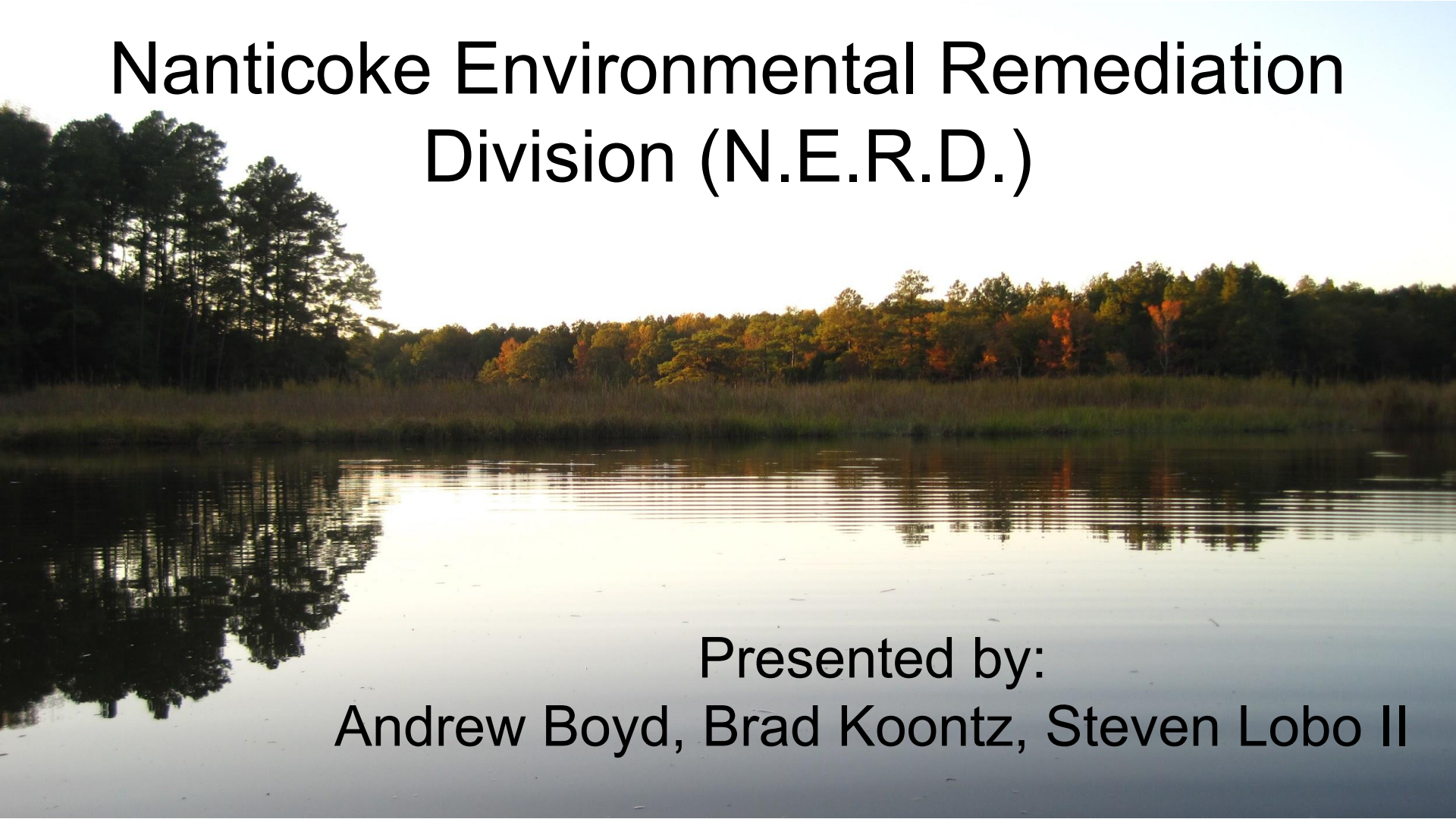
Nanticoke Environmental Remediation Division (N.E.R.D.)



Presented by:
Andrew Boyd, Brad Koontz, Steven Lobo II

Overview

- Mission Statement
- History and Characteristics
- Population
- Land Use
- Water Use
- Environmental Problems
- Existing Organizations
- Problems and Solutions

Figure 1: Nanticoke River during Winter

Mission Statement

- The Nanticoke River is a historically “dirty” river but, conditions are improving.
- This watershed is home to more than 250 endangered plant and animal species as well as containing the most significant wetlands of the Delmarva peninsula.
- Nitrogen and phosphorous are causing algal blooms. Also, the sandy soil is allowing groundwater pollution to travel faster.
- We seek to reduce nitrogen and phosphorus levels by 50% in the next 20 years, as well as reduce groundwater pollution transport by 25%.

Figure 2: Nanticoke River during Summer

History - Natives & Settlers

- 10th C: evidence of fishing, farming, and hunting by Nanticoke Indians
- Early 17th C: estimate of 1,000 acres of agriculture in watershed when Captain John Smith explored
- Mid 17th C: Nanticoke Indians have been removed to three reservations
- 1660's: land patents are first filed by settlers- primarily for use as tobacco fields
- Sharptown, Vienna, and Bethel become shipbuilding hubs and remained so until the early 20th C saw the forests cleared
- British attacked Vienna during the War of 1812 because it was considered a major port

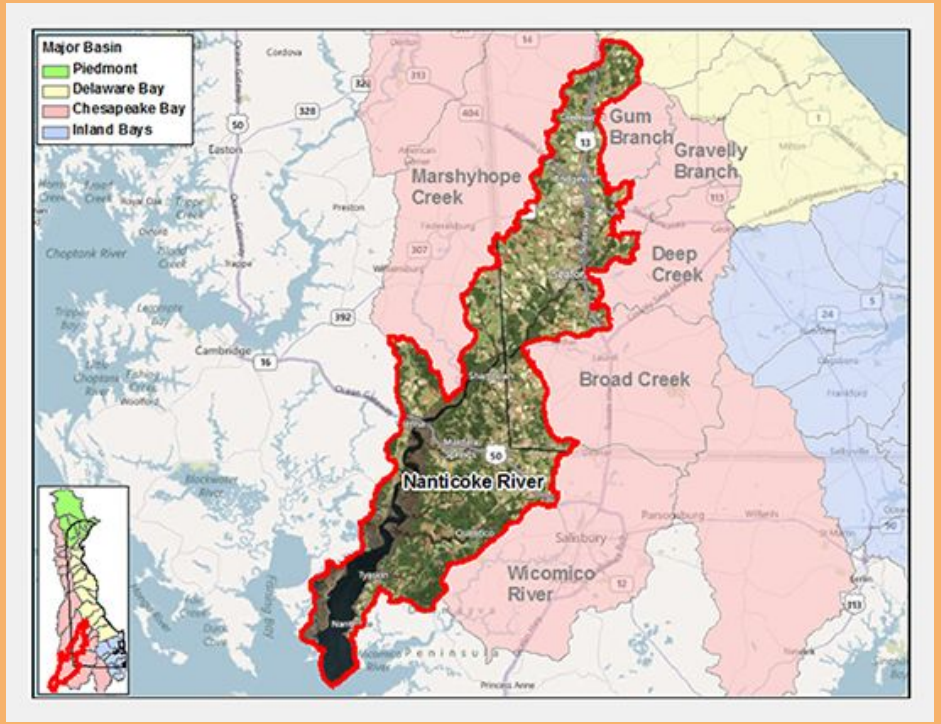


Figure 3: Outline of Nanticoke Watershed with Nearby Watersheds

GIS Applications 1

This map displays the Nanticoke DEM after the Fill tool has been run on it.

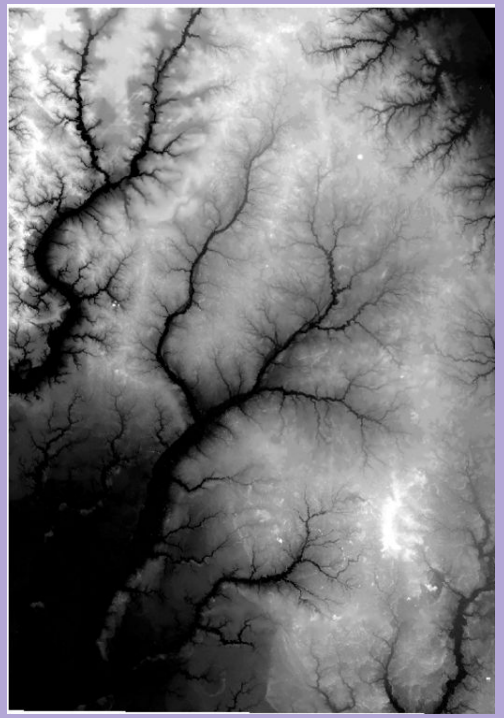


Figure 4: DEM Fill

This map displays the Naticoke DEM after the Flow Direction tool has been run on it.

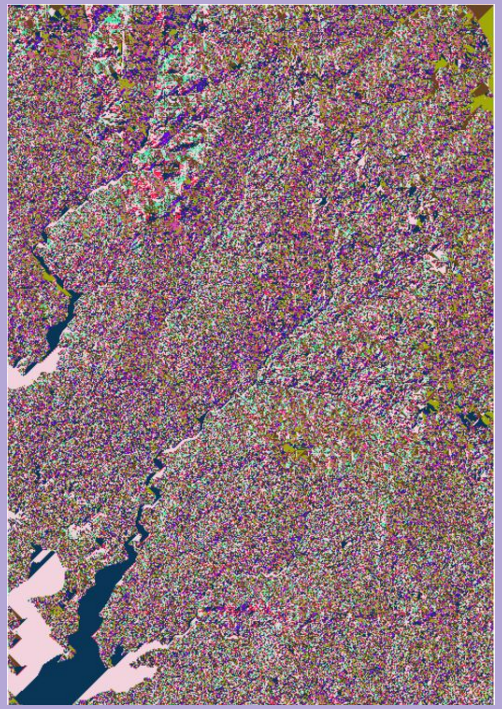


Figure 5: Flow Direction

This map displays the sub-basin areas that drain to each of the targeted stream links.

Figure 6: Sub-basin Drainage

Watershed Characteristics

- Area: 725,000 acres or 1,130 square miles
- Length: 88.5 miles
- Channel Depth: Dredged to 12 ft to Seaford, DE
- Maximum Elevation: 19.8 ft
- Features generally very flat terrain
- Span: 2 States and 5 Counties (Kent & Sussex in DE; Caroline, Dorchester & Wicomico in MD)

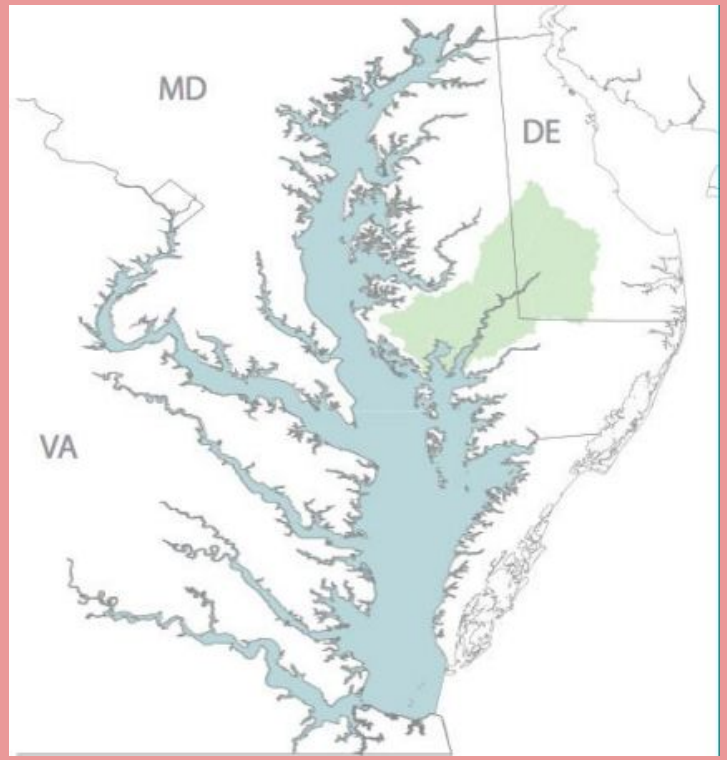
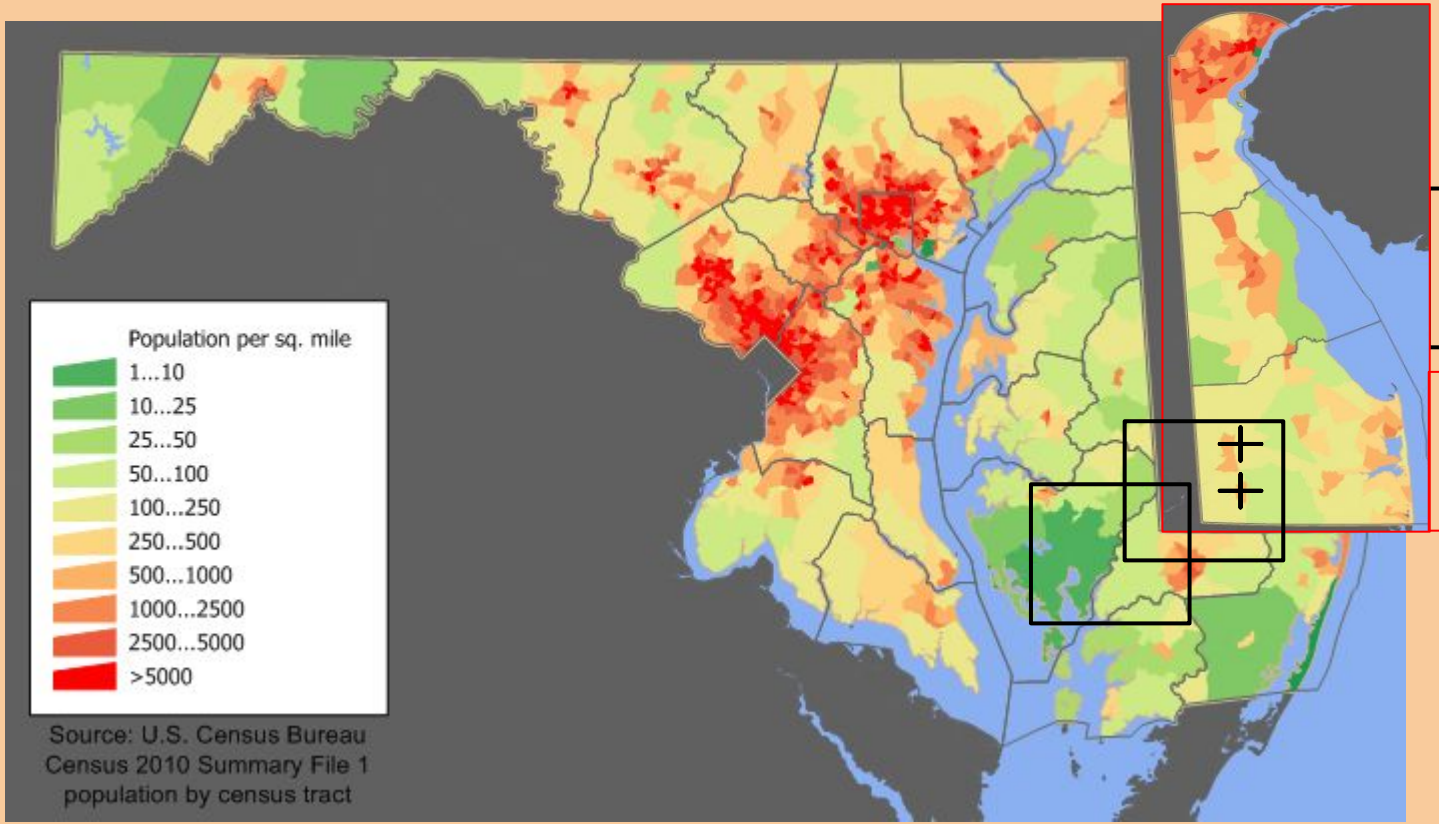


Figure 7: Nanticoke River Watershed is shaded in green

Population



Population: 42353

Source: U.S. Census

Major Cities
Seaford, DE (2013)- 7,325
Laurel, DE (2013)- 3,912

Figure 8: Population Density Map of Delaware and Maryland, Nanticoke River Watershed is roughly captured in the black boxes, Laurel and Seaford are marked with black crosses

Land Use

- Approximately 20% of Watershed is protected
- Blackwater Wildlife Refuge: 27,000 acres
- State and Local Parks: 32,000 acres
- Primarily agricultural with large forested areas near the bay and along waterways.
- Heavily residential and commercial near port cities such as Seaford and Federalsburg.
- Major decline in wetlands from approximately 50% historically to just over 20% by 1998.

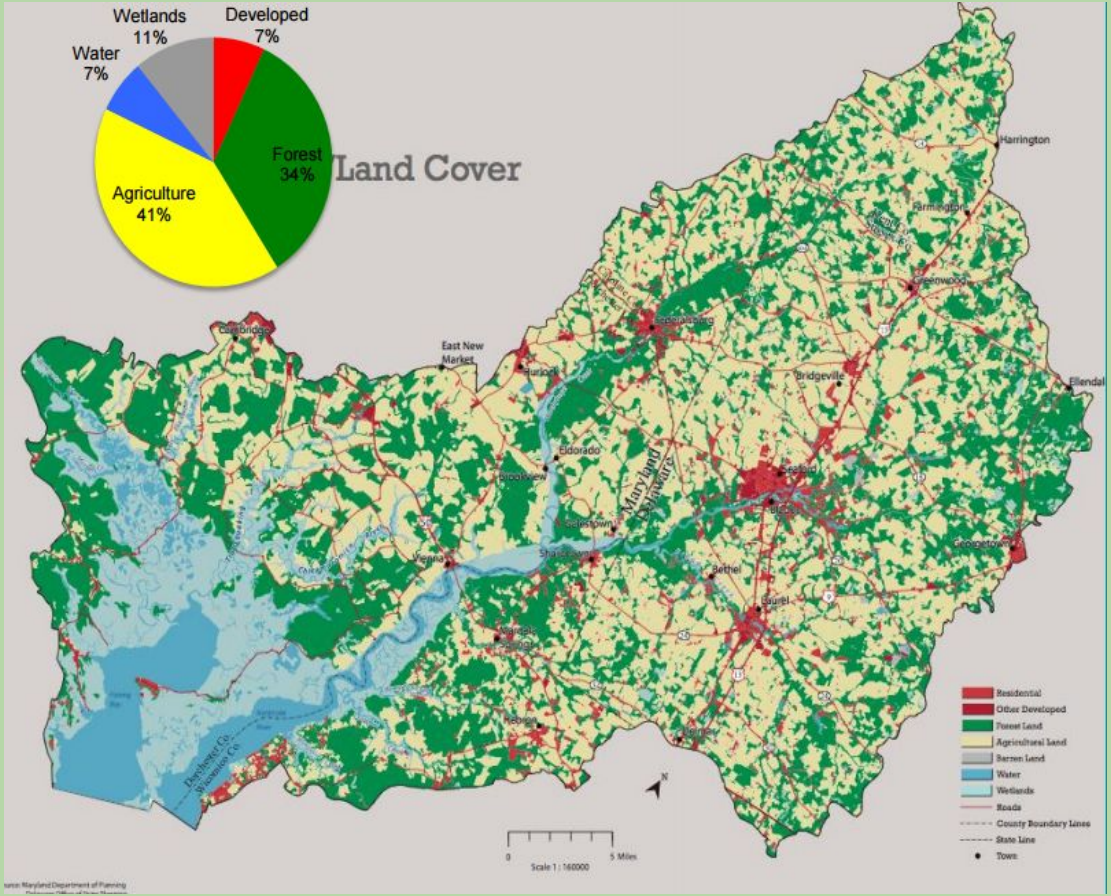


Figure 9: Land Use Map of Nanticoke River Watershed

Water Use

- With the exception of blue crabs, commercial fishing has been reduced due to poor stream health.
  - Overfishing of oysters in the past has all but eliminated them.
- Recreational fishing remains very popular.
- It is free of dams which supports the remaining fisheries.
- Popular for boating and supports a number of marinas and yacht clubs.

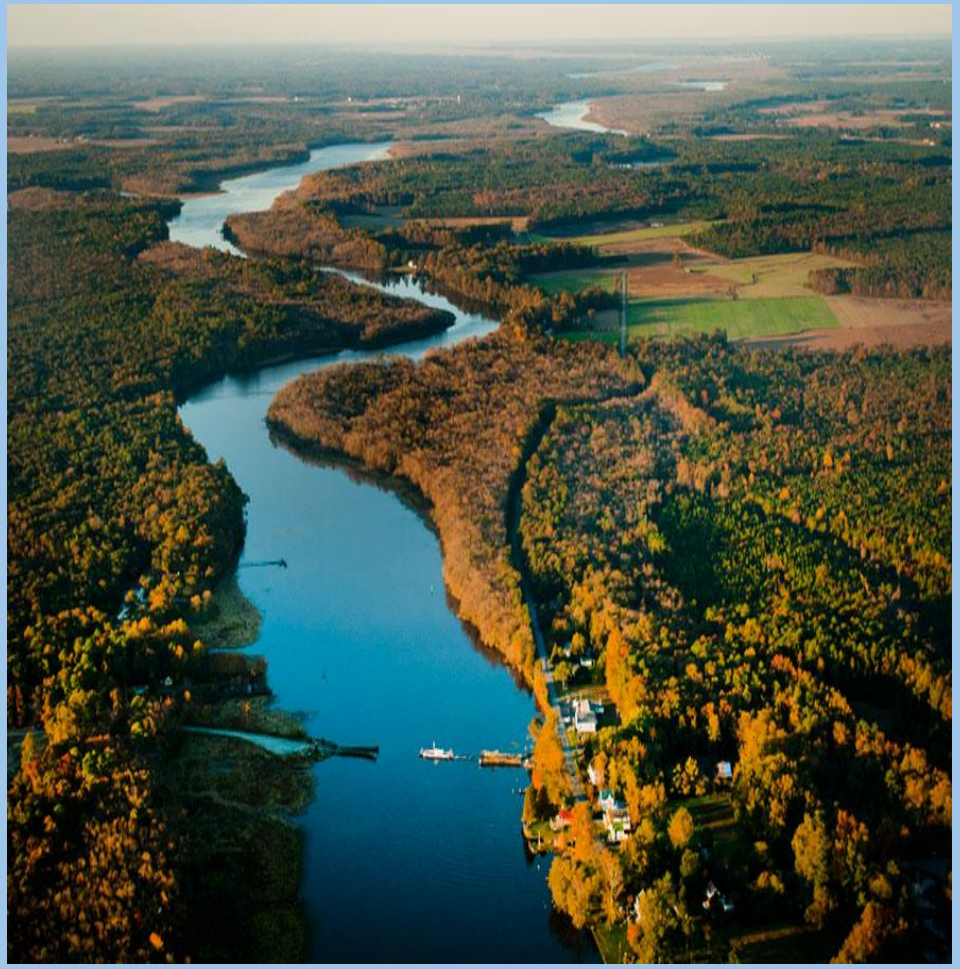
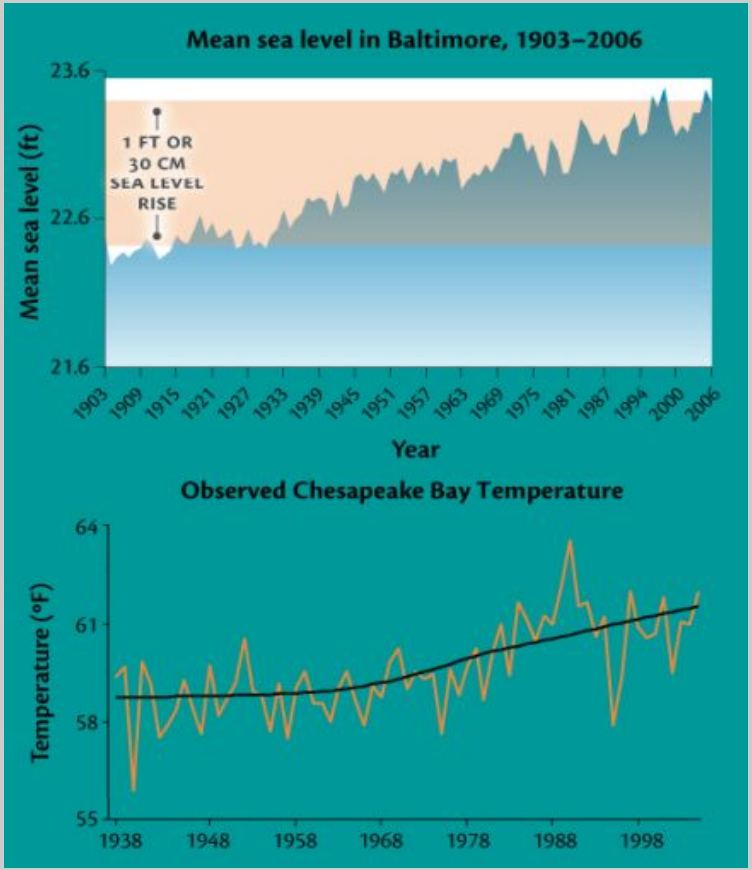


Figure 10: Aerial View of the Nanticoke River and Surrounding Areas

Environmental Problems

Sea-level Rise Will Redraw Maps



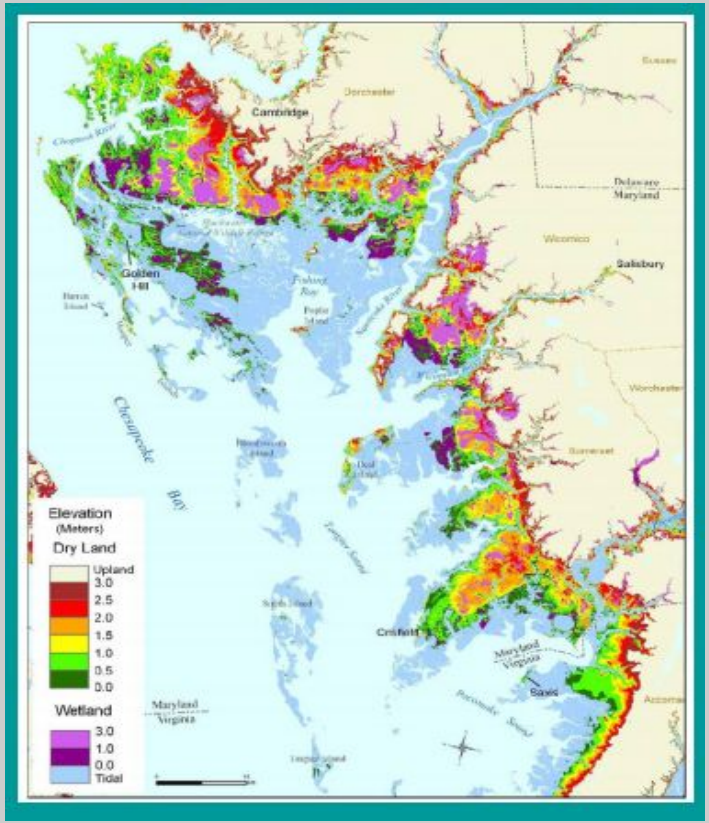


Figure 11 (Top Left): Graph depicting sea level rise over 100 years in Baltimore, MD.
Figure 12 (Bottom Left): Graph showing average water temperature increase in the Chesapeake Bay.
Figure 13 (Above): Graph showing low-lying areas around mouth of the Nanticoke River.

GIS Applications 2

This map displays agricultural areas extracted from the Landuse raster.

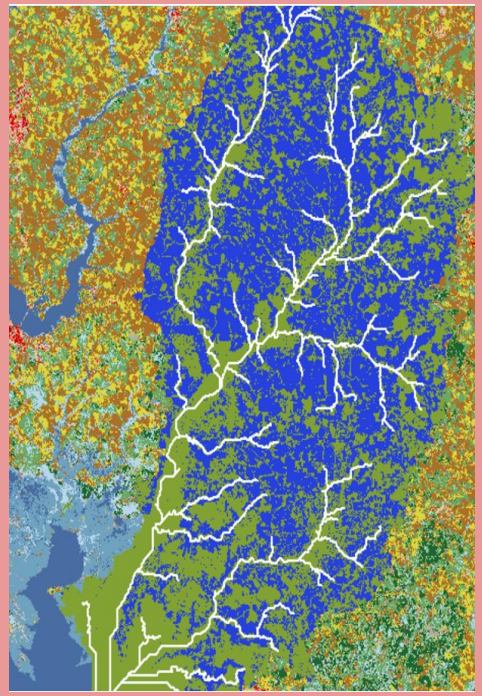


Figure 14: Agricultural Raster

This map displays the integer output map showing flow accumulations from agricultural cells only.

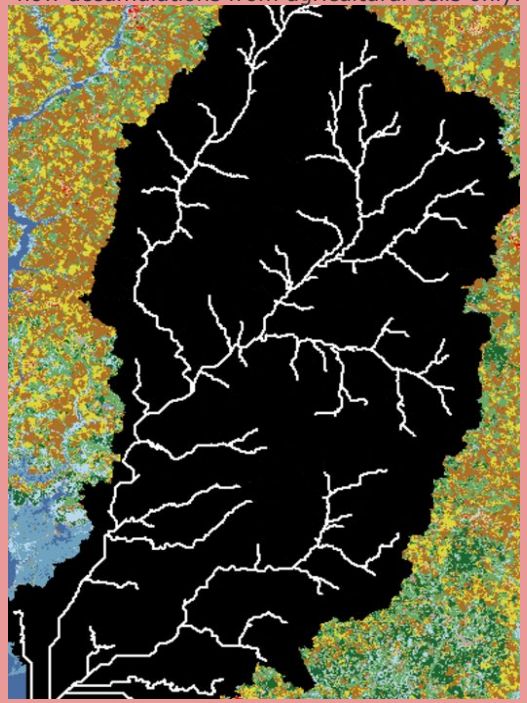


Figure 15: Integer Flow Accumulation

This map displays a better indication of the vulnerability of streams to agricultural runoff.

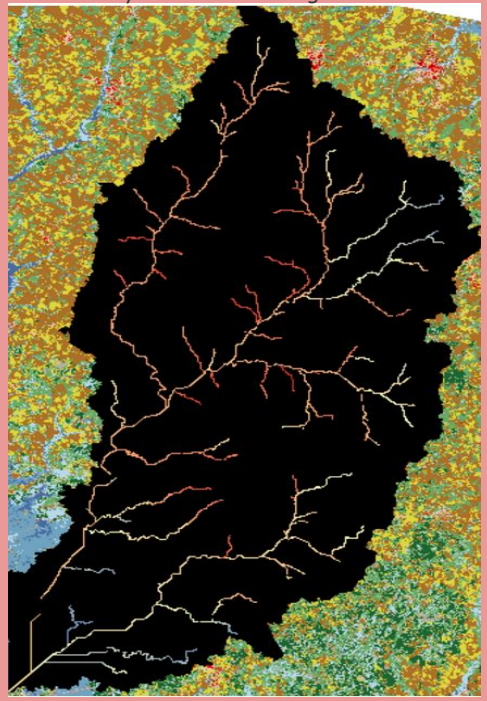


Figure 16: Runoff Vulnerability

GIS Applications 3

This image displays the normalized difference vegetation index map of the watershed.

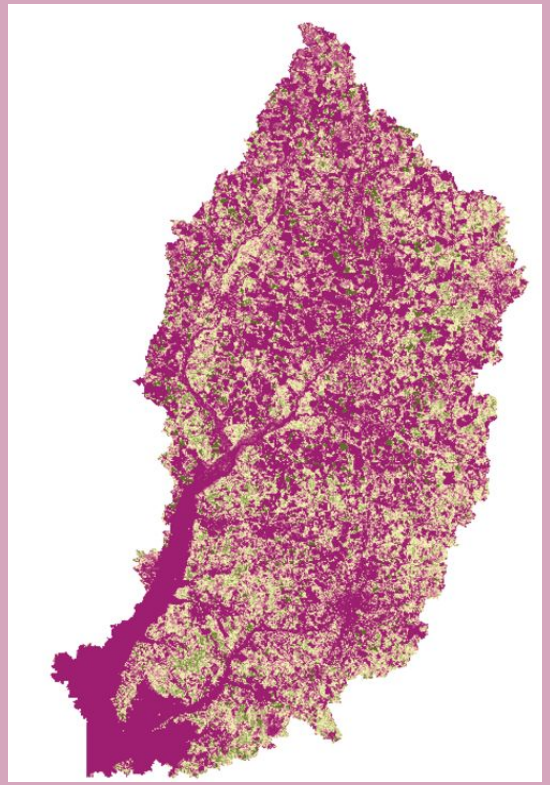


Figure 18: Vegetation Index

Runoff abatement map based on vegetation density weights.

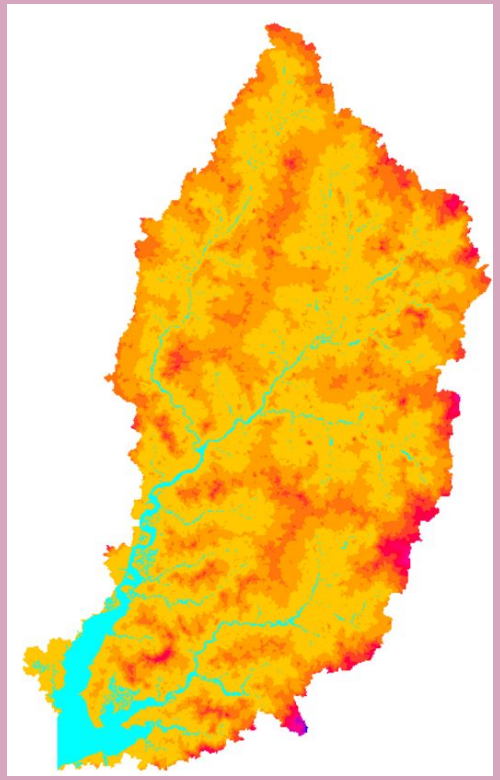


Figure 19: Runoff Abatement

Slope map from raster calculation

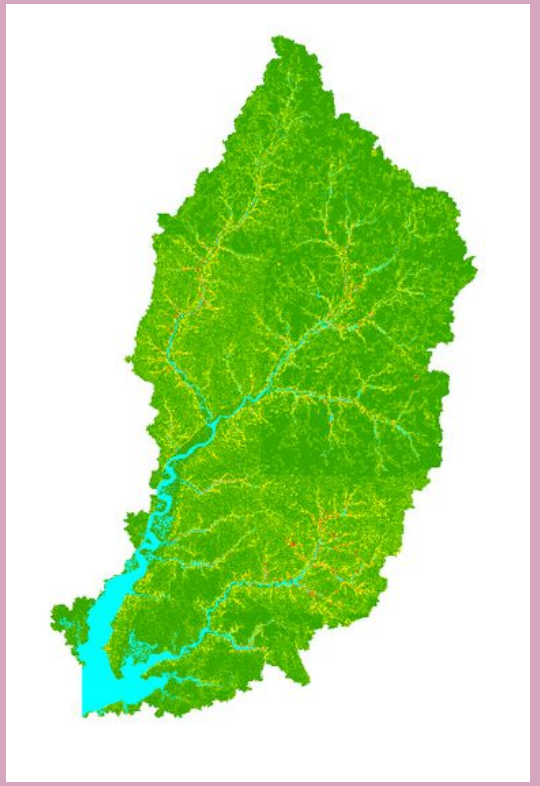


Figure 20: Slope Raster Calculation

Impervious Land

The total residential and urban developed land is about 2 percent of the watershed (CBF 1996). The watershed had 0.8 percent impervious surface cover in 1995.

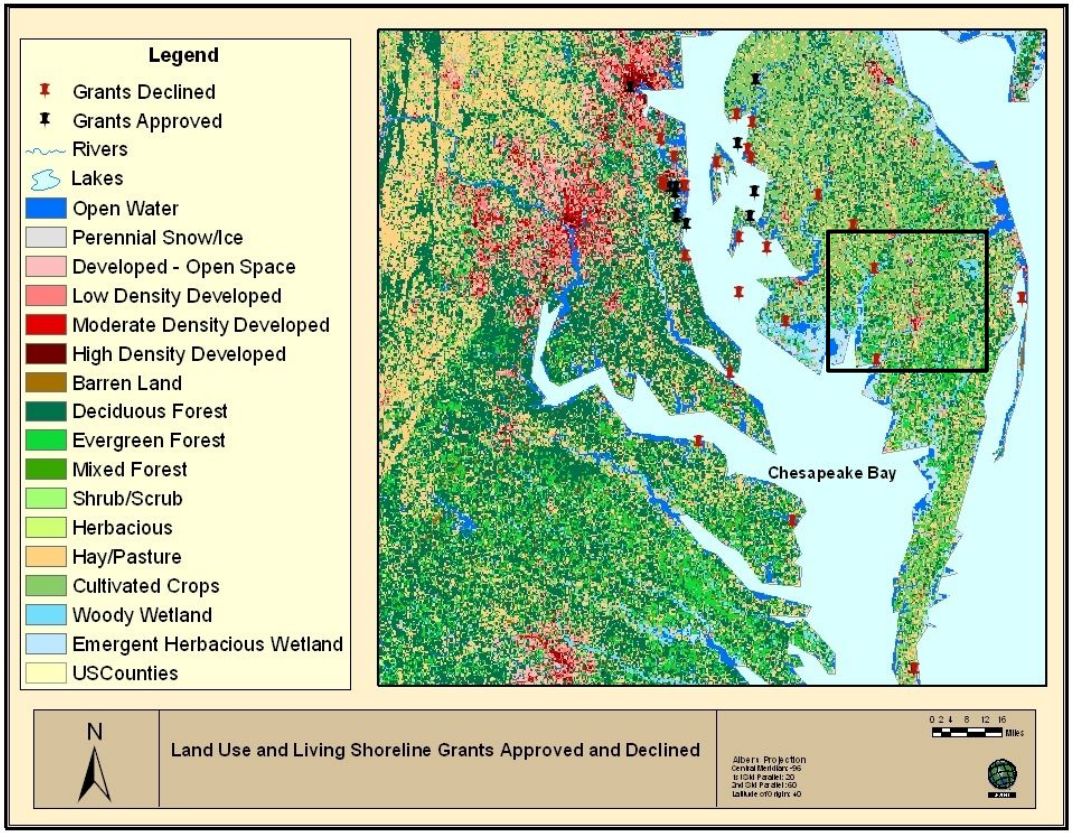


Figure 17: Impervious cover in the Chesapeake Bay area

Problems and Solutions

Table 1: Problem, Effect and Solution table

Problem	**Effect**	**Solution**
Excess nutrients (Nitrogen & Phosphorus) from poultry and crop farms	Algal blooms that result in decreasing dissolved oxygen	Agricultural programs or legislation to minimize runoff into the river
Sandy soil conditions in the watershed lead to groundwater pollution negatively impacting the river	Nitrates in groundwater flow in Nanticoke River	Regular emptying and maintenance of septic systems

Existing Programs and Organizations

- Envirocorp Labs
- Delaware Department of Natural Resources and Environmental Control
- Johns Hopkins University
- Chesapeake Bay Foundation
- National Park Service
- MD Department of Natural Resources
- Salisbury University
- Friends of the Nanticoke River
- Wicomico Environmental Trust
- Nanticoke Watershed Preservation Committee
- Nanticoke Resource Coalition
- The Nature Conservancy, Salisbury, MD Office
- Nanticoke River Conservation Directory

Sources

http://delawarewatersheds.org/chesapeake-bay/nanticoke-river/

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http://www.dnrec.delaware.gov/Admin/DelawareWetlands/Documents/Nanticoke%20Wetland%20Profile_final.pdf

http://imblackeagle.tripod.com/index-8.html