Mayor Keisha Lance Bottoms

Natural Green Infrastructure and Stormwater Benefits of Atlanta's Urban Tree Canopy

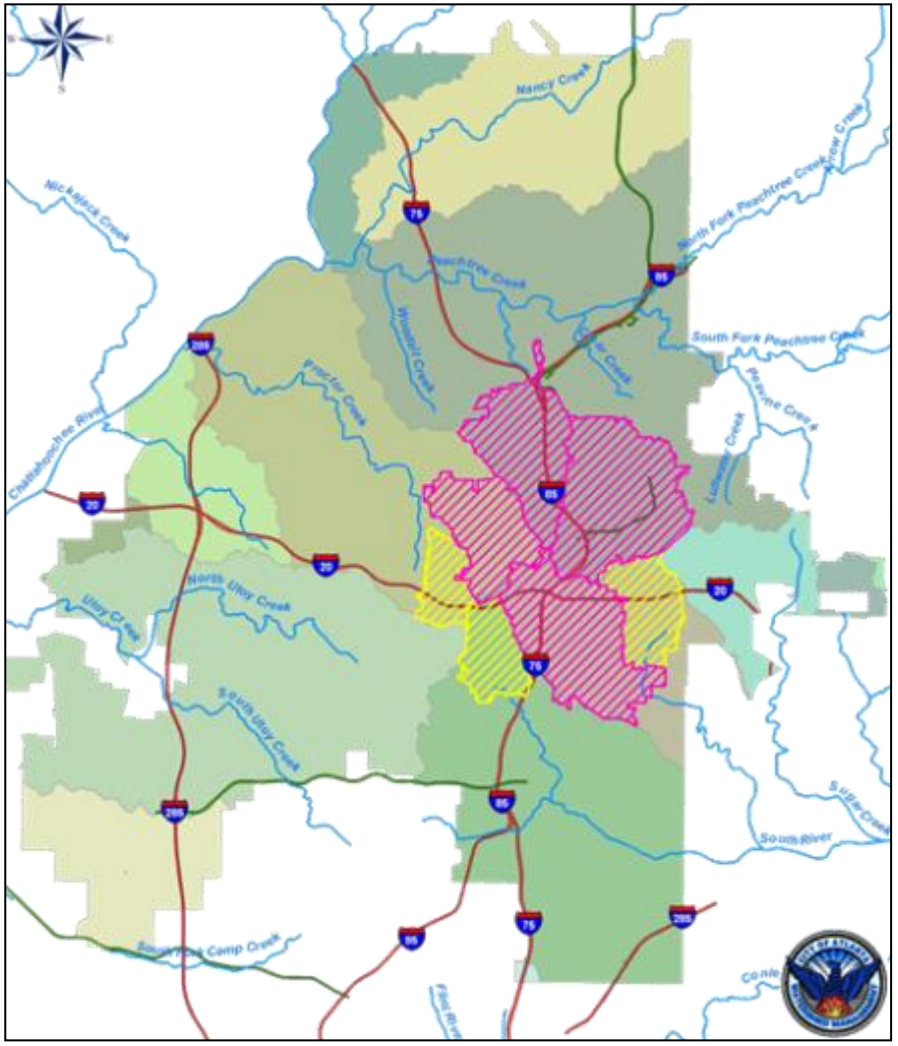
Tamara Graham, Project Manager

CITY OF ATLANTA DEPARTMENT OF watershed management

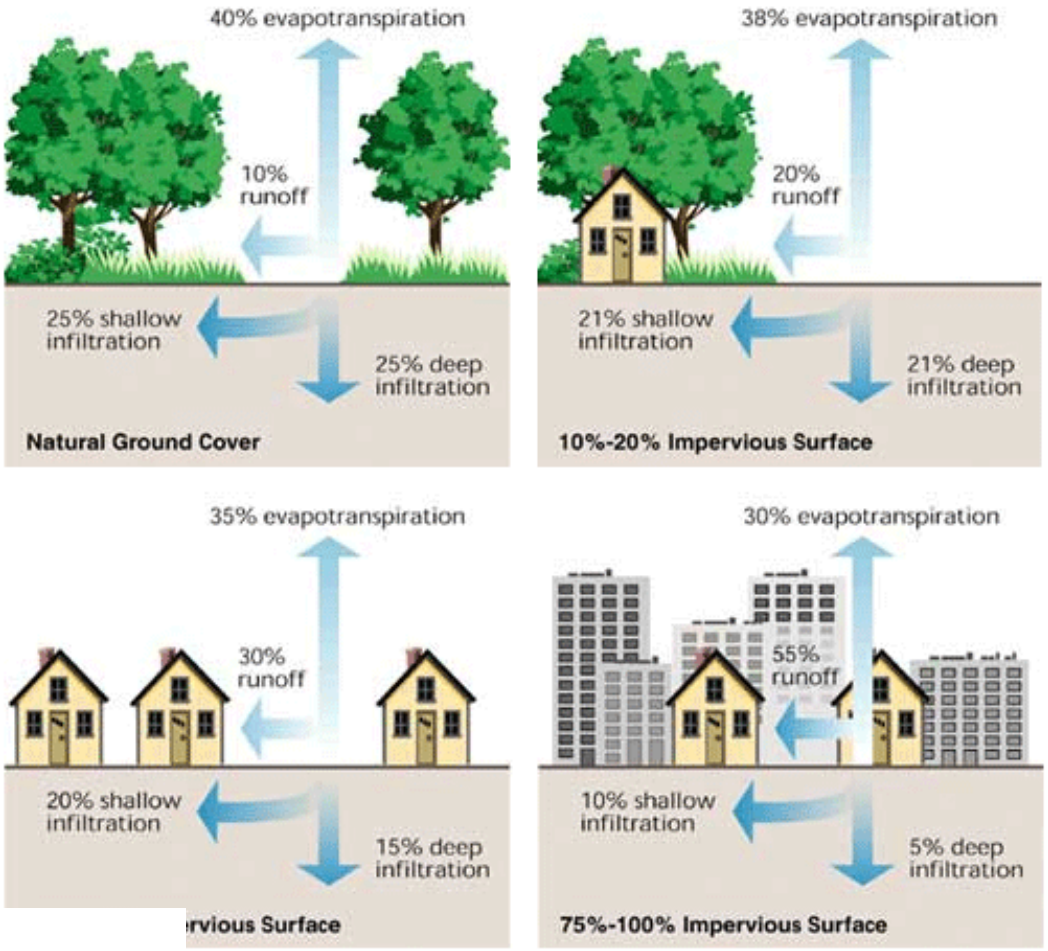
Kishia L. Powell, Commissioner
Department of Watershed Management

8/19/2019

Atlanta Watersheds and Sewersheds



How Urbanization Exacerbates Flooding

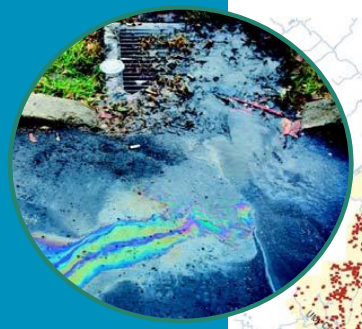


Stormwater Issues are City-wide

Damaged Infrastructure

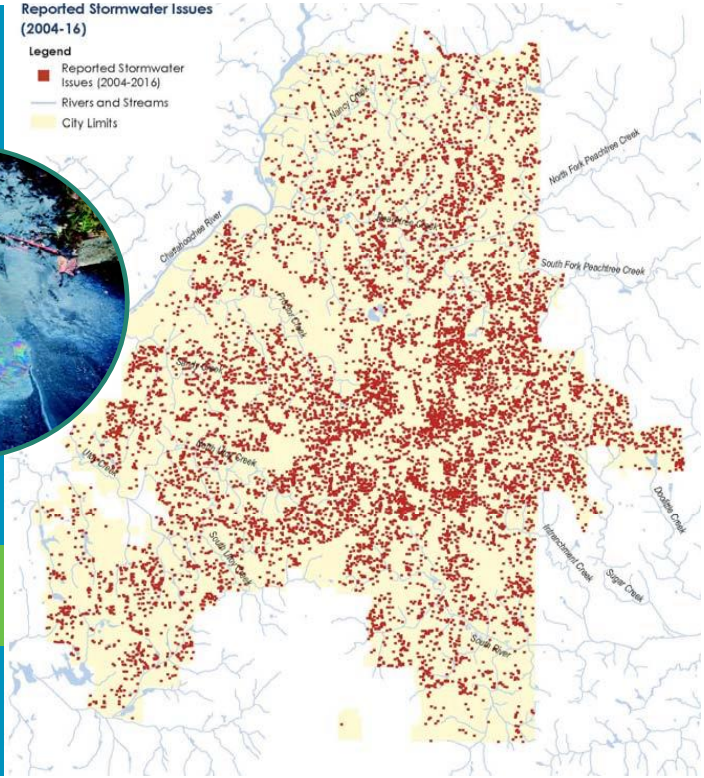
Street Flooding

Water Quality Issues



DWM receives about 1,300 complaints about stormwater issues every year.

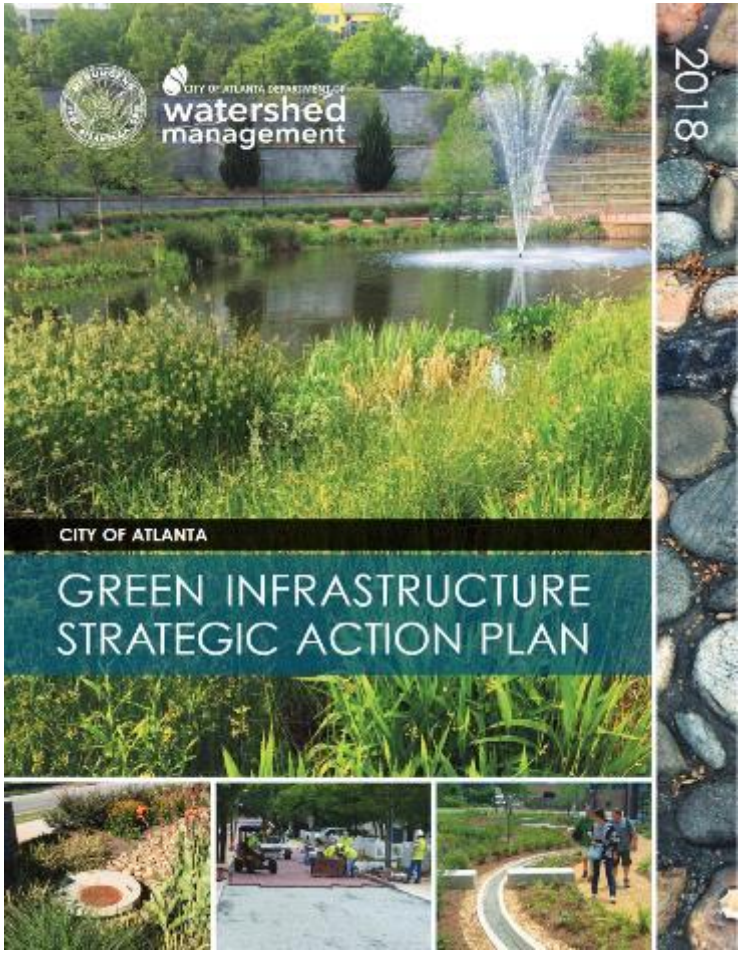
Issues are city-wide.



Green Infrastructure Strategic Action Plan

The City of Atlanta adopted the Department of Watershed Management's Green Infrastructure Strategic Action Plan in 2017

Goals: to integrate green infrastructure across city departments to manage stormwater and provide multiple co-benefits



What is Green Infrastructure?

- An interconnected natural or engineered system that preserves or mimics undeveloped hydrologic functions
- Capture the first 1.0” of rainfall
  - Infiltration
  - Evapotranspiration (uptake of water by plants + evaporation)
  - Reuse through rainwater harvesting

Green Infrastructure Strategic Action Plan

Mimics natural hydrology with

Engineered Green Infrastructure

+

Conserves & expands network of

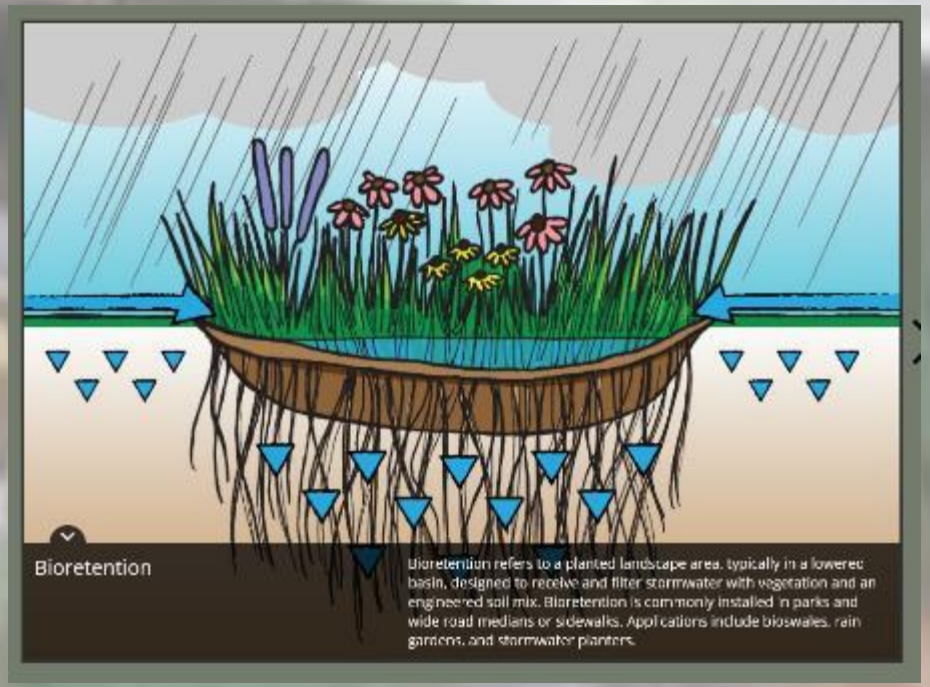
Natural Green Infrastructure

Engineered Green Infrastructure

Systems such as:

- ***rain gardens***
- ***green roofs***
- ***permeable pavement, and***
- ***cisterns***

that are designed to capture and treat stormwater runoff by replicating the natural drainage systems of undeveloped land.



Engineered GI Projects

Green Roof
City Hall

Rainwater Harvesting
Southface

Rain Garden
Adair Park

Permeable Pavers
Urban Market at Howell Mill

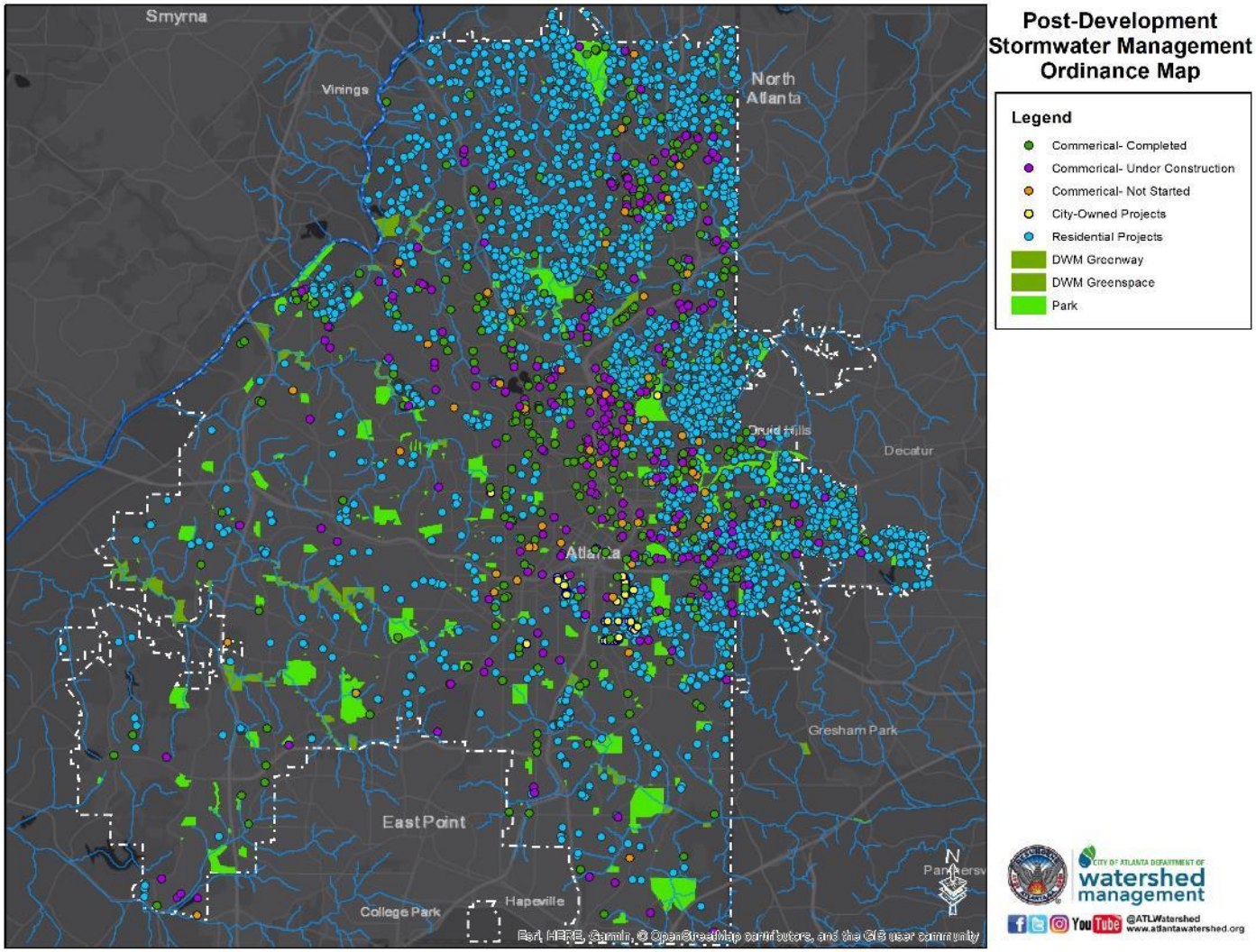
Stormwater Bump-out
Whitehall Terrace

Stormwater Planters
Boone Blvd Green Street

Wet Pond
Historic Old 4th Ward Park

Bioswale
Fernbank Museum

GI on Private Properties

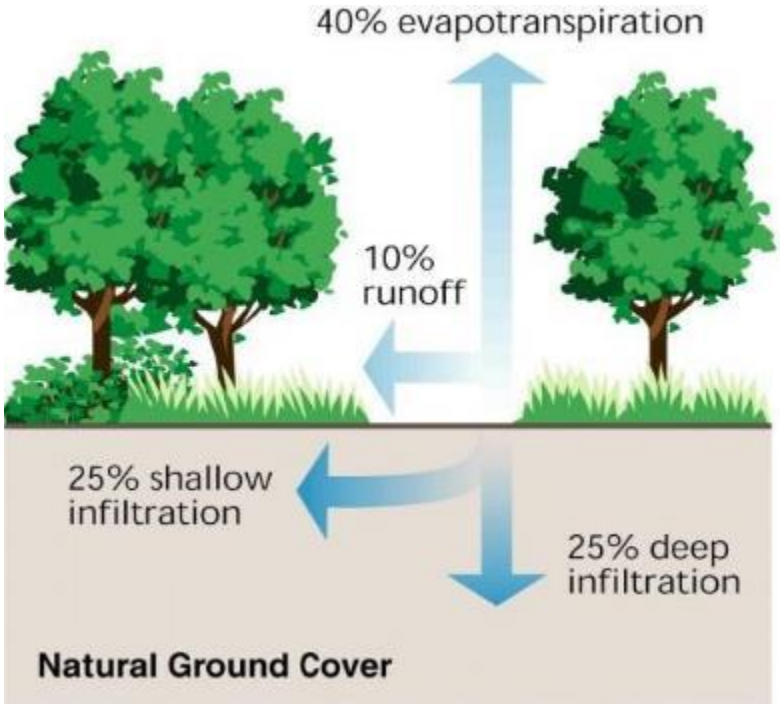


Natural Green Infrastructure

Preserving and restoring a network of protected forests, wetlands, riparian buffers, floodplains, and other vegetated areas, is a highly efficient means of protecting water quality and watershed health.

Hydrology in a Natural Watershed

Very little runoff leaves a forest…



Hydrology in a Natural Watershed

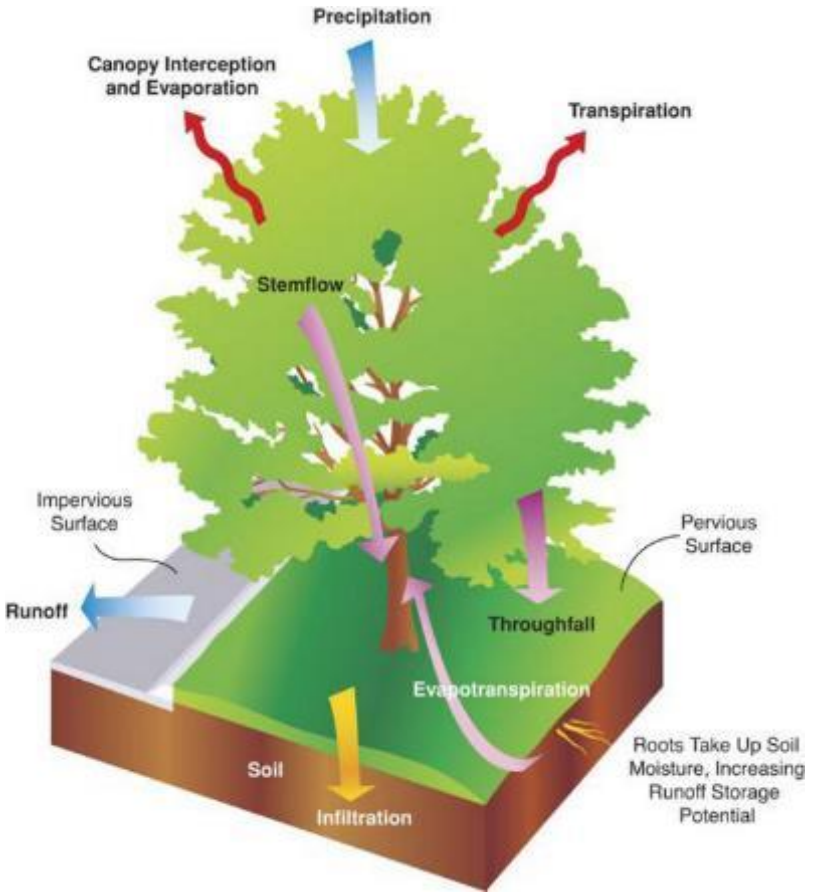
The forest's dense canopy cover and layers of vegetation intercept raindrops, dissipating the impact of rain

Moisture evapotranspires through the vegetation, cooling the air

More Strategic Approach to Urban Watershed Forestry

Maximize Ecosystem Services of Trees for Stormwater Management:

- *Canopy interception and evaporation*
- *Transpiration*
- *Stemflow*
- *Throughfall*
- *Infiltration*



More Strategic Approach to Urban Watershed Forestry

Acquiring and Conserving high quality greenspaces

Invasive management

to meet recompense requirements

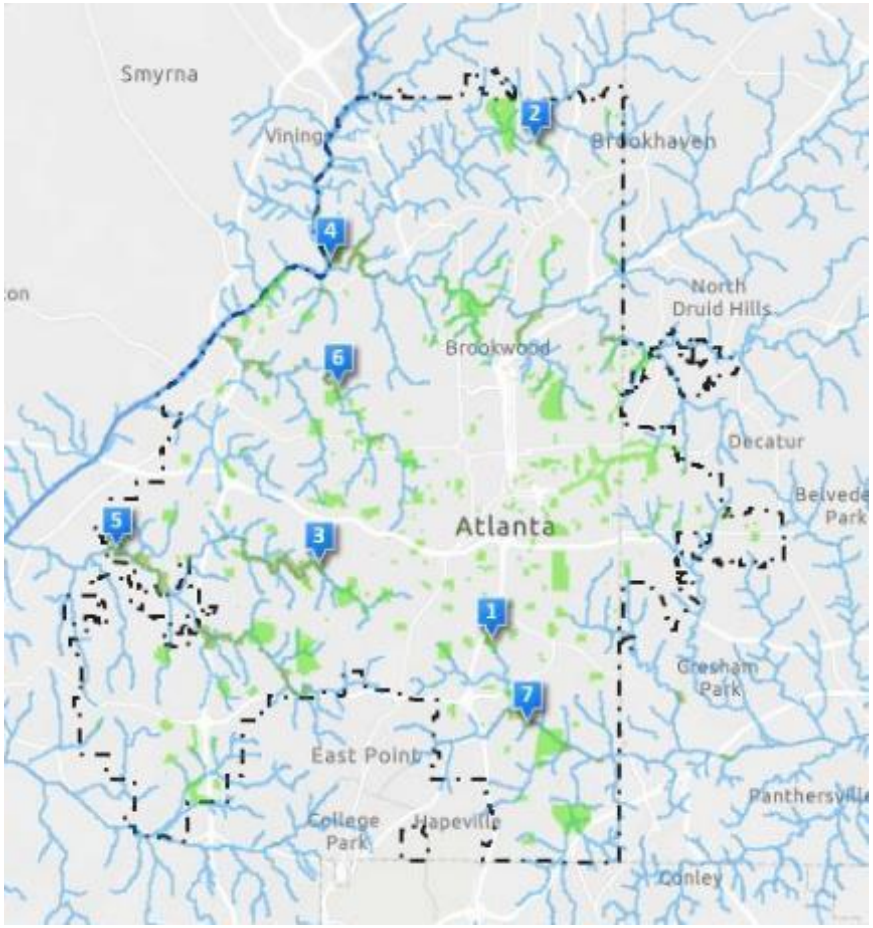
Identifying **"receiving sites"**

for trees for renaturalization

Natural Green Infrastructure

COA DWM presently owns and manages 1,900+ acres of protected Greenway and Greenspace properties in 12 watersheds around the City and metro area.

Property Category	Number of properties	Acres
Greenway-Consent Decree-Fee	99	767.43
Greenway-Consent Decree-CE	55	1,152.85
Greenway-non-Consent Decree-Fee	2	6.40
Greenway-non-Consent Decree-CE	2	23.56
Greenspace-FEMA	10	4.20
Greenspace-Other	5	13.80
TOTAL	173	1,968.23

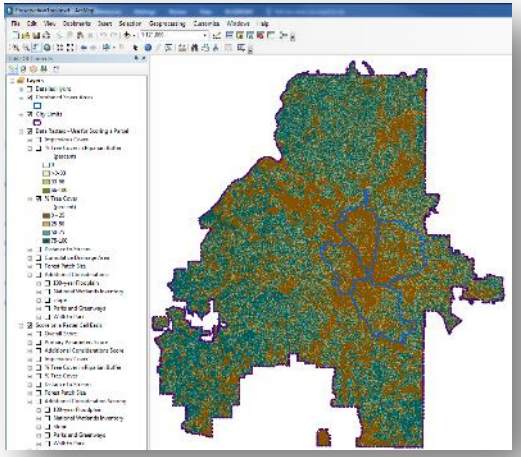


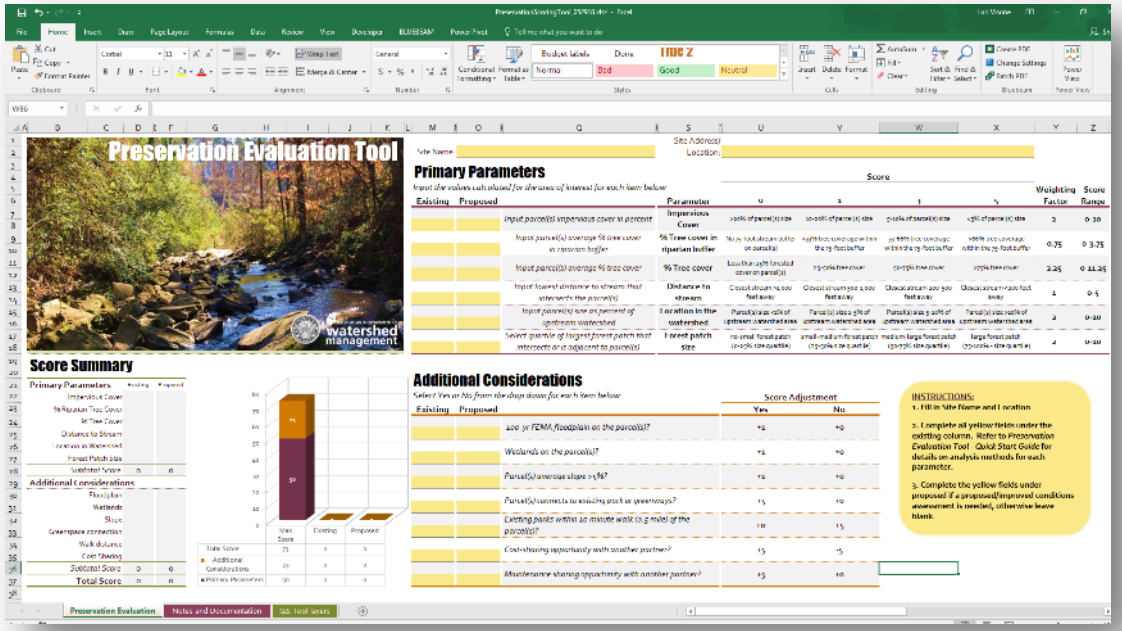
Greenway & Greenspace Properties

Preservation Evaluation Tool

Tool consists of two components

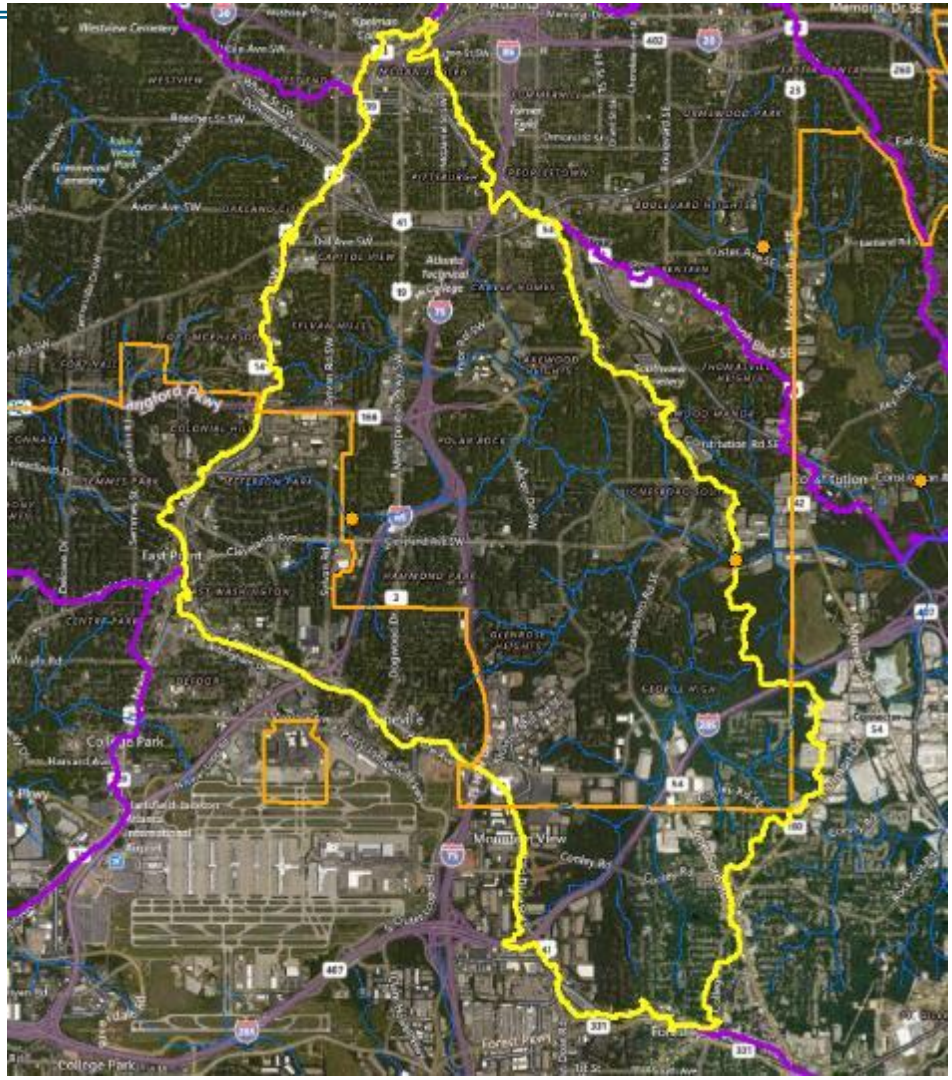
- GIS for analysis
- Excel for evaluation and documentation





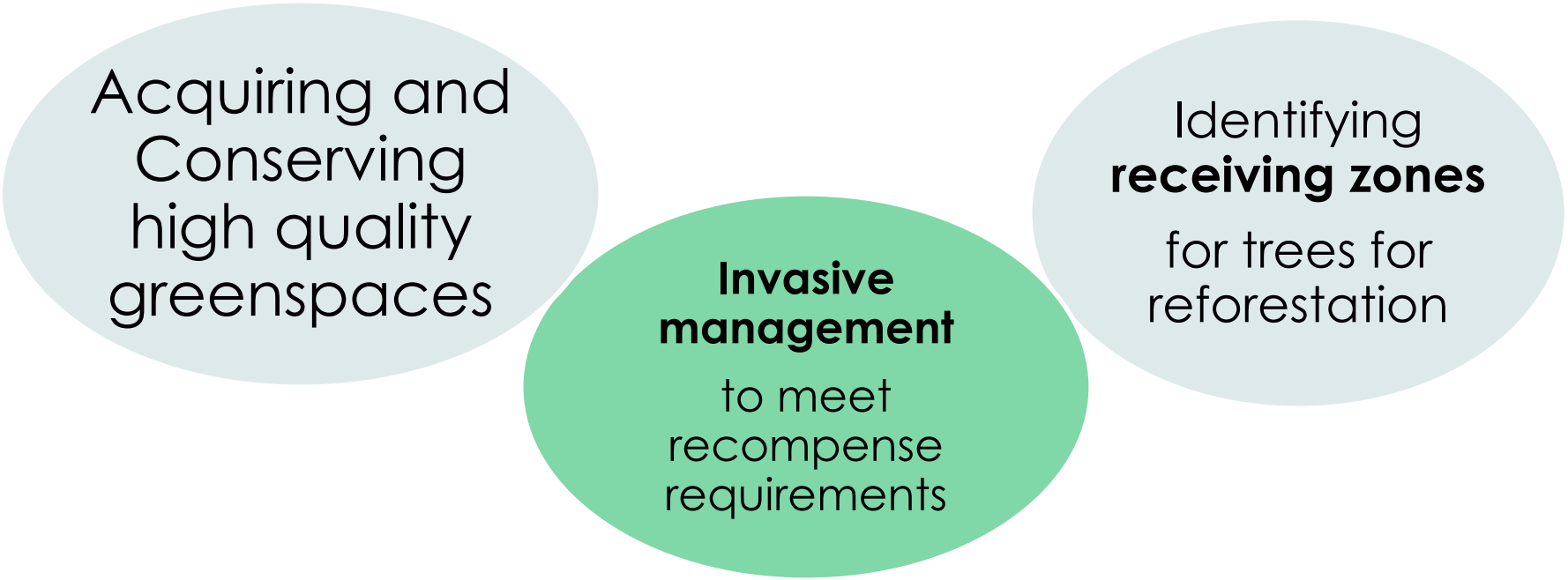
i-Tree Hydro: South River Case Study

- Model area
  - Outlet at SOU-1 (USGS station 02203655)
  - 23.1 mi^2
- Base model parameterization
  - Used additional parameterization developed by the forest service



Yellow boundary = i-Tree Study Area
Purple boundary = watershed boundaries

More Strategic Approach to Urban Watershed Forestry



Tree Recompense

As a public utility, DWM's work can unfortunately sometimes negatively impact the urban forest

Sewer lines typically follow natural drainage ways

City's Tree ordinance requires recompense for these impacts

Recompense, caliper inch planted for caliper inch destroyed

Cook Park regional stormwater project

More Strategic Approach to Urban Watershed Forestry

Tree ordinance has special provisions for DWM Consent Decree projects

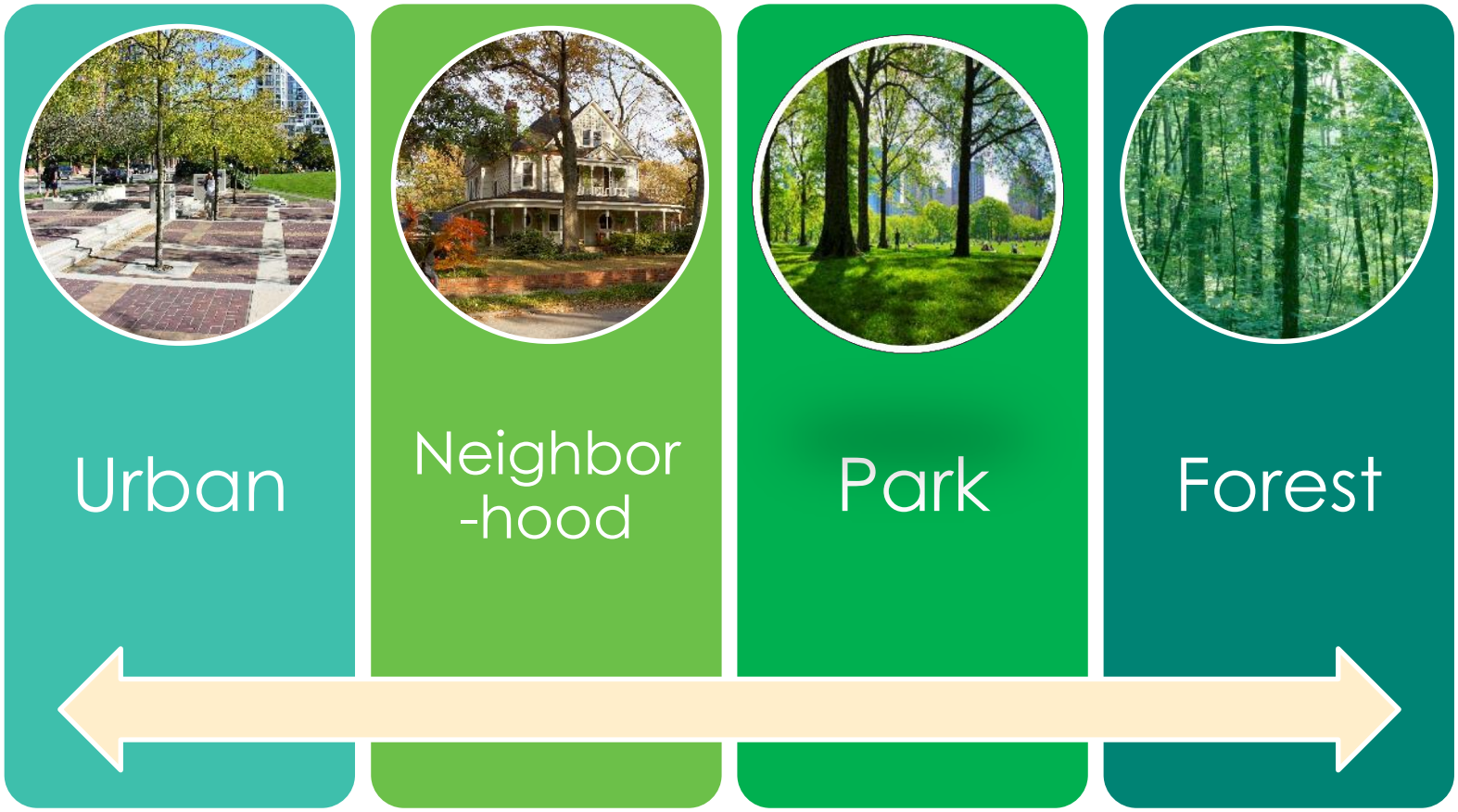
Recompense can be met through:

- Invasive removal
- Planting live stakes, liners

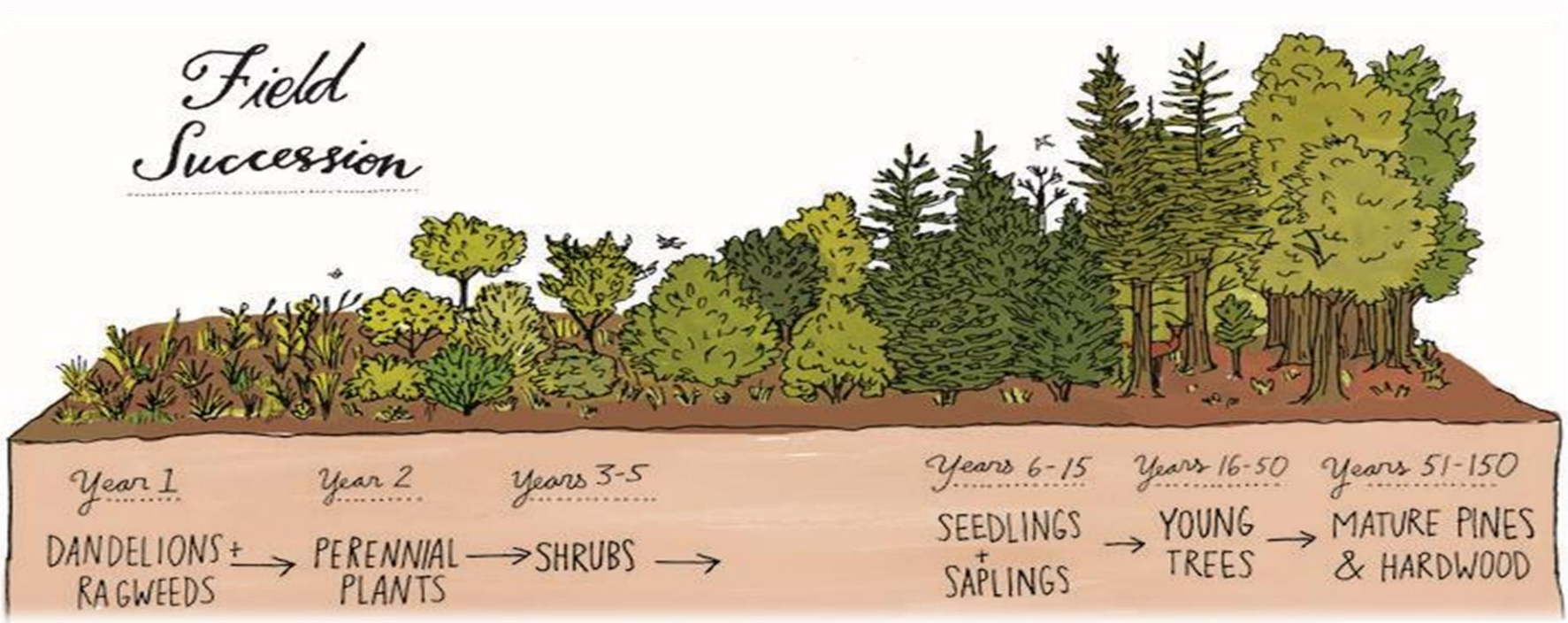
Recompense site example DWM Properties

South River Water Reclamation Plant

Urban Forest "Continuum"



Natural Ecological Succession



Southeastern Piedmont Forest is incredibly productive ecologically, naturally regenerating from abandoned farm field to oak hickory forest in 150 years

McDaniel Branch Watershed Improvement Project


Original stream condition


Immediately after construction, 2013


Restored stream, summer 2015

2 Project Components (completed 2015)**:**

- 1000 LF stream restoration (319 grant)
- Constructed stormwater ponds and wetlands (USACE)

Benefits:

- Restored stability and function to a degraded urban tributary of the South River
- Created 7 acres of wildlife habitat from an empty demolition site overgrown with invasive plants. (Audubon Wildlife Sanctuary Certification pending)
- Public nature preserve (site/trail design in progress)


Constructed wetland, 1st season after planting, 2015

"Jumpstarting" Succession

Immediately after construction, 2013

Restored stream, summer 2015

McDaniel Branch Stream Restoration, Atlanta

Invasive Management

- Trees Atlanta mapping and invasive removal
- Targeted invasives:
  - Japanese hops (yellow)
  - Kudzu (red and yellow)
- Mature trees saved:
  - est. +/- 20 24" avg. cal. trees

Environmental Education and Community Engagement

- Interpretive signage
  - Delineates extents of mowing
  - Shows that management is “intentional”

Certified as an Audubon Wildlife Sanctuary

Co-benefits:

- *Supports biodiversity*
- *Opportunities for recreation*
- *Enhances water quality*
- *Capacity relief*

Certified by the Atlanta Audubon Society as an Audubon Wildlife Sanctuary in October 2018

More Strategic Approach to Urban Watershed Forestry

Acquiring and Conserving high quality greenspaces

Invasive management

to meet recompense requirements

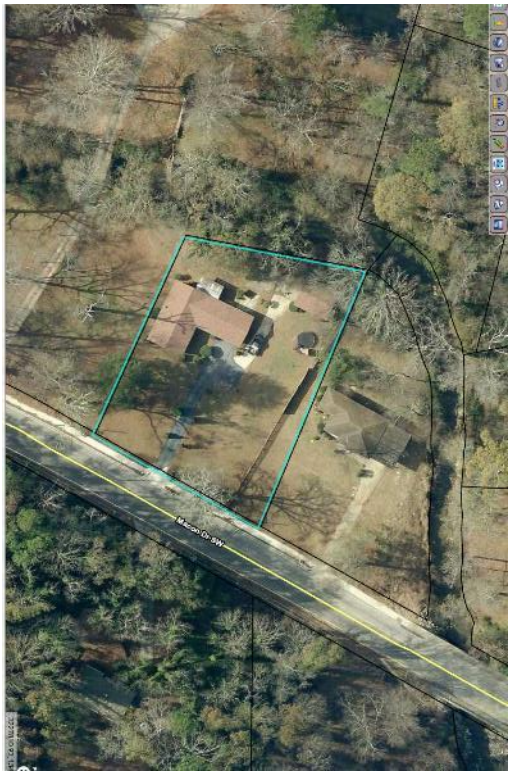
Identifying **"receiving sites"**

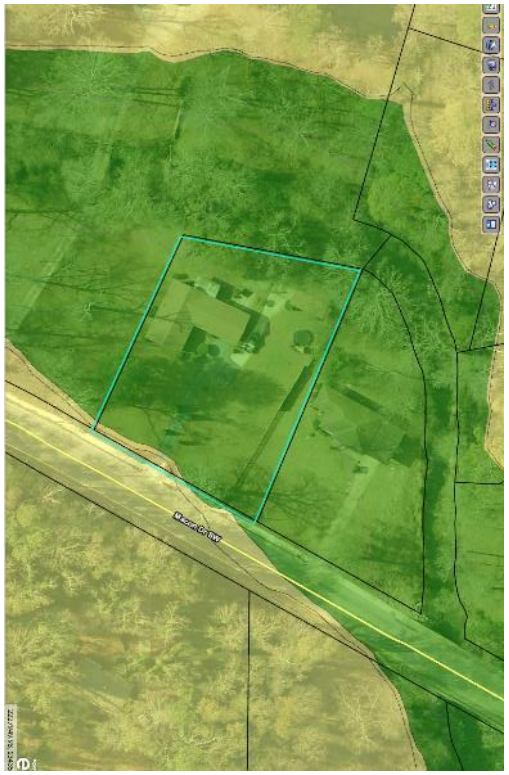
for trees for renaturalization

Example of a "Receiving Site": Macon Drive Greenspace

DWM Greenspace property – located in floodplain

- .43 acres
- South River frontage
- Impervious surfaces removed
- Acquired and protected as riparian buffer greenspace

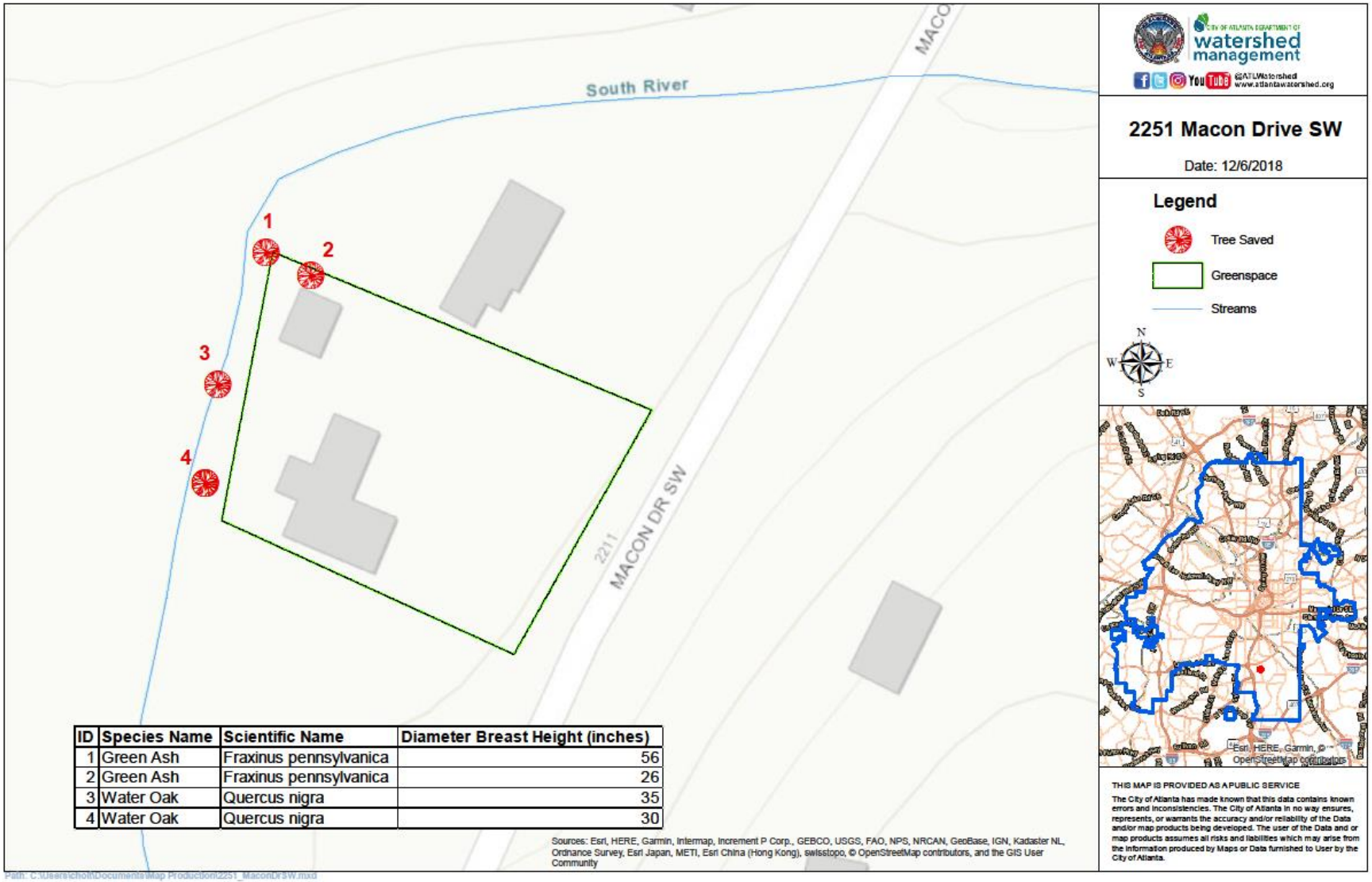




Macon Drive Renaturalization Plan

- Flood Limits
- Existing Trees
- Reforestation
- Reforestation with shrub layer
- Meadow (annual mow)
- Turf (routine mowing)
- Proposed Trees
- Former structure

Macon Drive Renaturalization



ID	Species Name	Scientific Name	Diameter Breast Height (inches)
1	Green Ash	Fraxinus pennsylvanica	56
2	Green Ash	Fraxinus pennsylvanica	26
3	Water Oak	Quercus nigra	35
4	Water Oak	Quercus nigra	30

Path: C:\Users\choit\Documents\Map Production\2251_MaconDrSW.mxd

Macon Drive Renaturalization

Trees:


tulip poplar


sycamore


sweetgum


American holly

Understory:


possumhaw


fothergilla

Live stakes on bank:


black willow


red osier dogwood

Macon Drive Renaturalization

Allow natural ecological succession to occur

- New plantings tighter spacing, staggered sizes, native plants
- Buffer enhancement
- Ongoing management for invasives

Macon Drive Renaturalization

Proposed Plant Schedule & Recompense Credits					
Qty	*Botanical Name*	*Common Name*	*Size*	*Tree Recompense Credits*	*unit*
Specimen/Street Trees					
3	*Quercus falcata*	southern red oak	2" cal.	3	in
5	*Carya glabra*	pignut hickory	2" cal.	5	in
3	*Liquidambar styraciflua*	sweetgum	2" cal.	3	in
Canopy Trees					
12	*Liriodendron tulipifera*	tulip poplar	1 " cal.	12	in
66	*Liriodendron tulipifera*	tulip poplar	whips	66	in
4	*Platanus occidentalis*	sycamore	1 " cal.	4	in
12	*Platanus occidentalis*	sycamore	whips	12	in
4	*Liquidambar styraciflua*	sweetgum	1 " cal.	4	in
12	*Liquidambar styraciflua*	sweetgum	whips	12	in
4	*Quercus nigra*	water oak	1 " cal.	4	in
12	*Quercus nigra*	water oak	whips	12	in
Mid-story trees					
4	*Pinus taeda*	Loblolly pine	4 - 6'	4	in
12	*Pinus taeda*	Loblolly pine	7 gal.	12	in
4	*Ilex opaca*	American holly	4 - 6'	4	in
12	*Ilex opaca*	American holly	7 gal.	12	in
8	*Magnolia virginiana*	sweetbay magnolia	4 - 6'	8	in
16	*Magnolia virginiana*	sweetbay magnolia	7 gal.	16	in
4	*Ilex decidua*	possumhaw	7 gal.	4	in
12	*Ilex decidua*	possumhaw	3 gal.	12	in
Shrubs					
12	*Fothergilla gardenii*	fothergilla	3 gal		
12	*Calycanthus floridus*	sweetshrub	3 gal		
20	*Ilex verticillata*	winterberry	3 gal		
Live stakes					
84	*Salix nigra*	black willow			
84	*Cornus sericea*	red-osier dogwood			
			Total recompense credits	**198**	in

Saved Trees for Recompense credits		
Species Name	**Scientific Name**	**Diameter Breast Height (inches)**
Green Ash	*Fraxinus pennsylvanica*	56
Green Ash	*Fraxinus pennsylvanica*	26
Water Oak	*Quercus nigra*	35
Water Oak	*Quercus nigra*	30
	Total recompense credits	147

Total Recompense Credits=
Proposed Recompense Credits + Saved Recompense Credits
= 198 + 147 = 345 inches

Natural Resources Management vs. Traditional Landscape Maintenance

Conventional Maintenance

"mow, blow and go…."

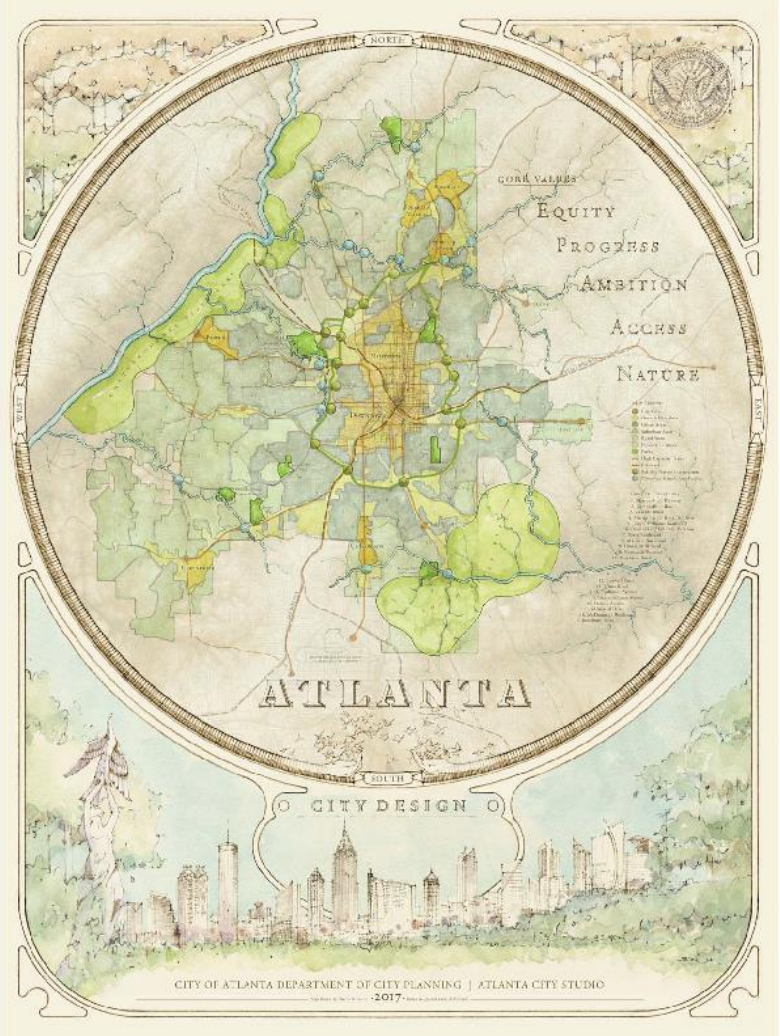
Natural Resources Management

Controlling invasives, ecological restoration

Moving Forward:
Atlanta City Design Goals

DWM is seeking to be a lead partner in City's larger goals of meeting targets for maintaining and expanding the City's urban canopy cover

- Invasive removal
- Renaturalization
- Buffer enhancements



Atlanta City Design

5 Nature

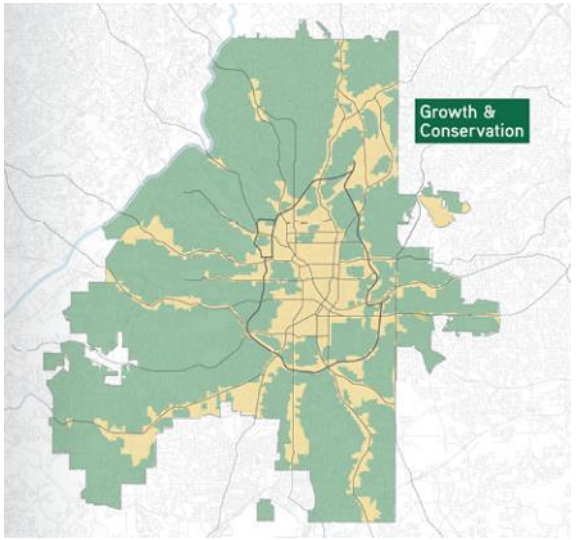
Excerpt from Atlanta City Design Plan, 2017

Our challenge for *nature* is to protect and expand the ecological value of our watersheds, forest and habitat in the face of rapid urbanization.

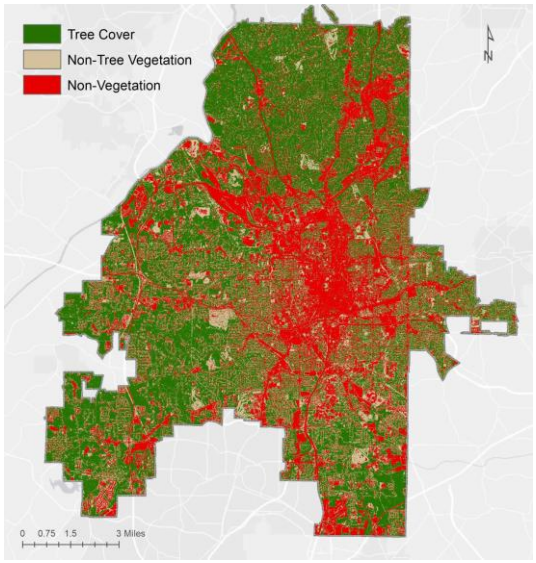
Atlanta's Urban Canopy

"The City in the Forest"

Atlanta's Urban Tree Canopy cover is 47.9%, among highest of major cities in the country.*

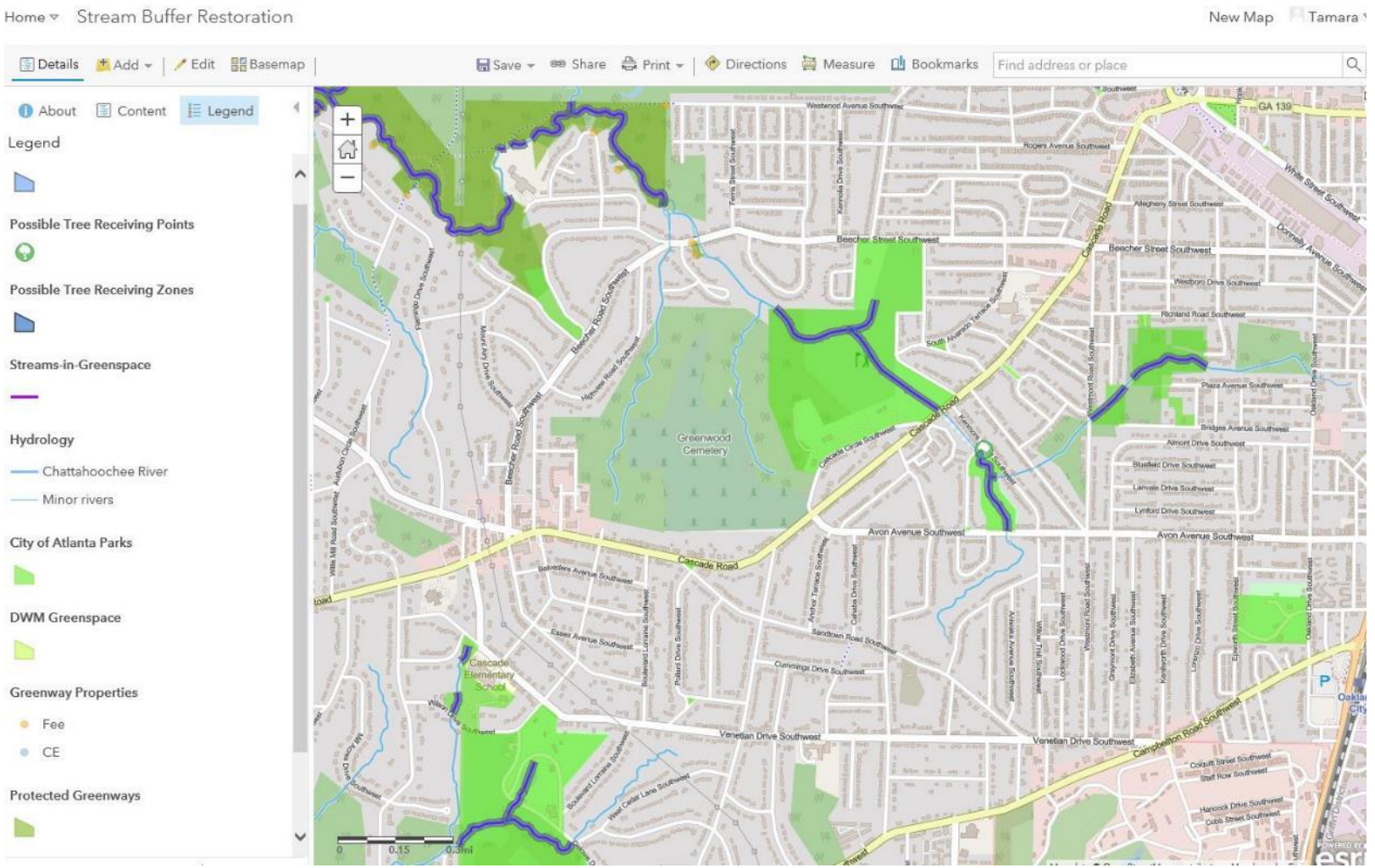


Areas of Growth & Conservation
Atlanta City Plan



**Most of these trees are on private property*

Mapping Potential "Receiving Zones" City-Wide



Inspiration:
GA Tech's Landscape Master Plan

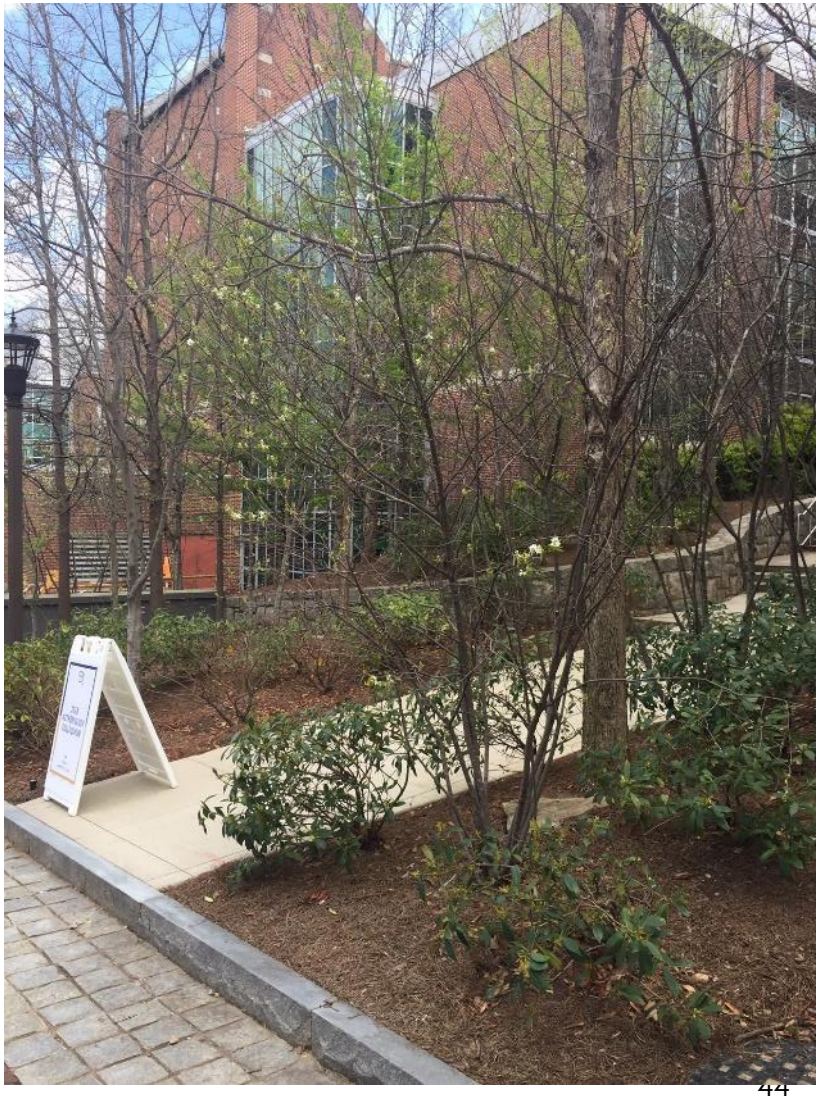
- Identifies potential sites on campus for reforestation – "forest patches"

Figure 6-17: Utility-free Areas for Potential Reforestation

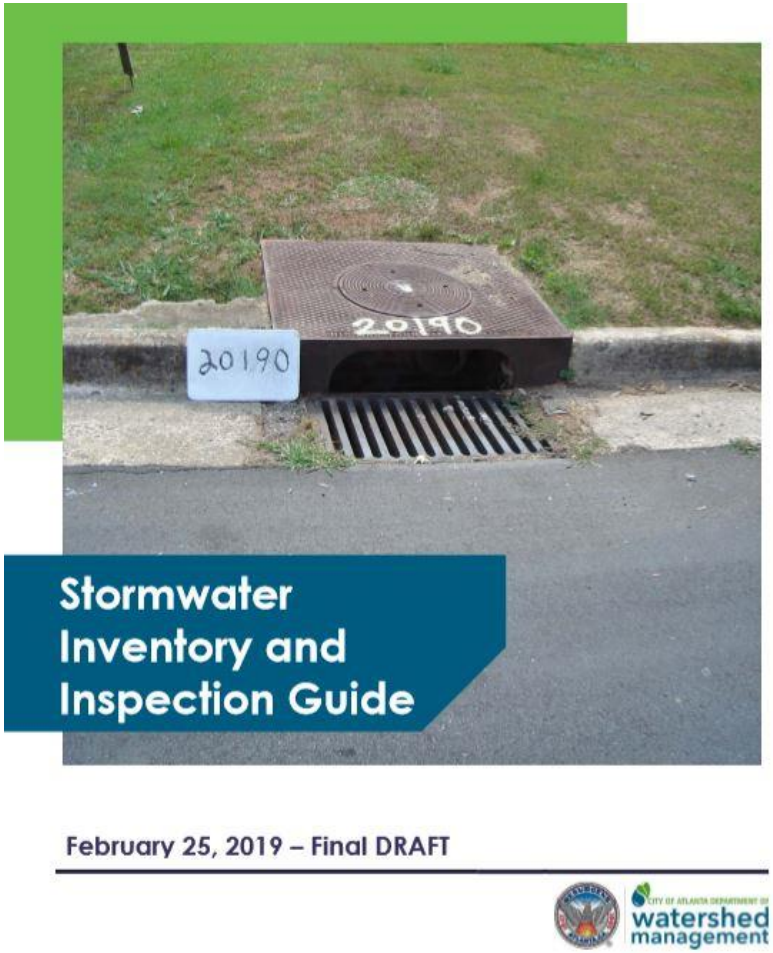
Inspiration:
GA Tech's Landscape Master Plan

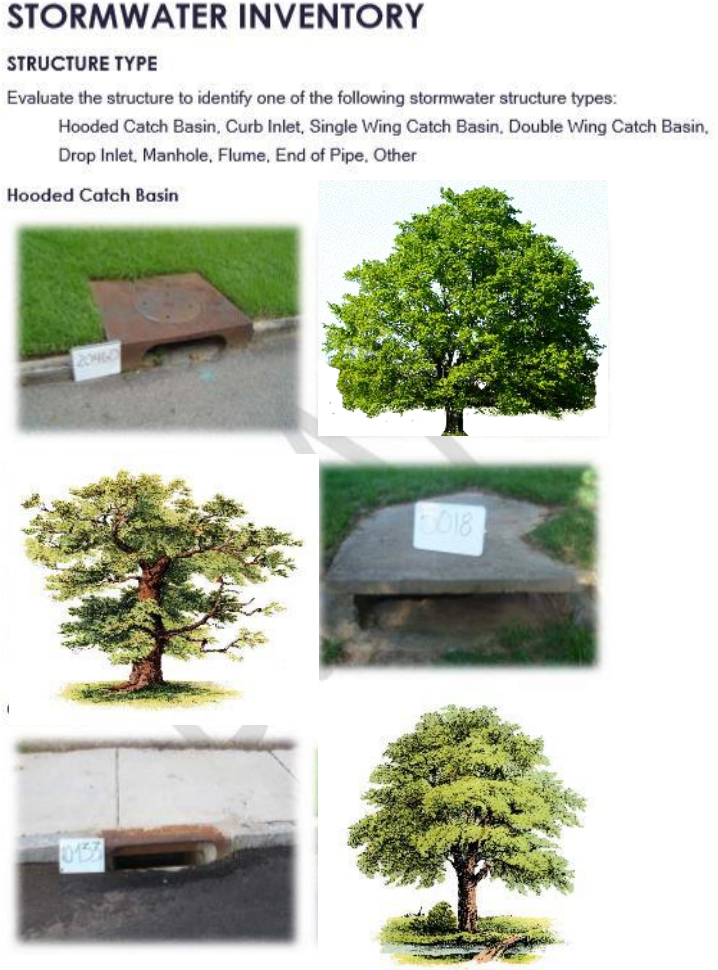
Receiving Zones for trees:

- Tighter spacing, staggered sizes
- diverse palette modeled on plant communities native to the Georgia Piedmont

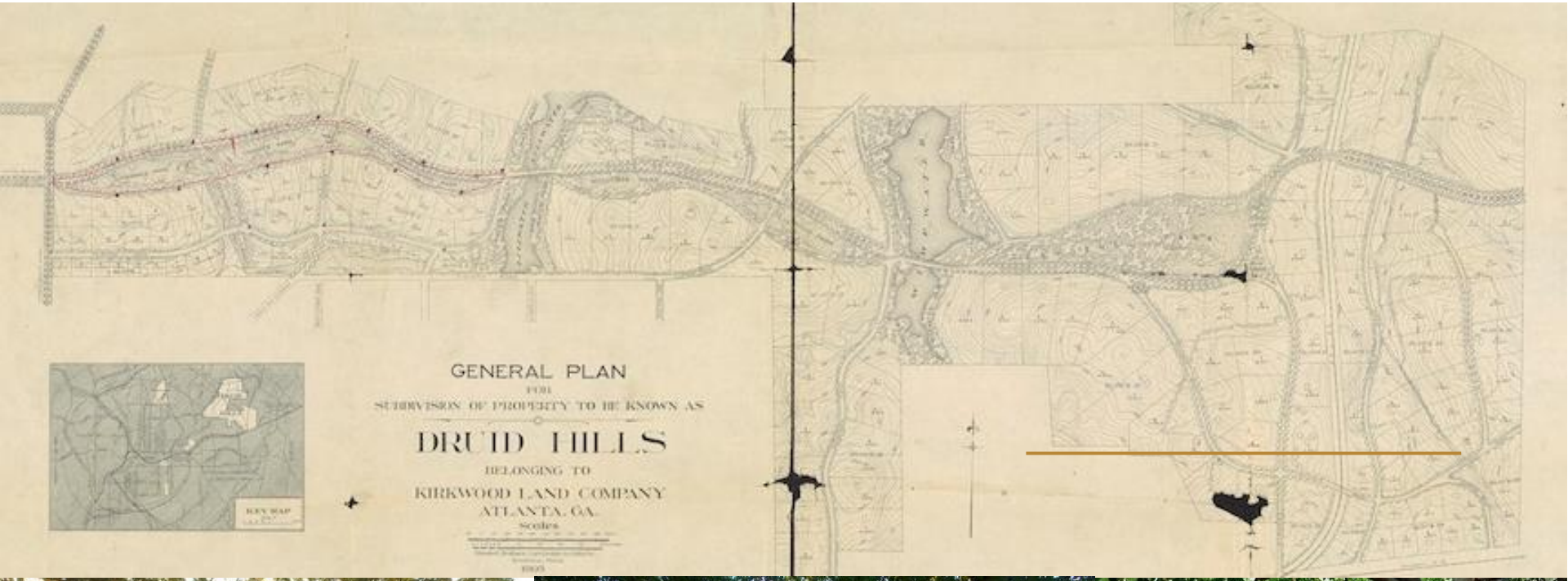


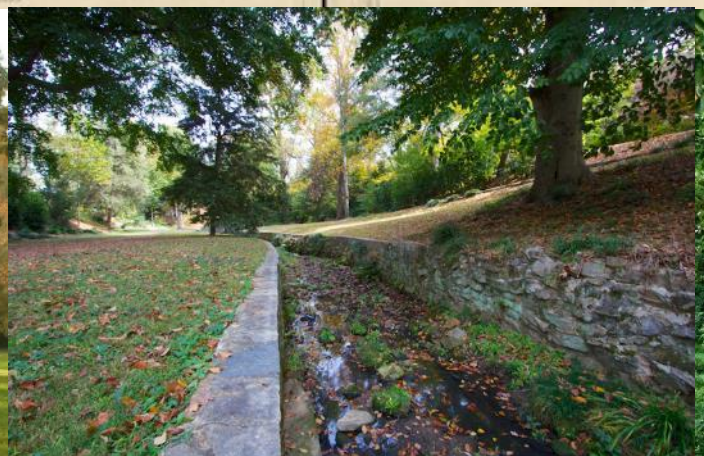
Trees are part of our stormwater infrastructure!



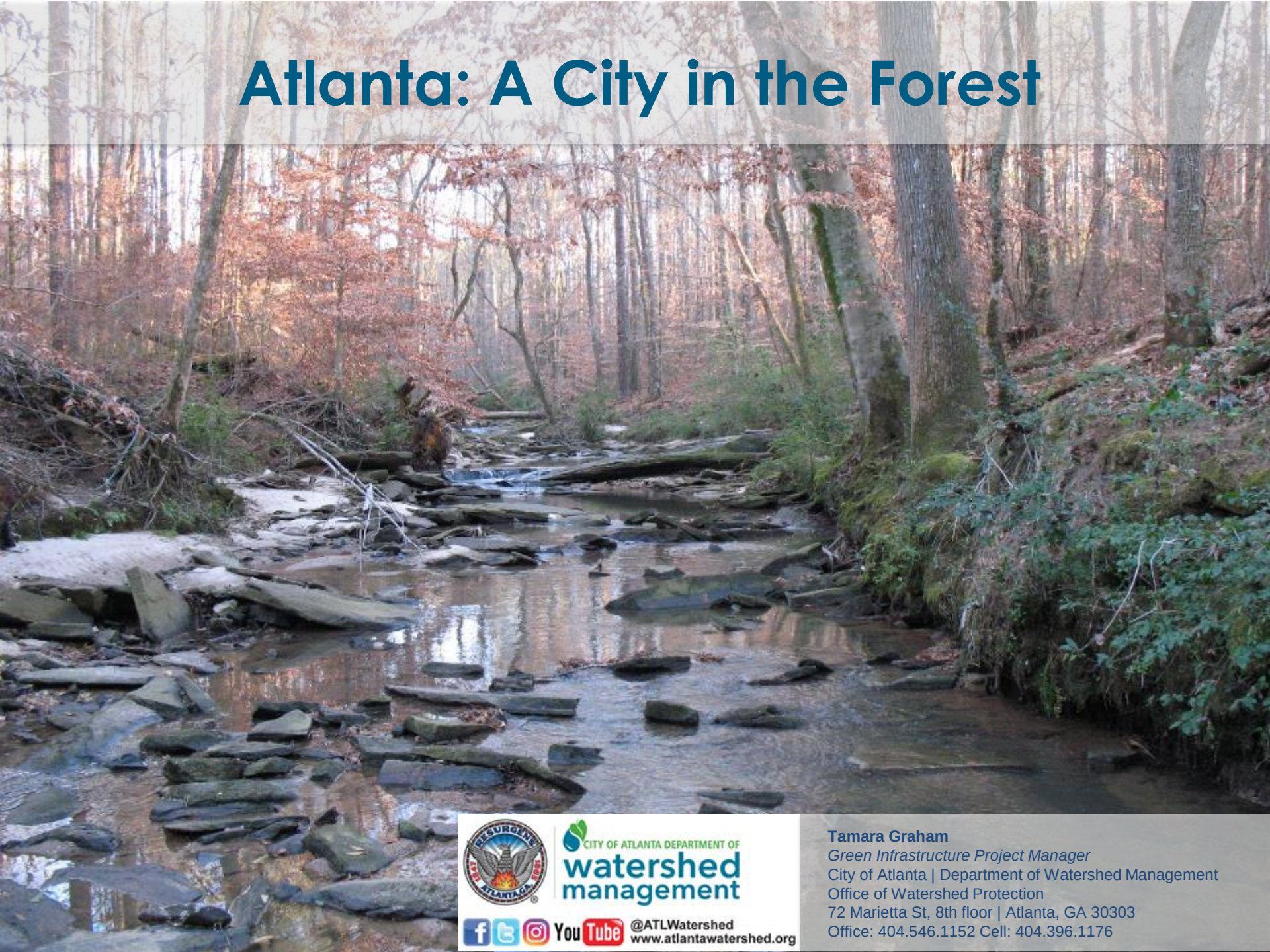


Atlanta's Historic Green Infrastructure





Atlanta: A City in the Forest



CITY OF ATLANTA DEPARTMENT OF watershed management

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www.atlantawatershed.org

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