

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

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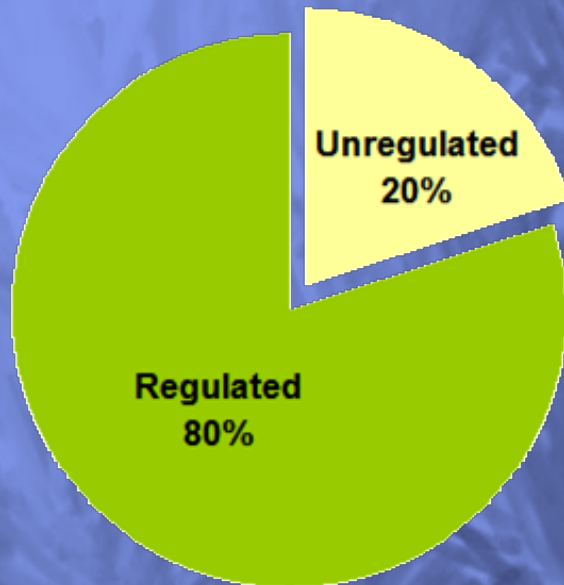
Delaware Department of Natural Resources
And Environmental Control



ASWM Annual Workshop -- March 2013

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





Delaware Wetlands:

Status and Changes from 1992 to 2007

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 assess potential of wetlands to perform certain functions

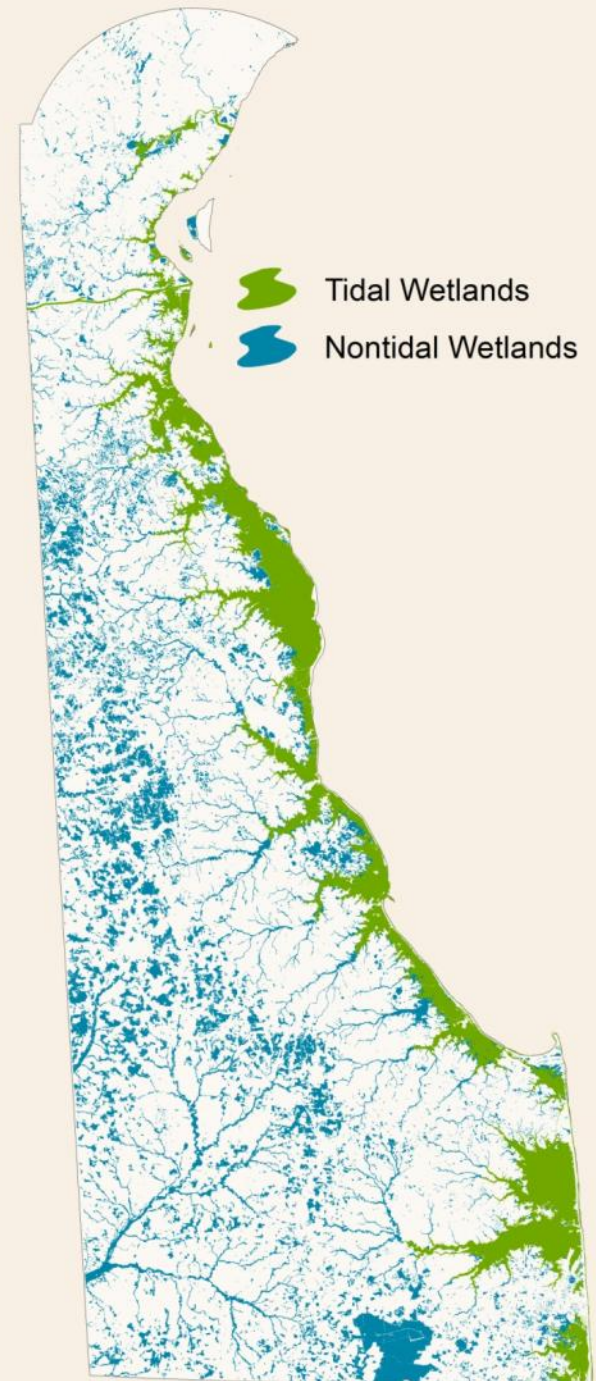
How Many Wetlands Do We Have?

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

> 350,000 acres inventoried
(including large open water)

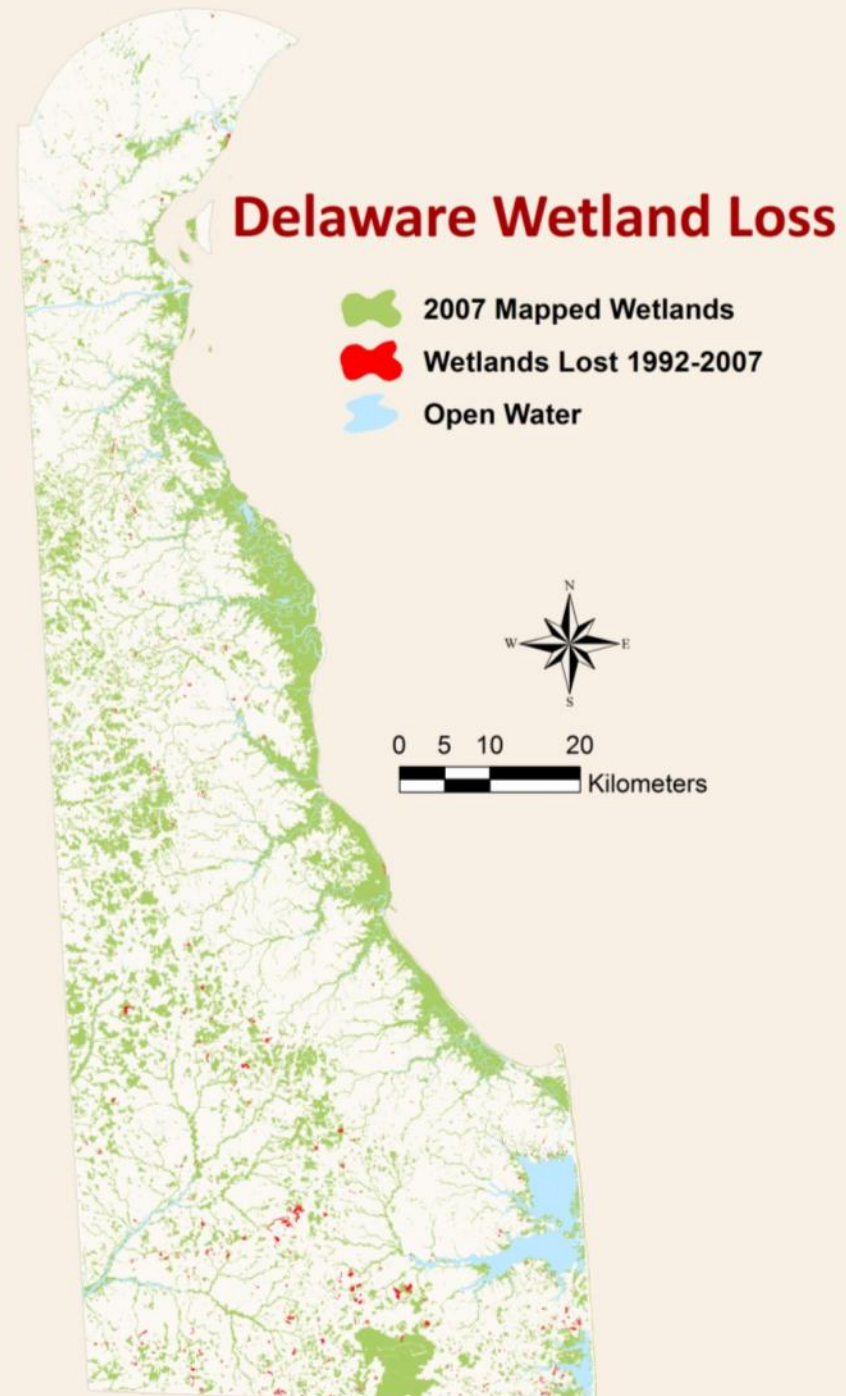
Non-tidal wetlands comprise 2/3 of the State's wetlands

Have lost over 50% of original wetlands



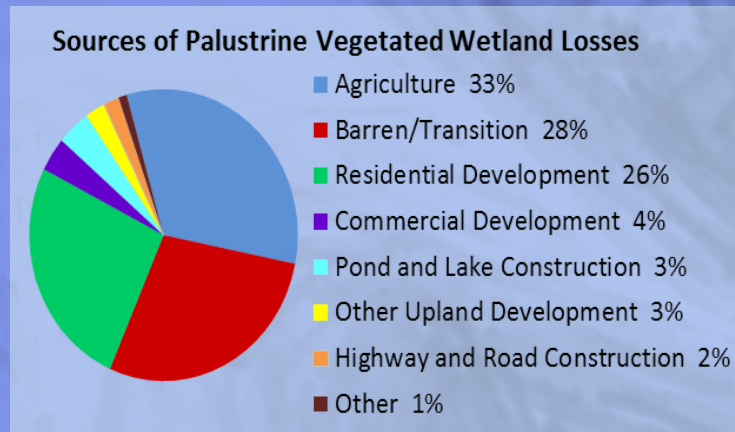
Delaware Wetlands (1992 to 2007)

- 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**

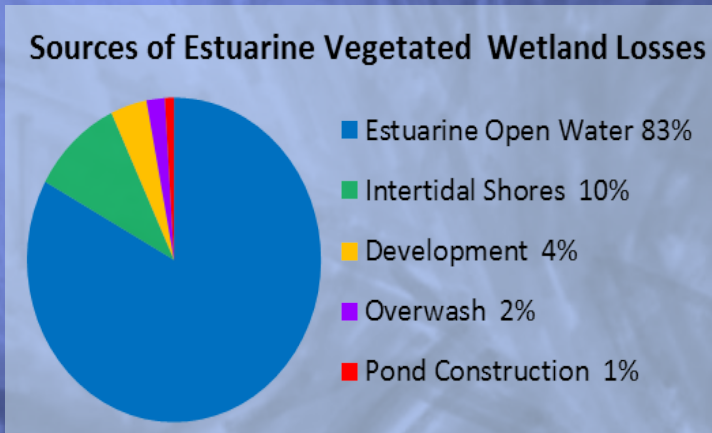


Delaware Wetlands – 1992 to 2007

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

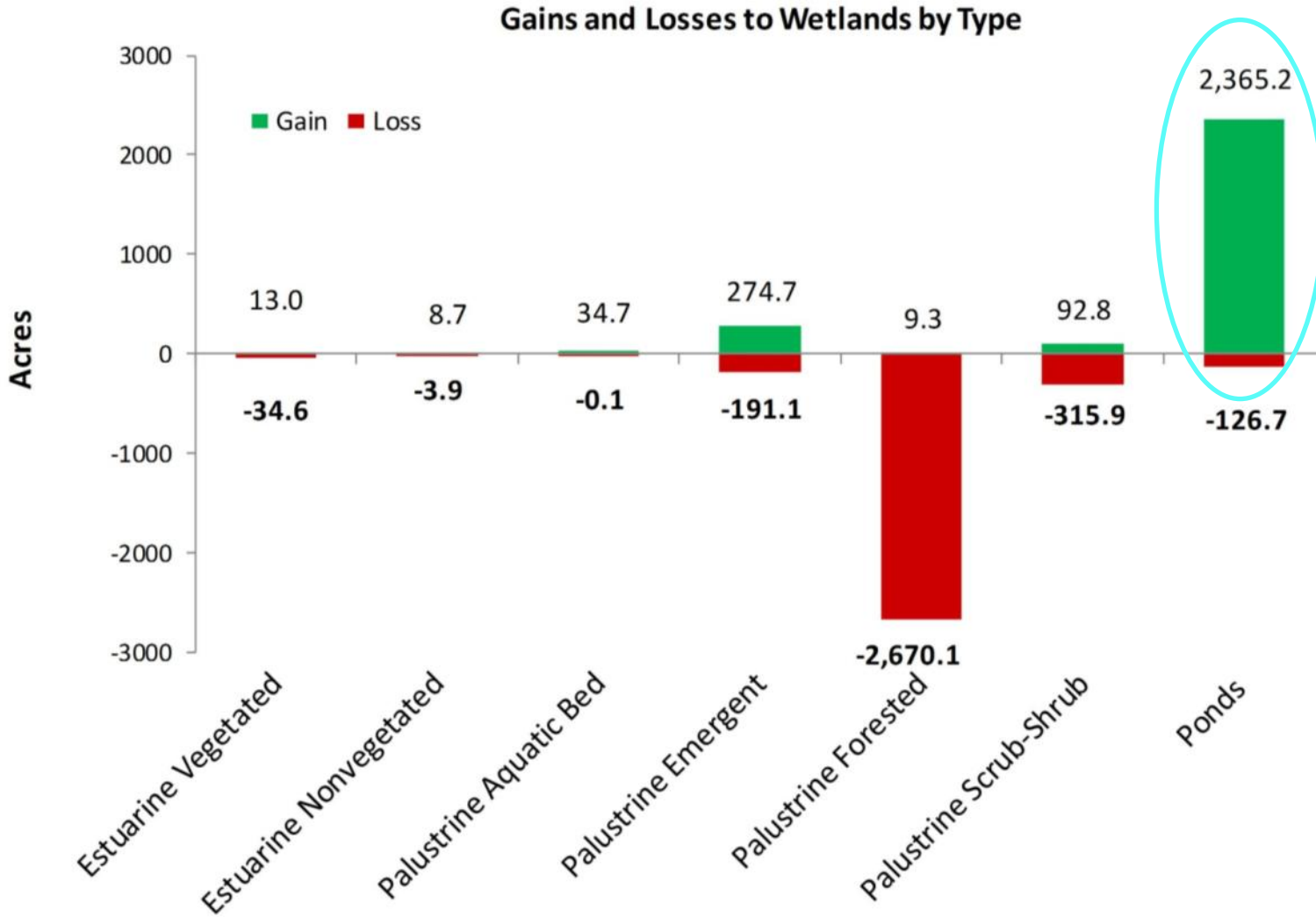


Net loss of 238 acres Estuarine wetlands fueled by submergence of marshes; gains came from emergence in open water



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

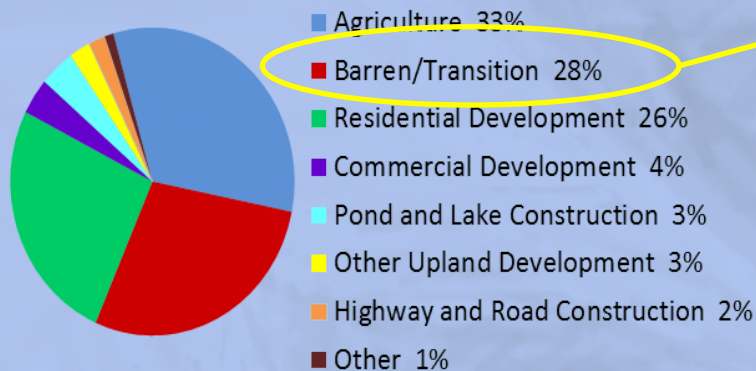
37 acres
Ponds
gained



Losses Further Categorized 2007-2010

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

Sources of Palustrine Vegetated Wetland Losses



what has become of these?

what can these losses be attributed to?

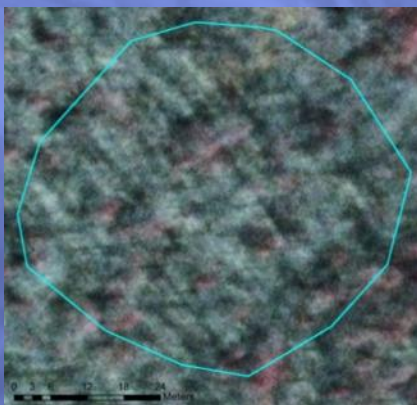
Using 2010 imagery

Determine change in use between 2007 to 2010

Example:

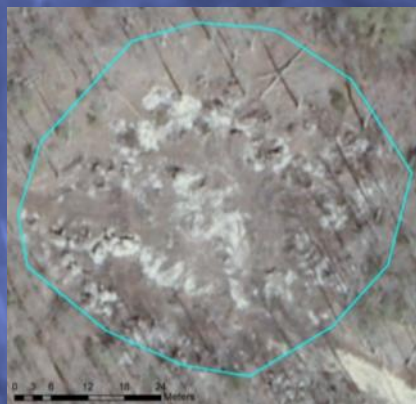
1992

Forested



2007

In transition



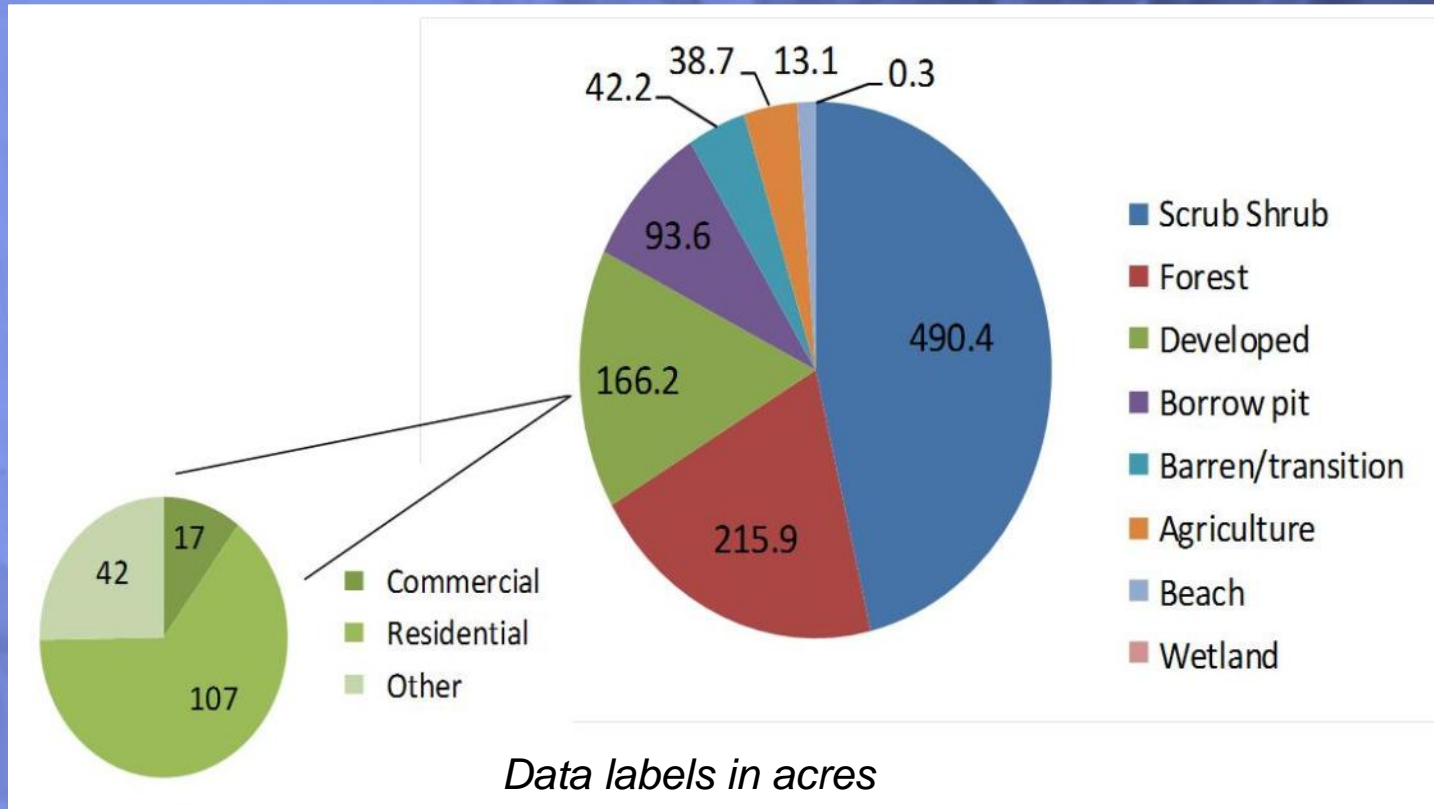
2010

Residential



Losses Further Categorized 2007-2010

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



- 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



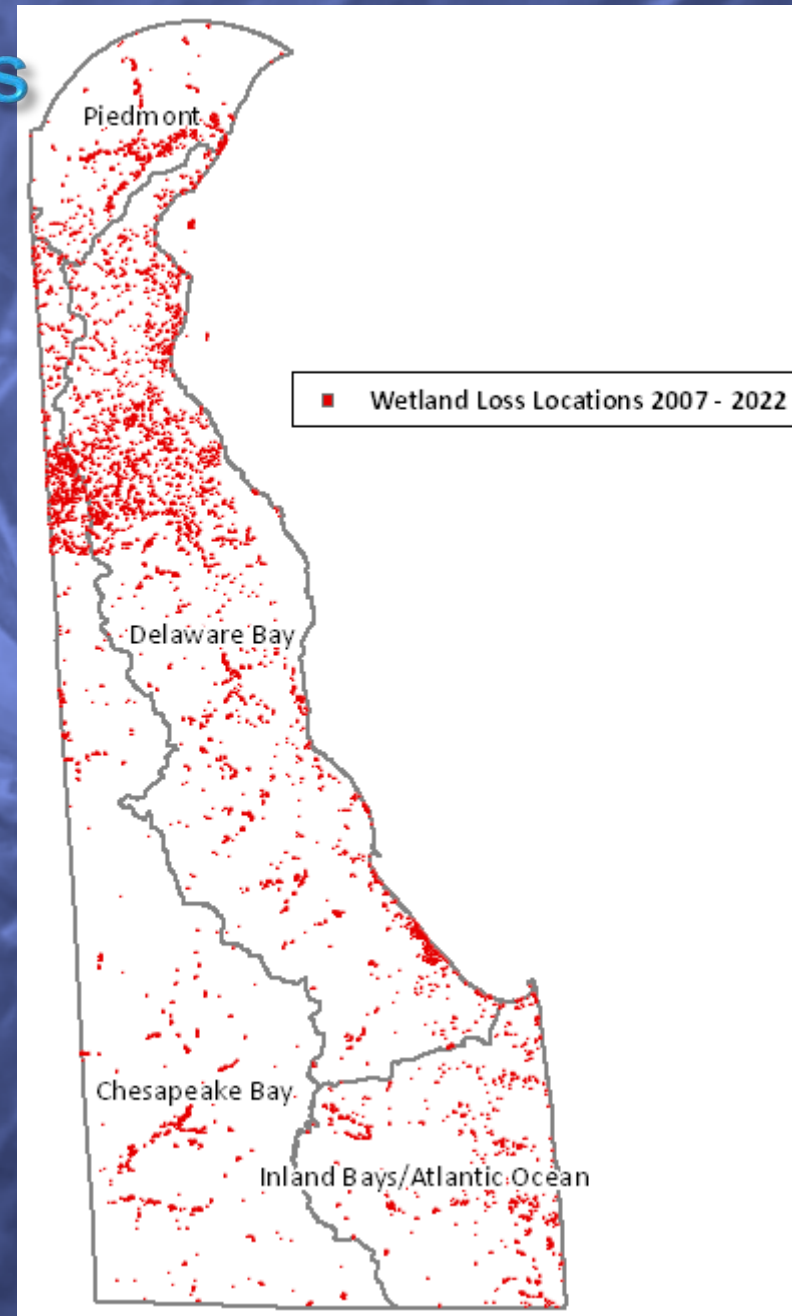
InVEST Approach

- ▣ 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



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	<ul style="list-style-type: none">• 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

St. Jones Wetland Health Report Card

Wetlands provide valuable and often irreplaceable services in the landscape. They contribute to our quality of life by protecting us from floods and storm damage, providing habitat for rare plants and animals, and purifying our water. They store water during storms thereby reducing flooding, serve as nursery grounds for commercial fisheries, and provide recreation and education opportunities.

In Delaware, we have lost about half of our original wetlands and many of our remaining wetlands have been degraded by human activities. The St. Jones River watershed has lost over 47% of its wetlands. In the watershed, the average condition of wetlands scored a C- for rivers, a B- for flats, and a C for total. This supports the need to prevent additional loss and focus on improving the health of the remaining wetlands so that they can continue to provide services to the citizens of Delaware.

Continue to page 2 for details on where we go from here to protect our wetlands from degradation and loss.

Wetland types and their value to the landscape.

All wetlands provide critical services that contribute to our well being. Below are highlights of different types of wetlands found in the St. Jones Watershed and some of the services they provide.

Flat Wetlands - are typically located at the upper reaches of the watershed. They are seasonally wet and often appear dry. They absorb precipitation and filter water slowly to surface and groundwater, prevent flooding downstream, improve water quality, and provide wildlife habitat. They represent approximately 13% of the watershed's wetlands.

Riverine Wetlands - occur along streams and rivers and provide storage for flood waters and groundwater. The water that flows into these wetlands is cleaned before it moves downstream. They form corridors of valuable wildlife habitat. They represent approximately 23% of the watershed's wetlands.

Depressions - occur in low lying areas that form depressions such as coastal plain ponds. They are seasonally wet and provide critical habitat for amphibians. *These wetlands are not yet used to their full capacity for the watershed as they represent approximately 2% of the watershed's wetlands.*

Tidal Wetlands - are regularly flooded by the tide and are some of the most productive ecosystems on earth supporting habitat for important fisheries. They provide coastal riparianity with critical services by reducing flooding and storm damage. They represent approximately 41% of the watershed's wetlands.

Wetland health better grades noted for each wetland type.

Delaware Wetlands

For more information:
The full St. Jones Wetland Condition Report is available at:
www.dnrn.delaware.gov/delawarewetlands

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wetland health report card

CENTER FOR THE INLAND BAYS STATE OF THE BAYS REPORT SERIES 2009-2010

The wetlands of the Inland Bays help supply clean water and protect property from flooding and coastal erosion. They also sustain diverse wildlife populations. But, due to activities that have filled and altered these wetlands, these services have been reduced. This report card uses current research to present the health of wetlands in the Inland Bays Watershed.

why are wetlands important?

- A one-acre wetland can hold up to 1 million gallons of water. Wetland protection and proper management equals less flood damage.
- Wetlands can remove pollutants before they enter our drinking water, streams, and bays. Vegetated buffers around wetlands enhance this feature.
- Wetlands contribute filtered water to drinking water supplies.
- Wetlands prevent erosion of uplands, keeping property safe and sediments out of the water.
- Wetlands provide habitat for rare plants and animals. They are also critical nesting areas for many birds, and nursery habitat essential to certain fish and shellfish species.
- Wetlands can store large amounts of carbon. When wetlands are degraded, greenhouse gases are released into the atmosphere.

changes in wetland acreage

The Inland Bays watershed has lost approximately 60% of its wetland resources since European settlement. Nearly all lost were freshwater/terrestrial wetlands. An analysis conducted on loss occurring between the early 1960's and 1990's showed that most of the modern wetland loss was due to the conversion of wetlands to development, farm fields, and pond construction. Saltmarsh/ tidal wetlands loss was due primarily to residential development, excavation and impoundments. A new study of wetland acreage changes during the past 15 years will be available soon.

Currently wetlands represent 16% of the watershed. For wetlands to continue to provide valuable services to the citizens of Delaware, additional loss must be reduced as much as possible. Many of the remaining wetlands can be managed better to improve the services they provide.

The research presented here will be used to develop a voluntary wetland restoration and management plan for the watershed and inform landuse planning that could impact wetlands.

This figure illustrates the loss of wetlands, which is a major concern and priority for the Inland Bays Wetland Working Group.

*This percentage is based on the 2007 Land Use/Land Cover Inventory effort.

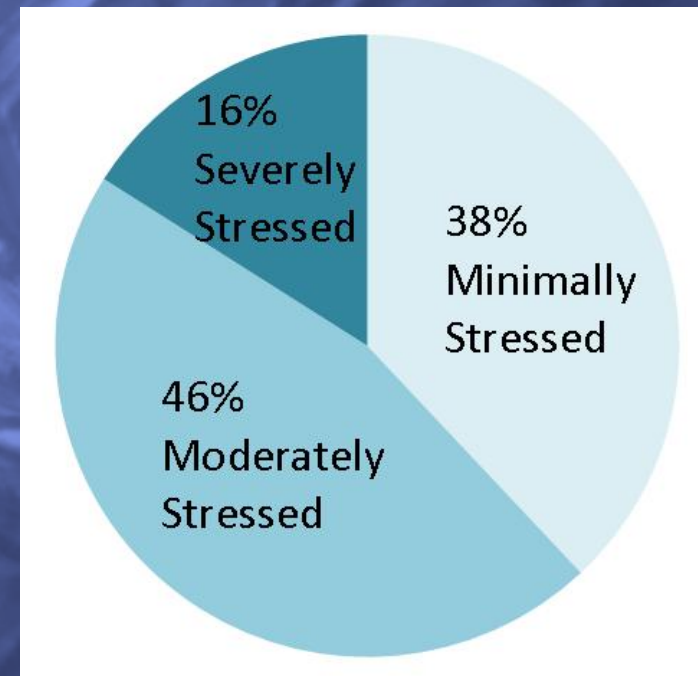
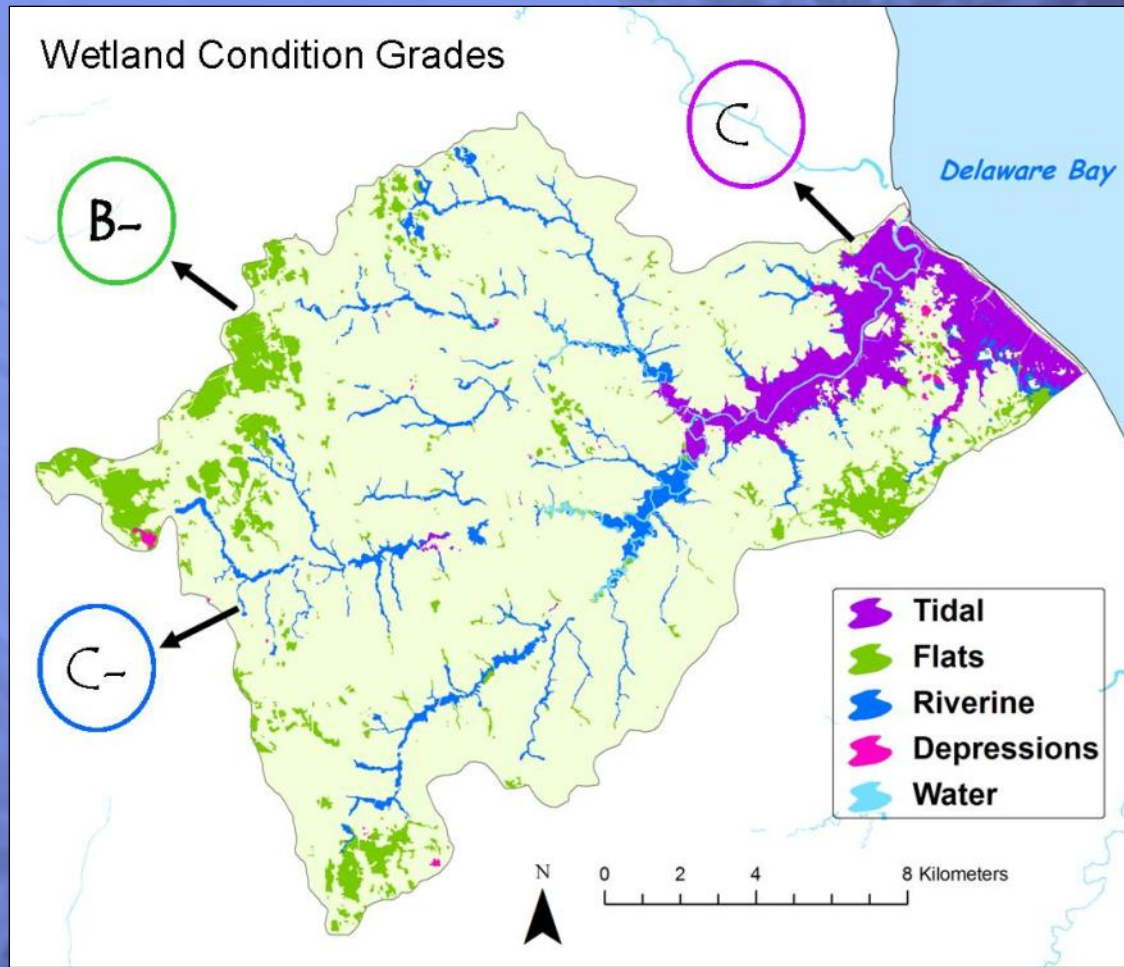
Read on to learn about the health of the remaining wetlands and what can be done to improve and protect them.

Nanticoke River Watershed Restoration Plan

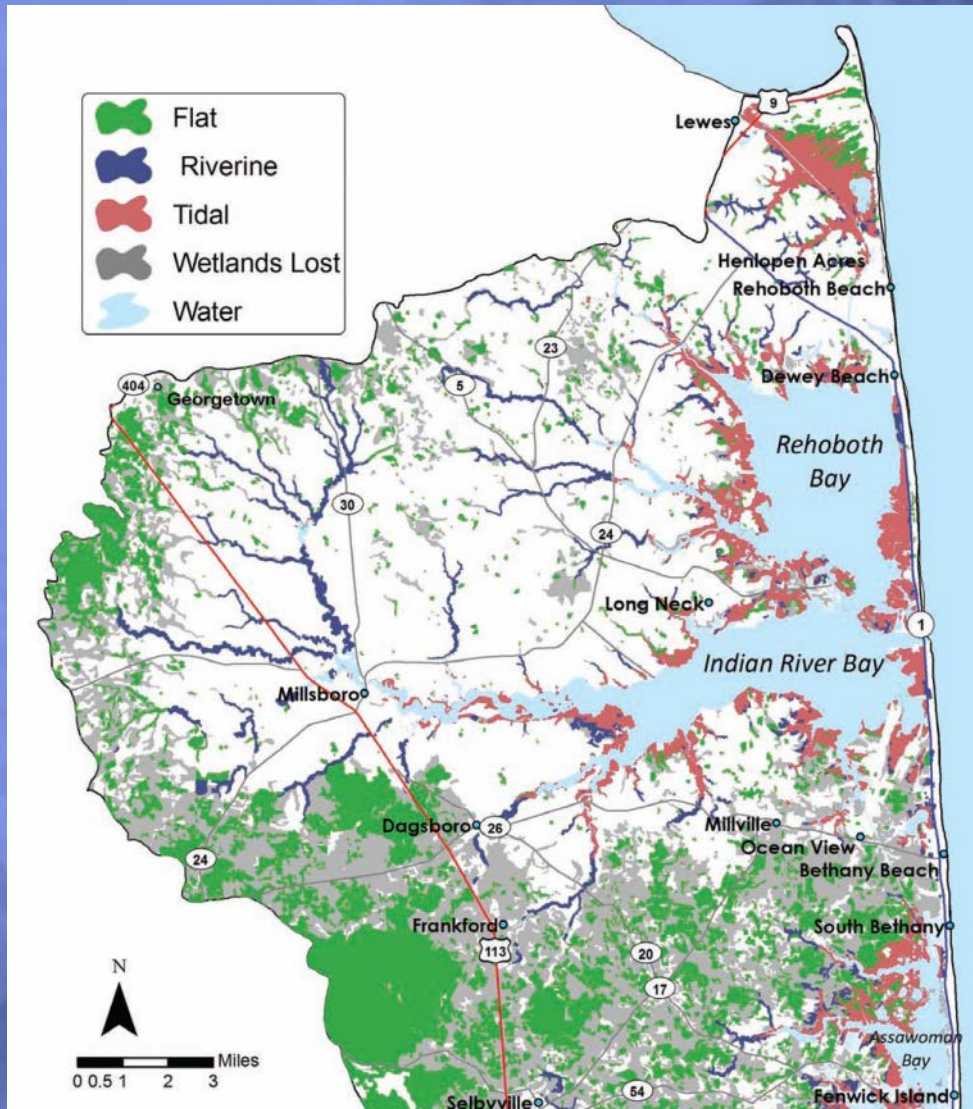
Developed by:
The Nanticoke Restoration Work Group

May 19, 2009

Overall Wetland Health for the Murderkill River Watershed



Inland Bays wetland report card



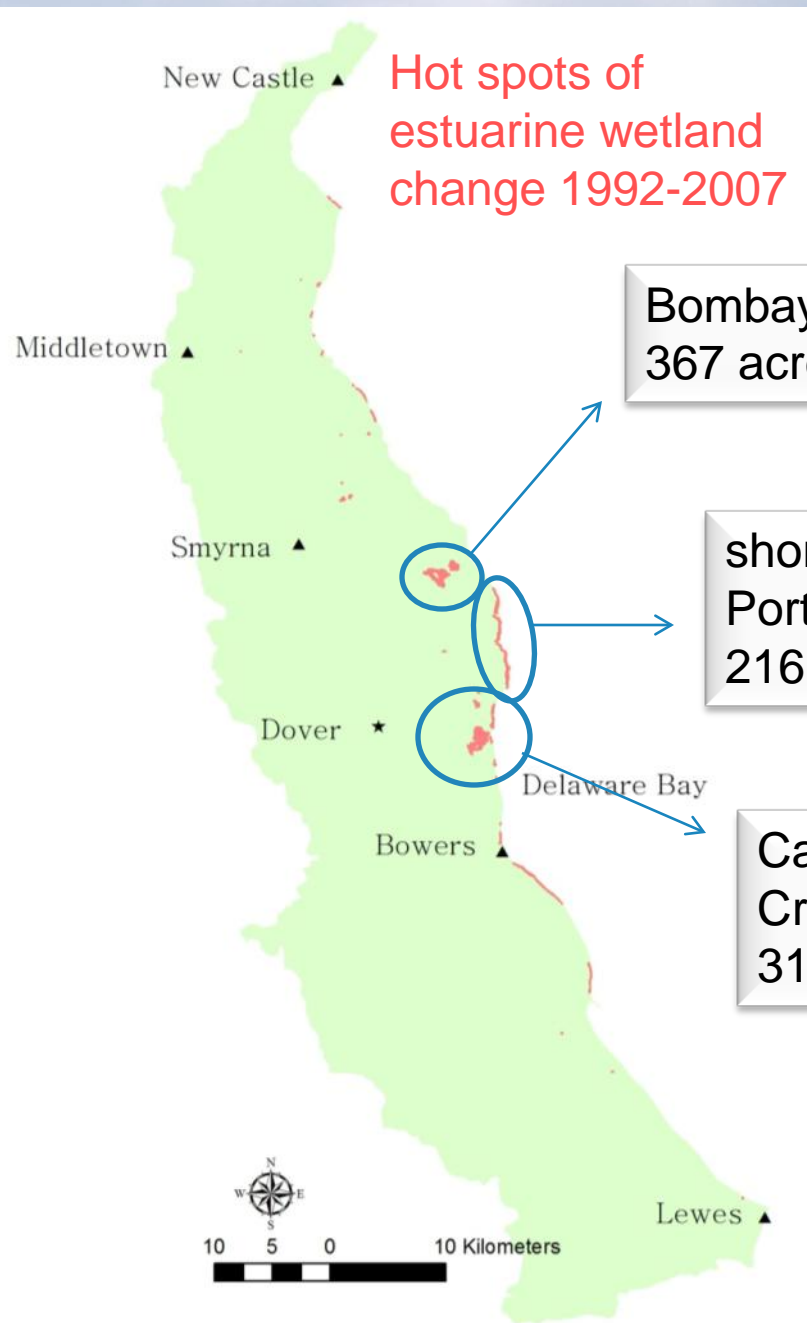
Tidal Wetland Health = D+

Riverine Wetland Health = D

Forested Flat Wetland Health = B-

Sea level rise a big concern

Delaware Bay Basin - Estuarine Wetland Changes



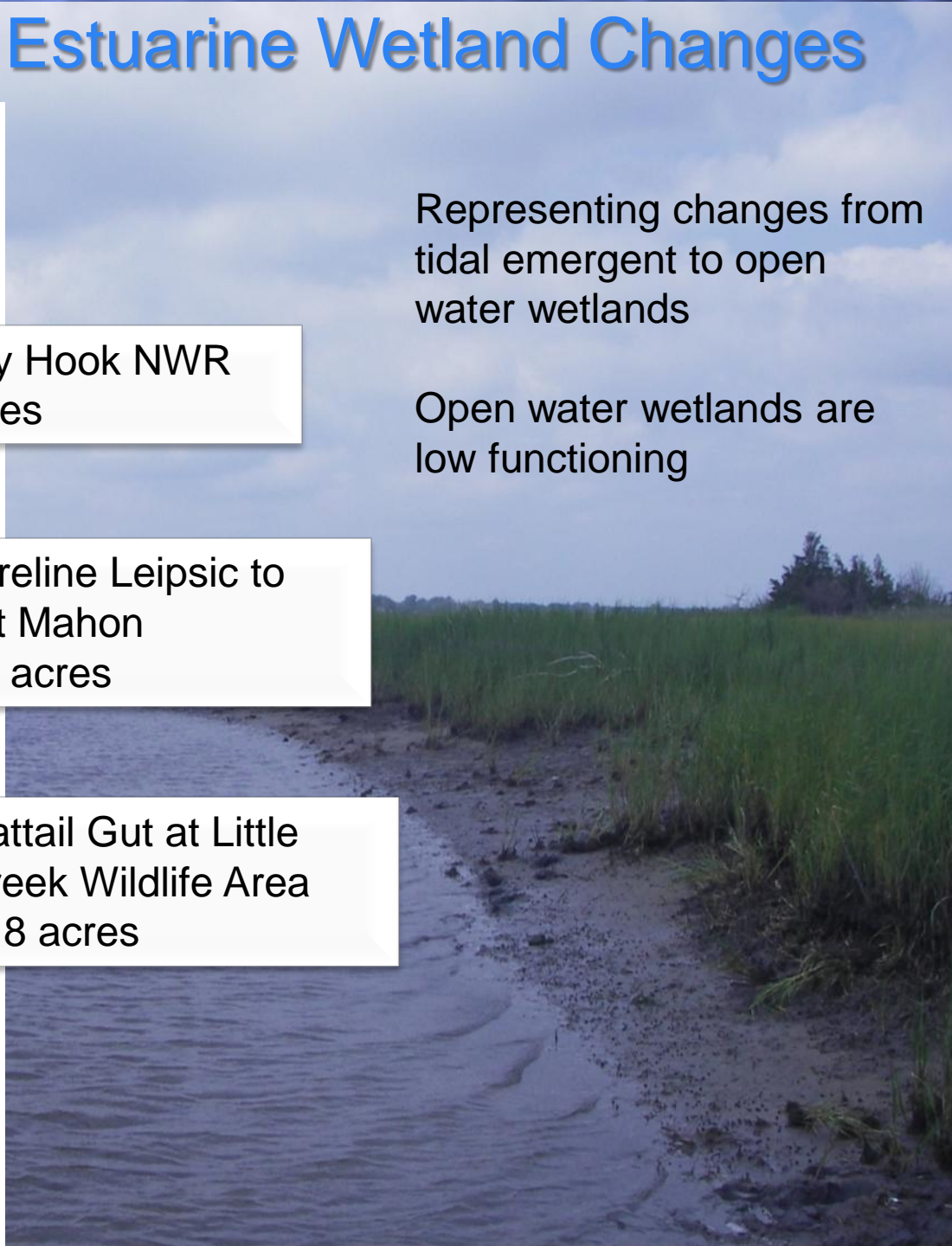
Bombay Hook NWR
367 acres

shoreline Leipsic to
Port Mahon
216 acres

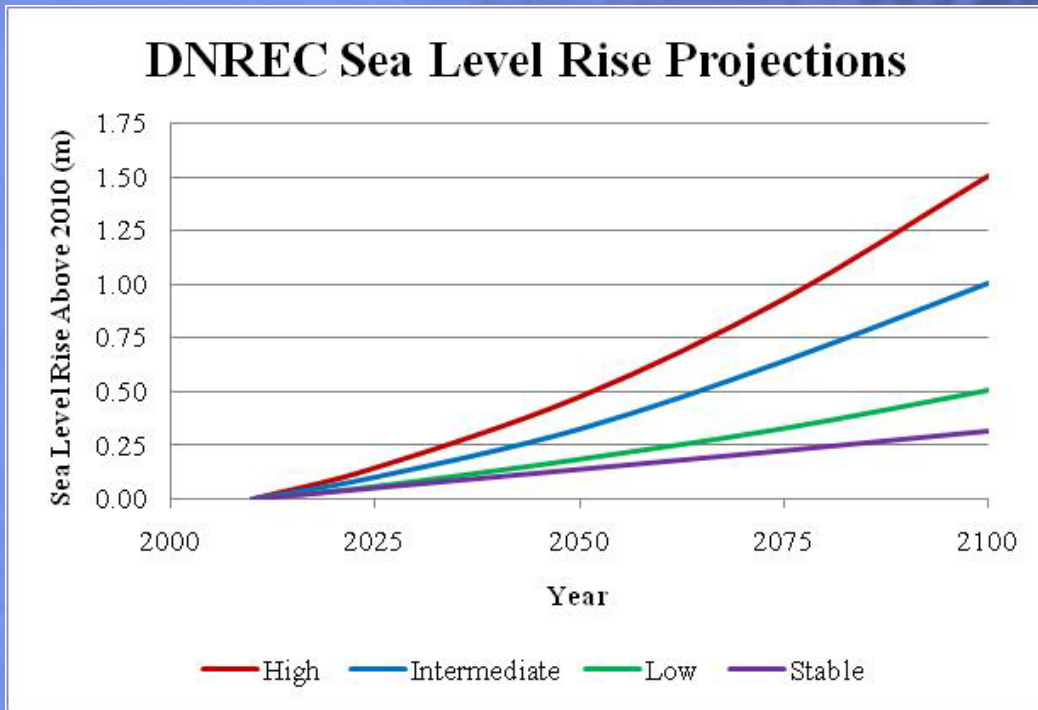
Cattail Gut at Little
Creek Wildlife Area
318 acres

Representing changes from
tidal emergent to open
water wetlands

Open water wetlands are
low functioning



Climate Change and Sea Level Rise



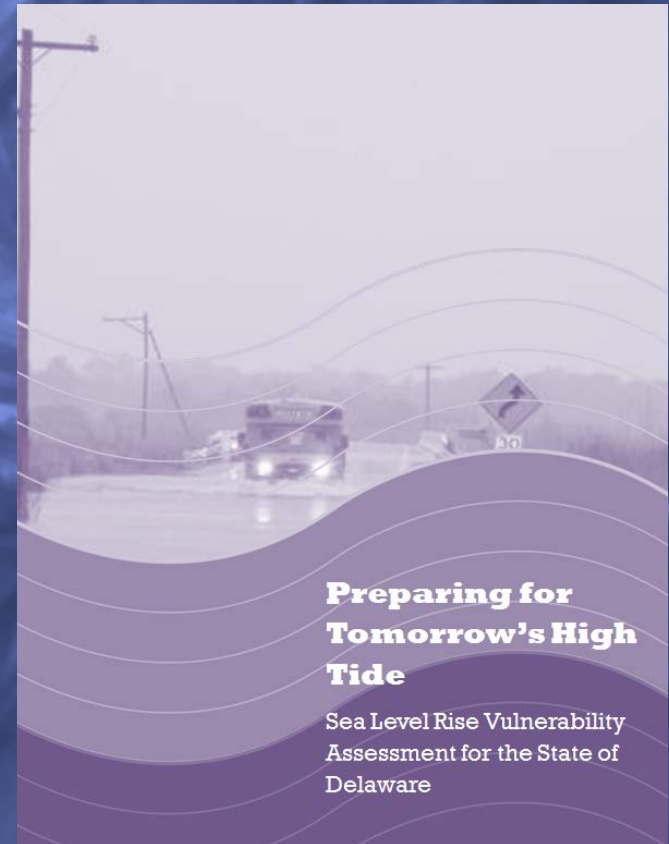
Options for Adapting
Retreat and Avoid
Elevate
Armor

Proactive Decisions

What is at risk?

What can be protected? At what cost?

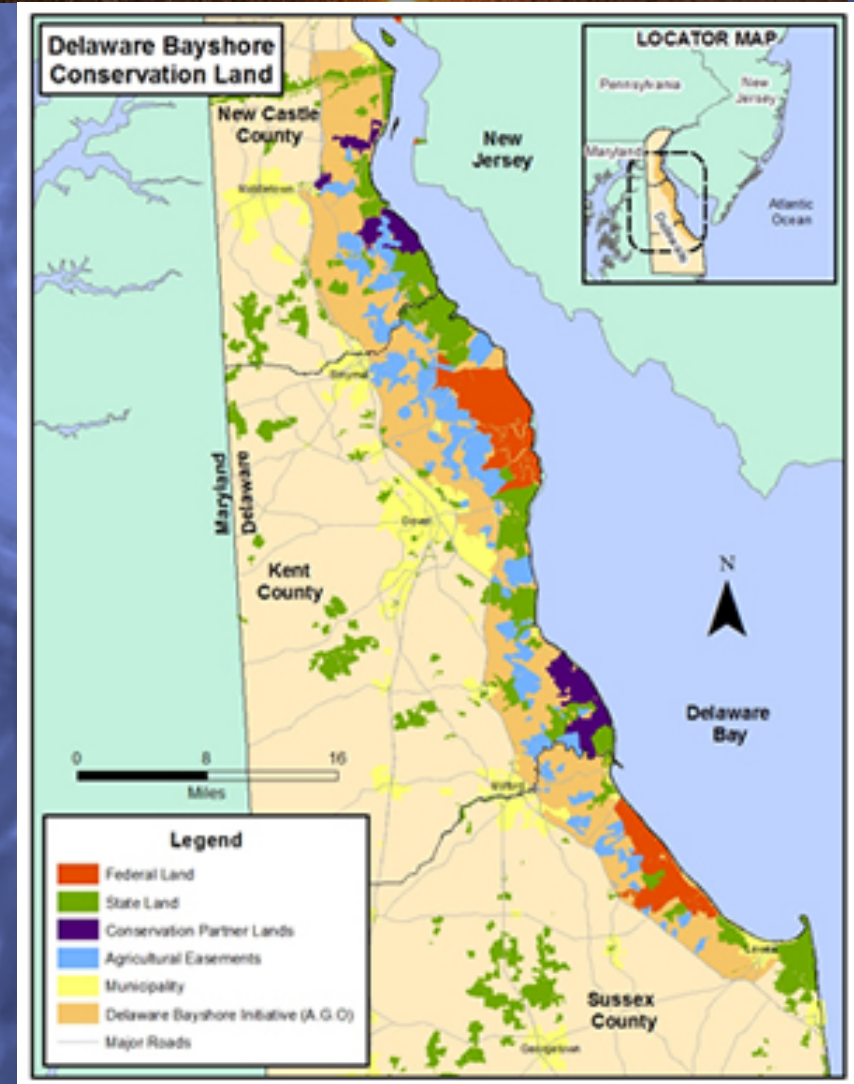
Where can we let nature take its course?



DELAWARE BAYSHORE INITIATIVE

3 Key Focus Areas

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



Protection Focus



Develop a Statewide Wetland Protection Strategy

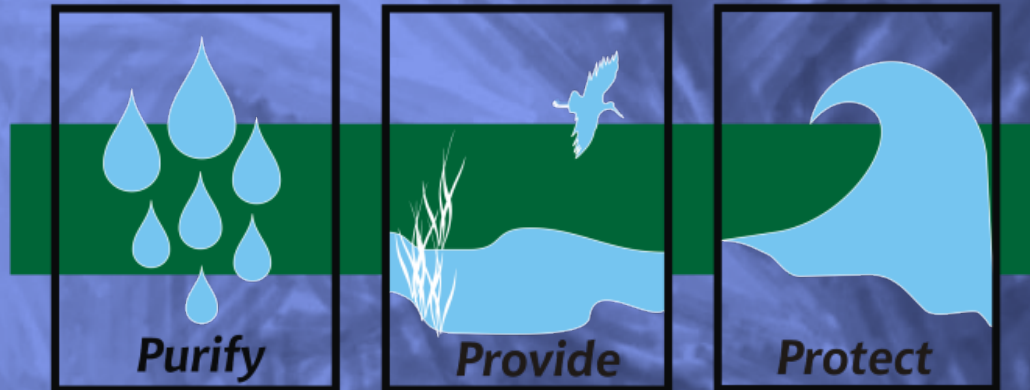
Contract with the Environmental Law Institute (ELI) to facilitate development of strategy

Involving all partners and special interest groups

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

Questions?

Delaware Wetlands



www.dnrec.delaware.gov/admin/delawarewetlands

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