Addressing Conowingo Infill Nutrient and Sediment Loads

Chesapeake Bay Commission
September 8, 2017

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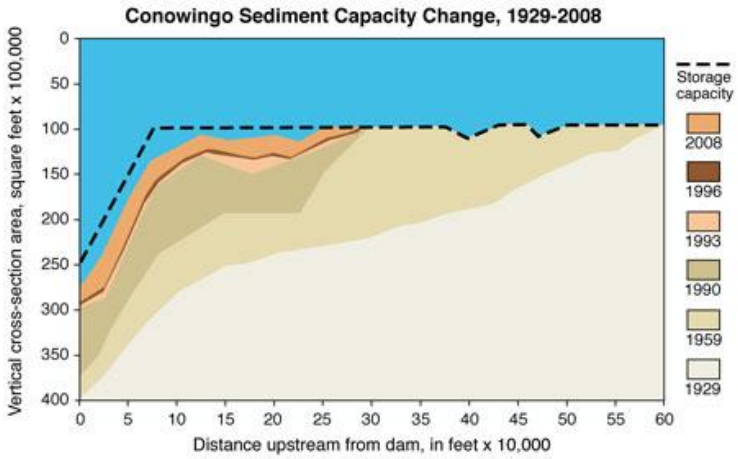
Timeline for 2017 Midpoint Assessment Decisions

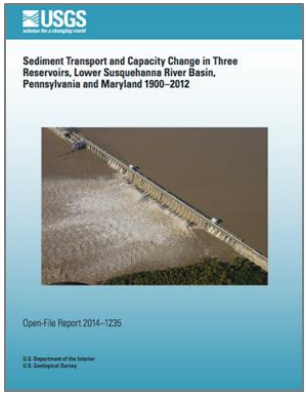
- **December 2016**: Initial framework for determining which jurisdictions will be responsible for addressing the additional nutrient and sediment loads resulting from infill of the Conowingo Reservoir
- **By Sept 30, 2017**: Determine how much additional nutrient and sediment loads must be addressed 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

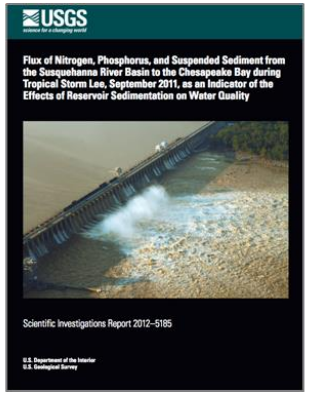
Source: December 2016 PSC Meeting

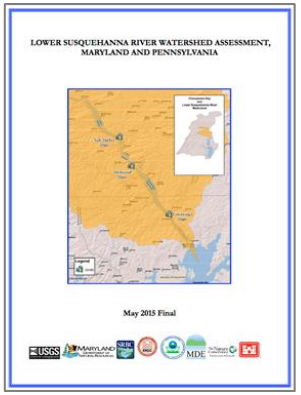
A Brief Overview of Conowingo Infill

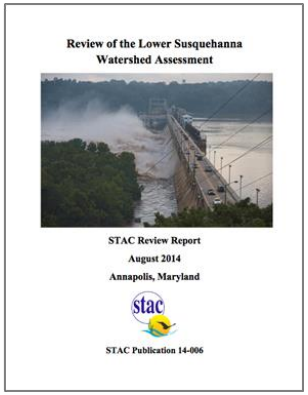
- Conowingo reservoir is effectively at dynamic equilibrium, which has reduced its ability to trap sediment and nutrients.
- Numerous scientists using observed data, have documented the reservoir condition. The scientific information has been incorporated into the Bay modeling system.

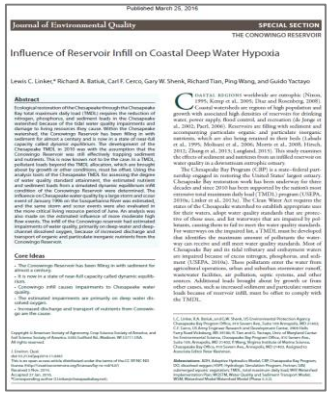






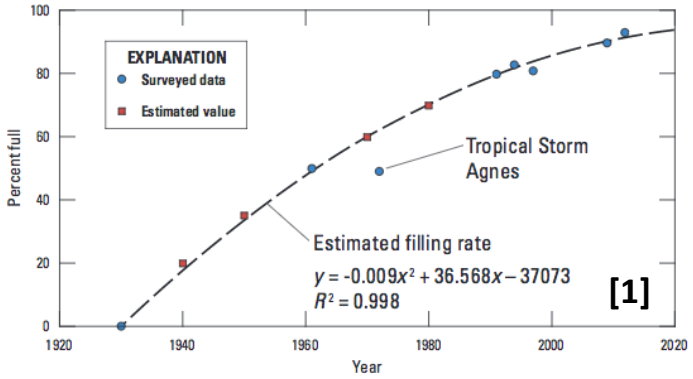


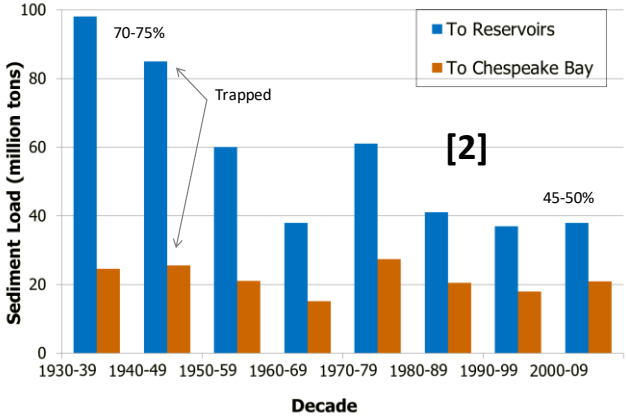


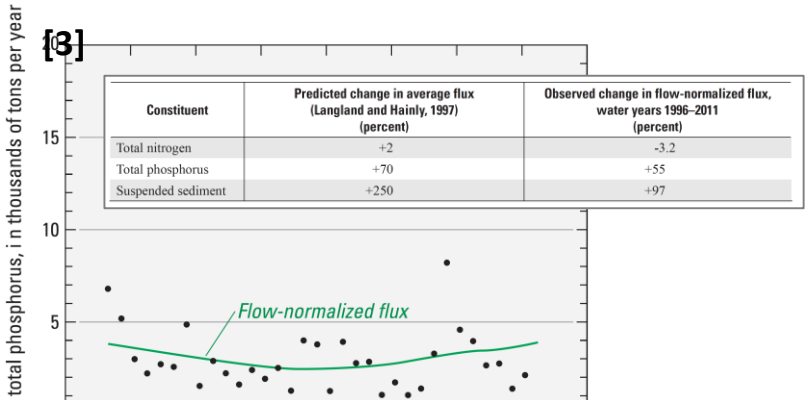


Source: G. Bhatt, 8/17 to WQGIT

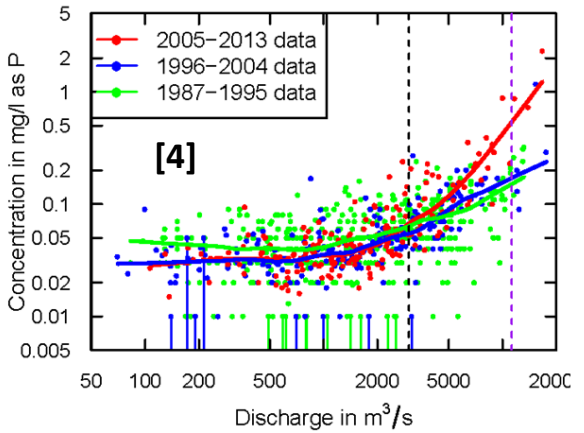
The Multiple Lines of Evidence

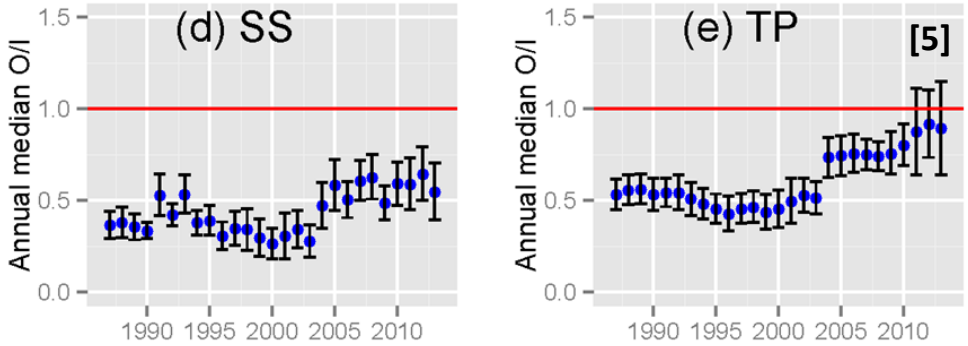


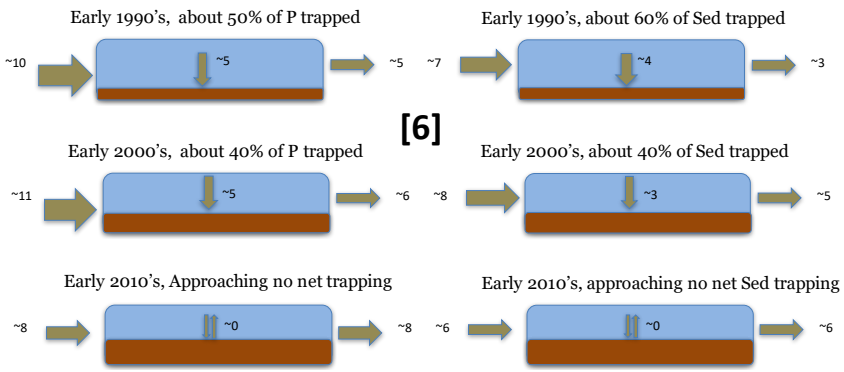




Constituent	Predicted change in average flux (Langland and Hainly, 1997) (percent)	Observed change in flow-normalized flux, water years 1996–2011 (percent)
Total nitrogen	+2	-3.2
Total phosphorus	+70	+55
Suspended sediment	+250	+97



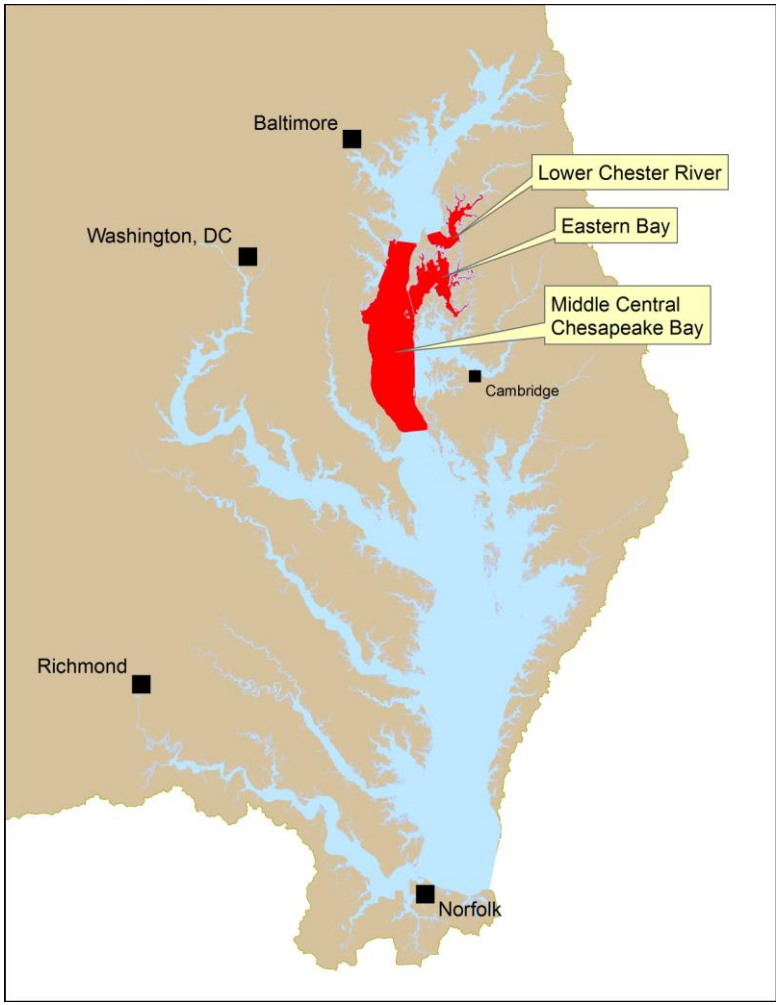




[1][2] Langland, M.J., 2009. Bathymetry and sediment-storage capacity change in three reservoirs on the lower Susquehanna River, 1996–2008: U.S. Geological Survey Scientific Investigations Report 2009–5110, 21 p.
[3] Hirsch, R.M., 2012. Flux of nitrogen, phosphorus, and suspended sediment from the Susquehanna River Basin to the Chesapeake Bay during Tropical Storm Lee, September 2011, as an indicator of the effects of reservoir sedimentation on water quality: U.S. Geological Survey Scientific Investigations Report 2012–5185, 17 p.
[4][5] Zhang, Q., Hirsch, R.M., Ball, W.P., 2016. Long-term changes in sediment and nutrient delivery from Conowingo Dam to Chesapeake Bay: Effects of reservoir sedimentation, Environ. Sci. Technol, 50(4), 1877-1886.
[6] Currey, L., 2017, Conowingo dam update, WQGIT

Source: G. Bhatt, 8/17 to WQGIT

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

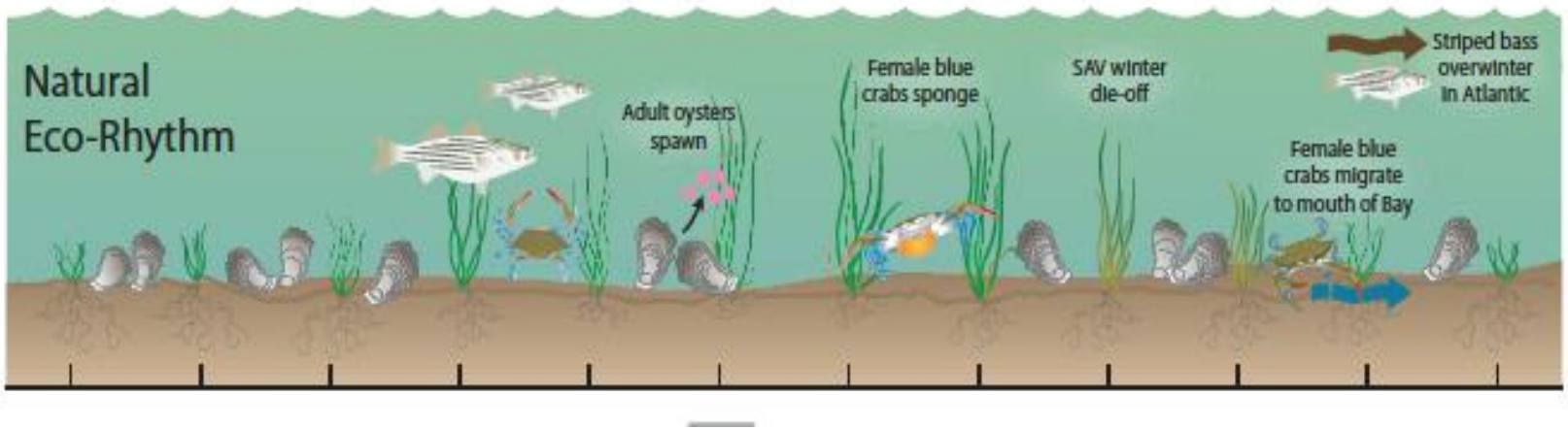
Estimates of about 1 - 3% additional water quality DO standards non-attainment in 3 segments

Lowers overall DO in many segments, adding to stress for fish, crabs and oysters

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

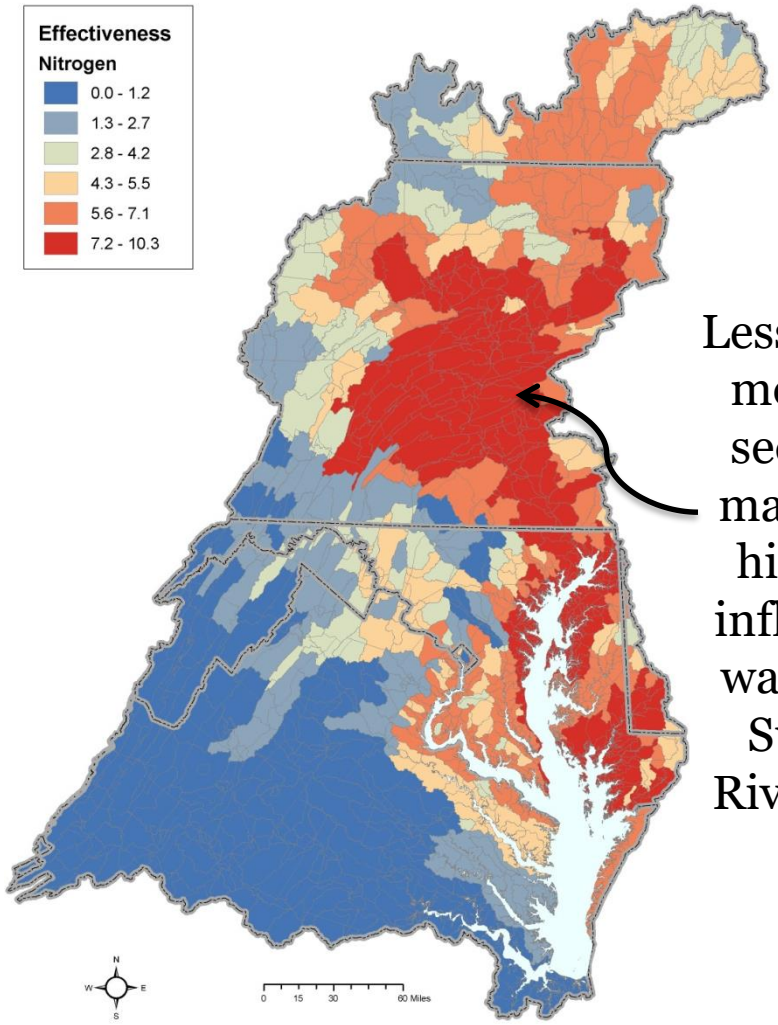
Poor Upper Bay Water Quality Conditions Impact Entire Bay

Striped Bass – Migratory Species
Crabs – Migratory Species
Oysters
Forage Fish (Menhaden) – Migratory Species
Benthic organisms are food source for multiple species

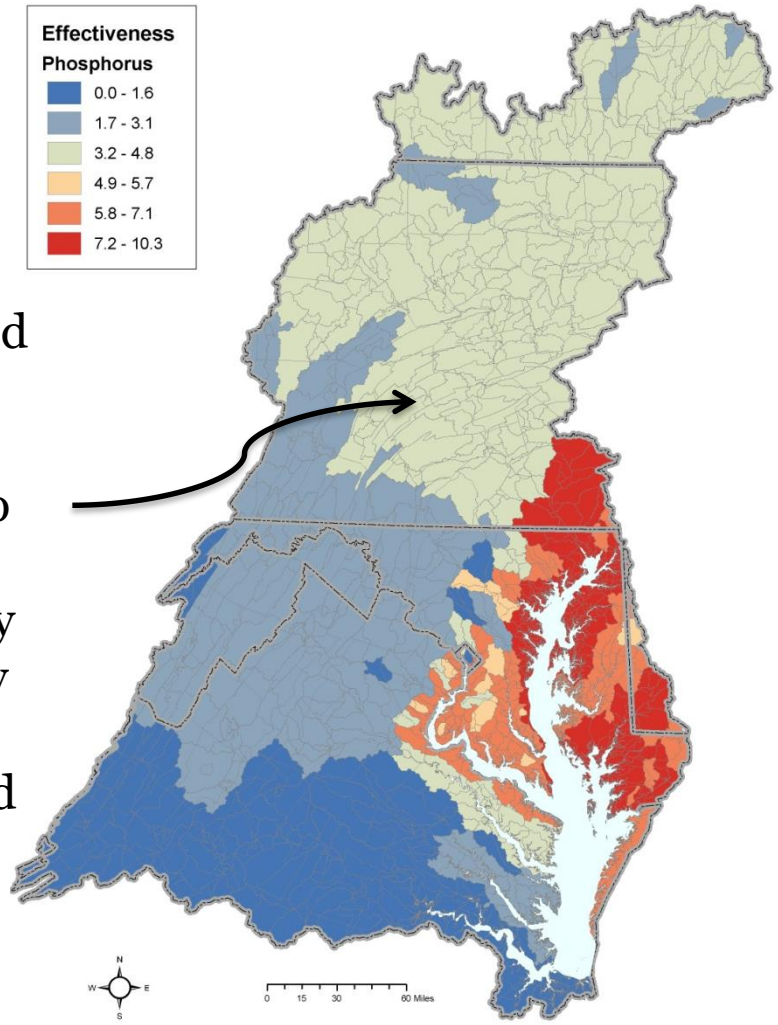


Source: Images UMCES

“With Infill, Areas Upstream of the Reservoir Now Have More Impact”



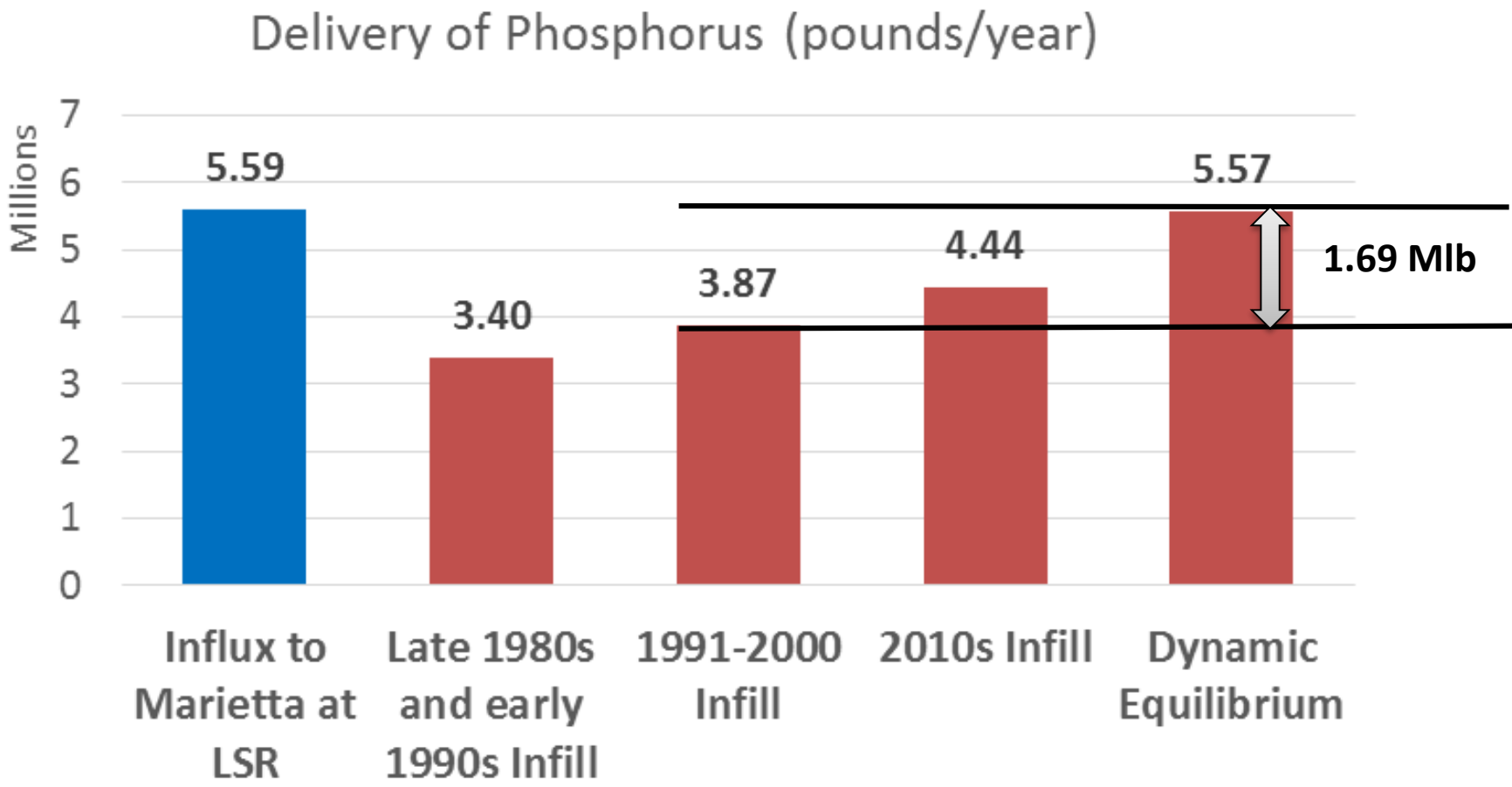
Less trapping and more nutrient/ sediment loads may translate to higher relative influence on Bay water quality by Susquehanna River Watershed loads



Source: U.S. EPA 2010

Lower Susquehanna Reservoirs – Phase 2 WIP

Hydrologic Period 1991 – 2000



Source:
Adapted from Bhatt, WQGIT 8/14/17. Estimates are based on the Draft Phase 6 Model and inputs

How the Policy Questions Are Currently Framed to the PSC

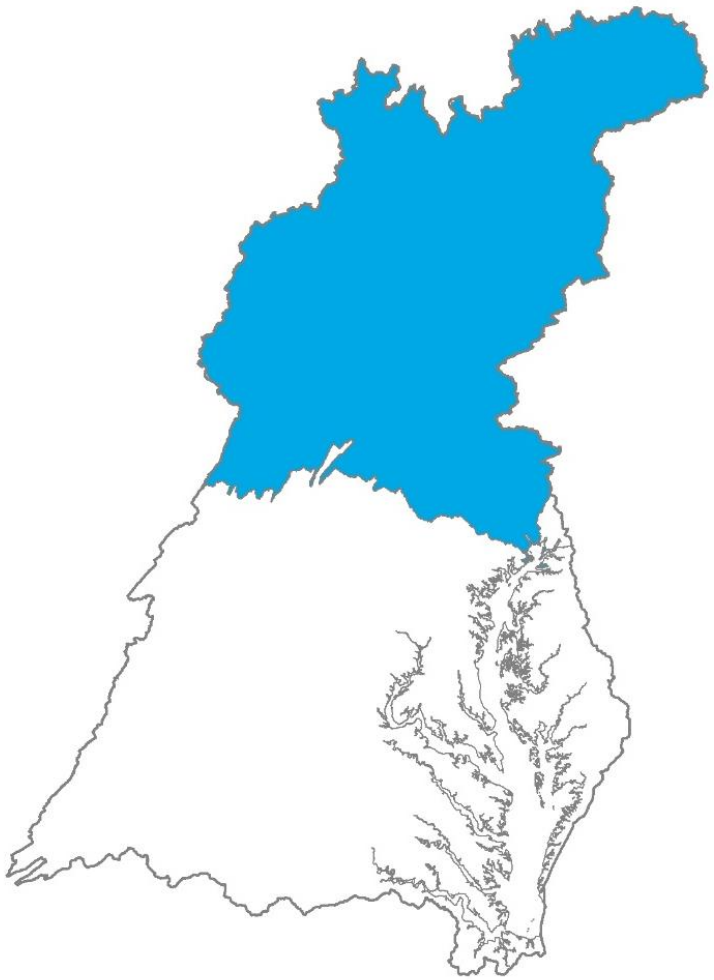
- **Who** is responsible for additional load reductions?
  - Susquehanna watershed only
  - Susquehanna watershed + Maryland and Virginia
  - All Chesapeake Bay watershed jurisdictions

- **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

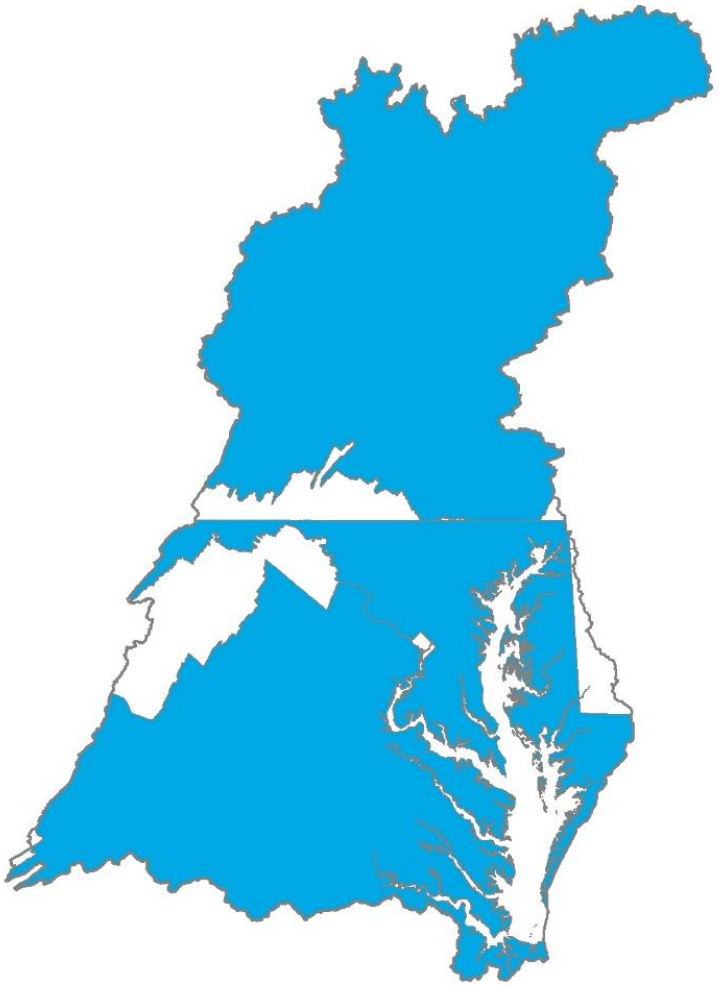


Potential Range of Percent Increase in Phosphorus Load Above Each Jurisdiction's Phase II WIP Load

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

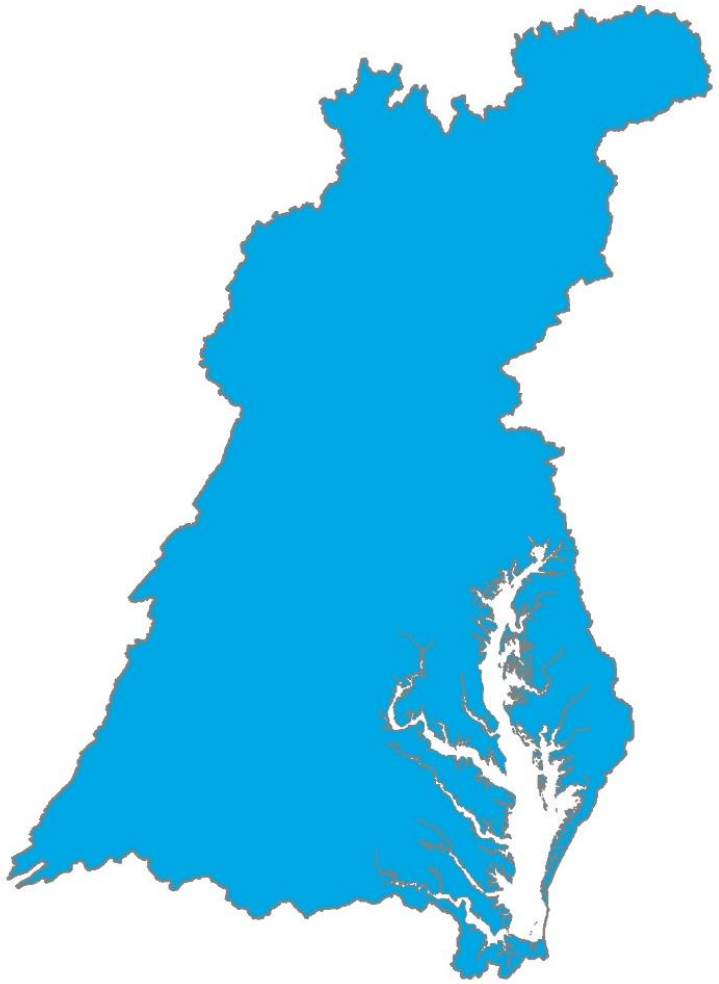


Potential Range of Percent Increase in Phosphorus Load Above Each Jurisdiction's Phase II WIP Load

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



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

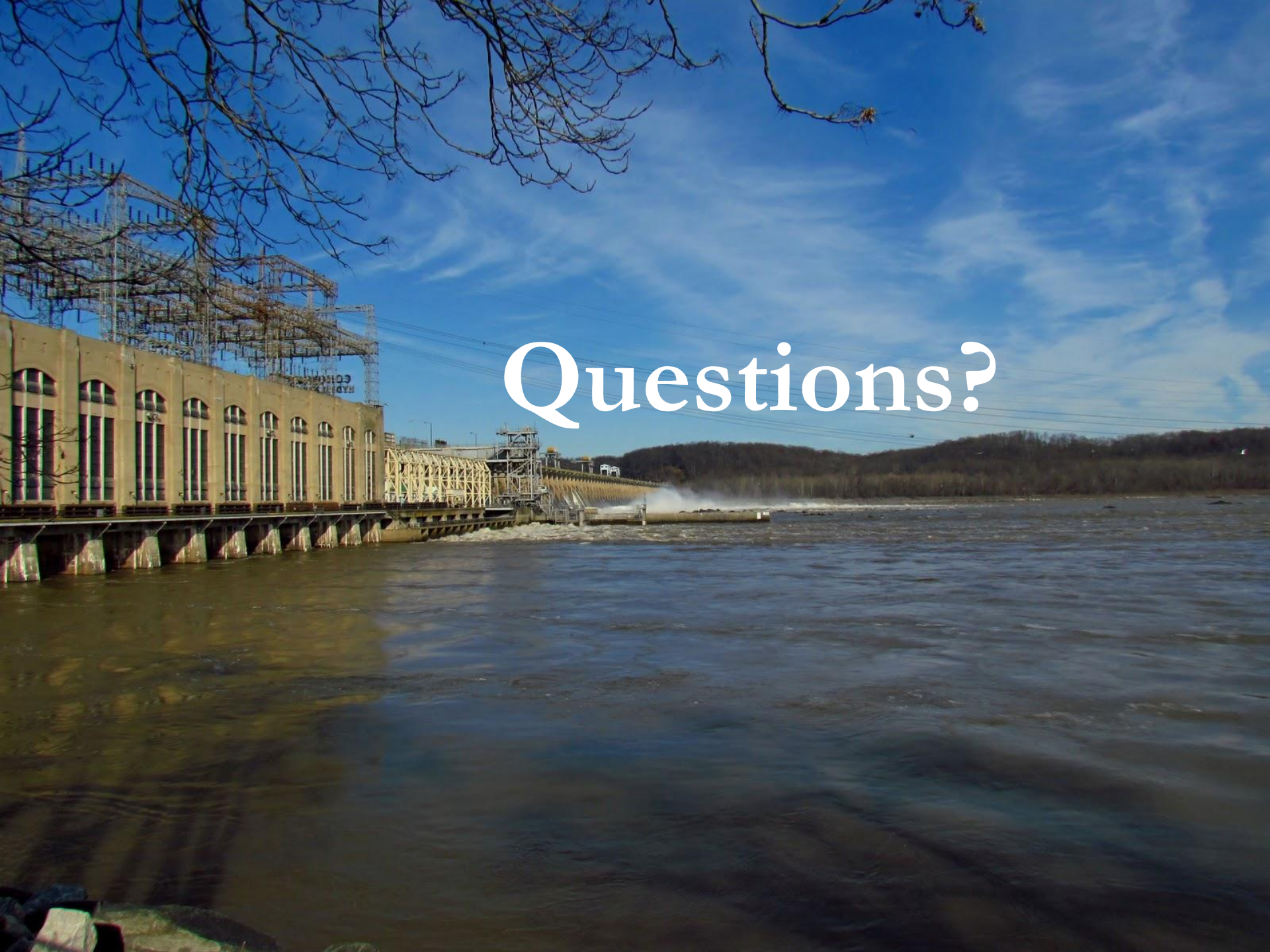
Source: December 2016 PSC Meeting , results are preliminary

Phase III WIP Solutions to Address Increased Loads

- Additional upstream implementation
  - P BMP implementation in Susquehanna River Watershed
- Increase reservoir capacity
  - Potential dredging and beneficial reuse
- More downstream implementation
  - P BMP implementation by all jurisdictions

Summary

- Recent analysis supports that State WIPs will not meet State WQS with current Conowingo infill condition. Need to seek further reductions beyond the WIP
- The Bay functions as an ecosystem as a result of migratory species. Water quality improvement in the mid Bay affect living resources in the entire Bay
- Additional cost can be reduced if pollution reduction practices are applied across the Bay watershed and not just limited to the Susquehanna Basin
- Current estimates indicate that reductions may be toward the upper end of the range provided to the PSC in Dec
- Policy decisions by PSC in late October at the 2-day retreat


Questions?

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