Allocation of Conowingo Infill Nutrient and Sediment Loads

Presented to the Chesapeake Bay Program Modeling Workgroup

June 15, 2017

Topics for Today

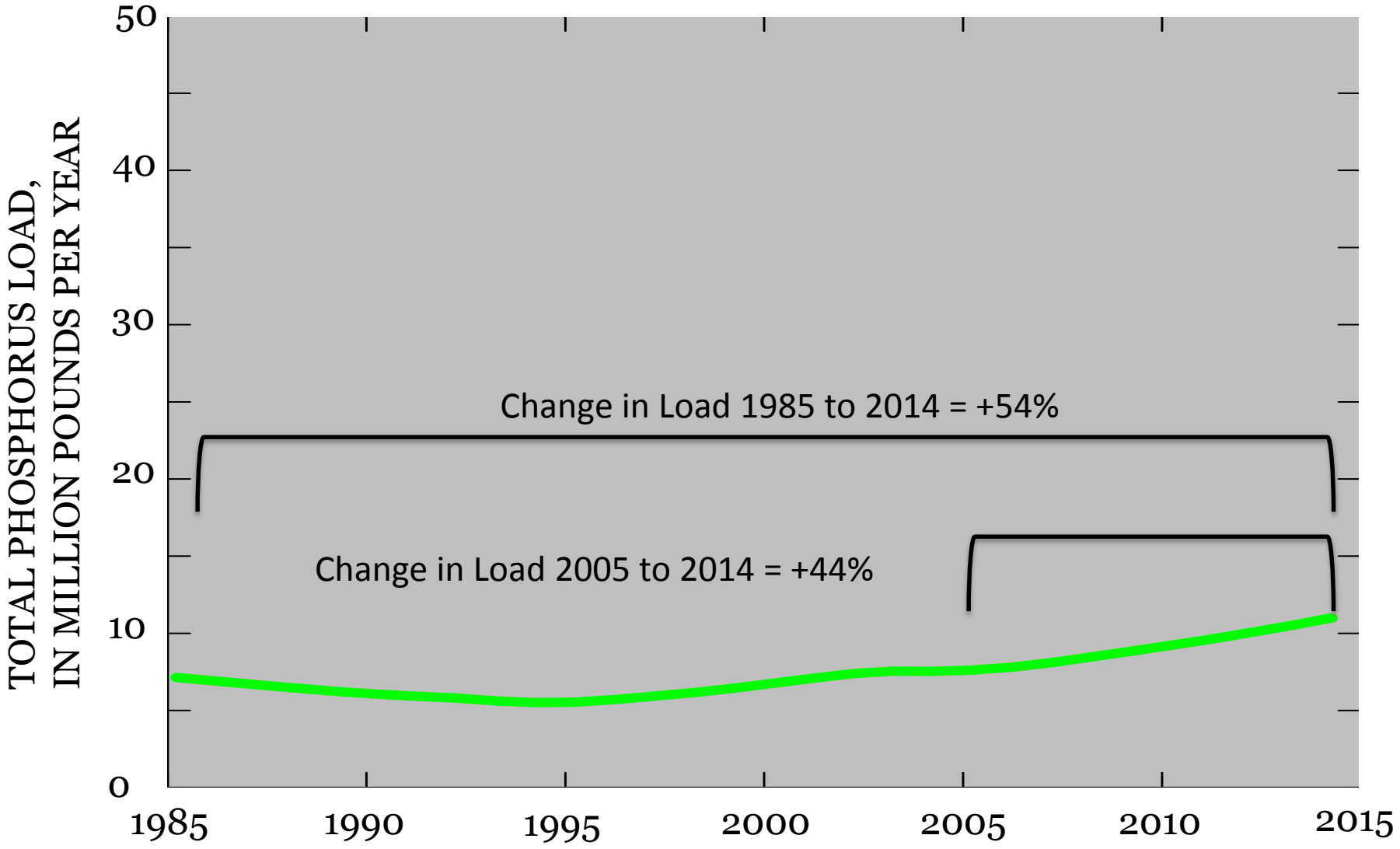
- Timeline
- Background on Science and Policy
- Preliminary Cost Analysis

Timeline for 2017 Midpoint Assessment Decisions

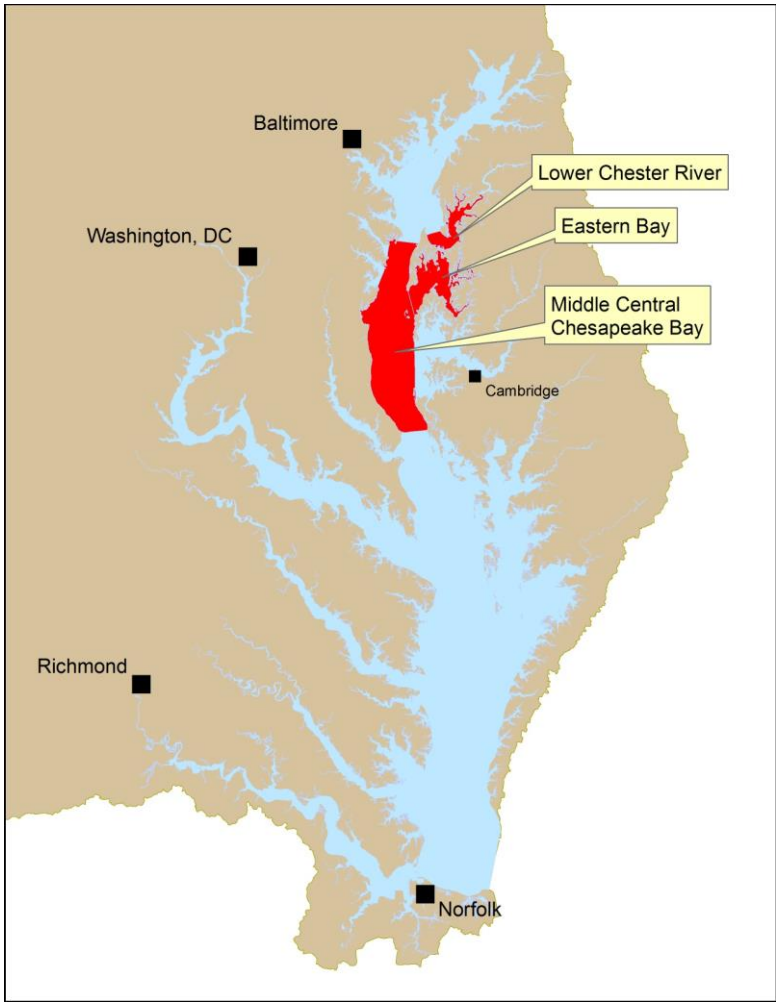
- **December 2016**: Initial framework for determining which jurisdictions will be responsible for addressing the additional nutrient and sediment loads resulting from infill of the Conowingo Reservoir
- **By Sept 30, 2017**: Determine how much additional nutrient and sediment loads must be addressed resulting from infill of the Conowingo Reservoir and decide upon allocation rules
- **Late October:** PSC 2-day Retreat
- **October 31, 2017**: Draft Phase III WIP planning targets fully reflect best understanding of additional loads from infill of the Conowingo Reservoir
- **March 2018**: Final Phase III WIP planning targets fully reflect best understanding of additional loads from infill of the Conowingo Reservoir

Source: December 2016 PSC Meeting

Flow-Normalized Phosphorus Load
Susquehanna River at Conowingo



Impact of Changed Conowingo Reservoir Conditions on Chesapeake bay Water Quality



Chesapeake Bay Water Quality with Watershed Implementation Plans Fully Achieved and Dams in Dynamic Equilibrium

Estimates of about 1 - 3% additional water quality DO standards non-attainment in 3 segments

Source: Linker et al. (2016), LSRWA (2015)

Framing the Policy Questions
Modeling WG to Bring Context to Decisions

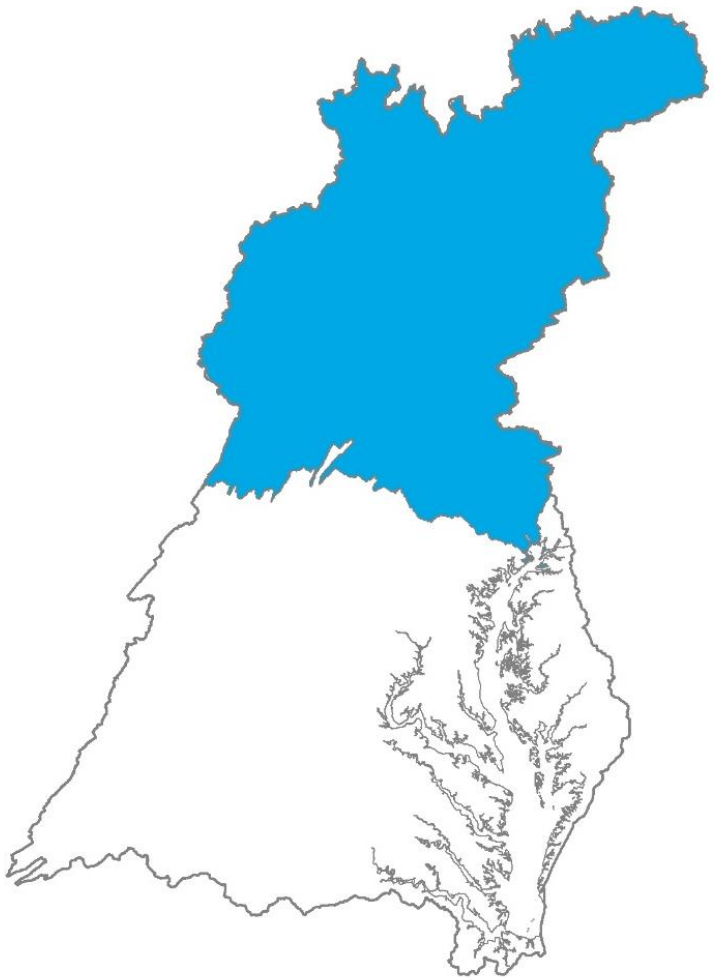
- **Who** is responsible for additional load reductions?
  - Susquehanna watershed only
  - Susquehanna watershed + Maryland and Virginia
  - All Chesapeake Bay watershed jurisdictions

- How will responsibility assigned?
  - Allocation equity rules used in the Bay TMDL
  - Most cost effective practices and locations

- **When** will the additional reductions be required to be met?
  - Allocate additional loads into Phase III Planning Targets and address by 2025
  - Allocate additional loads into Phase III Planning Targets, but establish timeframe beyond 2025 to address Conowingo infill loads
  - Quantify impacts due to Conowingo infill but allocate and address necessary load reductions post-2025

Source: December 2016 PSC Meeting

Susquehanna Watershed Only
Using allocation rules

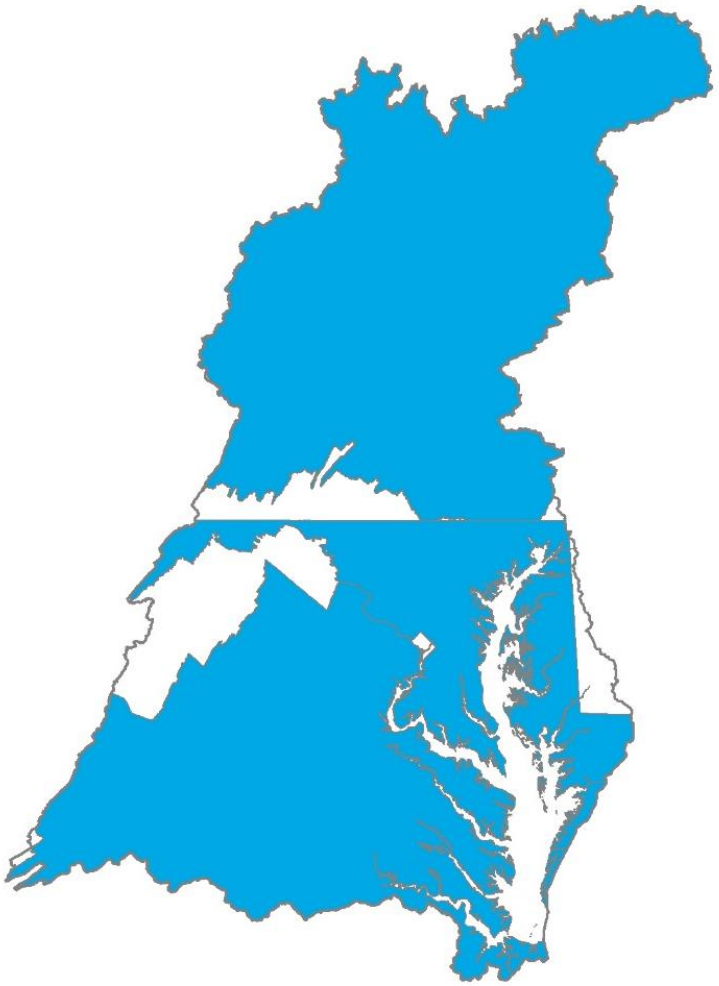


Potential Range of Percent Increase in Phosphorus Load Above Each Jurisdiction's Phase II WIP Load

NY:	10 - 21
PA:	12 - 25
MD:	1 - 1
VA:	0 - 0
DE:	0 - 0
DC:	0 - 0
WV:	0 - 0

Source: December 2016 PSC Meeting, results are preliminary

Susquehanna Watershed + Maryland & Virginia Using allocation rules

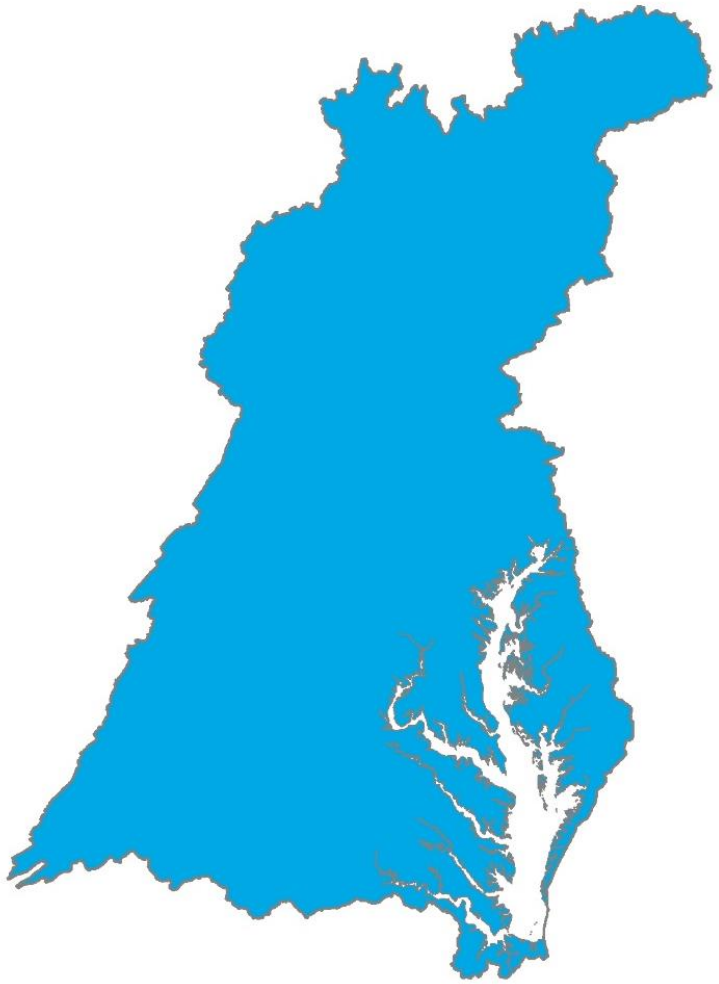


Potential Range of Percent Increase in Phosphorus Load Above Each Jurisdiction's Phase II WIP Load

NY:	6 - 11
PA:	7 - 14
MD:	7 - 16
VA:	4 - 9
DE:	0 - 0
DC:	0 - 0
WV:	0 - 0

Source: December 2016 PSC Meeting , results are preliminary

All Chesapeake Bay Watershed Jurisdictions Using allocation rules



Potential Range of Percent Increase in Phosphorus Load Above Each Jurisdiction's Phase II WIP Load

NY:	5 - 10
PA:	7 - 14
MD:	6 - 14
VA:	4 - 8
DE:	9 - 20
DC:	1 - 3
WV:	5 - 11

Source: December 2016 PSC Meeting , results are preliminary

Phase III WIP Solutions to Address Increased Loads

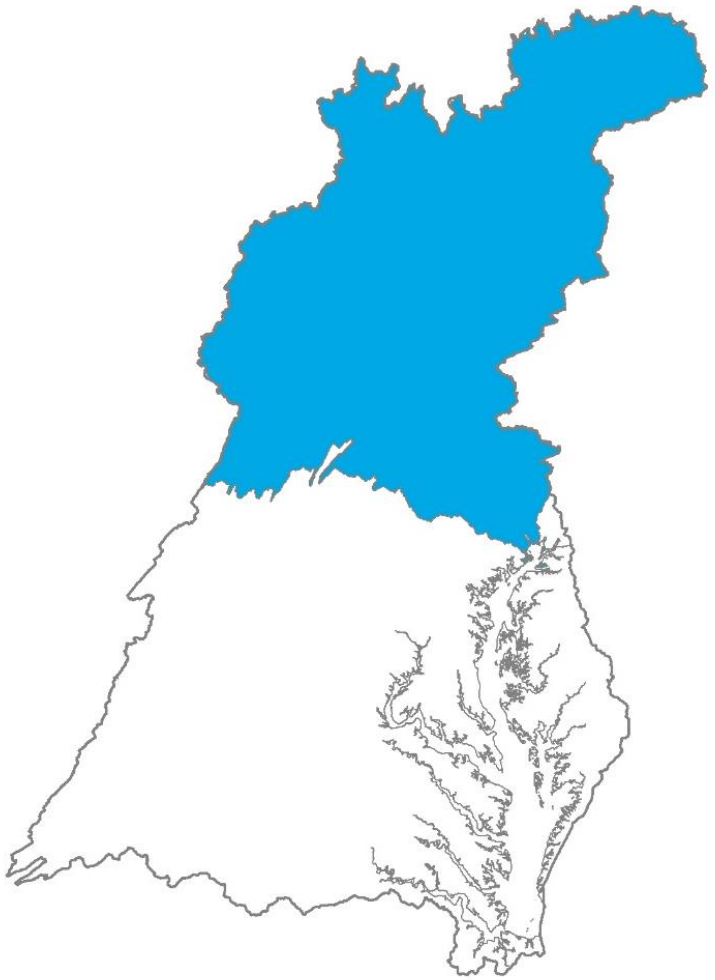
- Additional upstream implementation
- Increase reservoir capacity
- More downstream implementation

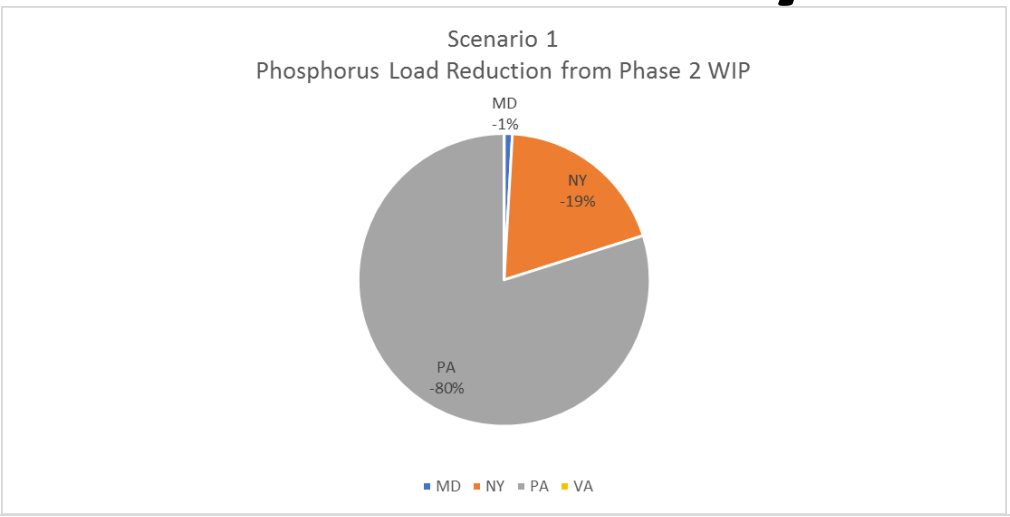
- The following Slides are based on Draft Report Titled “Allocation of Conowingo Infill Nutrient and Sediment Loads: Comparing Cost Effectiveness in Different Phosphorus Load Allocation Scenarios among Jurisdictional Partners”

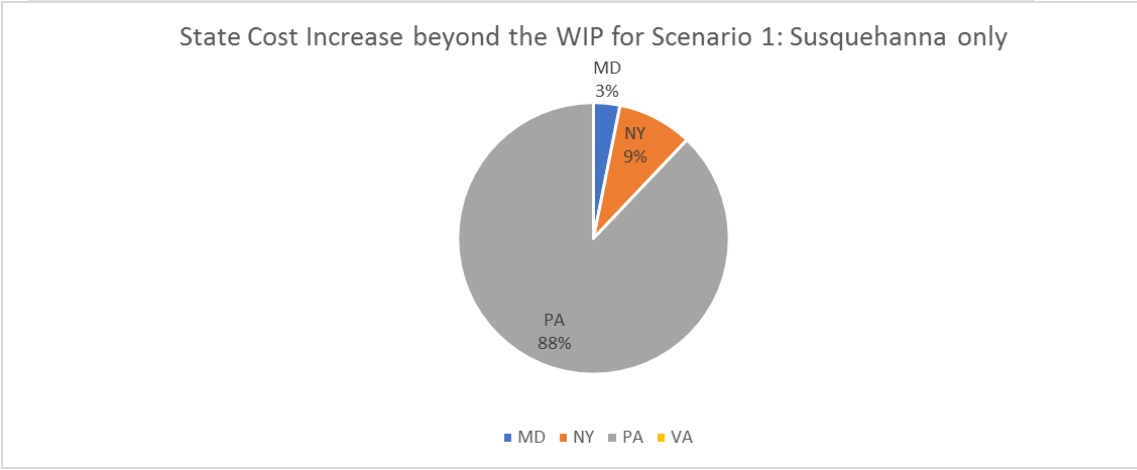
Developing Cost Scenarios

- Assumptions:
  - Use the three geographic options from the PSC. Assume a 38% increase in Phosphorus.
  - E3 was not an upper constraint
- Three Steps:
  - Step I – First cut at least cost scenario to allocate additional loads
    - The least expensive and most effective BMPs were selected. The BMPs selected for each scenario vary depending on the scenario. Selections were made using an analysis that previously was conducted to show the cost of BMPs per pound of phosphorus reduced.
    - The BMPs already in the WIP generally were not altered. However, more cost savings could be made by altering all the BMPs in the scenario, not just the added implementation to counter the increased load from the reservoir infill.
    - There was no assumption of equality of BMP implementation among sectors.
    - There was also no consideration of the public will to implement the BMPs.
    - These scenarios mathematically meet the target. They would benefit by input from the source sector workgroups
  - Step II – Realism - Input from Workgroups
  - Step III – Exchange of N and P – Modeling Workgroup

Susquehanna Watershed Only

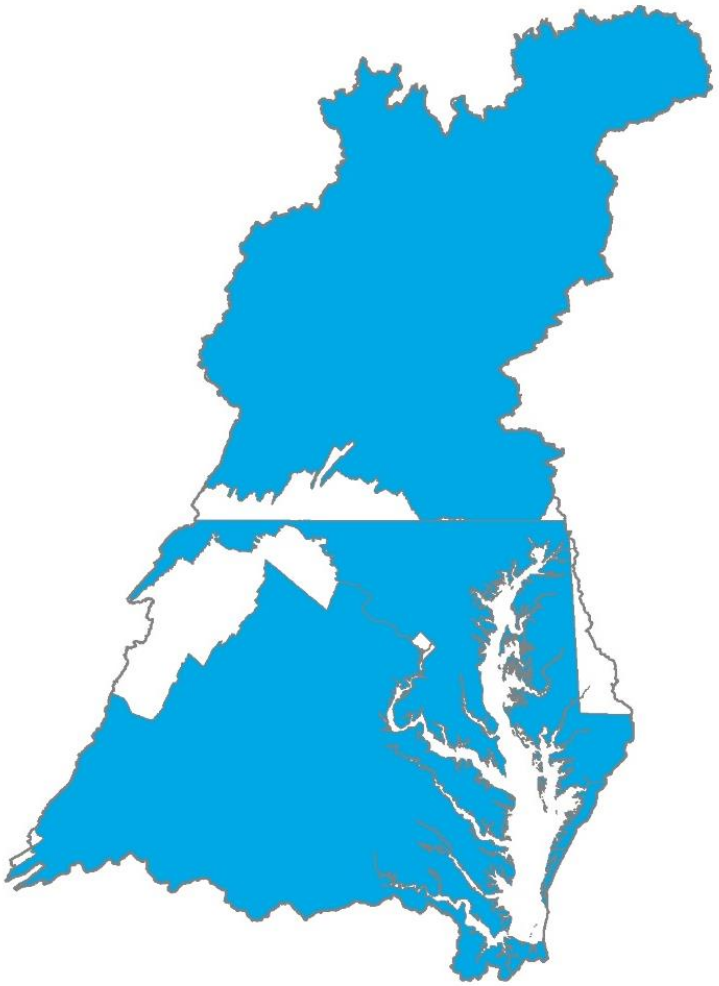


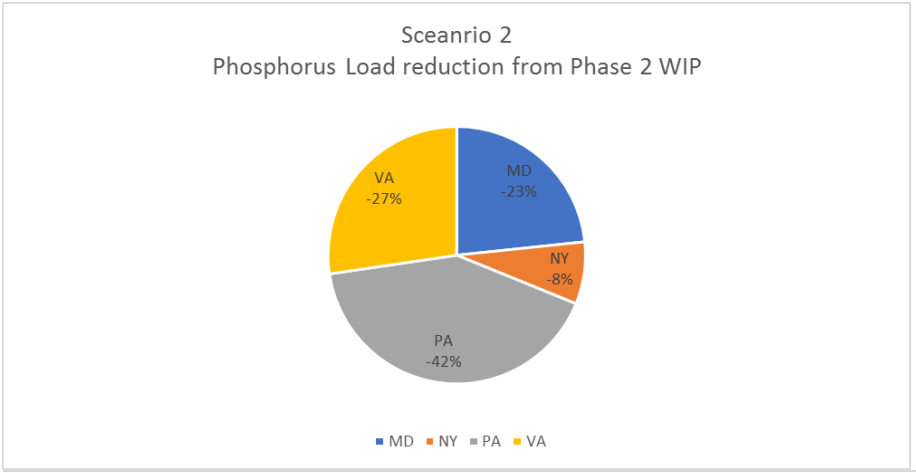




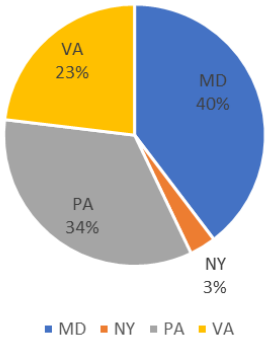
To achieve the additional reduction beyond those already achieved in the Phase 2 WIP, forest buffers were increased to 20 percent in Scenario 1. This level of implementation was chosen because forest buffers are one of the least costly BMPs when considering the phosphorus reduction. Manure transport out of the Chesapeake Bay Watershed also was implemented at 20 percent of available manure in Scenario 1. While costly, this BMP removes a portion of one of the major sources of phosphorus. The implementation levels of other BMPs also were increased to reduce the load beyond the Phase 2 WIP allocation.

Susquehanna Watershed + Maryland & Virginia

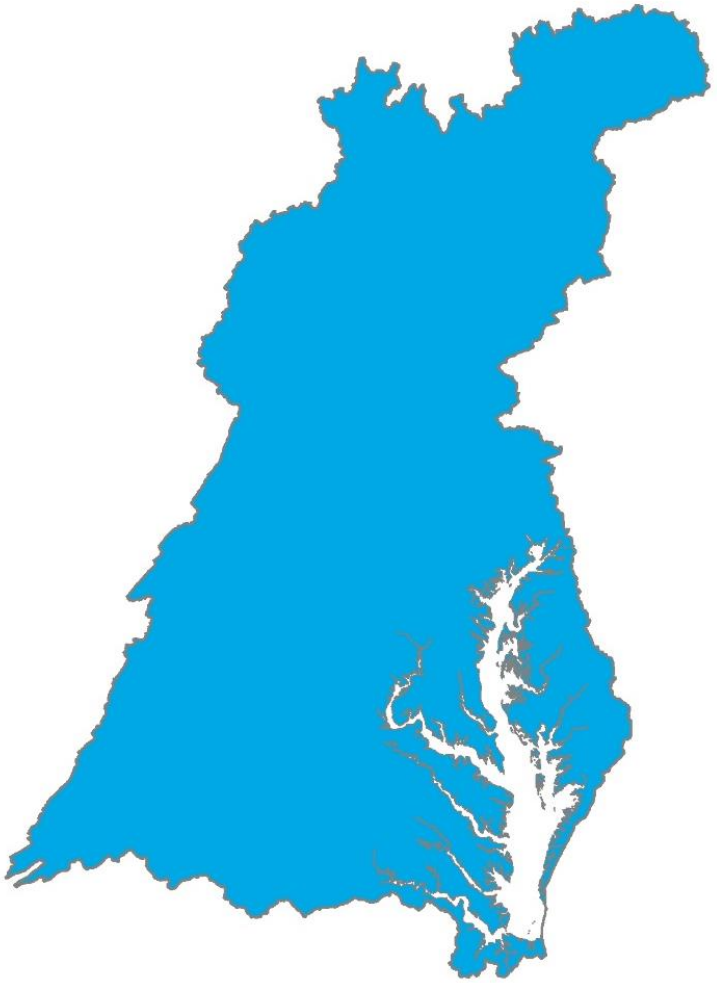


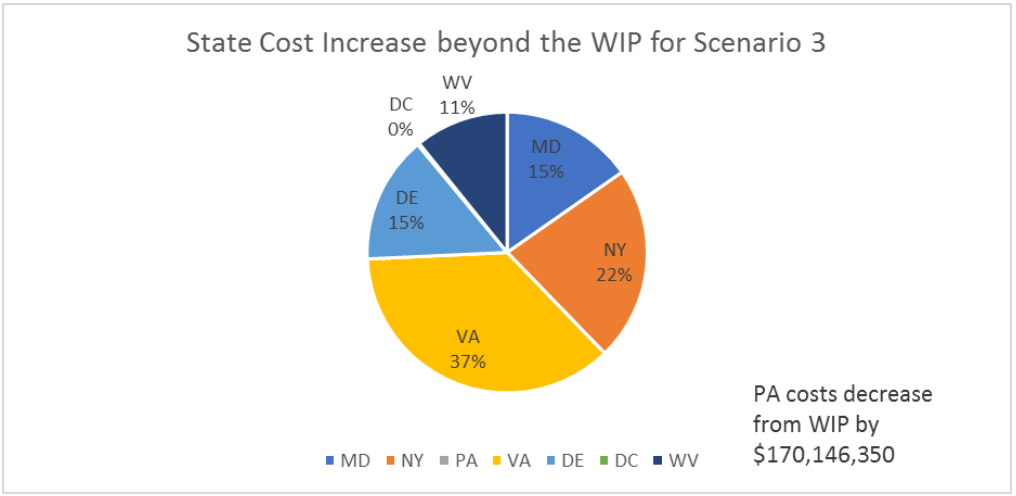


State Cost Increase beyond the WIP for Scenario 2



All Chesapeake Bay Watershed Jurisdictions





Source: December 2016 PSC Meeting , results are preliminary

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Table 1: Cost of Phase 2 WIP and additional increase required for each scenario.

	Increased Cost from WIP			
Sector	**WIP-all CBWS**	**Scenario 1**	**Scenario 2**	**Scenario 3**
All Sectors	***$6,530,226,012***	***$495,098,643***	***$380,299,858***	***$81,953,671***
Land and septic	$6,059,405,938	$478,981,537	$362,250,459	$76,392,397
Animal	$457,103,828	$2,240,606	$(1,979,765)	-$14,467,890
Manure transport	$13,716,246	$13,876,500	$20,029,164	$20,029,164

Table 2: Comparison of the reductions from the Phase 2 WIP. Reduction is calculated by subtracting the WIP load from the scenario load. All three scenarios have the same impact on Bay water quality. Total reductions vary among scenarios because the various river basins have different effects on water quality in the Bay.

	Phosphorus Load Reduction from Phase 2 WIP (Lbs)		
Sector	**Scenario 1**	**Scenario 2**	**Scenario 3**
Total	(2,199,722)	(1,266,851)	(1,323,776)
Agriculture	(1,059,053)	(1,204,774)	(1,235,776)
Natural	(1,491)	4,703	6,926
Urban	(78,634)	(66,780)	(94,406)

Input Needed for Step II

- Seeking input from Modeling WG today, looking for comments by end of June
- Seeking input from Workgroups Review - Realism
  - Forestry Workgroup June 7
  - Urban Stormwater Workgroup on June 27
  - Agricultural Workgroup on June 28