

Climate Smart Forestry

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NYC Parks





Writing NYC Forest Management Framework, NYC 2016

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Environment & Planning
NYC Parks



Visiting potential stand thinning site, NYC 2022

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Natural Areas Conservancy

Our work together in NYC

Case Making & Research:

Characterizing Urban Forests
(*specifically natural areas*) and
their value to increase funding,
protection, care

Implementation: Boots on
the ground management
and decision making to
improve forest condition,
resilience, access



Urban forestry means multiple things



Urban Forests & Climate Change

Climate Impacts



Increased frequency and intensity of storms
Periods of drought
Warmer temperatures



Urbanization Impacts



More pavement
Smaller forest patch size
Increased invasive species pressure
Trees have safety risks for people

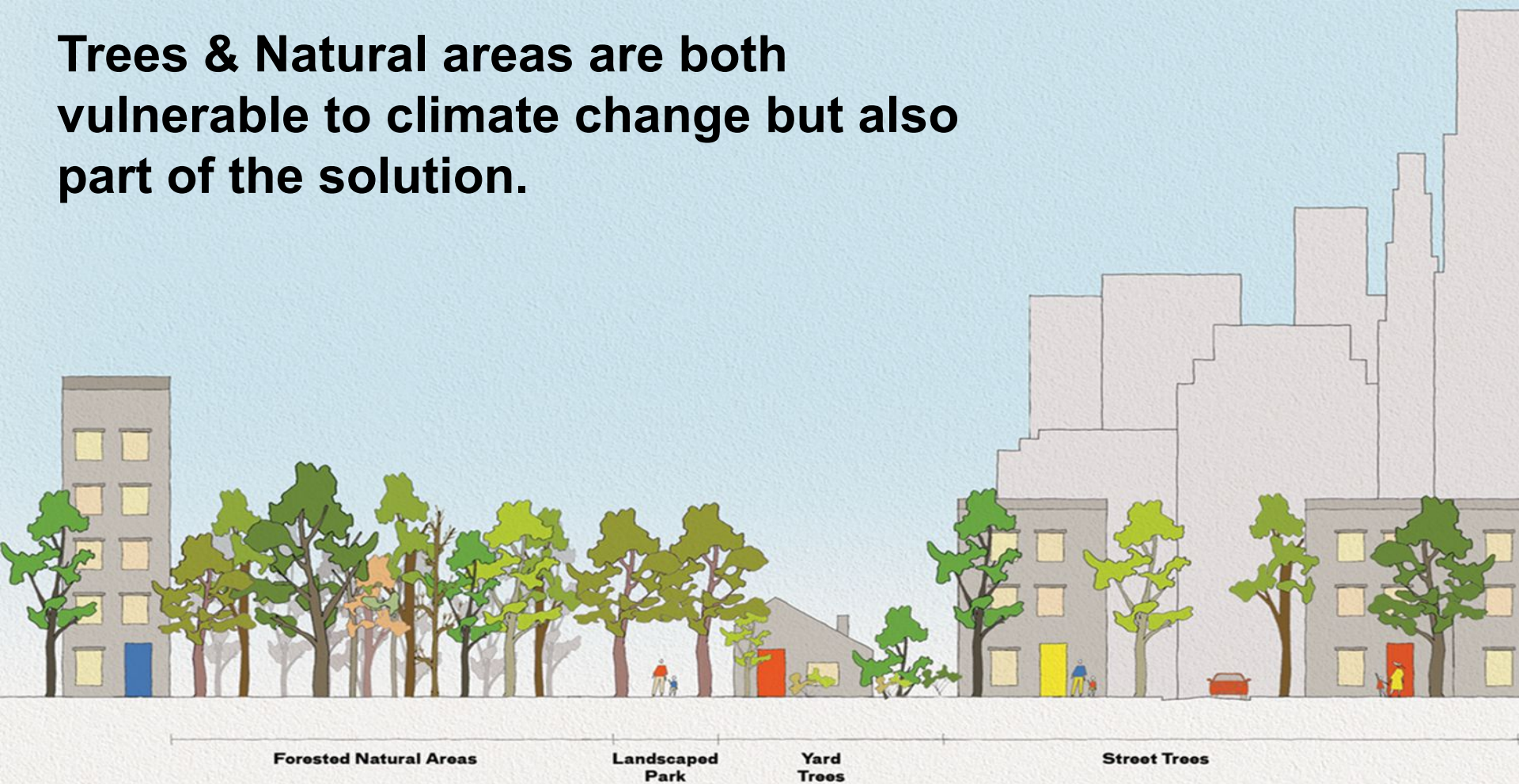
Climate change & urbanization can lead to:

- Flooded forests
- Increased prevalence of invasive species
- Increased pest and pathogens
- Marsh migration
- Plant stress and mortality
- Windfall events and loss of tree canopy
- Soil erosion
- Loss of biodiversity
- Changes in plant and animal communities
 - insect/bird relationships and pollination
- Increased plant competition and altered regeneration and competition dynamics

Overall loss of ecological and social benefits



Trees & Natural areas are both vulnerable to climate change but also part of the solution.



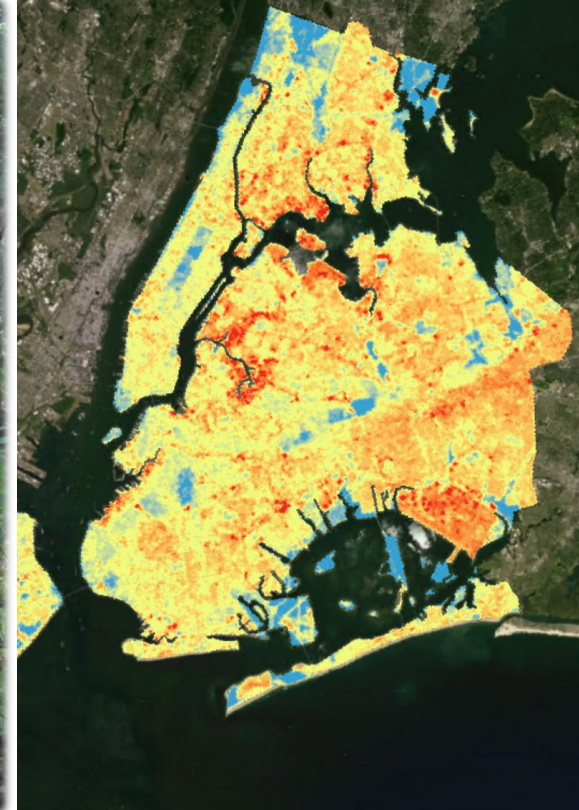
Three examples of the value of healthy urban forests in a climate change context



Biodiversity & Structure & Composition



Storing & Sequestering Carbon



Cooling and Mitigating Urban Heat

Biodiversity, structure, composition

Largest urban natural area assessment done in 2014 - plan to remeasure in 2024

Spatial data characterizing the amount of natural area forest across NYC

Field collected data

- 1,124 fixed area plots across all NYC natural area forests
- Assigned forest type based on NY State Natural Heritage classifications

Rural Forest Comparison

- Compiled non-urban forest types from Forest Inventory and Analysis (FIA) in New York State



NYC's Forested Natural Areas are Native Dominated

- 5.5% of NYC is forested natural areas - more than we thought!
- New York City's forests are native dominated (87% native species in canopy), in contrast to previous assessments.
- New York City's forests are similar in type to rural forests in New York State.
- Invasive species are more prevalent in the groundcover layer- suggesting the future canopies will be threatened.



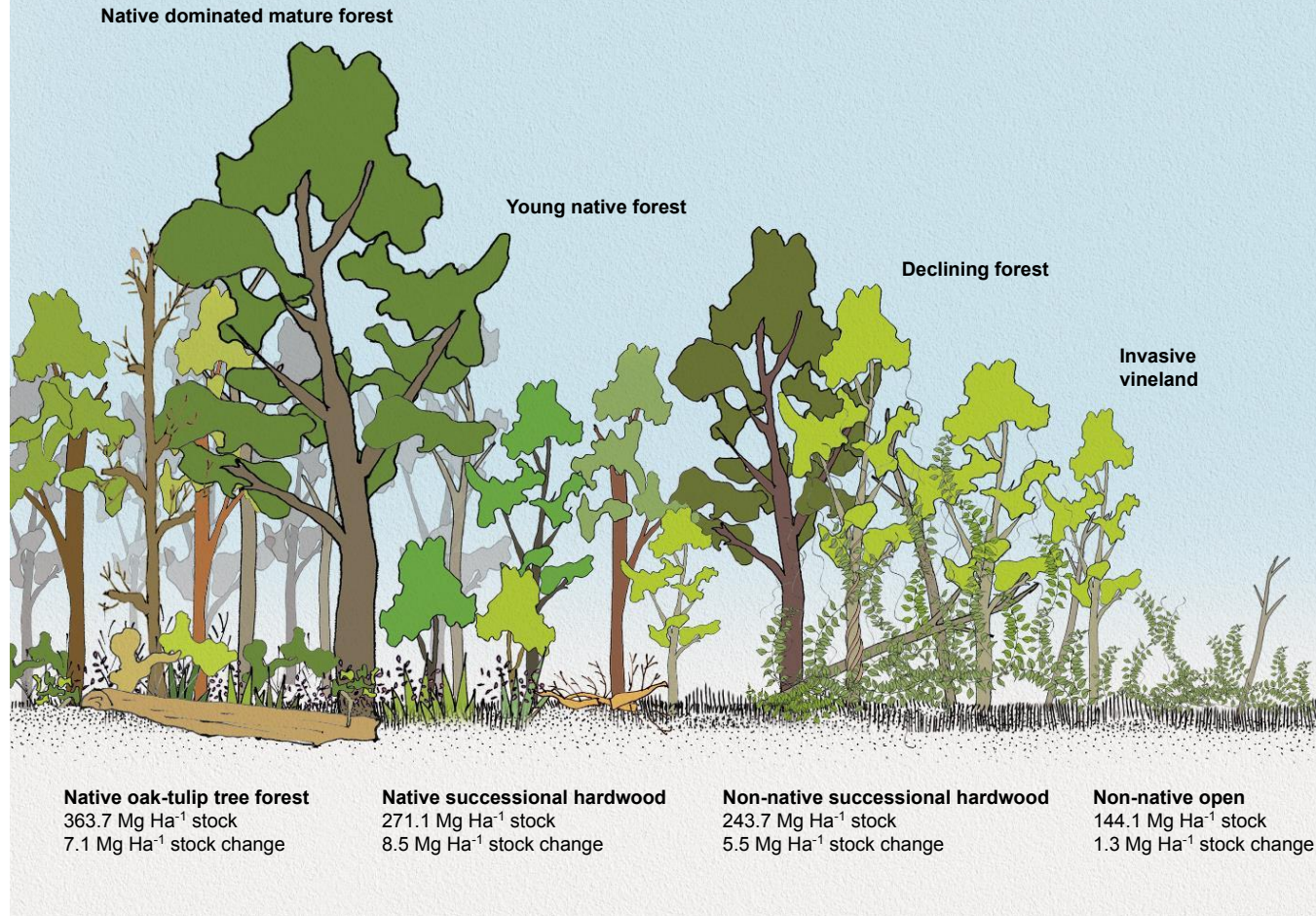
Pregitzer, C. C., S. Charlop-Powers, S. Bibbo, H.M. Forgiione, B. Gunther, R.A. Hallett and M.A. Bradford. 2019. A city-scale assessment reveals that native forest types and overstory species dominate New York City forests. Ecological Applications 29:1-11

Urban Forested Natural Areas are Carbon Sinks

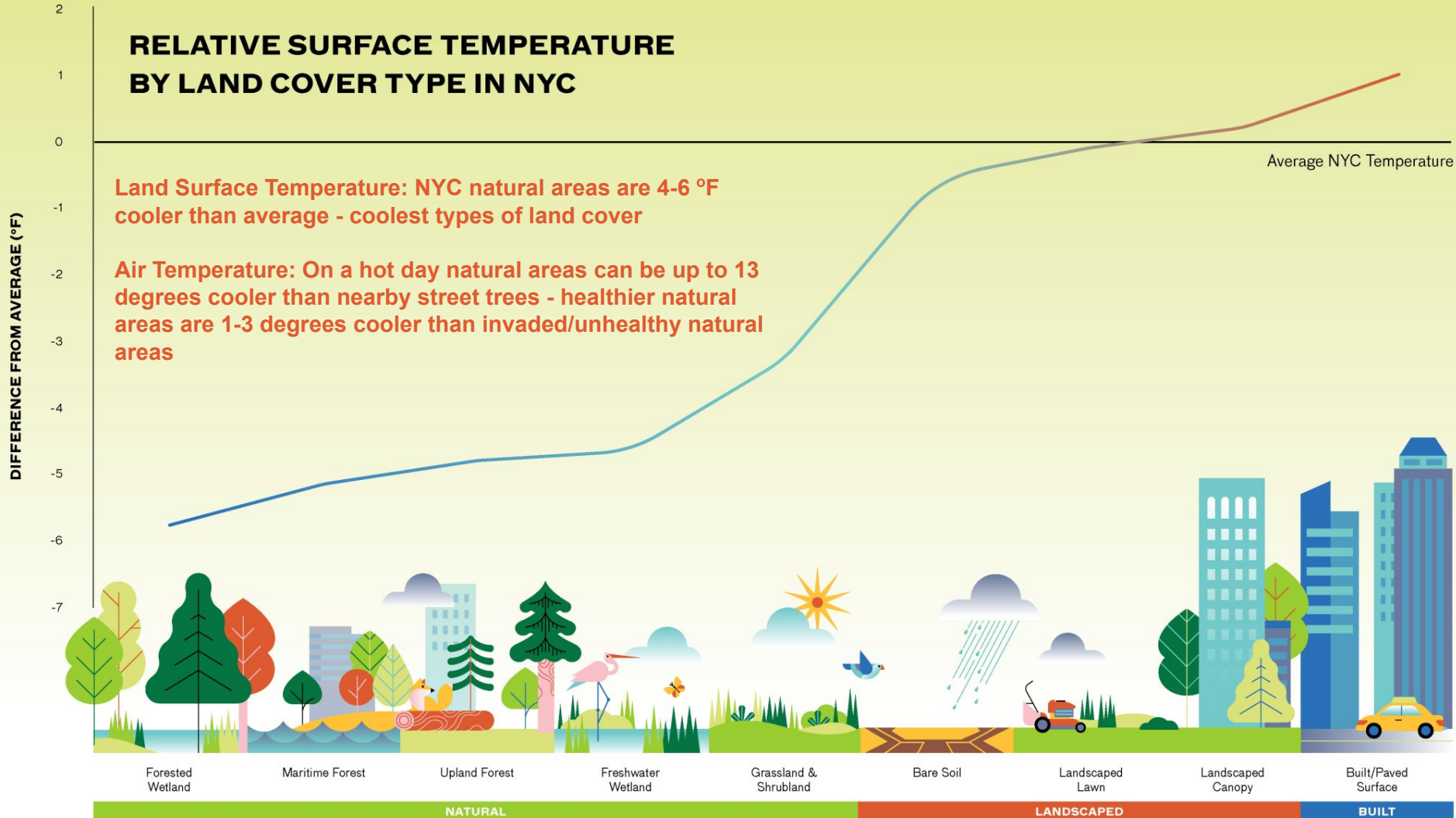
- Majority of Carbon stored despite being minority of tree canopy : 25% of Tree Canopy – 69% of Carbon Storage
- 4x more carbon than all street trees combined
- City forests are storing carbon in similar (per-acre) amounts to non-city forests



Forest Type & Condition Matter for Carbon and Cooling



RELATIVE SURFACE TEMPERATURE BY LAND COVER TYPE IN NYC



Local opportunities to connect the majority of the population with local climate solutions

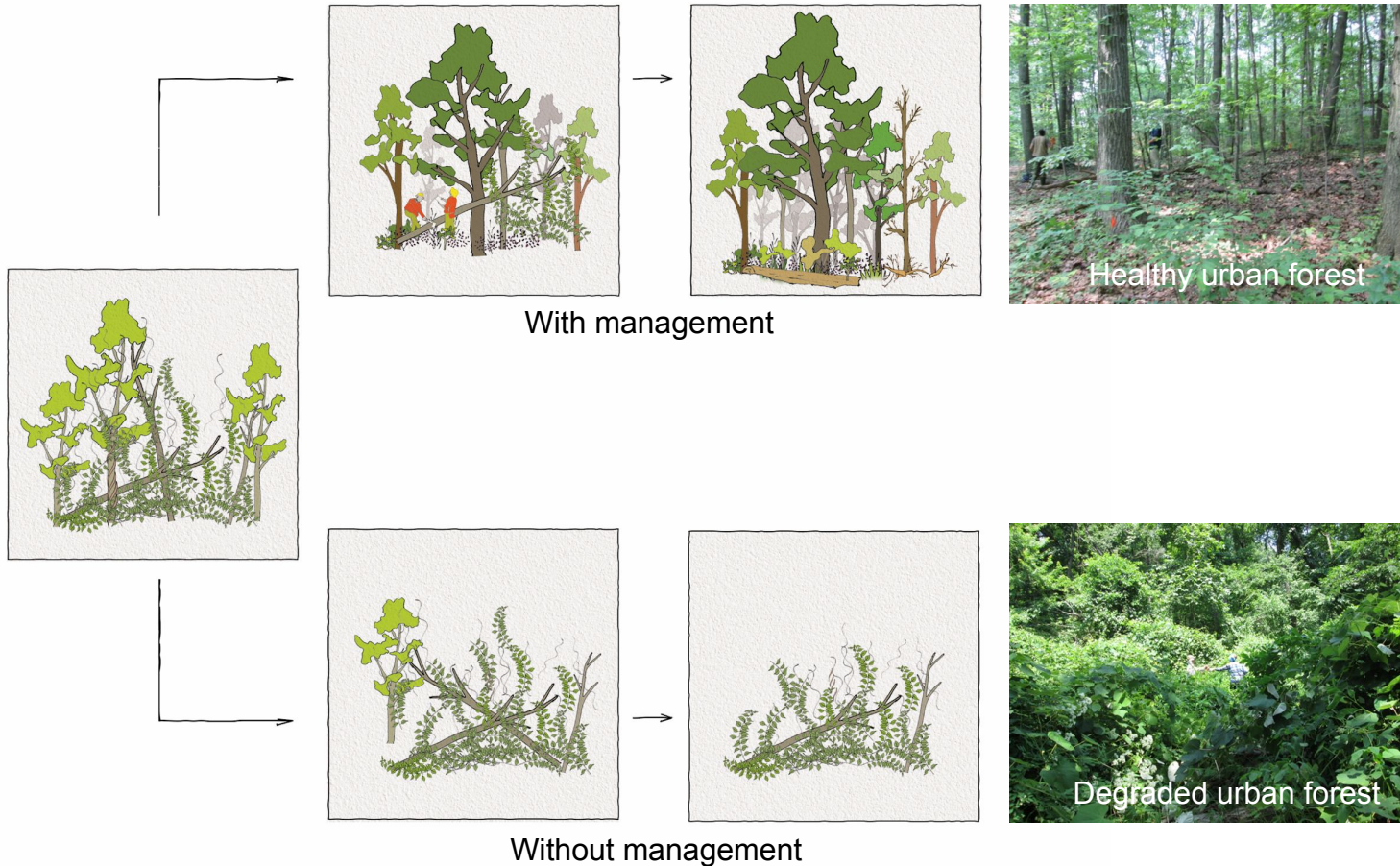
Forested natural areas provide urban dwellers with opportunities to connect with nearby nature based solutions to climate change



Implementation: How Urban Forests are managed for climate change impacts



Healthier natural areas provide more benefits.



- High Carbon Storage
- Maximum cooling
- High social benefits

- Low Carbon Storage
- Reduced cooling
- Reduced social benefits

Incorporating Climate Change Principles into Management



Forest Service
U.S. DEPARTMENT OF AGRICULTURE

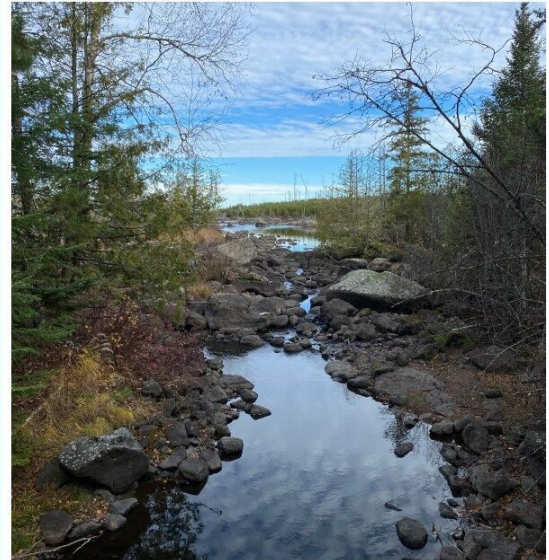
Northern Research Station | NRS-INF-41-22 | September 2022

Existing Urban Climate Change Adaptation Strategies (NIACS)

1. Activate social systems for equitable climate adaptation, urban forest, and human health outcomes
2. Reduce the impact of human health threats and stressors using urban trees and forests
3. Maintain or increase extent of urban forests and vegetative cover
4. Sustain or restore fundamental ecological functions of urban ecosystems
5. Reduce the impact of physical and biological stressors on urban forests
6. Enhance taxonomic, functional, and structural diversity
7. Alter urban ecosystems toward new and expected conditions
8. Promote mental and social health in response to climate change
9. Promote human health co-benefits in nature-based climate adaptation

This is a nice framework - but how it gets done is a little more complicated!

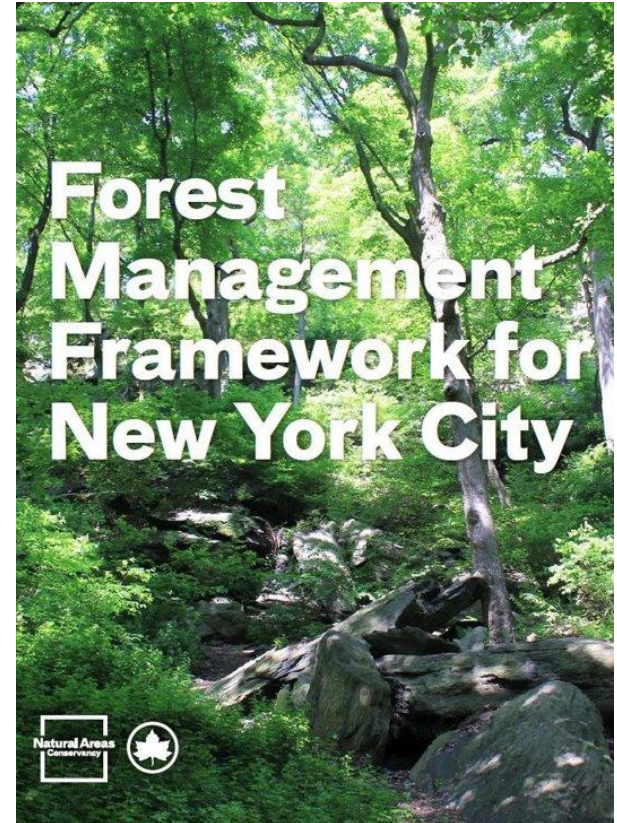
A Quick Guide to Adaptation Planning for Natural Resources Professionals



Reality Check: with limited resources and support - keep it simple

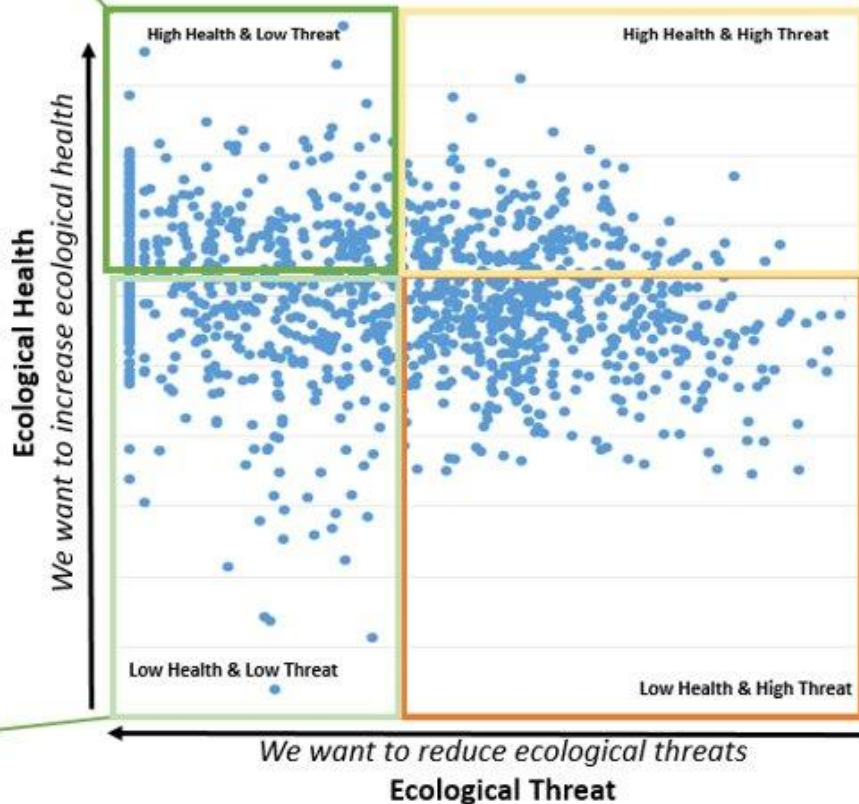
Core management principles

- Protection - No net loss of natural areas
- Match condition with management strategy
- Manage for native species and intact communities
- Consider existing knowledge about climate change & trees
- Accelerate forest growth towards healthy canopy, diverse forest structure and composition



Forest Condition Matrix

Using an index for ecological health and ecological threat we represent the condition of NYC's forest along a gradient so that they can be understood and compared to one another. Each point in the matrix below represents a single plot point where data was collected in the field. The data was combined into an index that represents ecological health and ecological threat.



Forests in this category are the highest quality. Monitoring is required to ensure that quality remains high and we protect them.



Forests in this category have minimal threats but desired health attributes such as structure and composition metrics are not met. Management can be used to accelerate the transition into high health but monitoring over time with little intervention could also result in improved health.



Forests in this category contain many of the attributes of a high quality forest, for example native canopy, but at the same time also contain many of the attributes of a highly threatened forest, for example invasive understory. Management intervention of these forests could be critical to ensure invasive species don't overcome the healthy components of these forests.



Forests in this category are the most degraded in NYC. They are categorized as high threat and are likely dominated by invasive non-native species. Intensive management interventions are needed.



FIGURE 11

Forest Condition Drives Management Strategy

The assessed condition of the forest determines the management strategy, resources needed, and costs estimated.



Forest Restoration



Forest Management



Forest Monitoring and Maintenance

		High Threat	Medium Threat	Low Threat	Very Low Threat
Acreage	Total Acres in Category	519	2,527	3,090	1,184

Ecological Conditions	Percent Invasive Herbaceous Cover	≥ 70%	40–70%	10–40%	≤ 10%
	Invasive Vines on Trees* <small>*Where there are >350 trees/hectare</small>	> 50%	20–50%	1–20%	0
	Invasive Canopy Basal Area (m²/ha)	> 10	4–10	.1–4	0
	Invasive Midstory (stem count/hectare)	> 500	100–500	1–100	0

To qualify for Forest Monitoring & Maintenance and be in the Very Low Threat status forests must also have a minimum of 5,000 native tree seedlings/hectare, 100 native midstory stems/hectare, and 6 native herbaceous species present.

NYC Parks: 40 years of Active Management

**Invasive Control:
Mechanical Maintenance**



**Invasive Control:
Herbicide Application**



**Tree Planting,
MillionTreesNYC
Seeding**



GUIDELINES FOR URBAN FOREST RESTORATION



NYC Parks



FIRST Tool



Forest Identification and Restoration Selection Tool

Choose a restoration planting plan
by identifying a forest

Choose a restoration planting plan
from a list of forest types

Choose a restoration planting plan
based on general forest conditions

About this tool

FIRST Tool

High Allegheny Rich Red Oak - Sugar Maple Forest

Red Oak / Heath Woodland Rocky Summit

Northeastern Maritime Forest

Silver Maple Floodplain Levee Forest

Lower New England Red Maple Swamp Forest

Northeastern Old-field Meadow

Pin Oak Small River Floodplain Forest

Piedmont-Central Appalachian Silver Maple Floodplain Forest

Lower New England High Slope Chestnut Oak Forest

Northern Coastal Plain Little Bluestem Grassland

Northeastern Maritime Forest

Tier 1:

Resilient to climate-based Disturbance; Resilient to climate-based range shift

Red Maple (*Acer rubrum*)

[Common Hackberry \(*Celtis occidentalis*\)](#)

Eastern Redcedar (*Juniperus virginiana*)

Pitch Pine (*Pinus rigida*)

Black Oak (*Quercus velutina*)

Sassafras (*Sassafras albidum*)

Tier 2:

Vulnerable to climate-based Disturbance; Resilient to climate-based range shift

Transition through management



Restored forest in Van Cortlandt Park before (left) and after (right) stand thinning. The restoration site is characterized by a dense midstory dominated by successional trees and an underdeveloped understory

Examples from across US



A screenshot of a web browser displaying a document viewer interface. The browser's address bar shows the URL 'fic.naturalareasnyc.org/docs/climate-change'. The page title is 'Climate Change' with a sub-header '9 Articles in this category'. A sidebar on the left lists several categories: 'Management Plans', 'Policy, Communications, and Advocacy', 'Stewardship, Volunteers, and Community Engagement', and 'Climate Change' (which is highlighted in green). Below the sidebar, the text 'Powered by DOCUMENT360' is visible. The main content area displays three article snippets, each with a blue title and a short text description. The first article is 'Adaptive Silviculture for Climate Change in the Mississippi National River and Recreation Area', the second is 'Planning for Climate Change Through Riparian Restoration in Houston, Texas', and the third is 'Climate Change Vulnerability and Response in Seattle's Urban Natural Areas'. A green arrow icon is located at the bottom right of the document viewer.

Opportunities & Challenges

- **Land Conversion.** 4% of natural area parkland nationwide was converted to a different land use type in a 5 year period (~40,000 acres).
- **Lack of Funding and Political Will.** Average of <5% of Parks Budgets go to natural areas care despite being a major park land use type.
- **Lack of Data:**
 - Where urban natural areas exist (tree canopy is mapped)
 - Risks and mapping climate impacts
 - Downscaled climate data

Urban areas can be agents of change - and also can be a bell weather

Connections to people - form of nearby nature

Thank you.

Clara.Pregitzer@naturalareasnyc.org

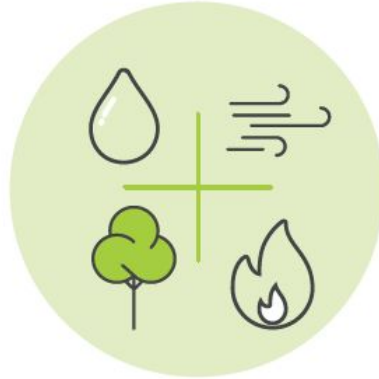
Kristen.King@nycparks.gov

NATURAL AREAS IN CITIES ARE VALUABLE

Urban Forested Natural Areas



**Make Cities
More Livable**



**Contribute to Climate
Change Solutions**



**Provide Ecological
Benefits**

Trajectories of Urban Parks and Natural Areas

- **Land Conversion.** 4% of natural area parkland was converted to a different land use type in a 5 year period (~40,000 acres).
- **Lack of Funding and Political Will.** Average of <5% of Parks Budgets go to natural areas care despite being a major park land use type.
- Lack of Data (monitoring, downscaled climate data)

Central Park 2010 - 2017 LiDAR Canopy Change

Gain Loss No Change



Urban Forest in NYC?

We work in Natural Areas

NYC Natural Areas

NYC's Land Cover: **40.5% of NYC Is Green**



Source: Natural Areas Conservancy Ecological Coverture Map⁷

NYC's Natural Areas: **11.6 % of NYC's Land Cover Is Natural Areas**



Source: Natural Areas Conservancy Ecological Coverture Map⁸