# The Chesapeake Bay TMDL: Putting 18 Million Watershed Resident on a Pollution Diet

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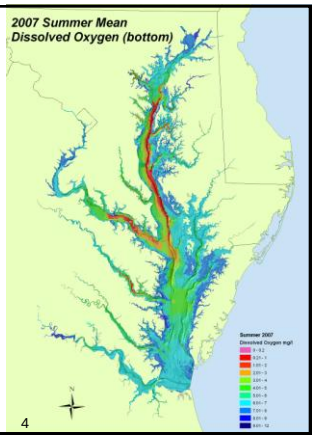
Chesapeake Bay Program
U.S. Environmental Protection Agency

June 26, 2014

Low to no dissolved oxygen in the Bay and tidal rivers every summer

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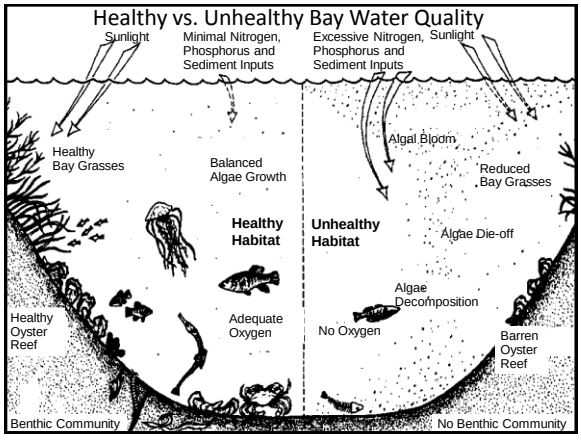
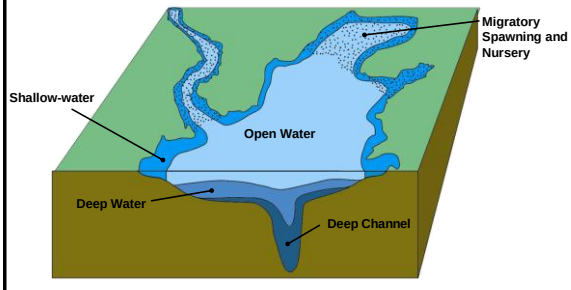
## The Chesapeake Bay Restoration: A 50-Year History with a Challenging Future

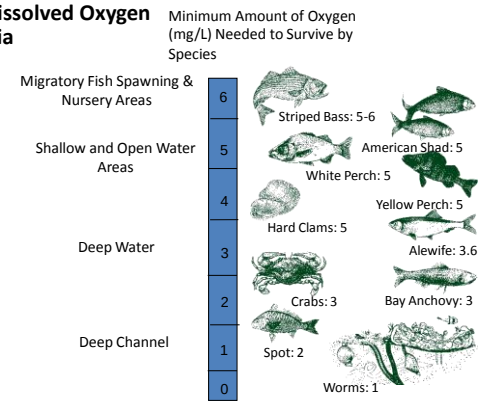
- 1960s-70s Visible decline in Bay resources
- 1967 Chesapeake Bay Foundation established
- 1976-1982 EPA conducts 5-year Bay study
- 1980 Chesapeake Bay Commission established
- 1983 **First Bay Agreement – Chesapeake Bay Program created**
- 1987 **Second Bay Agreement – WQ Goals**
- 1992 Amendments to Agreement – Tributary Strategies
- 2000 **Third Bay Agreement – Precursor to TMDL**
- 2008 Acknowledged Bay impairments will not be addressed by 2010
- 2010 Chesapeake Bay **TMDL established**
- 2011 Watershed jurisdictions adopt Watershed Implementation Plans
- 2014 **Fourth Bay Agreement – Well into Bay TMDL implementation**
- 2017 60% of Bay TMDL loads achieved
- 2025 100% of practices implemented to achieve TMDL allocations



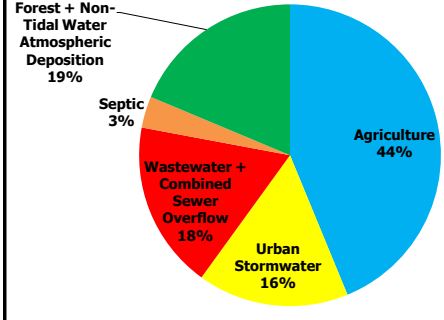

## Designated Use for Tidal Habitats



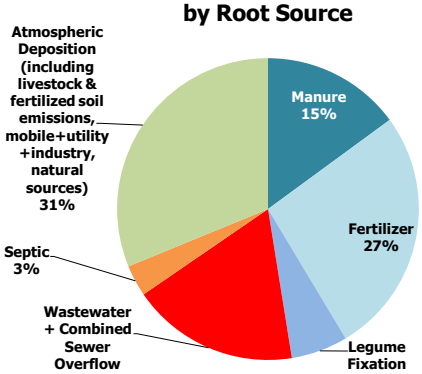

## Bay Dissolved Oxygen Criteria



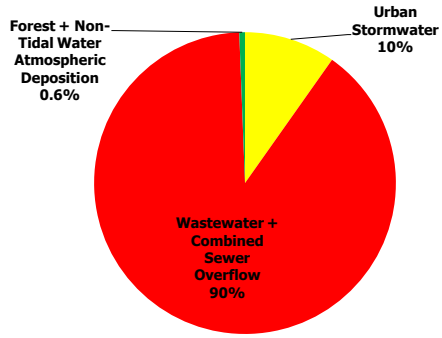

## Nitrogen Loads to the Bay 2011 by Source



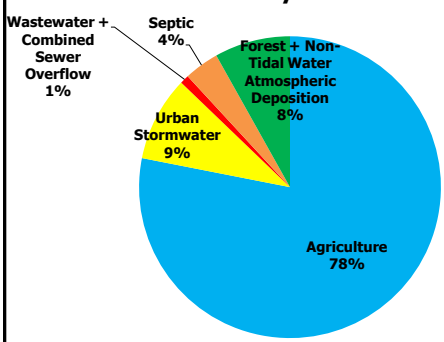
## Nitrogen Loads to the Bay
### by Root Source



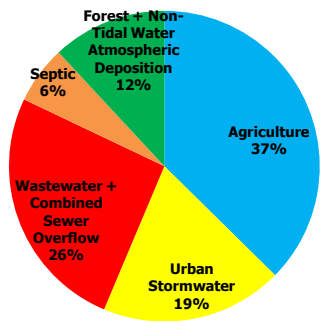

## DC Nitrogen Loads to the Bay
### 2011 by Source



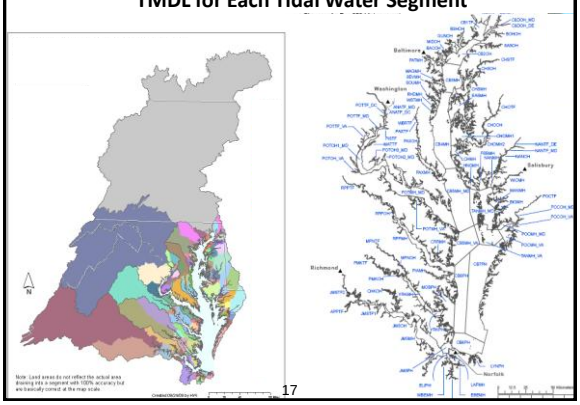

## DE Nitrogen Loads to the Bay
### 2011 by Source




## MD Nitrogen Loads to the Bay
### 2011 by Source




## TMDL for Each Tidal Water Segment



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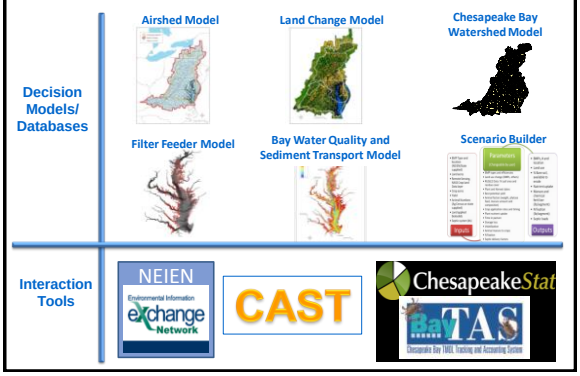
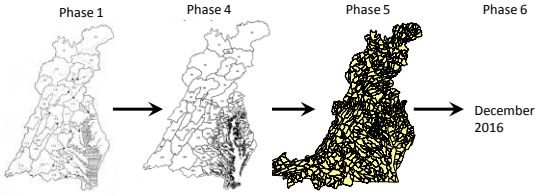
## Chesapeake Bay Program Partnership Models and Decision Support Tools



## History of Chesapeake Bay Watershed Models

Phase 1 → Phase 4 → Phase 5 → Phase 6



December 2016

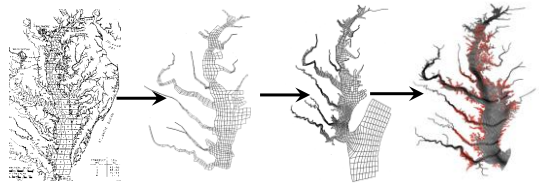
- Completed in 1982
- 63 model segments
- 5 land uses
- 2 year calibration period
- No BMPs simulated

- Completed in 1998
- 94 model segments
- 9 land uses
- 14 year calibration period
- 20 BMP designations

- Completed in 2010
- 1,000+ model segments
- 30 land uses
- 21 year calibration period
- 1400 BMP designations

## History of Chesapeake Bay Water Quality Models

1987 → 1992 → 2003 → 2008

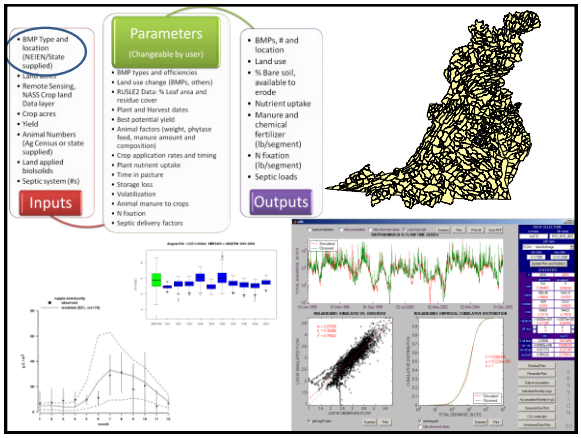


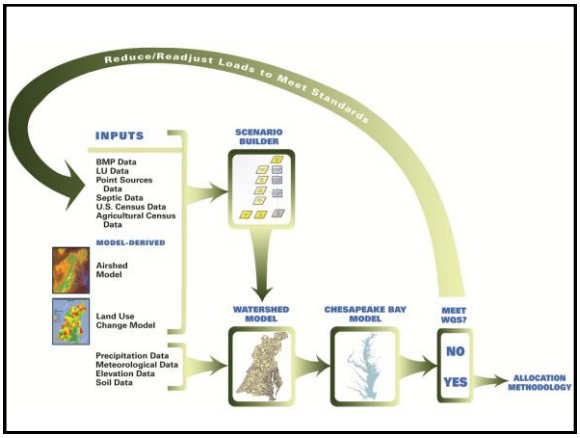
- 585 cells
- Steady State
- Advanced Bay Science
- Contributed to initial "40%" goal

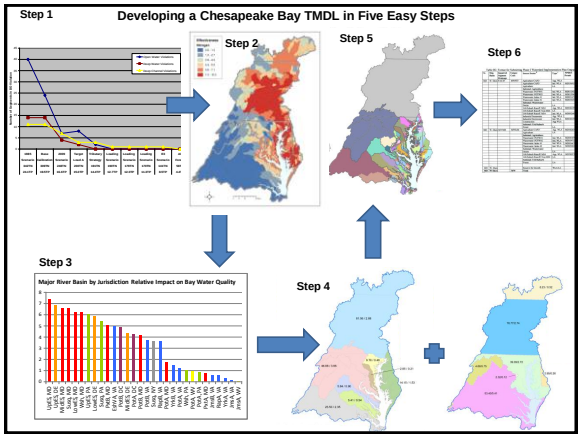
- 5,000 cells
- Time variable
- Sediment/water interaction
- Used for 1st tributary strategies

- 10,000 cells
- Bay grasses
- Plankton, benthic organisms
- Used for 2nd tributary strategies

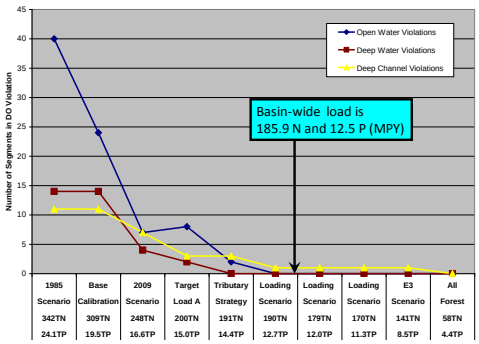
- 57,000 cells
- Sub-hour hydrodynamics
- Oysters, menhaden
- Used for 2010 Bay TMDL



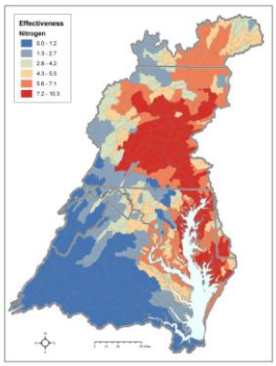




## Dissolved Oxygen Criteria Attainment

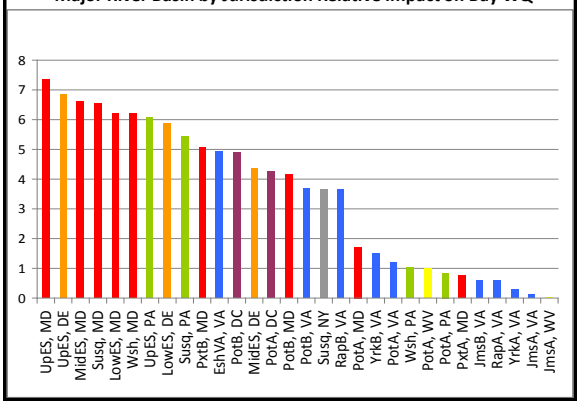



| 1985 Scenario | Base Calibration | 2009 Scenario | Target Load A | Tributary Strategy | Loading Scenario | Loading Scenario | Loading Scenario | E3 Scenario | All Forest |
|---|---|---|---|---|---|---|---|---|---|
| 342TN | 309TN | 248TN | 200TN | 191TN | 190TN | 179TN | 170TN | 141TN | 58TN |
| 24.1TP | 19.5TP | 16.6TP | 15.0TP | 14.4TP | 12.7TP | 12.0TP | 11.3TP | 8.5TP | 4.4TP |

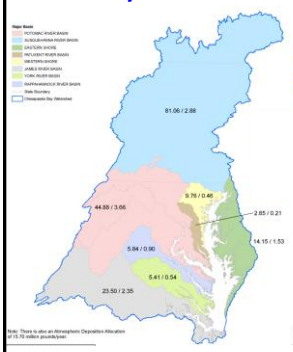
## Relative Effect of a Pound of Pollution on Bay Water Quality



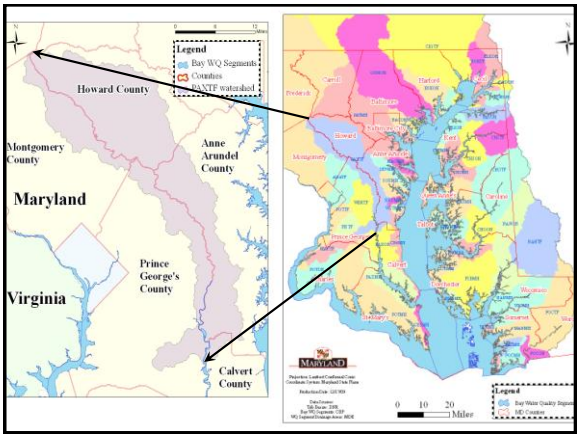

## Major River Basin by Jurisdiction Relative Impact on Bay WQ




## TMDL by River




## TMDL by State




## Jurisdictions' Watershed Implementation Plans

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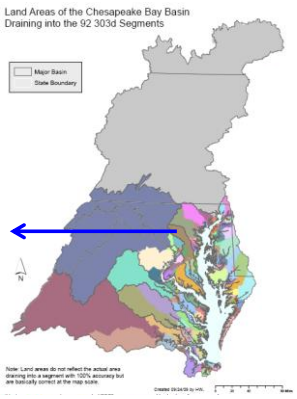
## 92 Individual TMDLs

Table B2. Format for Submitting Phase I Watershed Implementation Plan Outputs

| St. | Maj. Basin | Impaired Segment Drainage | Unique Code | Source Sector[a] | Type[b] | NPDES Permit |
|---|---|---|---|---|---|---|
| MD | W. Shore | PAXTF | MWPTF | Agriculture-CAFO | Agg. WLA | |
| | | | | Agriculture-CAFO | Ind. WLA | MD356913 |
| | | | | Agriculture | LA | |
| | | | | Subtotal: Agriculture | | |
| | | | | Wastewater: POTW#1 | Ind. WLA | MD012452 |
| | | | | Wastewater: POTW#2 | Ind. WLA | MD013943 |
| | | | | Wastewater: Indus #1 | Ind. WLA | MD021672 |
| | | | | Wastewater: Indus #2 | Ind. WLA | MD853653 |
| | | | | Subtotal: Wastewater | | |
| | | | | Onsite | LA | |
| | | | | Urb/Suburb Runoff: MS4 | Agg. WLA | MD546195 |
| | | | | Urb/Suburb Runoff: Non-MS4 | LA | |
| | | | | Urb/Suburb Runoff: MS4 | Ind. WLA | MD892645 |
| | | | | Industrial Stormwater | Agg. WLA | |
| | | | | Industrial Stormwater | Ind. WLA | MD246139 |
| | | | | Construction | Agg WLA | |
| | | | | Subtotal: Urb/Suburb | | |
| | | | | Forest | LA | |
| MD | W. Shore | SEVMH | MWSeM | Agriculture-CAFO | Agg. WLA | MD382614 |
| | | | | Agriculture | LA | |
| | | | | Subtotal: Agriculture | | |
| | | | | Wastewater: POTW#1 | Ind. WLA | MD083699 |
| | | | | Wastewater: POTW#2 | Ind. WLA | MD054732 |
| | | | | Wastewater: Indus #1 | Ind. WLA | MD836679 |
| | | | | Wastewater: Indus #2 | Ind. WLA | MD544469 |
| | | | | Subtotal: Wastewater | | |
| | | | | Onsite | LA | |
| | | | | Urb/Suburb Runoff: MS4 | Agg. WLA | MD588578 |
| | | | | Urb/Suburb Runoff: Non-MS4 | LA | |
| | | | | Subtotal: Urb/Suburb | | |
| | | | | Forest | LA | |
| MD | W. Shore | | | Reserve for Growth | WLA/LA | |
| MD | W Shore | | MW | Total | | |

Land Areas of the Chesapeake Bay Basin Draining into the 92 303d Segments

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| | | | | Agriculture-CAFO | Ind. WLA | MD356913 |
| | | | | Agriculture | LA | |
| | | | | **Subtotal: Agriculture** | | |
| | | | | Wastewater: POTW#1 | Ind. WLA | MD012452 |
| | | | | Wastewater: POTW#2 | Ind. WLA | MD013943 |
| | | | | Wastewater: Indus #1 | Ind. WLA | MD821672 |
| | | | | Wastewater: Indus #2 | Ind. WLA | MD853653 |
| | | | | **Subtotal: Wastewater** | | |
| | | | | Onsite | LA | |
| | | | | Urb/Suburb Runoff: MS4 | Agg. WLA | MD546195 |
| | | | | Urb/Suburb Runoff: Non-MS4 | LA | |
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| | | | | Industrial Stormwater | Agg. WLA | |
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| | | | | Construction | Agg WLA | |
| | | | | **Subtotal: Urb/Suburb** | | |
| | | | | Forest | LA | |
| MD | W. Shore | SEVMH | MWSeM | Agriculture-CAFO | Agg. WLA | MD382614 |
| | | | | Agriculture | LA | |
| | | | | **Subtotal: Agriculture** | | |
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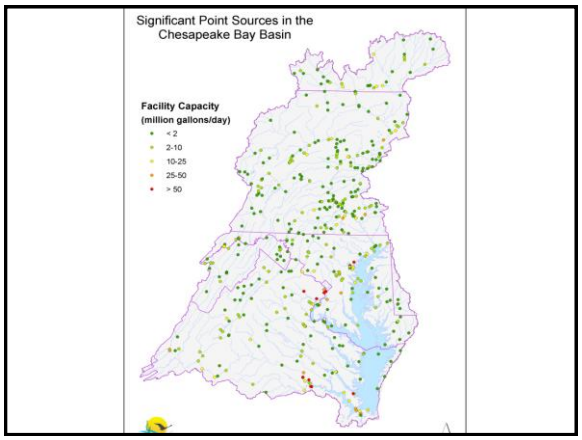
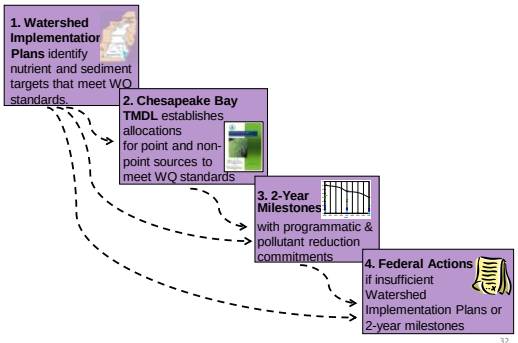
| | | | | **Subtotal: Urb/Suburb** | | |
| | | | | Forest | LA | |
| MD | W. Shore | | | Reserve for Growth | WLA/LA | |
| MD | W Shore | | MW | Total | | |




## Components of Bay TMDL Accountability Framework

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## Chesapeake Bay TMDL Based on 7 Watershed Implementation Plans

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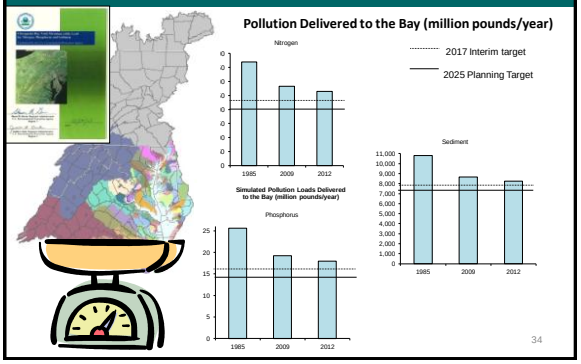
## Chesapeake Bay TMDL: Pollution Diet for All Sectors and Sources

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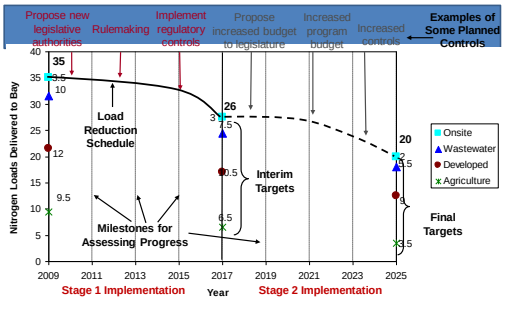
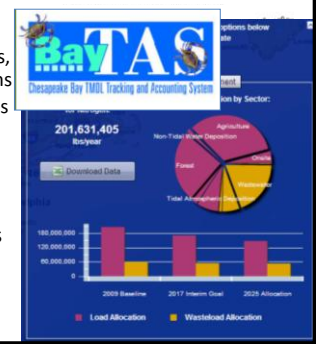
## Remember: 15 Year Timeline to Build Capacity and Control Pollution




## Phase II WIPs: Part of Chesapeake Bay Accountability Framework

- WIPs
  - Phase I: Define strategies, propose TMDL allocations
  - Phase II: Refine strategies
  - Phase III: Mid-course adjustments
- 2-Year Milestones
- Track and Assess Progress
- Federal Actions, as necessary



## Phase II WIP Planning Targets

Issued August 1, 2011

| Jurisdiction | Nitrogen million lbs/year | | Phosphorus million lbs/year | | Sediment million lbs/year | |
|---|---|---|---|---|---|---|
| | 2010 | 2025 | 2010 | 2025 | 2010 | 2025 |
| District of Columbia | 2.5 | 2.37 | .10 | 0.12 | 18 | 17 |
| Delaware | 4.3 | 3.39 | .30 | 0.28 | 97 | 100 |
| Maryland | 52.76 | 41.17 | 3.01 | 2.81 | 1376 | 1350 |
| New York | 10.58 | 8.35 | .77 | 0.64 | 362 | 304 |
| Pennsylvania | 112.06 | 78.83 | 4.15 | 3.60 | 2469 | 1945 |
| Virginia | 68.92 | 52.46 | 7.35 | 6.46 | 3802 | 3251 |
| West Virginia | 5.52 | 5.00 | .74 | 0.64 | 444 | 373 |
| TOTAL | 256.66 | 191.57 | 16.42 | 14.55 | 8532 | 7341 |

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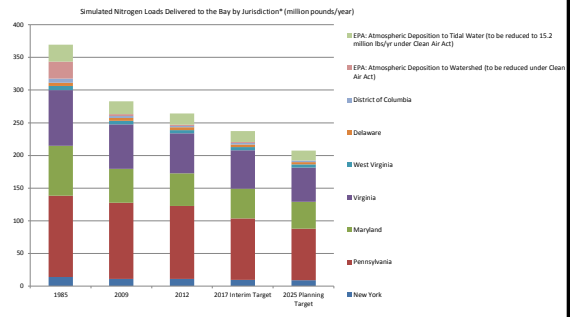
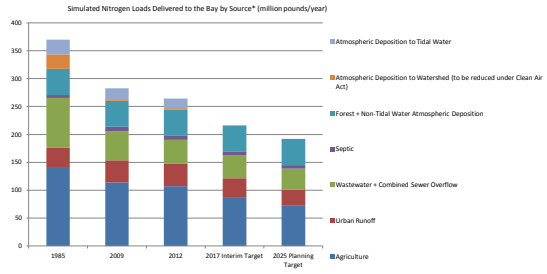
## Simulated Nitrogen Loads Delivered to Chesapeake Bay by Jurisdiction




*Loads simulated using 5.3.2 version of Watershed Model and wastewater discharge data reported by Bay jurisdictions...

## Simulated Nitrogen Loads Delivered to Chesapeake Bay by Source

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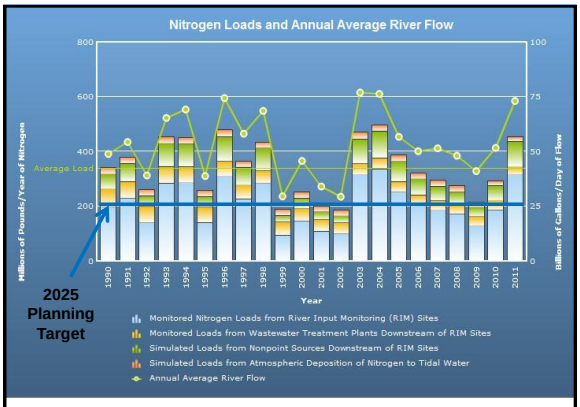
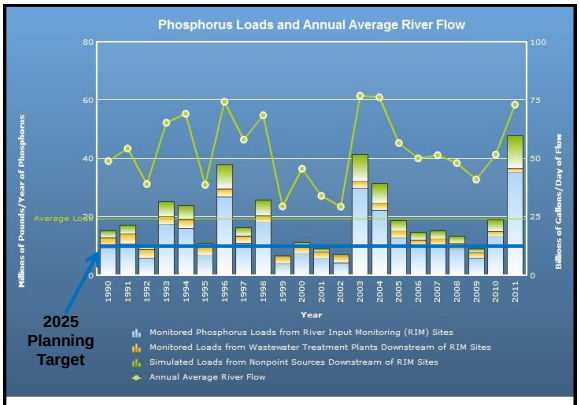
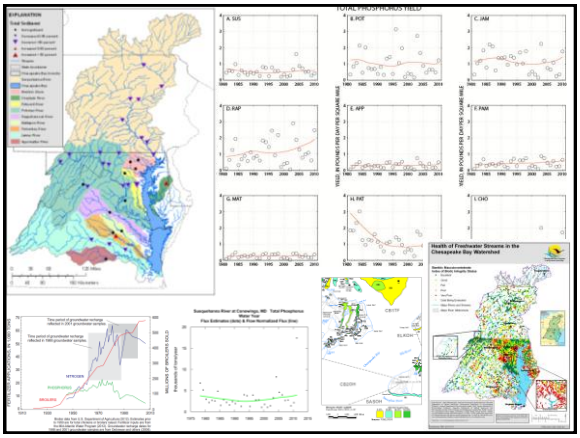


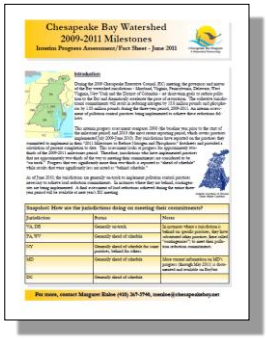

Approximately 455 million pounds of nitrogen during the 2011 water year.




Approximately 48 million pounds in the 2011 water year.



# Keeping All of Us Accountable!


Chesapeake Bay Watershed
2009-2011 Milestones
Interim Progress Assessment/Fact Sheet - June 2011

- 2-year milestones
- Annual reporting to governors, EPA Administrator, public on milestone progress
- Quarterly oversight discussions with states, DC
- Goals:
  - ☑No surprises
  - ☑Work together to address issues early
  - ☑ Accountable to public

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## Delaware WIP Examples of Ag Commitments

| Practice | 2009 Levels | TMDL Commitment |
|---|---|---|
| Nutrient Management | 100% | 0% |
| Decision Agriculture | 0% | 99% |
| Cover Crop | 12.2% | 36% |
| Commodity Cover Crop | 0% | 14% |
| Conservation Tillage | 66.8% | 100% |
| Continuous No Till | 0% | 16% |

Continue to implement current regulatory programs; ramp up voluntary incentive programs, promote new technologies (new seed varieties), and revise P index.

## 2012-2013 Numeric Reduction Commitments by Jurisdiction

| Jurisdiction | Nitrogen (lbs) | Phosphorus (lbs) | Sediment (lbs) |
|---|---|---|---|
| DC | 394,069 | 9,130 | |
| DE | 48,149 | 42,702 | 18,731,484 |
| MD | 790,549 | 161,611 | 904,079 |
| NY | + 433,730 | + 51,988 | 16, 397,577 |
| PA | 6,328,907 | 254,377 | 204,112,700 |
| VA | 5,714,226 | 623,424 | 117,460,819 |
| WV | 58,613 | 69,782 | 125,733,105 |
| EPA Tidal Deposition | 2,5000,000 | | |
| EPA Non tidal deposition | 900,000 | | |

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## Milestone Highlights: MD, NY, PA

- MD
  - 2012/13 Commitment: Bay Restoration Fund Fee Increase
  - 2009/11 Progress: Poultry Litter Regulation and Stormwater Permits
  - 2009/11 Progress: Laws: Septic System, Fertilizer, Trading, Environmental Site Design
- NY
  - 2012/13 Commitment: Implement a program for stream corridor restoration
  - 2009/11 Progress: Dishwasher Detergent & Nutrient Runoff Law
  - 2009/11 Progress: Chesapeake Bay Program Forest Conservation Directive
  - 2009/11 Progress: Strengthened Permits, Enforcement and Compliance
- PA
  - 2012/13 Commitment: Model Ag Compliance Policy
  - 2009/11 Progress: Erosion & Sediment Control Regulations and Stormwater MS4
  - 2009/11 Progress: Phosphate Dishwater Detergent Ban

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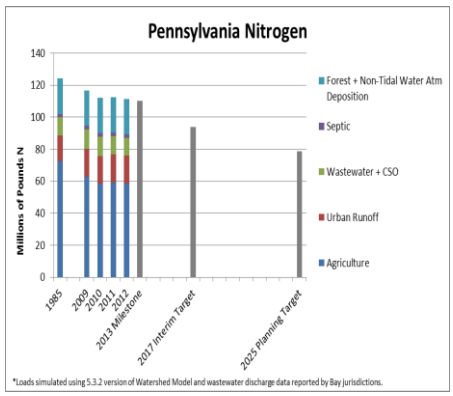


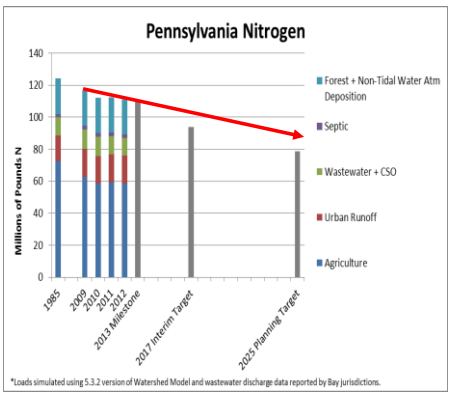
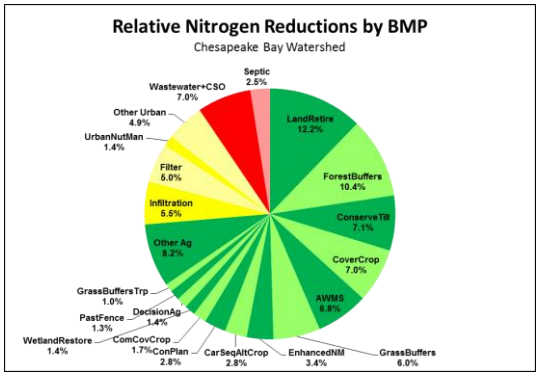



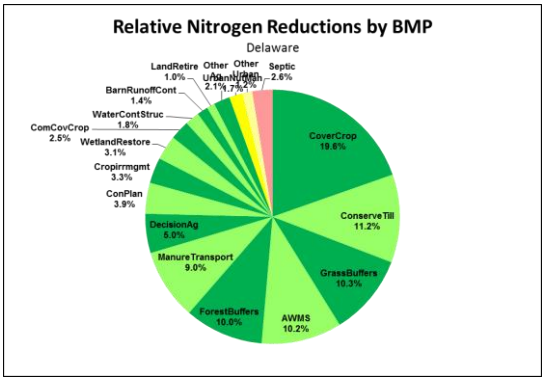
**Table 1. Most Common Agricultural BMP Phase II WIP Acres Watershed-Wide**

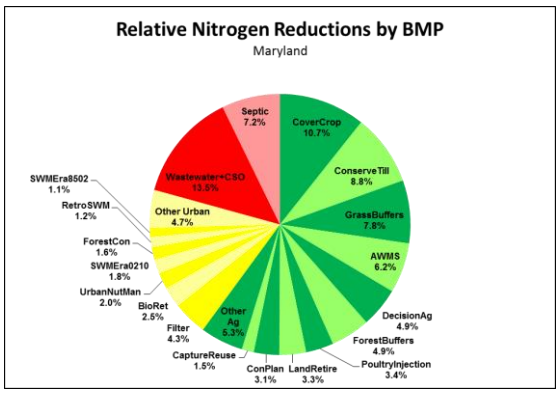
| BMP | Acres |
|---|---|
| Conservation Plans | 6,811,304 |
| Enhanced Nutrient Application Management | 2,082,419 |
| Other Conservation-Till | 2,002,283 |
| Decision Agriculture | 1,143,587 |
| Cover Crop | 1,136,034 |
| Nutrient Application Management on Pasture | 1,033,992 |
| Nutrient Application Management on Crop | 995,989 |
| Prescribed Grazing | 948,389 |
| Land Retirement | 609,407 |
| Liquid & Poultry Injection | 371,823 |
| Continuous NoTill | 321,901 |
| Commodity Cover Crop | 307,143 |
| Precision Intensive Rotational Grazing | 286,210 |
| Forest Buffers | 277,913 |
| Crop Irrigation Management | 251,767 |

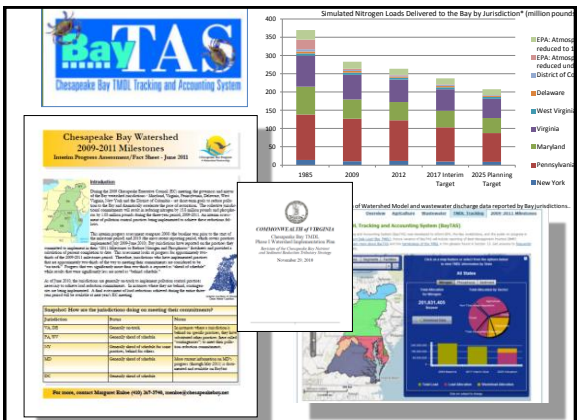
**Table 2. Most Common Urban BMP Phase II WIP Acres Watershed-Wide**

| BMP | Acres |
|---|---|
| Filtering Practices | 848,488 |
| Infiltration Practices | 655,730 |
| Wet Ponds & Wetlands | 411,753 |
| Extended Dry Ponds | 225,756 |
| Dry Ponds | 174,664 |
| Forest Harvesting BMPs | 164,821 |
| Extractive Erosion and Sediment Control | 149,635 |
| Forest Conservation | 113,977 |
| SWM by Era (1985-2002) | 98,803 |
| Street Sweeping | 89,474 |
| Erosion and Sediment Control | 83,551 |
| Retrofit Stormwater Management | 69,208 |
| SWM by Era (2002-2010) | 65,668 |
| Impervious Surface & Urban Growth Reduction | 61,956 |
| Abandoned Mine Reclamation | 61,285 |



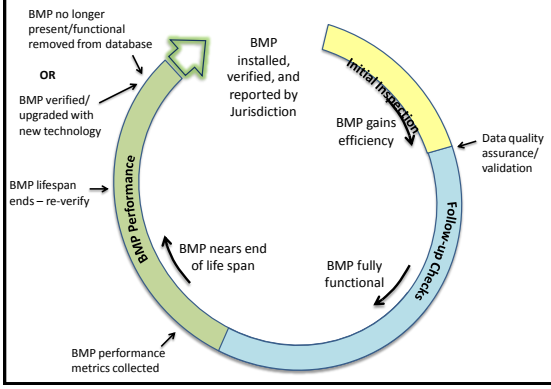



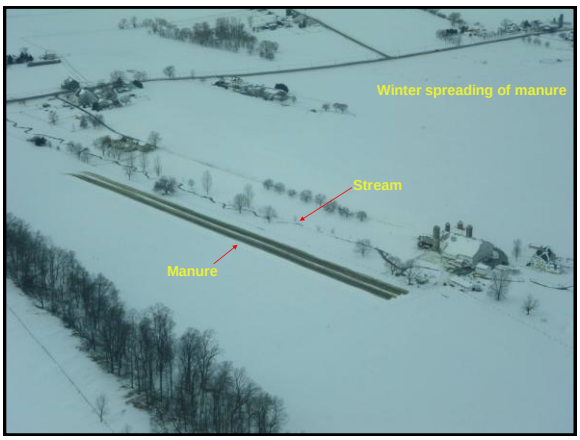



"The CBP Partnership has defined verification as the process through which agency partners ensure practices, treatments, and technologies resulting in reductions of nitrogen, phosphorus, and/or sediment pollutant loads are **implemented and operating correctly**."

# "…implemented and operating correctly."

## BMP Verification Life Cycle






## Great Sources of Information

- CBP Partnership's website
  - www.chesapeakebay.net
- Chesapeake Bay TMDL documentation
  - www.epa.gov/chesapeakebaytmdl
  - Appendix B provides links to 100s of relevant documents
- Sept 2013 JAWRA Issue Dedicated to Chesapeake Bay TMDL
  - Can provide access via an FTP site

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Questions
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