Delaware: A study on wetland loss, economic value, and building a wetland program

Mark Biddle
Alison Rogerson
Delaware Department of Natural Resources
And Environmental Control

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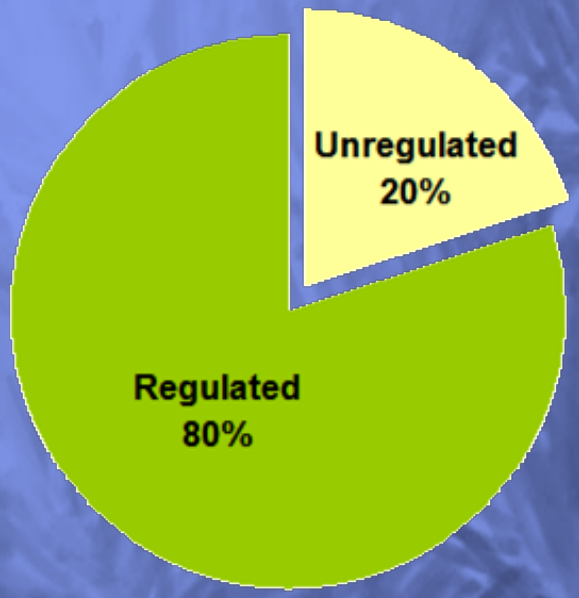
Wetland Regulation in Delaware

Delaware's Freshwater Wetlands



State: regulates all tidal wetlands – they're well protected

Federal: The Army Corps of Engineers regulate nontidal wetlands - not all nontidal wetlands are under their jurisdiction

Even with numerous federal and state level protection efforts, many nontidal (e.g., headwater tributaries) and isolated (e.g., flooded forests, seasonal ponds) wetlands are threatened because of gaps in existing regulations or are being impacted illegally due to limited enforcement activity.

Justification

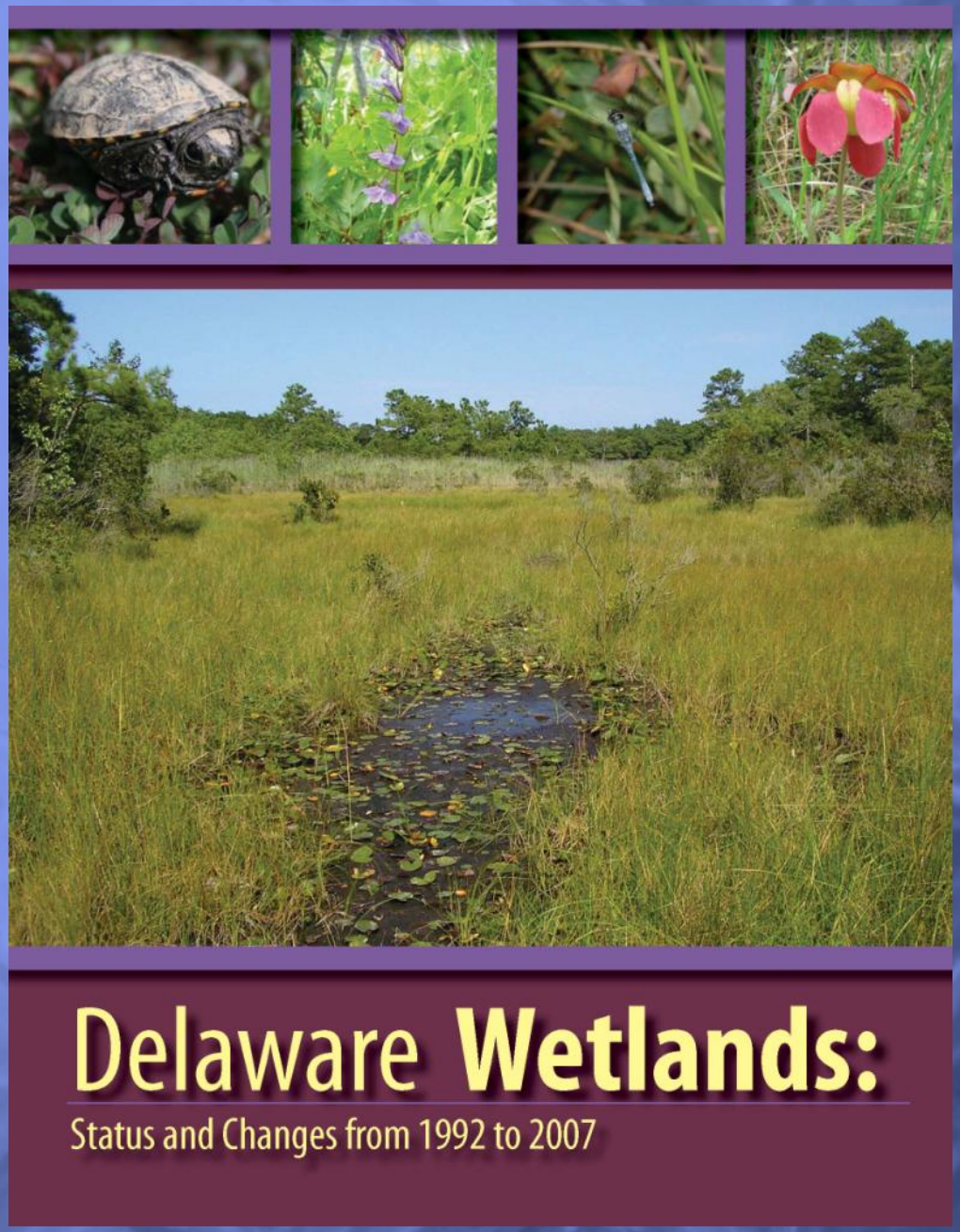
1. Determine if there are losses to wetlands in both acreage and function

2. Establish whether the existing protections are effective

3. Continue assessment of wetland health statewide

4. Connect wetland ecosystem services to economic value

5. Develop a strategic plan forward for wetland protection and conservation



Periodic Wetland Mapping

Ideally every 5-10 years

National Mapping Standards

Ability to track wetland acreage and change in type, gains and losses

Using NWI+, can asses potential of wetlands to perform certain functions

How Many Wetlands Do We Have?

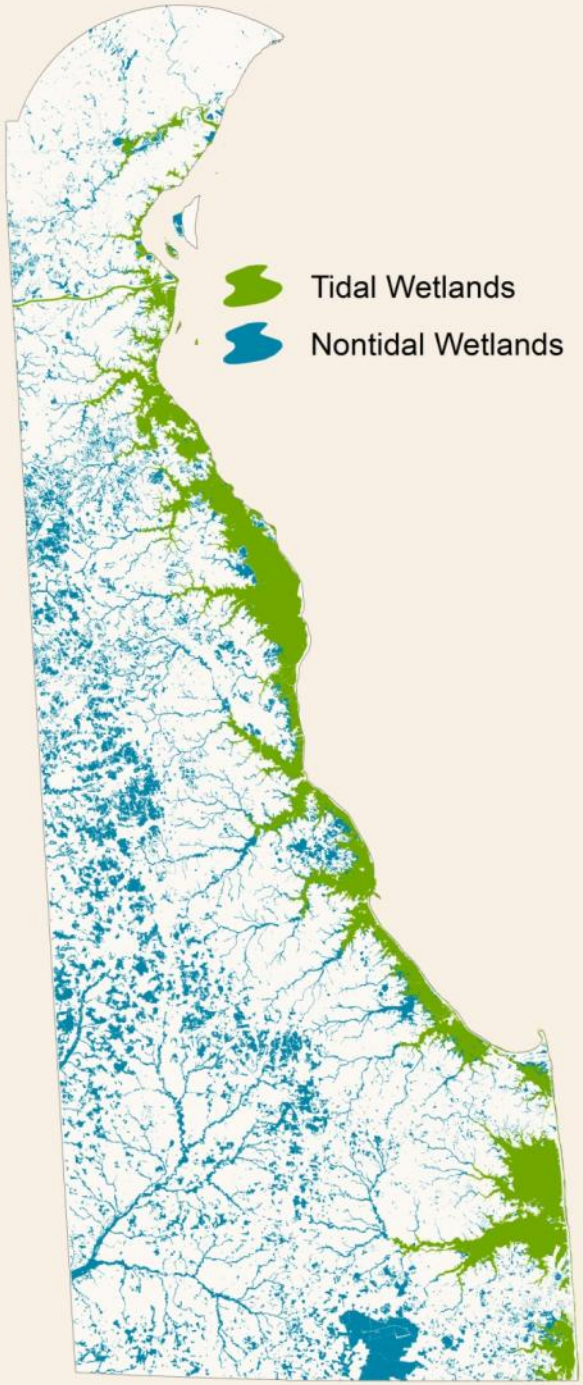
25% of Delaware's land area is covered by wetlands

> 350,000 acres inventoried

(including large open water)

Non-tidal wetlands comprise 2/3 of the State's wetlands

Have lost over 50% of original wetlands

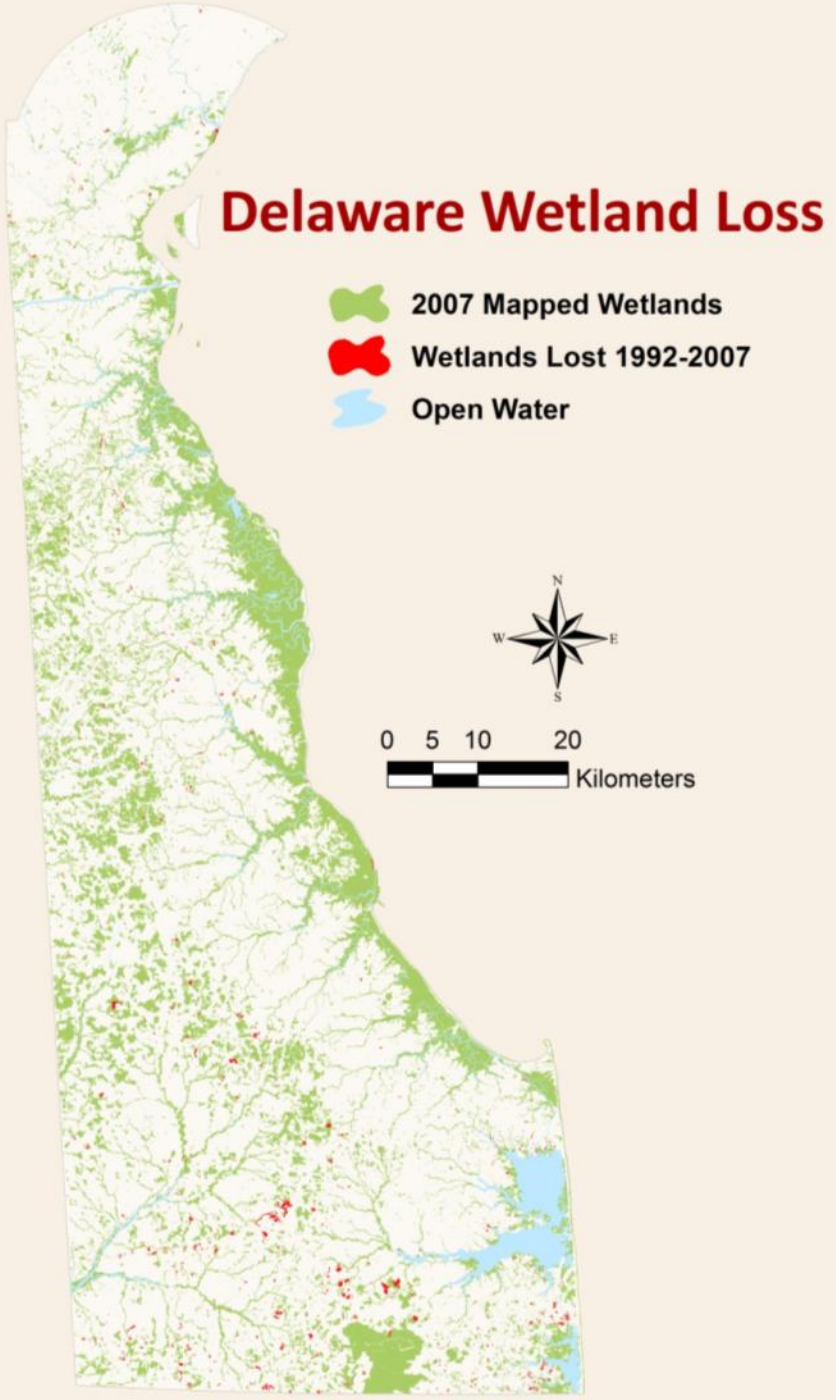


Delaware Wetlands (1992 to 2007)

- 320,076 acres of wetlands inventoried in 2007

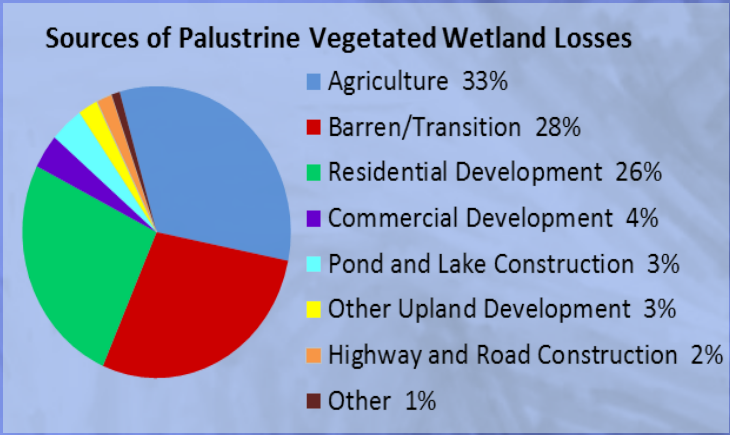
- *vegetated wetlands*

  -3,894 ac Gross loss
  +768 ac Gross gain
  -3,126 ac Net loss 1992-2007

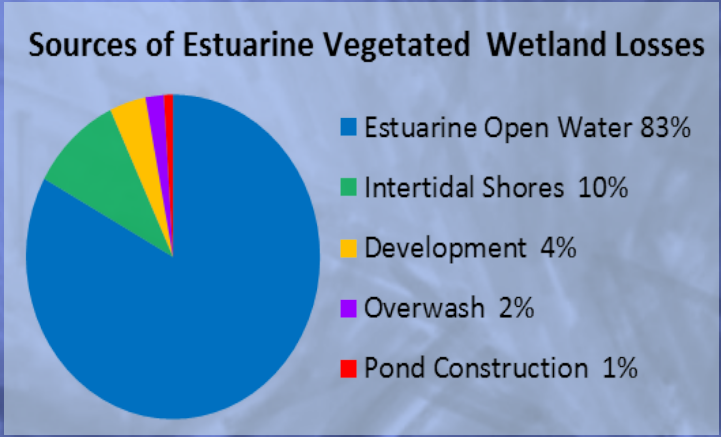


Delaware Wetlands – 1992 to 2007

92% of all losses were Palustrine wetlands (forested headwaters)

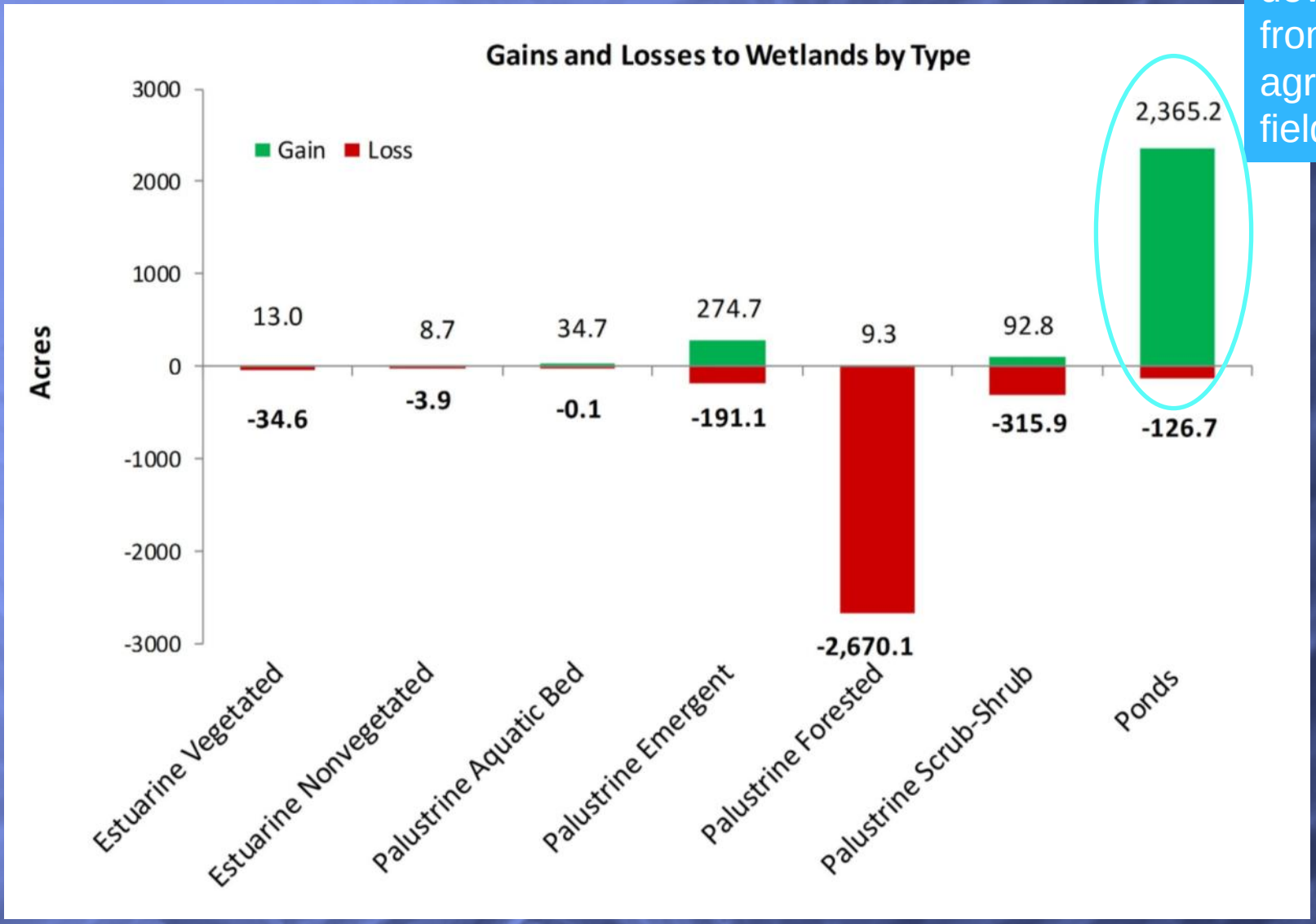


Net loss of 238 acres Estuarine wetlands fueled by submergence of marshes; gains came from emergence in open water



Delaware Wetlands – 1992 to 2007

65% of created ponds were in new developments from converted agriculture fields



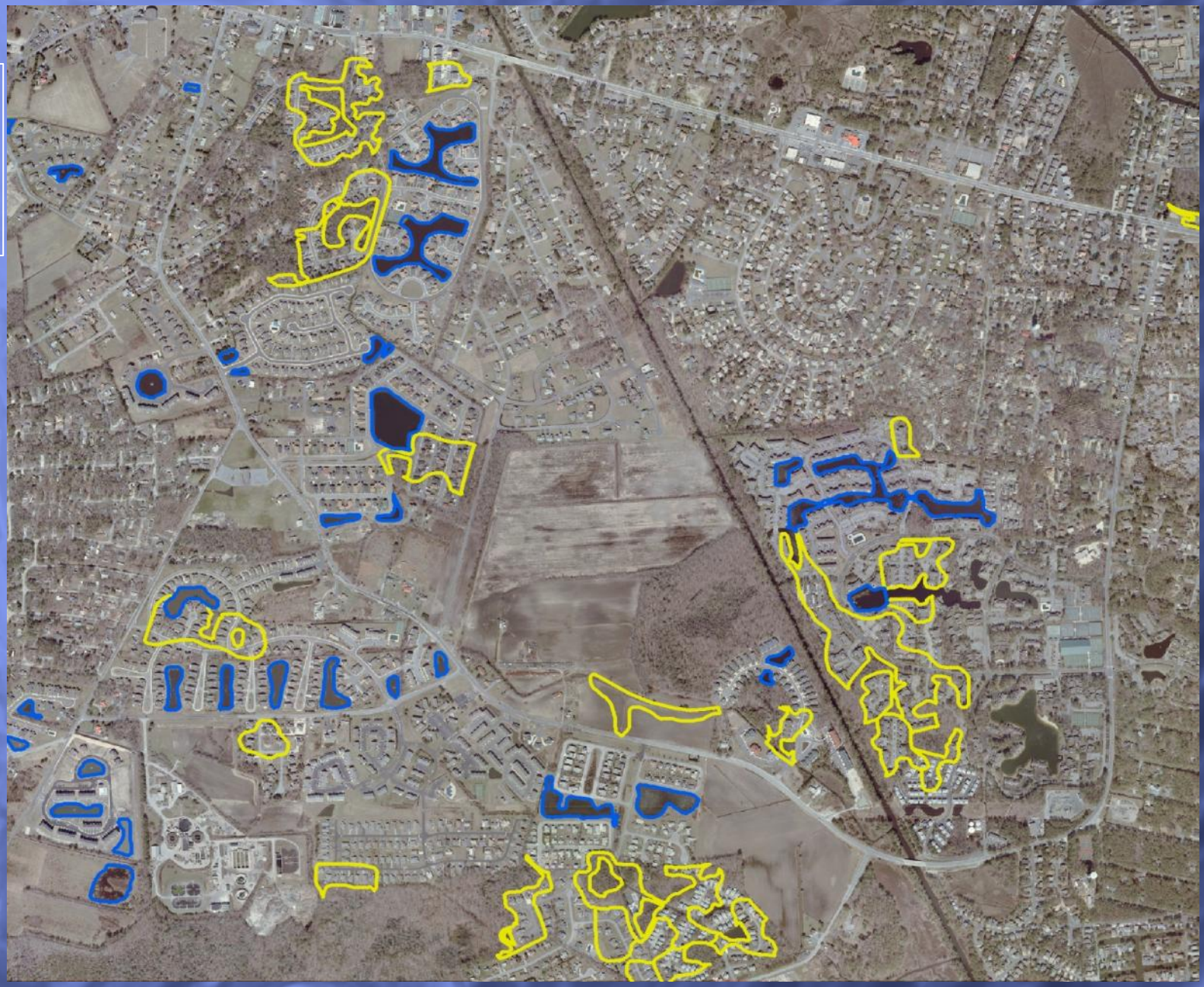
2007 Conditions – showing loss and gain

Loss

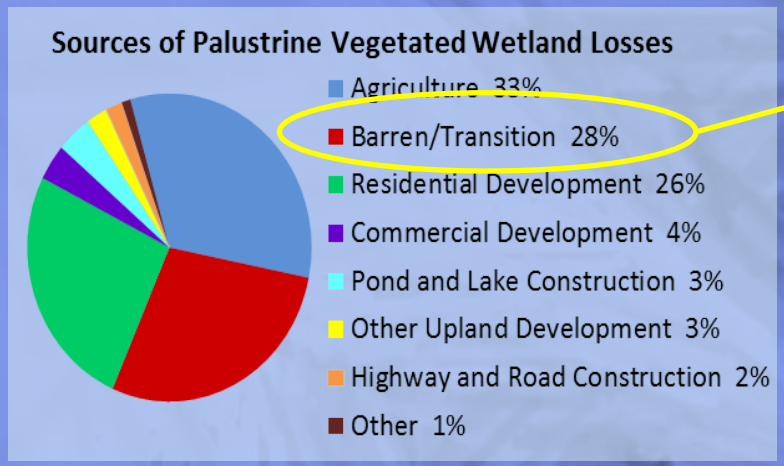
Gain

93 acres forested & emergent Lost

37 acres Ponds gained



Losses Further Categorized 2007-2010



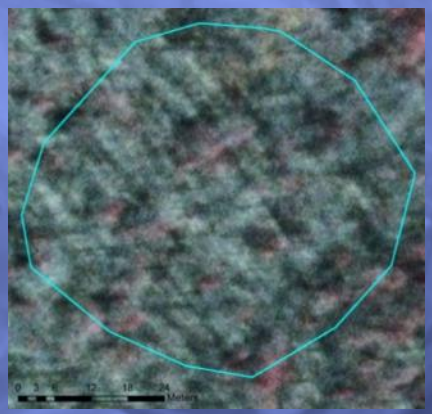
1061 acres of Palustrine vegetated wetlands were categorized "Barren/Transition" in 2007

what has become of these?

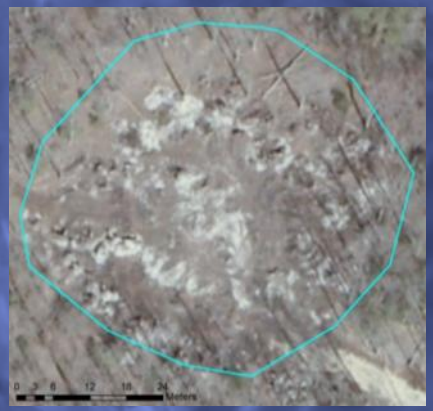
what can these losses be attributed to?

Using 2010 imagery
Determine change in use between 2007 to 2010
Example:

1992
Forested



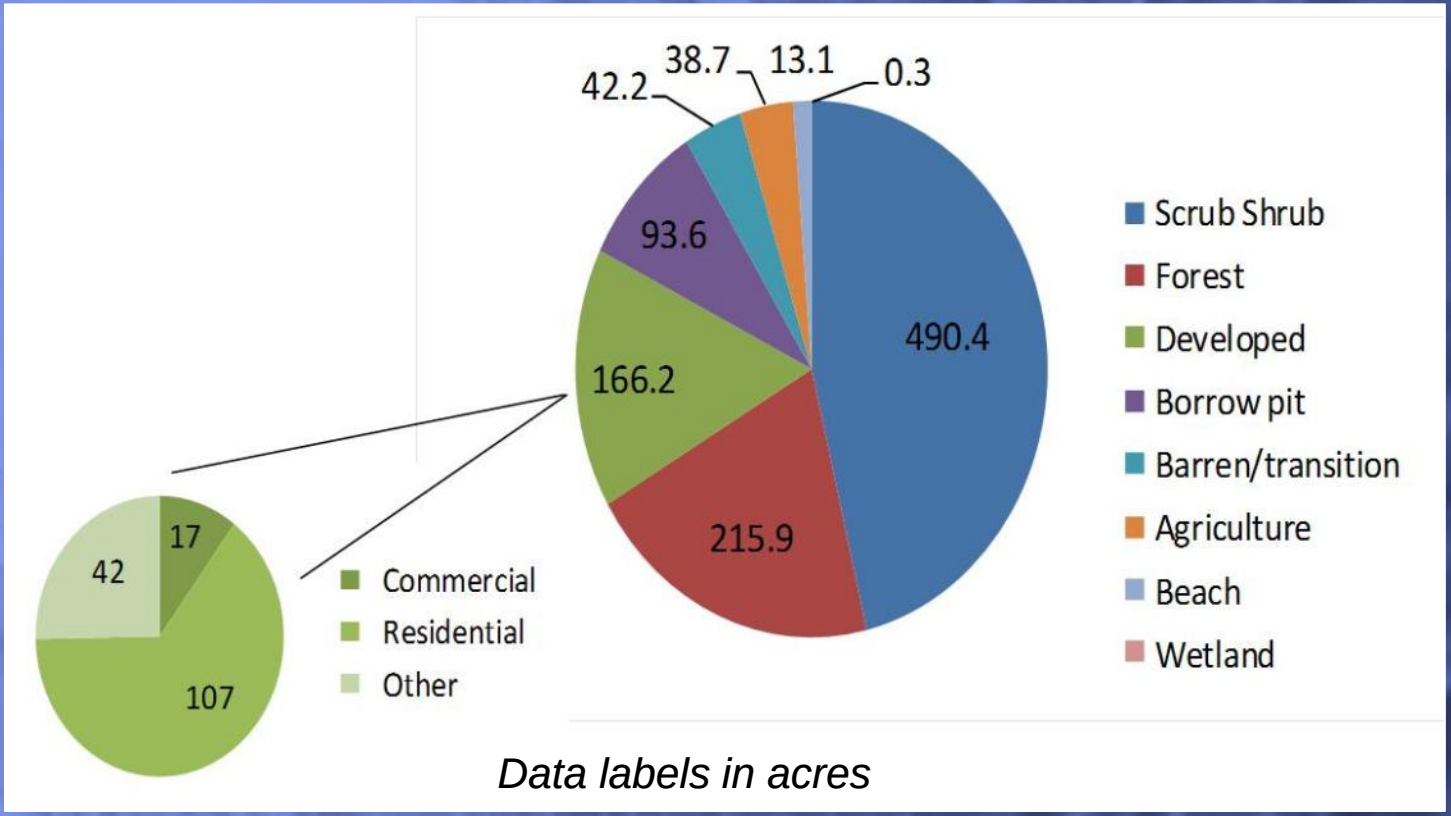
2007
In transition



2010
Residential

Losses Further Categorized 2007-2010

Landuse outcomes for 'barren/transition' lost wetlands based on 2010 aerial photography



Data labels in acres

- 66% transition land regenerated into scrub shrub or forest
- Additional 107 acres were converted to residential development

Understanding Wetland Loss

DNREC met with Corps, EPA , USFWS and NRCS to further dissect changes to wetlands and causes

Clarified how the regulatory permitting process affects wetland loss

- Exemptions
- Nationwide Permits
- Isolated Wetlands
- Lack of resources
- No regard for cumulative effects

Takeaways:

1. Regulatory programs not 100% effective at protecting wetland acreage or function

2. Most focus is on wetland acreage and type with minimal regard to functional services

DNREC Initiative

Renewed focus on developing protection mechanisms or programs

Acquisitions and Easements (over 10,000 acres of wetland from 1992-2007)

Creative incentives

Work with partners for protection

Explore multiple funding opportunities

InVEST Approach

- Integrated Valuation of Ecosystem Services and Tradeoffs
  - Series of open-source GIS models
  - Multiple services
  - Spatially explicit
  - Site-specific biological/physical data
  - Driven by policy-relevant scenarios
  - Biophysical and economic endpoints

natural capital PROJECT

Woods Institute for the Environment Stanford University

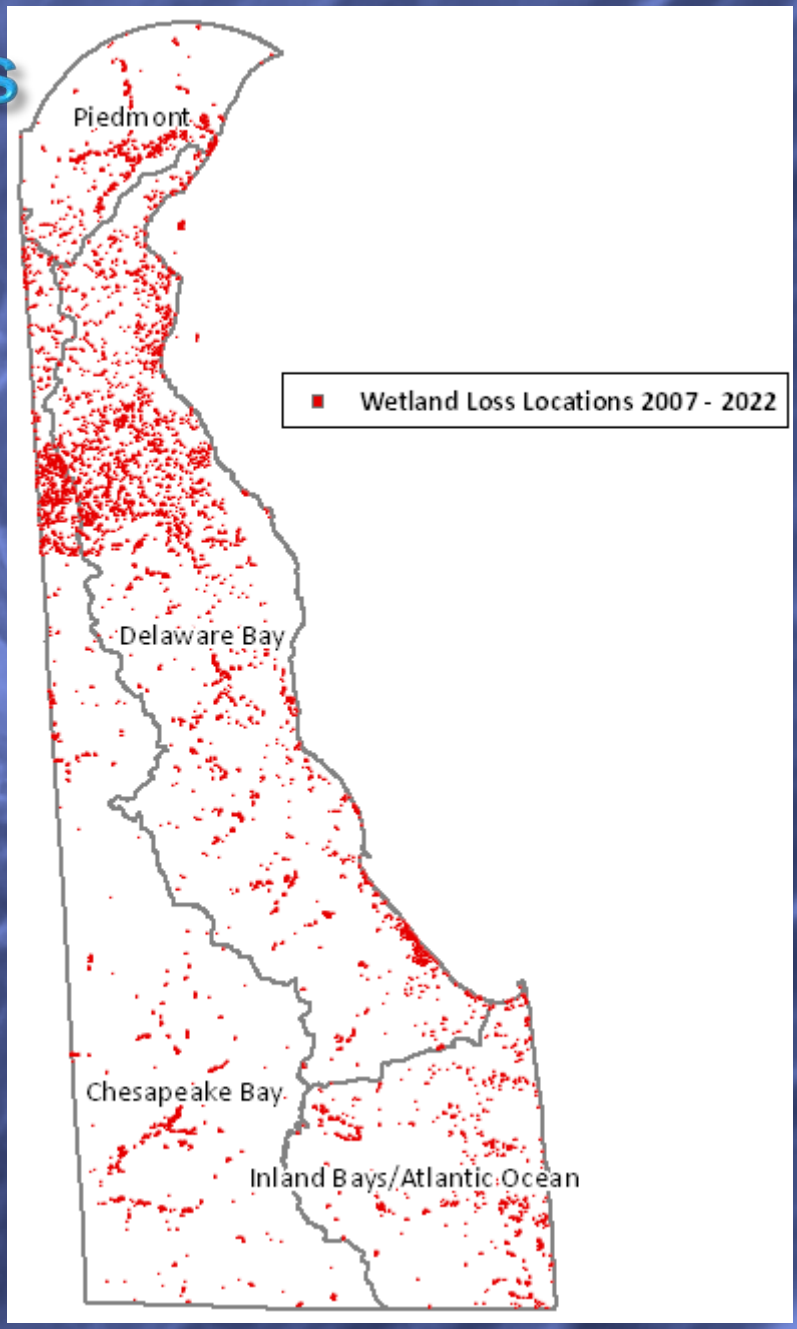
WWF

The Nature Conservancy

Institute on the Environment University of Minnesota Driven to Discover

Forecasted Wetland Losses

- Estimated loss of 3,132 acres 2007 to 2022
  - 250 acres estuarine to open water
  - 2270 acres forested fresh to:
    - developed (900 acres)
    - agriculture (860 acres)
    - transitional (510 acres)



Value of Loss

- Projected Annual loss of approximately $2.4 million in wetland services
- $2.4 million should not be used to value the entirety of Delaware's wetlands and should not be derived to a per acre value

Summary of Results

Service	Biophysical change	Economic value	Value of loss 2007-2022
Carbon Sequestration	194,417 metric tons of carbon storage lost	Social cost based on damages associated with climate change (human health, crops, coastal environments)	$19.9 million ($118/Mg of C) ($2010)

Summary of Results

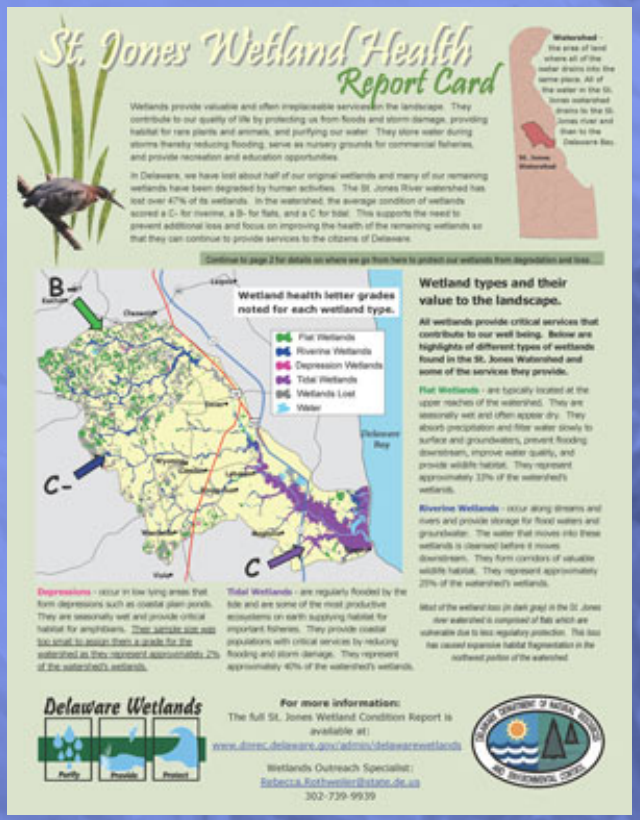
Service	Biophysical Change	Economic Change	Value of loss 2007-2022
Water Purification	• 1.2% increase in N delivered to waterways • 0.9% increase in P delivered to waterways • 1.3% increase in sediment delivered to waterways	Municipal water treatment costs	$9.67 million

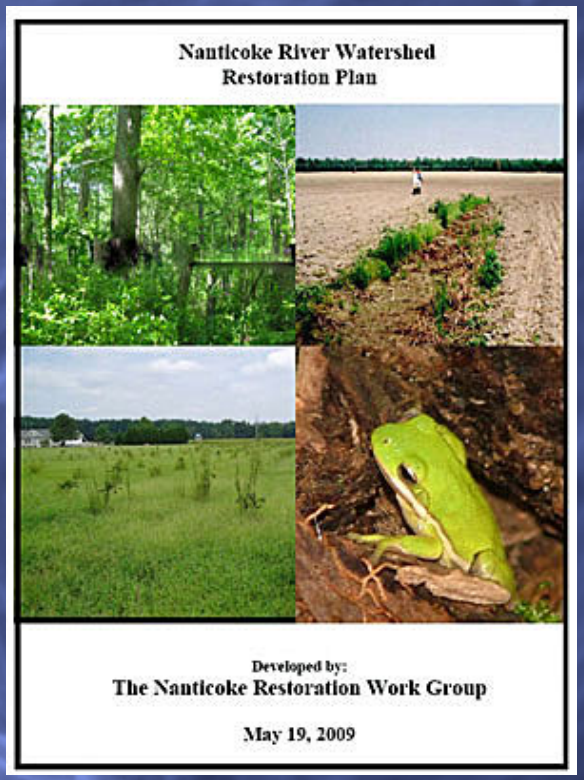
Key Challenges

Providing an adequate assessment between the structures and functions of natural systems, the benefits derived by humanity, and their subsequent values

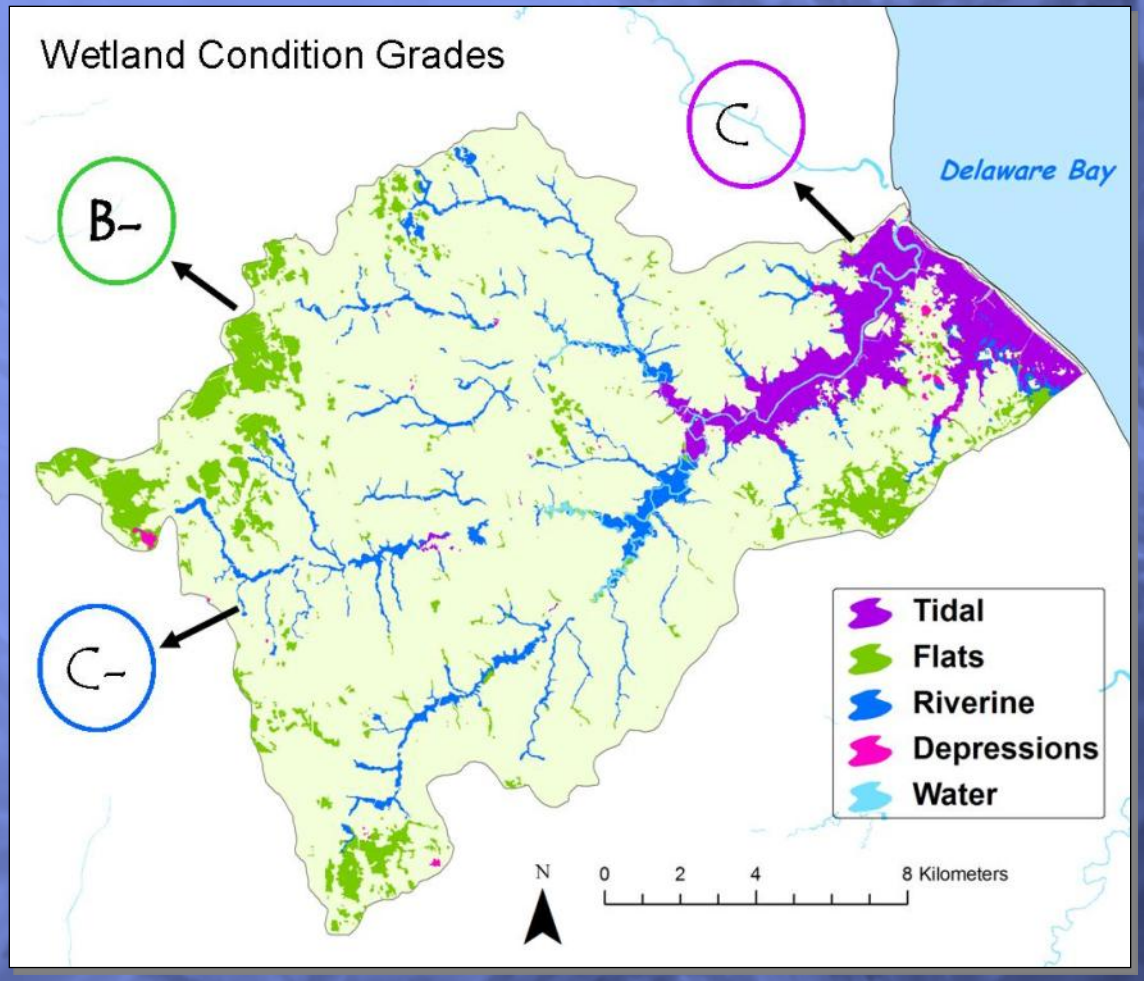
- Many inputs/outputs
- Limited by available information
- Spatial and temporal variation
- Complex biophysical relationships
- Translation to economically relevant ecosystem changes
- Consistency with ecological and economic principles/theory

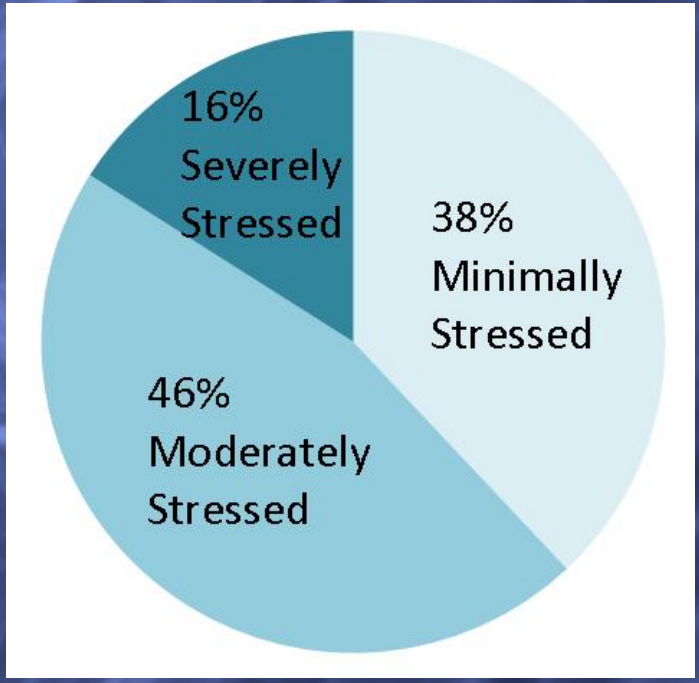
Watershed Wetland Health



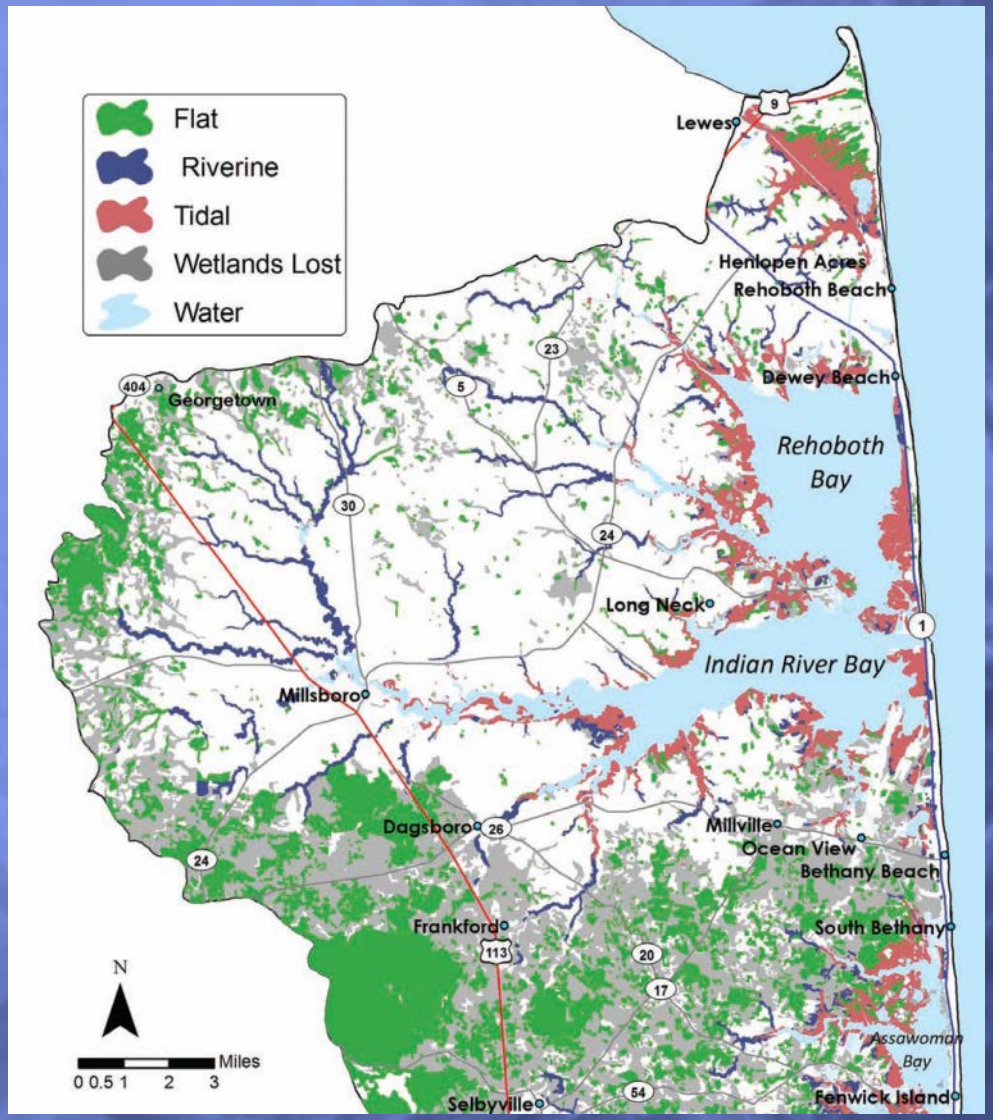


Overall Wetland Health for the Murderkill River Watershed





Inland Bays wetland report card



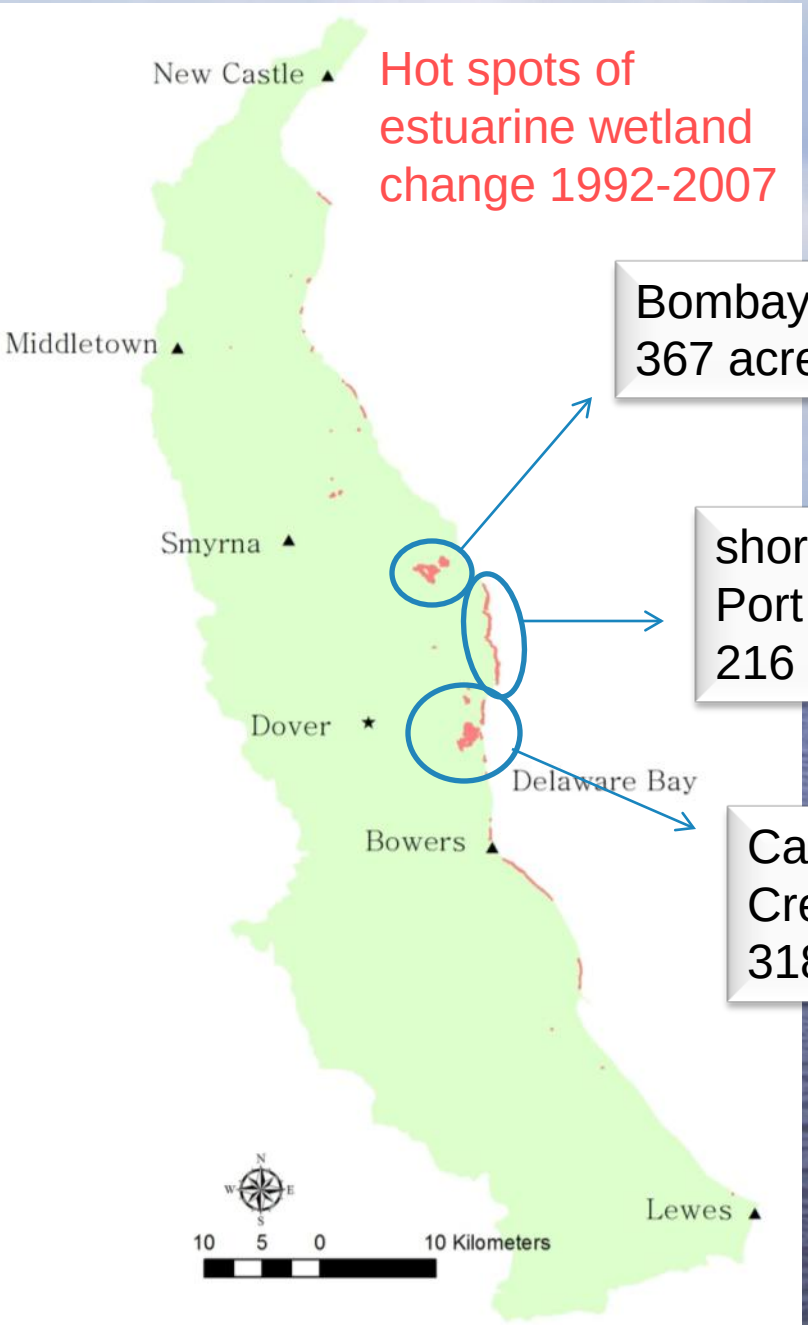
Tidal Wetland Health = D+

Riverine Wetland Health = D

Forested Flat Wetland Health = B-

Sea level rise a big concern

Delaware Bay Basin - Estuarine Wetland Changes



Hot spots of estuarine wetland change 1992-2007

Bombay Hook NWR
367 acres

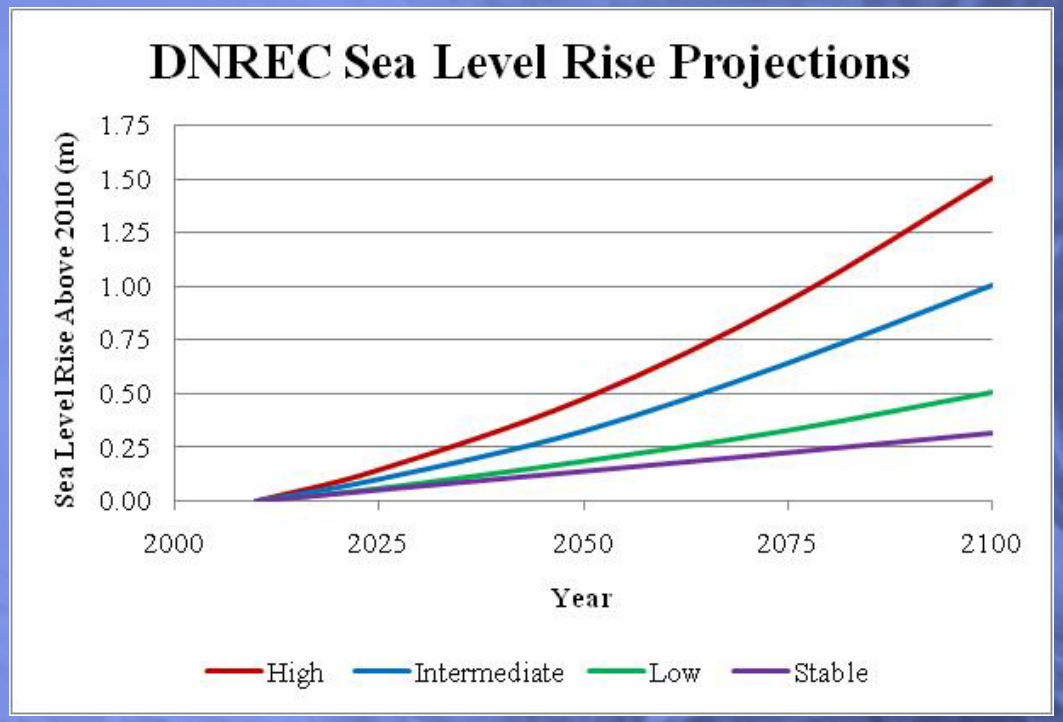
shoreline Leipsic to Port Mahon
216 acres

Cattail Gut at Little Creek Wildlife Area
318 acres

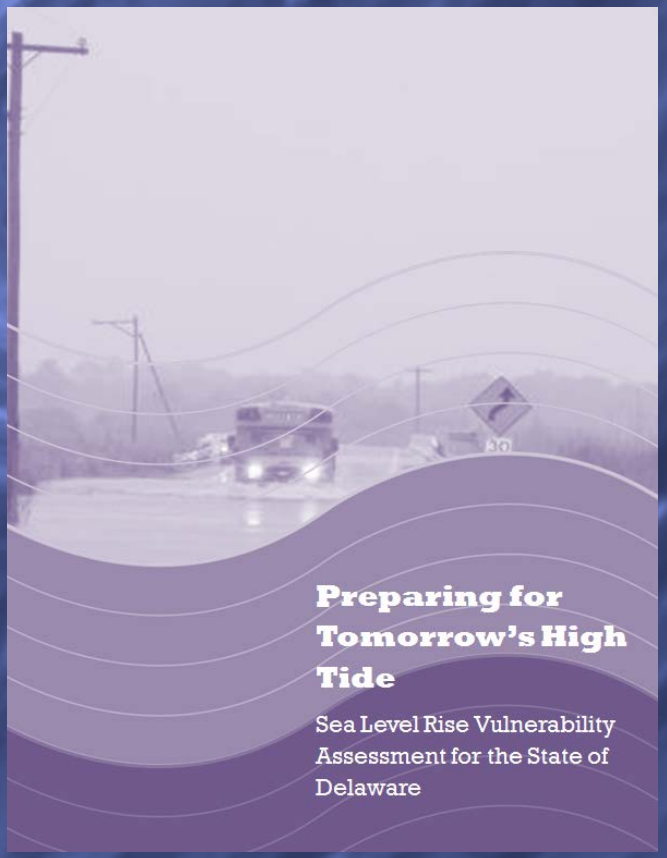
Representing changes from tidal emergent to open water wetlands

Open water wetlands are low functioning

Climate Change and Sea Level Rise



<u>Options for Adapting</u>
Retreat and Avoid
Elevate
Armor

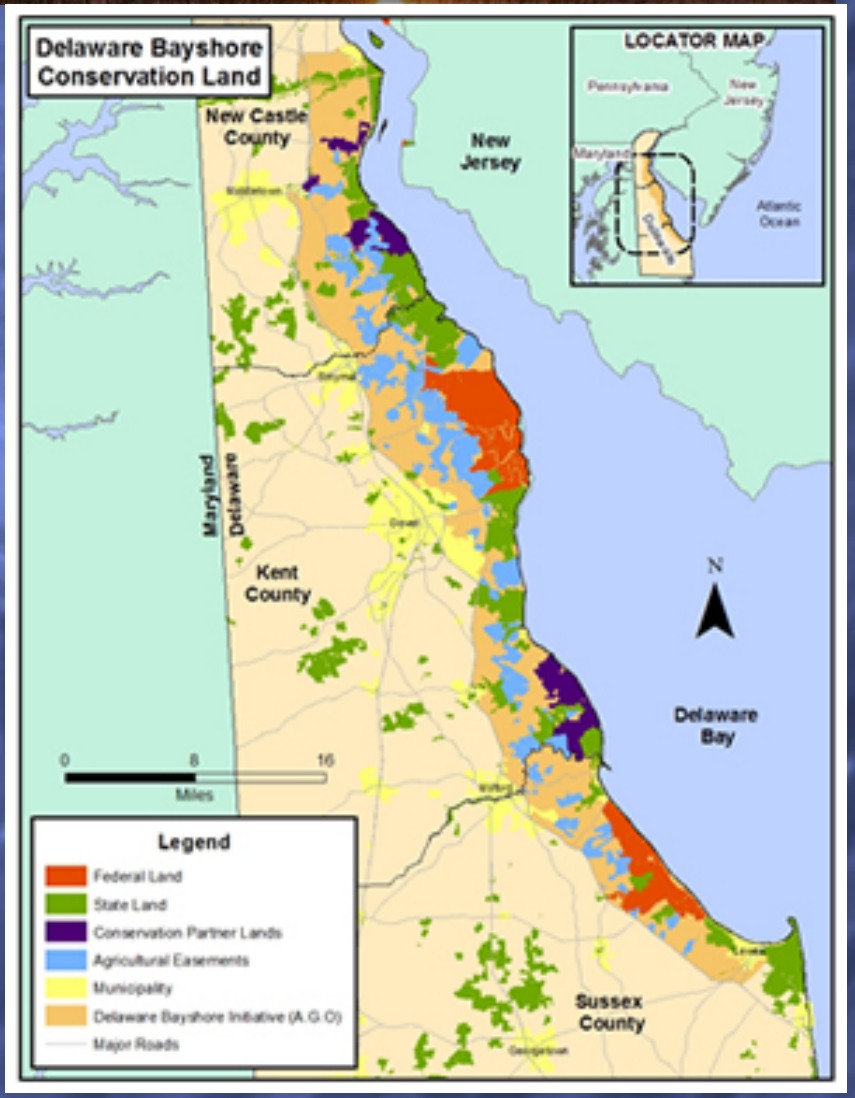


<u>Proactive Decisions</u>
What is at risk?
What can be protected? At what cost?
Where can we let nature take its course?

Delaware Bayshore Initiative

3 Key Focus Areas

- Conservation and Restoration
- Recreation and Connectivity
- Engagement and Marketing



Protection Focus

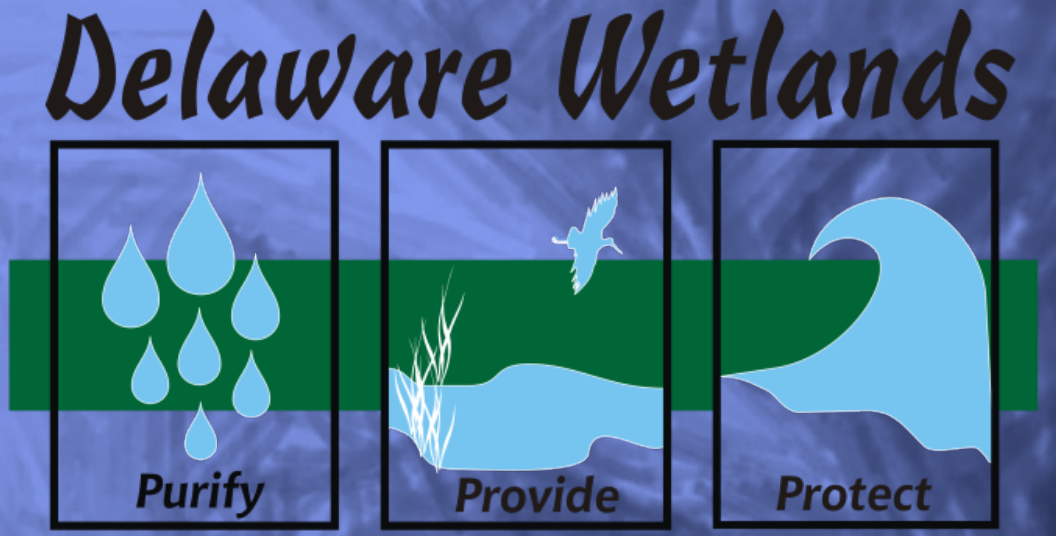
Develop a Statewide Wetland Protection Strategy

Contract with the Environmental Law Institute (ELI) to facilitate development of strategy

Involving all partners and special interest groups

Incentive based: tax credits, density bonuses, conservation easements, acquisition, compensation for ecosystem services

Questions?



Mark Biddle
DNREC, Division of Watershed Stewardship
Watershed Assessment Section
302-739-9939