Water Quality, Sustainability, and Green Infrastructure

Green Infrastructure for the Hudson / Raritan Watersheds

The Institute for Sustainable Cities - CUNY

December 1, 2010

Overview

Why should we consider green infrastructure?

- water quality
- costs
- sustainability

What will NYC do to adopt green infrastructure?

- demonstration projects
- watershed planning
- funding and staffing
- interagency cooperation
- community engagement
- regulatory cooperation

Green Infrastructure Is a Decentralized Network

Green Roof, Bronx County Courthouse

Blue Roof, Queens

Streetside Bioswale, Queens

Porous Pavement, Brooklyn

Water Quality in New York City Harbor

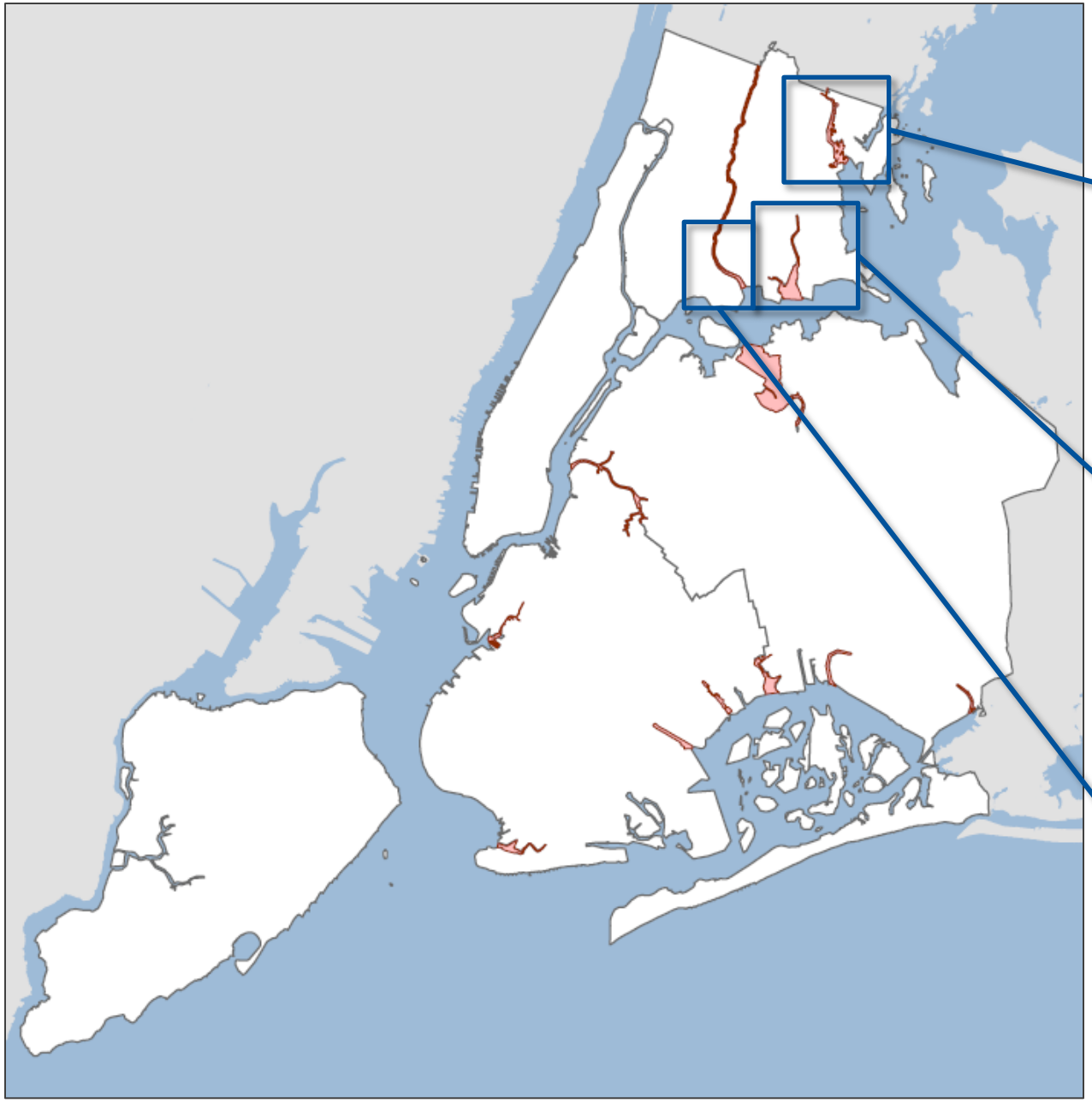
= does not meet water quality standards (pathogens/DO)

75% of Harbor meets pathogen standards for swimming

19% meets standards for boating, fishing

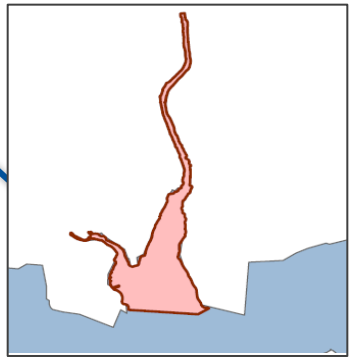
7% of our Harbor is made up of tributaries that do not meet secondary contact standards

Bronx Tributaries

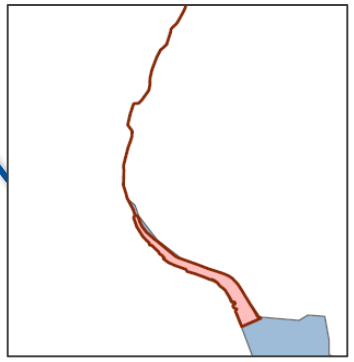


Hutchinson River

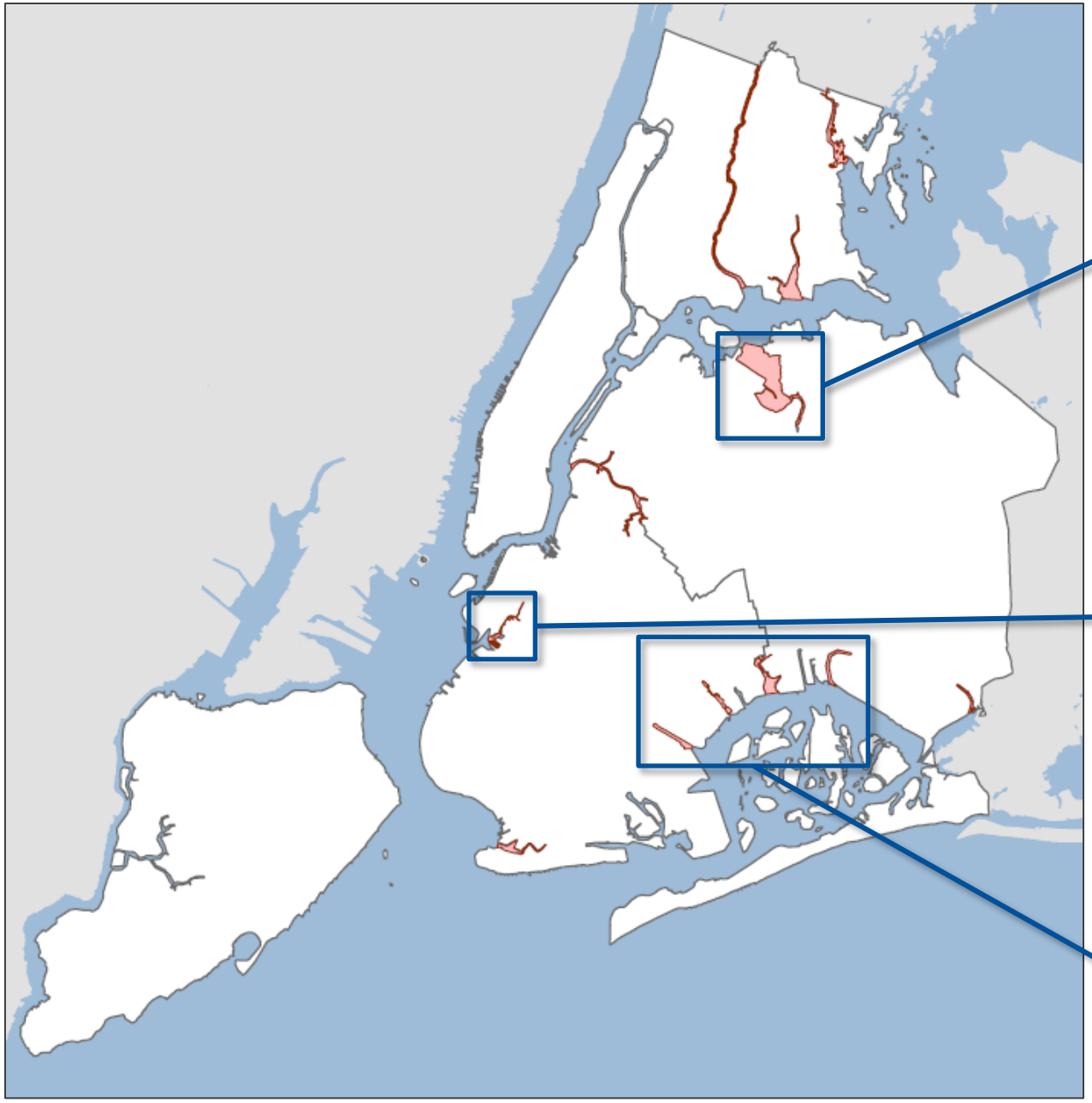
Westchester Creek



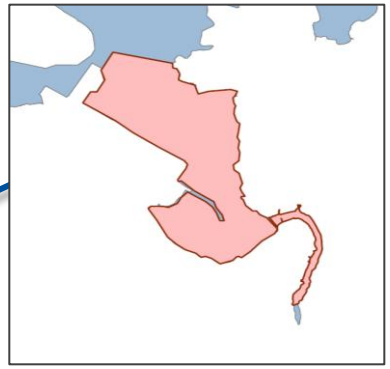
Bronx River



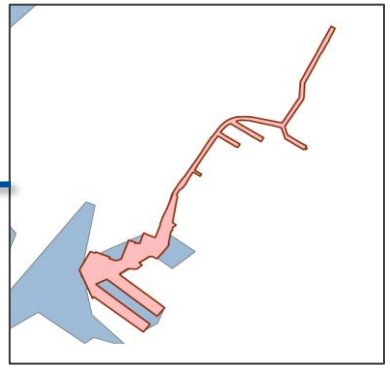
Brooklyn and Queens Tributaries



Flushing Bay & Creek



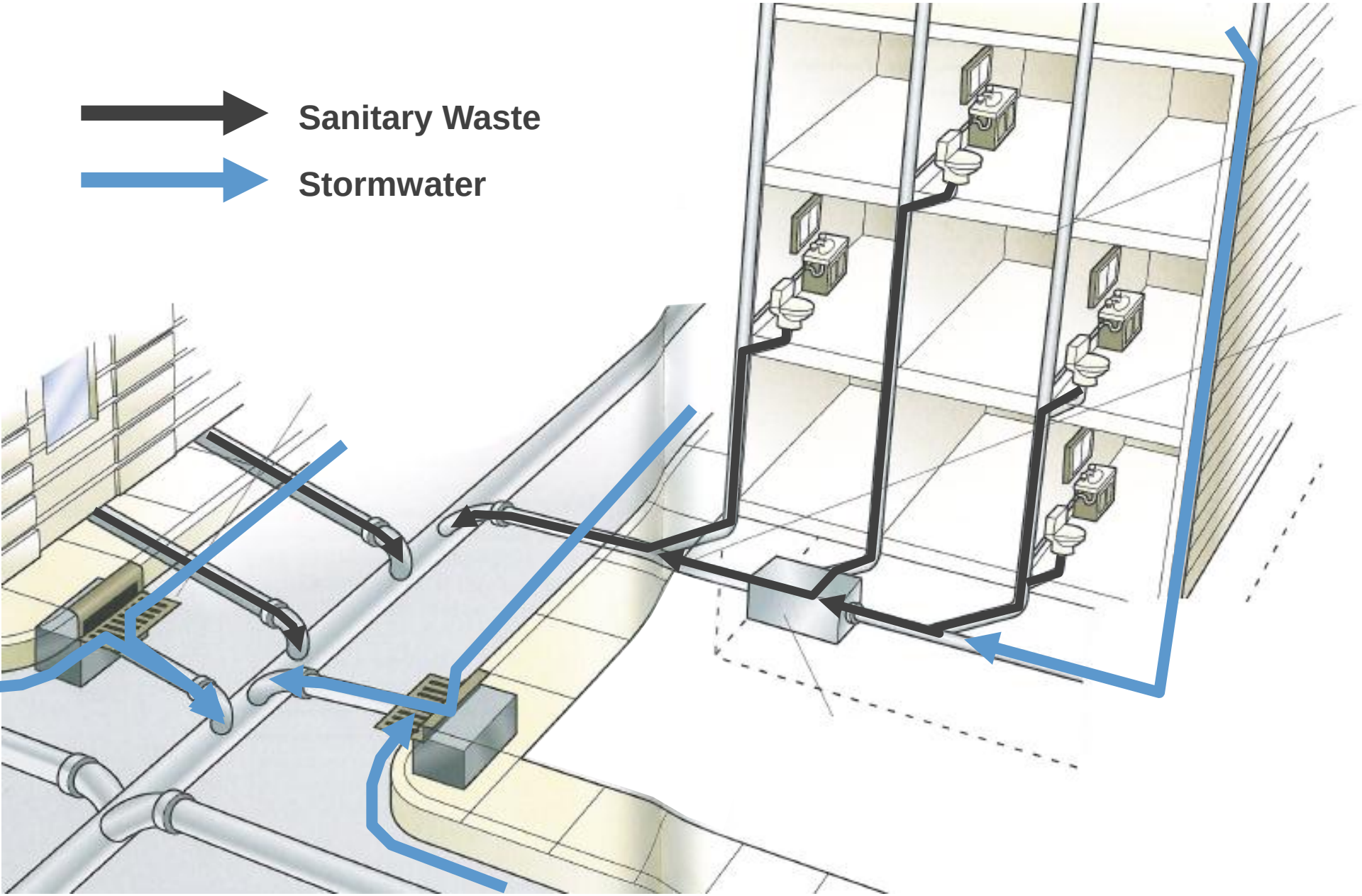
Gowanus Canal



Jamaica Bay Tributaries

Dense Settlements Mean Impervious Surfaces

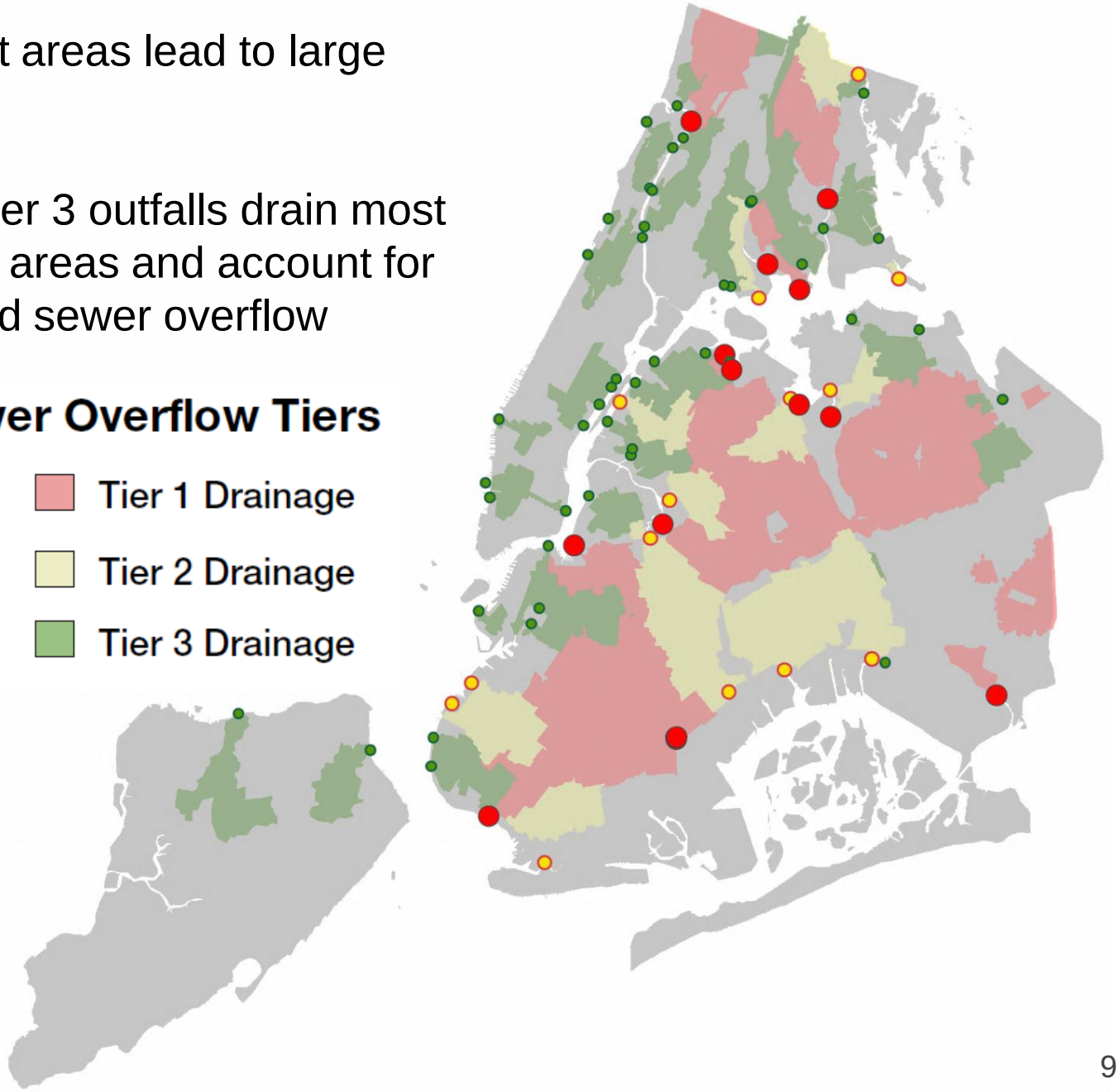
Combined Sewer Systems



Source - The Works: Anatomy of a City, Kate Ascher

Impervious Surfaces and Rainfall Lead to CSOs

- Large catchment areas lead to large CSOs
- Tier 1 through Tier 3 outfalls drain most of our combined areas and account for 90% of combined sewer overflow

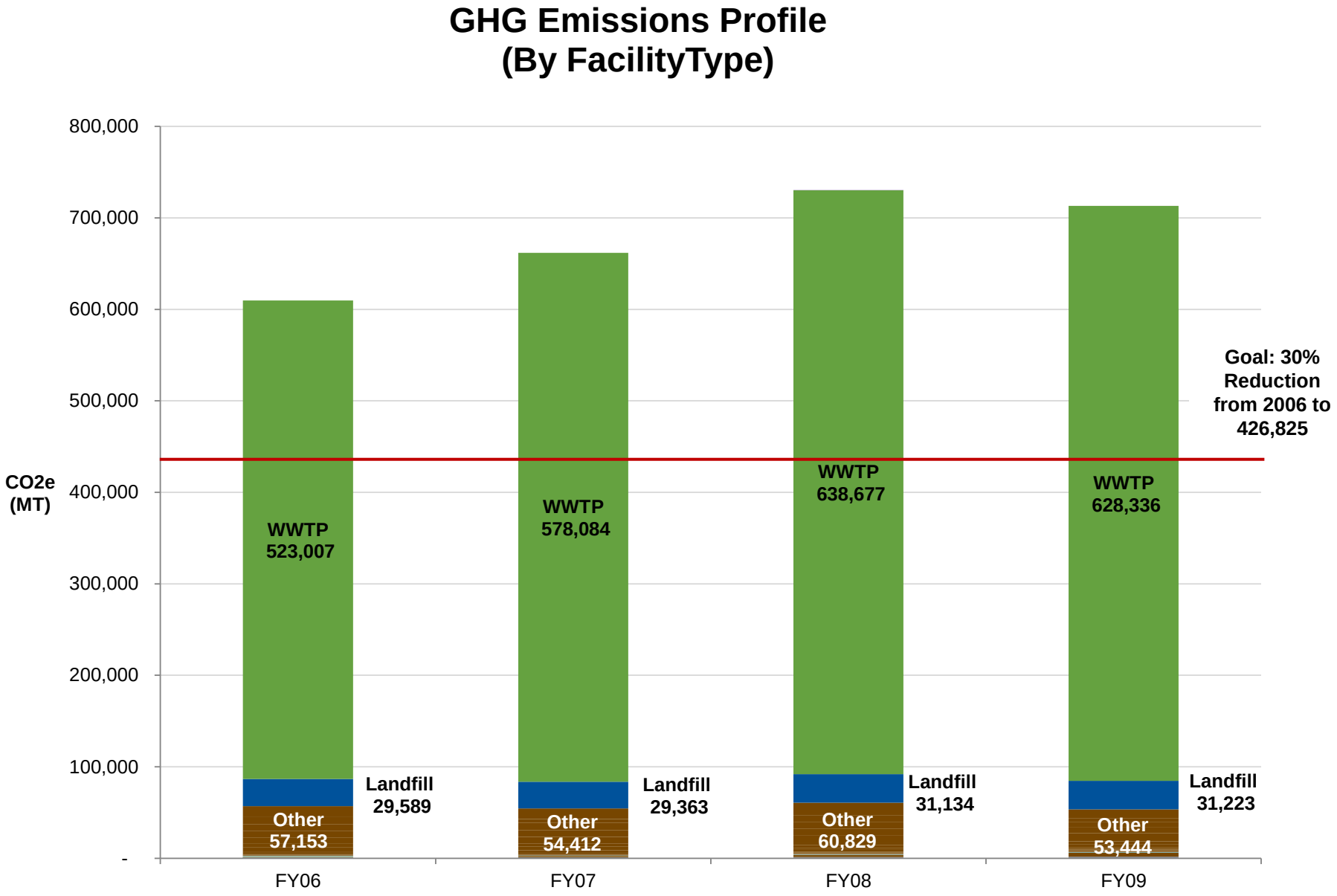


NYC Impacts of Climate Change

	BASELINE 1971-2000	2020s	2050s	2080s
Air Temperature[2]	55°F	+ 1.5 to 3°F	+ 3 to 5°F	+ 4 to 7.5°F
Precipitation[2]	46.5 in	+ 0 to 5%	+ 0 to 105%	+ 5 to 10%
Sea Level Rise[2,3]	NA	+ 2 to 5 in	+ 7 to 12 in	+ 12 to 23 in
Rapid Ice-Melt Sea Level Rise[4]	NA	~ 5 to 10 in	~ 19 to 29 in	~ 41 to 55 in

Source: New York City Panel on Climate Change

Water Utility GHG Emissions Profile



A Sustainable, Hybrid Approach

1. Build cost-effective grey infrastructure
2. Optimize the existing wastewater system
3. Control runoff from 10% of impervious surfaces through green infrastructure and other source controls
4. Institutionalize adaptive management, model impacts, measure CSOs, and monitor water quality
5. Sustain stakeholder engagement

A Portfolio of Approaches Balances Risks

Grey Strategy

- Large, expensive projects
- Economies of scale
- Proven performance
- Exposure to equipment failures, energy markets
- Long design and construction time
- End of pipe technology bears brunt of higher rainfall from climate change

Green Strategy

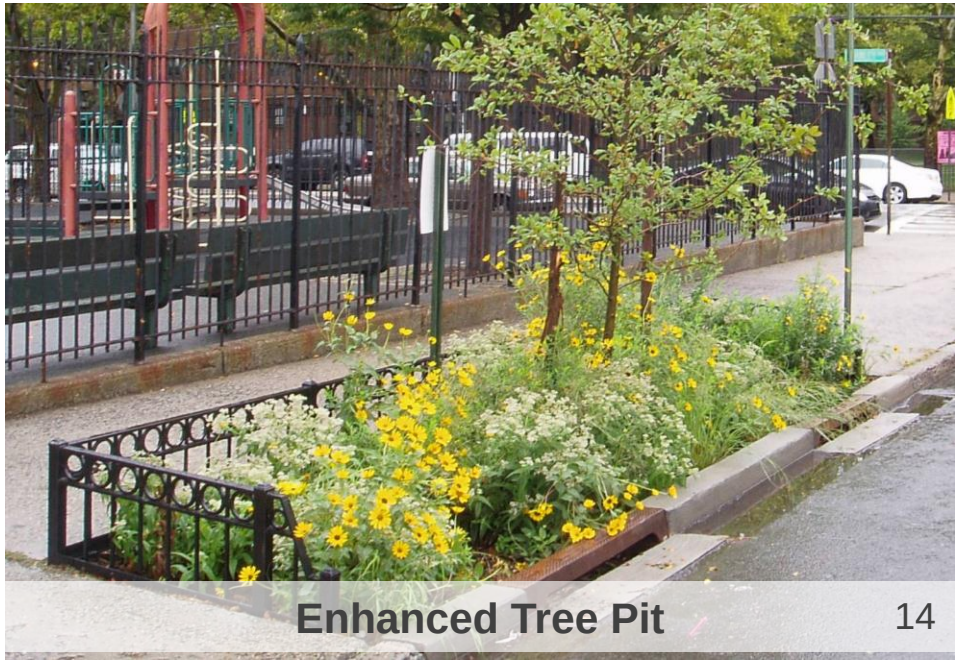
- Smaller, inexpensive projects
- Network requires numerous projects
- Proven on demonstration level
- Low energy inputs reduce exposure to market fluctuations
- Shorter design and construction time
- Resilient to impacts of climate change
- Allows for adaptation and flexibility

A Portfolio for Water as Waste and Resource

Paerdegat Detention Facility

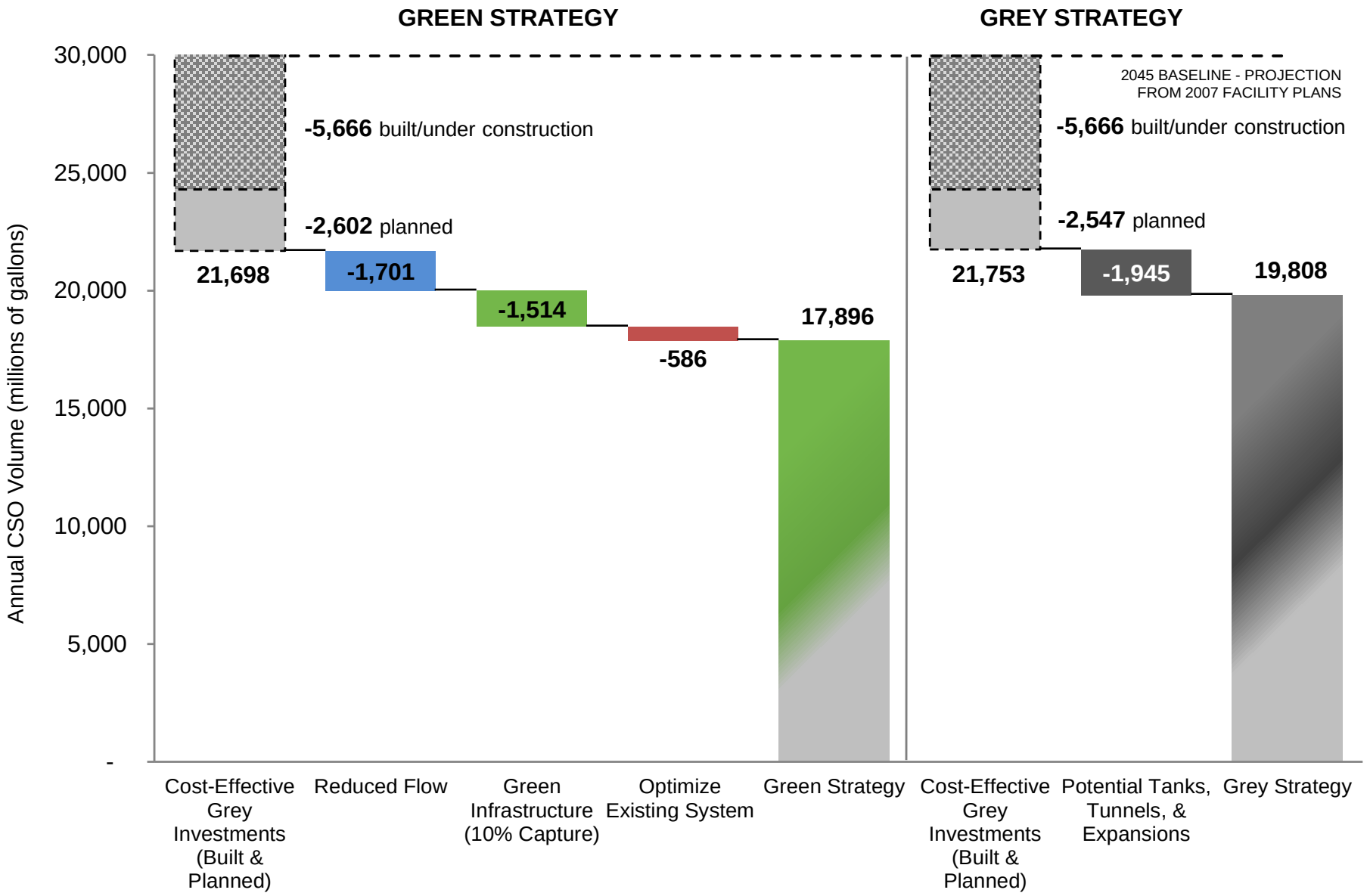
Staten Island Bluebelt

Catch Basins



Enhanced Tree Pit

The Hybrid Approach Has Better Performance

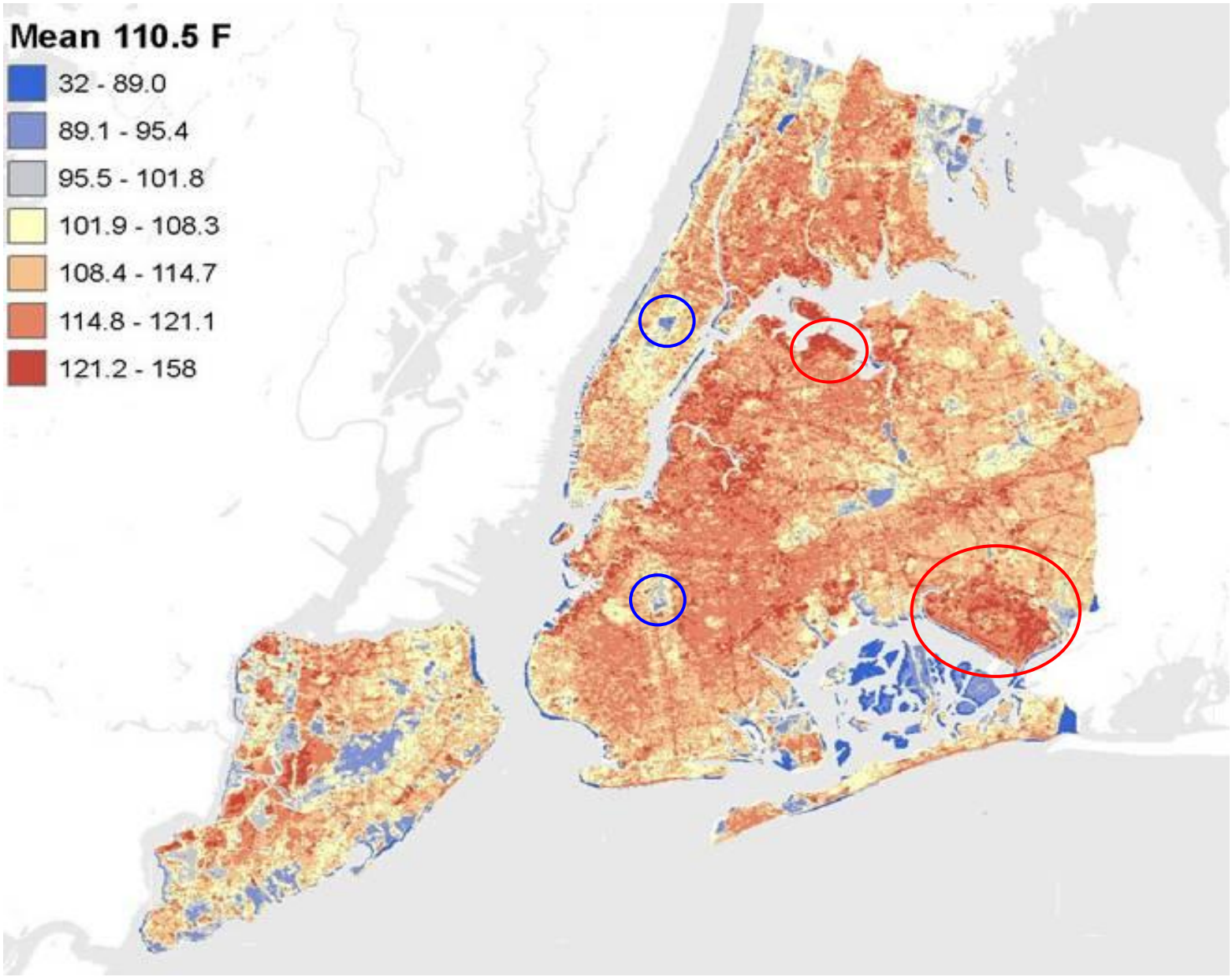


Green Infrastructure Adds Value to the City

Construction of Enhanced Tree Pit Transforms a Commercial Strip in Sutter Avenue, Brooklyn

June 2010

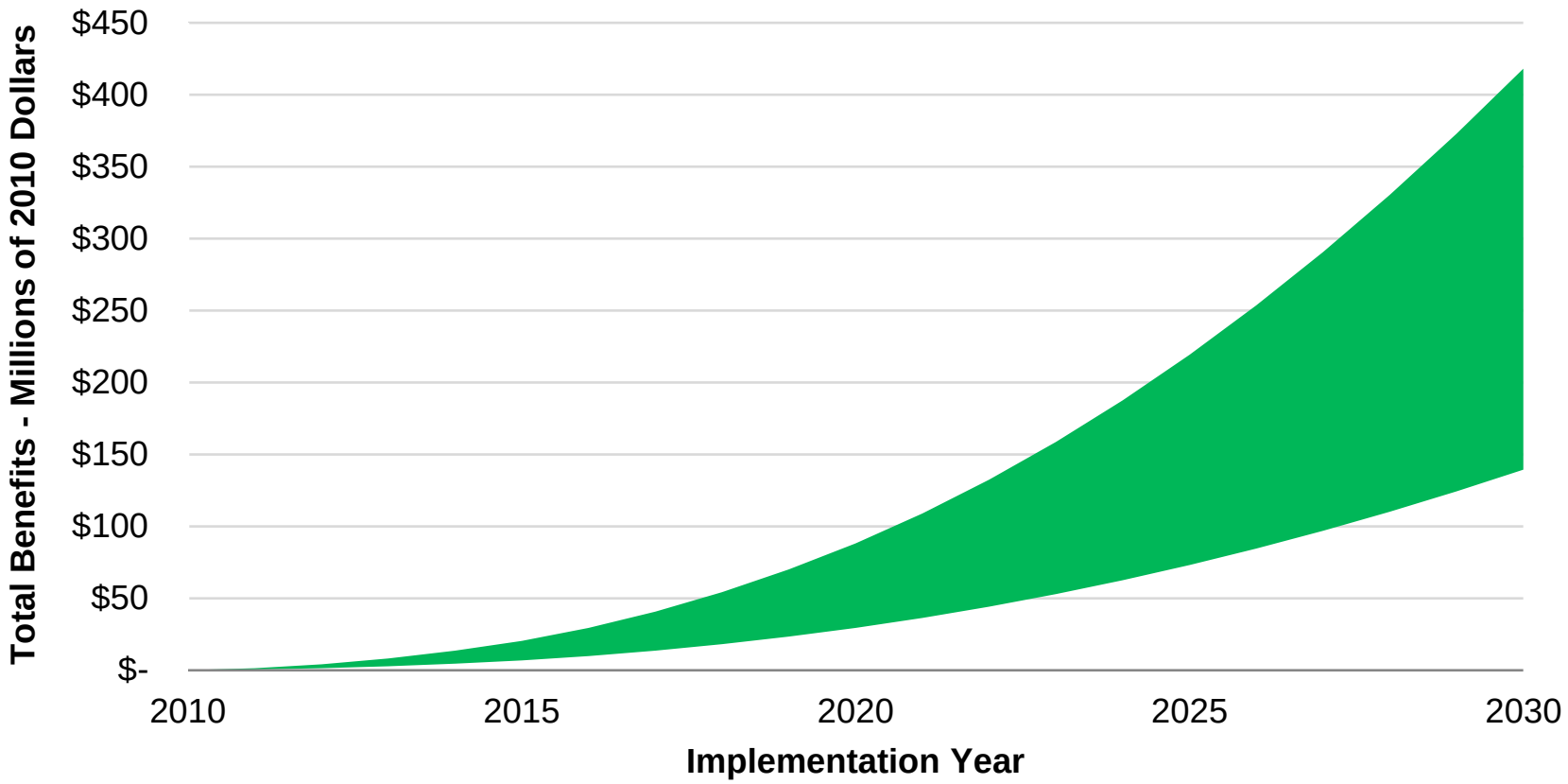
Planted Areas Can Reduce Overall Risk



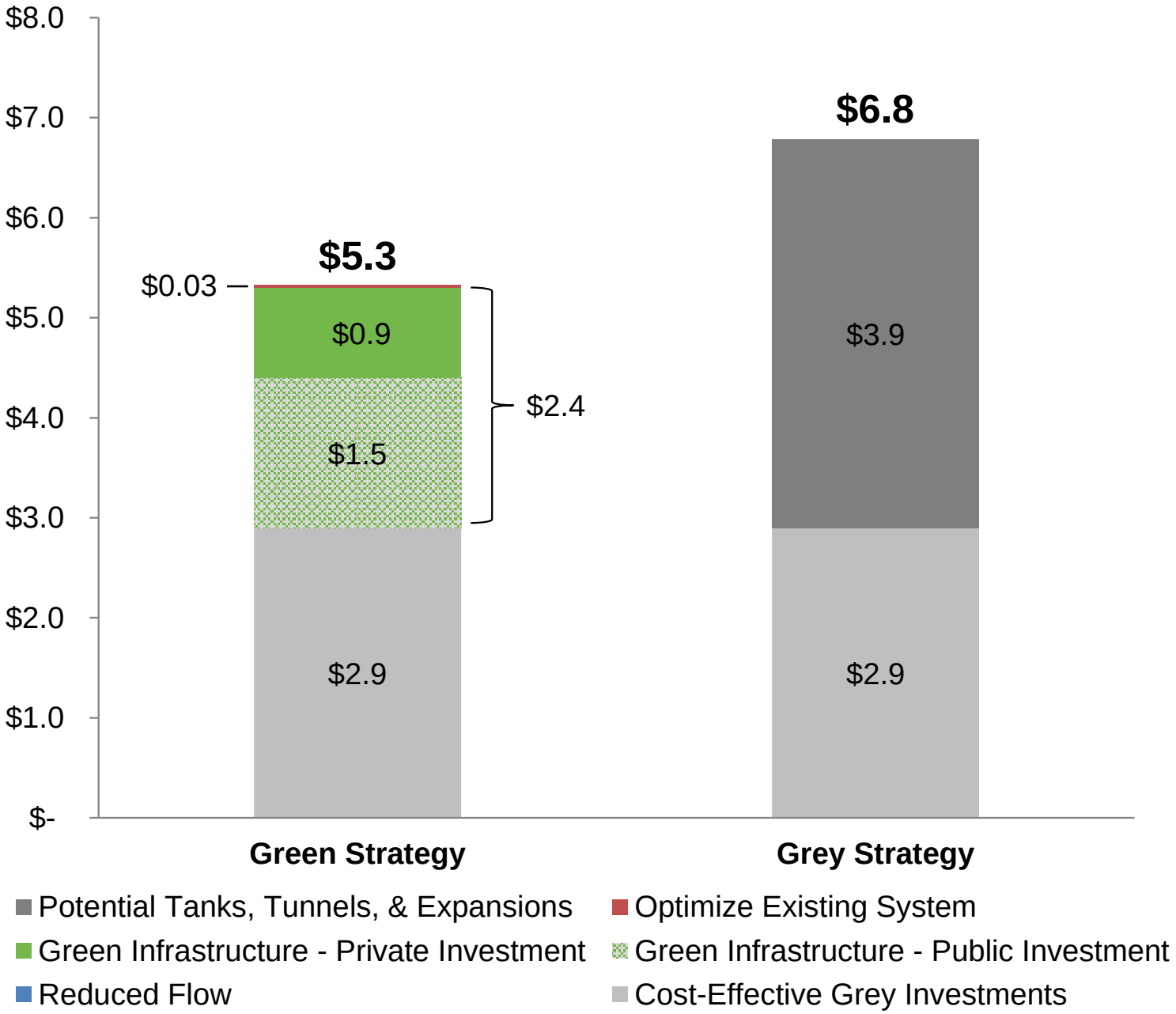
Positive Co-Benefits

Annual benefits of green infrastructure per acre	
Reduced energy demand:	$5,513
Reduced carbon dioxide:	$117
Improved air quality:	$759
Increased property value:	$4,725

Acres of planted green infrastructure in 2030	
25% planted green infrastructure	1,085 acres
75% planted green infrastructure	3,255 acres

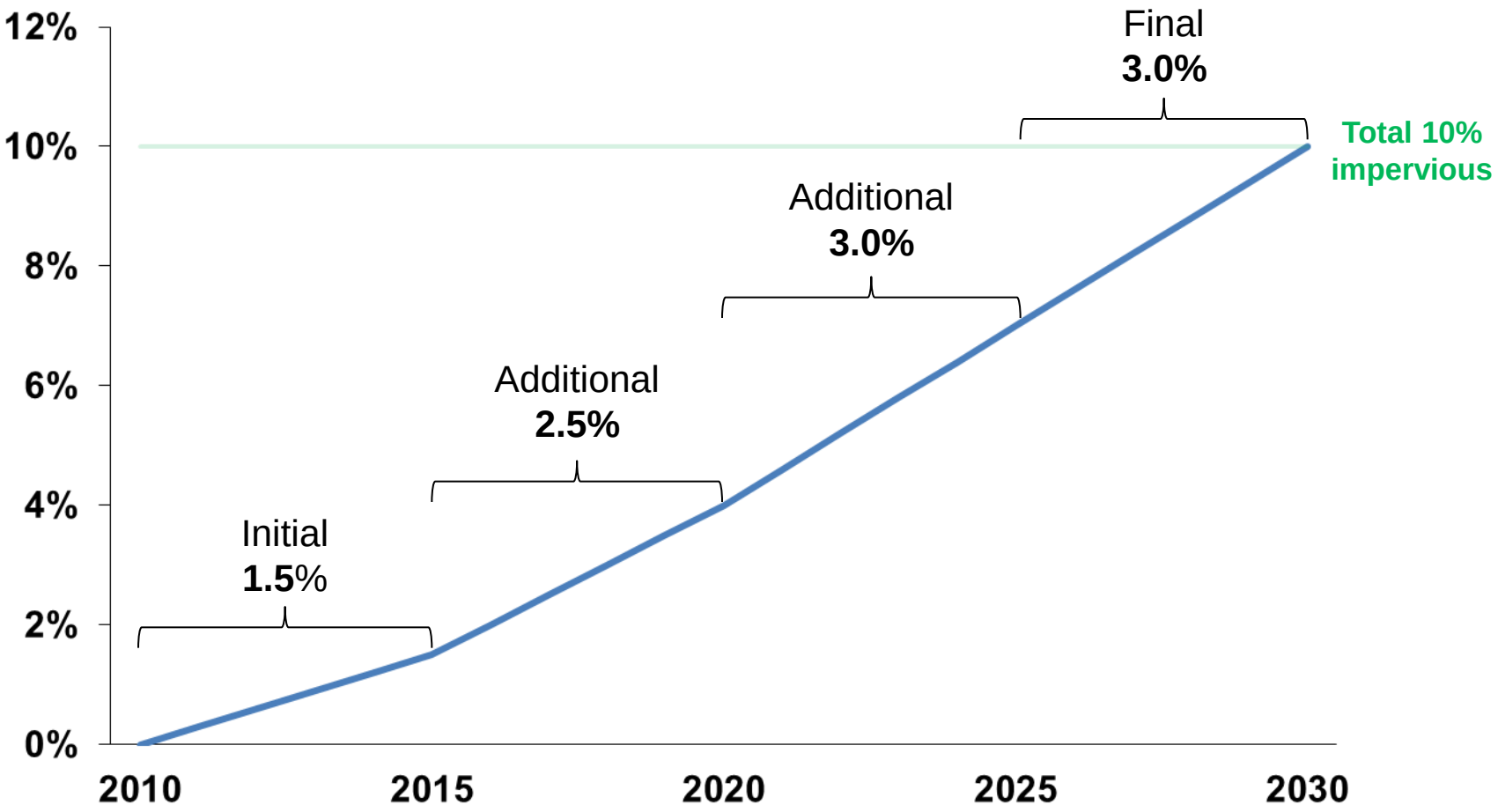


The Hybrid Approach Costs Less



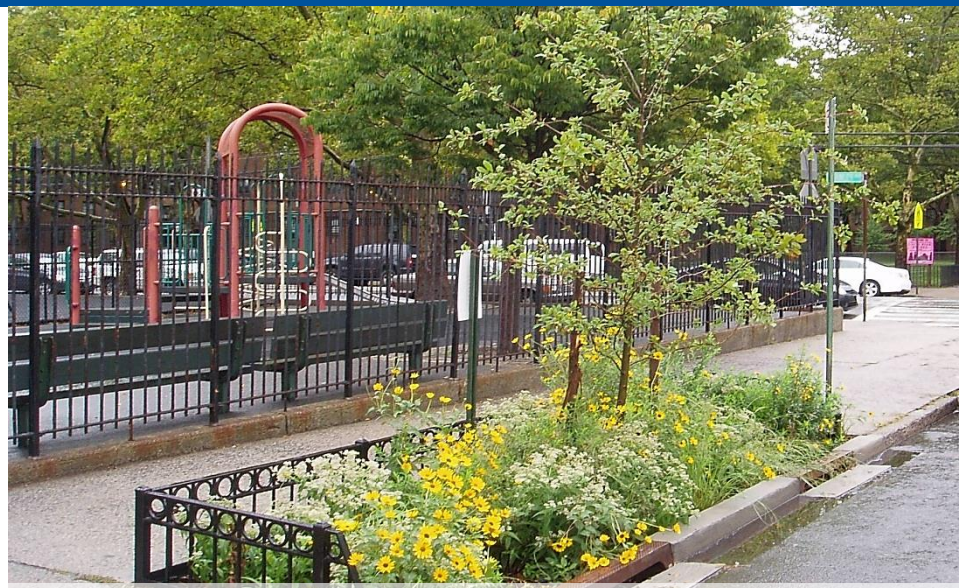
Phased Implementation of Green Infrastructure

To meet 10% goal, the City must exploit cost-effective opportunities by adding green infrastructure in select capital projects in the right of way and other areas, with a goal of standardizing the practice citywide



Green Infrastructure in the Right of Way

Greenstreets – Stormwater Bioswale



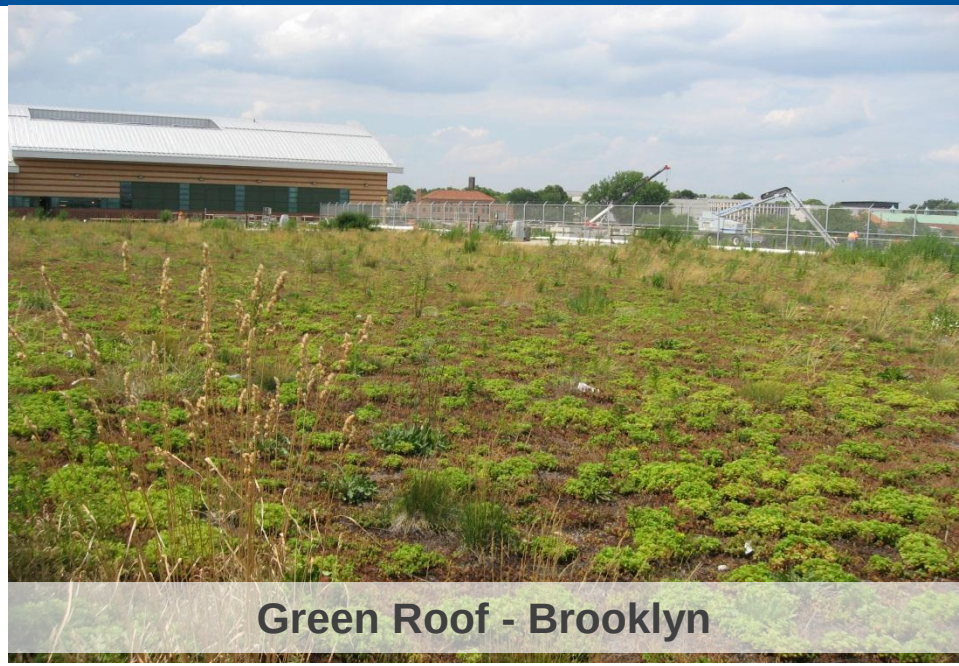
Enhanced Tree Pit

Streetside Infiltration Bioswale

Porous Pavement

Green Infrastructure on Rooftops

Blue Roof

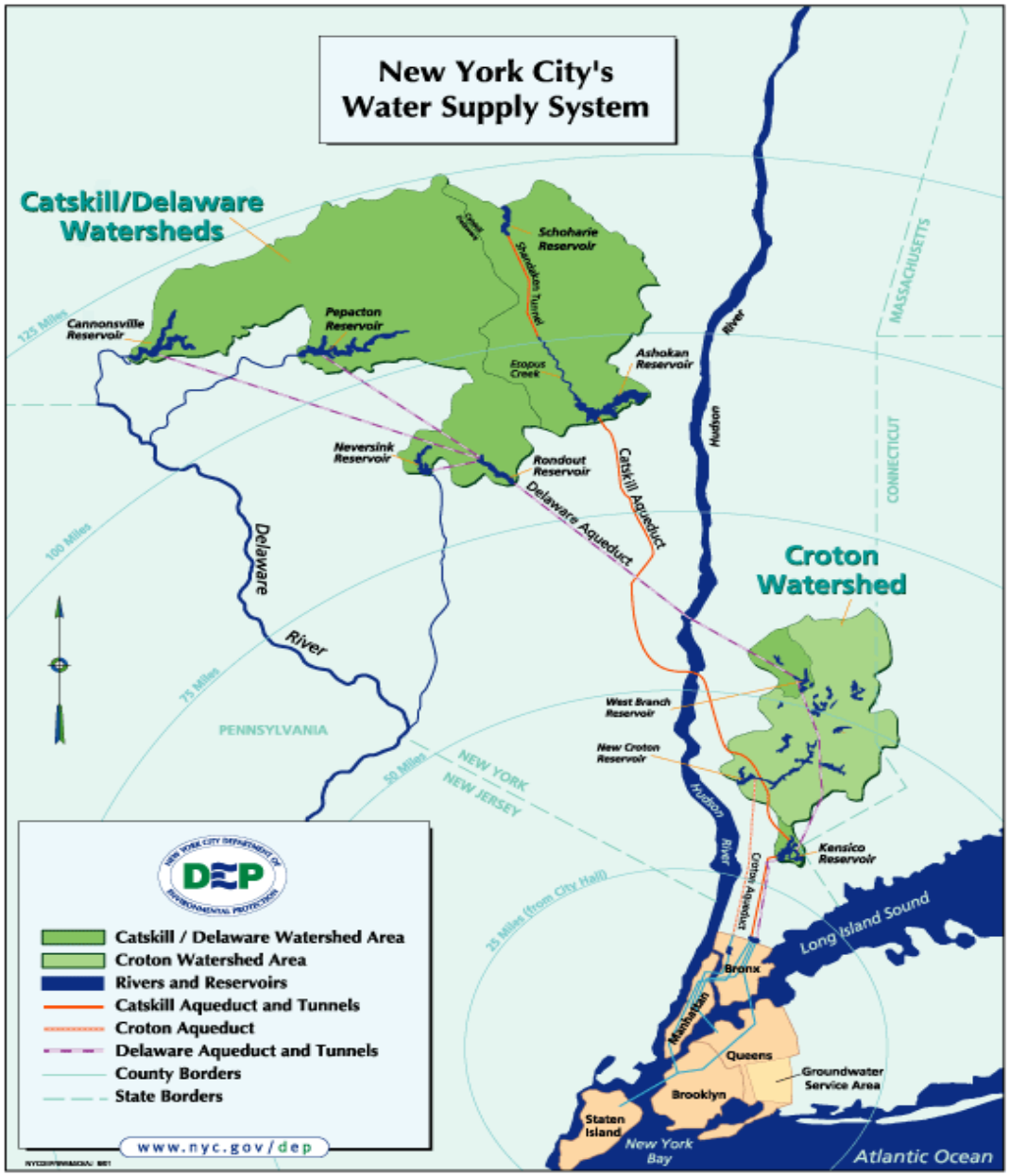


Green Roof - Brooklyn

Green Roof - Bronx

Rain Barrels

NYC Watershed Protection as a Model



- Regulatory partnerships endorsed in 10-year filtration avoidance determination (2007 to 2017)
- 2,000 square mile watershed
- Serves 9 million people (50% of State)
- $1.5 billion spent to date
- 109,000+ acres acquired since 1997

Watershed Planning

Green Infrastructure Funding

- $1.5 billion in capital funding through 2029
- $187 million in capital funds for FY12 to FY15

Green Infrastructure Funding ($000s)

	2012	2013	2014	2015	Total
Roadway and sidewalk projects	8,160	16,200	20,280	20,280	64,920
Stormwater projects	-	10,824	13,492	16,608	40,924
Retrofitting agency facilities	2,500	2,500	2,500	2,500	10,000
Other public facilities and projects	18,000	18,000	18,000	18,000	72,000
Total Capital	28,660	47,524	54,272	57,388	187,844
Total O&M	11,060	12,040	13,032	14,035	50,167
Total Capital and O&M	39,720	59,564	67,304	71,423	238,011

Green Infrastructure Task Force

Mission

- Identify cost-effective opportunities in planned capital projects (e.g., road and sidewalk reconstruction)
- Build green infrastructure

Members

- Led by Mayor's Office and DEP
- DOT, Parks, DDC, DOE, SCA, NYCHA, HPD, DCAS, EDC, SBS, DCA and other operating agencies
- Task Force will also seek to partner with the MTA, Port Authority, and other non-city capital agencies

Tasks

- Review capital projects for green infrastructure potential
- Choose investments based on water quality impact
- Standard specifications and designs
- Design and project support
- Develop and administer grant program
- Watershed-level planning

Leveraging New Development

Runoff Standard

- Performance standard to slow down the release of runoff from new development and redevelopment
- One acre site in Brooklyn will be required to detain and release runoff at a rate 1/10th as fast as existing rules
- Can be met through a variety of proven techniques: rooftop detention (used in >20 schools), subsurface installations (commonly used), permeable pavement (Citi Field), and green roofs (Bronx County Courthouse)

Impact

	CSO Reduction (MGY, in 2030)	Total Cost ($000s)	Cost per Gallon
New Development Standard	**899**	**$870,500**	**$0.97**
Public Green Infrastructure	**615**	**$1,523,500**	**$2.47**
Total	**1,514**	**$2,394,000**	**$1.58**

Status

- Proposed rule vetted by DEP and other agencies
- External outreach and CAPA process
- Design manual to be completed by December 2010
- Permit unit to be expanded, processes streamlined

Questions?

The NYC Green Infrastructure Plan can be viewed at and downloaded from DEP's website:

http://www.nyc.gov/html/dep/html/stormwater/nyc_green_infrastructure_plan.shtml