

NYC Urban Forest: Growing Equity and Resilience

Photo credit: Diane Cook and Len Jenshel

Emily Nobel Maxwell
Director, Cities, New York

The Nature
Conservancy 

The Nature Conservancy

Our mission is to conserve
the lands and waters on
which all life depends.



Urban Forest Makes Headlines!

amNY

Op-Ed

Op-Ed | New York City trees are an environmental justice issue

By: Annel Hernandez, Shrvanathi Kanekal, and Victoria Sanders

silive.com

A tale of two shores: NYC tree distribution disproportionate, first-of-its-kind study finds

SPECTRUM NEWS NY

SPECTRUM NOTICIAS NY



FORESTFORALL.NYC

The New York Times

A Million More Trees for New York City: Leaders Want a Greener Canopy

The city's five borough presidents are also urging the mayor to honor a pledge to spend 1 percent of the municipal budget on parks.

THE CITY

First NYC Tree Canopy Study Shows Growth as Storms and Budget Cuts Threaten Gains

DAILY NEWS

OPINION
Plant NYC trees today, reap the rewards tomorrow

WNYC



Published by All of It

We Need More Trees

Listen 18 min

+ Queue

...

news12 BROOKLYN

'Lungs of the city' - City of Forest Day puts spotlight on NYC's 7 million trees

CITYLIMITS

'We Need More Trees': City Council Probes Planting Progress

Future Forest NYC

- Science
- Partnership
- Convening
- Policy

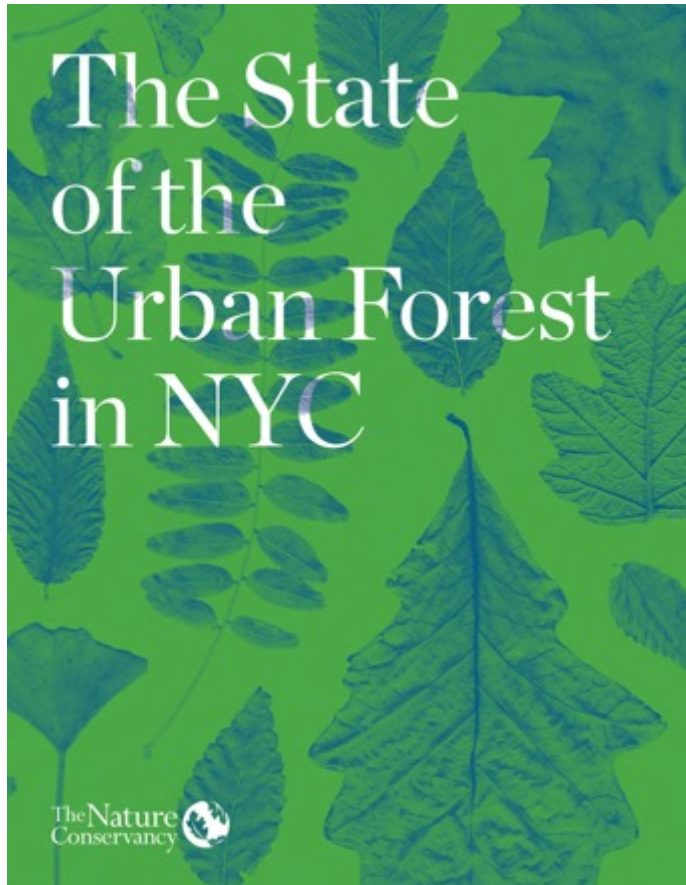
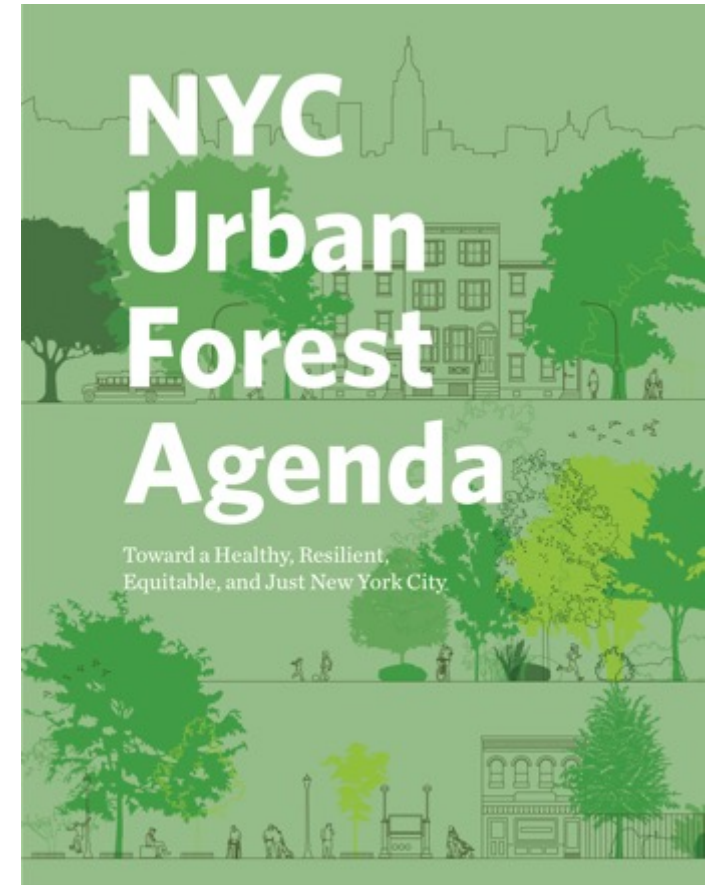


Photo credit: May Yeung



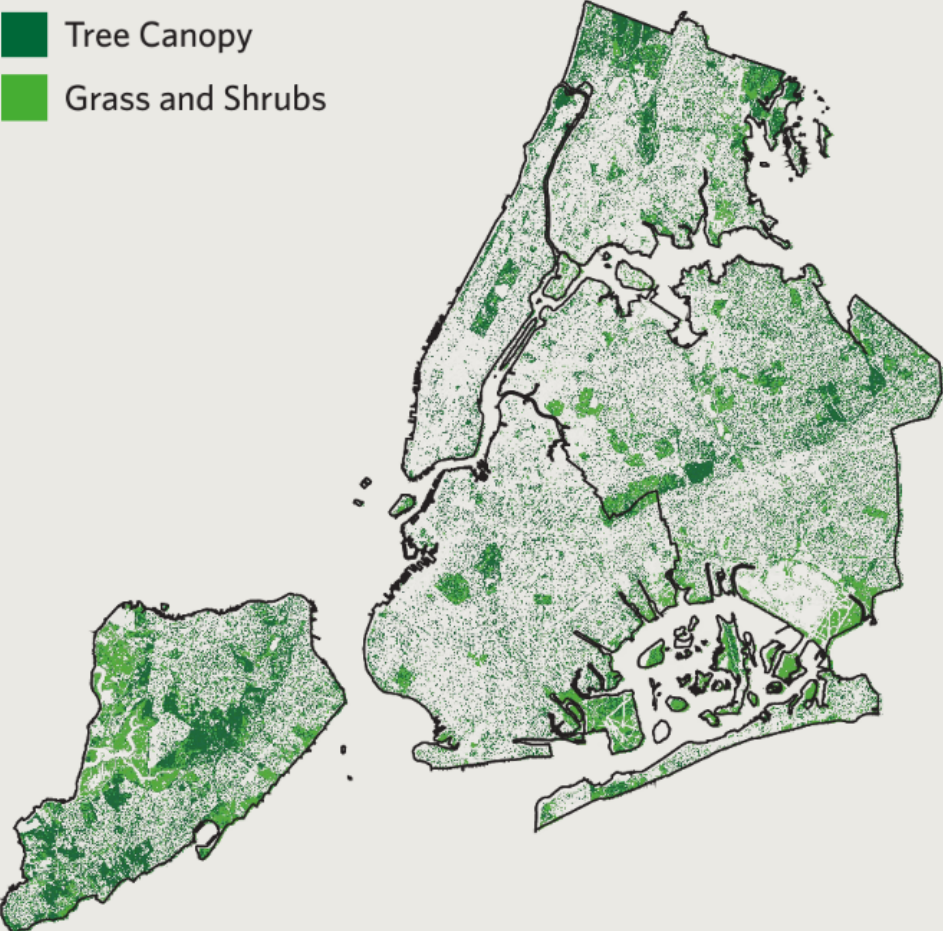
Climate Change



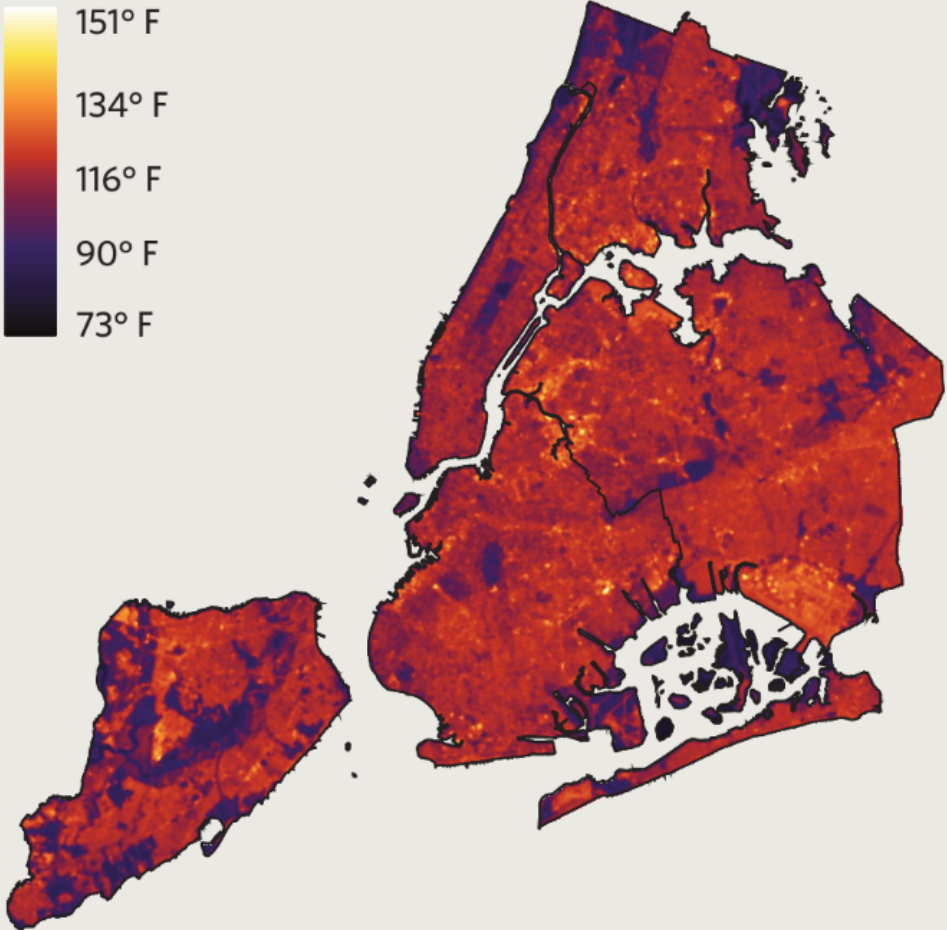
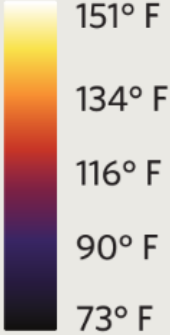
The Urban Heat Island Effect

Vegetation (2017)

- Tree Canopy
- Grass and Shrubs



Surface Temperature (July 6, 2020)



Data sources: Temperature Data: Provisional Surface Temperature from Landsat 8, July 6, 2020 (U.S. Geological Survey); Vegetation Data: 2017 Land cover raster dataset (NYC Department of Information Technology and Telecommunications)



Photo credit: iStock.com/James Andrews

“The urban forest of New York City includes over 7 million trees, as well as the physical and social infrastructure that supports them.”

Urban Forest Benefits



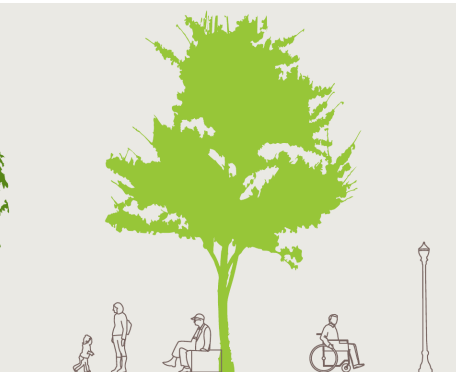
Removes 1,100 tons of pollutants from the air per year, which improves air quality and leads to fewer emergency room visits, lower rates of chronic diseases, and fewer hospitalizations



Stores 1.2 million tons of carbon and annually sequesters 51,000 tons of carbon (or 187,000 tons of CO₂)



Decreases air temperature by an average of 0.13°F, therefore cooling city streets and mitigating the urban heat island effect and extreme heat



Reduces stress (as shown by slower heartbeats, lower blood pressure, and relaxed brain patterns) and promotes healing and contemplation



Increases the cohesiveness of communities by fostering stronger connections between neighbors, feelings of attachment to place, and an opportunity to experience nature



Encourages children and adults to spend more time outdoors engaging in physical activity, therefore reducing childhood obesity rates and improving fitness

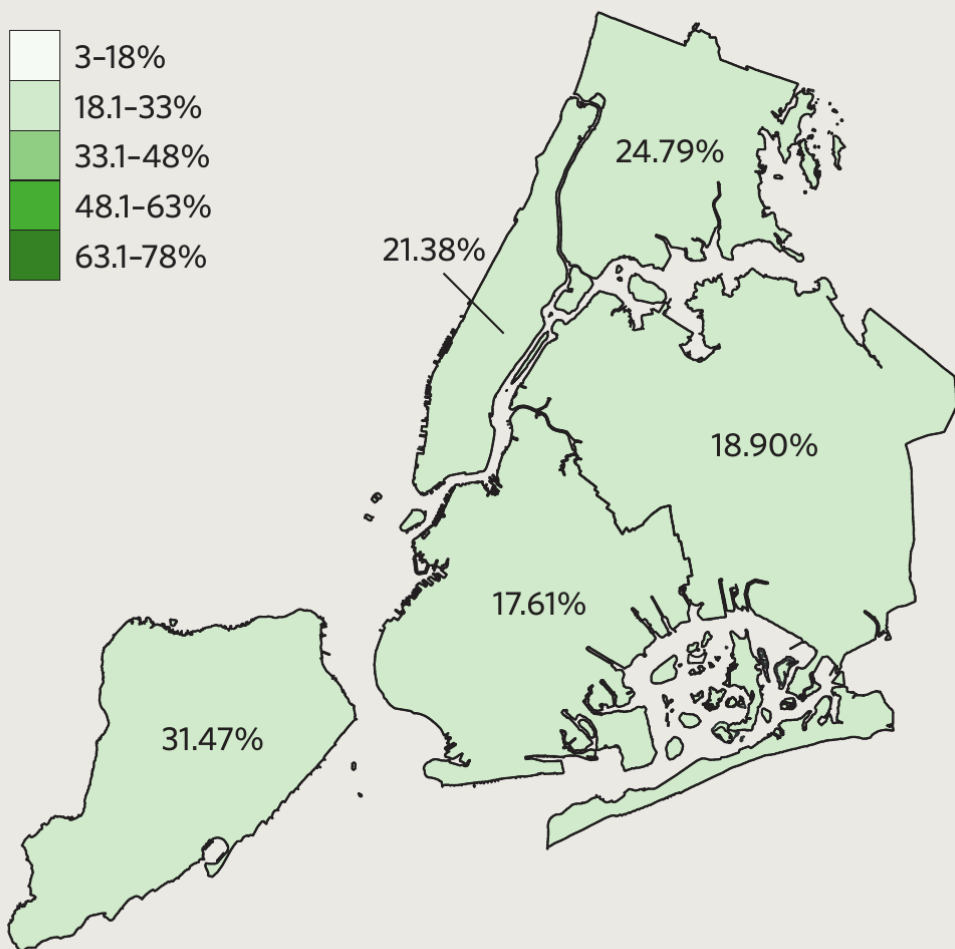
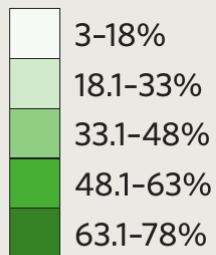


Reduces stormwater runoff by 69 million cubic feet per year, decreases the rate that runoff travels off surfaces (e.g., streets and sidewalks), and stabilizes soil by preventing erosion

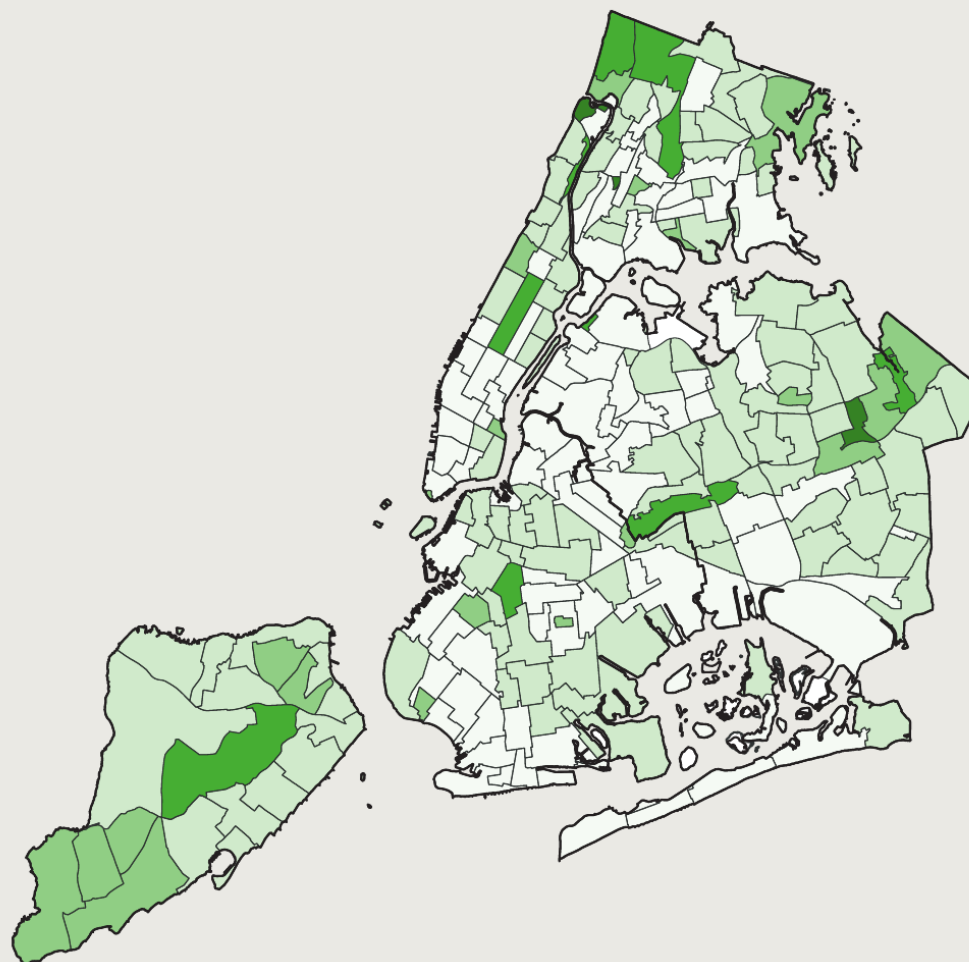


Provides habitat and refuge for a variety of wildlife and plant species and enables pollinators, seed dispersers, and other species to move throughout the region

Tree Canopy Distribution 2017

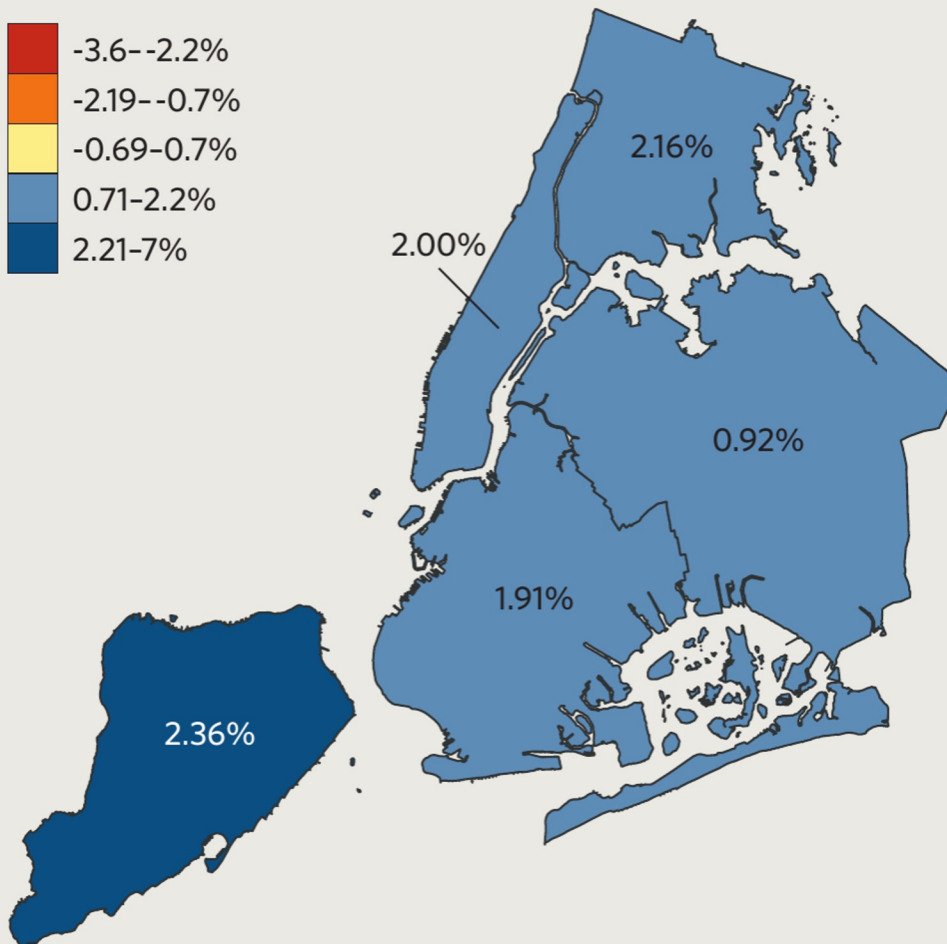
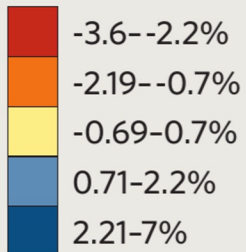


Boroughs

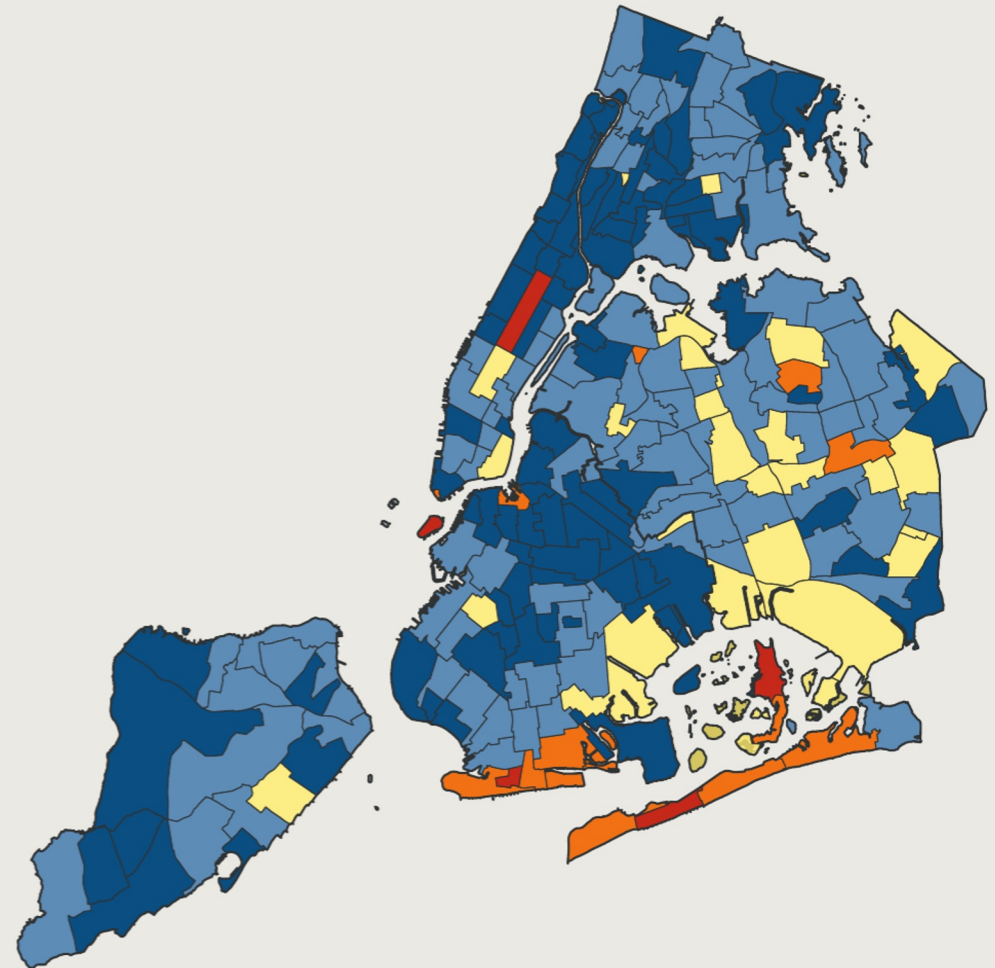


Neighborhood Tabulation Areas

Net Change In Tree Canopy 2010-2017



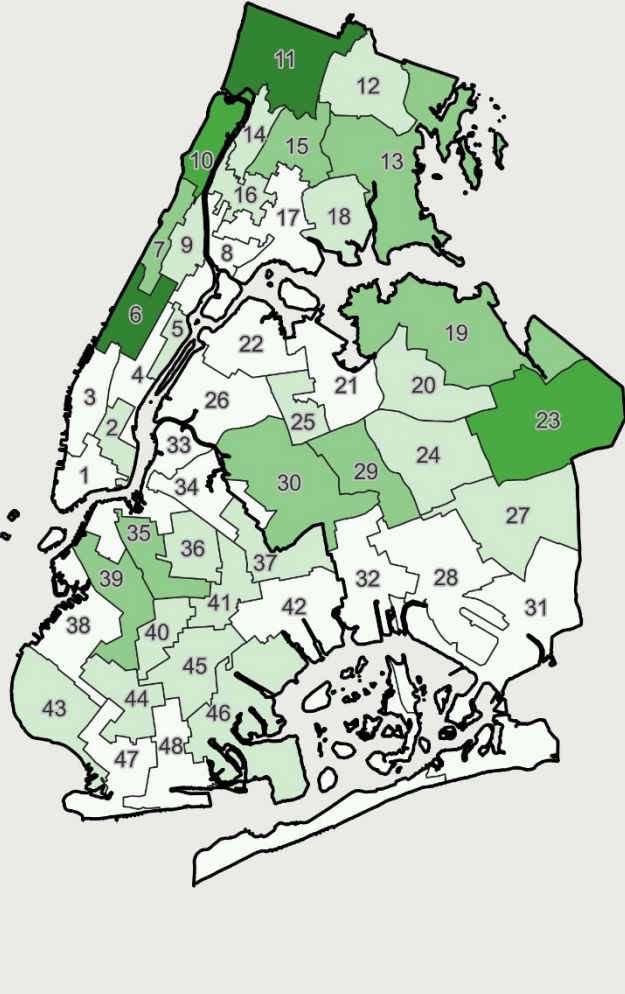
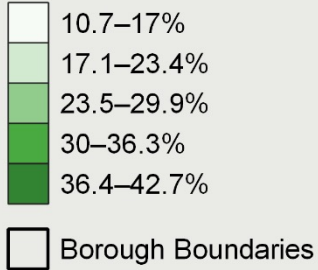
Boroughs



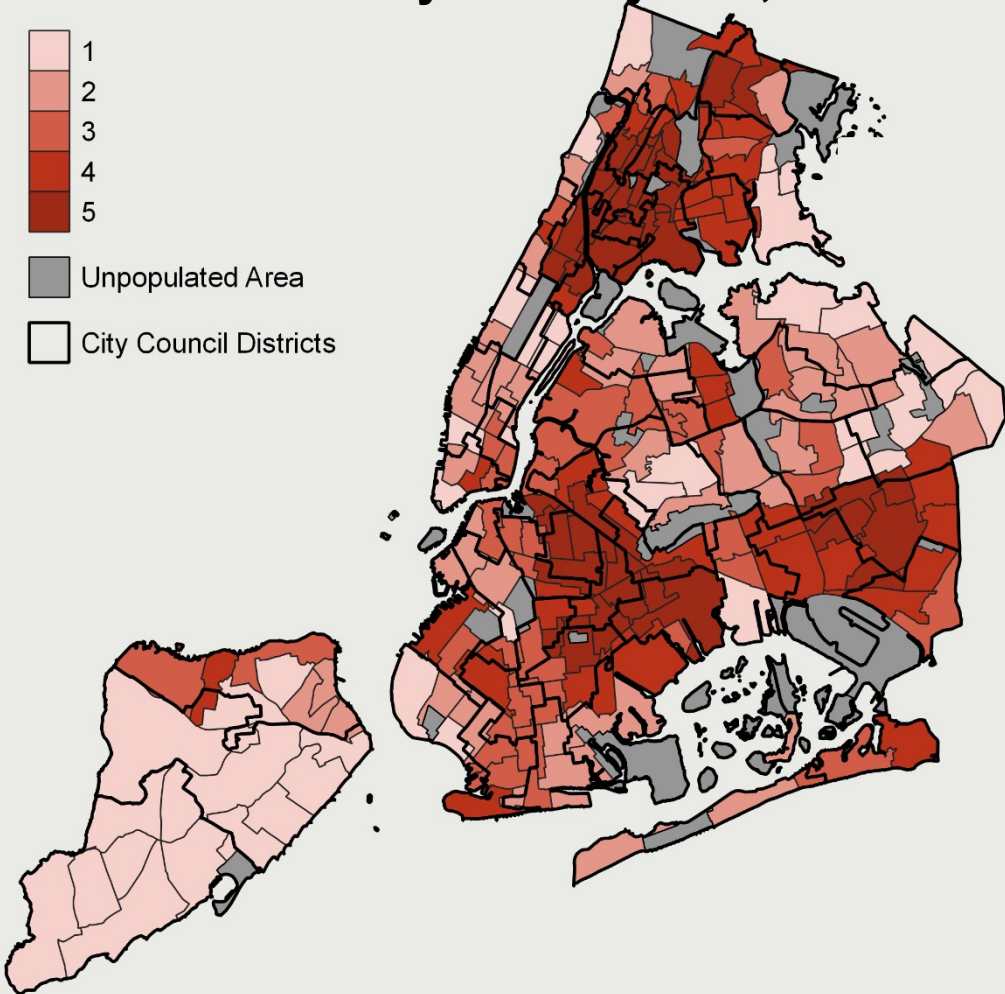
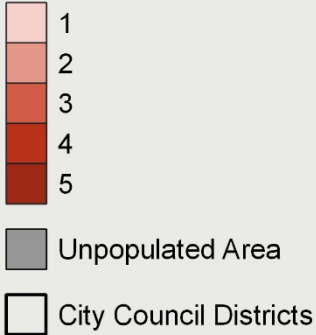
Neighborhood Tabulation Areas

Tree Canopy and Heat Vulnerability

Canopy Cover, 2017



Heat Vulnerability Index by NTA, 2018

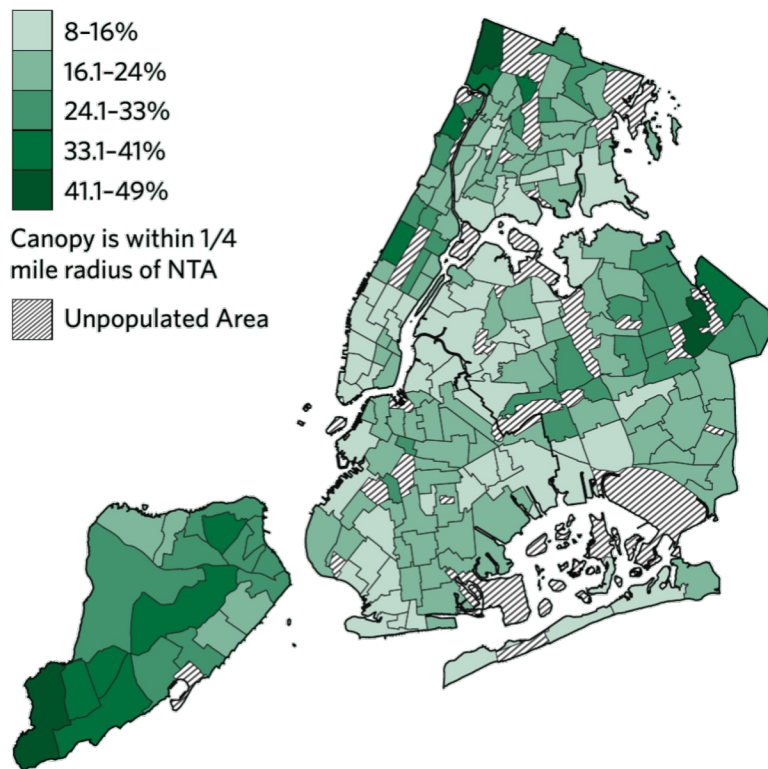


Data sources: Percent Canopy Cover derived from 2017 Tree Canopy Change (2010–2017) data (NYC Department of Information Technology and Telecommunications); Administrative Boundaries from NYC Department of City Planning

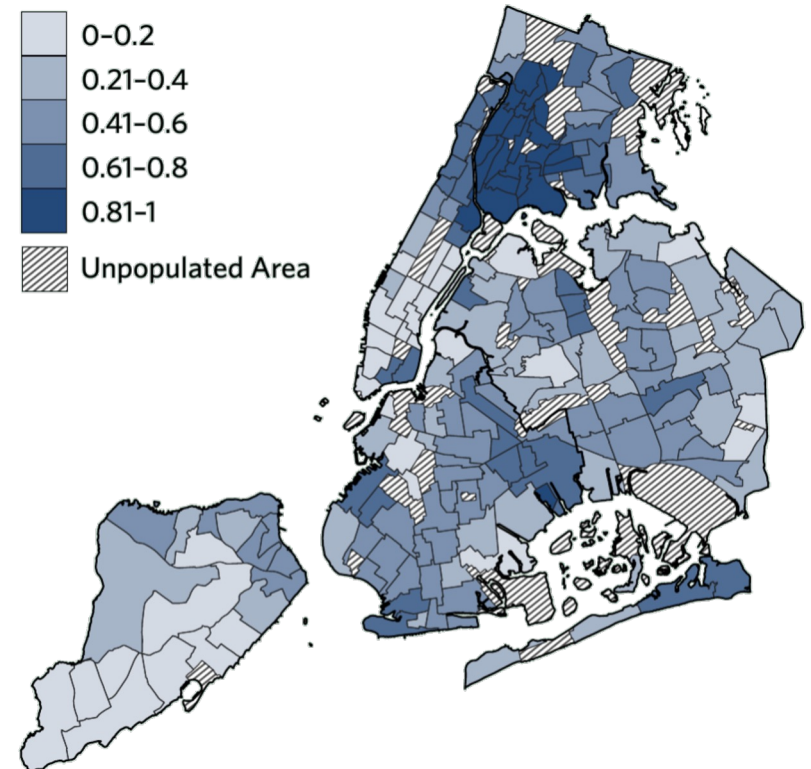
Data sources: Heat Vulnerability Index from the NYC Department of Health and Mental Hygiene Administrative Boundaries from NYC Department of City Planning

Unequal Distribution

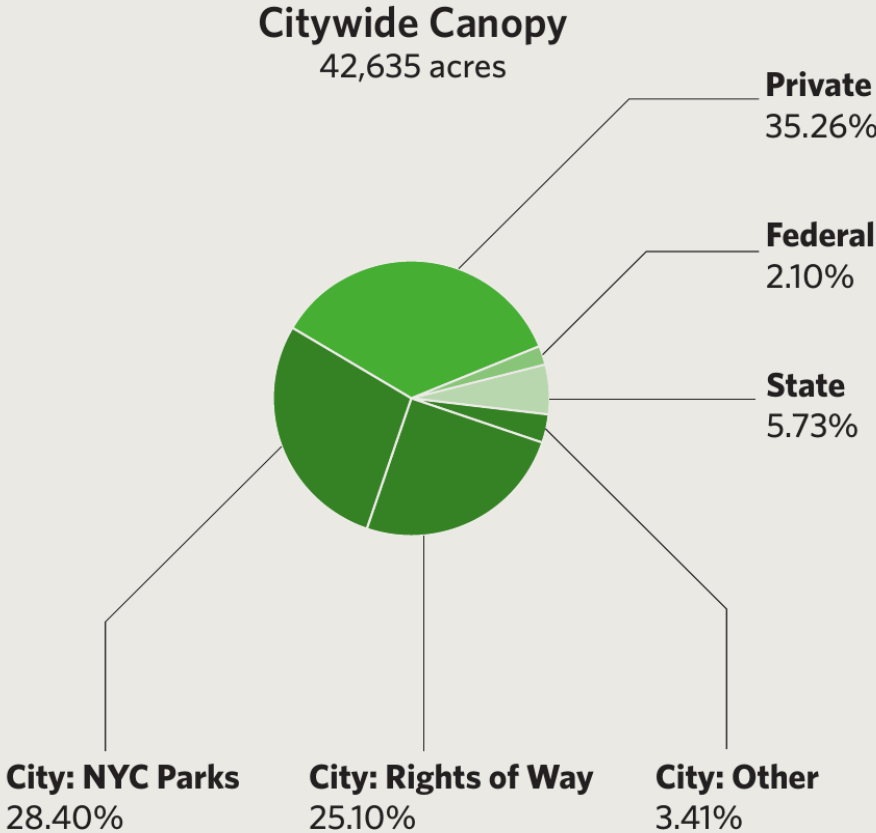
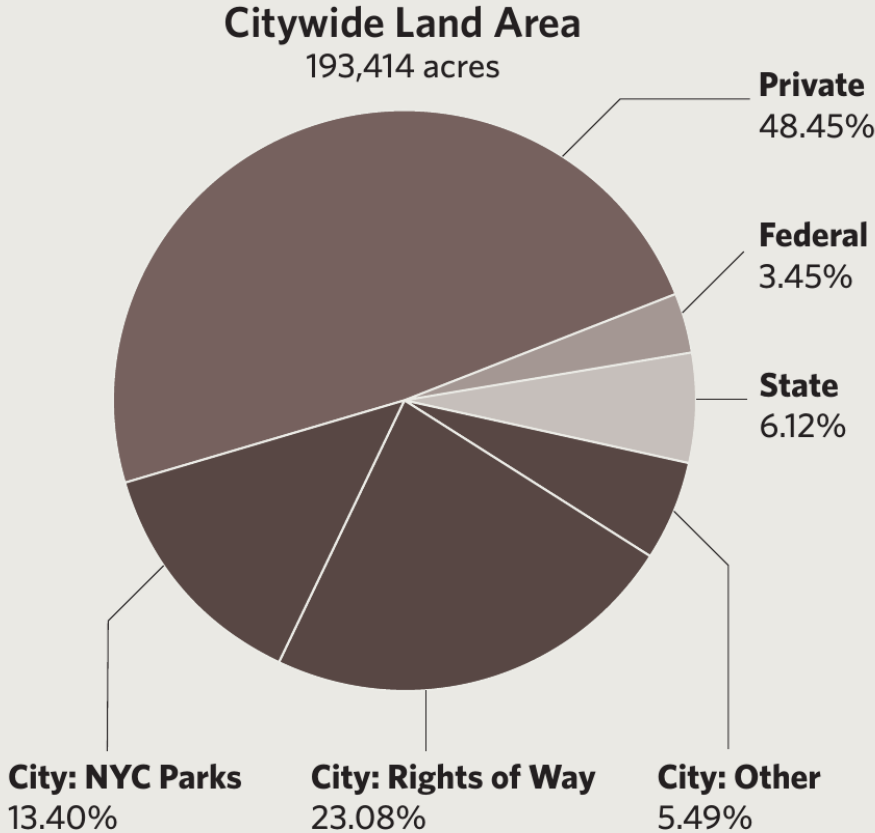
Tree Canopy



Social Vulnerability Index



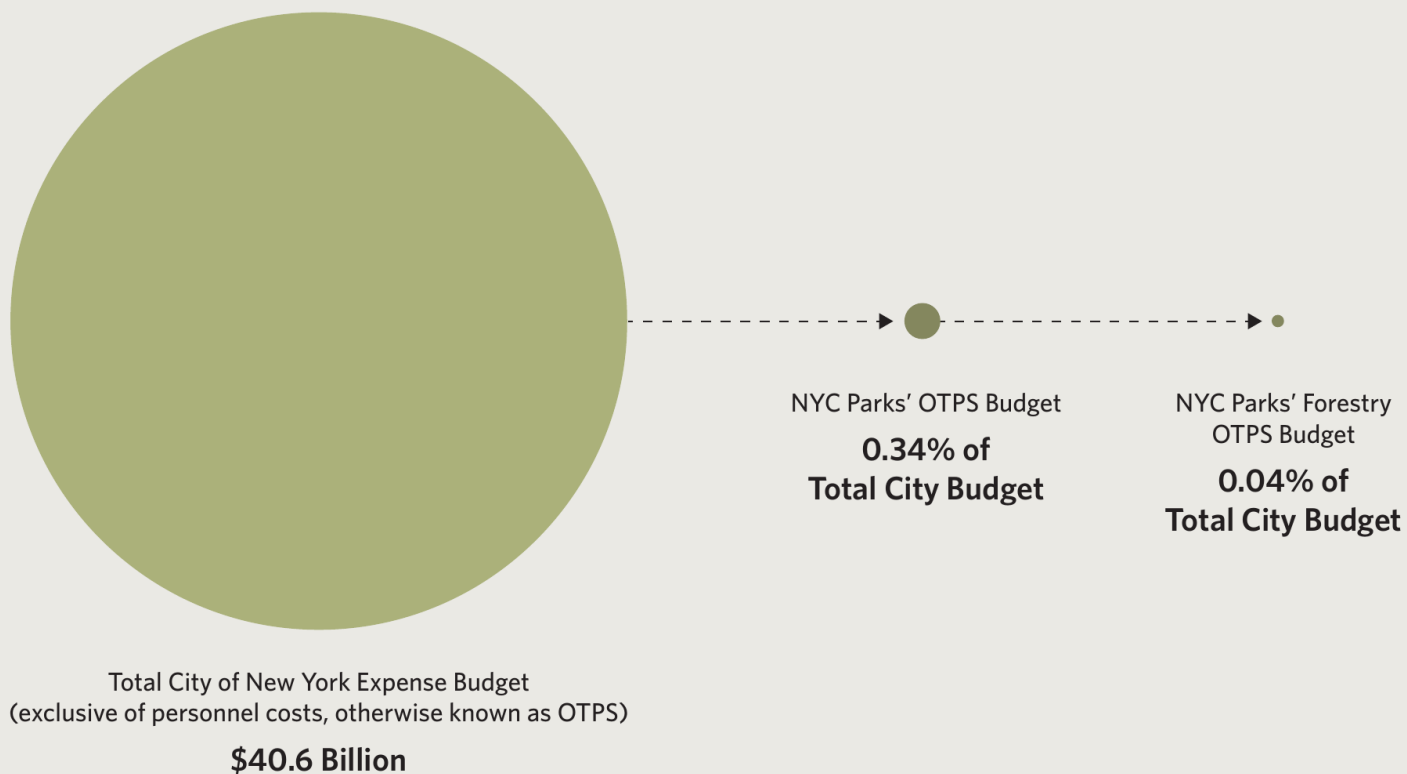
Jurisdiction of Land and Tree Canopy



Data sources: Land Area derived from NYC parcel data MapPLUTO 20v6 (NYC Department of City Planning) and agency- or entity-specific datasets where available; Canopy metrics derived from 2017 Tree Canopy Change (2010-2017) data (NYC Department of Information Technology and Telecommunications)

Insufficient Funding

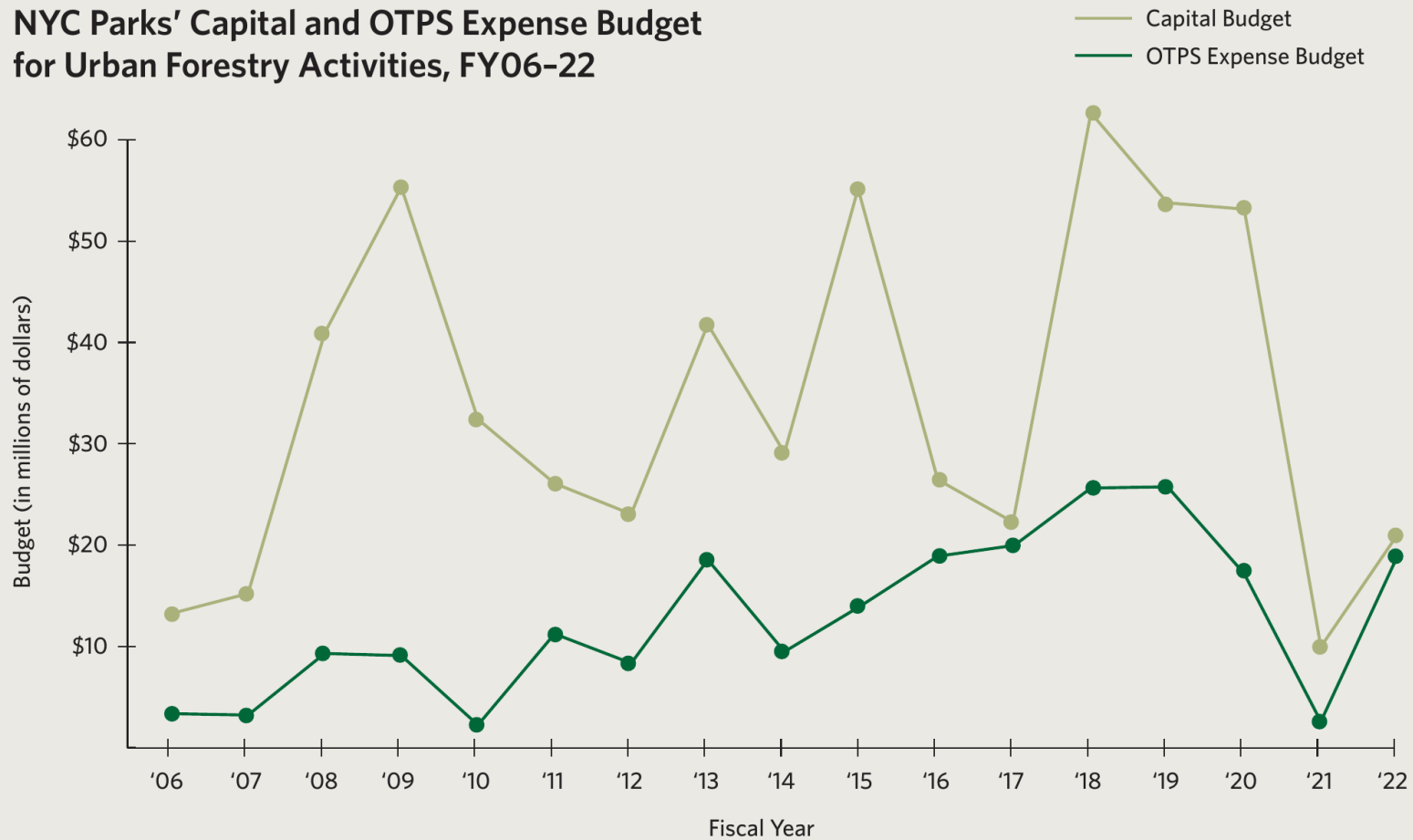
Average OTPS Expense Funding for the Urban Forest in the NYC Budget, FY18-22



Data source: NYC Office of Management and Budget - Adopted Annual Fiscal Year budget reports (FY18-22)

Insecure Funding

NYC Parks' Capital and OTPS Expense Budget for Urban Forestry Activities, FY06-22



Data source: NYC Office of Management and Budget - Annual Fiscal Year Adopted Budget reports

Strengths

- A healthy and expanding forest with many kinds of trees
- Diverse people and institutions steward the urban forest
- Strong NYC Parks leadership
- Expansion opportunities



Challenges



Photo by NYC Department of Parks and Recreation

- Inequitable distribution of urban forest
- Patchwork of policies
- Insufficient and insecure funding
- Limited knowledge of NYC residents' attitudes
- Climate change
- Pests and diseases

Practical Canopy

Practical Canopy

An Approach to Answer:

How much canopy can a landscape have given current conditions?

Practical Canopy Contributors and Outputs

The screenshot shows the preprint page for the article "Understanding Opportunities for Urban Forest Expansion to Inform Goals: Working Toward a Virtuous Cycle in New York City". The page includes navigation links like "Preprints", "HOW IT WORKS", "INSTRUCTIONS FOR AUTHORS", "SUBJECT AREAS", "ADVISORY BOARD", "SCREENING PREPRINTS", "ABOUT", and "STATISTICS". The article title is prominently displayed, along with the authors' names: Michael L. Treglia, Natalia C. Piland, Karen Leu, Alaina Van Slooten, and Emily Nobel Maxwell. A note indicates "This version is not peer-reviewed". The "How to cite" section provides the full citation information, including the DOI and the date of publication. The abstract begins by stating that urban forests are critical infrastructure for mitigating environmental and social challenges in cities.

Acknowledgements

- Funding for this work was provided in part by The Leona M. and Harry B. Helmsley Charitable Trust.
- Input & Review:
 - Staff from the NYC Department of Parks and Recreation, Division of Forestry, Horticulture, and Natural Resources
 - Sarah Charlop-Powers, Crystal Crown, and Clara Pregitzer, Natural Areas Conservancy
 - Lindsay Campbell, J. Morgan Grove, Rich Hallett, and Dexter Locke, USDA Forest Service, Northern Research Station
 - Jarlath O'Neil-Dunne, University of Vermont/USDA Forest Service, Northern Research Station
 - Tami Lin-Moges and Kate Galbo, The Nature Conservancy, New York State Cities Program
- License Grants for Esri Software Provided by Esri to The Nature Conservancy.

The screenshot shows a news article from silive.com titled "How much tree canopy can NYC sustain? Study explores question, opportunities." The article is dated August 16, 2022. It features a map of the northwest section of Staten Island, New York, with green areas representing 2017 tree canopy and blue areas representing available practical canopy. The article is by Joseph Ostapuk and includes social media sharing icons for Facebook, Twitter, and LinkedIn.

Preprint:
<https://www.preprints.org/manuscript/202206.0106/v1>
Dataset:
<https://zenodo.org/record/6547492>
Recent News Coverage:
<https://www.silive.com/news/2022/08/how-much-tree-canopy-can-nyc-sustain-study-explores-question-opportunities.html>

Practical Canopy: Main Takeaways

- Practical canopy, **conceptually**, gives us an idea of where new trees could be planted and how much new canopy could be added if nothing about the underlying landscape changed
- It gives us a **method** to make the implicit assumptions about the landscape explicit with partners
- It **informs** the goals that align our support of the urban forest with explicit principles such as equity
- It becomes a **conversation starter and supports additional tools** for more specific, local decisions about tree planting, maintenance, and protection

Spatial Opportunities and Priorities for Urban Forest Expansion

Our Approach - Building on the 3 P's:

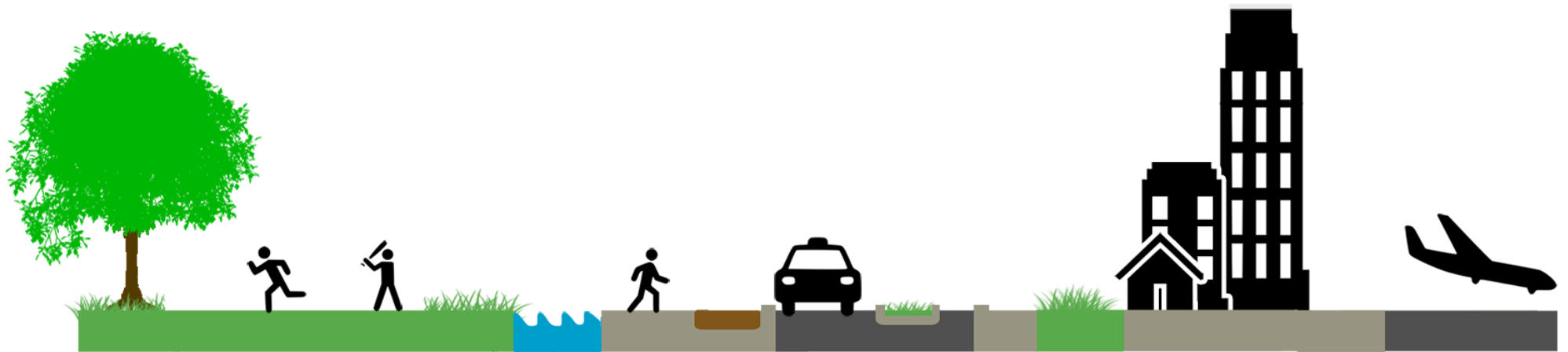
- **Practical Canopy**
 - For mapping where canopy *can likely go* based on land use and land cover constraints
 - Incorporates local data
 - Can incorporate values or preferences of land managers

Spatial Opportunities and Priorities for Urban Forest Expansion

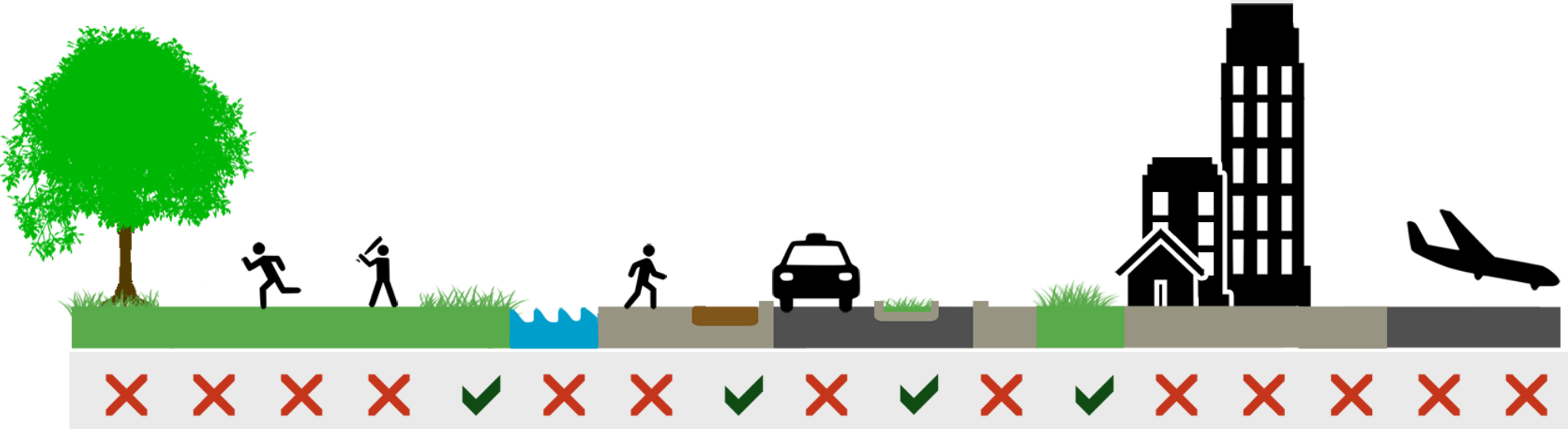
Our Approach - Building on the 3 P's:

- **Practical Canopy**
 - For mapping where canopy *can likely go* based on land use and land cover constraints
 - Incorporates local data
 - Can incorporate values or preferences of land managers
- **Priority Canopy**
 - For understanding where canopy is desired or needed
 - Accounts for needed services, community preferences, and equity considerations

The Concept of Practical Canopy



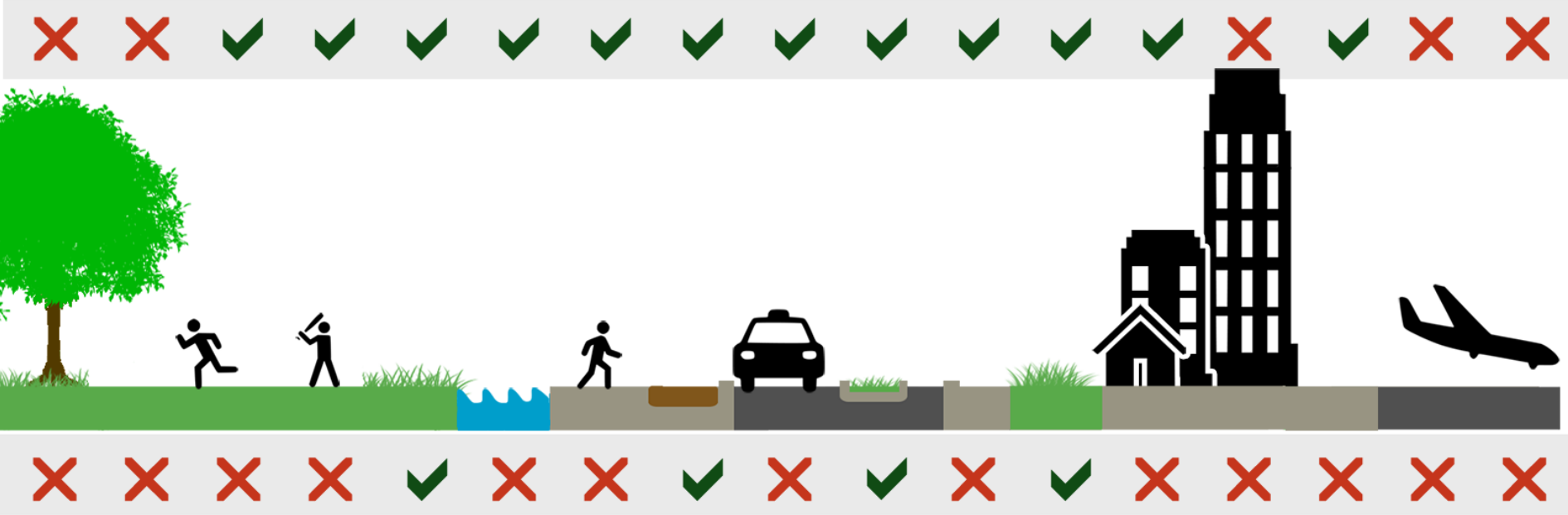
The Concept of Practical Canopy



Can you plant a tree?

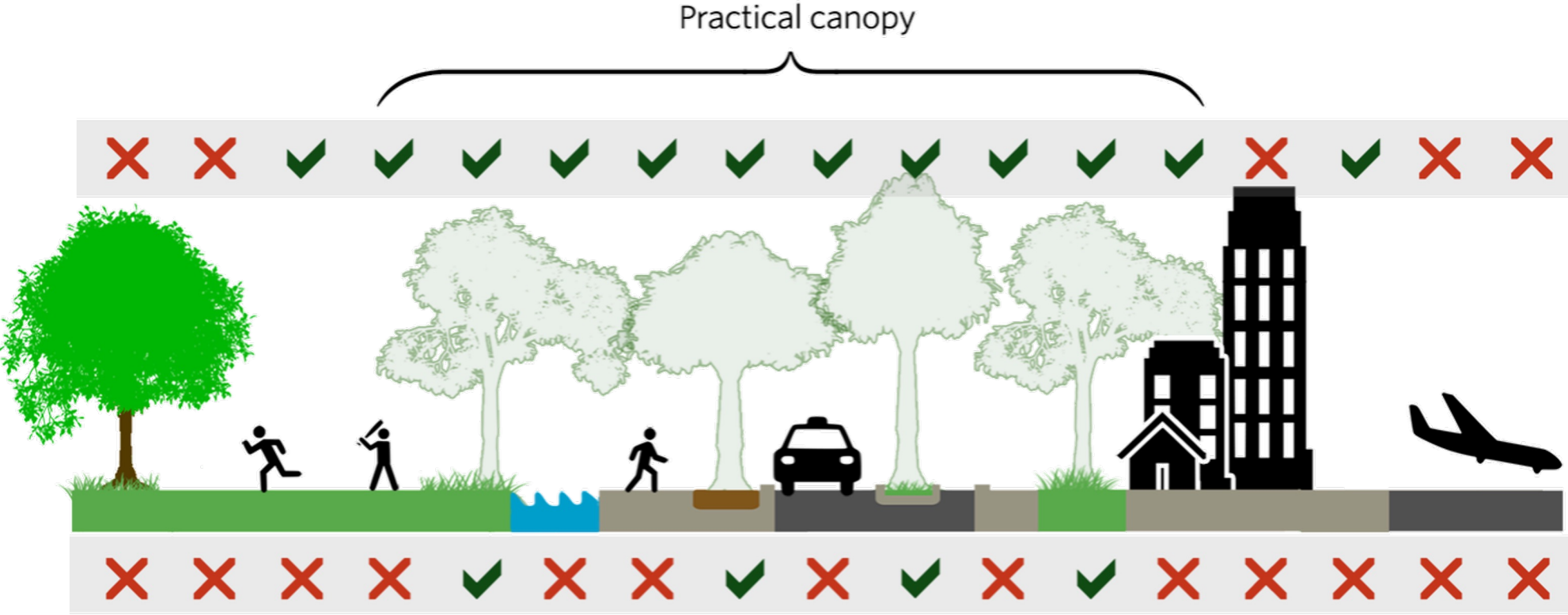
The Concept of Practical Canopy

Can canopy grow?



Can you plant a tree?

The Concept of Practical Canopy



Strengths & Limits of our Analysis

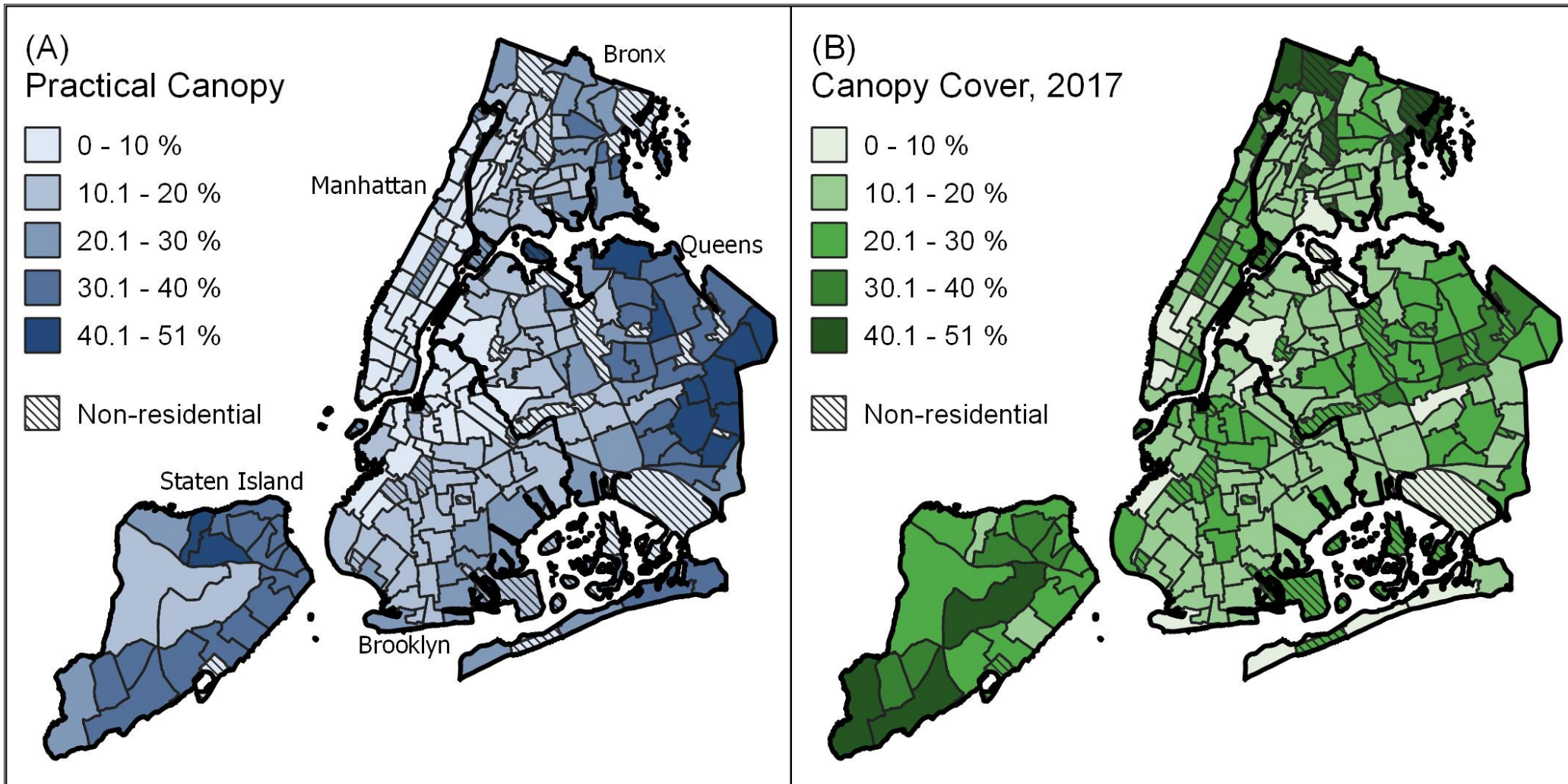
What Practical Canopy Does Well

- Incorporate canopy opportunity over short buildings & roads
- Incorporate knowledge about land use
- Yields informed estimates of opportunity for new tree plantings and their growth
- Grounds conversations about where these new tree plantings can go

What Practical Canopy Does Not Do Well

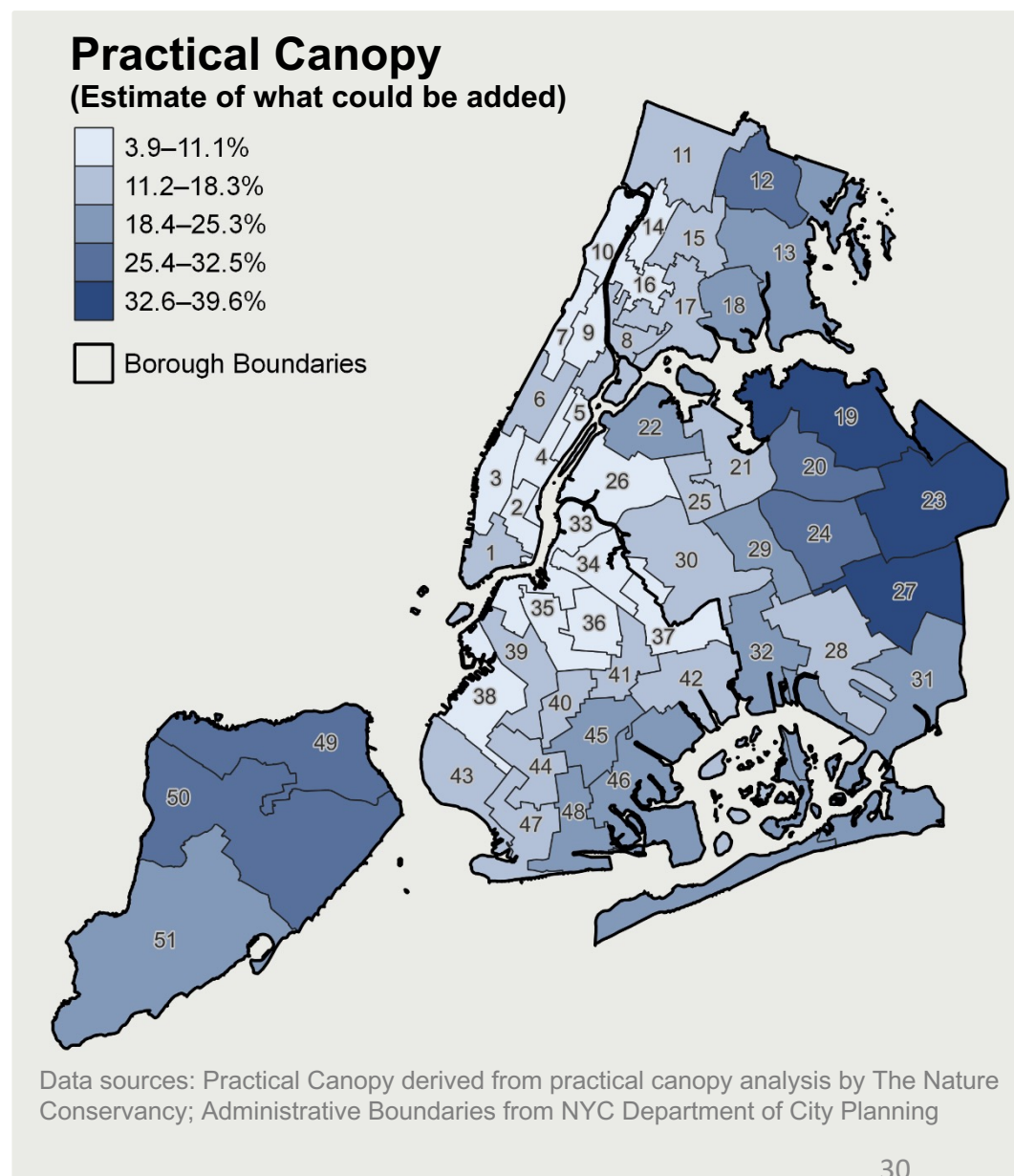
- Incorporate variables lacking data (e.g., underground infrastructure)
- Give information through time
- Tell you exactly what it would look like on the ground based on local perspectives

High-Level Results: Opportunities in NYC



Potential to Add “Practical” Canopy

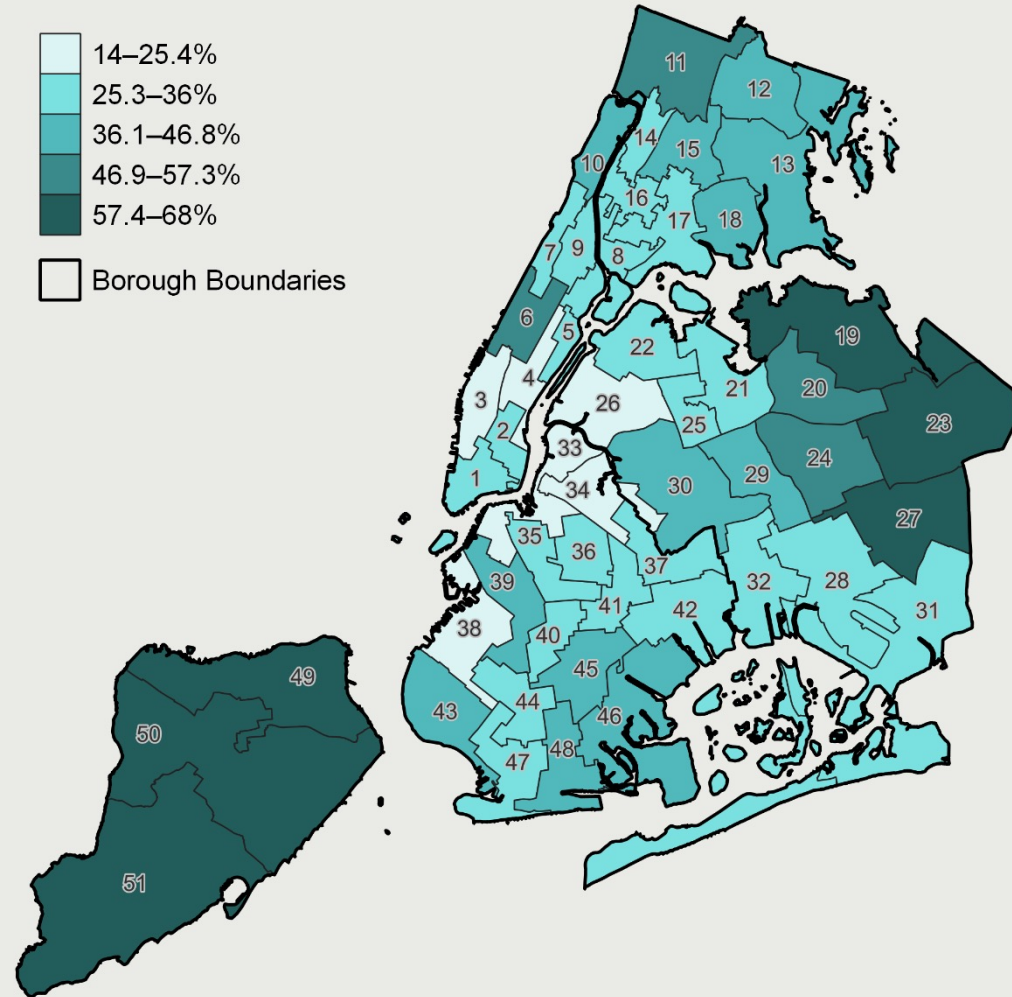
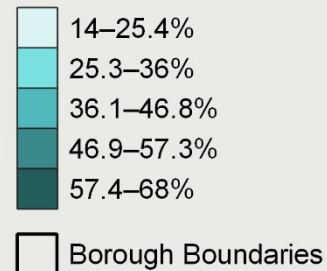
- Opportunities for planting and growth of new trees in the existing landscape in all neighborhoods
- Existing trees will continue to grow if maintained
- New planting opportunities are often constrained by the landscape as it is today



Limits of the Current Landscape

- Only relying on existing opportunities for planting can exacerbate inequities
- Creating new spaces for planting: e.g. Streetscape Design, Zoning
- What is needed and desired by local communities?

Practical + Existing Canopy



Data sources: Practical + Existing Canopy derived from practical canopy analysis by The Nature Conservancy and 2017 Tree Canopy Change (2010–2017) data (NYC Department of Information Technology and Telecommunications); Administrative Boundaries from NYC Department of City Planning

High-Level Results:

- **There is practical canopy in all neighborhoods (Neighborhood Tabulation Areas)**
- **Most practical canopy is on private property**
- **Expanding canopy only in areas of practical canopy could exacerbate inequities**
- **Total Practical Canopy: 39,287 Acres**
 - **20.3% of Land Area**
- **Practical + Existing Canopy = ~40% canopy cover citywide**

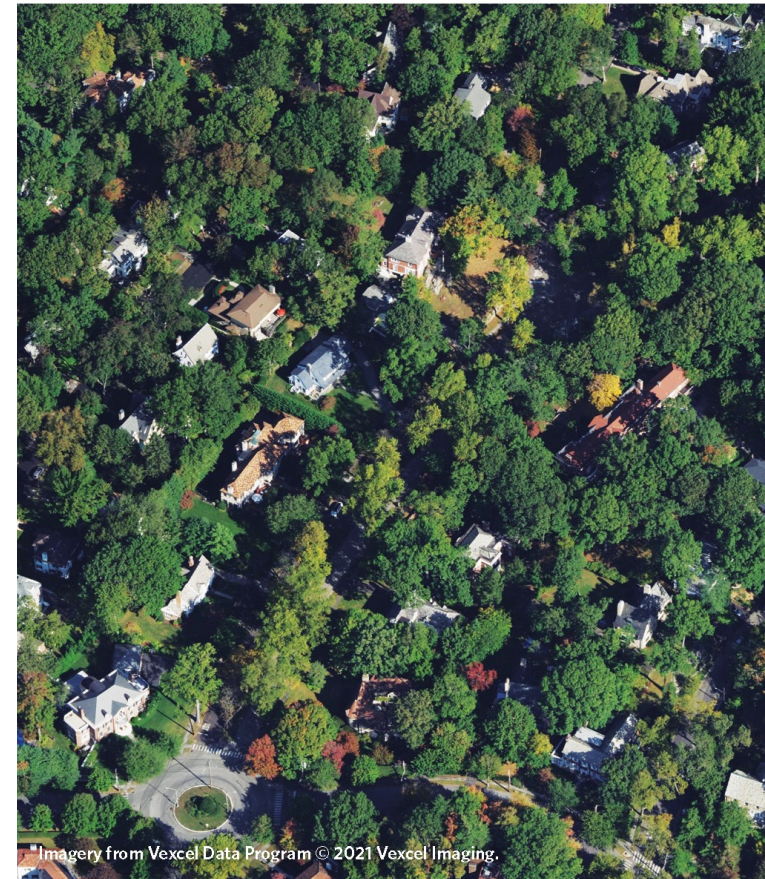




Photo credit: kusska/istock.com

NYC Trees: Challenges Faced

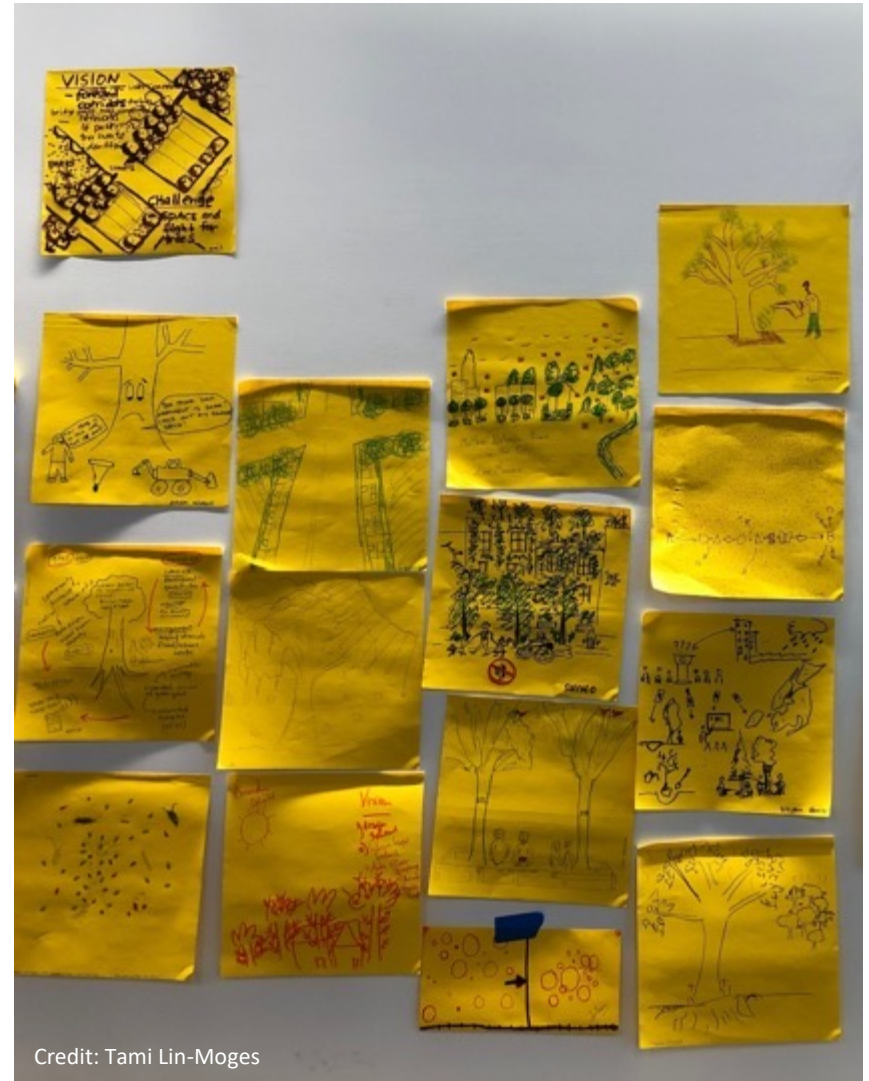
- Climate change
- Pests and pathogens
- Disparate management
- Lack protection
- Lack coordinated planning and cohesive vision

Forest for All NYC



Our Vision

- A healthy, biodiverse, robust, accessible, well-understood and resilient urban forest that **justly and equitably delivers its multiple benefits** to all NYC residents.
- **Protect, maintain, use, monitor, understand, promote, and expand the New York City urban forest**
- New York City expands its role as a **leader in urban forestry**



Credit: Tami Lin-Moges

Forest for All NYC

- American Society of Landscape Architects, New York Chapter
- Assemblage Landscape Architecture
- Audubon New York
- Bird Soil Biochemistry Lab at Queens College's School of Earth & Environmental Sciences, CUNY
- Broadway Mall Association
- Brooklyn Botanic Garden
- Brooklyn Greenway Initiative
- Brooklyn Queens Land Trust
- Brooklyn Public Library
- Brooklyn Woods
- Brooklyn Workforce Innovations
- Central Park Conservancy
- City Hall Park Conservancy
- City Parks Foundation
- Con Edison
- Coney Island Beautification Project, Inc.
- Davey Resource Group, Inc.
- Design Trust for Public Space
- El Puente
- Forest Hills Green Team
- Future Green Studio
- Gowanus Canal Conservancy
- Green and Blue Eco Care
- Green City Force
- Green-Wood Cemetery
- GrowNYC
- Hudson Square Business Improvement District
- iDig2Learn
- Jackson Heights Beautification Group
- James Baldwin Outdoor Learning Center
- Long Island City Partnership
- Love Your Street Tree Day
- Madison Square Park Conservancy
- Mathews Nielsen Landscape Architects
- National Wildlife Federation
- Natural Areas Conservancy
- New York Cares
- New York City Environmental Justice Alliance
- New York City Housing Authority*
- New York City Soil & Water Conservation District
- New York League of Conservation Voters
- New York Restoration Project
- New York State Department of Environmental Conservation*
- New Yorkers for Parks
- North Brooklyn Neighbors
- North Brooklyn Parks Alliance
- NYC Audubon
- NYC Department of Parks and Recreation*
- NYC H2O
- NY/LONDON BIZ
- One Tree Planted
- Prospect Park Alliance
- Queens Chamber of Commerce
- Randall's Island Park Alliance
- Real Estate Board of New York
- Riverdale Country School
- Riverside Park Conservancy
- School of Earth & Environmental Sciences, Queens College, City University of New York
- Snug Harbor Cultural Center & Botanical Garden
- Starr Whitehouse Landscape Architects
- Stewards of Ewen Park
- Stickbulb
- Student Conservation Association
- The Evergreens Cemetery
- The Friends of Governors Island
- The HOPE Program
- The Katz Lab at Cornell University
- The Nature Conservancy
- The New School, Urban Systems Lab
- The New York Botanical Garden
- The Reinmann Lab at the CUNY Advanced Science Research Center
- The Sustainable Water Resource Engineering Lab at Drexel University
- The Trust for Governors Island
- The Trust for Public Land
- Trees New York
- Tri-Lox
- USDA Forest Service, NYC Urban Field Station*
- Van Cortlandt Park Alliance
- Washington Square Park Eco Projects
- WE ACT for Environmental Justice
- Wild Ones (Long Island, Brooklyn, and Queens Chapter)



Credit: Sergio Moncada Leiva

Key Drivers/NYC Urban Forest Agenda

- Human health and well-being
- Climate change adaptation
- Distribution of benefits to EJ communities
- Connection to the urban forest
- Coordination and collaboration
- Understanding of the NYC urban forest
- Citywide-scale
- Biophysical state of NYC trees and biodiversity

NYC Urban Forest Agenda

Toward a Healthy, Resilient,
Equitable, and Just New York City

ACTION 1.1

Achieve 30% Canopy Cover by 2035



Promote and foster support for a new citywide goal of achieving at least 30% tree canopy cover by 2035. Encourage the City of New York and other key stakeholders to adopt this goal and immediately launch action. Collaboratively establish targets for urban forest health, protection, management, restoration, and planting for all parts of the resource, including street trees and those in parks (landscaped parkland and forested natural areas), and all other property, both public and private. Strategies to achieve the overall goal and associated targets include the following:

1. Preserve existing canopy across private and public lands, including limiting removal to prevent loss (except as appropriate for good management practice);
2. Improve forest health and increase tree canopy through management and restoration; and
3. Plant new trees, and replace lost and removed trees, with a specific focus on areas with high, unutilized potential for canopy including private property, and areas with greatest potential to benefit from new canopy, such as the most heat vulnerable parts of NYC.



Photo credit: Diane Cook and Len Jenshel

Why at least 30%^{x'35}, equitably?

- Visionary and Achievable
- Informed by Data and Analysis
- “Reasonable” Time Horizon
- Easy to Talk About

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Photo credit: Diane Cook and Len Jenshel

What will it take to get to 30x35

- Protection of existing urban forest
- Management, maintenance, and stewardship of existing trees
- New plantings and expansion of trees across all jurisdictions
- A heavy focus on both protecting and planting new trees on private property



Plan

Plan for the future of the NYC urban forest by adopting a coordinated, long-term vision for the protection and care of the urban forest and equitable distribution of its benefits.

ACTIONS:

- 1.1** Achieve 30% Canopy Cover by 2035
- 1.2** Support Development of Community-Scale Urban Forest Plans and Goals
- 1.3** Establish a Master Plan for the Urban Forest



Invest

Invest in the people, essential social infrastructure, and reliable funding sources that are critical to the long-term care and protection of the urban forest.

ACTIONS:

- 2.1** Grow and Sustain the Forest for All NYC Coalition
- 2.2** Cultivate Urban Forest Careers
- 2.3** Increase and Equitably Distribute Funding for Urban Forestry Projects

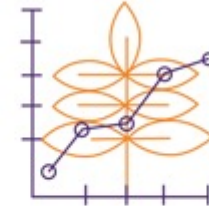


Manage

Manage our urban forest through its life cycle on public and private lands to increase its growth and resilience.

ACTIONS:

- 3.1** Strengthen Tree Regulations and Establish Incentive Programs
- 3.2** Set Tree Planting and Management Standards
- 3.3** Develop Conditions to Transform Wood Waste into a Sustainable Local Resource



Learn

Learn more about the NYC urban forest through research and monitoring, develop better practices related to forest management, and deepen the public's connection to the forest.

ACTIONS:

- 4.1** Create an Urban Forestry Research and Monitoring Agenda
- 4.2** Establish Citywide Educational and Tree Stewardship Events
- 4.3** Monitor Urban Forest Environment and Health

Thank you!

**More Info:
emaxwell@tnc.org
ForestForAll.nyc**