Restoring urban wetlands for increased coastal resiliency: needs and priorities in NYC

Marit Larson[1], Leah Beckett[1] and Jamie Ong[2]
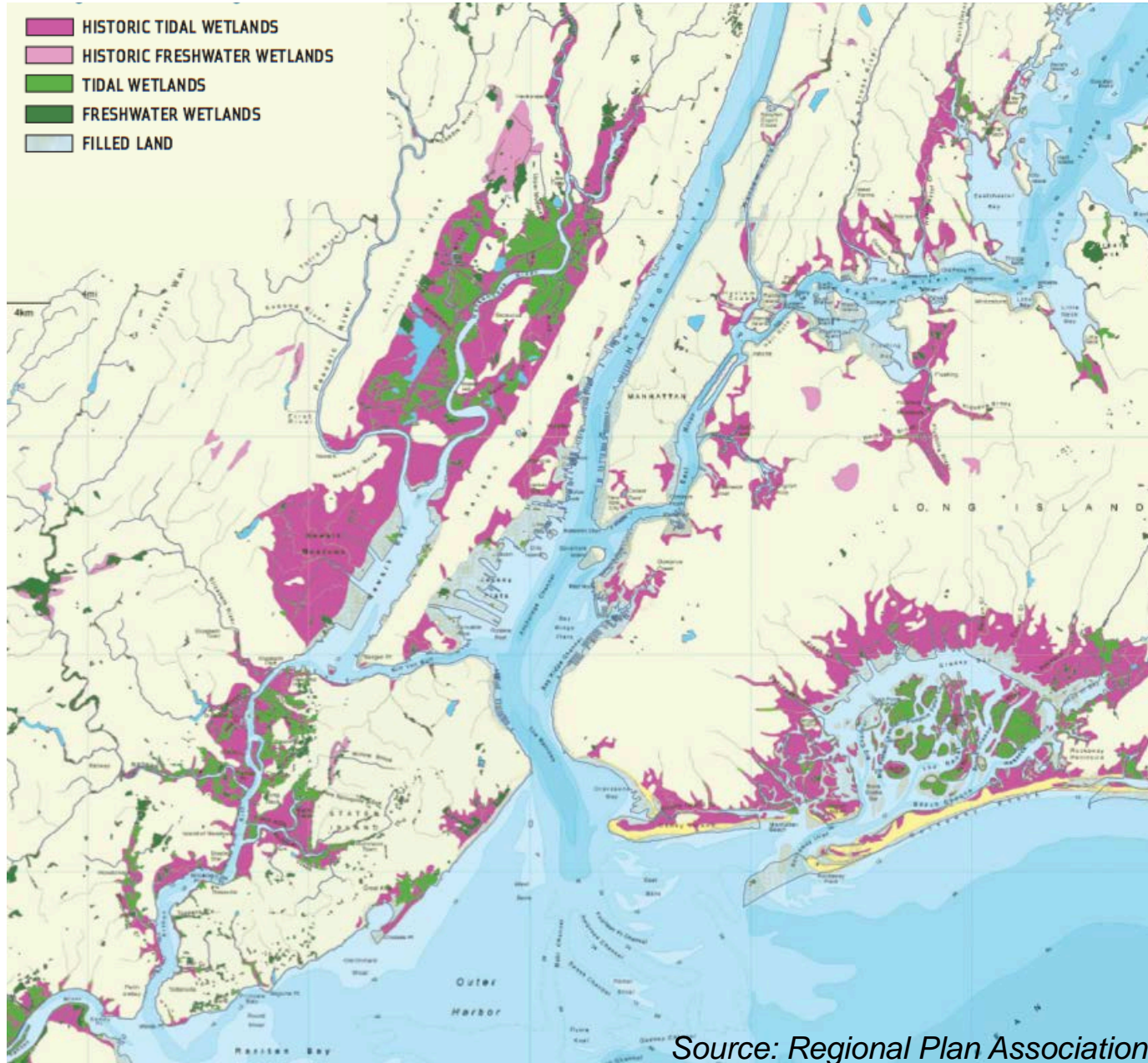[1]NYC Dept. of Parks & Recreation
[2]Natural Areas Conservancy

Conference on Ecological and Ecosystem Restoration

July 28, 2014

NYC Parks

Natural Areas Conservancy

Tidelands of NY NJ Harbor Estuary

Legend:
- HISTORIC TIDAL WETLANDS
- HISTORIC FRESHWATER WETLANDS
- TIDAL WETLANDS
- FRESHWATER WETLANDS
- FILLED LAND

Source: Regional Plan Association

NYC Parks

Lost wetland values

Habitat — fish and horseshoe crabs spawning and rearing; bird feeding and nesting

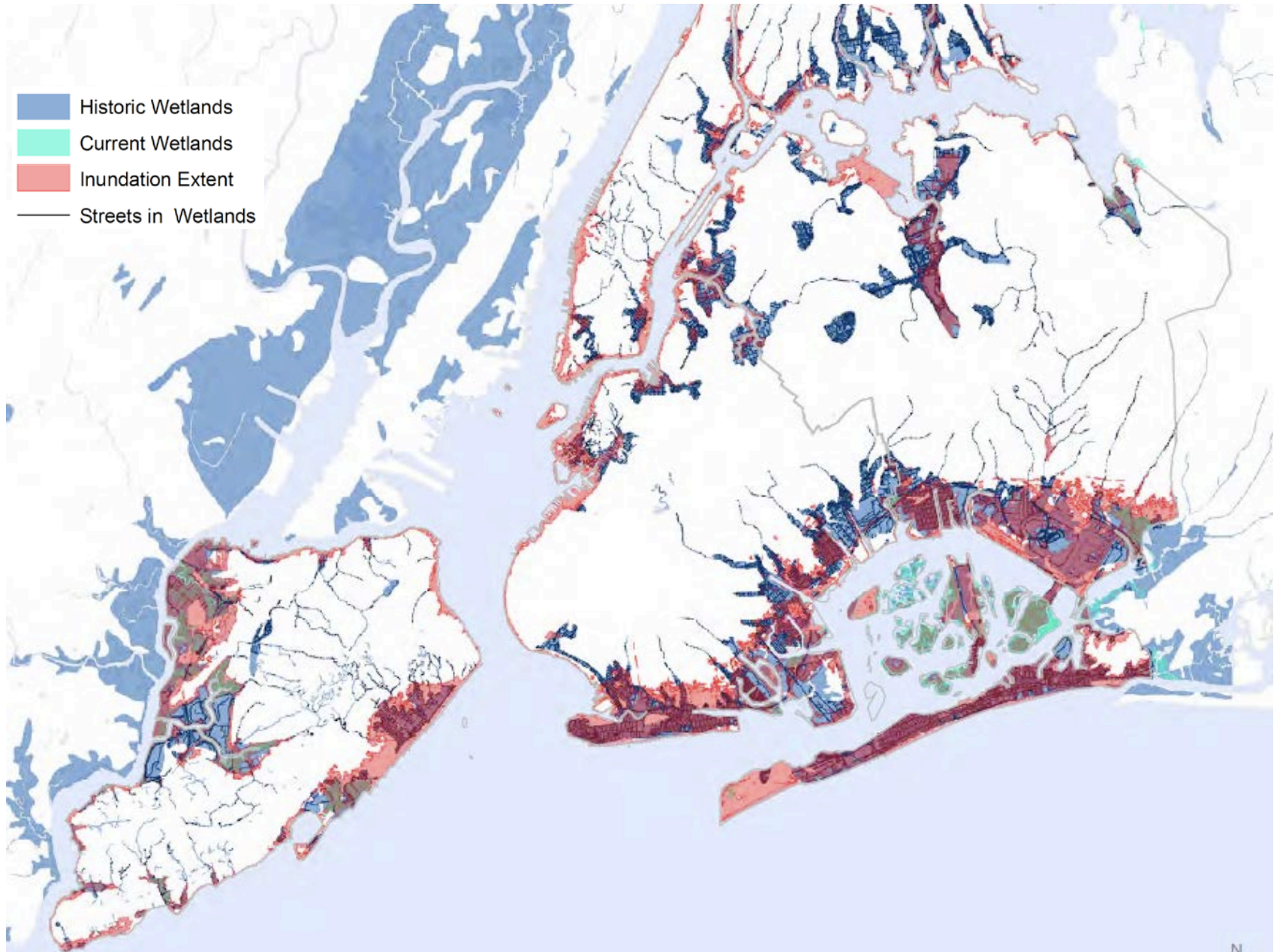**Water quality enhancement** — filtering, nutrient and pollutant absorption and uptake

Recreation — birding, walking, painting, fishing

Storm and flood protection — wave attenuation, storm surge reduction

Climate regulation — carbon sequestration

NYC Parks

Hurricane Sandy inundation over historic wetlands

Legend:
- Historic Wetlands
- Current Wetlands
- Inundation Extent
- Streets in Wetlands

NYC Parks

Goal: Restore and reconstruct marsh for habitat, water quality and other benefits

Strategies	Tactics
Restore elevation, substrate & hydrology	• Excavate historic fill • Place clean sand to cap or reconstruct • Remove or breach berms
Restore and manage vegetation	• Control invasive plants (mechanically, chemically) • Remove anthropogenic marine debris • Remediate oil spills
Reduce impacts	• Establish stable toe (erosion control) • Prevent dumping • Remove marine debris

NYC Parks

Small scale salt marsh restoration

Fill removal, sand placement, berm breach
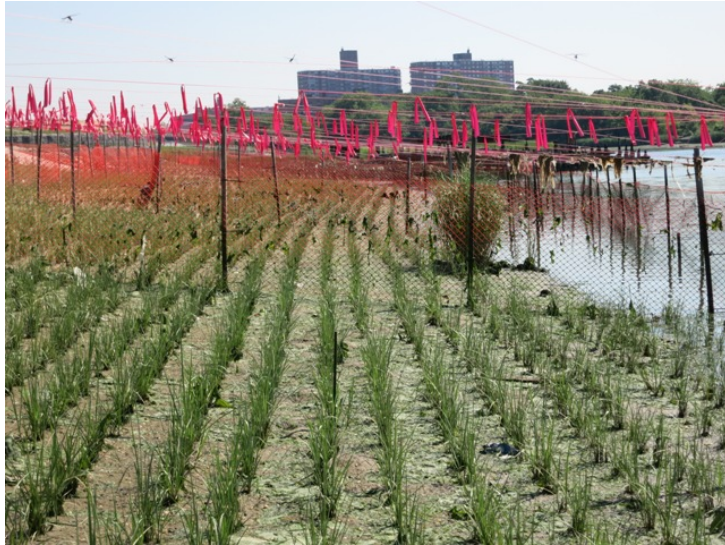
Calvert Vaux Pk (0.5 ac)

Pugsley Creek (1.2 ac)

Turtle Cove (2ac)

Soundview Pk w/ ACE (3.2 ac)

NYC Parks

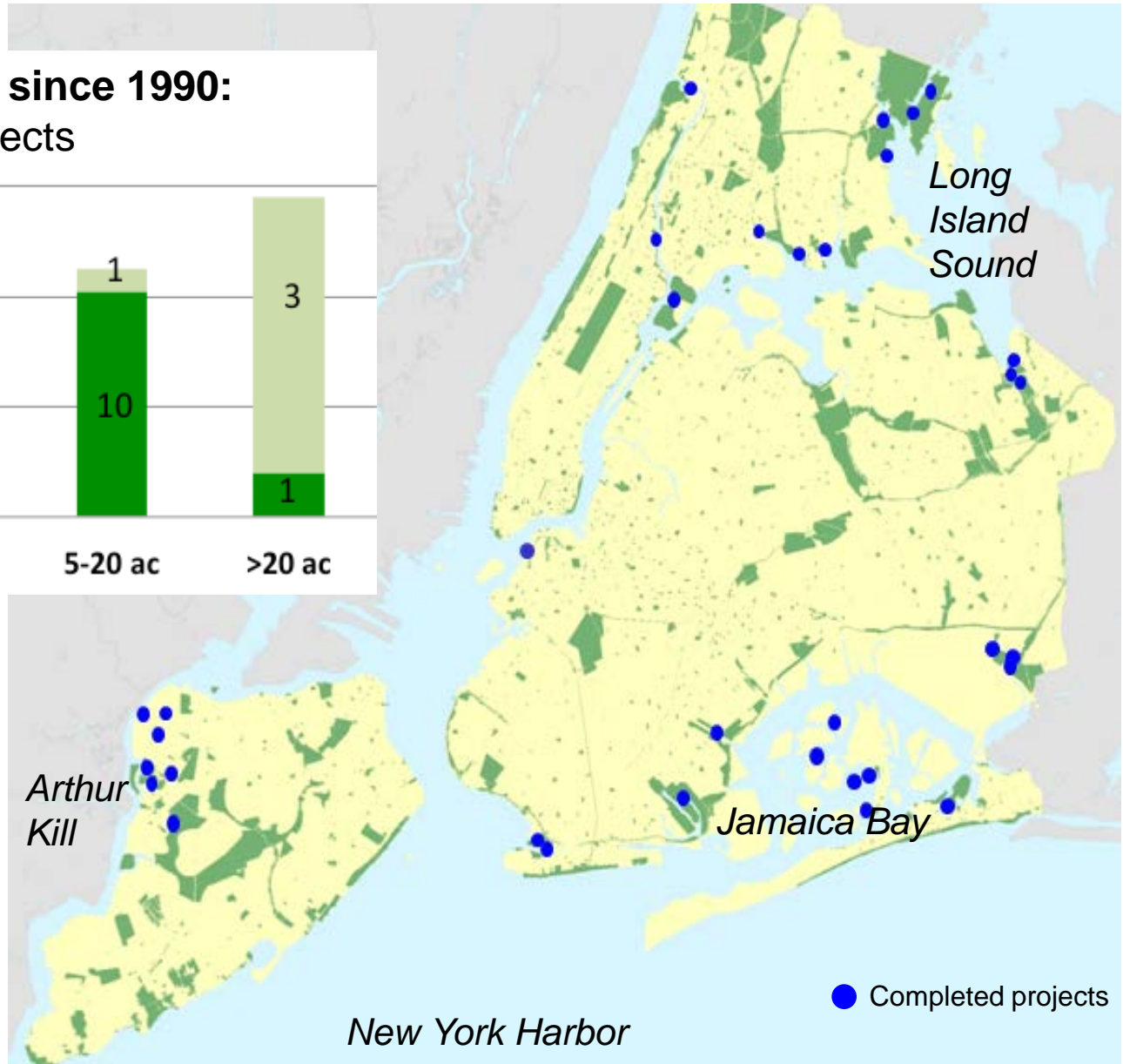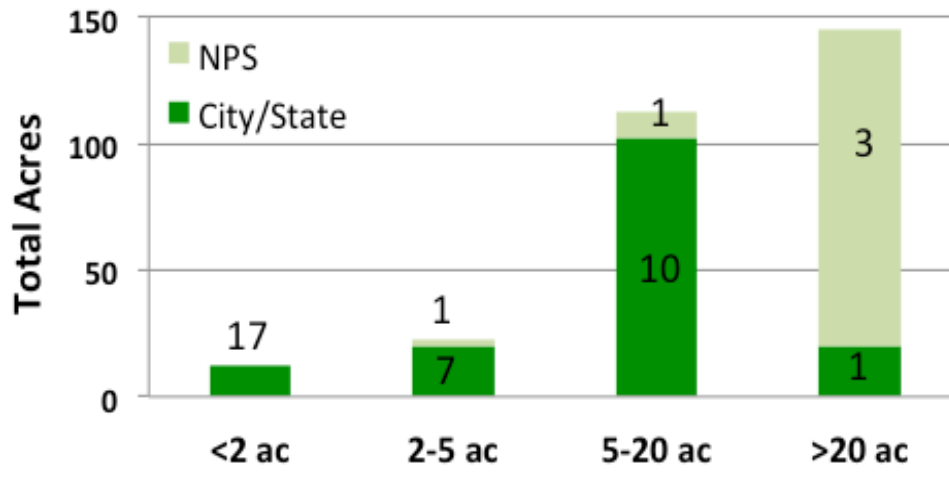# Large scale salt marsh restoration

Fill removal, sand placement

U.S.ACE & Parks: Gerritsen Ck (20 ac)

U.S. ACE: Jamaica Bay (>100 ac)

NYC Parks

Completed coastal wetlands restoration / GI
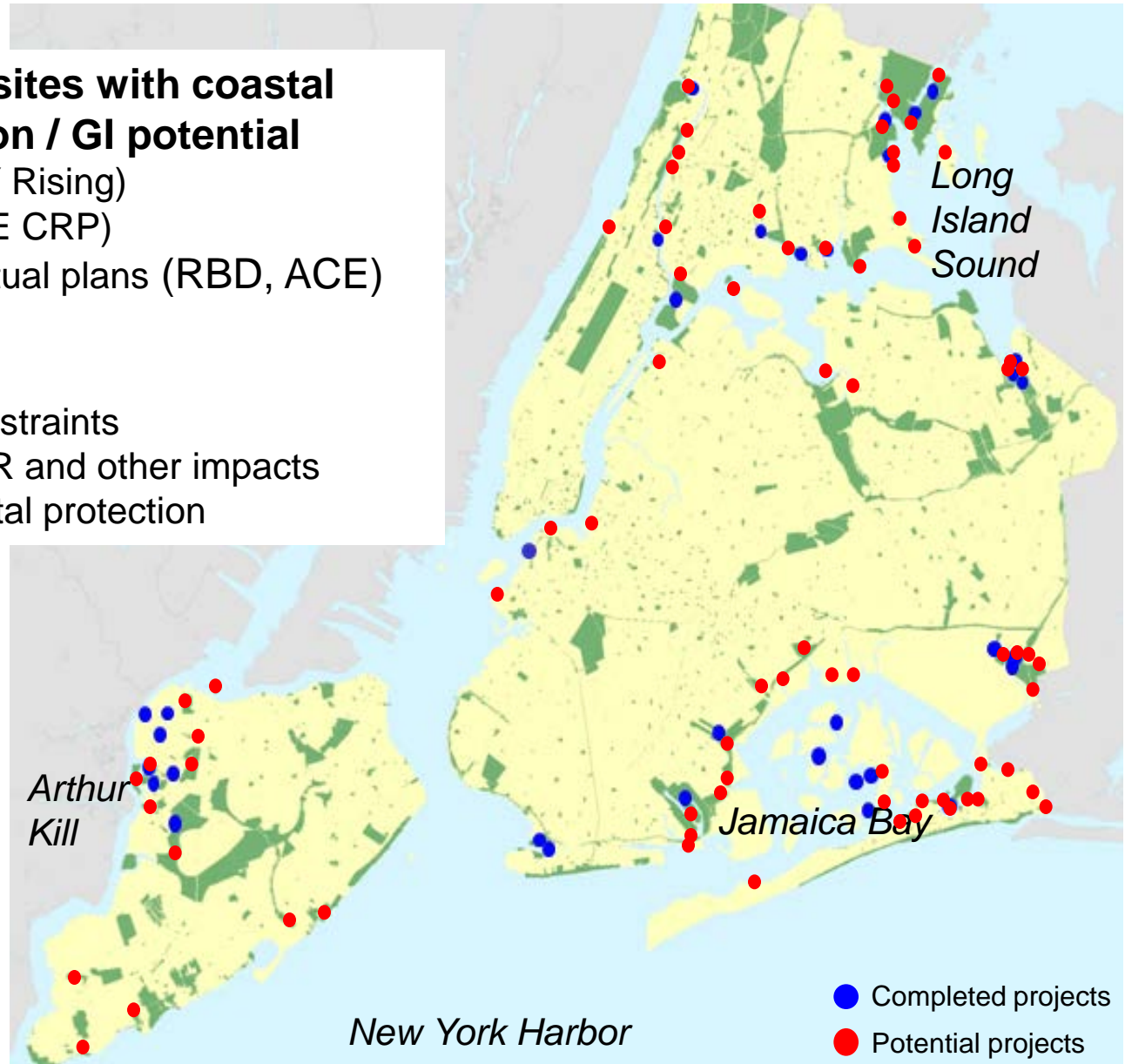
Restoration in NYC since 1990:
>200 acres, >40 projects

Long Island Sound

Arthur Kill

Jamaica Bay

● Completed projects

New York Harbor

NYC Parks

Next coastal restoration / GI opportunities?

Over 90 identified sites with coastal wetlands restoration / GI potential
Local proposals (NY Rising)
Regional plans (ACE CRP)
Post-Sandy conceptual plans (RBD, ACE)

New context
Increasing site constraints
Vulnerability to SLR and other impacts
Emphasis on coastal protection

Long Island Sound

Arthur Kill

Jamaica Bay

New York Harbor

● Completed projects
● Potential projects

NYC Parks

Conceptual model for prioritizing sites

Synthesize data from landscape and field assessments (with additional metrics)
to identify salt marsh most in need of management and restoration

Preserve
Conserve
Monitor

Manage
Restore
Protect

No Immediate Action
Lower Priority

Value
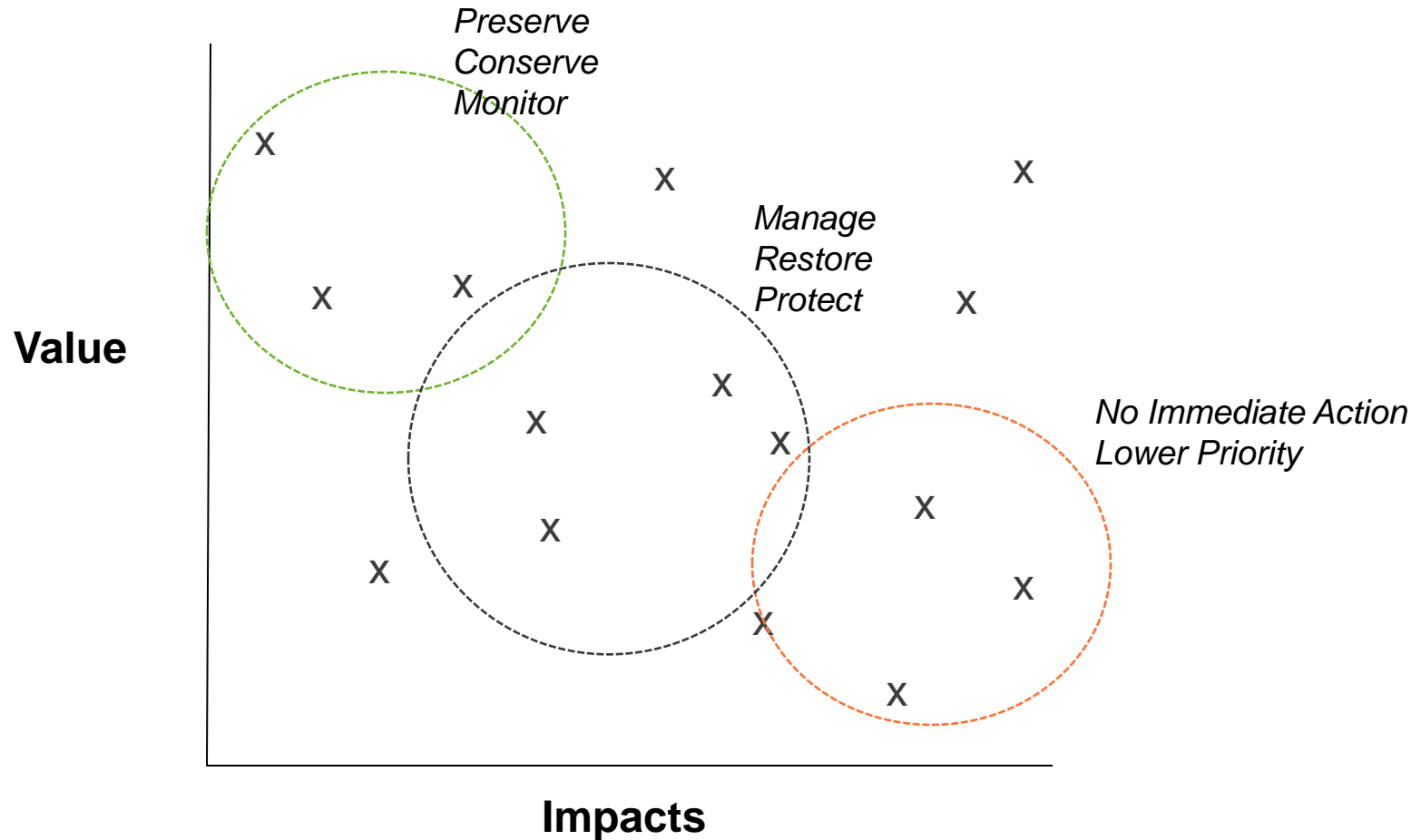
Impacts

Framework for assessing restoration needs and opportunities

Field Analysis

- **Ecological condition**
- **Anthropogenic impacts**
- **Elevation and erosion**

Landscape Analysis

- **Filled wetlands**
- **Recent historic loss**
- **Inundation modeling**
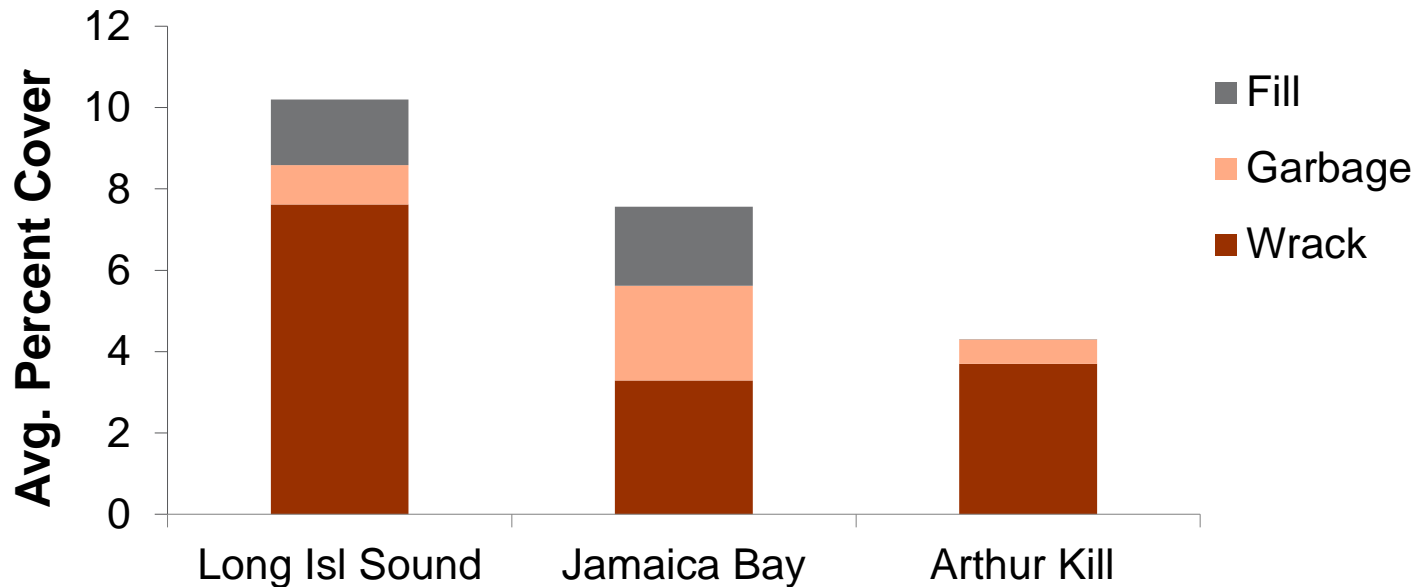- Marsh buffer conditions
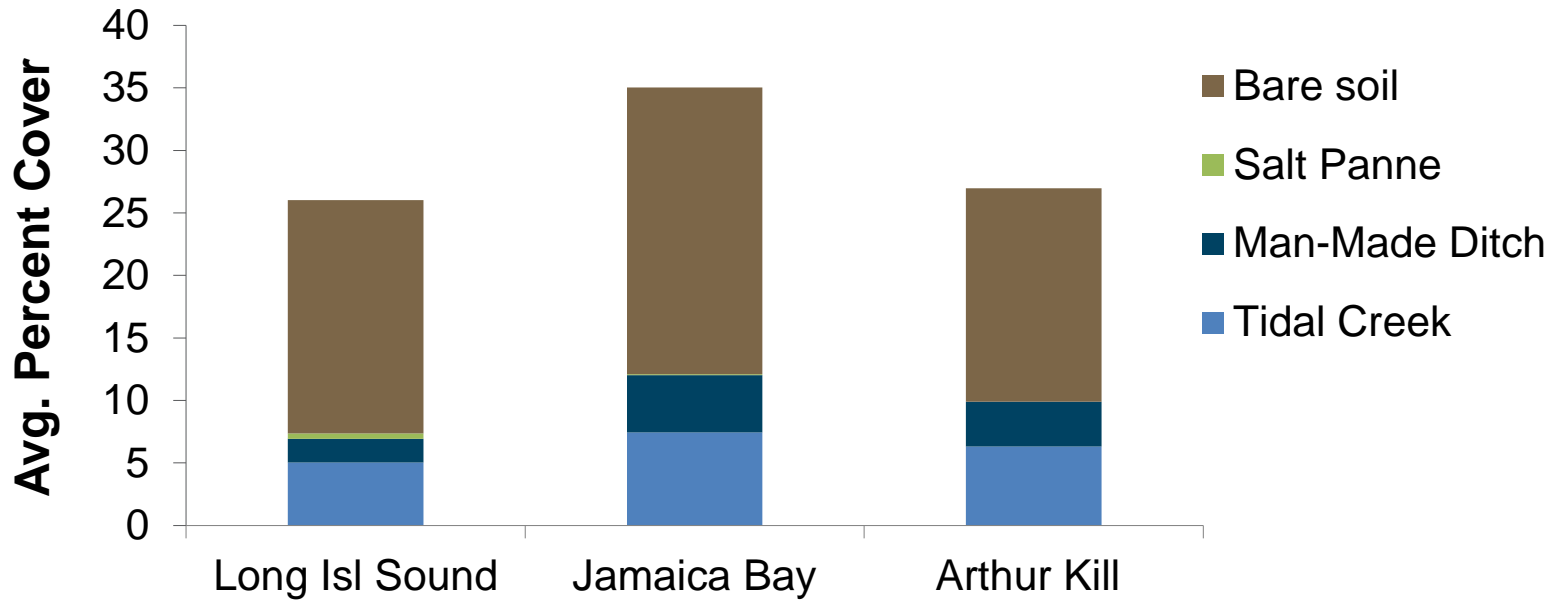- Hydraulics & geomorphology
- Socio-economic factors

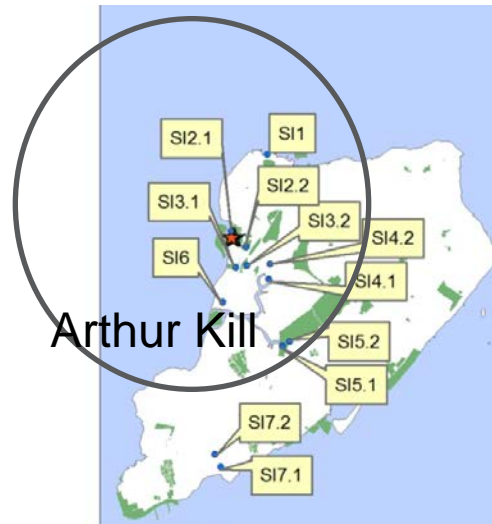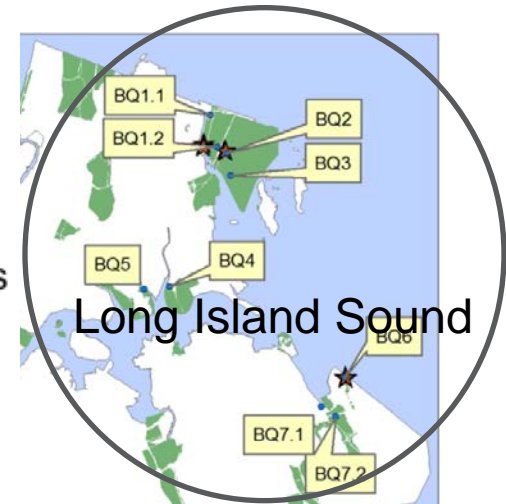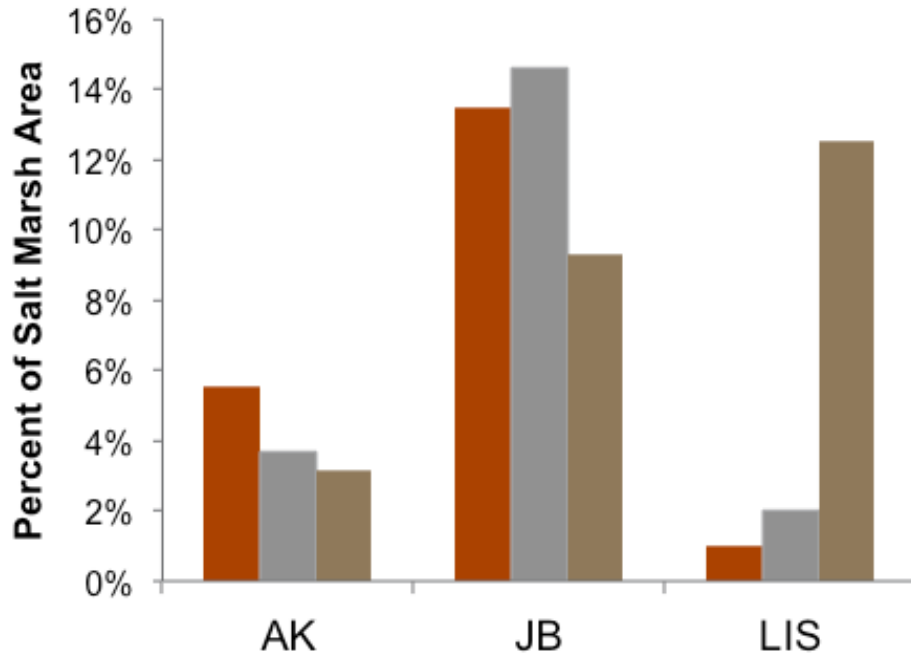# Existing conditions: vegetation cover sampling
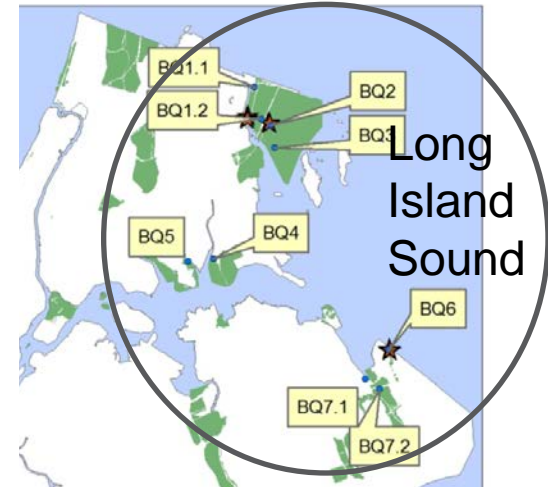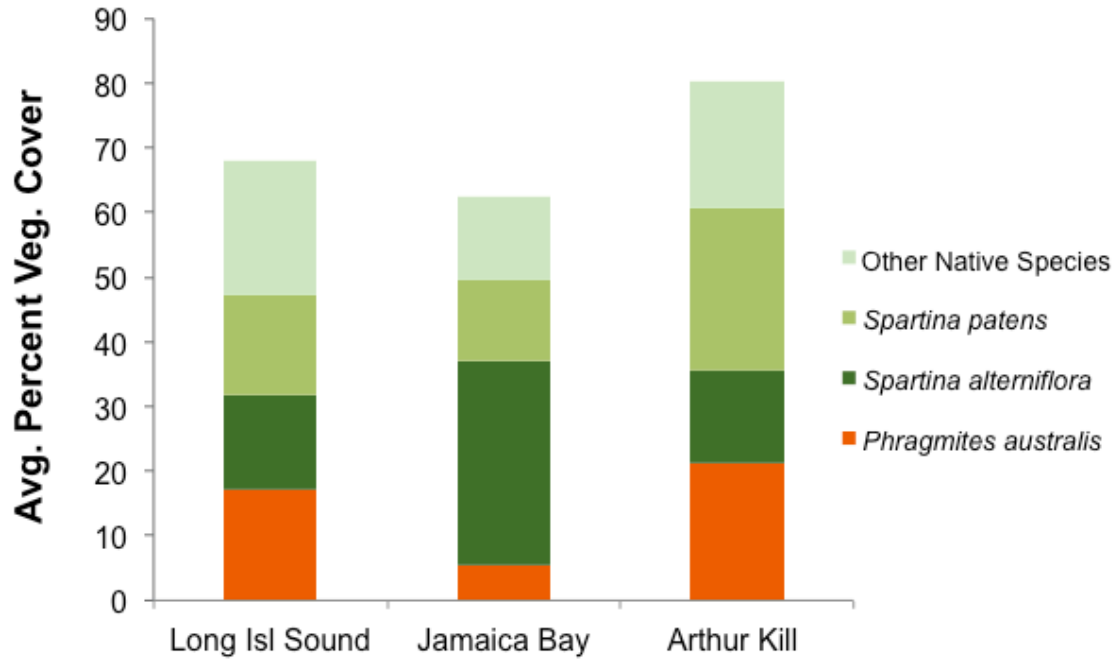
Conditions influencing vegetation

Mapped debris, fill and vegetation loss

Long-term site-specific monitoring

Elevation Change and Accretion (SETs - Surface Elevation Tables)

Vegetation (community type and above and below ground biomass indicators)

Erosion (lateral erosion at creeks and presence and rate of pool expansion

Soil nutrients (nitrate and ammonia concentrations in soils)

Marsh restoration needs:

Boats

Treated wood debris piles

Miscellaneous floatable debris

Fill and construction rubble

NYC Parks

Marsh restoration needs:

Waters edge marsh loss

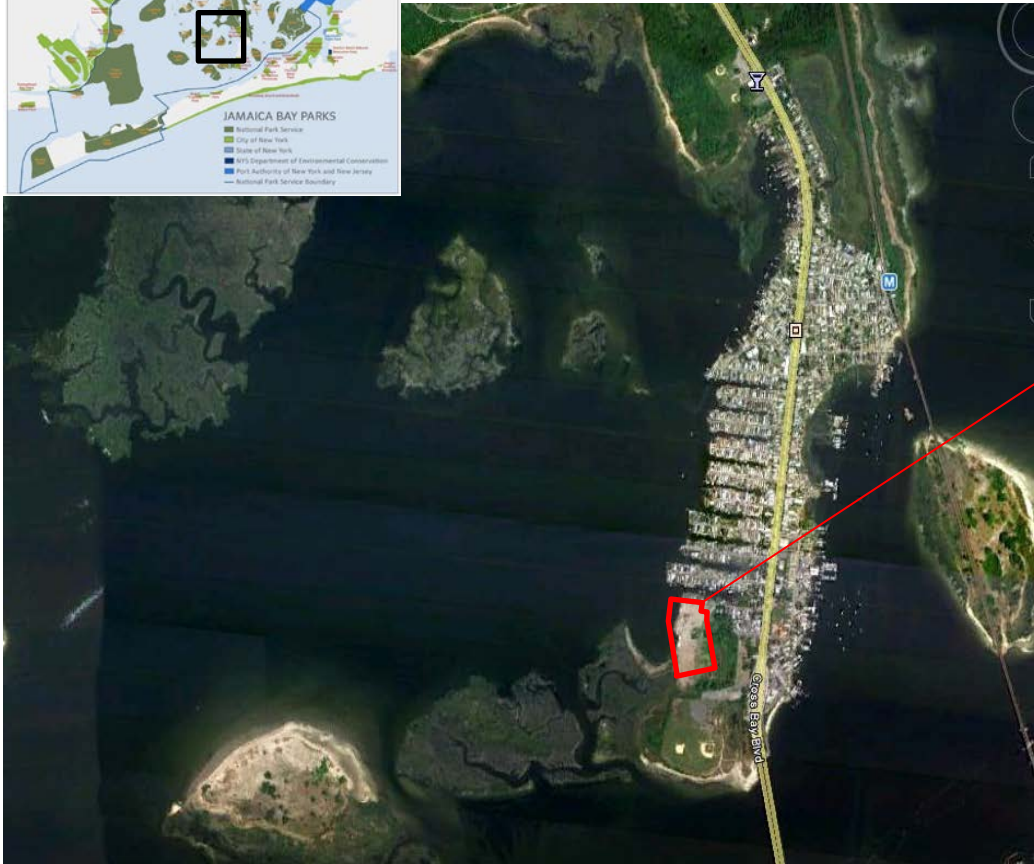Infrastructure impeding salt marsh

Potential scour

Tidal creek expansion

NYC Parks

Opportunities for fill removal

Sunset Cove Park, Queens:
~7 acres of contaminated fill on historic salt marsh

NYC Parks

Sunset Cove restoration project

**Sunset Cove, Broad Chann[el]
Jamaica Bay** 11/5/12

Remnant *Sp. alterniflora* edge at along the shore of our planned salt marsh restoration site.

Feasibility factors
- Fill height, extent and quality
- Community support
- Adjacent land use
- Ecological uplift
- Exposure

NYC Parks

Recent salt marsh loss

- Overlay 1974 salt marsh boundaries with 2012 mapping to calculate areas of marsh loss along the waters edge from 1974 to 2012

- Identify sites with greatest loss: 1974-2012

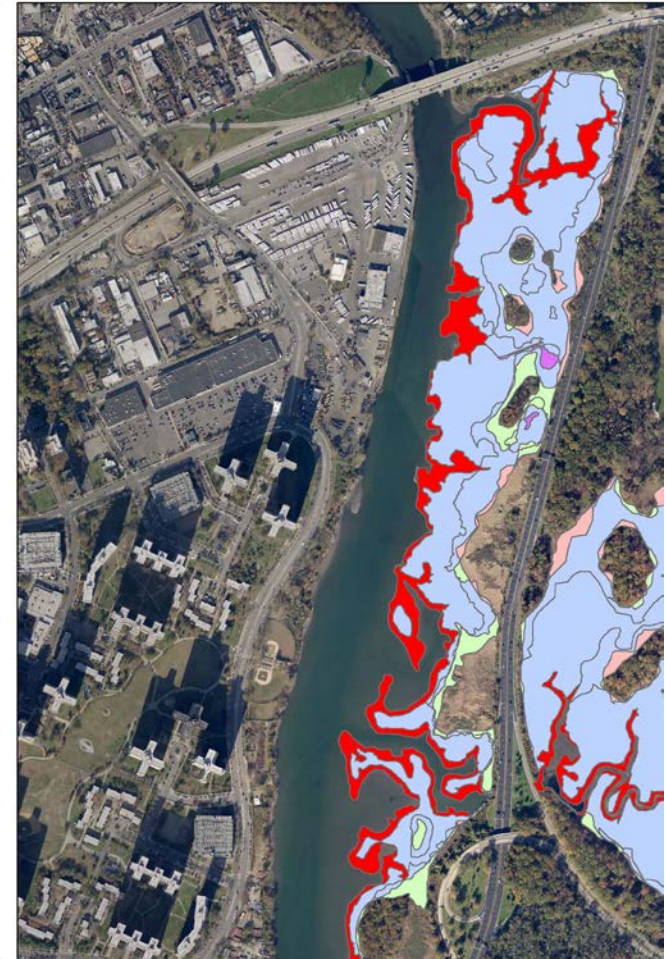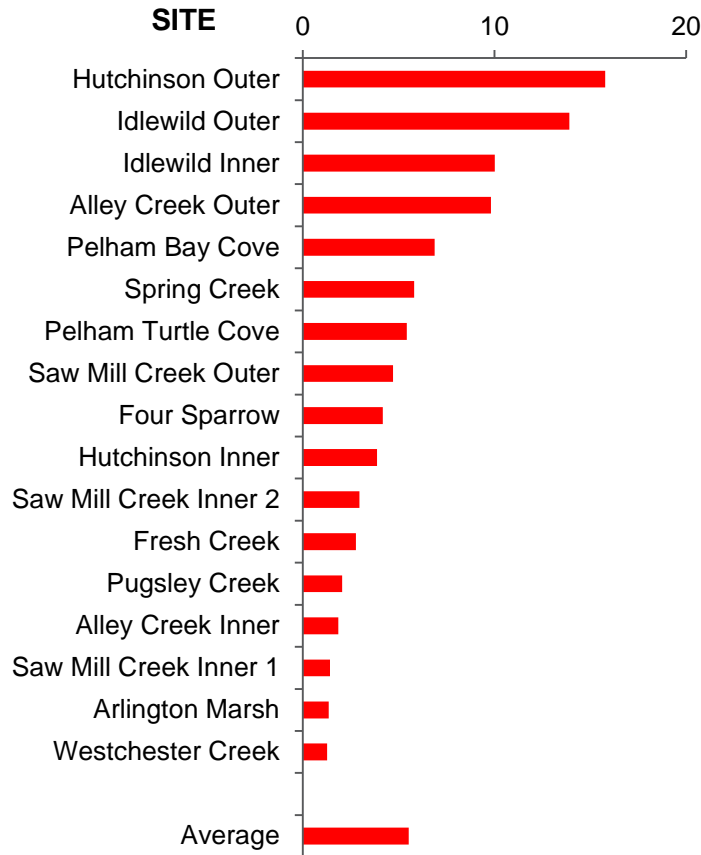Example from Idlewild Park, Queens, NY
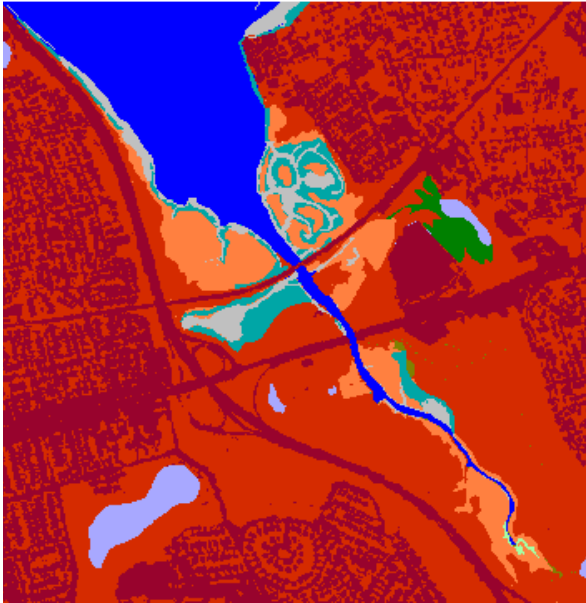

1974

2012

Marsh loss in red

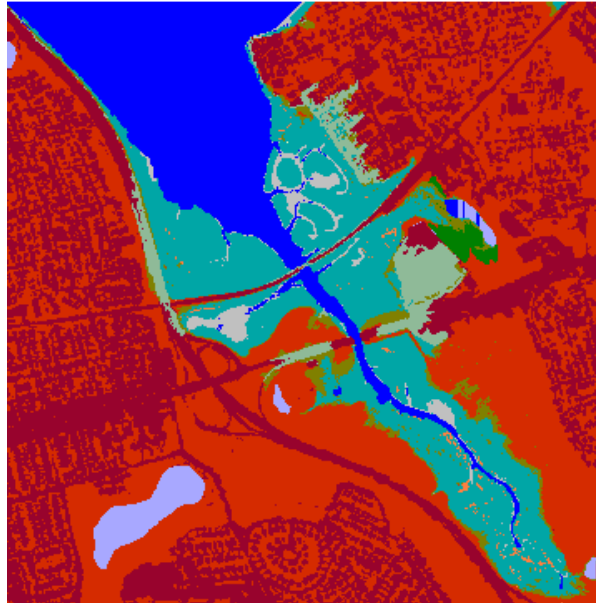# Feasibility of addressing marsh loss

Marsh loss (acres) — bar chart with SITE axis (values 0 to 20):
- Hutchinson Outer
- Idlewild Outer
- Idlewild Inner
- Alley Creek Outer
- Pelham Bay Cove
- Spring Creek
- Pelham Turtle Cove
- Saw Mill Creek Outer
- Four Sparrow
- Hutchinson Inner
- Saw Mill Creek Inner 2
- Fresh Creek
- Pugsley Creek
- Alley Creek Inner
- Saw Mill Creek Inner 1
- Arlington Marsh
- Westchester Creek
- Average

NYC Salt Marsh Trends Analysis, 1974 – 2012

Hutchinson River

Legend
2012_1974_Final
GainLoss, WaterLand
- SAME
- GAIN, land_side
- GAIN, water_side
- LOSS, land_side
- LOSS, water_side
- POOLS
- RESTORED

0   80   160   320 Meters

NYC Parks

Inundation modeling

SLAMM (Sea Level Affecting Marshes Model): Alley Creek, LIS

Initial condition in 2008   2100 scenario (67.8 inches SLR)

	Developed Dry Land
	Undeveloped Dry Land
	Swamp
	Tidal Fresh Marsh
	Transitional Salt Marsh
	Regularly-flooded Marsh
	Tidal Flat
	Estuarine Open Water
	Irregularly-flooded Marsh
	Tidal Swamp
	Flooded Developed Dry Land

What is percent likelihood of: Coastal Marsh
Habitat Change
Flooded Developed Land
Open Water ?

Current priority sites

No. of Sites	Total Size (ac)	Approx. Cost
25	117	$120,000,000

Potential Restoration Tactics City-wide
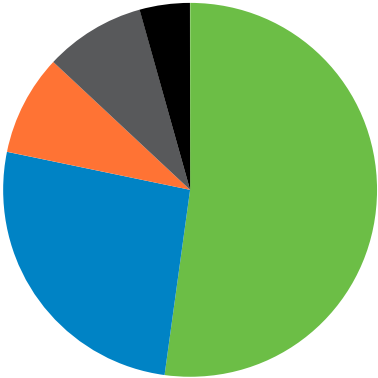
- Landfill excavation
- Waterward Reconstruction
- Wrack/Debris Removal
- Lawn to Marsh Conversion
- Wave Break/Living Shoreline

NYC Parkland priorities in Jamaica Bay

NYC Parks

Prioritization criteria

- **Political & community support**
  Regional plan, property type,
  committed NGOs, leveraging of
  related commitments / goals

- **Feasibility**
  Proof of concept, regulatory support,
  cost, construction access, technical
  complexity

- **Coastal resiliency value**
  Future change in inundation
  frequency, sustainability of design,
  inundation tolerance

- **Ecological value**
  Size, species of concern,
  connectivity to other coastal
  ecosystems

NYC Parks

Partners

Natural Areas Conservancy
U.S. EPA, Region 2
NYS Dept. of State
NYS Dept. Environmental Conservation
U.S.ACE
NY-NJ Harbor Estuary Program
American Littoral Society
Jamaica Bay Ecowatchers
NYC DEP
New England Interstate Pollution Control Commission
Partners for the Delaware Estuary
NYC Parks interns
The Nature Conservancy

Contact: Marit Larson, Marit.larson@parks.nyc.gov