Science-Based Evidence for Water Quality Improvements, Challenges, and Opportunities in the Chesapeake Bay Ecosystem

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Lessons from Chesapeake Bay restoration efforts

- Reviewed 40 case studies
- Report (44 pp.) release date soon after government restarts
- “Without engineers, science is just policy”
- Three sections:
  - What works
  - Challenges
  - What we need
What works: Upgrades in wastewater treatment result in rapid local water quality improvements.

Nutrient removal upgrades in the upper Patuxent River estuary.
which can lead to the reestablishment of submerged aquatic vegetation
Improvements in sewage treatment technology were crucial.
Ecological feedbacks can create synergistic positive and negative trajectories.
Major nitrogen reductions have occurred throughout the Chesapeake Bay Watershed.

The Clean Water Act works.
What works: Improvements in air quality lead to reductions in atmospheric nitrogen deposition.

Annual mean wet inorganic nitrogen deposition
Mobile sources of air emissions are major contributors to atmospheric deposition and nutrient loading to the Chesapeake Bay.

U.S. nitrogen oxide (Nox) emissions by category (2006)

U.S. mobile sources of nitrogen oxide (Nox) emissions by sector (2007)
Improvements in air quality are from power plant scrubbers and vehicle catalytic converters.

Pre 1970’s: Over concern from early studies of smog in Los Angeles, CA, the catalytic converter was invented in the 1950’s by Eugene Houndry, a French mechanical engineer living in the United States. Catalytic converters were further developed by John J. Mooney and Carl D. Keith, creating the first production catalytic converter in 1973.

1975: The U.S. EPA requires that all new cars be equipped with catalytic converters. These ‘two way’ converters combine carbon monoxide (CO) and unburned hydrocarbons (HC) to produce carbon dioxide (CO₂) and water (H₂O)

1981: To keep up with the Clean Air Act of 1970, a new generation of catalytic converters act as a ‘three way’ catalyst, converting carbon dioxide (CO₂) and hydrocarbons (HC) to water (H₂O), and reducing nitrogen oxides (NOₓ) to elemental nitrogen (N₂) and oxygen (O₂).
Stream nitrate in forested watersheds is declining
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The Clean Air Act works.
What works: Reductions of agricultural nutrient sources result in improved stream quality.
Poultry litter export and cover crops significantly reduced total nitrogen concentrations.
Chicken population trends
Location and of individual poultry houses throughout the Delmarva Peninsula
2013 Chesapeake Bay Report Card

Chesapeake Bay Report Card 2013

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