



# Chesapeake Bay Restoration

## CHESAPEAKE BAY MODELING WEBINAR

Jeff Sweeney

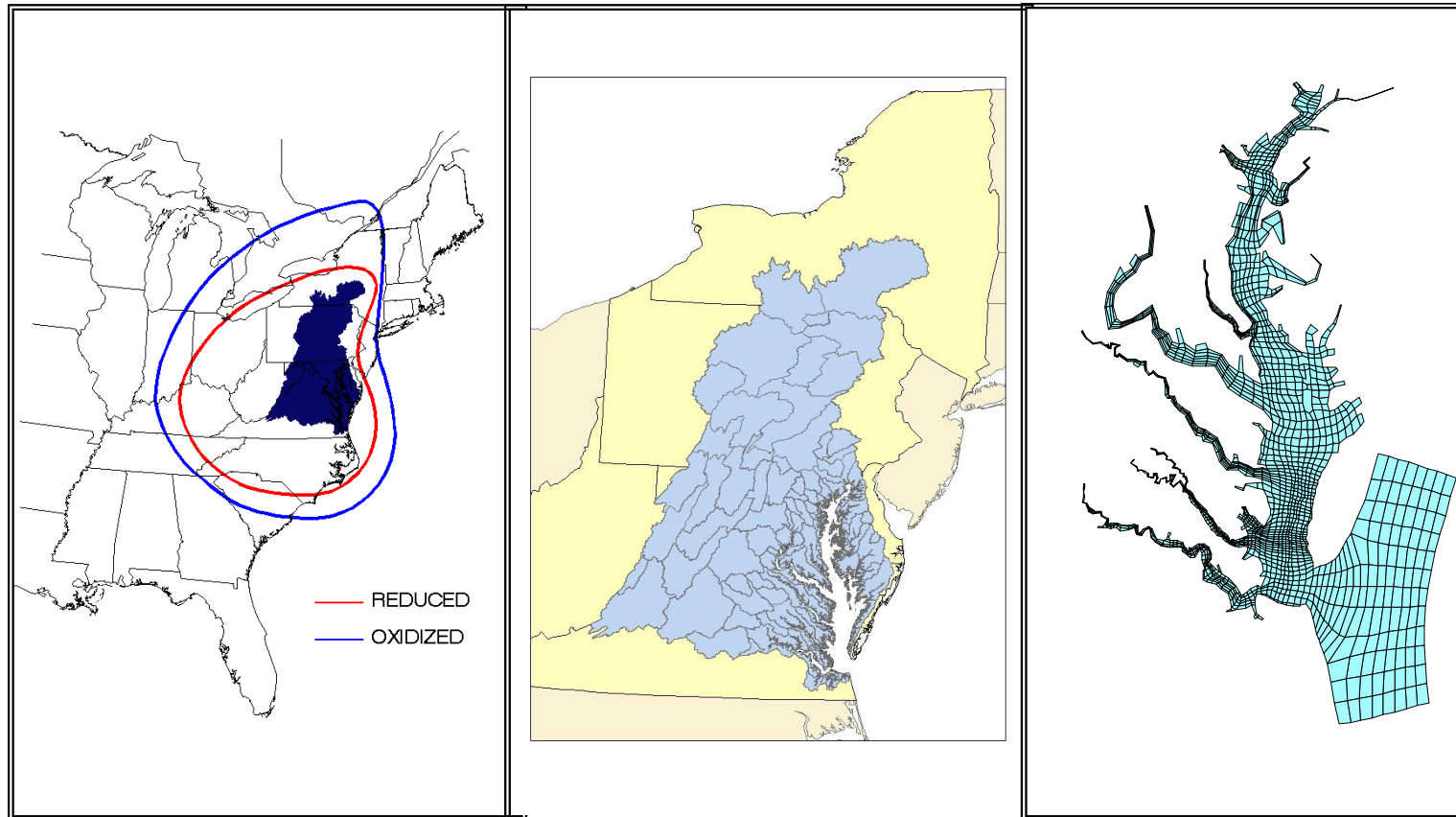
EPA, Chesapeake Bay Program Office

Chesapeake Bay Commission Webinar

May 8, 2020



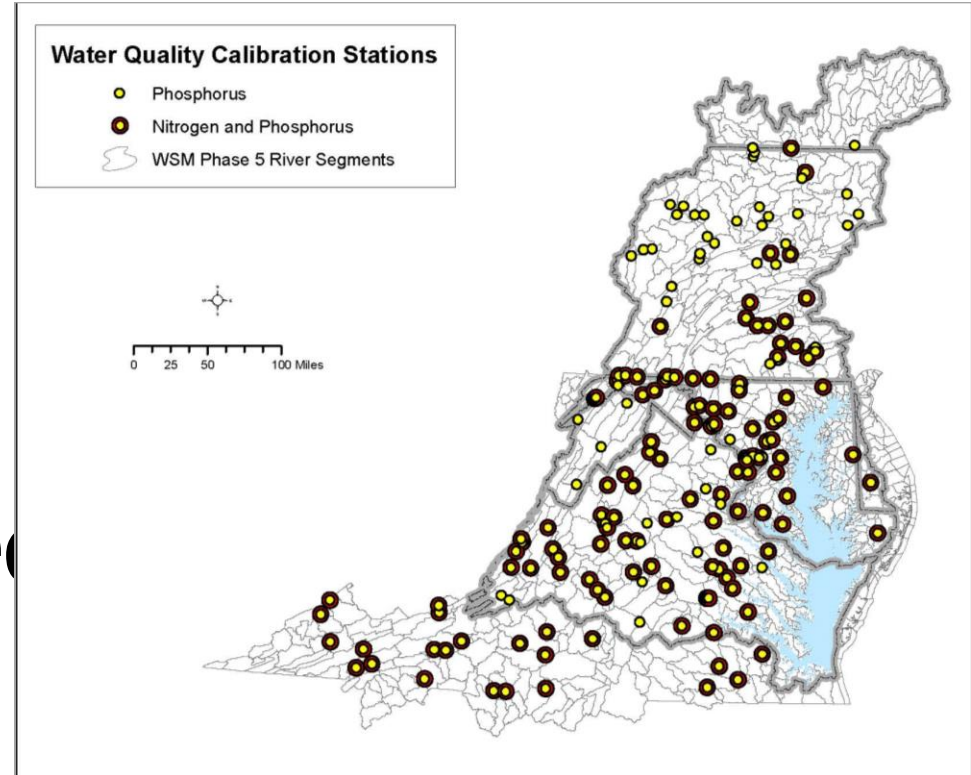
## Where do the models get their information?





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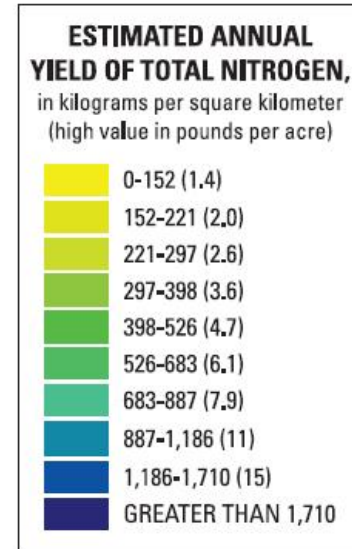
- The outputs of the Watershed Model are loads of Nitrogen, Phosphorus, and Sediment
- Model is calibrated to monitoring data throughout the Chesapeake Bay watershed over 30 years
  - flows X concentrations = loads



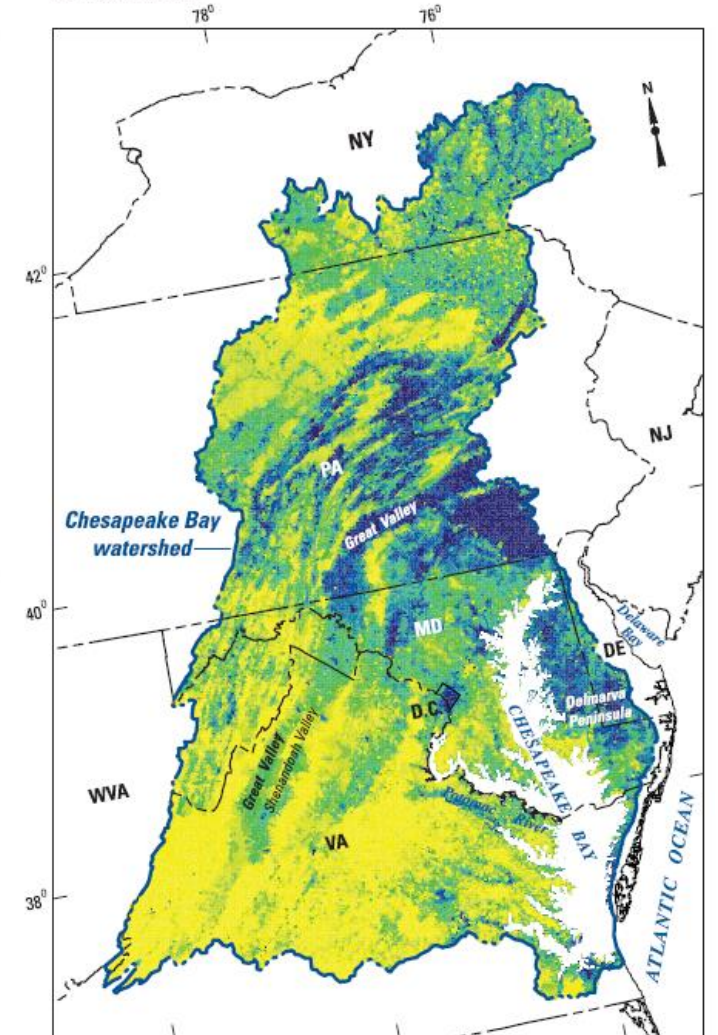


# Where do the models get their information?

- Other models inform the Watershed Model



**B. Delivered**







# Where do the models get their information?

## **The inputs to the model are numerous**

- Manure nutrients, animals populations
- Nutrients from chemical fertilizers
- Soils, plant uptake, fixation
- Land uses
- Waste treatment facilities and septic
- Atmospheric deposition
- Best Management Practices
- Precipitation, meteorological, elevation data





# Where do the models get their information?

- Expert Panels, peer-reviewed scientific publications, Census of Agriculture, agronomic databases, other models, GIS, NPDES permitting, business groups, jurisdictions' tracking & reporting, localities, etc.



# Where do the models get their information?

- Model data and methods are assessed, reviewed and approved by Partnership groups of the Chesapeake Bay Program
  - Federal + States + DC + CBC
  - Universities, Consortia, Extension Services, STAC
  - Managers, Practitioners
  - Industry Groups
  - Local organizations, NGOs



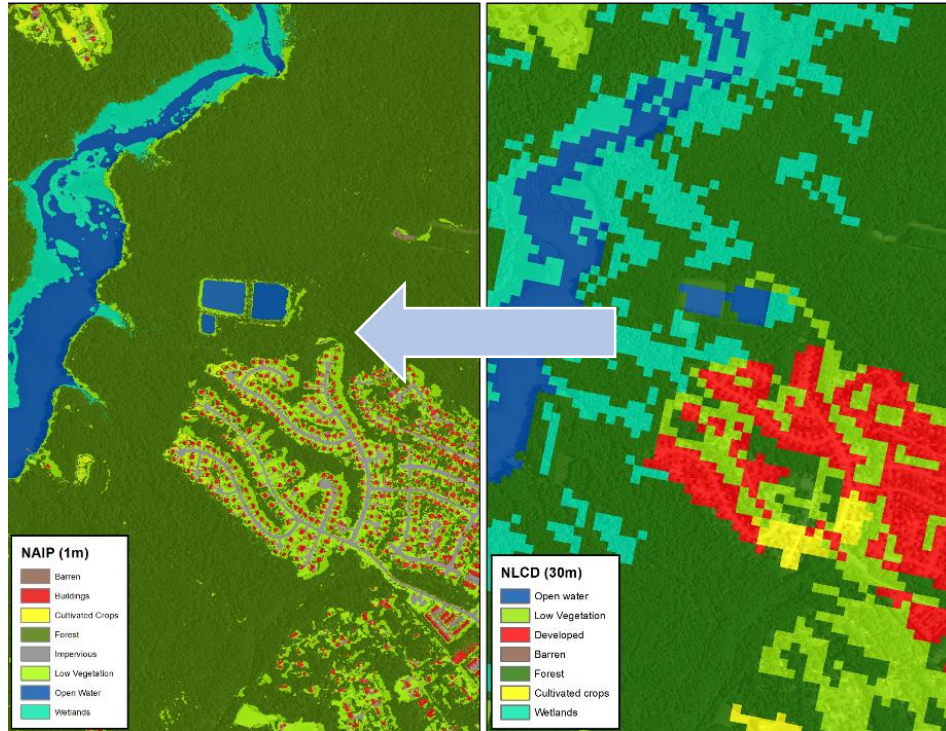




# Land Use / Land Cover

**New Model**

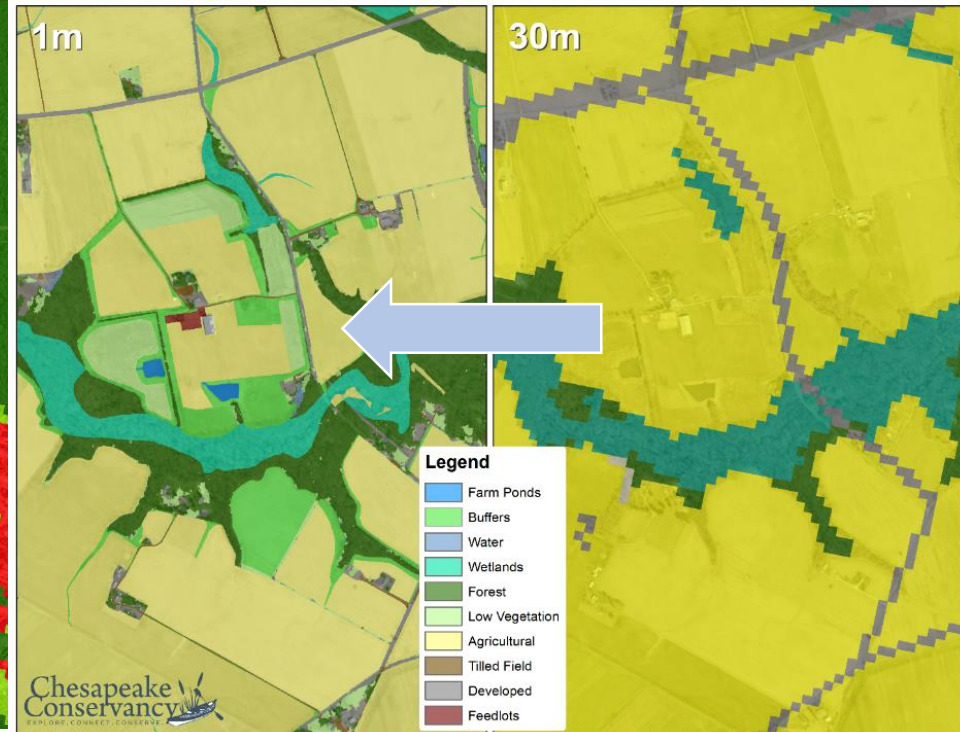
**Old Model**



**Urban/Suburban Settings**

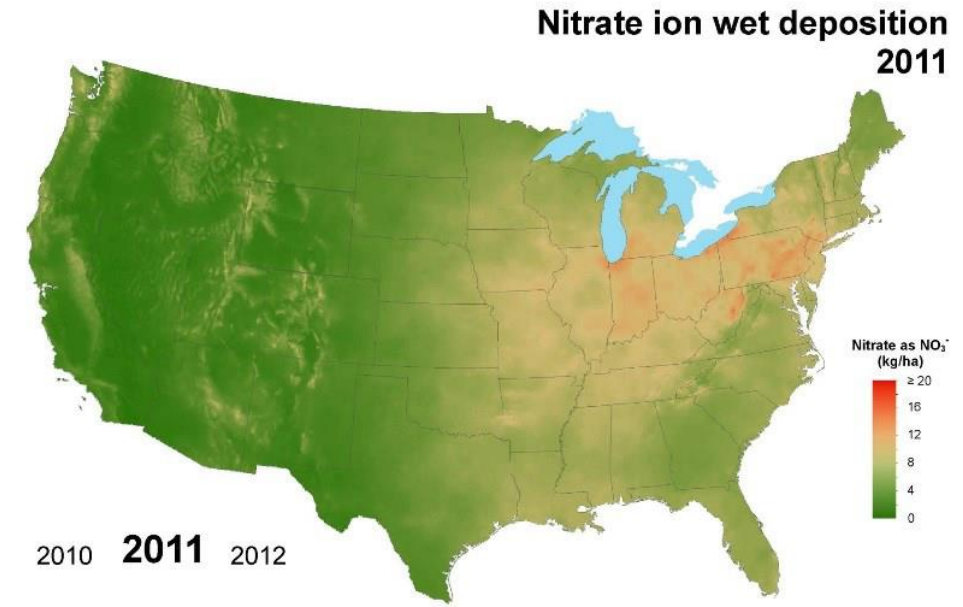
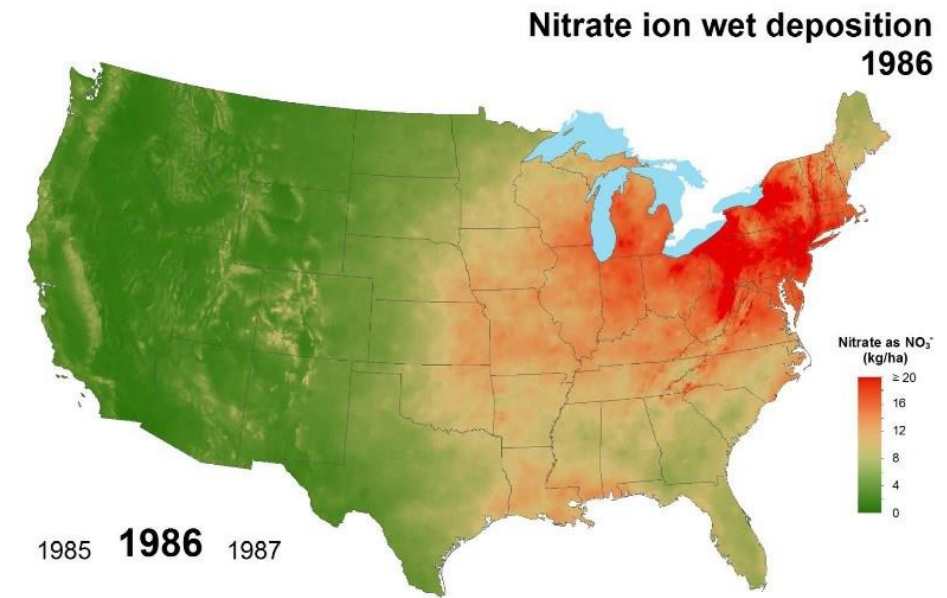
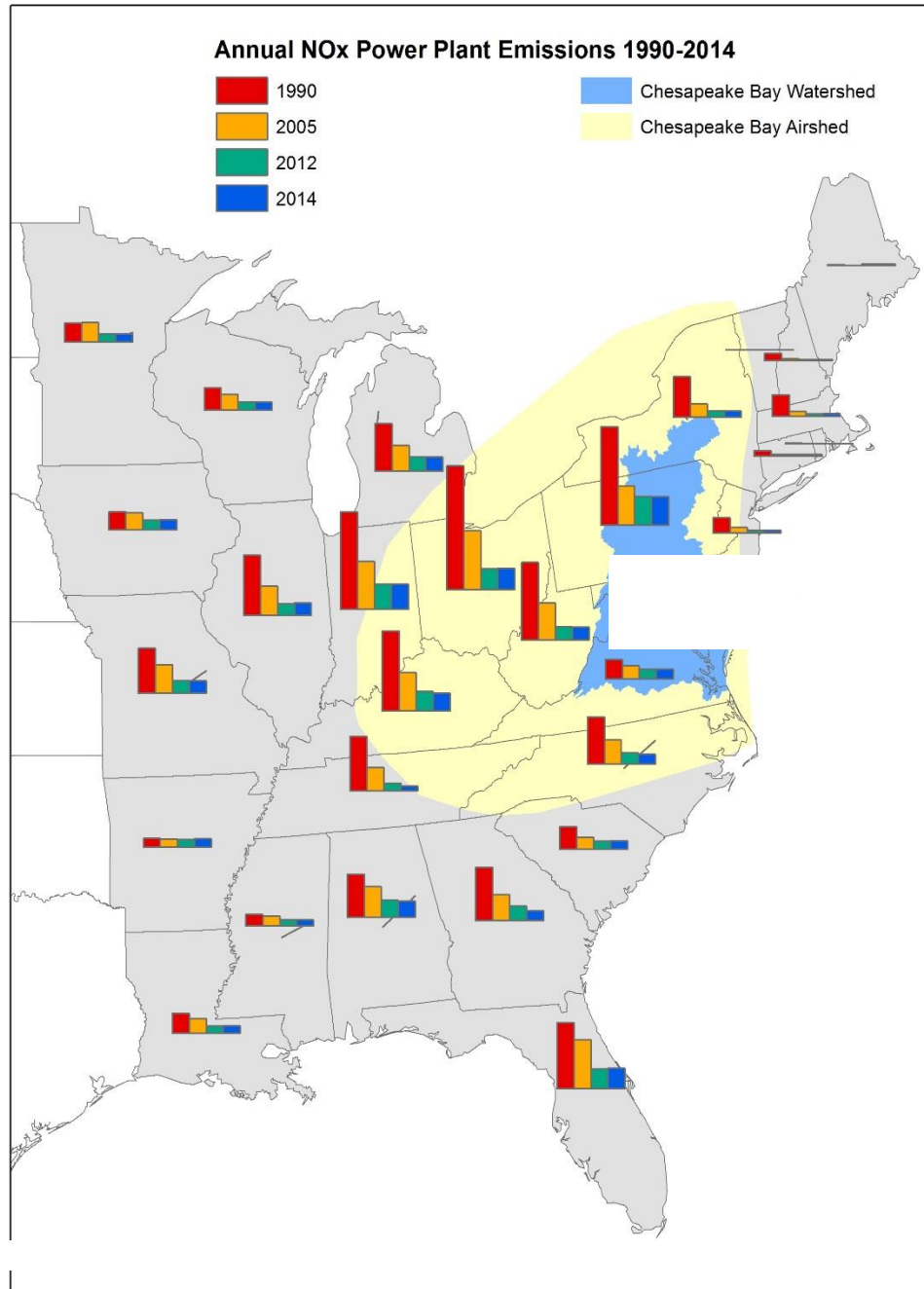
**New Model**

**Old Model**



**Rural Settings**

**Clean Air Act  
implementation  
by the states  
has resulted in  
about a 35  
million pound  
Nitrogen load  
reduction to  
the Chesapeake  
Bay from 1985  
to 2015**







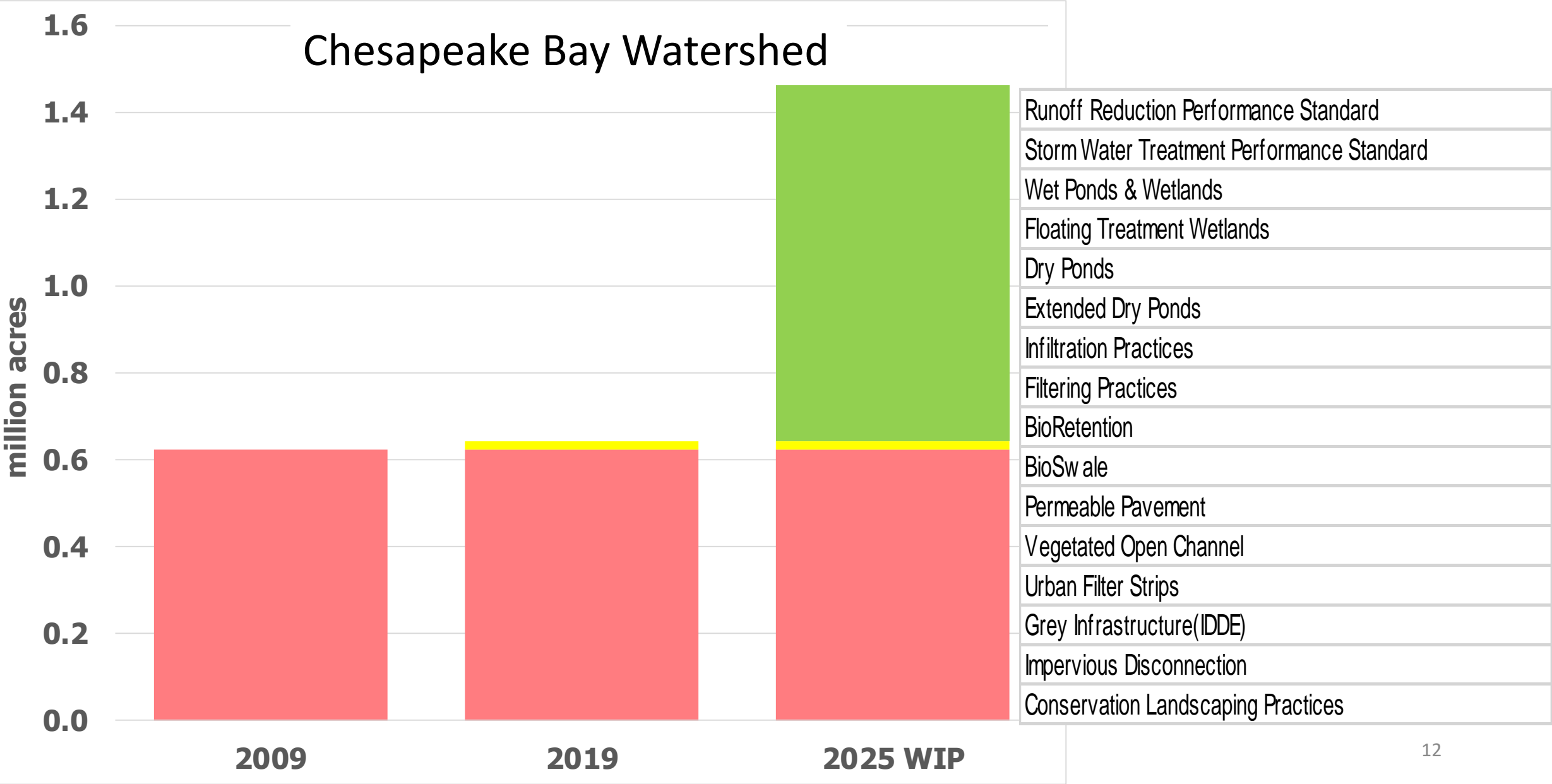
# Best Management Practices

- 300+ unique practice names available for reporting progress and for devising cost-effective implementation plans – across all sectors
  - Agriculture
  - Developed lands
  - Wastewater
  - Septic
  - Natural = forestry, oyster restoration, etc.



# Implemented and Planned Stormwater Management

## Chesapeake Bay Watershed





# CAST = Chesapeake Assessment Scenario Tool

The screenshot shows the CAST website with a navigation bar at the top containing links: HOME, SCENARIOS, RESULTS, COST PROFILES, HOW TO, ABOUT, and CONTACT US. Below the navigation bar is a large banner with the text "CAST PLANNING TOOLS" and a description: "Logging in to CAST allows users to rapidly develop scenarios for reducing nitrogen, phosphorus and sediment with varying best management practices to streamline environmental planning. Costs are provided so users may select the most cost-effective practices to reduce pollutant loads." Below the banner is a "Welcome" message and a "RESOURCES" section. The resources section is divided into six categories, each with a description and a button:

- MODEL DOCUMENTATION**: Find information about the Phase 6 model, its documentation and links to calibration data, model review webinars and files. Button: [Learn More](#)
- DEVELOP A PLAN**: Get answers to your questions about how to use CAST to develop a plan. Button: [Develop A Plan](#)
- SOURCE DATA**: Download data tables including information on load sources and agencies, BMPs, animals, geographic references and delivery factors. Button: [View Source Data](#)
- RIVER TRENDS**: Scientists calculate flow-adjusted trends in nitrogen, phosphorus and sediment levels to better determine whether pollution has changed over time. Button: [View Trends](#)
- MAP TOOLS, BMPs & VERIFICATION**: View Geographical Information and Shapefiles, BMPs and Verification information. Button: [Learn More](#)
- TRACK TMDL PROGRESS**: Information on how to submit progress data via NEIEN and view implementation data on meeting the Chesapeake Bay TMDL. Button: [Track TMDL Progress](#)

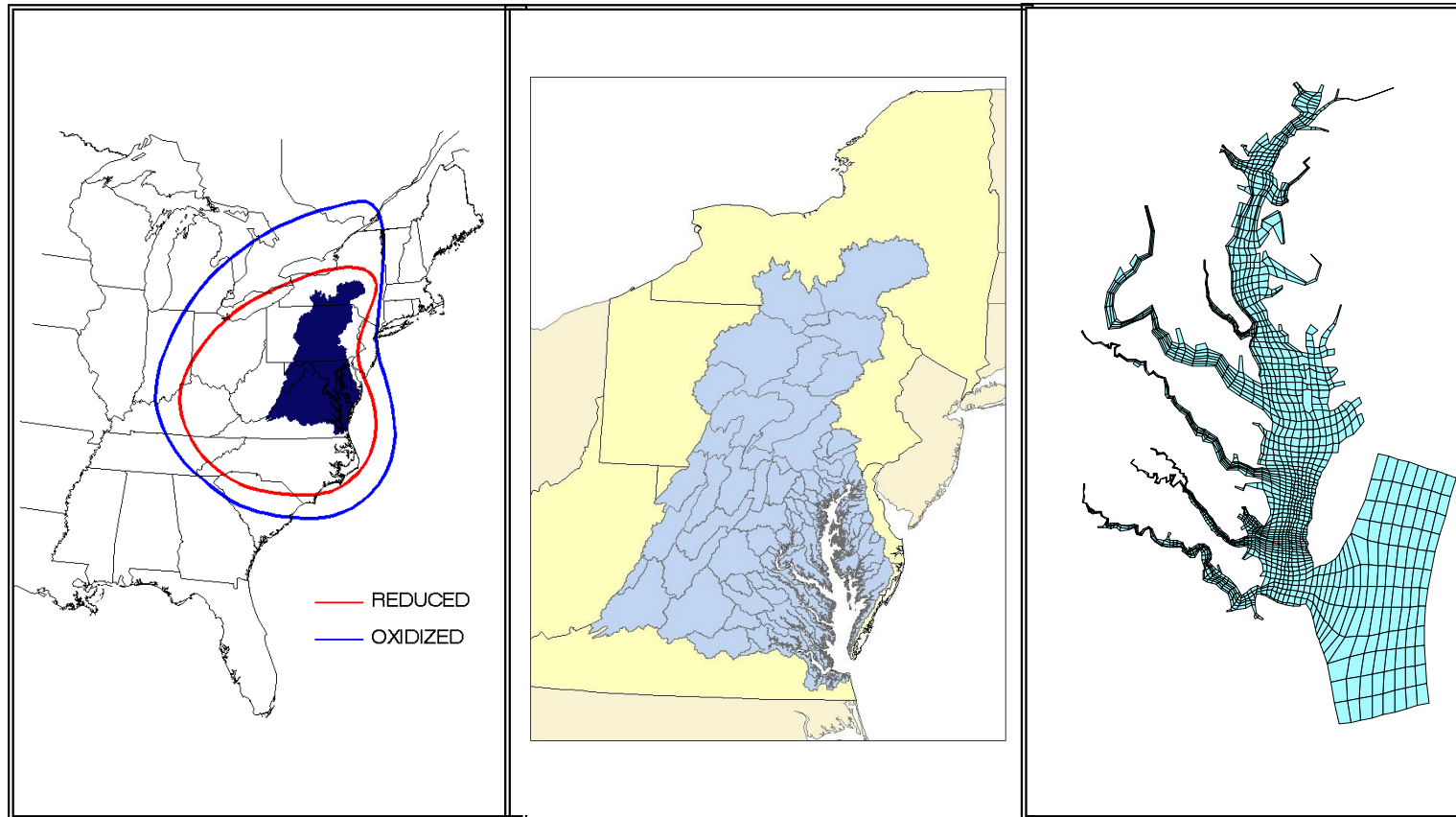
- The complex becomes simple with CAST  
<https://cast.chesapeakebay.net/>
- Users select a geographic area, add and remove implementation, and get estimated nutrient & sediment reductions + costs in minutes.





# Chesapeake Bay Program Modeling

How does model information impact policy decisions?

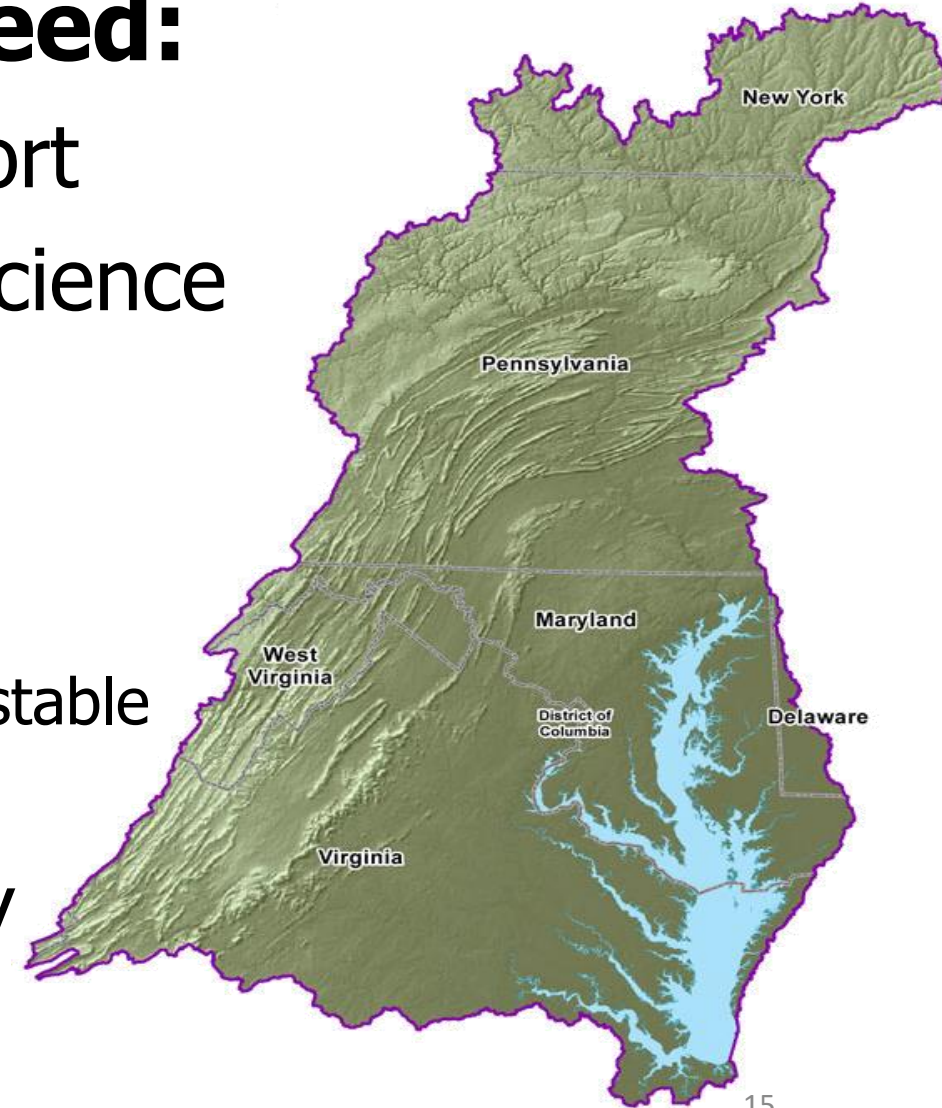




# How does model information impact policy?

## **For Success, Bay Managers Need:**

- Political, financial and science support
- Restoration plans based on sound science to achieve a shared vision
- Tools that
  - Foster collaboration and innovation
  - Are transparent, relevant, straight-forward, stable
  - Quantify benefit, cost and risk
- Science that has relevance, integrity and is timely

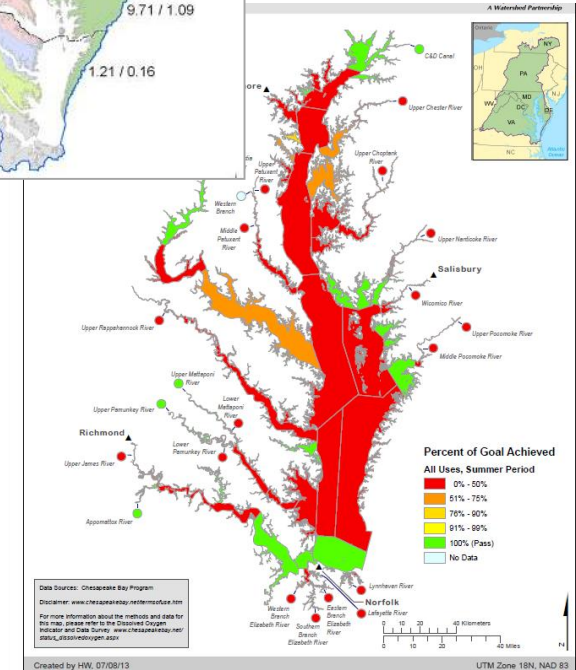
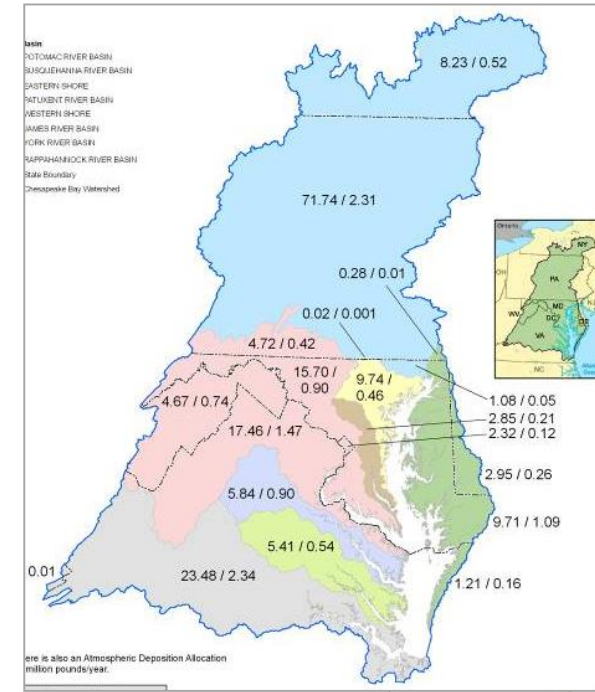




# How does model information impact policy?

## Partnership Model Uses:

- Set TMDL allocations and Watershed Implementation Plan (WIP) loading targets that meet Water Quality Standards
- Develop WIP scenarios and 2-year Milestones that describe what amount, how, where, and when for implementation





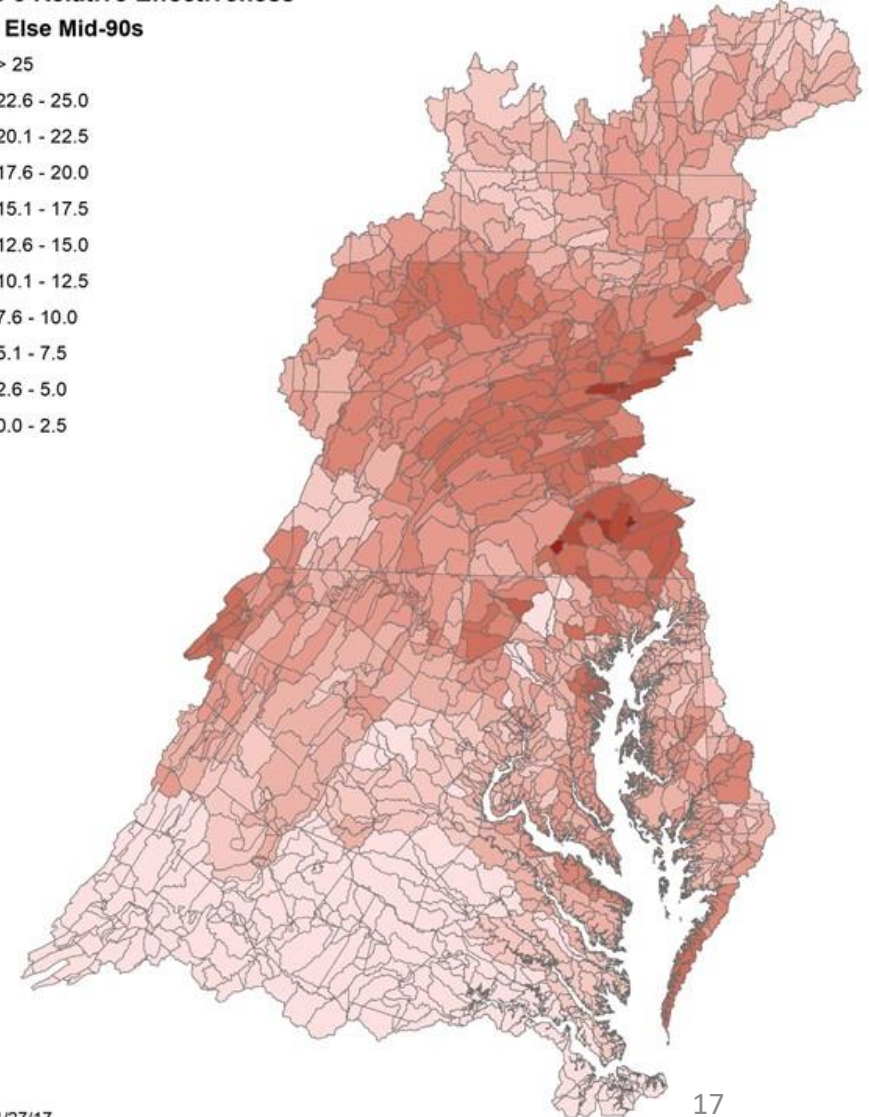
# How does model information impact policy?

## Rules of Equity for Setting Loading Goals:

- Those who pollute more should do more
- Those that have a greater influence on attaining water quality standards should have a greater level of effort

Phase 6 Relative Effectiveness

TN All Else Mid-90s



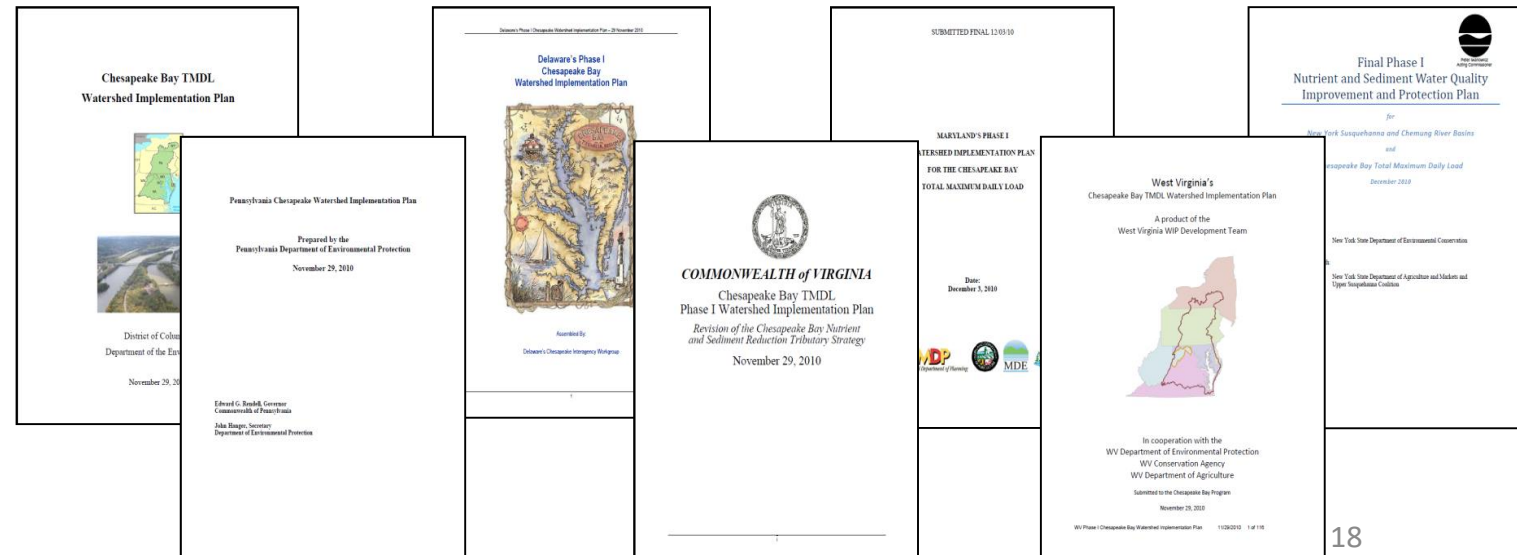
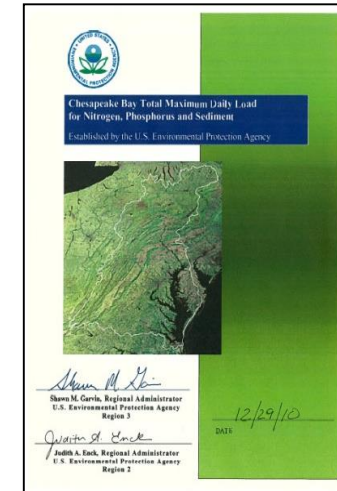




# How does model information impact policy?

## Today's Partnership Models Are Driving Significant Bay Policy And Funding Decisions

- The WIPs drive billions of dollars in environmental investments
- The scientific underpinnings to these jurisdictional plans are the CBP Partnership models



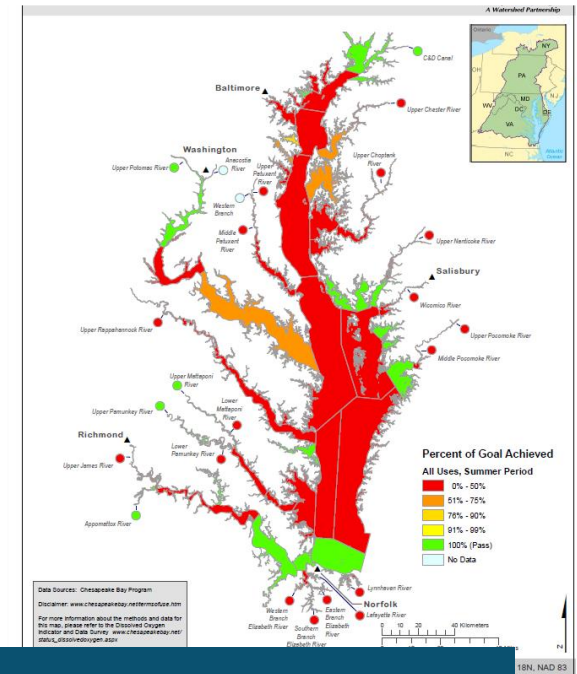




# How does model information impact policy?

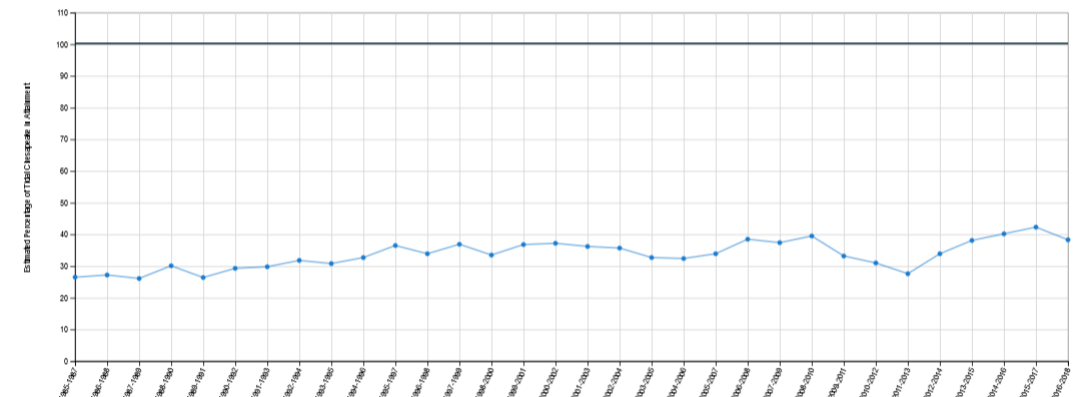
## Partnership Model Uses:

- Measure progress toward goals, annually, with models, along with:
  - Monitoring data, watershed + estuary
  - Progress on programmatic commitments
  - BMP data submissions
- Guide the allocation of EPA grant funds



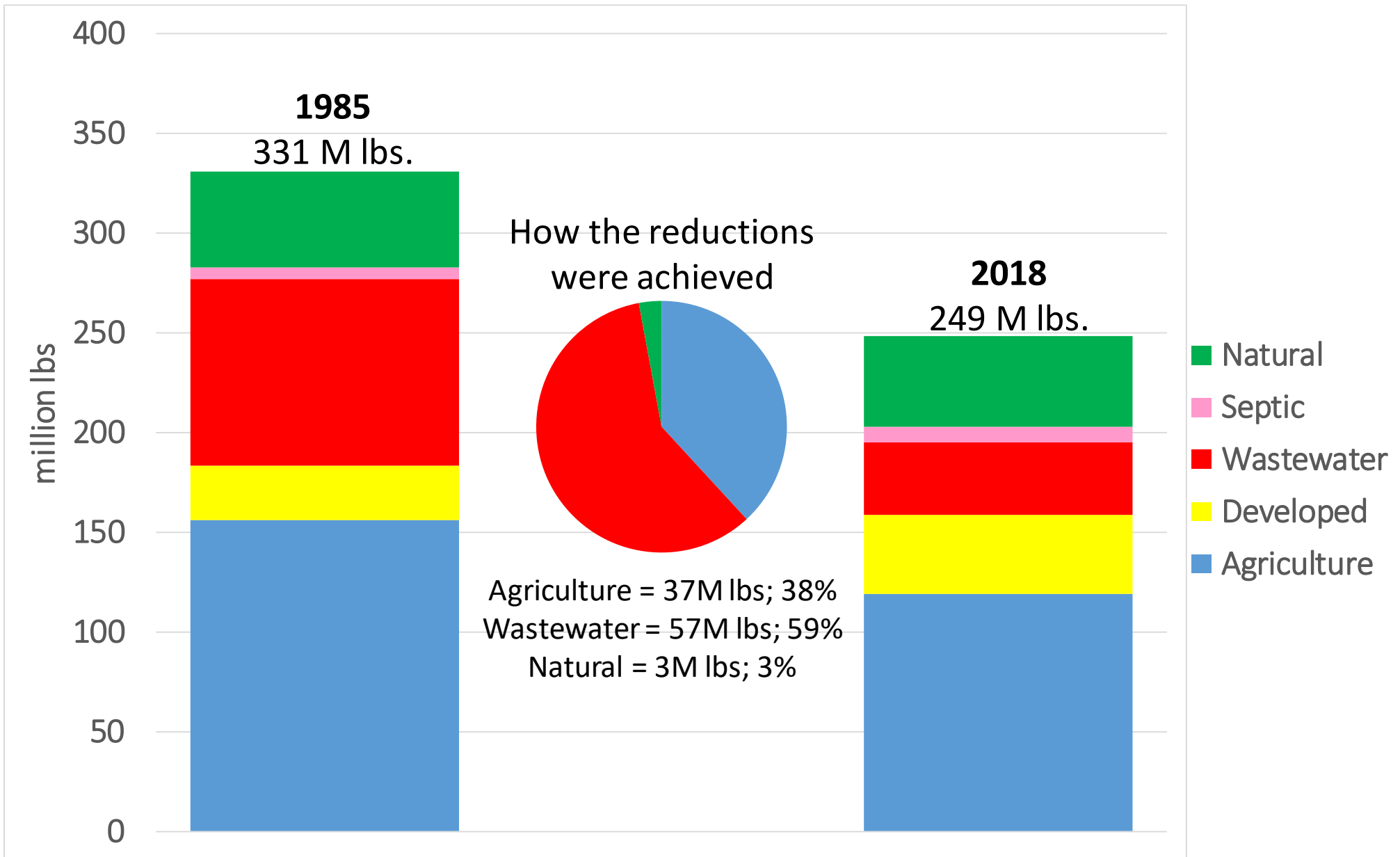
**Water Quality Standards Attainment (1985-2018)**

Water quality is evaluated using three parameters: dissolved oxygen, water clarity or underwater grass abundance, and chlorophyll a (a measure of algae growth).



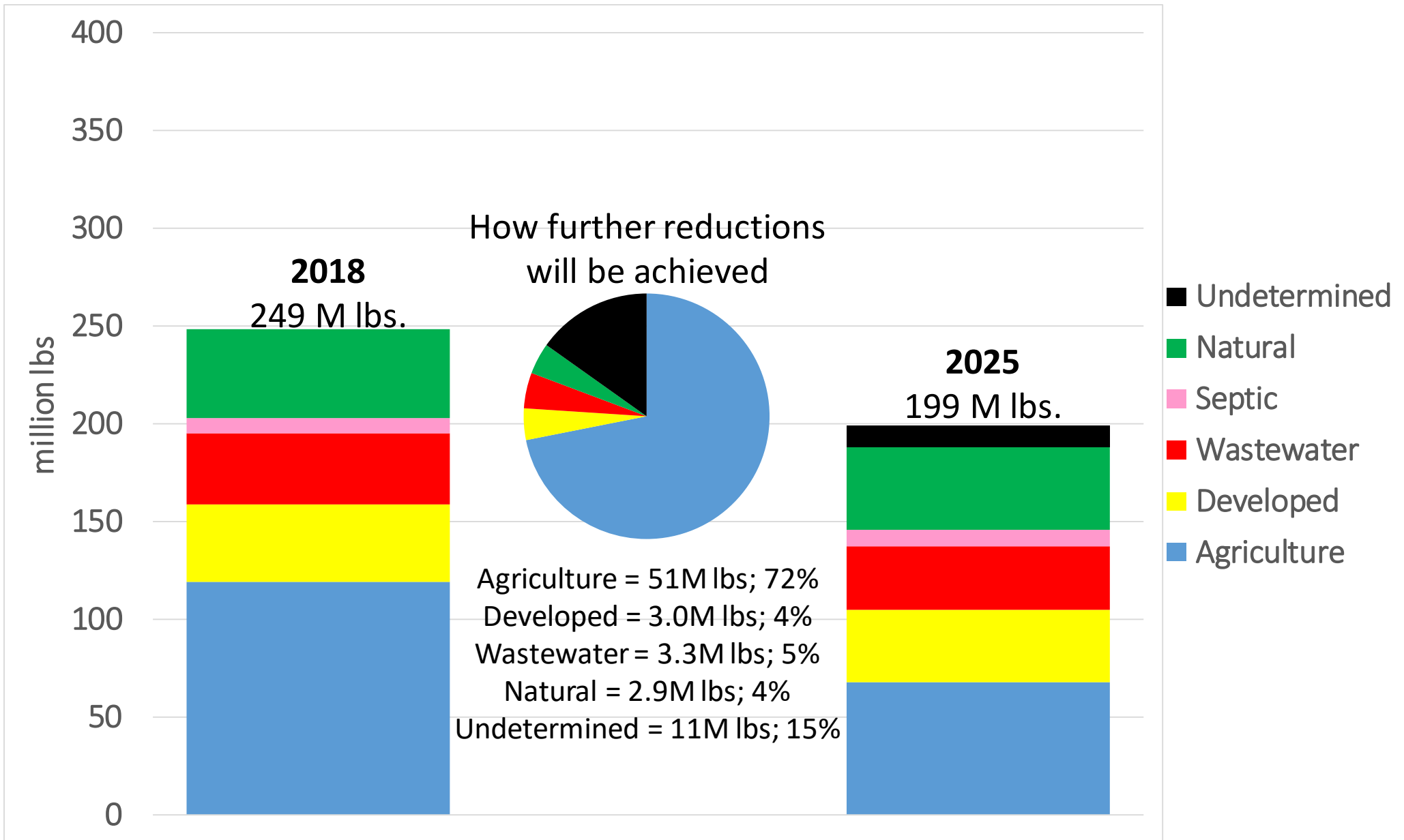


# Chesapeake Bay Watershed Nitrogen Loads: 1985 – 2018





# Chesapeake Bay Watershed Nitrogen Loads: 2018 – 2025





# Local Engagement

- Localities face their own incentives to act:
- Impaired water quality conditions in local streams, rivers, and lakes
- Increased nuisance algae
- High nitrate levels with health implications for local drinking water supplies





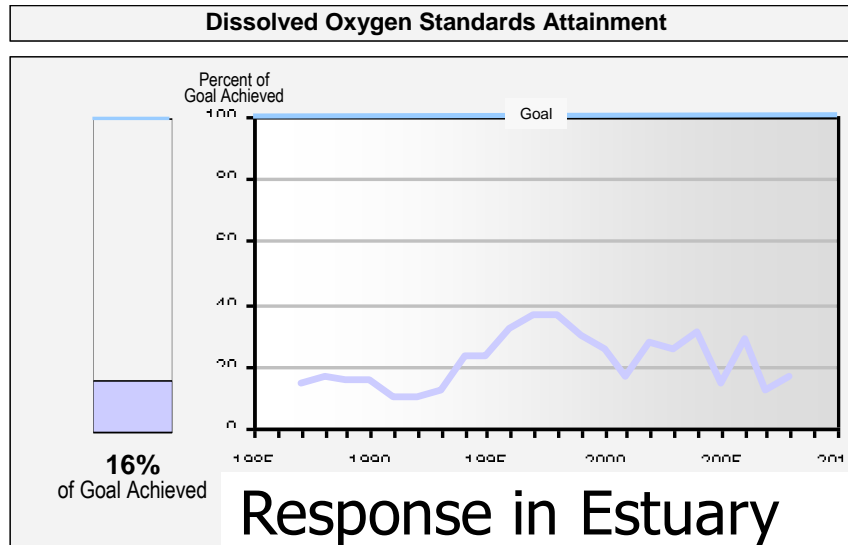
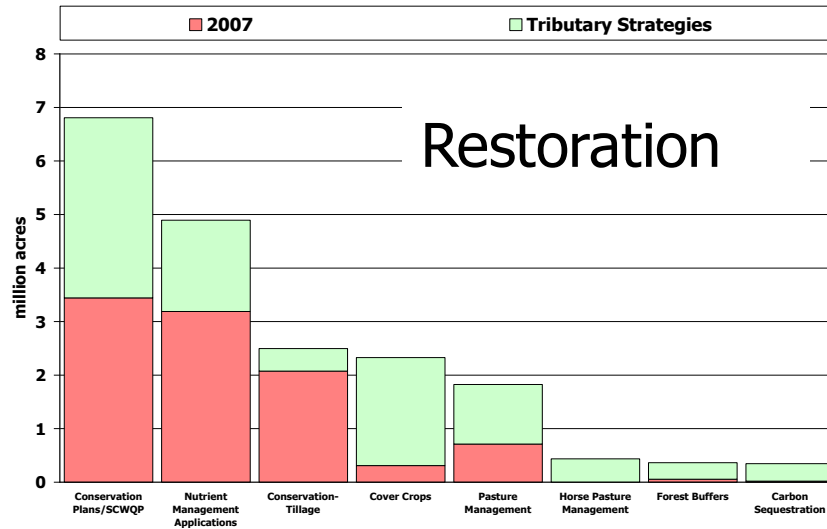
# Local Engagement

- Localities better at identifying priority practices; better understanding of economic impacts of implementation
- Can use the CBP models to design cost-effective plans that meets local targets and objective – experiment with what-if scenarios
  - Conservation and preservation
  - Hold the line on urban growth
  - BMPs on new development + retrofits
  - Regulated versus unregulated stormwater
  - Cobenefits



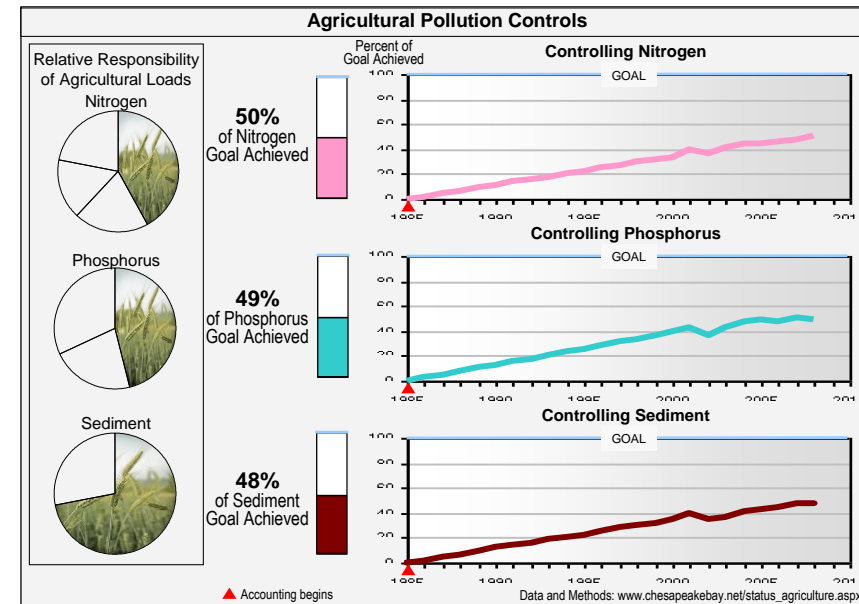


# Planning and Executing



Response in Estuary

Load Response



**Our Vision:** An environmentally and economically sustainable Chesapeake Bay watershed with clean water, abundant life, conserved lands and access to the water, a vibrant cultural heritage, and a diversity of engaged citizens and stakeholders.





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