning and Natural Resources	Urban Forestry and Natural Resources Manager	TRUE	We work across an entire city.
WA	Seattle	Forterra, Green Seattle Partnership	Non-profit	Green Cities	Stewardship Associate	TRUE	We work in multiple cities in different metro regions.
WA	Seattle	Seattle Parks and Recreation, Green Seattle Partnership	Municipal government	Natural Resource Unit	Plant Ecologist	TRUE	We work across an entire city.
WA	Kent	City of Kent	Municipal government	Kent Parks Department	MTC Supervisor	TRUE	We work across an entire city.
WI	Milwaukee County	Milwaukee County Parks	Municipal government	Natural Areas Program	Natural Areas Coordinator	TRUE	We work across many cities within one metro region.
WI	Milwaukee	Urban Ecology Center	Non-profit	Land Stewardship	Manager of Land Stewardship	TRUE	We work in multiple parks/ properties.
WI	Racine	City of Racine	Municipal government	Parks Department/Forestry Division	City Forester	TRUE	We work across an entire city.

References

1. United States Department of Agriculture Forest Service. 2018. The Urban Forest of New York City. Available from: https://www.nrs.fs.fed.us/pubs/57234

2. Pew Research Center. 2018. "What Unites and Divides Urban, Suburban and Rural Communities." 90 pgs. Available from: www.pewresearch.org.

3. Kellert SR, Case DJ, Escher D, Witter DJ, Mikels-Carrasco J, Seng PT. 2017. The Nature of Americans: Disconnection and Recommendations for Reconnection. 364 pgs.

4. Auyeung, DSN, Campbell, LK, Johnson, ML, Sonti, NF, Svendsen, ES. 2016. Reading the Landscape: Citywide Social Assessment of New York City Parks and Natural Areas in 2013–2014. USDA Forest Service Report. 69 pgs.

5. Centers for Disease Control and Prevention. 2013. Heat-Related Deaths After an Extreme Heat Event—Four States, 2012, and United States, 1999–2009. Morbidity and Mortality Weekly Report 62(22), 433–436.

6. U.S. Environmental Protection Agency. 2008. Reducing urban heat islands: Compendium of strategies. Draft. Available from: https://www.epa.gov/heat-islands/heat-island-compendium.

7. http://www.fao.org/resources/infographics/infographics-details/en/c/411348/

8. Griscom BW, Adams J, Ellis PW, Houghton RA, Lomax G, Miteva DA, Schlesinger, WH, Shoch, D, Siikamaki, JV, Smith, P, Woodbury, P, Zganjar, C, Blackman, A, Campari, J, Conant, RT, Delgado, C, Elias, P, Gopalakrishna, T, Hamsik, MR, Herrero, M, Kiesecker, J, Landis, E, Laestadius, L, Leavitt, SM, Minnemeyer, S, Polasky, S, Potapov, P, Putz, FE, Sanderman, J, Silvius, M, Wollenberg, E, Fargione J. 2017. Natural climate solutions. Proceedings in the National Academy of Sciences. 114(44):11645–50.

9. Climate Policy Initiative. Global Landscape of Climate Finance. 2017. Report Available from: www.climatepolicyinitiative.org

10. Trust for Public Land. 2017 City Park Facts. Center for City Park Excellence. 2017. Available from: https://www.tpl.org/center-city-park-excellence

11. Kuo M. 2015. How might contact with nature promote human health? Promising mechanisms and a possible central pathway. Front. Psychol. 6:1093. Available from: doi: 10.3389/fpsyg.2015.01093

12. Godbey G, Mowen A, Ashburn VA. 2010. The benefits of physical activity provided by park and recreation services: The scientific evidence. Available from: http://www.nrpa.org/uploadedFiles/nrpa.org/Publications_and_Research/Research/Papers/Godbey-Mowen-Research-Paper.pdf

13. Weinstein N, Balmford A, Dehaan CR, Gladwell V, Bradbury RB, Amano T. 2015. Seeing Community for the Trees: The Links among Contact with Natural Environments, Community Cohesion, and Crime. Bioscience. 65(12):1141–53.

14. Nowak DJ, Dwyer JF. 2008. Understanding the Benefits and Costs of Urban Forest Ecosystems IN: Urban and Community Forestry in the Northeast. Available from: http://link.springer.com/10.1007/978-1-4020-4289-8

15. Kenward A, Yawitz D, Sanford T, Wang R. 2014. Summer in the city: Hot and getting hotter. Climate Central. Report. 29 pgs.

16. Nowak DJ, Crane DE, Stevens JC. 2006. Air pollution removal by urban trees and shrubs in the United States. Urban Forestry and Urban Greening.4:115–23.

17. Pregitzer, C. C., Charlop-Powers, S., Bibbo, S., Forgione, H. M., Gunther, B., Hallett, R. A., & Bradford, M. A. 2018. A city-cale assessment reveals that native forest types and overstory species dominate New York City forests. Ecological Applications, 29:1.

18. Honnay, O., Jacquemyn, H., Bossuyt, B., & Hermy, M. 2005. Forest fragmentation effects on patch occupancy and population viability of herbaceous plant species. New Phytologist, 166(3), 723-736.