



*THE WEALTH  
& WORTH OF  
DELAWARE  
WETLANDS*

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So ... what's the big deal about wetlands?



Photo courtesy of Bob Meadows, Delaware Division of Fish & Wildlife

The big deal is ...  
that wetlands are ...



a key element of DE's natural heritage  
and vital to the economy of the region



prominent features of DE's  
landscape and watersheds

**Just Get Out!**



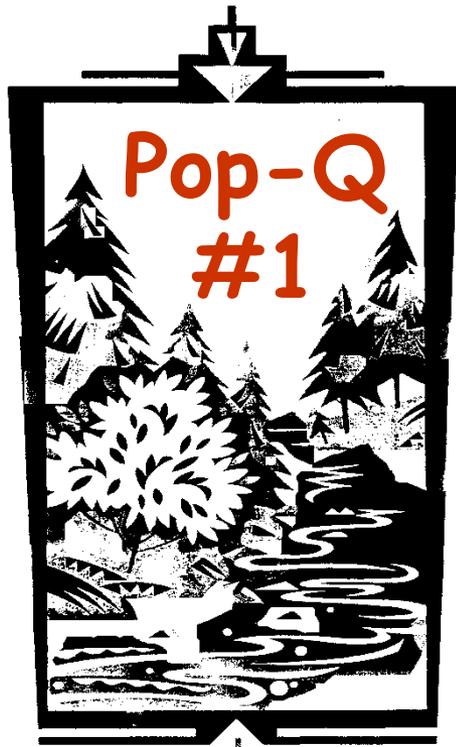
fun places for exploring!

*"Wetlands are powerful places in which to learn."*

great resources for teaching and learning

So ... what are wetlands anyway?





Delaware's Watersheds



**True or False:** Wetlands are defined as areas of land that have water visible at the surface throughout the year.

And the answer is ...

**False!** To be classified as a wetland, water does not have to be present at the surface all year or even on a seasonal basis.



**Defining WETLANDS** *"Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."*

*Federal Register, EPA, 1982*

# In other words, wetlands don't always look wet!

The aerial photograph at right features Huckleberry Swamp, near the town of Milton. From winter through spring, it appears as a several-acres-long, several-feet-deep, pond-like body of water.

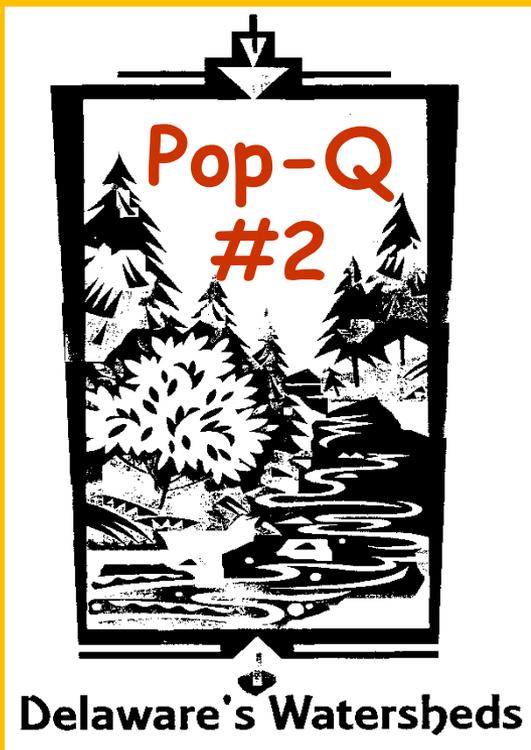


The photo at left shows Huckleberry (from ground level view) during its "drying-down" phase. *Can you guess the season here?*

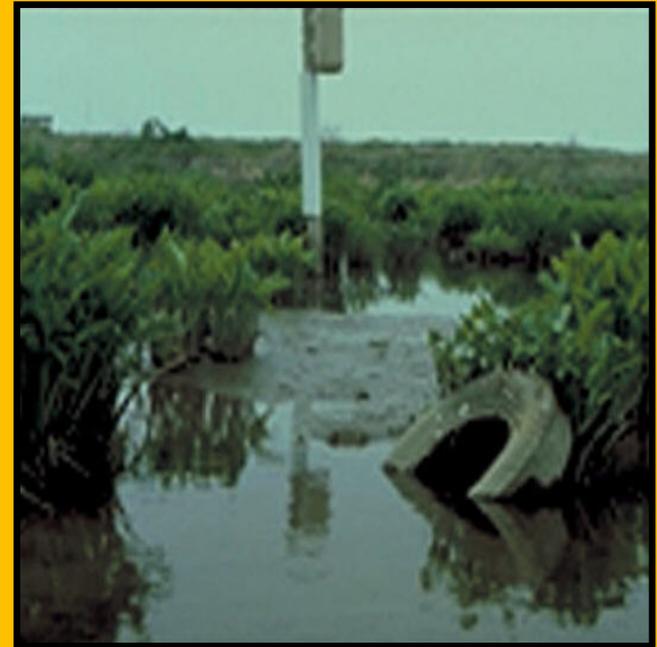
Despite their only-seasonally-wet nature, wetlands like these provide vital habitat for Delaware wildlife.

So ... how do we know which lands are wetlands, if they're not always wet?





This picture illustrates the 3 essential characteristics that make a wetland a wetland. They are:



- A. Presence of used tires, old appliances and other human debris
- B. Hydrology: water at or near the soil surface at some times
- C. Hydric soils: soils that tend to be saturated or waterlogged
- D. Hydrophytic vegetation: plants that are adapted to surviving in saturated, often anaerobic (low-to-no oxygen) soil conditions

# And the answers are ... B/C/D!

The 3 essential characteristics that define wetlands are:



wetness at or near the surface for some time of the year (wetland **hydrology**)



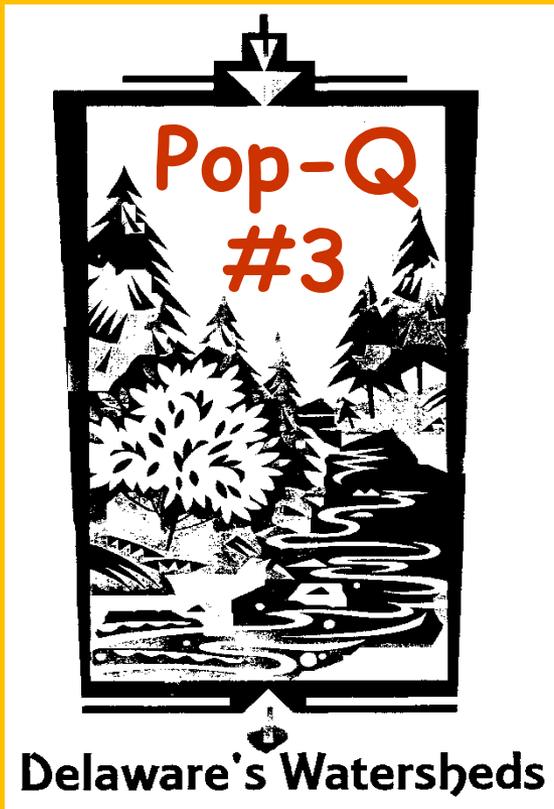
soils that tend to be saturated and anaerobic at times (referred to as **hydric** soils)



plants adapted to surviving in low- $O_2$  soggy-soil conditions (called **hydrophytes**)

So ... just how wet does a wetland  
have to be ... to be called a wetland?





To be classified as a wetland, the land has to be wet or saturated for:

- A. the better part of every year
- B. at least one full season each year
- C. a minimum of 4 weeks each year
- D. a minimum of 2 weeks in most years

And the  
answer is ...

D. a minimum of 2 weeks in most years



### Another Definition:

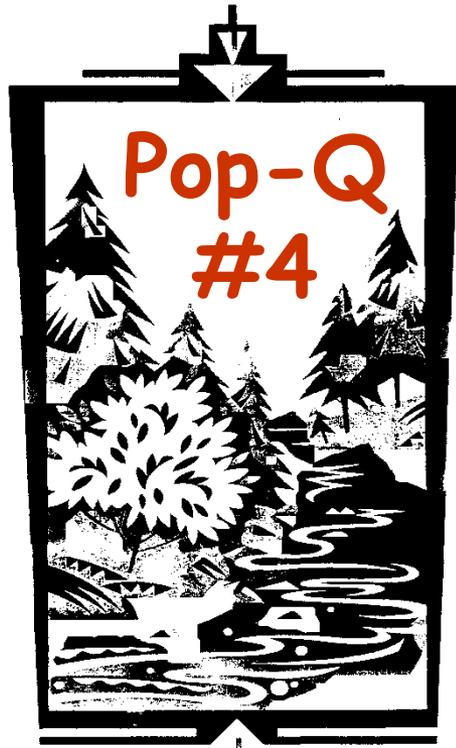
*"Wetlands are lands that are periodically flooded or saturated with water near the surface for periods long enough to affect plant growth and soil development ..."*

*"the minimum wetness ... is saturation within 1 foot of the ground surface for 2 weeks or more of the growing season in most years."*

*Tiner, 2001*



So ... now that we know what wetlands are ...  
what kinds of wetlands do we have in DE?



Delaware's Watersheds

Before we go there, let's see what you know about wetland types in general:  
How do you tell a **Swamp** from a **Marsh**?

- A. Marshes have saltwater and border on bays or oceans, while swamps are always freshwater and occur inland.
- B. Swamps always have trees in them, and marshes do not.
- C. Marshes are usually connected to other waterways, swamps are not.
- D. Swamps tend to have more water in them throughout the year.

Here's betting that many of you missed this one. To find out why, let's use a process of elimination ...

If you answered **A**, you got it wrong. Although in DE, many of our marshes are coastal and salty, some are freshwater as well. Although the swamps we have in DE are inland and freshwater, some swamps such as tropical *mangroves*, are coastal and tidal.

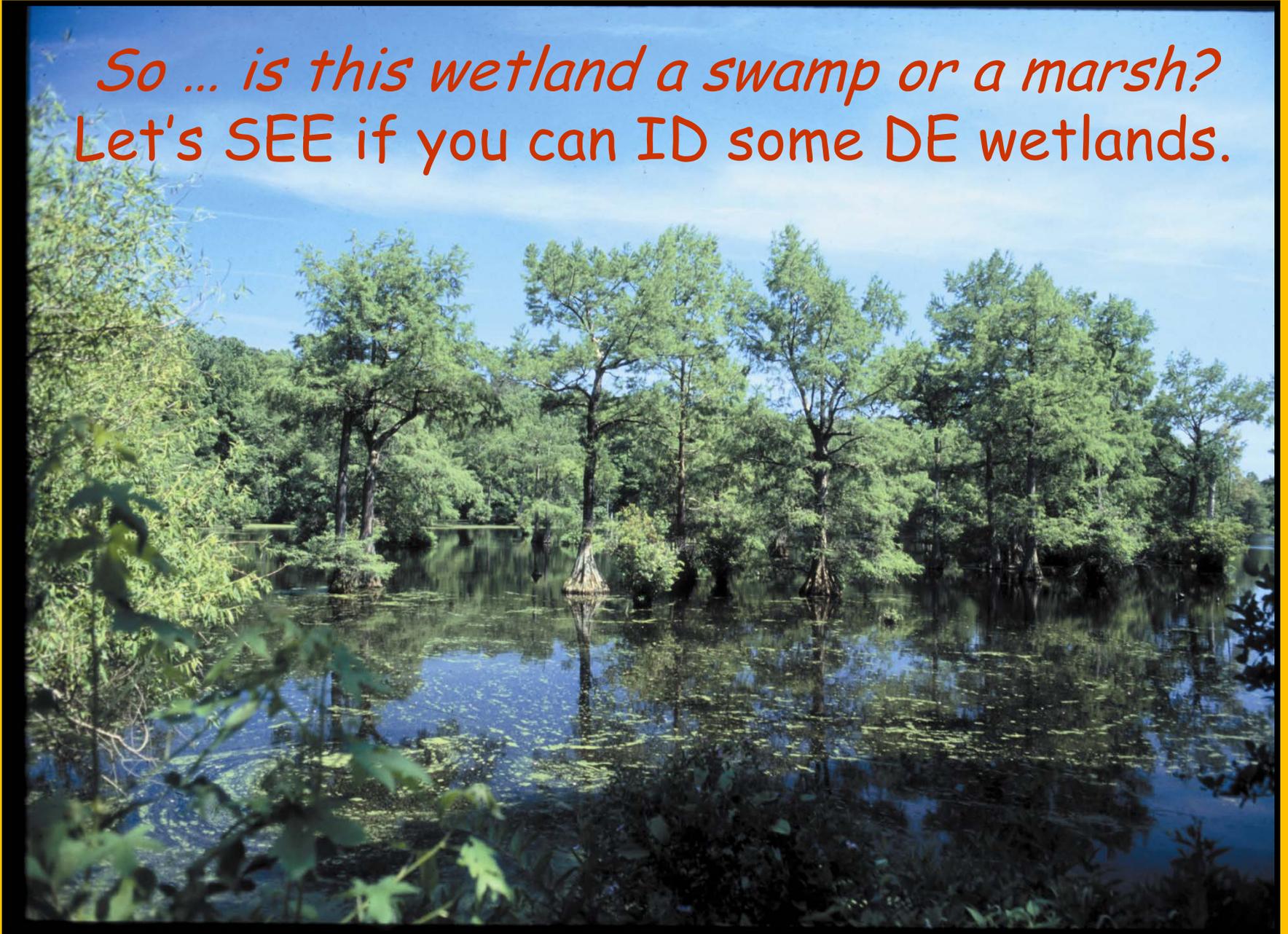
If you answered **D**, you also missed the mark. There is no hard or fast rule distinguishing water levels in marshes and swamps. Most DE swamps have no standing water for much of the year.

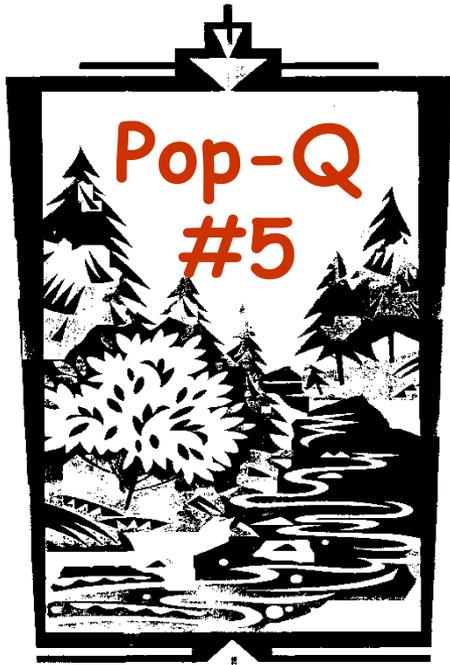
If you answered **C**, you also score zip here. Both marshes and swamps may or may not be connected to streams/rivers/ponds.

So the winning answer here is ...

**B.** Swamps have trees in them, and marshes don't

*So ... is this wetland a swamp or a marsh?  
Let's SEE if you can ID some DE wetlands.*



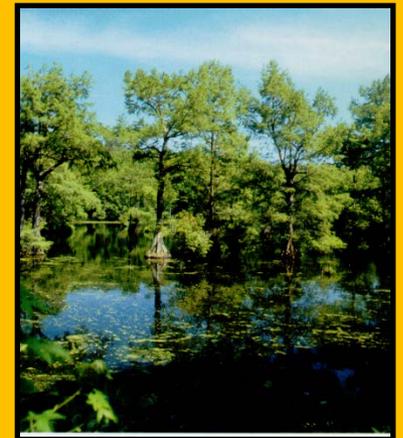
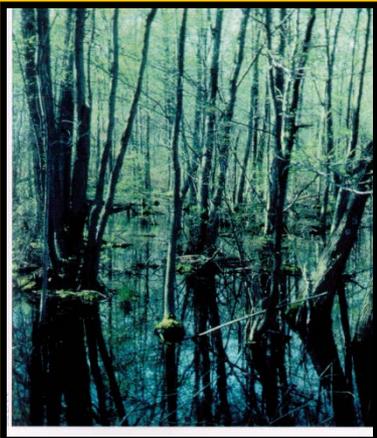


Delaware's Watersheds

Yes, that wetland is a swamp!

The pictures below feature 4 of DE's prominent wetland types. Try your luck matching the pictures to the names.

- A. estuarine (tidal) marsh
- B. freshwater hardwood swamp
- C. cypress swamp
- D. Delmarva Bay (coastal plain pond)



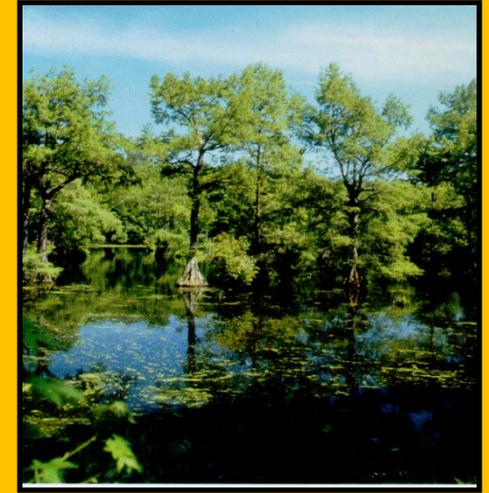
# And the correct answers are ...



A. estuarine marsh



B. hardwood swamp



C. cypress swamp

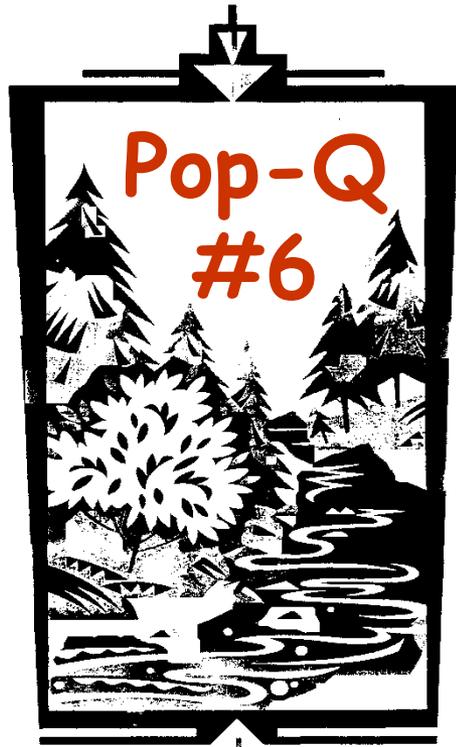


D. Delmarva Bay

If you missed 'D', don't feel bad. This is a special kind of seasonal wetland found on the coastal plain. Called *Delmarva Bays*, *coastal plain ponds* or *whale wallows*, these wetlands appear as small, shallow depressions, often surrounded by woods, where water collects in winter/spring, then dries up in summer.



So, we  
have  
different  
kinds of  
wetlands  
in DE,  
but which  
kinds are  
most  
abundant?



Delaware's Watersheds

The most abundant wetland types by acreage in Delaware today are:

- A. coastal tidal marshes
- B. freshwater hardwood swamps
- C. Cypress swamps
- D. Delmarva Bays
- E. Constructed (man-made) wetlands

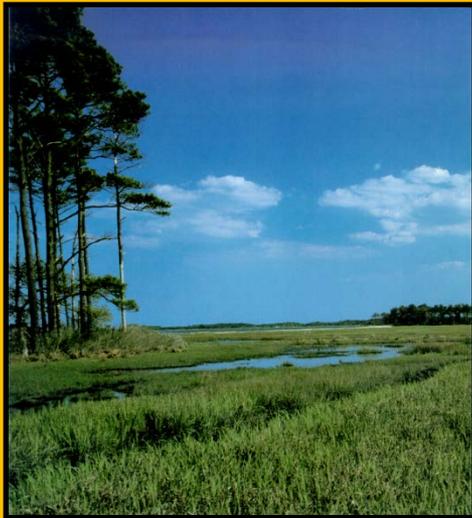
And the  
answer is ...

Other DE  
wetland types  
of note ...



## B. Hardwood Swamps

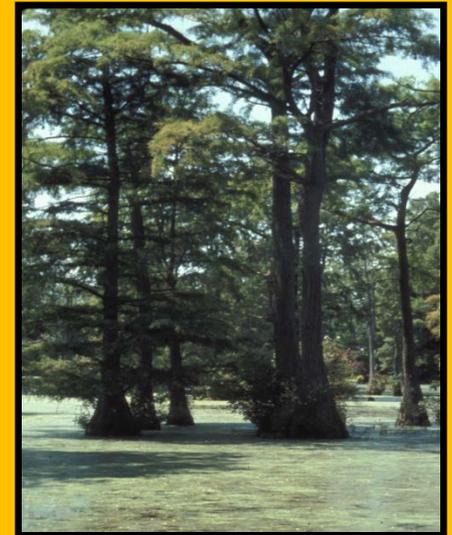
(comprise about  
half of DE's  
wetland areas)



Tidal Marshes  
(1/3 of DE's wetlands)



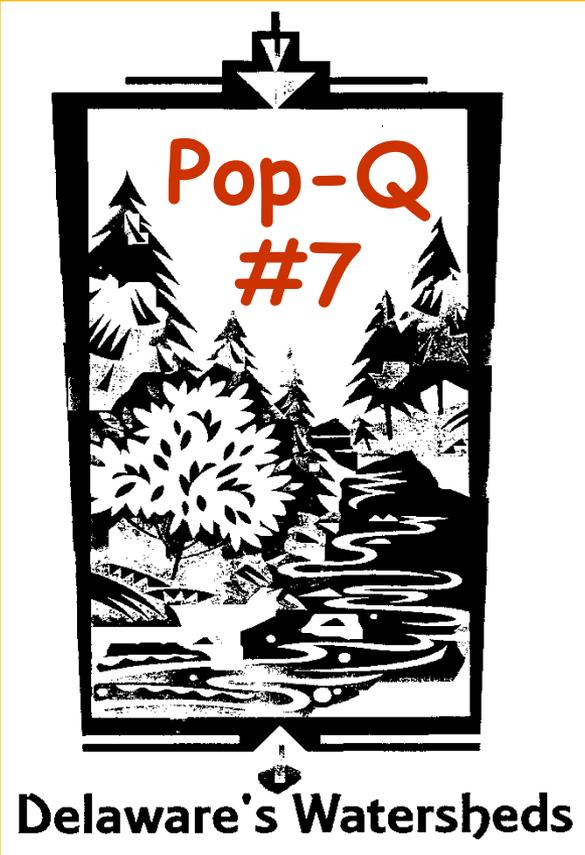
Delmarva Bays  
(havens for biodiversity)



Cypress Swamps  
(northernmost in U.S.)



So ... some kinds of wetlands are abundant,  
but how rich is Delaware in wetlands overall?



In terms of percentage of total land area that is wetlands, today DE has:

- A. over 50%
- B. about 33%
- C. around 25%
- D. less than 10%

And the correct answer is ...

- B. about 25% of Delaware's land area today (>350,000 acres) is classified as wetland.

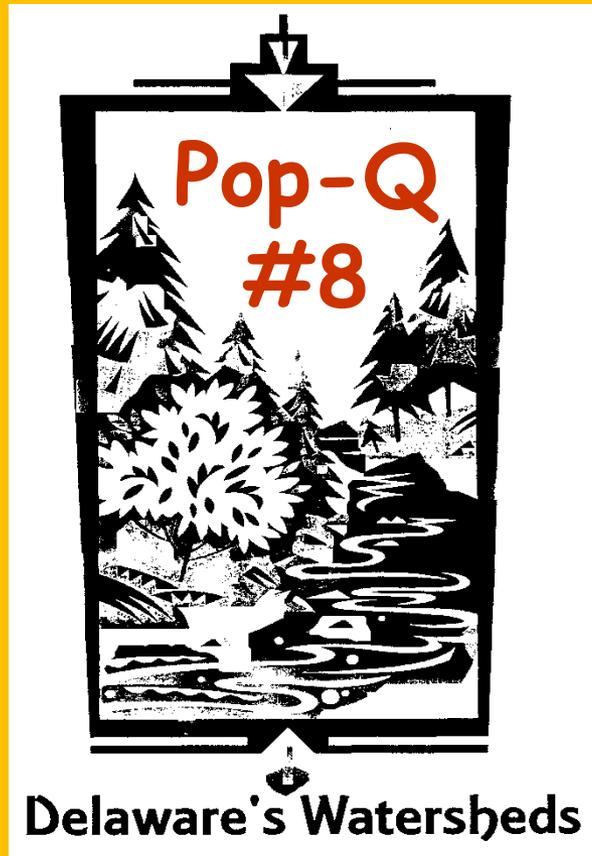


If you answered **C** on this one you should give yourself half-credit! For many years, it was reported that Delaware had about 18% of its present-day land area in wetlands. But recent refinements in mapping smaller wetland areas, along with addition of man-made wetlands, have increased those estimates.

*So ... quick review Q - Swamp or Marsh?  
How do present acreages compare to past?*



If you said 'Marsh', give yourself a bonus point.

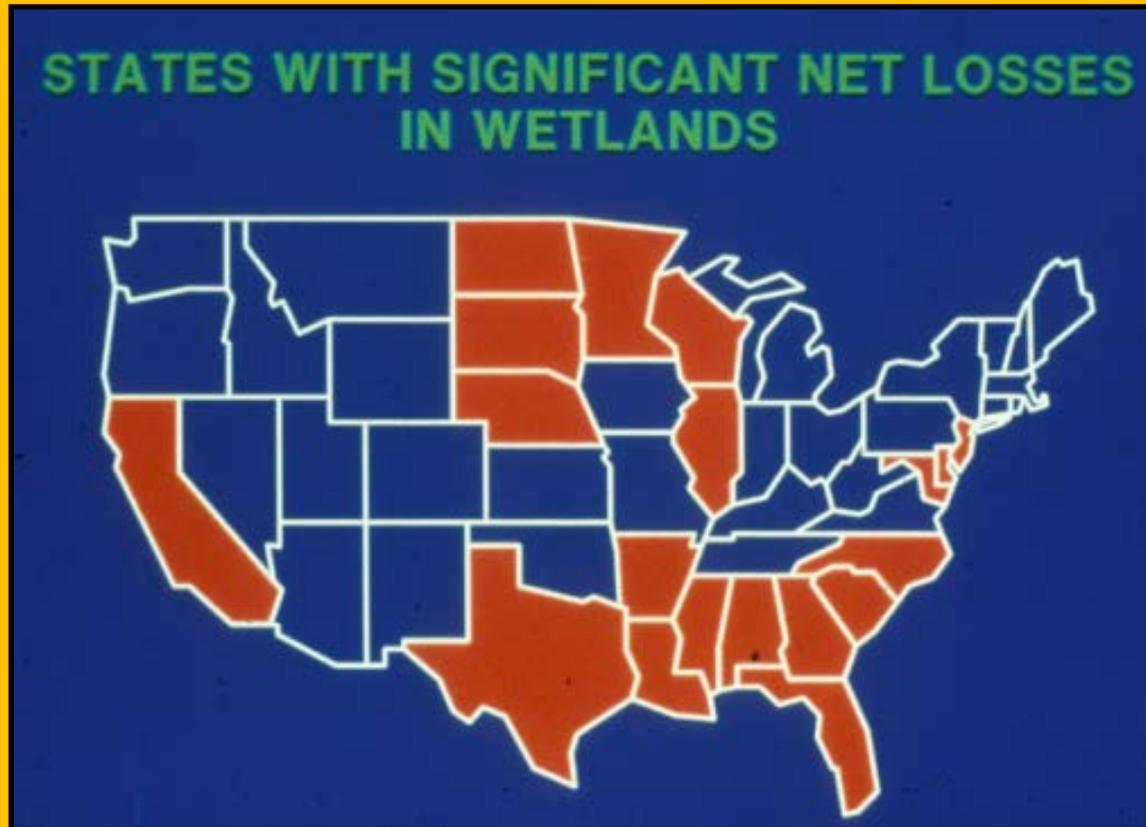


In terms of past/present comparisons of wetland acreages, Delaware:

- A. is the "Good to be First" state in having the highest proportion of its native wetlands remaining.
- B. has lost a greater share of its wetlands than any other state.
- C. has about half now of what it had before European settlement.
- D. we really just don't know.

And the answer is ...

C. DE has about half now of what it had before European settlement.



1. **ALASKA**  
(170 million acres)
2. **FLORIDA**  
(11 million acres)
3. **LOUISIANA**  
(8.8 million acres)
4. **MINNESOTA**  
(8.7 million acres)
5. **TEXAS**  
(7.6 million acres)

Despite losses, fortunately, plenty of wetlands remain. Bonus Q:  
*How many of the top 5 states (in wetland acres) can you guess?*

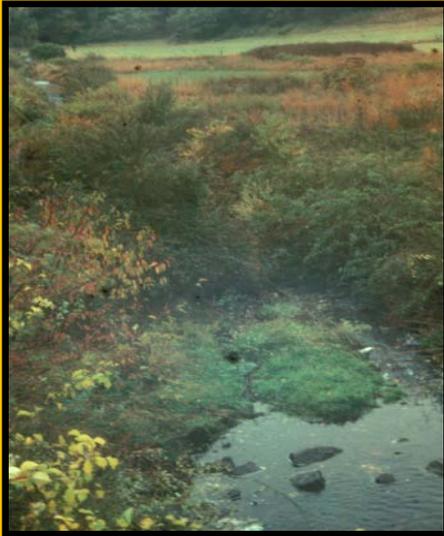


So ... we've got all these wetlands here, but what do they have to do with watersheds?

# ROLE OF WETLANDS IN OUR WATERSHEDS



Wetlands are often transitional places between deepwater habitats and the upland areas where we live, play, shop, etc. As such, they help buffer us from the damaging impacts of storms and floods.



Because wetlands are also very good at filtering and trapping pollutants, they help clean water coming off the land before it runs off to our rivers and bays.

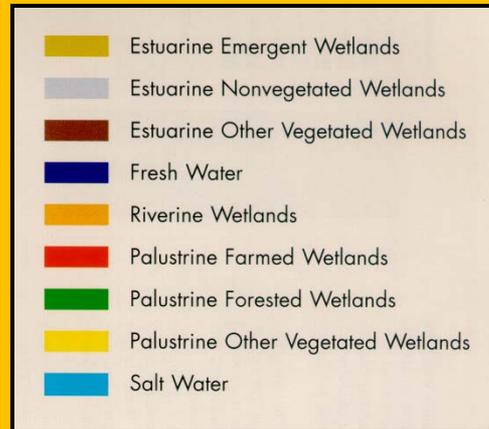
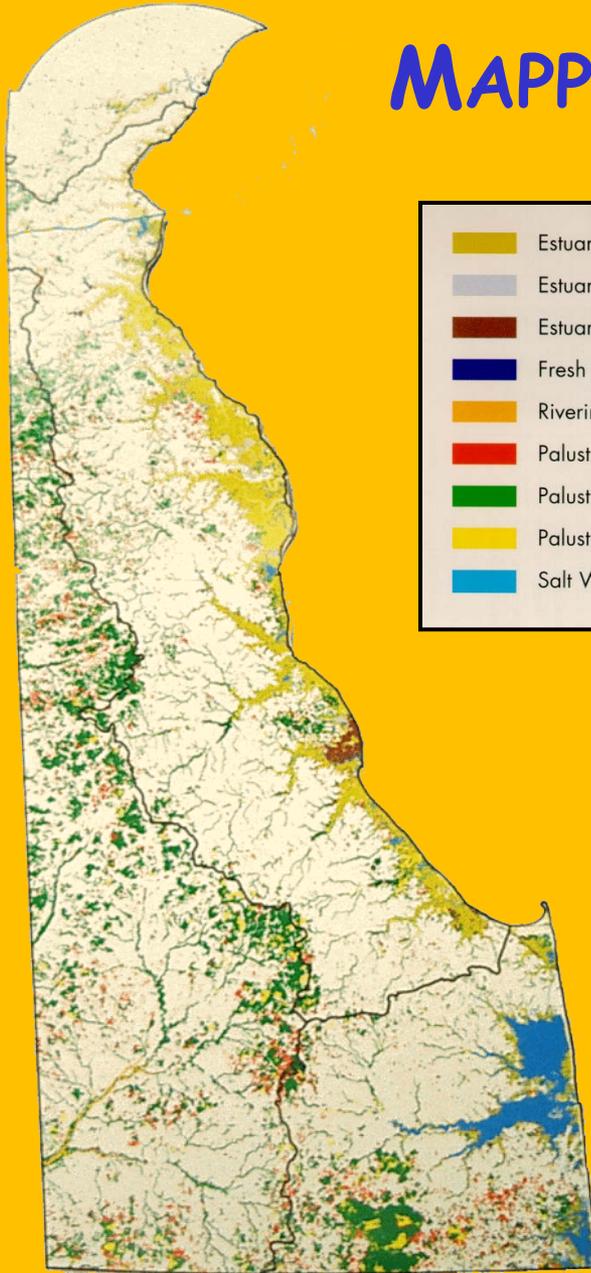


Wetlands also hold water in times of drought. This helps recharge our drinking water aquifers.



Wetland plants hold soils together, reducing and preventing erosion and the problems it causes.

# MAPPING DELAWARE WETLANDS



The good news is ... just about anywhere you live in DE, wetlands are close by helping do their part for our watersheds.

The two bands (coastal yellow and inland green) represent the two predominate wetland types in DE:

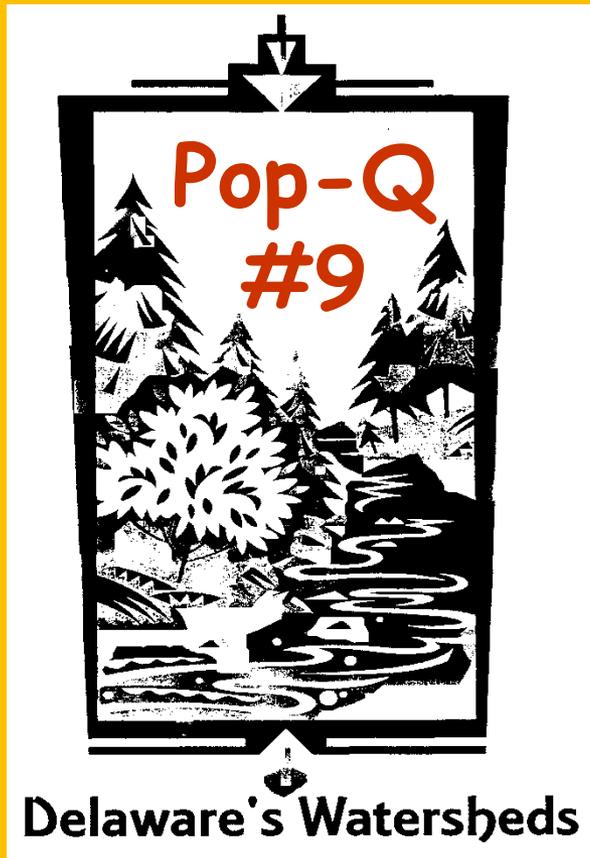
Estuarine (tidal) marshes

Freshwater forested wetlands

**Source:** Tiner, R.W. 2001. Delaware Wetlands: Status and Recent Trends. U.S. Fish & Wildlife Service. 19 pp.

So ... wetlands are vital to watersheds,  
but what values do they hold for us?





DE wetlands are beneficial in that they ...

- A. provide critical habitat for many rare and threatened species.
- B. buffer adjoining lands from full effects of storms and floods.
- C. improve water quality by trapping filtering, and removing pollutants.
- D. serve as valuable nursery areas for fish and shellfish resources.
- E. offer natural 'recycling' places for old tires and used appliances.

# And the answers are ... A,B,C & D and more ...



provide critical habitat for many of our rarest and threatened species

serve as refuges for recreating & reconnecting with the natural world



*"When I would recreate myself, I seek the darkest wood, the thickest and most interminable and most dismal swamp. I enter the swamp as a sacred place - a sanctum sanctorum. This is the strength, the marrow of nature."*

*Henry David Thoreau*



buffer land areas from the full effects of storms and floods



act as "Nature's kidneys" by trapping, filtering and removing water pollutants



offer valuable nursery and growing areas for fish and shellfish

For those of  
you who like  
that old  
bottom line ...



**\$22,100,000,000**  
estimated direct value  
of all U.S. wetlands to  
fishing/hunting/trapping



**\$2,600,000,000**

value to wildlife watching  
& eco-tourism activities



**\$11,700,000,000**

value to flood control  
& shoreline protection



**\$1,600,000,000**

value to filtering and  
improving water quality

**Grand Total: \$38 billion**

**Source:** Valuing wetlands: the cost of destroying America's wetlands. 1994. National Audubon Society. Washington, DC. 32 pages.

# Hard lessons from recent "natural disasters"

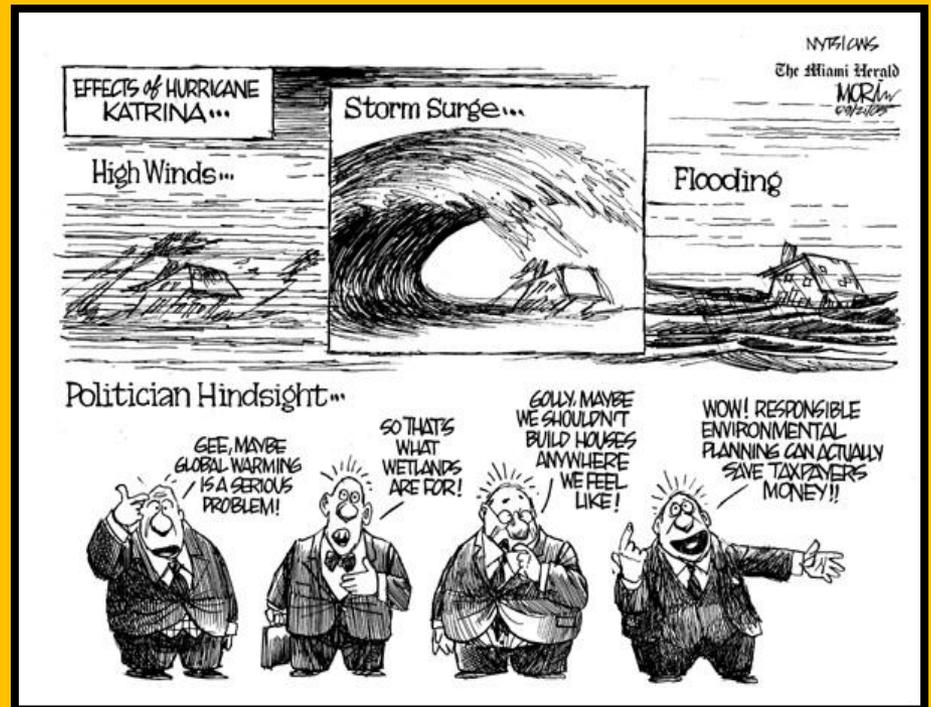
Wetlands provide the primary line of defense against storms and floods.

Satellite images from the 2004 Asian tsunami showed that coastal areas where mangrove swamps were still present (not lost to human development) suffered far less damage than places where wetlands had been removed.

The same lessons apply to Hurricane Katrina & the Gulf Coast in 2005.

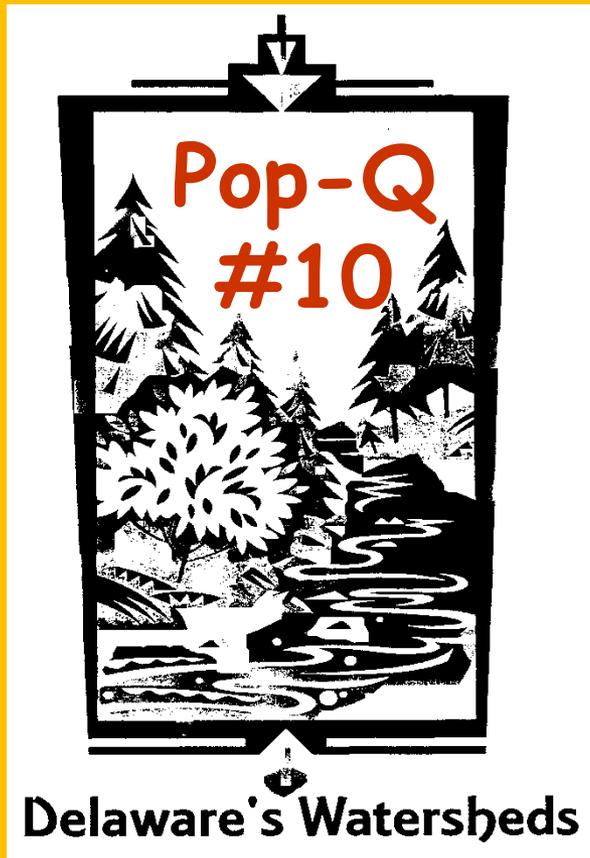
Since 1930, 1900 square miles of Louisiana's coastal wetlands have been lost (about the size of DE). For every 2.7 miles of coastal wetlands present, storm surges reduce by as much as one foot!

Although protection is a higher priority today, >25 square miles of Louisiana's valuable coastal wetlands are still lost each year (roughly two acres every hour).



So ... if wetlands are so valuable, we must be placing a high priority on protecting them, right?





Which of the following statements most correctly describes the recent trend in loss/gain of Delaware wetland acreages?

- A. Due to rampant development, loss of DE wetlands, especially coastal marshes, is occurring at a faster rate than ever.
- B. Hundreds of wetlands acres are still being lost each year, but some of those losses are offset by acres added through wetland mitigation (creation) projects.
- C. DE is holding steady in its wetland acreages, with total losses offset by new wetland creation projects.
- D. Thanks to stricter government regulations and enforcement, DE is now gaining more wetlands than it's losing.



And the answer is ...

B. Wetlands are still being lost, but some of the losses are offset by wetland creation projects.



And those losses are mainly impacting the smaller, more inland freshwater wetlands, not the larger, better-protected expanses of coastal marshes.



COASTAL Wetlands: Protected!  
(averaging <11 acres lost/year)



FRESHWATER Wetlands: Need help!  
(averaging >200 acres lost/year)

So ... what should  
we be watching  
out for?

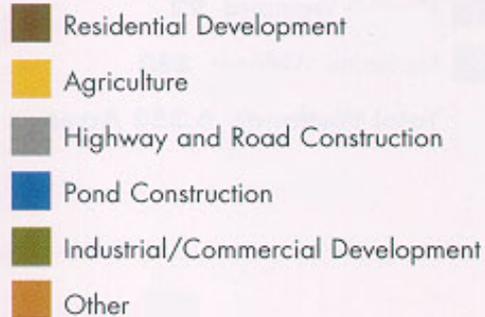
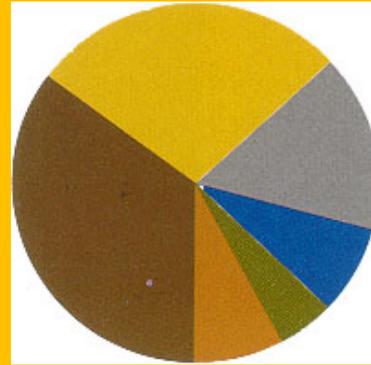


Photo courtesy of Bob Meadows, Delaware Division of Fish & Wildlife

residential development - the urbanization of the coastal plain



## THREATS TO DELAWARE WETLANDS TODAY



Causes of wetland loss on DE's coastal plain (source: Tiner, 2001)

habitat loss/fragmentation



loss of protection for small, seasonal, isolated wetlands



maintaining and restoring the quality of wetlands remaining



So, is there hope for Delaware wetlands?





Wetland restoration in marginal agricultural land

*USFWS Partners  
for Wildlife*

*Delaware  
Landowner  
Incentive  
Programs*



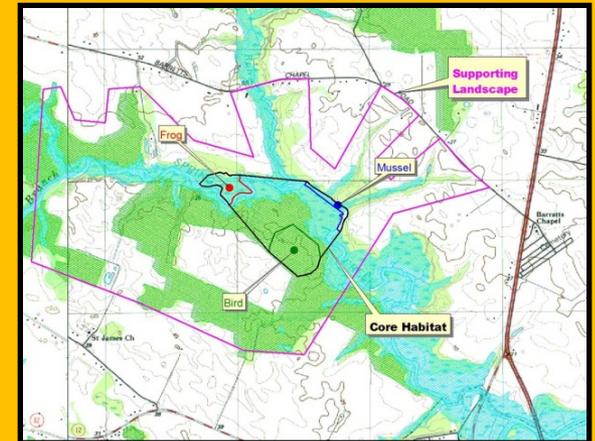
*Northern DE Wetlands  
Rehabilitation Project*

**YES INDEEDY!  
& HERE'S WHY**



DE Wetlands Monitoring  
and Assessment Project

Some current  
programs that  
are helping  
restore and  
protect  
Delaware  
wetlands



*Delaware Wildlife  
Action Plan*



# Delaware Wetlands:

Status and Changes from 1992 to 2007

Explore a wealth of information for engaging students in DE wetlands research/reporting

## 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 sustain 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/benthic wetlands. An analysis conducted on loss occurring between the early 1980's and 1990's showed that most of the modern wetland loss was due to the conversion of wetlands to development, farm fields, and good 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 watershed's wetland restoration and management plan for the watershed and inform land-use planning that could impact wetlands.

\*This percentage is based on the 2007 Land Use/Land Cover mapping 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

Check out the newly-updated, science-rich DE wetlands website maintained by DNREC's Division of Watershed Stewardship at:

[www.dnrec.delaware.gov/Admin/DelawareWetlands](http://www.dnrec.delaware.gov/Admin/DelawareWetlands)

## Delaware Wetlands

**Purify**      **Provide**      **Protect**

[www.dnrec.delaware.gov/admin/delawarewetlands](http://www.dnrec.delaware.gov/admin/delawarewetlands)

There is hope ... and it is us!

Transition to *Wetland Dominoes* and  
*Wetland (WADE) kit* activities

The following individuals/agencies contributed photos used in this slide show:

Todd Fritchman, Indian River School District

Bob Meadows, DE Division of Fish and Wildlife, Mosquito Control Section

Amy Jacobs, DE Division of Water Resources, Watershed Monitoring Section

Mark Biddle, DE Division of Water Resources, Watershed Monitoring Section

Steve Williams, DNREC Secretary's Office, Ecological Restoration Program

Delaware DNREC, Natural Heritage and Endangered Species Program

DE-DNREC, Aquatic Resources Ed. Center and Adopt-a-Wetland Program

Photos and data relating to DE wetlands types/status were also taken from:

Tiner, R.W. 2001. *Delaware's Wetlands: Status and Recent Trends*.  
U.S. Fish and Wildlife Service, Northeast Region, Hadley, MA.