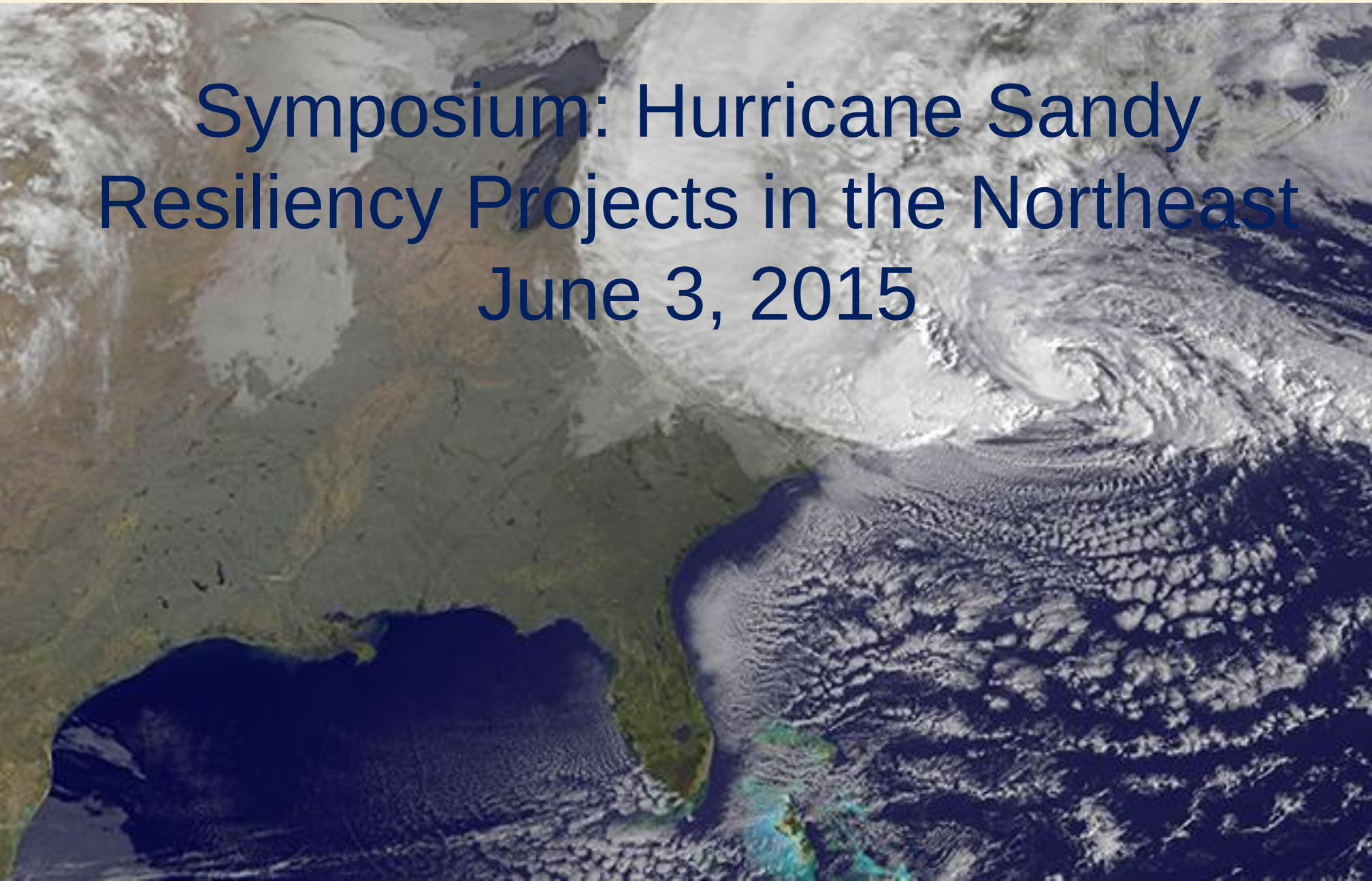
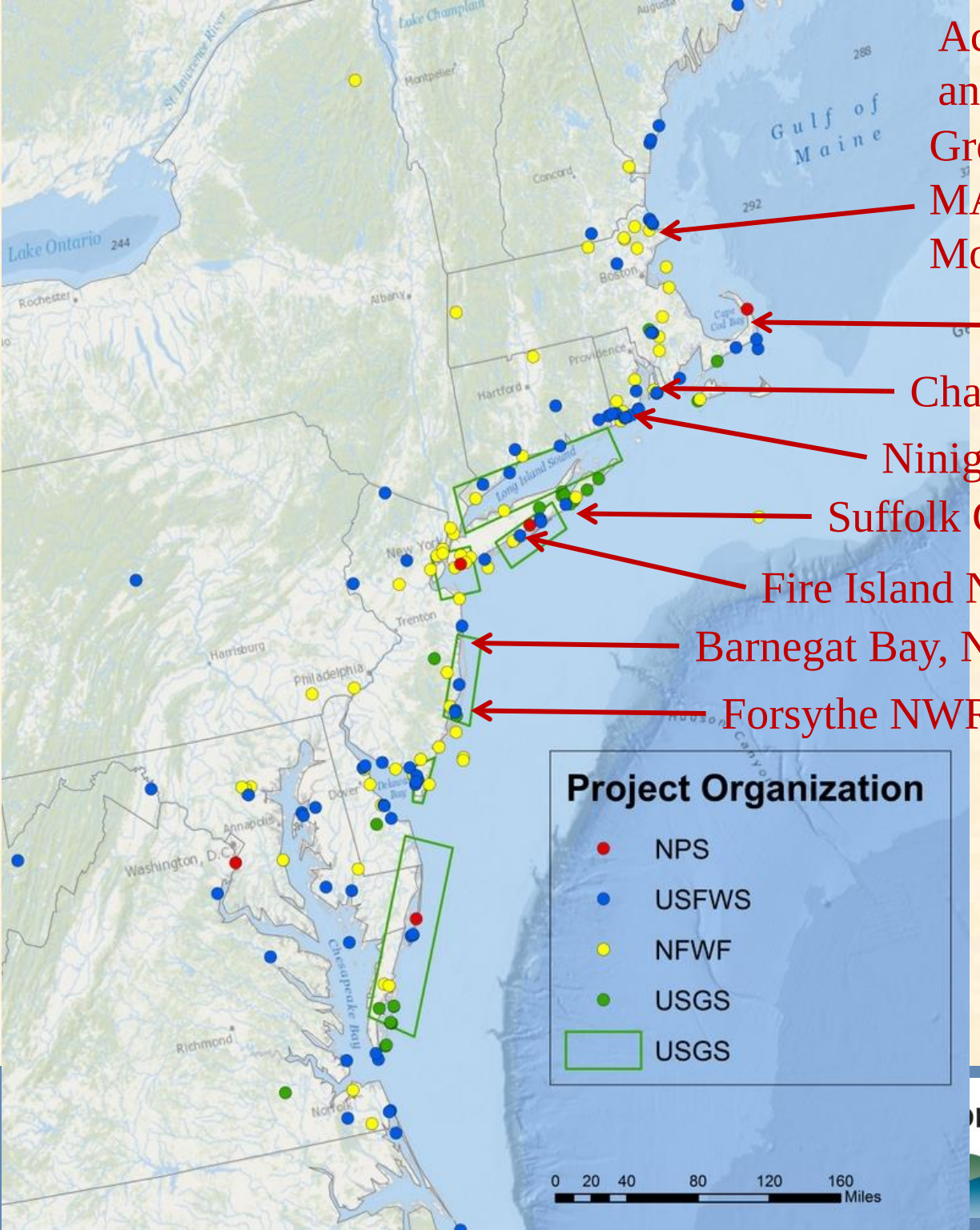
# Society of Wetland Scientists



## Symposium: Hurricane Sandy Resiliency Projects in the Northeast

June 3, 2015




Across region (Paton/Milliken and Elphick)

Great Marsh/Plum Island Estuary, MA (Burdick, Phippen, Edwards, Morris )

Cape Cod NS, MA (Tyrrell)

Chafee NWR, RI (Ernst)

Ninigret Marsh, RI (Chafee)

Suffolk County, NY (Ninivaggi)

Fire Island NS, NY (Hychka)

Barnegat Bay, NJ (Ganju)

Forsythe NWR, NJ (Crouch)

# DOI Hurricane Sandy Resiliency Areas Discussed in Symposium

# Tidal Marsh Restoration and Evaluation Following Super-storm Sandy, the Quest for a More Resilient System

*Suzanne Paton Southern New England Coastal Program and Andrew Milliken, North Atlantic Landscape Conservation Cooperative, U.S. Fish and Wildlife Service*

Hurricane Sandy Resiliency Projects in the Northeast Symposium
Society of Wetland Scientists
Providence, Rhode Island, June 3, 2015

**Hurricane Sandy Disaster Relief Supplemental Appropriations Act of 2013, Public Law 1132**

The Act provides explicit direction to use mitigation funds to:

1) restore and rebuild national parks, national wildlife refuges and other federal public assets; and

2) to increase the resiliency and capacity of coastal habitat and infrastructure to withstand storms and reduce the amount of damage caused by such storms


# DOI Resiliency
## ($360 million)

**Coastal Restoration**

**Science Support**

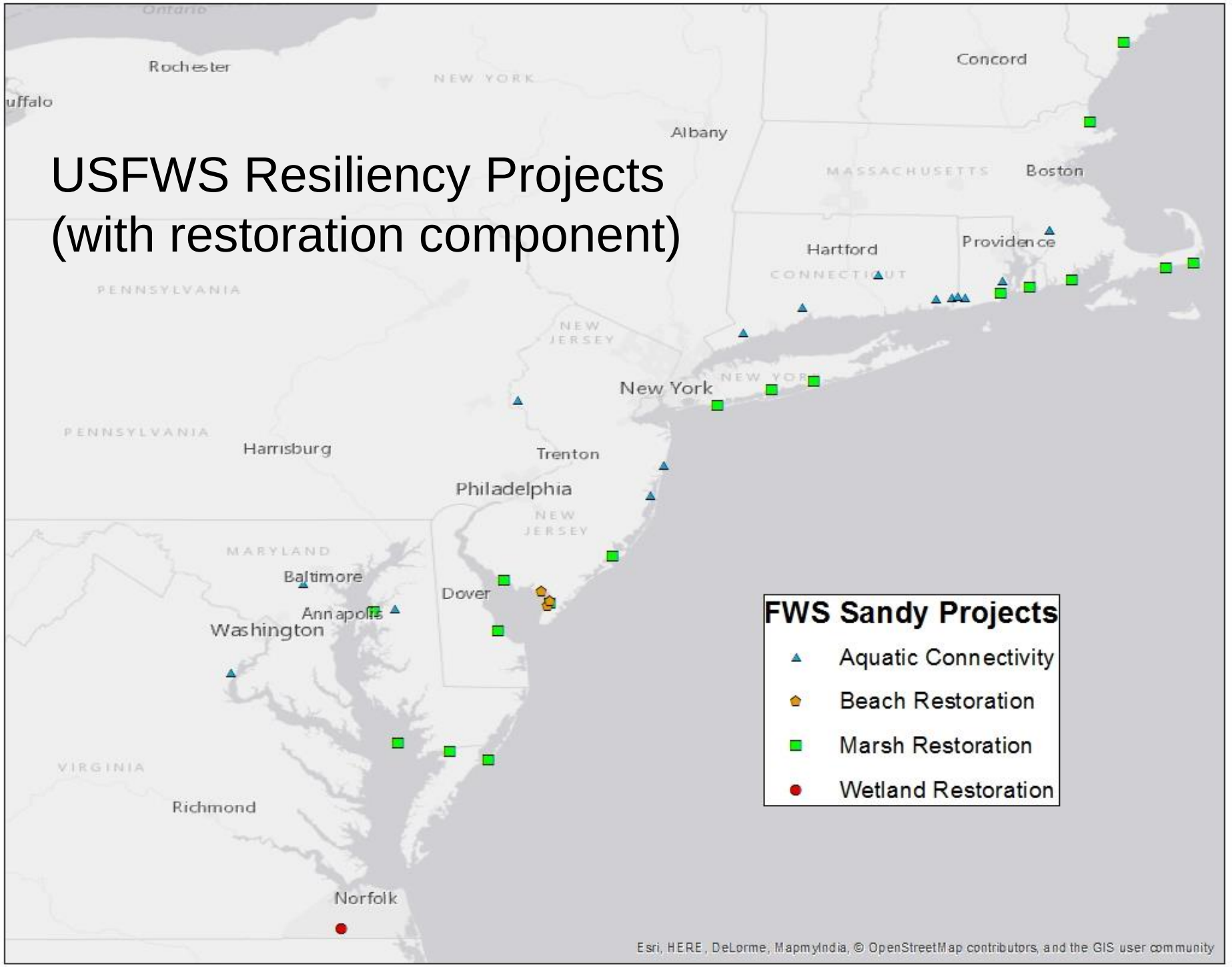
**Planning & Design**

**FWS, USGS, NPS, BOEM, BLM, BIA**

**+ Partners (NFWF)**

Projects are designed to increase resiliency by restoring coastal marshes, conducting beach and dune restoration, providing aquatic connectivity in streams and rivers, and by providing integrated science decisions that bring partners and science together to reduce redundancy and increase the effectiveness of conservation actions.

Projects on Federal, State, Town and privately owned lands


USFWS Resiliency Projects
(with restoration component)
Rochester
NEW YORK
Albany
Concord
MASSACHUSETTS
Boston
Hartford
Providence
CONNECTICUT
PENNSYLVANIA
NEW JERSEY
New York
Harrisburg
Trenton
Philadelphia
MARYLAND
Baltimore
Dover
Annapolis
Washington
VIRGINIA
Richmond
Norfolk
FWS Sandy Projects
Aquatic Connectivity
Beach Restoration
Marsh Restoration
Wetland Restoration
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# FWS Resiliency Projects

## Aquatic Connectivity

- Nine Projects funded
  - MA (1), RI (1), CT (4), MD (1), NJ (1), VA (1)

- focused on dam removals and culvert replacements

- will restore fish access to 138 miles of stream and 526 acres of pond habitat

- Potentially provide sediment to marshes

- Science to prioritize future efforts for both connectivity and road stream crossings across region

# FWS Resiliency Projects

## Beach Restoration

- Protecting important coastal areas
- Protecting  associated marshes,
- Provide valuable habitat for natural resources and
- Provide significant economic benefits to state and local communities.

- Science to understand impacts of storms, sea level rise and management on beaches

# FWS Resiliency Projects

## Coastal Marsh Restoration

- Fourteen projects funded
  - MA, RI, NY, NJ, MD, DE, VA

- $75,896,425.

- proposals that will restore significant acreage to wetland habitats across the eight impacted states in the Northeast

# Challenge - Lots of money. Two years to spend it.

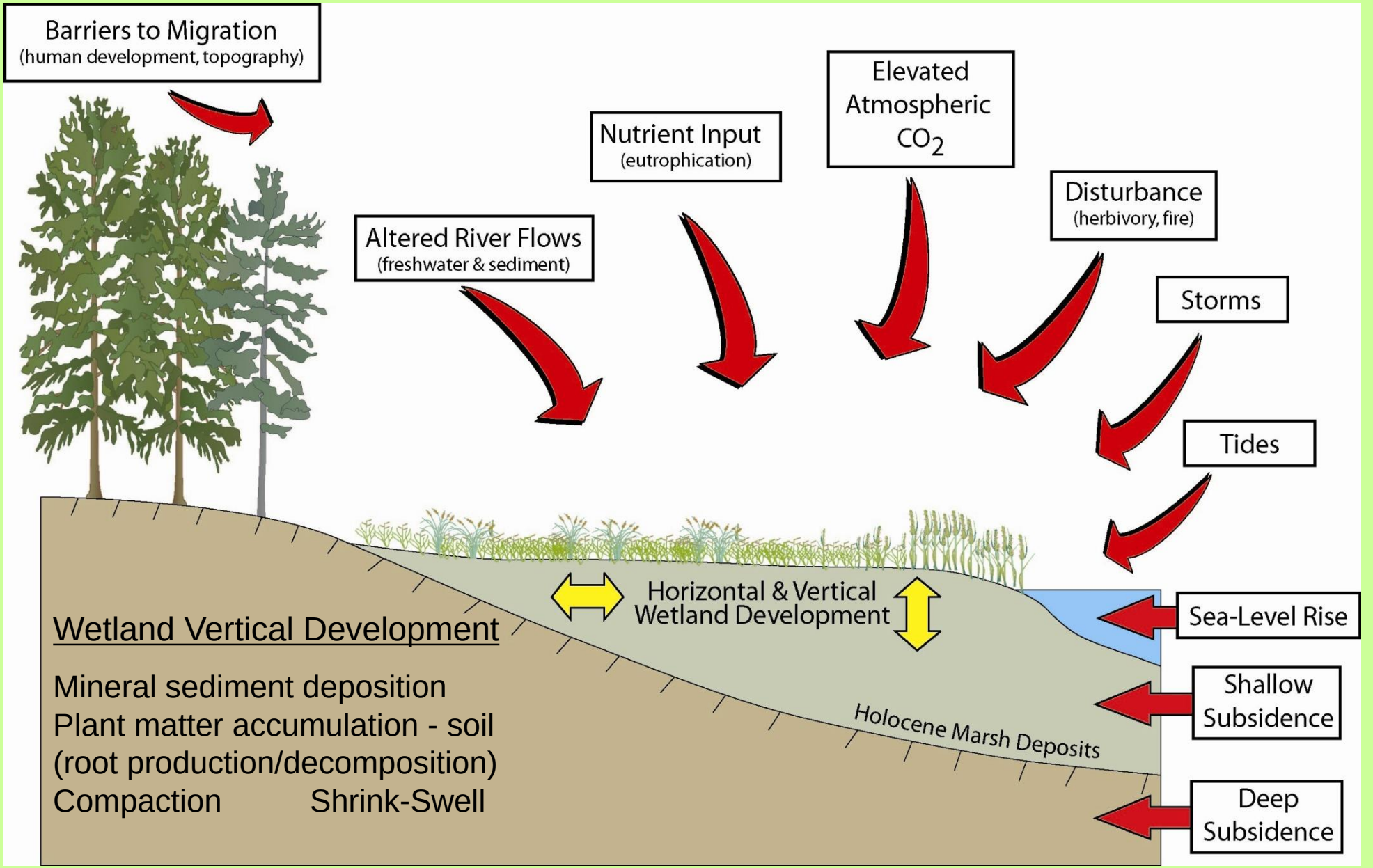
**BROADLY, focused on**

1) **Improving the biological integrity, diversity and environmental health of these tidal marsh systems (NWR Improvement Act of 1997 mandates)**
2) **Improving habitat for Federal Trust Species (esp. marsh obligate)**
   - **Migratory Birds, T&E species, Diadromous Fish**

**LOCALLY,**

1) **Developing broad partnerships to compile existing data and collect additional baseline data to evaluate each individual system, identify potential restoration actions, develop environmental compliance documentation, and develop implementation plans.**

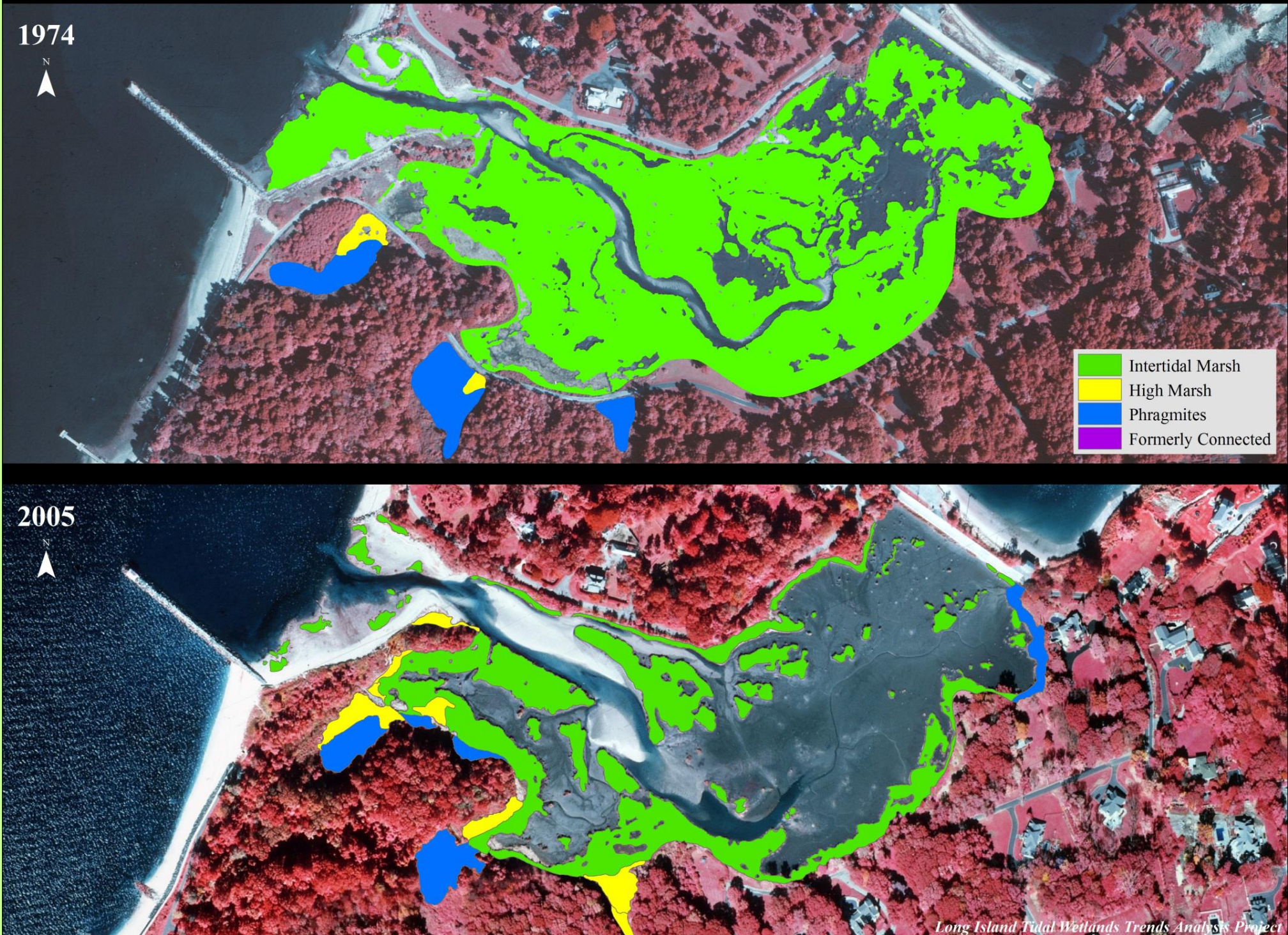
2) **Develop monitoring and evaluation strategy**


Barriers to Migration
(human development, topography)
Altered River Flows
(freshwater & sediment)
Nutrient Input
(eutrophication)
Elevated
Atmospheric
$CO_2$
Disturbance
(herbivory, fire)
Storms
Tides
Horizontal & Vertical
Wetland Development
Sea-Level Rise
Shallow
Subsidence
Deep
Subsidence
Holocene Marsh Deposits
Wetland Vertical Development
Mineral sediment deposition
Plant matter accumulation - soil
(root production/decomposition)
Compaction
Shrink-Swell

# Rates of Tidal Wetland Loss (just a few examples)

- Long Island – 11-79% - 1974-2005
  - Mushacke, 2007
  - Overall average 23.8% (704 acres lost)
- Jamaica Bay – 50% - 1924-1998
  - Hartig et al, 2002
- Hempstead Bay – 50% - 1926-1983
  - Crappetta 2010, Browne et al 2011)
- SW Connecticut Marshes – 31-86% - 1974-2004
  - Tiner et al 2006
- Cape Cod – up to 50-63% - (1952/1971-2005)
  - Smith 2009
- Chesapeake Bay Marshes – 16-29% (1850-1990)
  - Wray et al 1995

# West Pond (Oyster Bay)




"We must develop adaptation strategies to face shifting baselines and maintain ecosystem services at a sustainable level rather than striving to restore an ecosystem state of the past" - *Canstensen et al*

# Building Marsh Resilience

Thin layer deposition – to enhance marsh capital

Facilitate marsh transgression

Install living Shorelines

# Improve Hydrology

- Remove tidal restrictions
- Improve drainage


NEW YORK
Albany
Concord
MASSACHUSETTS
Boston
Hartford
CONNECTICUT
Providence
NEW JERSEY
NEW YORK
New York
PENNSYLVANIA
Harrisburg
Trenton
Philadelphia
NEW JERSEY
MARYLAND
Baltimore
Dover
Annapolis
Washington
VIRGINIA
Richmond
Norfolk
Restoration Techniques
Facilitating Migration
Improving Hydrology
Living Shoreline
Thin Layer Deposition
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# FWS Resiliency projects

## Science Support and Decision Making

•Seven projects – across all states

•$19,009,733

•Predictive model for SAV prevalence & salt marsh resiliency (mid-Atlantic)
•Decision support models – tidal wetlands and tidal wetland species, including coordinated monitoring program (multi-agency)
•NWR – Coastal Resilience Preparedness (survey support for shoreline, salt marsh integrity, and IWMM)
•Resilience of tidal marsh bird community (SHARP)
•ID/map/prioritize culvert & road stream crossings (LCC & Fisheries)
•CBRA – map modernization
•Increase resiliency of beach habitats & beach dependent species

# Increasing Resiliency of Tidal Marsh Habitats and Species in the Face of Storms & SLR

- Develop/refine models for understanding impacts of sea level rise and storms on tidal marshes and marsh species
  - Vegetation and wildlife response (SHARP)
  - Modeling marsh community response (USC, LSU, USGS)
- Decision support models and incorporation into decision model framework
  - UMass, TNC
- High/low marsh mapping, elevation surveys
  - SHARP (U Maine, U Del)
- Monitoring and assessment of effectiveness of restoration for marsh resiliency
  - USFWS, NPS, SHARP (U Maine, U Conn, U Del, SUNY)
- Delivery of results to partners
  - NROC, MARCO