The Mid-Atlantic Coastal Wetland Assessment:

Monitoring wetlands through rapid and intensive methods

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PARTNERSHIP FOR THE DELAWARE ESTUARY, INC

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

Barnegat Bay National Estuary Program

Wetland Strategy – Why Needed?

Coastal wetlands are:

- a hallmark feature of the Delaware Estuary because of both their diversity and sheer extent
- critical for sustaining fish and wildlife, protecting against flooding, preserving water quality, etc.
- one of the most degraded habitats due to past land use practices and degradation, now increasingly threatened by future sea level rise.

Tracking and understanding the health and acreage of coastal wetlands is a top priority for coastal managers

White Paper Top Ten Issues *(PDE 2006)*

1. **Contaminants** (forms, sources, fates & effects for different classes)
2. **Tidal Wetlands (status, trends and relative importance of different types)**
3. **Ecologically Significant Species & Critical Habitats** (benthos, horseshoe crabs)
4. **Ecological Flows** (effects of flow changes on salt balance & biota)
5. **Physical-Chemical-Biological Linkages** (e.g., sediment budgets, toxics & biota)
6. **Food Web Dynamics** (key trophic connections among functional dominant biota)
7. **Nutrients** (forms, concentrations and balance of macro- and micronutrients)
8. **Ecosystem Functions** (assessment and economic valuation of ecosystem services)
9. **Habitat Restoration and Enhancement** (science & policy)
10. **Invasive Species** (monitoring, management & control)

State of the Estuary Report 2008

Acreage?

no recent, consistent, high resolution data across the estuary

Condition?

no data

Tidal Wetlands

POSITIVE

NEGATIVE

INDICATOR DESCRIPTION: Coastal wetlands are one of the Delaware Estuary's most important and characteristic habitats, and they are a premier environmental indicator for the area's ecosystem. The Estuary has one of the largest freshwater tidal prisms in the world running from Trenton, New Jersey, to approximately Wilmington, Delaware. The gradual transition from fresh to salt water allows for abundant and rare freshwater tidal wetlands in the Upper Estuary, brackish marshes in the Middle Estuary, and salt marshes surrounding Delaware Bay. Together, these marshes form a nearly continuous perimeter fringing the tidal system. Tidal wetlands furnish essential spawning, foraging, and nesting habitat for fish, birds, and other wildlife. These wetlands are considered by many scientists to function like the ecosystem's "kidneys," absorbing contaminants, nutrients, and suspended sediments. Other scientists regard them as "fish factories" that are crucial to the success of important finfisheries. They also provide a first line of defense against storm surge and flooding. Acre for acre, tidal wetlands likely provide more ecosystem services than any other habitat type in the region.

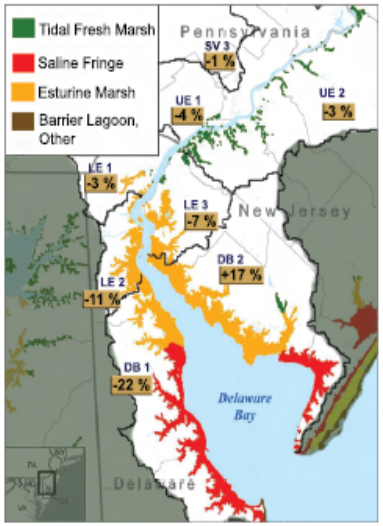
STATUS: A 1992 to 2001 land cover data comparison (for both tidal and non-tidal wetlands combined) showed wetland loss throughout the Estuary, except along the New Jersey side of Delaware Bay where extensive marsh restoration may have offset this trend (see map). During the preceding decade, a more in-depth analysis showed that Delaware's tidal marshes dropped by 12 percent and the proportion of marshes with degraded conditions almost doubled.

TRENDS: For over 300 years, the extent and integrity of tidal wetlands has been under assault across the Estuary. Perhaps 50 percent of the natural marshes have been lost to development, conversion, or degradation associated with human activities. Losses have been most severe in the urban corridor where perhaps only five percent of pre-settlement acreage of the nationally rare freshwater tidal marsh remains. Despite proactive laws protecting marshes, a growing awareness of their ecological value, and mounting restoration attention, marsh acreage and condition are still lost from human-caused impairments, land uses, and sea level rise.

ACTIONS AND NEEDS: Tidal wetlands are a hallmark feature of our watershed that suffer continued losses of both area and condition. Coordinated monitoring and assessment programs are urgently needed to regularly and carefully track tidal marsh extent and condition across the three Estuary states. A better scientific understanding is also needed of the factors that govern wetland well-being, such as sediment supply, water quality, and ecology. Studies of their ecosystem services and natural capital value would benefit land-use and regional-restoration planning.

A coconut fiber log is deployed along the edge of a tidal marsh in Bivalve, New Jersey, in an effort to establish a "living-shoreline" reef that may soon protect against erosion.

Relative Change in Wetland Acreage 1992-2001



Please refer to the map on page 31 to view the full range of each region.

MACWA

Delaware Estuary

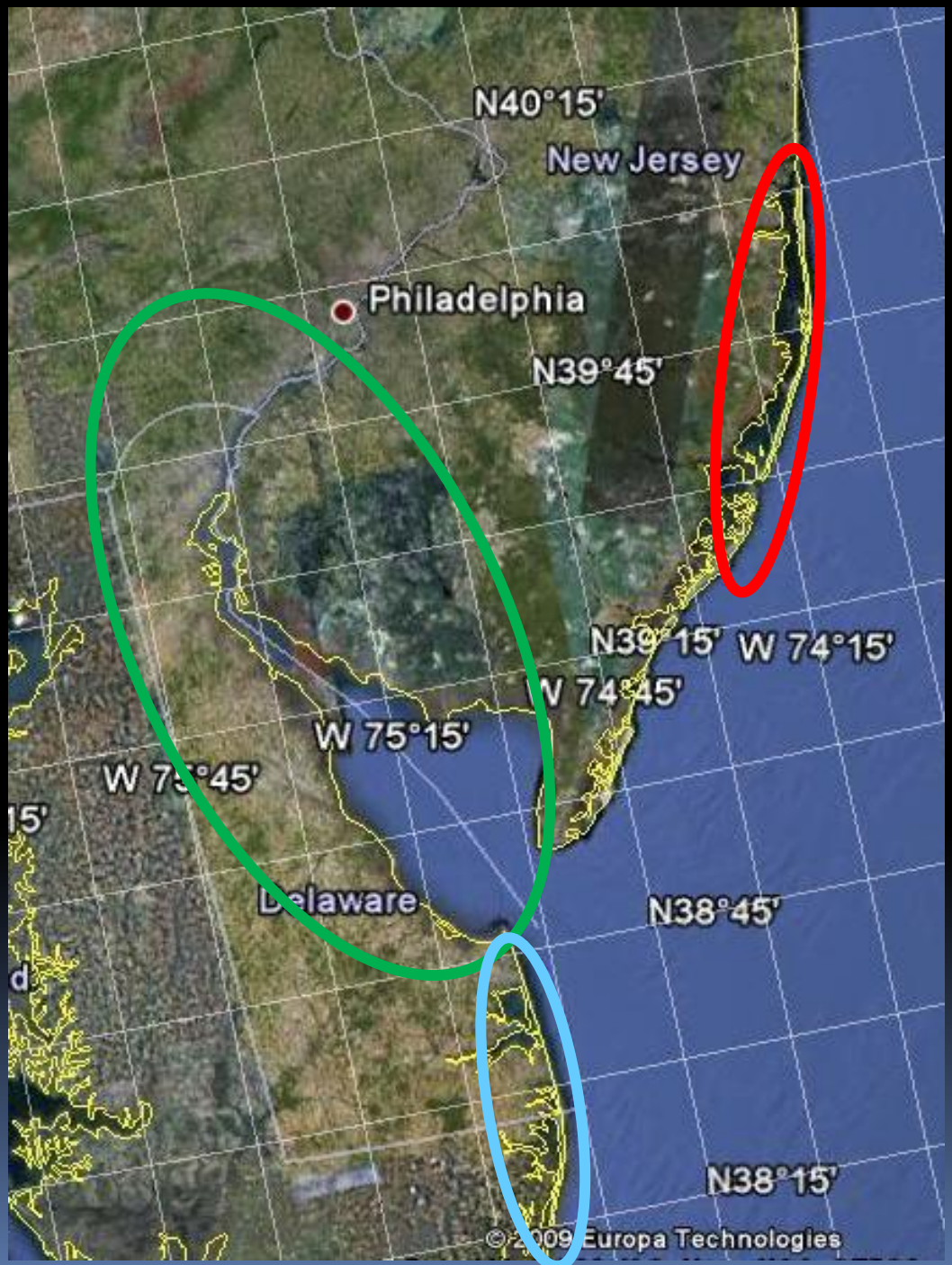
Barnegat Bay

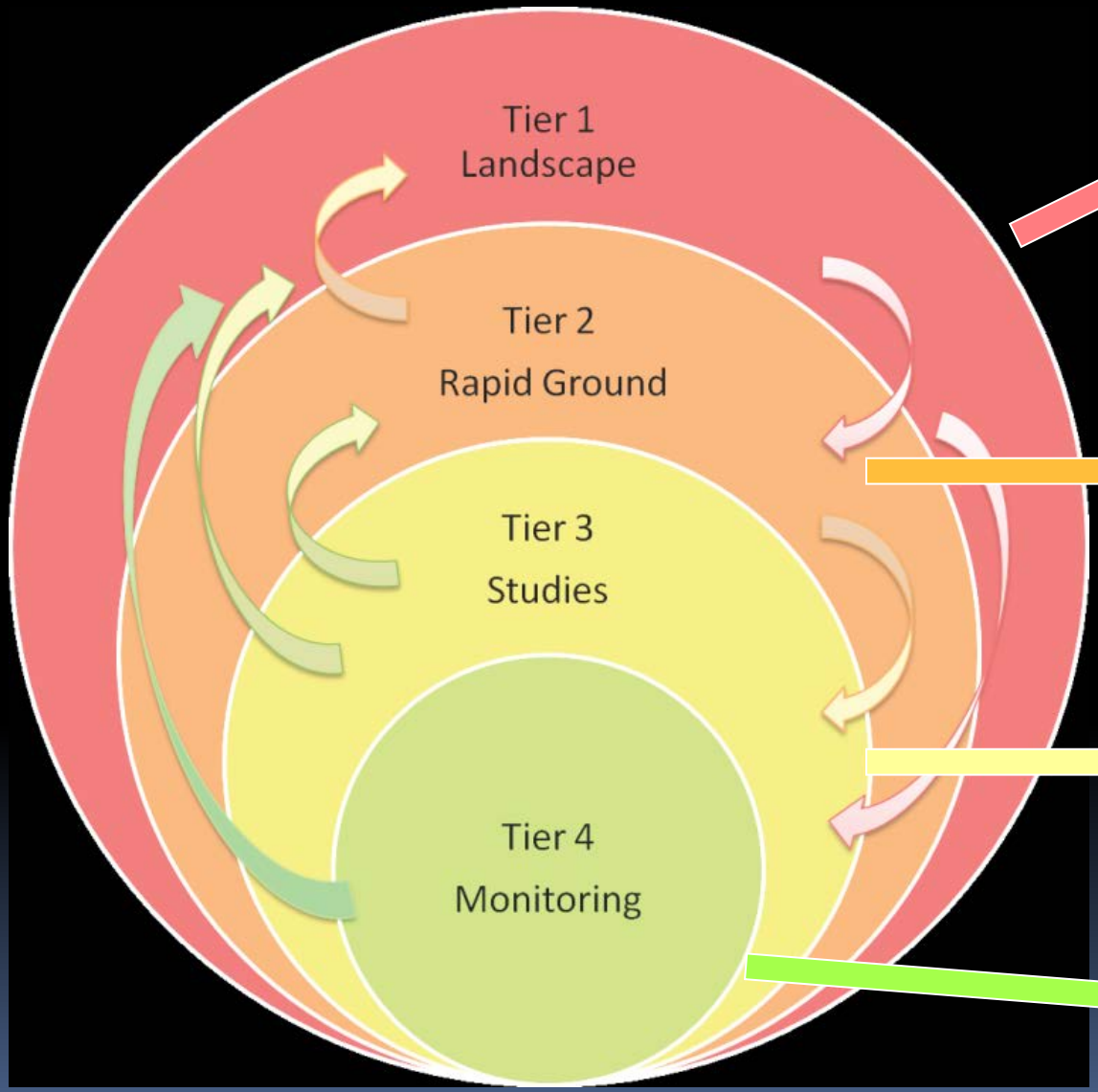
DE Inland Bays

MD Coastal Bays

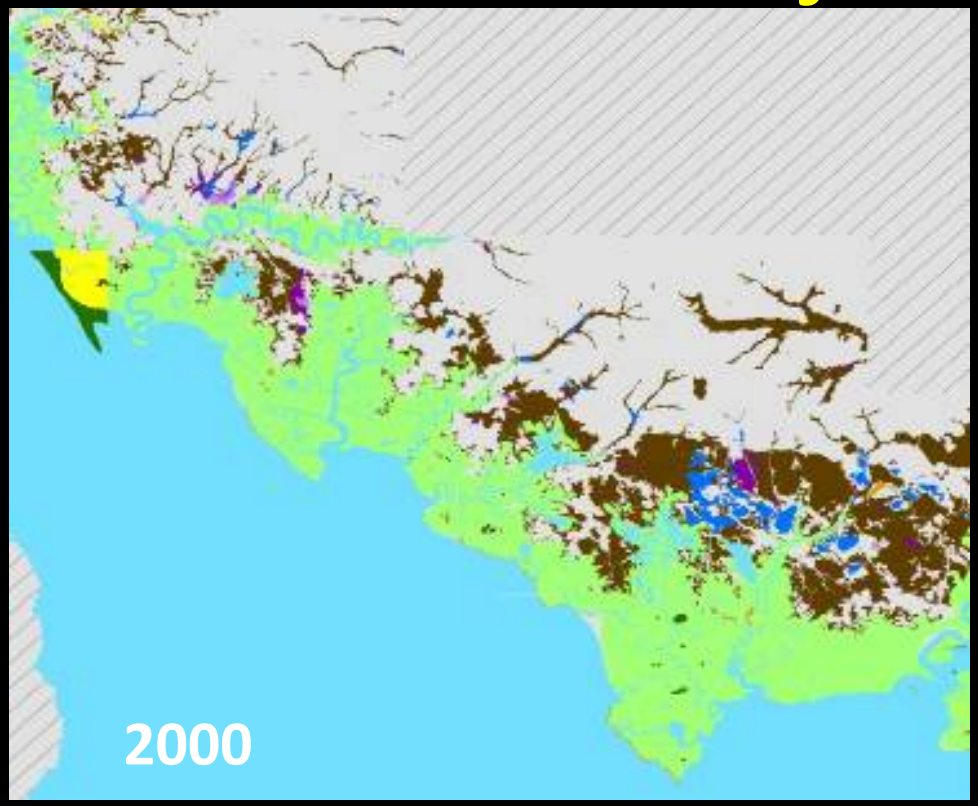
Others?

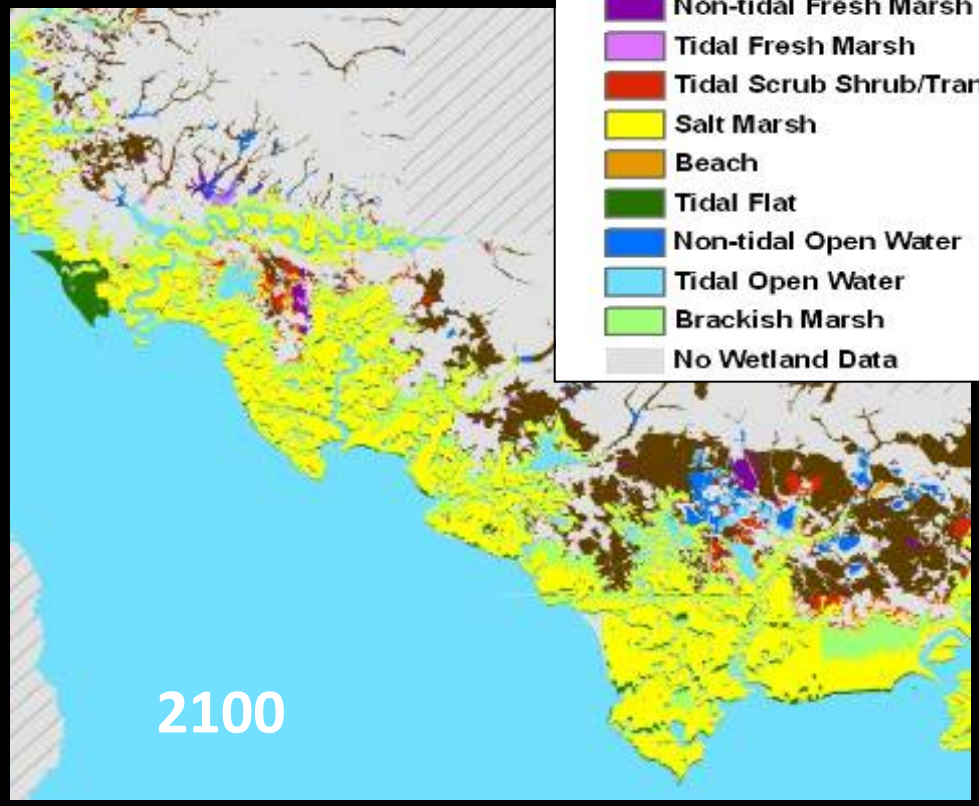
Other NJ Coastal




Tier 1
Landscape
Tier 2
Rapid Ground
Tier 3
Studies
Tier 4
Monitoring

Tidal Wetland Projections - IEc





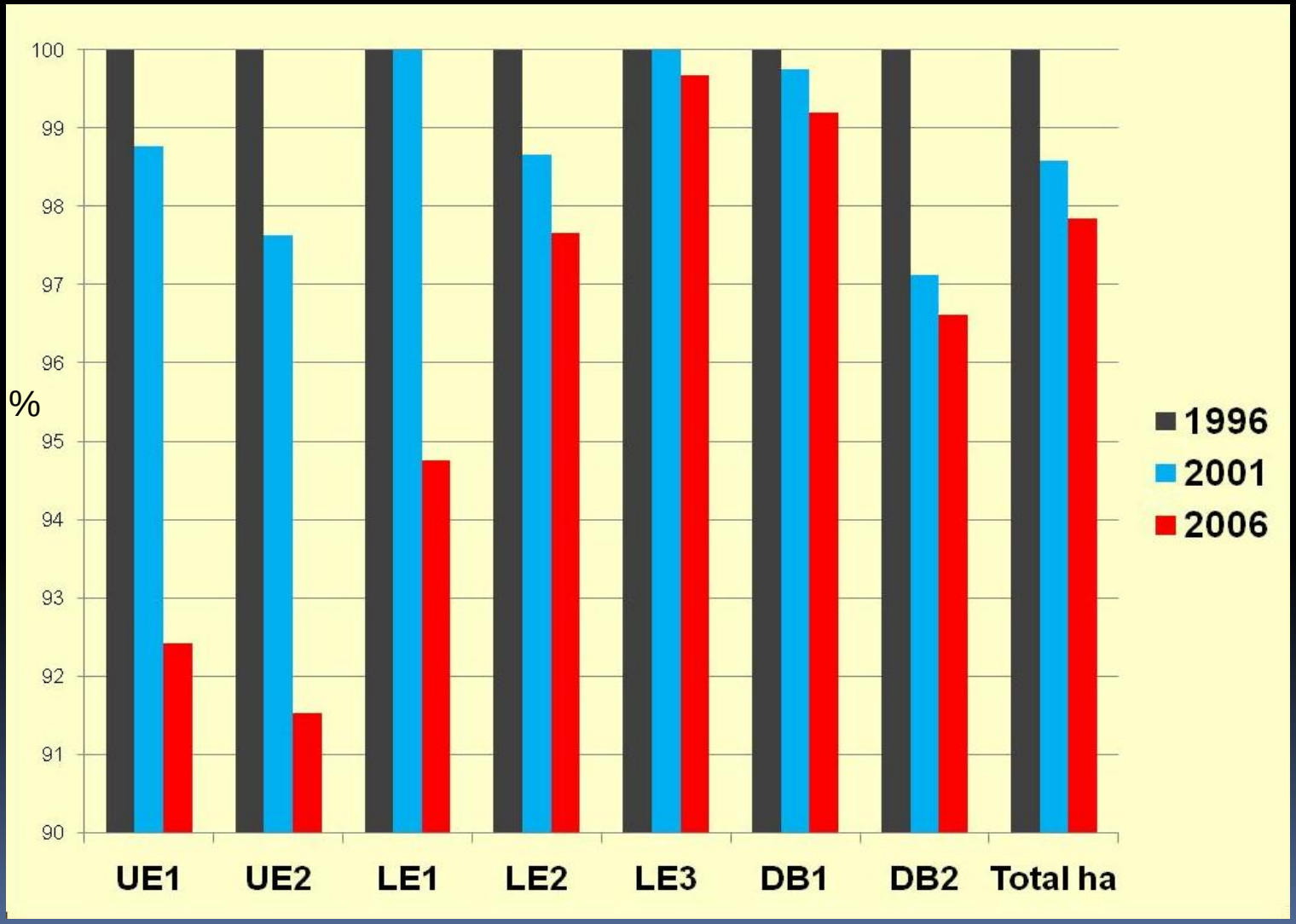
Legend
- Scrub Shrub/Forested Swamp
- Non-tidal Fresh Marsh
- Tidal Fresh Marsh
- Tidal Scrub Shrub/Transitional
- Salt Marsh
- Beach
- Tidal Flat
- Non-tidal Open Water
- Tidal Open Water
- Brackish Marsh
- No Wetland Data

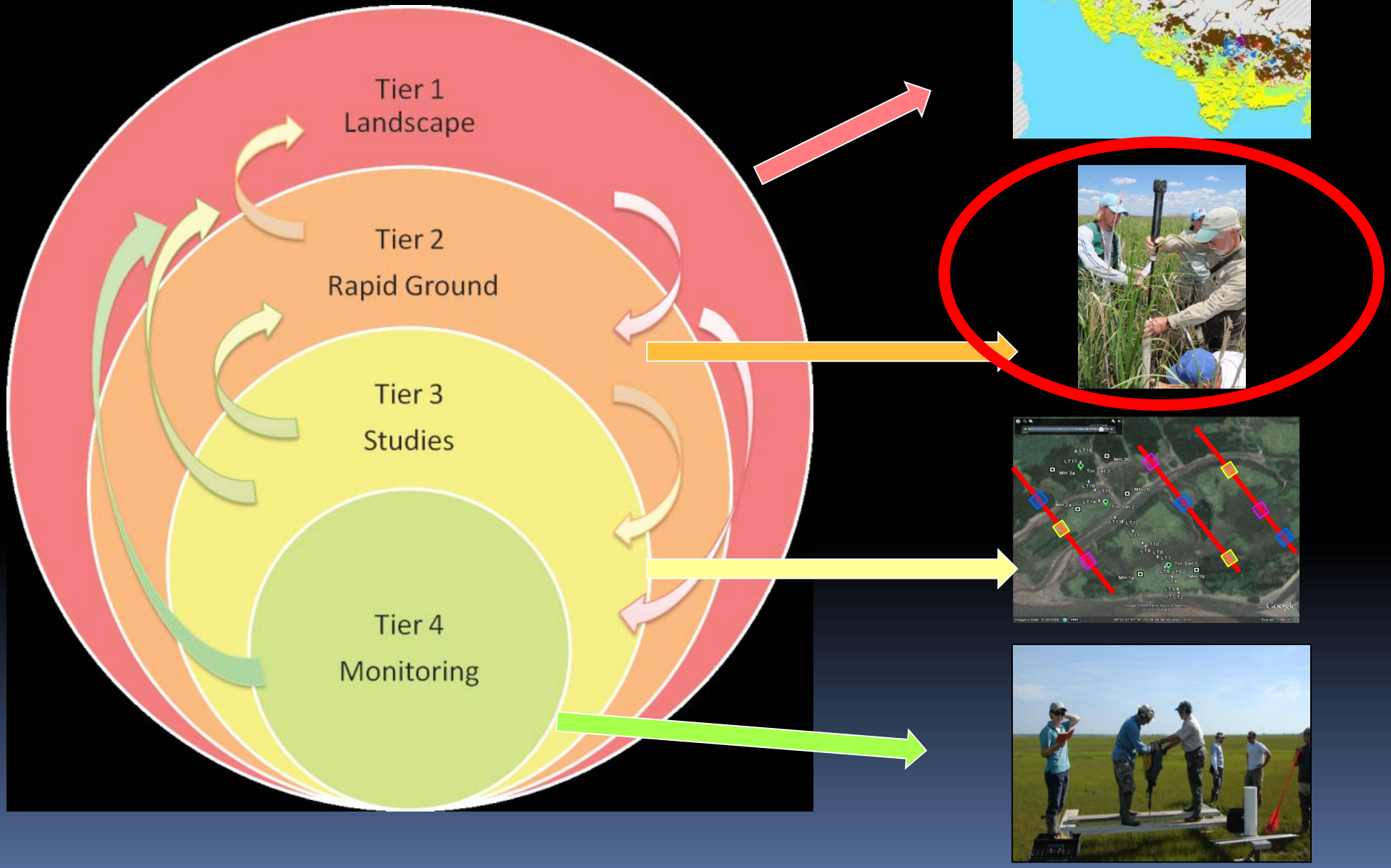
SLAMM V.6 Predictions by 2100:

- 26% net loss of 42,558 hectares of tidal wetlands
- loss of 50,236 hectares of adjacent uplands and non-tidal wetlands
- gain of 106,529 hectares of open water and tidal flats
- net loss of >60,000 metric tons/year of primary production services

PARTNERSHIP FOR THE DELAWARE ESTUARY, INC

State of the Estuary Report 2012

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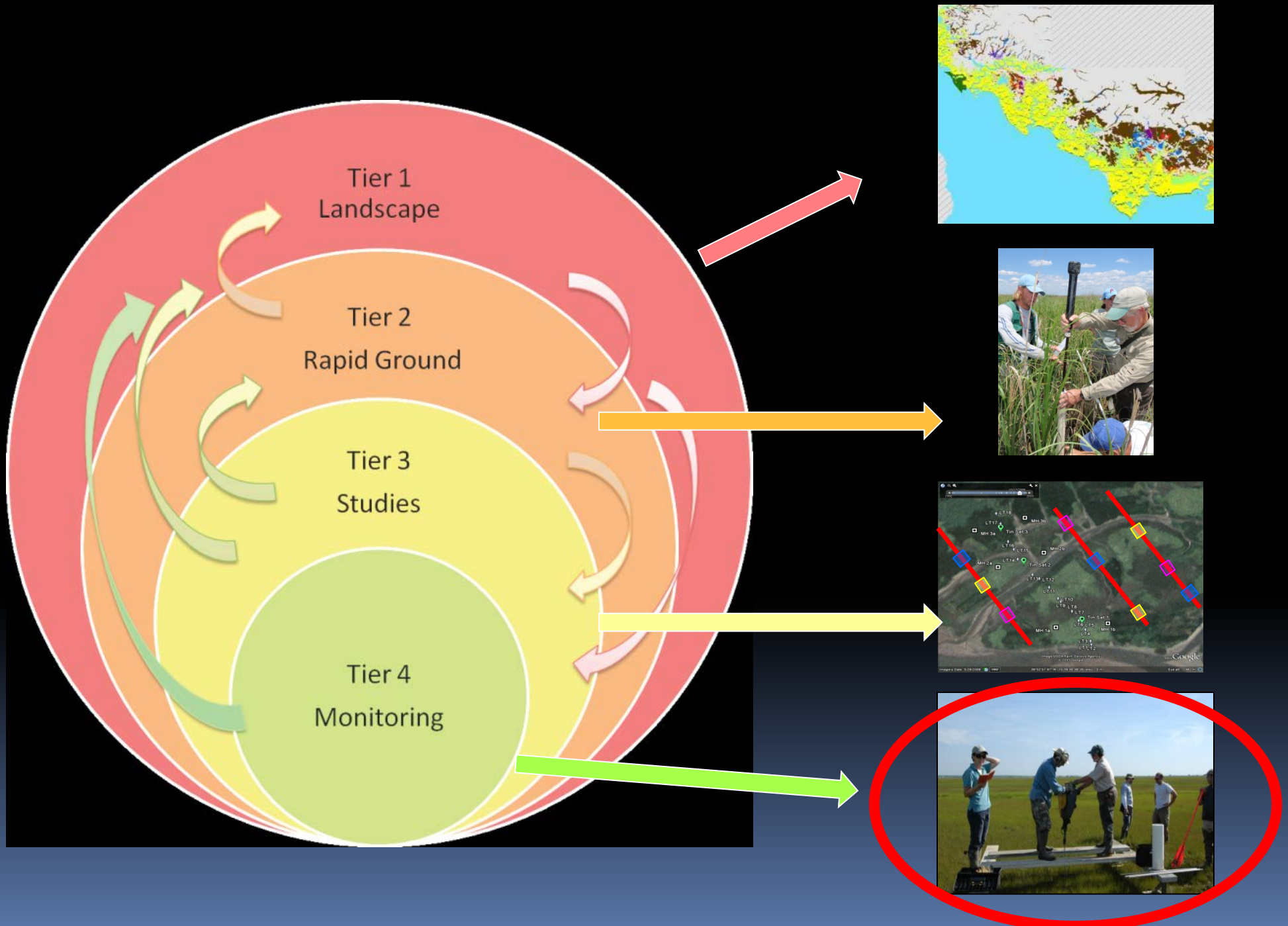
Landscape
Tier 2
Rapid Ground
Tier 3
Studies
Tier 4
Monitoring

Tier 2

Rapid Assessments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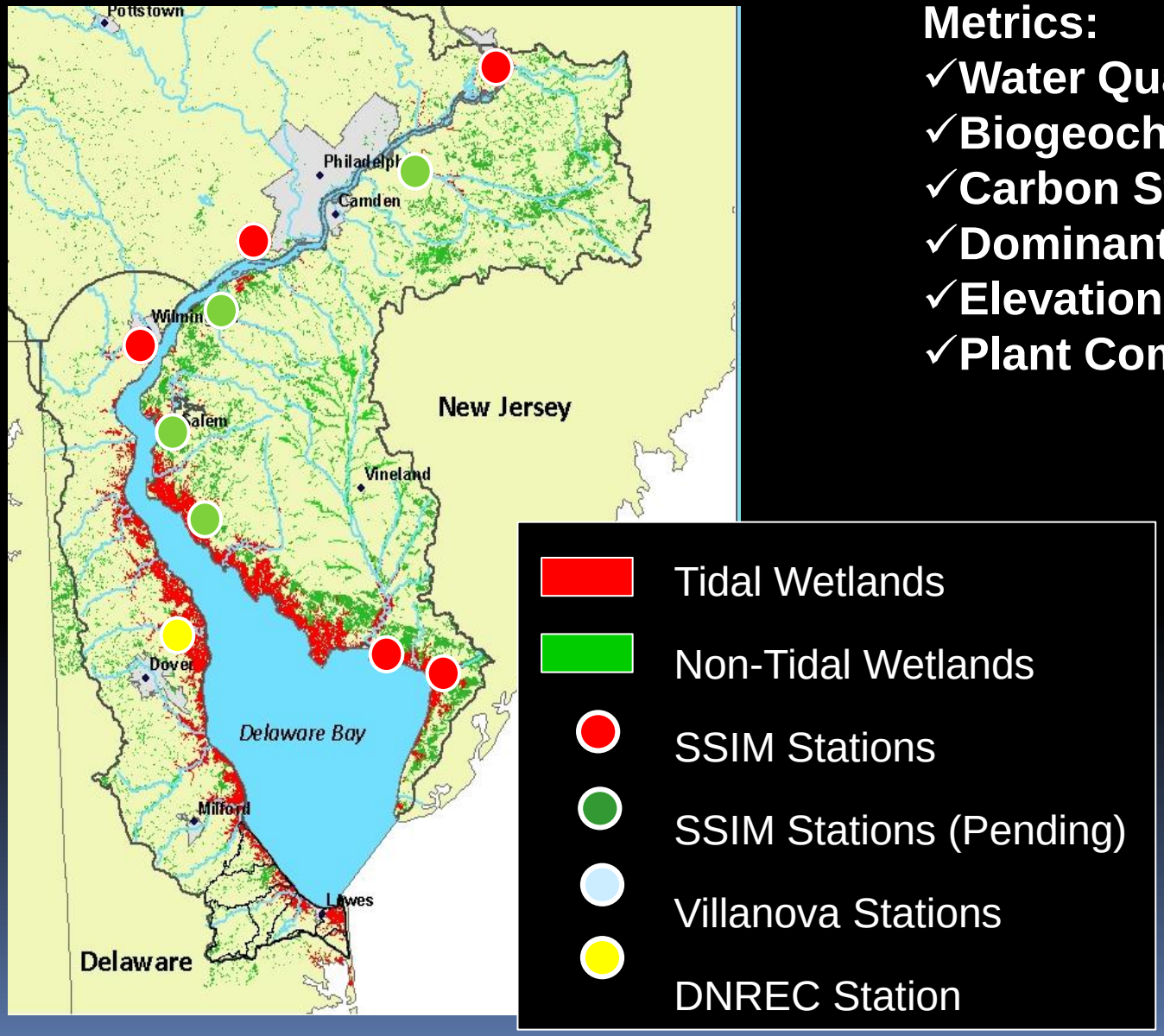
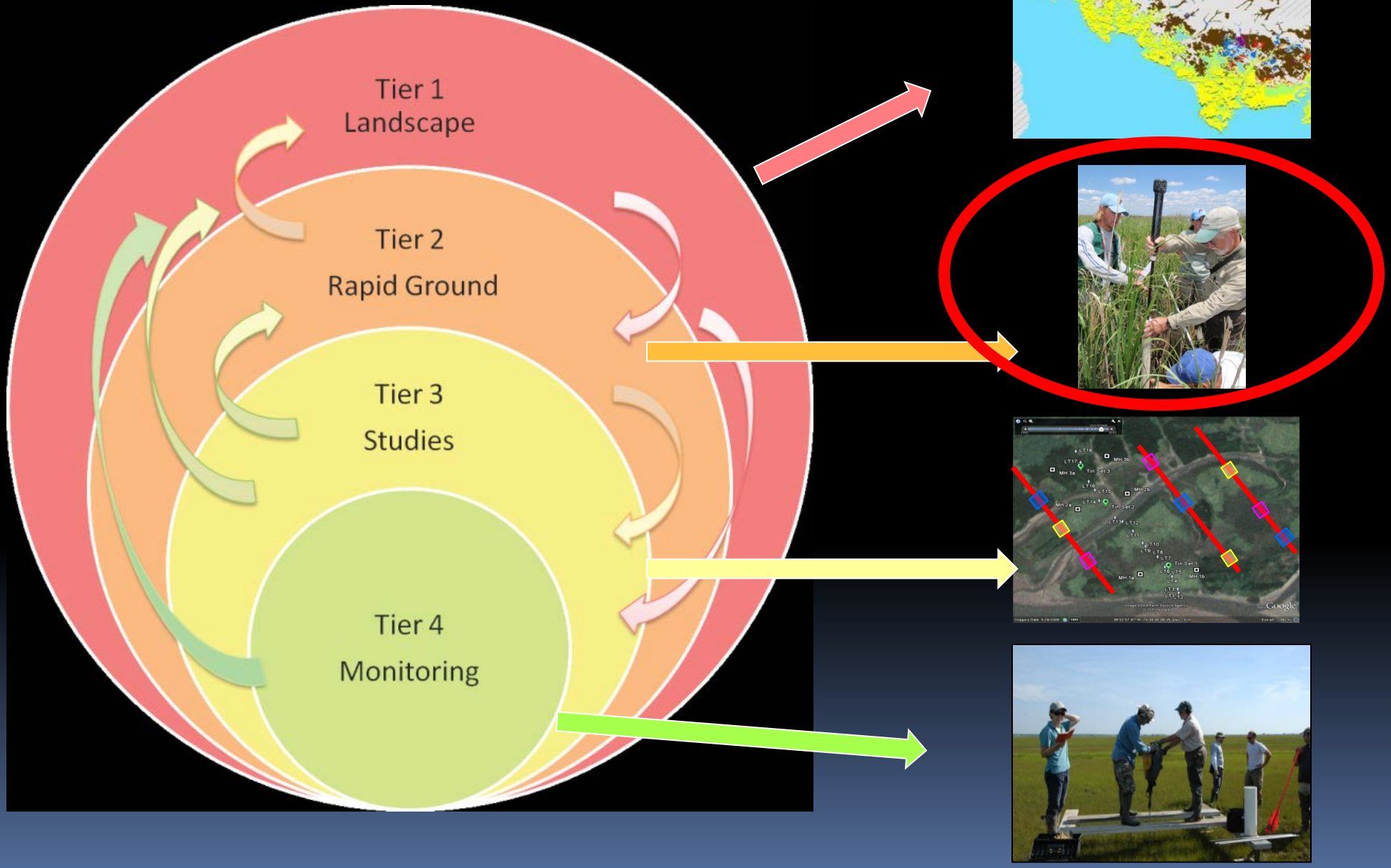
Studies
Tier 4
Monitoring

Site-Specific Intensive Monitoring (SSIM)



Metrics:

- ✓**Water Quality**
- ✓**Biogeochemical Cycling**
- ✓**Carbon Storage**
- ✓**Dominant Fauna Integrity**
- ✓**Elevation and Sediment Budget**
- ✓**Plant Community Integrity**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RAM

DE MidTRAM (Jacobs et al.)

3 Attributes:

- Buffer Integrity
- Hydrologic Integrity
- Habitat/Bio Integrity

Attribute	Metric	Description
Buffer/Landscape	Percent of AA Perimeter with 5m-Buffer	Percent of AA perimeter that has at least 5m of natural or semi-natural condition land cover
Buffer/Landscape	Average Buffer Width	The average buffer width surrounding the AA that is in natural or semi-natural condition
Buffer/Landscape	Surrounding Development	Percent of developed land within 250m from the edge of the AA
Buffer/Landscape	250m Landscape Condition	Landscape condition within 250m surrounding the AA based on the nativeness of vegetation, disturbance to substrate and extent of human visitation
Buffer/Landscape	Barriers to Landward Migration	Percent of landward perimeter of wetland within 250m that has physical barriers preventing wetland migration inland
Hydrology	Ditching & Draining	The presence of ditches in the AA
Hydrology	Fill & Fragmentation	The presence of fill or wetland fragmentation from anthropogenic sources in the AA
Hydrology	Wetland Diking / Tidal Restriction	The presence of dikes or other tidal flow restrictions
Hydrology	Point Sources	The presence of localized sources of pollution
Habitat	Bearing Capacity	Soil resistance using a slide hammer
Habitat	Vegetative Obstruction	Visual obstruction by vegetation <1m measured with a cover board.
Habitat	Number of Plant Layers	Number of plant layers in the AA based on plant height
Habitat	Percent Co-dominant Invasive Species	Percent of co-dominant invasive species in the AA
Habitat	Percent Invasive	Percent cover of invasive species in the AA

Locating Sub plots

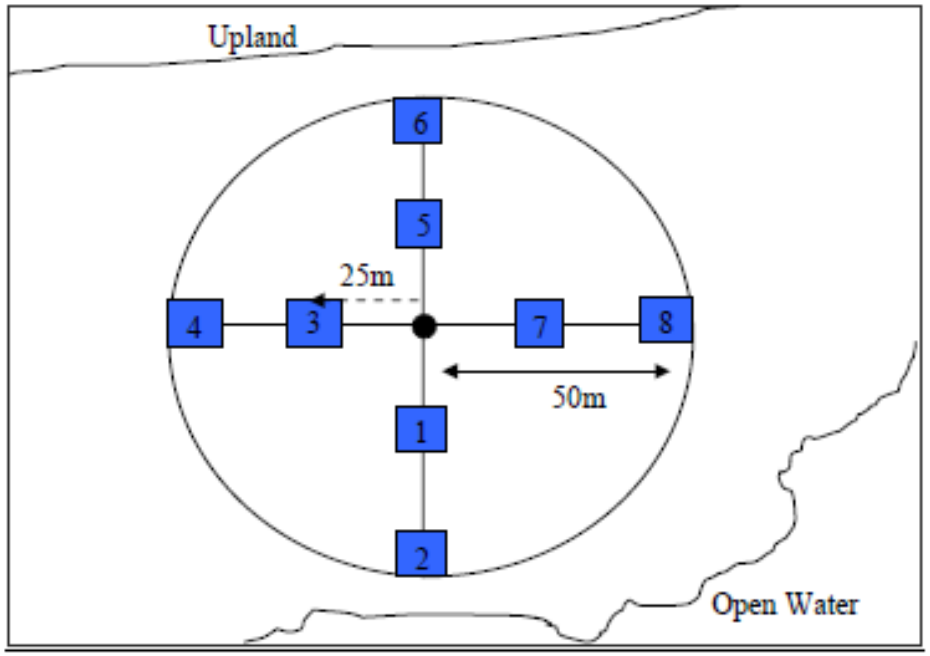


Figure 3: Location of Subplots in a circular assessment area.

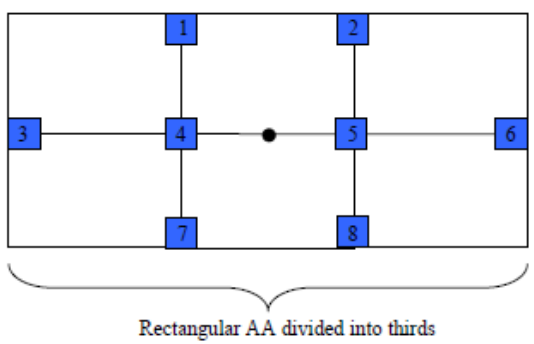


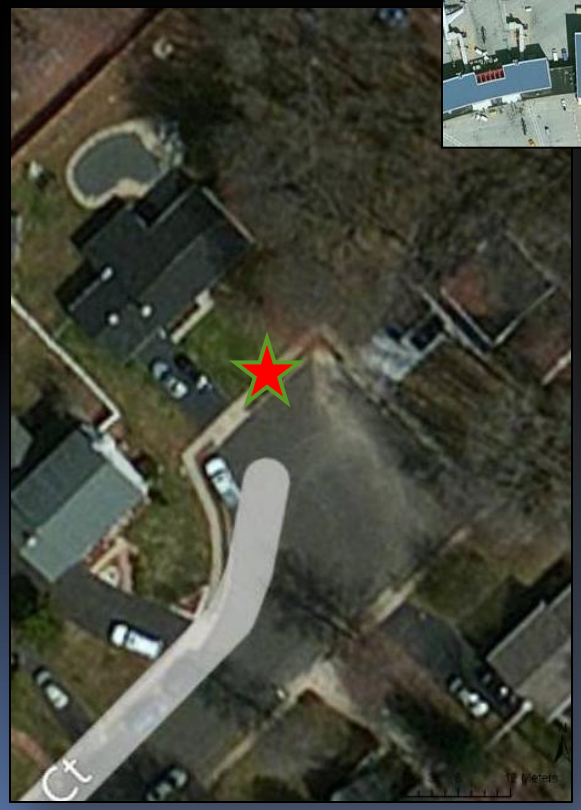
Figure 4. Location of Subplots in a rectangular assessment area.

Example Health Assessment in PA

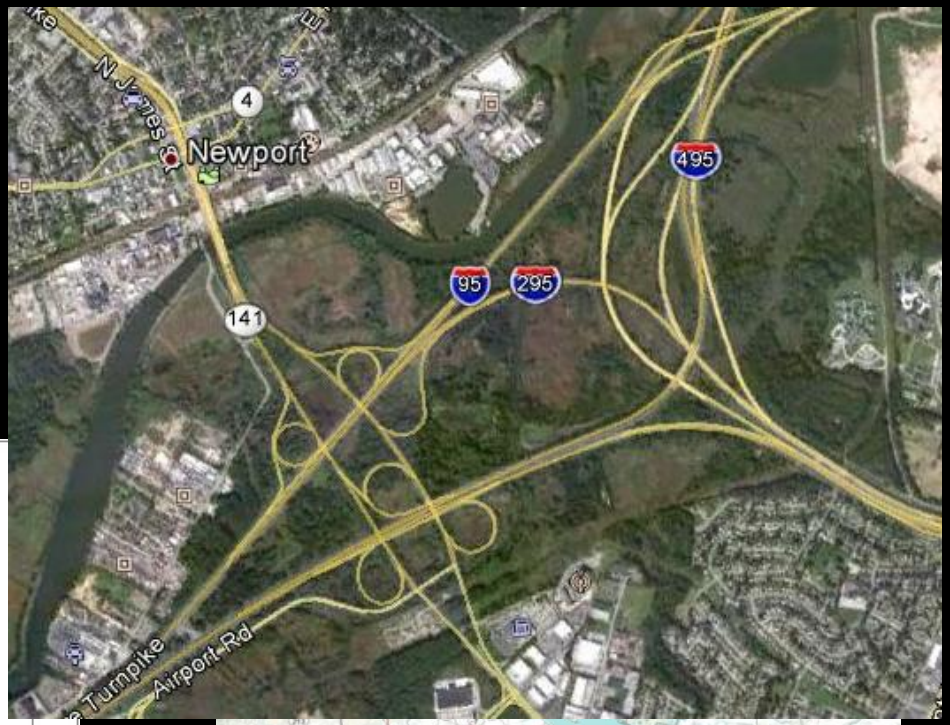
(EPA and PA CZ Funding)

- Used rapid methods to assess the condition of tidal marshes at 30 random sites
- PDE staff had to visit 60 sites listed in NWI as tidal wetlands to find 30 that were still tidal wetlands
- Half had become developed (parking lots, runways, etc)

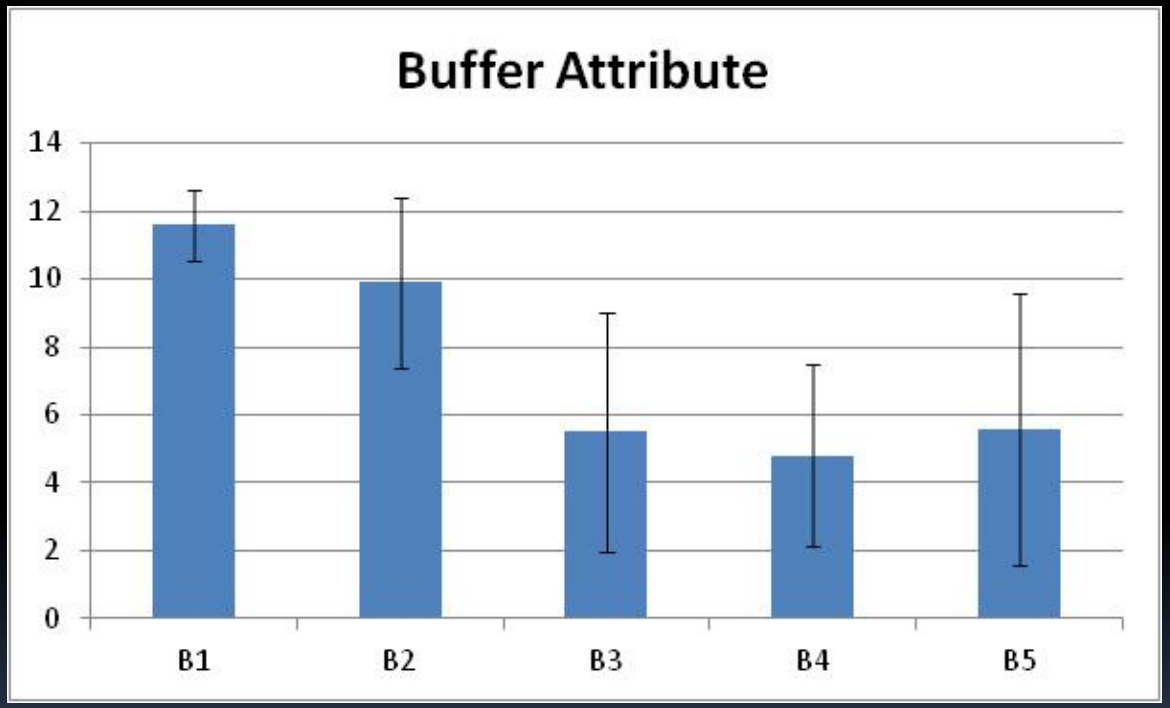
Therefore, losses of acreage are ongoing despite protections



2011 Christina Tidal Wetlands



2011 Christina Tidal Wetlands



B1. % of AA perimeter with 5m buffer

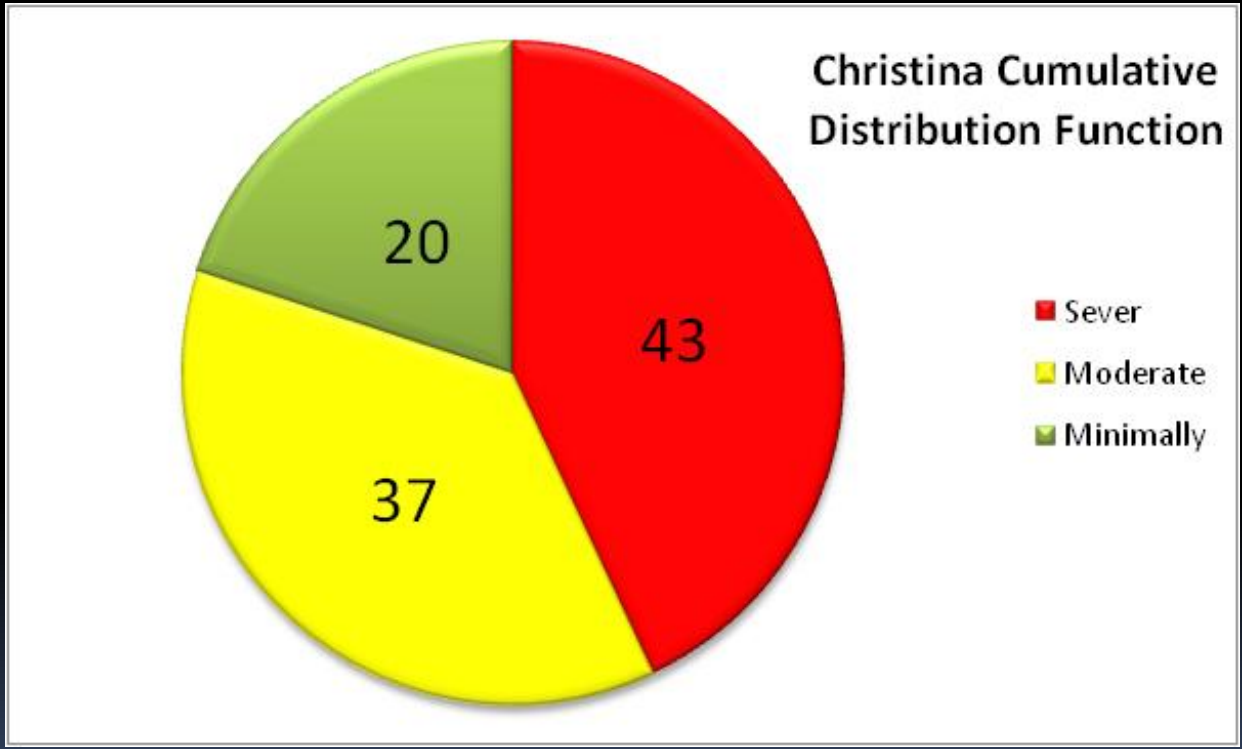
B2. Avg buffer width

B3. Surrounding development

B4. 250m Landscape condition

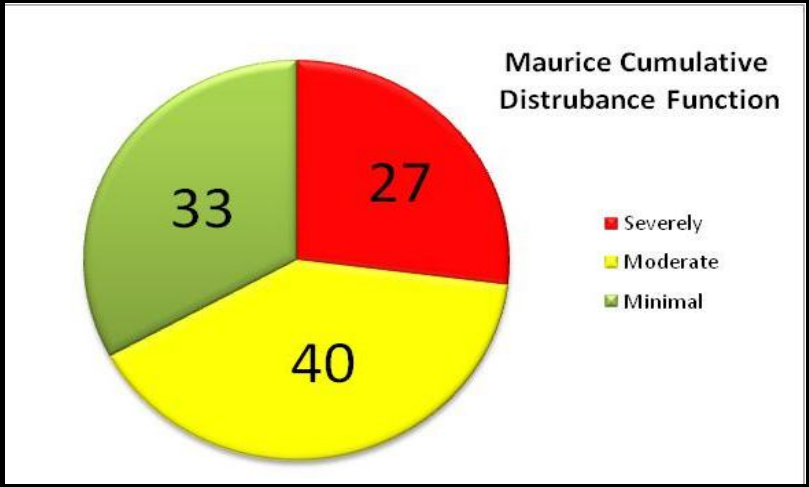
B5. Barriers to landward migration

2011 Christina Tidal Wetlands



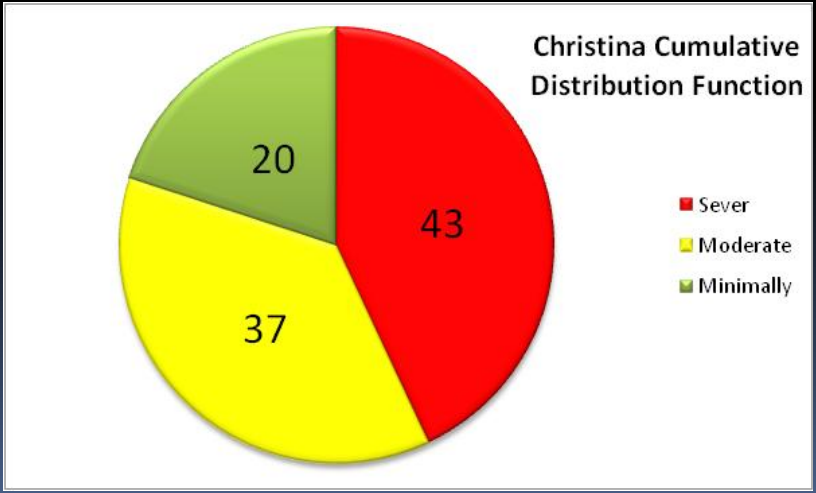
Rural

2011 Maurice Tidal Wetlands



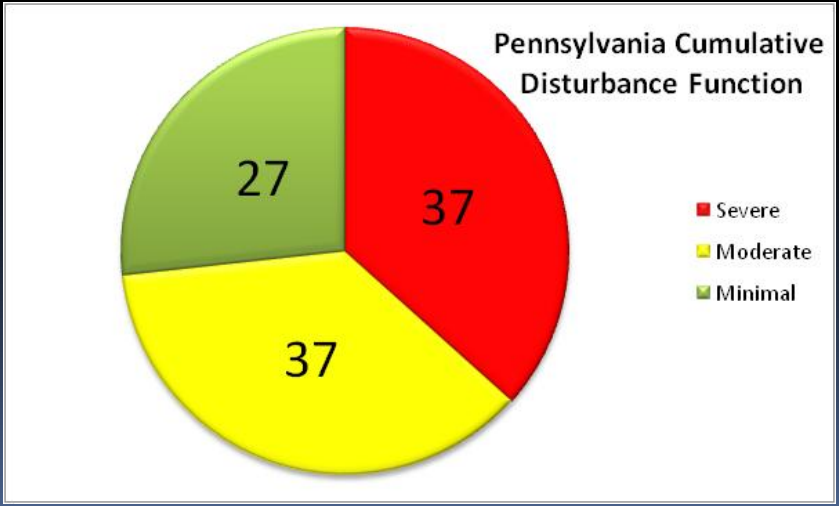
Suburban/Urban

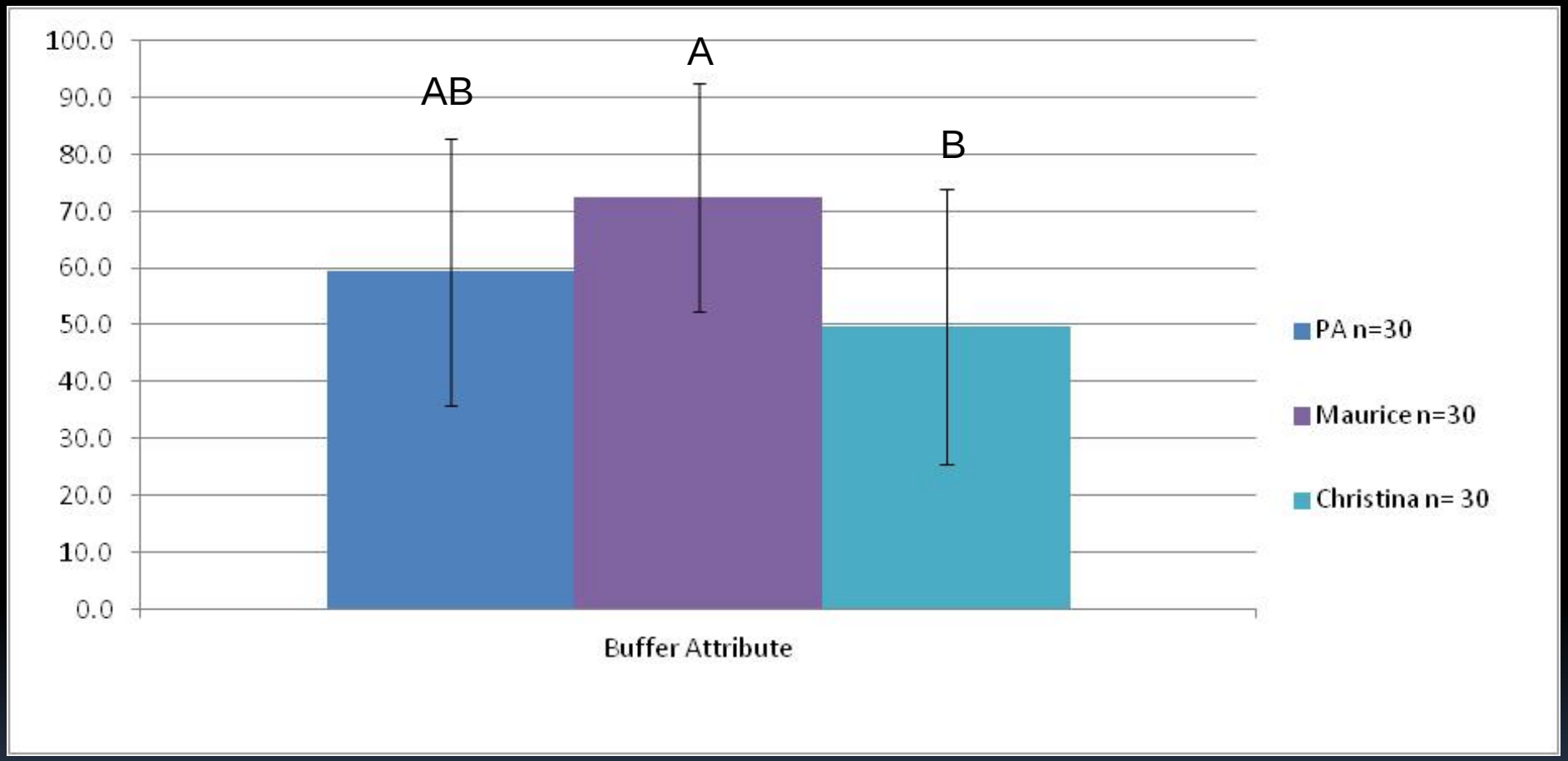
2011 Christina Tidal Wetlands



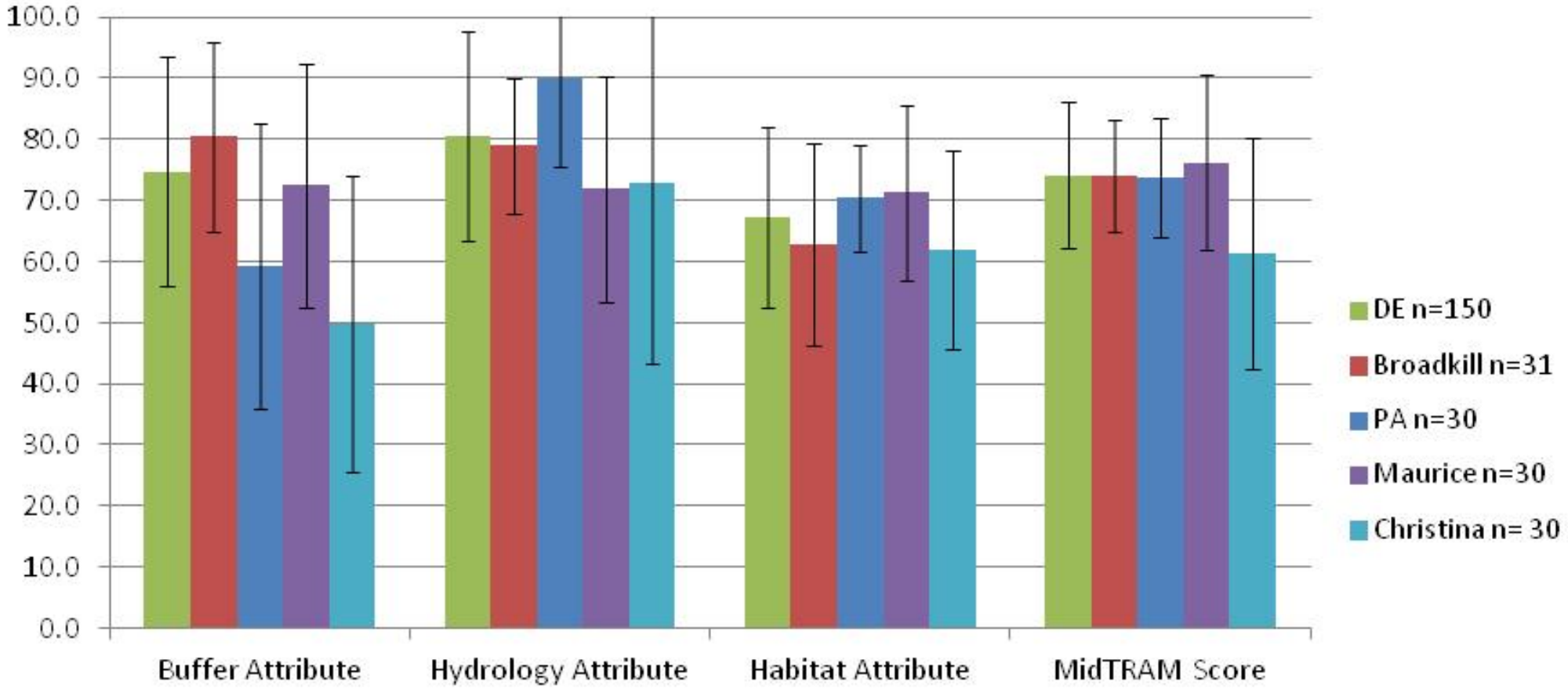
Urban

2010 Pennsylvania Tidal Wetlands




100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
AB
A
B
Buffer Attribute
PA n=30
Maurice n=30
Christina n= 30

Tidal Wetlands – Condition Comparison



RAM Progress

Completed:

- MidTRAM Training
- QAPP (x4)
- Demo Day SSIM and RAM
- Tests Near SSIM Stations
- All Tidal Wetlands in PA
- Broadkill Watershed, DE
- Maurice Watershed, NJ
- Christina Watershed, DE

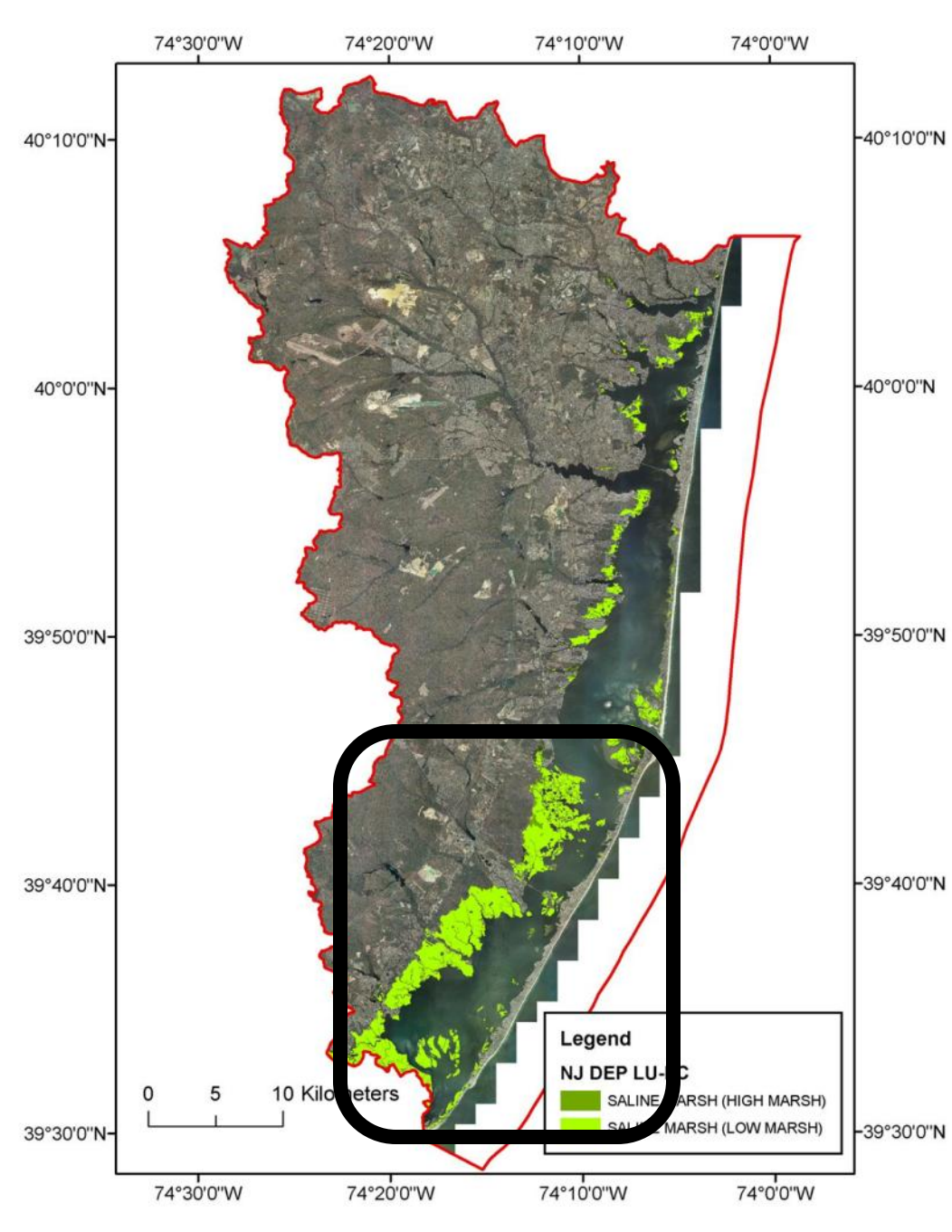
RAM Progress

2012:

- South Barnegat Bay, NJ
- ½ Crosswicks, NJ

2013:

- ½ Crosswicks, NJ
- North Barnegat Bay, NJ

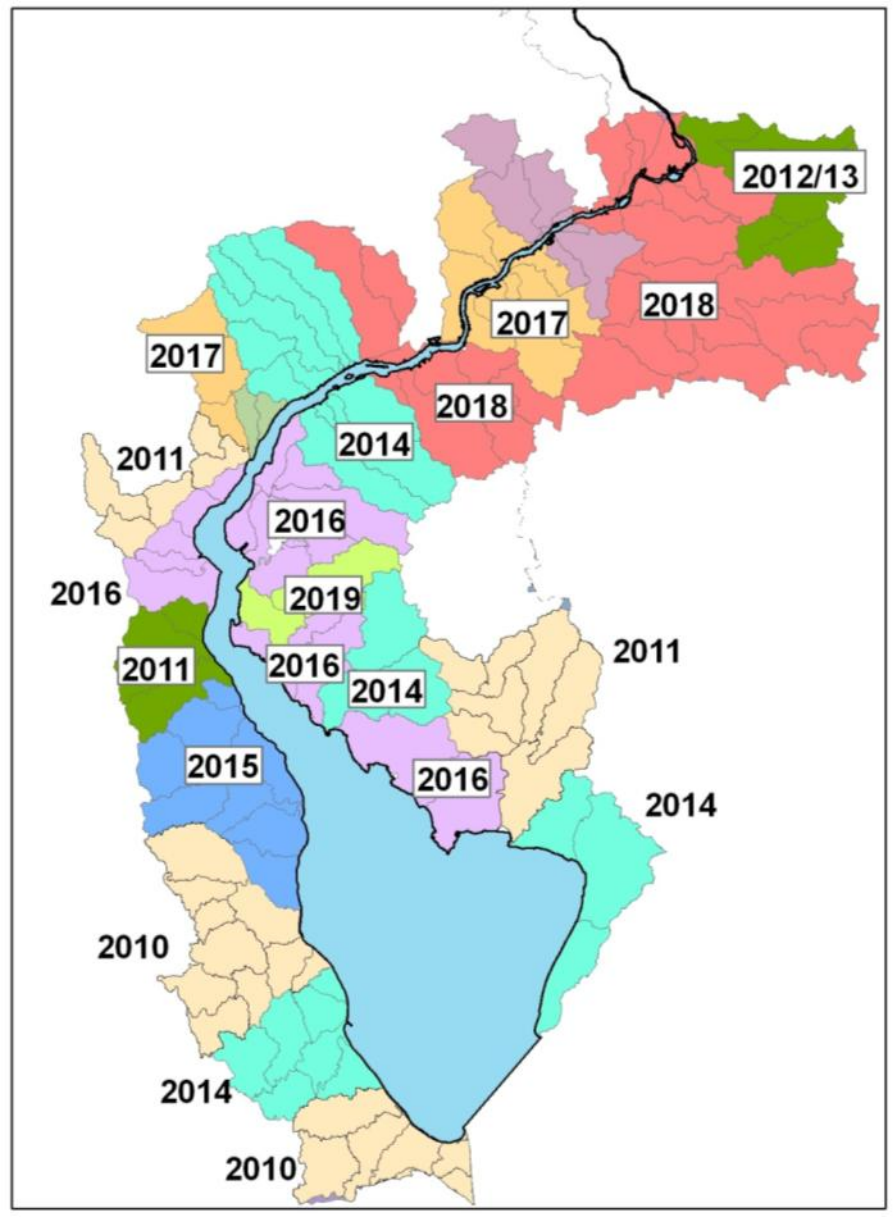


Future RAM Strategy

Delaware Estuary
2009 – 2019

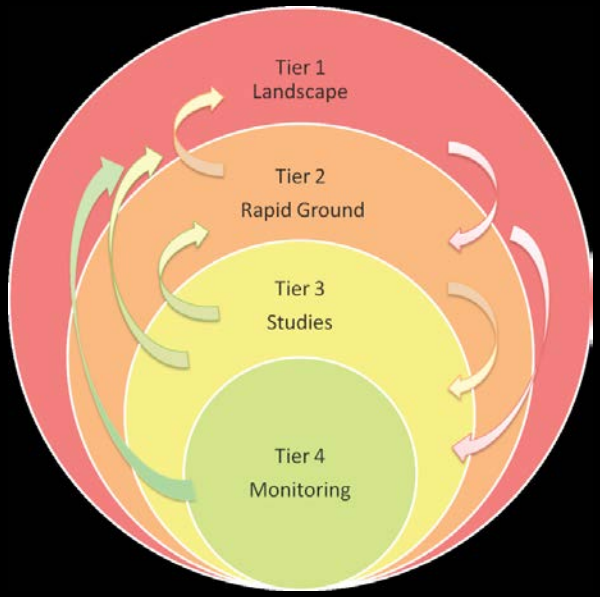
Contingent on Funding

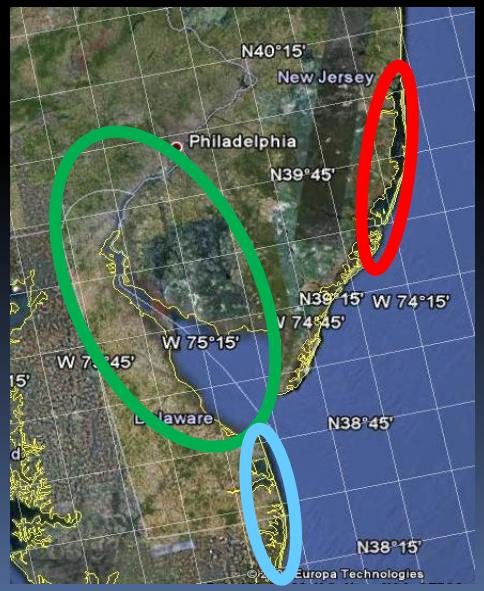
In coordination with states and partners



Summary

- Coastal wetlands are a hallmark feature of the Delaware Estuary and coastal mid-Atlantic
- They provide diverse critical goods and services that sustain lives and livelihoods
- They are extremely vulnerable to combined watershed and climate stressors
- Efficient and scientifically meaningful monitoring of wetland status and trends will assist in managing and sustaining them
- Regional coordination strengthens scientific outcomes, improves management and leverages more diverse funding





MACWA Partners (so far)

PDE (Coordinator)
Barnegat Bay Estuary Program
Academy of Natural Sciences
DNREC
EPA HQ, Regions 2 and 3
NJDEP + NJ Coast Zone Program
PADEP
Rutgers University
Villanova University
Wetland Associates

We Thank the Many People Who Have Assisted in Workshops, Workgroups and in the Field

And We Are Grateful to Our Funders:

EPA Headquarters
EPA Region 2
EPA National Estuary Program
DE Dept. of Natural Resources Environ. Control
NJ Coastal Management Program
PA Coastal Management Program

Functions of Greatest Interest

Carbon Storage

- Sequestration in wetland soil
- Litter and wrack accumulation

Elevation and Accretion/Subsidence

- Sediment Elevation Table (SET), marker horizon
- RTK GPS, Barcoding GPS

Plant Community Integrity

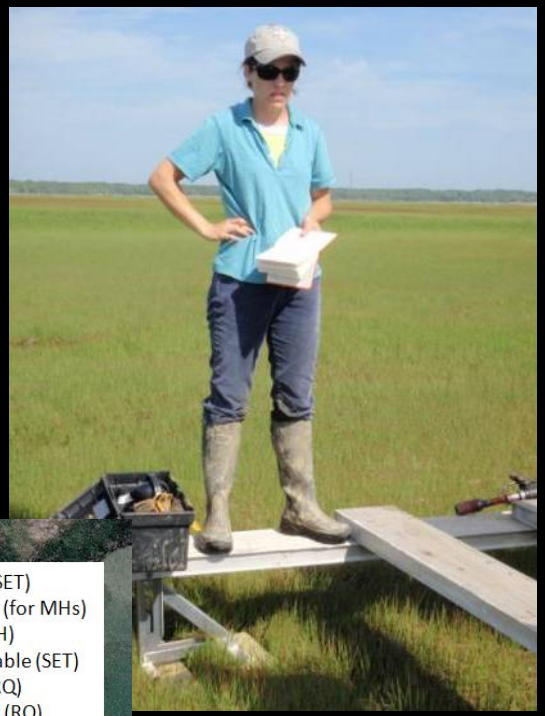
- Vascular plant richness and dominance
- Biofiltration capacity of bivalves

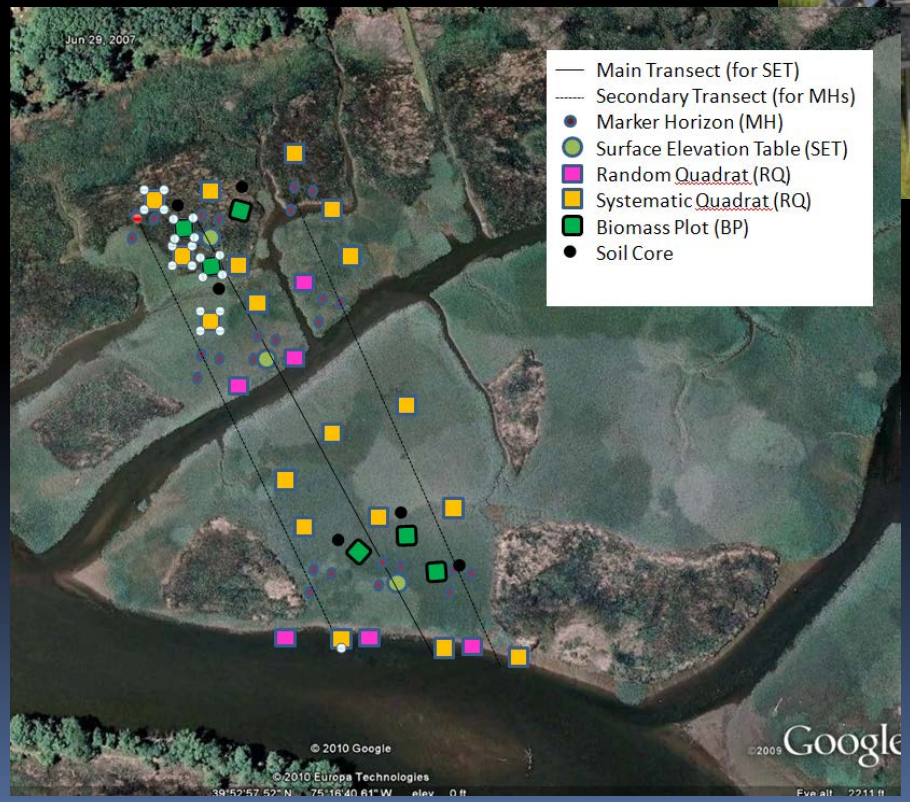
Water Quality

- Water monitoring in tidal creeks

Tier 4

Station Monitoring





Tidal Wetlands

A Signature Trait of System

Near Contiguous Band

Diverse: *Freshwater Tidal Marshes*
Brackish Marshes
Salt Marshes

<u>Nature's Benefits</u>

- Flood Protection
- Fish and Wildlife
- Natural Areas
- Carbon Sequestration
- Water Quality

Mid-Atlantic Coastal Wetland Assessment

- Sample Frame

  all tidal wetlands between coastal New Jersey and coastal Maryland, including the Delaware Estuary

- Subpopulations

  wetland type (oligohaline, mesohaline, polyhaline)

  state (DE, NJ, PA)

  estuary (NEPs and vicinity)

Rapid Assessment Methods (RAM)

Site-Specific Intensive Monitoring (SSIM)