

Conowingo Dam and the Midpoint Assessment Update

Presented to the Chesapeake Bay Program
Scientific and Technical Advisory Committee

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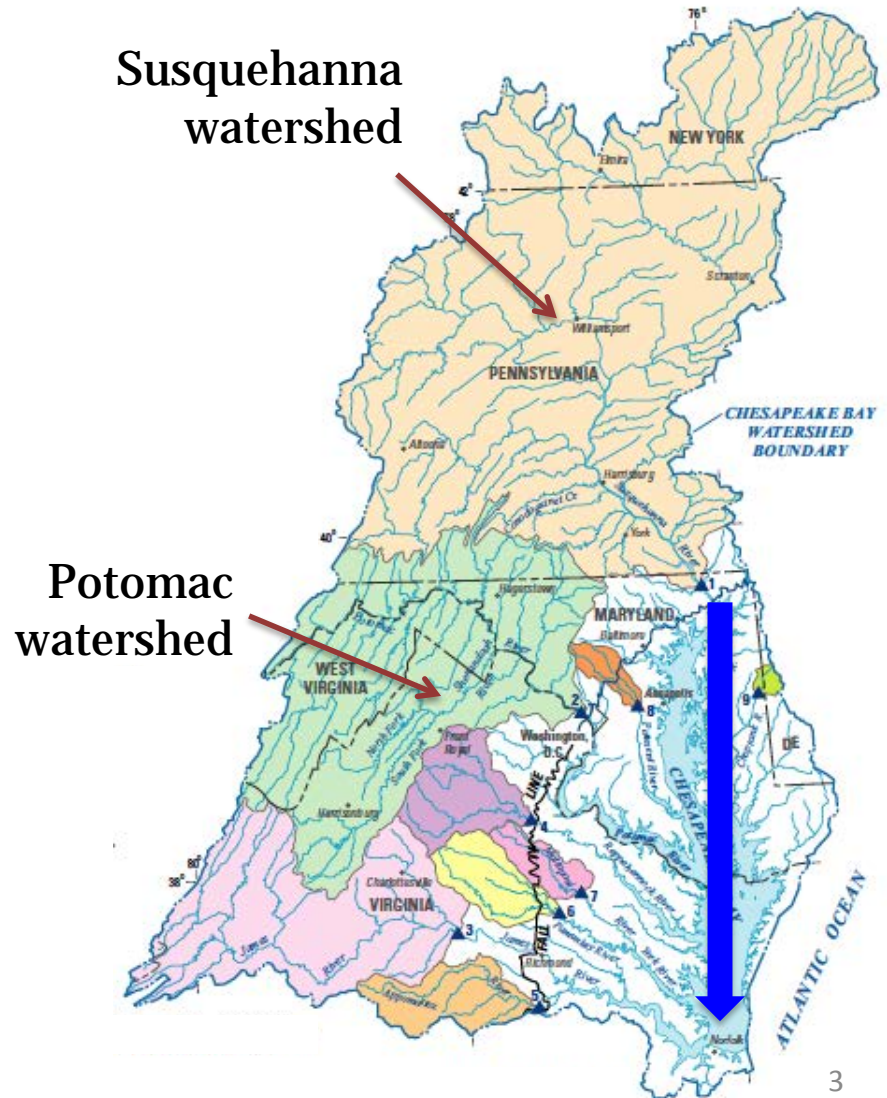
Topics for Today

- Background
- State of the science
- Policy decision-making



Susquehanna River Has a Major Influence on Chesapeake Bay Water Quality

- 43% of Chesapeake Bay watershed
- 47% of freshwater flow into the Bay
- 41% of nitrogen loads to the Bay
- 25% of phosphorus loads to the Bay
- 27% of sediment loads to the Bay
- Influences Bay water quality well into Virginia's portion of the Bay



Lower Susquehanna River Reservoirs

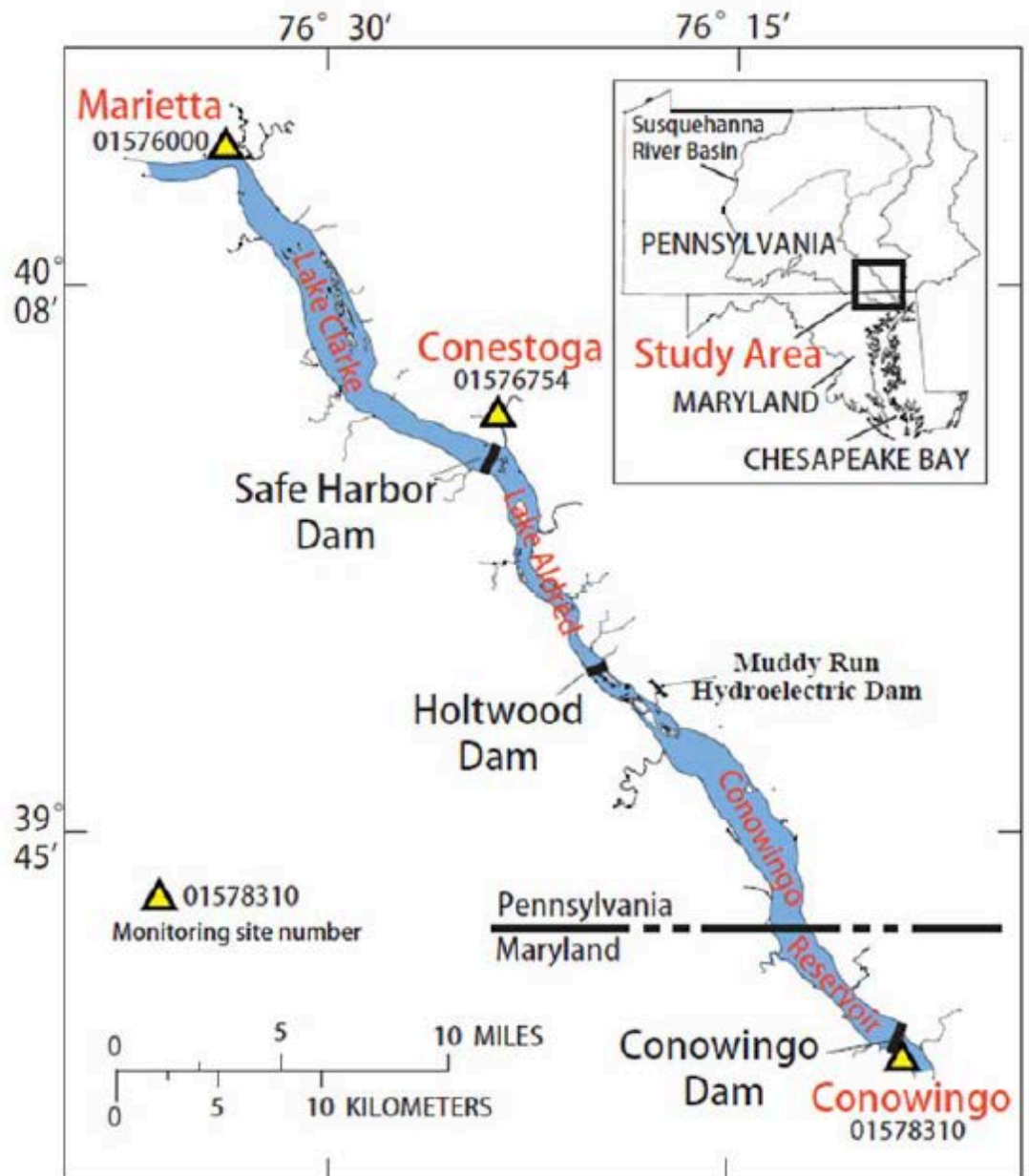
Safe Harbor (Constructed 1931)



Holtwood (Constructed 1910)



Conowingo (Constructed 1928)



Chesapeake Bay TMDL and the Conowingo Dam

The 2010 Chesapeake Bay TMDL said...

“EPA’s intention is to assume the current trapping capacity will continue through the planning horizon for the TMDL (through 2025). The Conowingo Reservoir is anticipated to reach a steady state in 15 – 30 years, depending on future loading rates, scour events and trapping efficiency.”

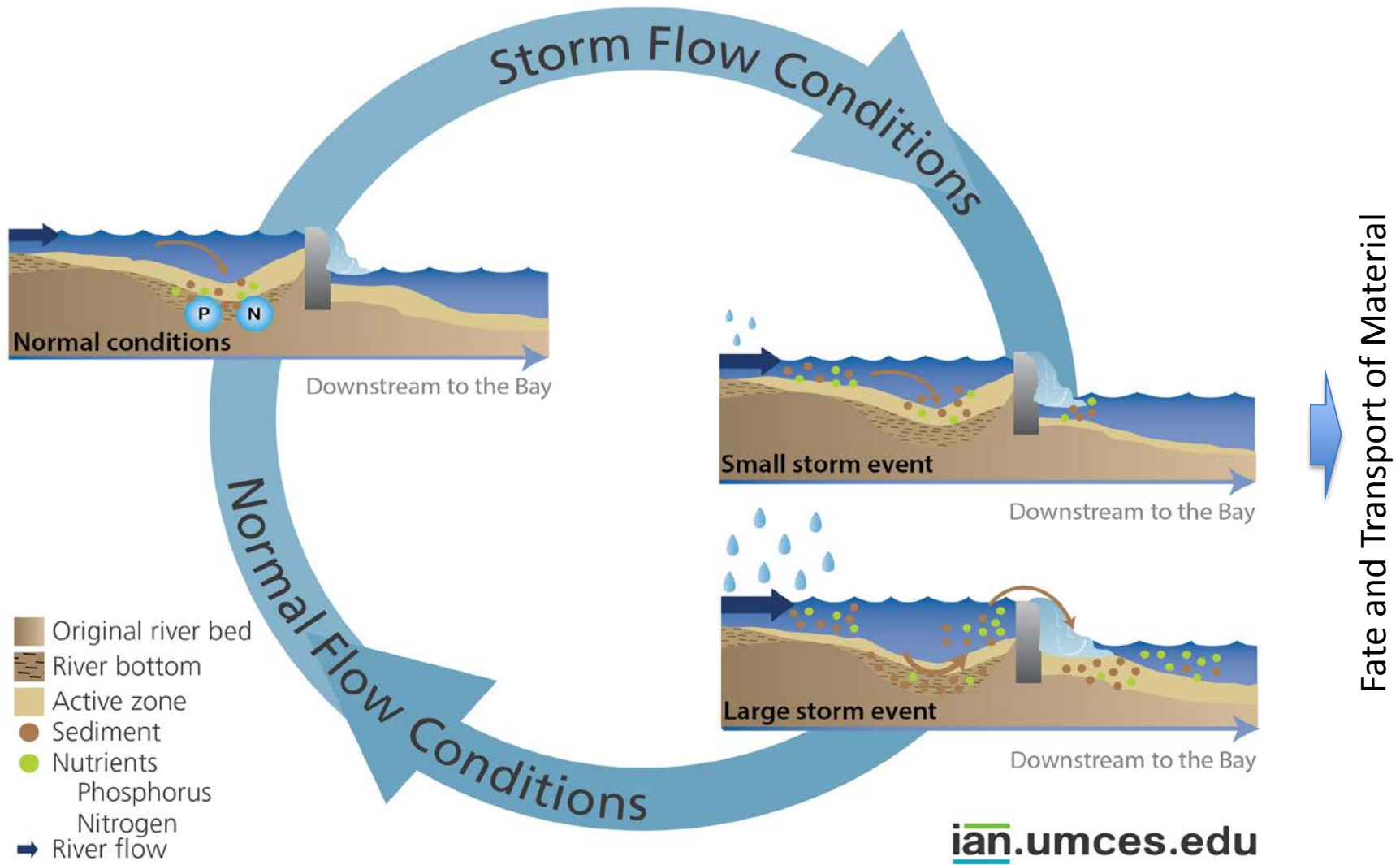
“Under these assumptions, the waste load allocations (WLA) and load allocations (LA) would be based on the current conditions at the dam.”

Significant New Monitoring And Research Since 2011 Indicate Conditions have Changed

- U.S. Geological Survey (USGS) (2012, 2014, 2015)
- U.S. Army Corps of Engineers (2015)
- Johns Hopkins University (2013, 2015, 2016)
- CBP Scientific and Technical Advisory Committee (2014, 2016)
- Enhanced Monitoring and Modeling funded by Exelon and conducted by Gomez and Sullivan, University of Maryland and USGS (2014-2016)

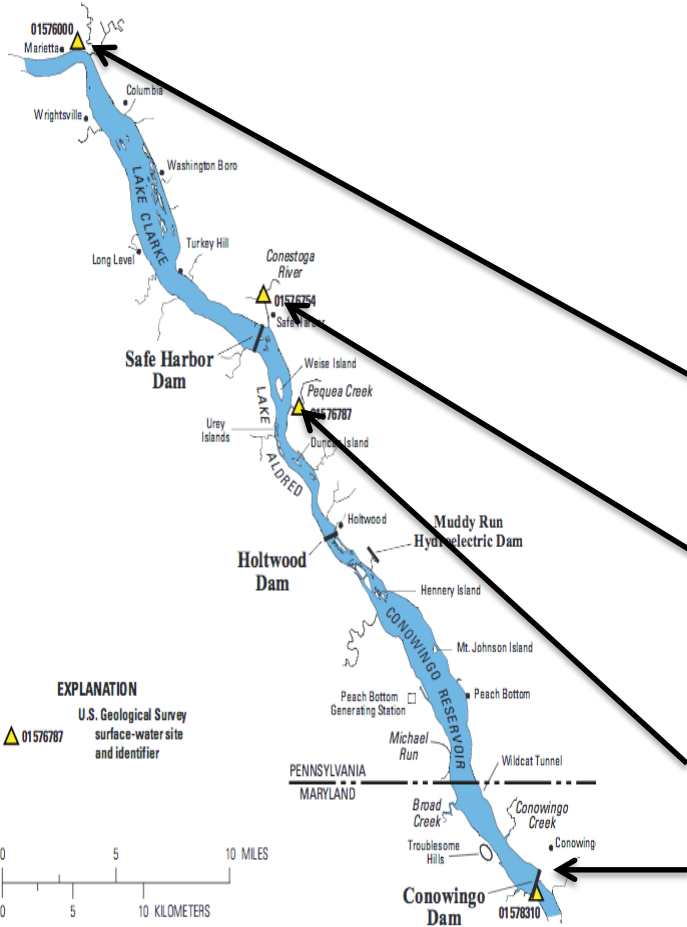


Characteristic of Reservoirs



Dynamic Equilibrium is when, over many years, the input is equal to the output

Nutrient and Sediment Loading Trends into and Out of the Reservoir System (1985 to 2014)

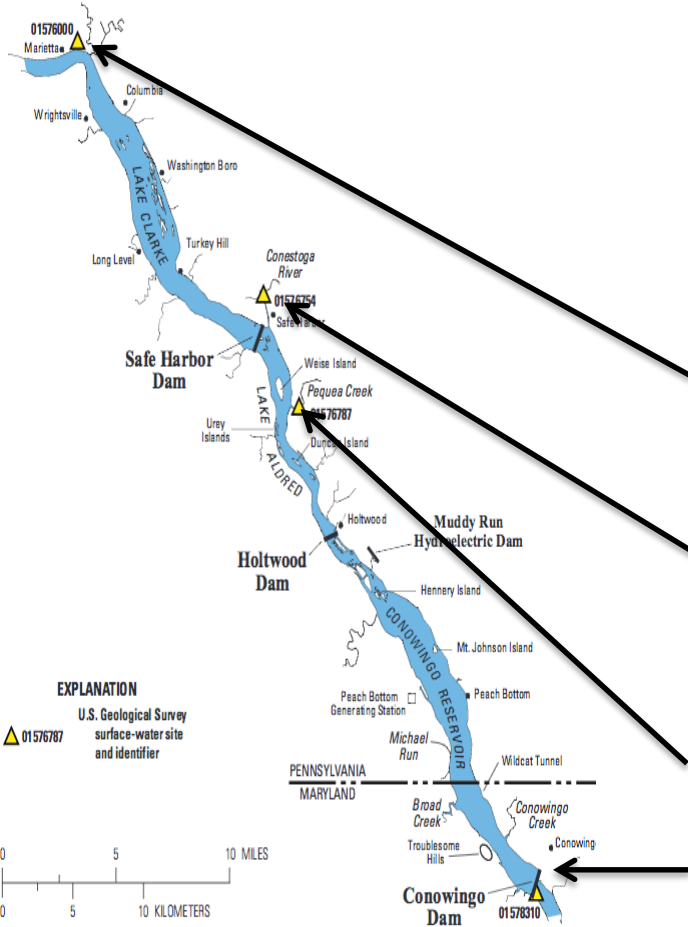


Long-Term Monitoring Trends			
Monitoring Station Name	Total Nitrogen	Total Phosphorus	Sediment
Susquehanna at Marietta	↓	↓	↓
Conestoga River	↓	↓	↓
Pequea Creek	*	*	*
Susquehanna at Conowingo	↓	↑	↑

↓ - improving
 ↑ - degrading

Source: USGS Trend Results published to internet in 2016
 * WQ data record not long enough for establishing trends

Nutrient and Sediment Loading Trends into and Out of the Reservoir System (2005 to 2014)

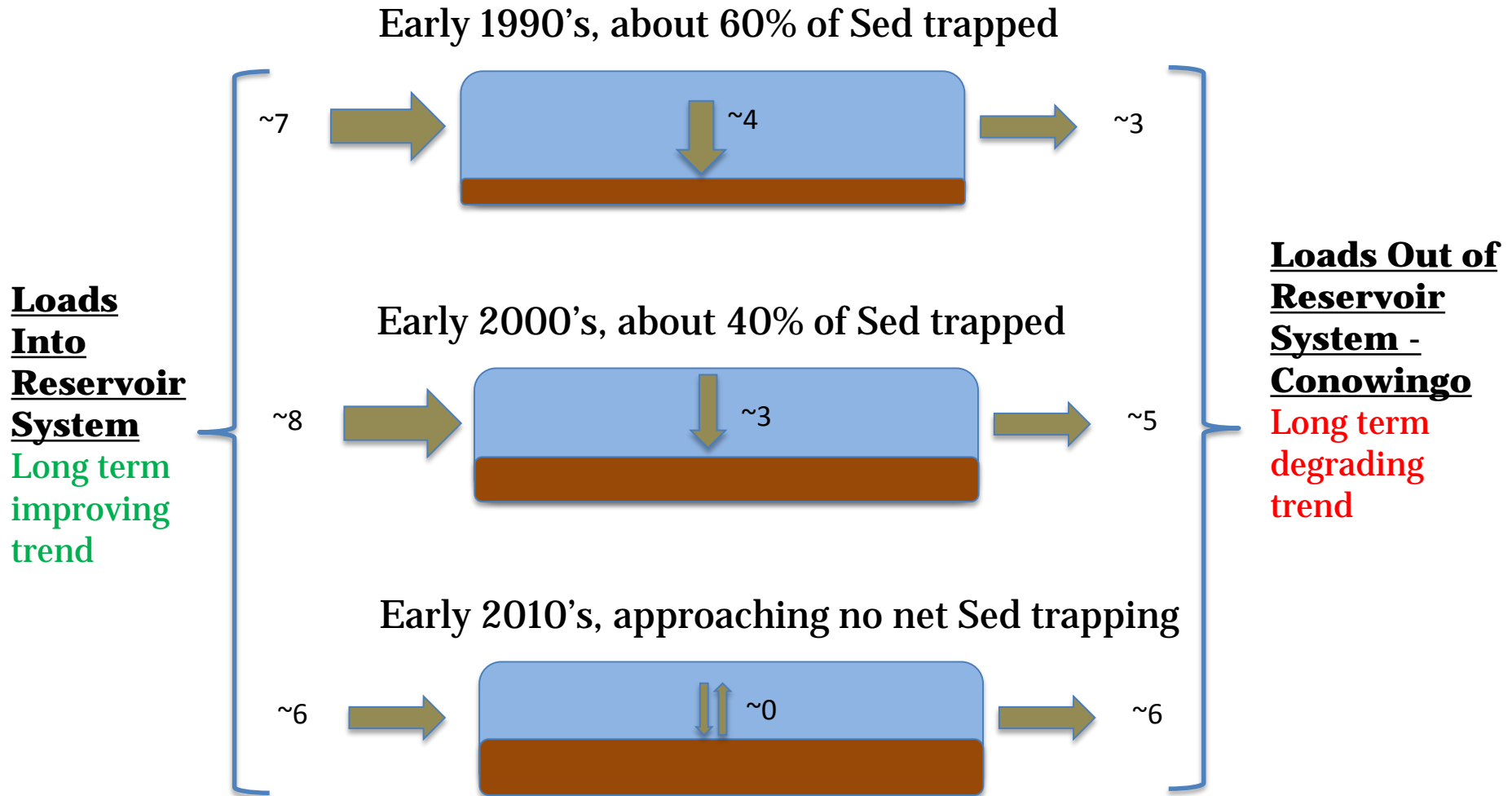


Recent Monitoring Trends			
Monitoring Station Name	Total Nitrogen	Total Phosphorus	Sediment
Susquehanna at Marietta	↓	↓	↓
Conestoga River	↓	↓	↓
Pequea Creek	↓	↑	?
Susquehanna at Conowingo	?	↑	?

Source: USGS Trend Results published to internet in 2016
 ? Indicates that trend analysis was inconclusive

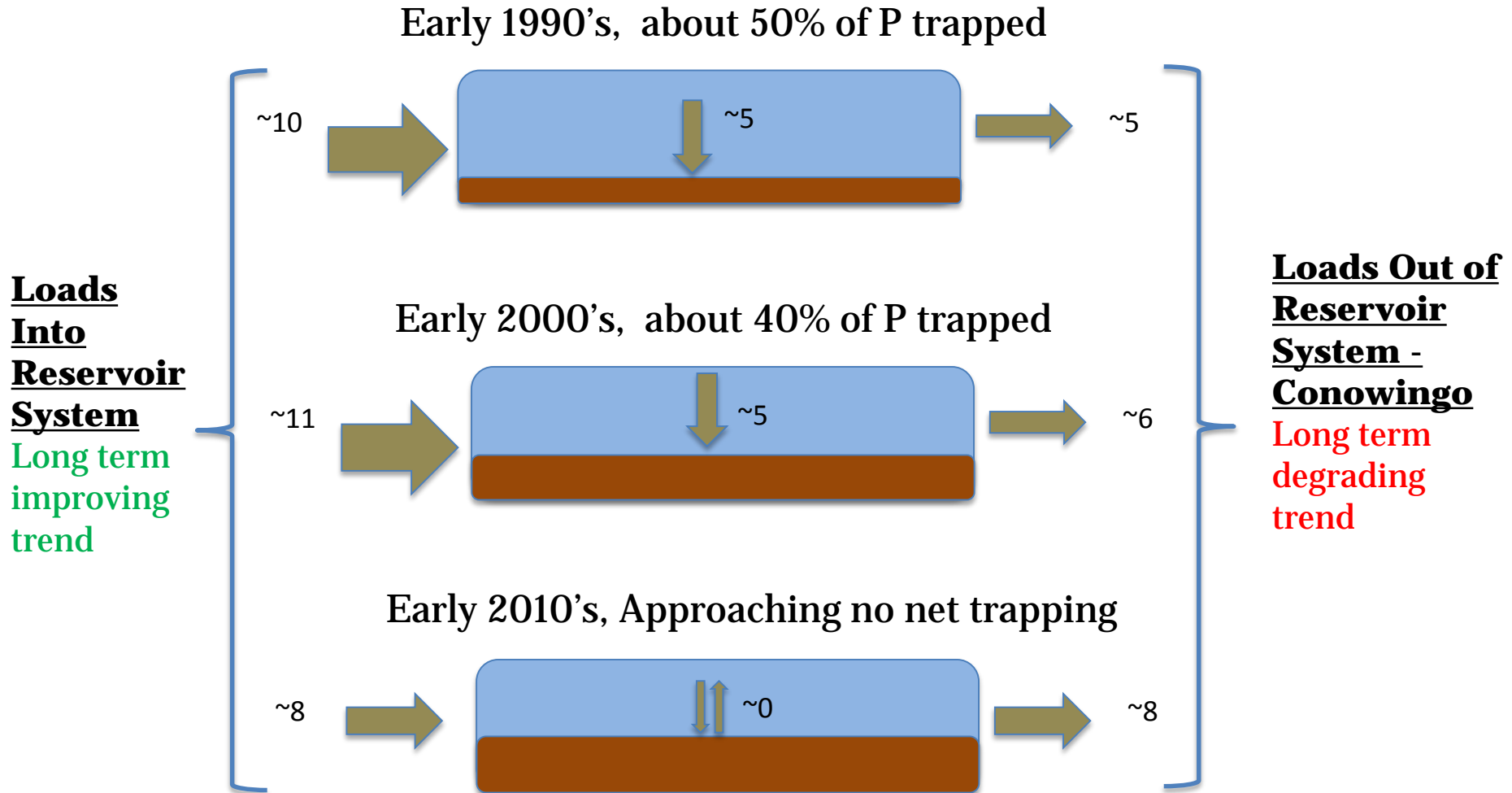
↓ - improving ↑ - degrading

Sediment Loads Into, Trapped Within and Exiting the Reservoir System: 1990s-2010s



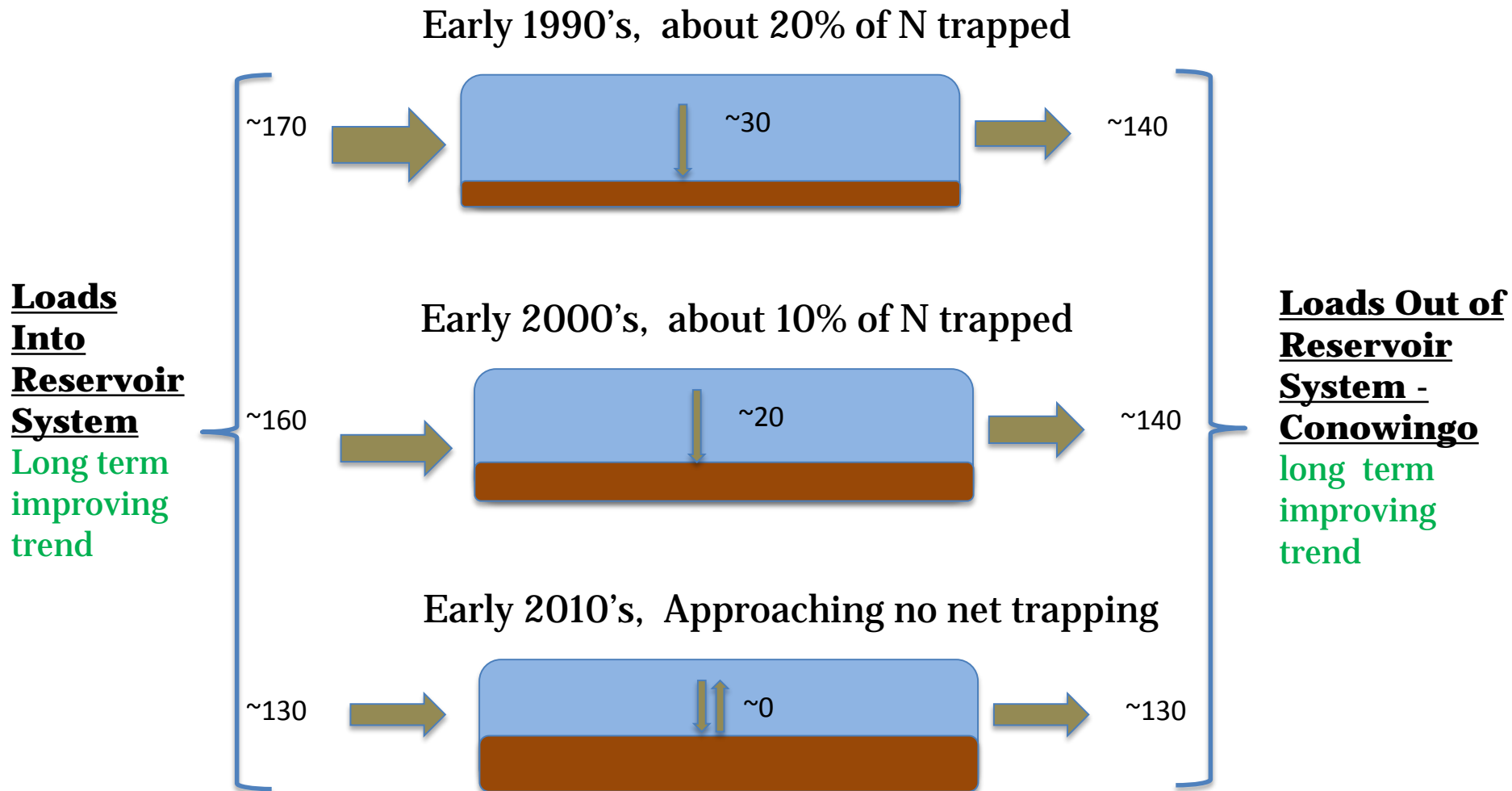
Source: Data from USGS (2016), http://cbrim.er.usgs.gov/loads_query.html
loads are approximate and in units of billion lbs/year using estimates for 1992, 2002, and 2012

Phosphorus Loads Into, Trapped Within and Exiting the Reservoir System: 1990s-2010s



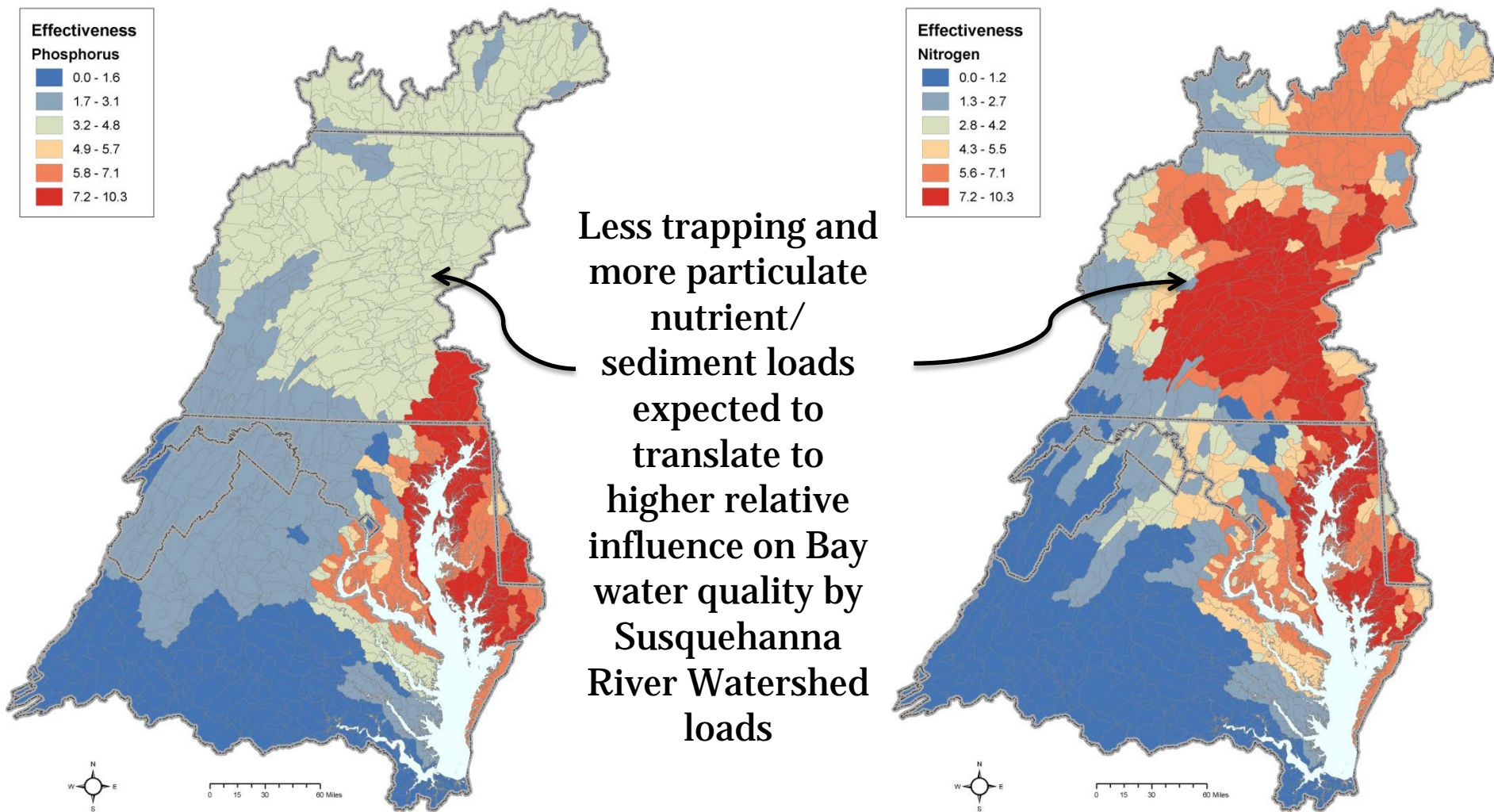
Source: Data from USGS (2016), http://cbrim.er.usgs.gov/loads_query.html
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Nitrogen Loads Into, Trapped Within and Exiting the Reservoir System: 1990s-2010s

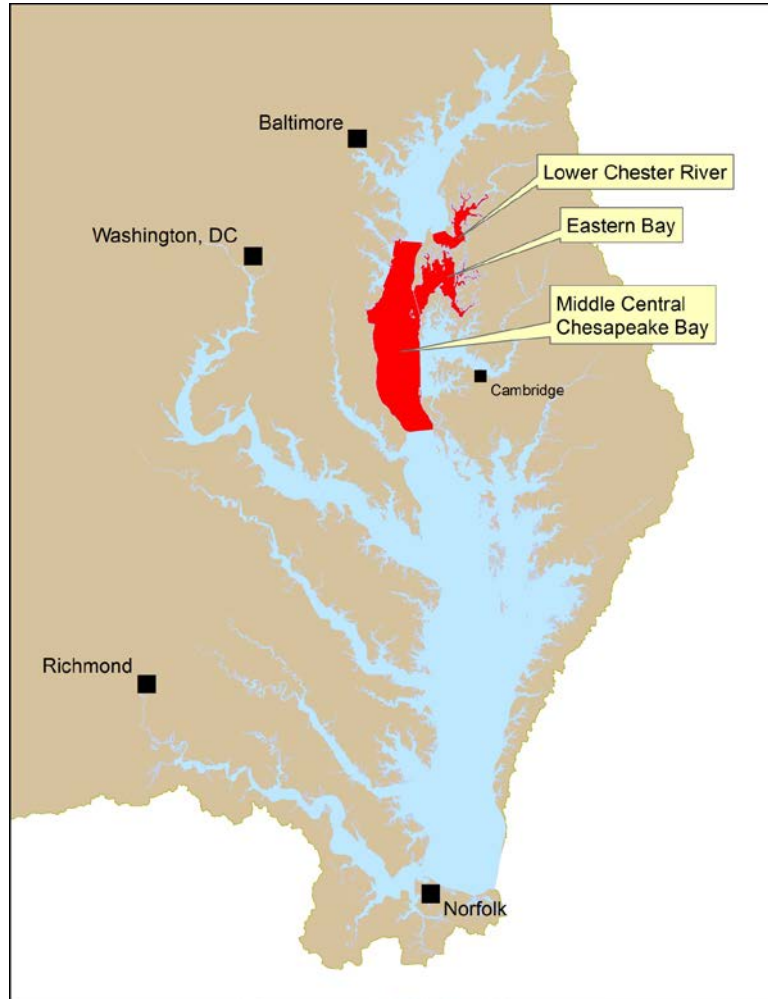


Source: Data from USGS (2016), http://cbrim.er.usgs.gov/loads_query.html
loads are approximate and in units of million lbs/year using estimates for 1992, 2002, and 2012

Reservoir Infill Changes Particulate Nutrient Delivery to the Bay



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

What are we doing in the Modeling WG?

- Characterizing the current state of the reservoir system
 - Multiple lines of evidence
- Determining the change in scour and deposition over time
 - WRTDS
- Estimating the reservoirs response to nutrient reductions
 - HDR
- Including the bioavailability of scoured organic material
 - HDR

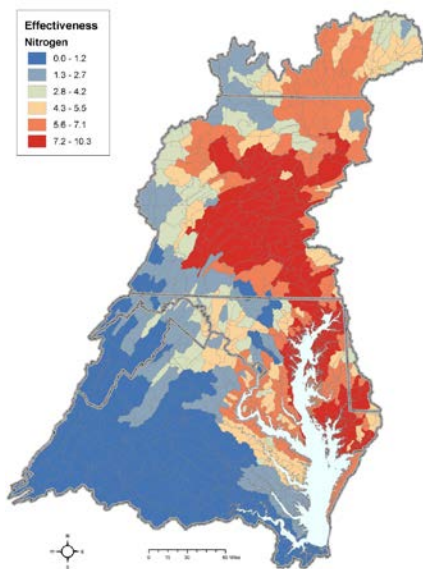
Policy Questions

- **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

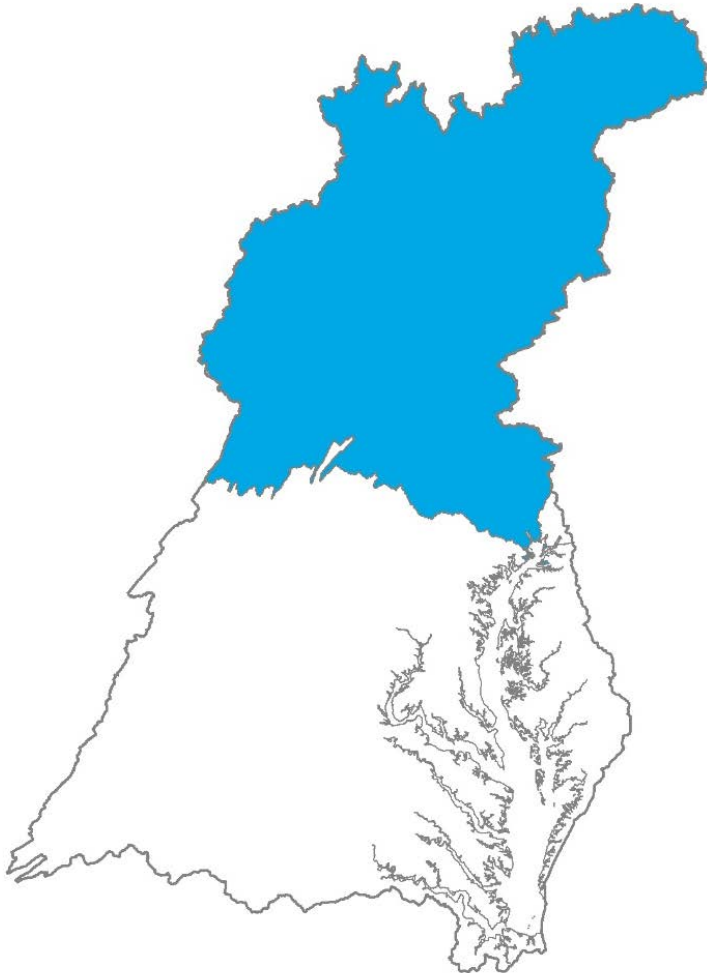
Who?



How?



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

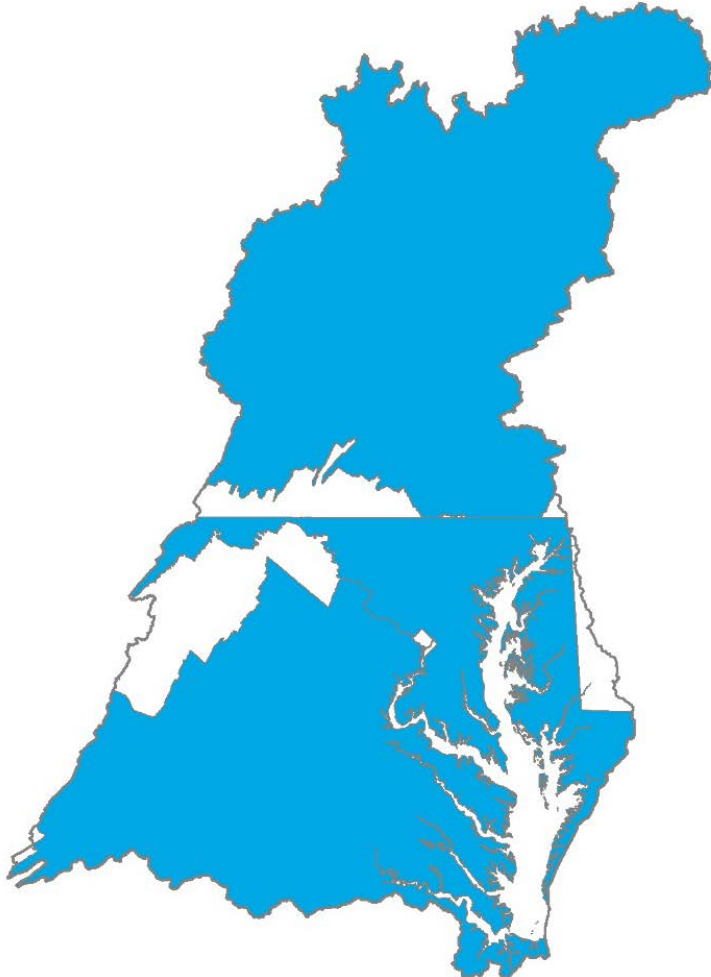
VA: 0 - 0

DE: 0 - 0

DC: 0 - 0

WV: 0 - 0

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

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

Timeline for 2017 Midpoint Assessment Decisions

- **December 2016:** Framework for determining which jurisdictions will be responsible for addressing the additional nutrient and sediment loads resulting from infill of the Conowingo Reservoir
- **Summer ~~May~~ 2017:** Determine how much additional nutrient and sediment loads must be addressed resulting from infill of the Conowingo Reservoir and decide upon allocation rules
- **Fall ~~June~~ 2017:** Draft Phase III WIP planning targets fully reflect best understanding of additional loads from infill of the Conowingo Reservoir
- **December 2017:** Final Phase III WIP planning targets fully reflect best understanding of additional loads from infill of the Conowingo Reservoir

Summary

- Susquehanna River has a significant influence on the Bay
- Multiple lines of evidence support that conditions in the Conowingo Reservoir are different than assumed in the Chesapeake Bay TMDL
- Studies indicate that additional reductions in nutrients and sediments are needed to meet water quality goals
- Current science describing the change in trapping and fate/transport is being incorporated into CBP modeling tools
- Assigning both the additional reductions and the date at which they are to be achieved will occur within the PSC