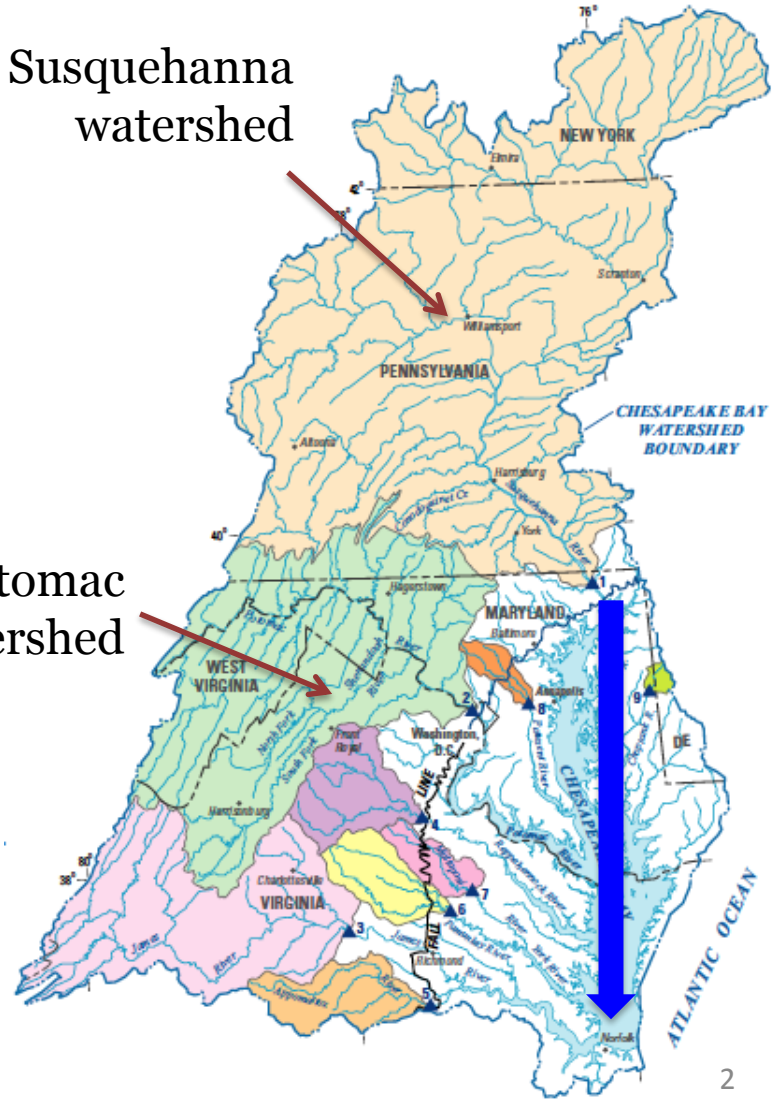
# Understanding the Influence of the Conowingo Reservoir Infill on Expectations for States' Nutrient and Sediment Pollutant Load Reductions

Presented to the Water Quality Goal Implementation Team
October 24, 2016

**Chesapeake Bay Program**
***Science, Restoration, Partnership***

# Susquehanna River Has a Major Influence on Chesapeake Bay Water Quality

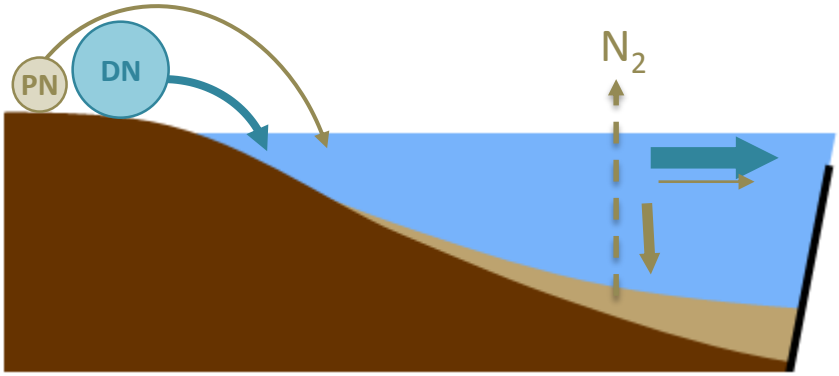
- 43% of Chesapeake Bay watershed
- 47% of freshwater flow into the Bay
- 41% of nitrogen loads to the Bay
- 25% of phosphorus loads to the Bay
- 27% of sediment loads to the Bay
- Influences Bay water quality well into Virginia's portion of the Bay



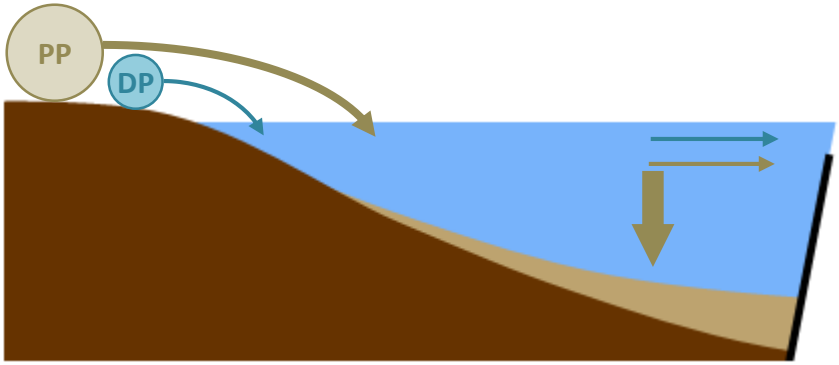

Source: Linker (2014)

# Characteristics of Net Reservoir Trapping

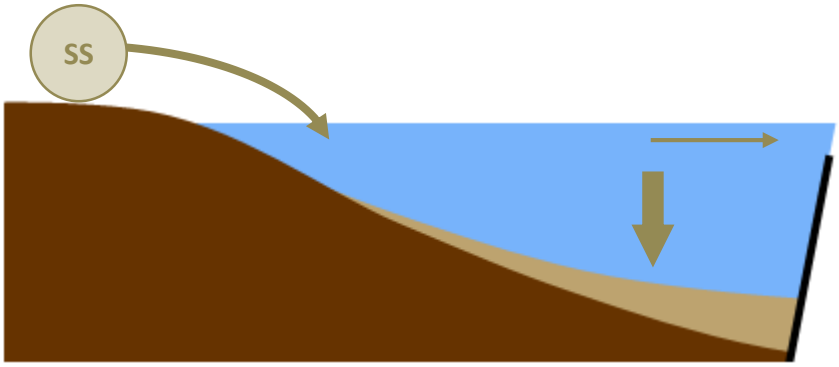
## Nitrogen




## Phosphorus



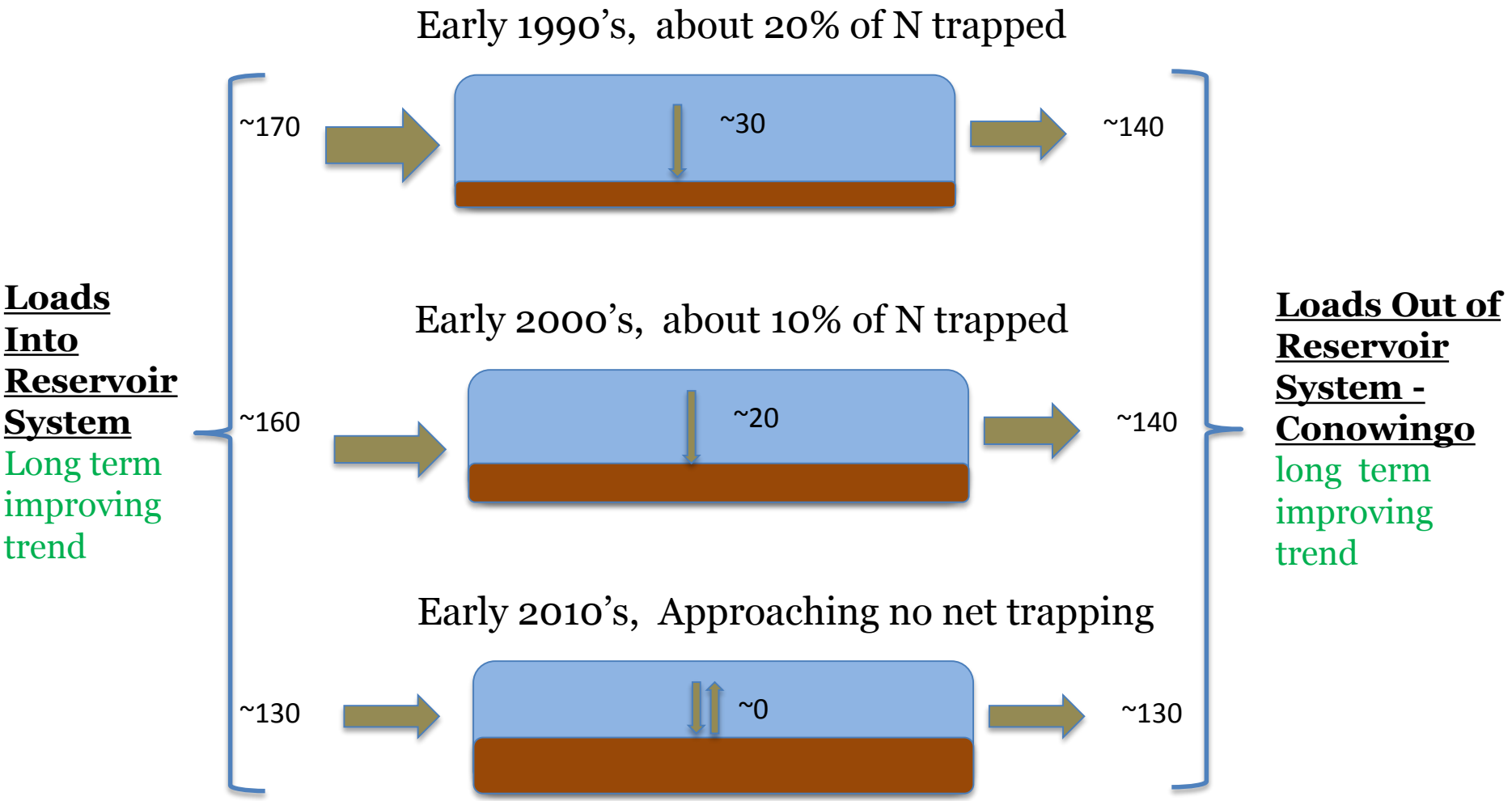

## Sediment




| Key: | |
|---|---|
| PN= | Particulate Nitrogen |
| DN= | Dissolved Nitrogen |
| PP= | Particulate Phosphorus |
| DP= | Dissolved Phosphorus |
| SS= | Suspended Sediment |

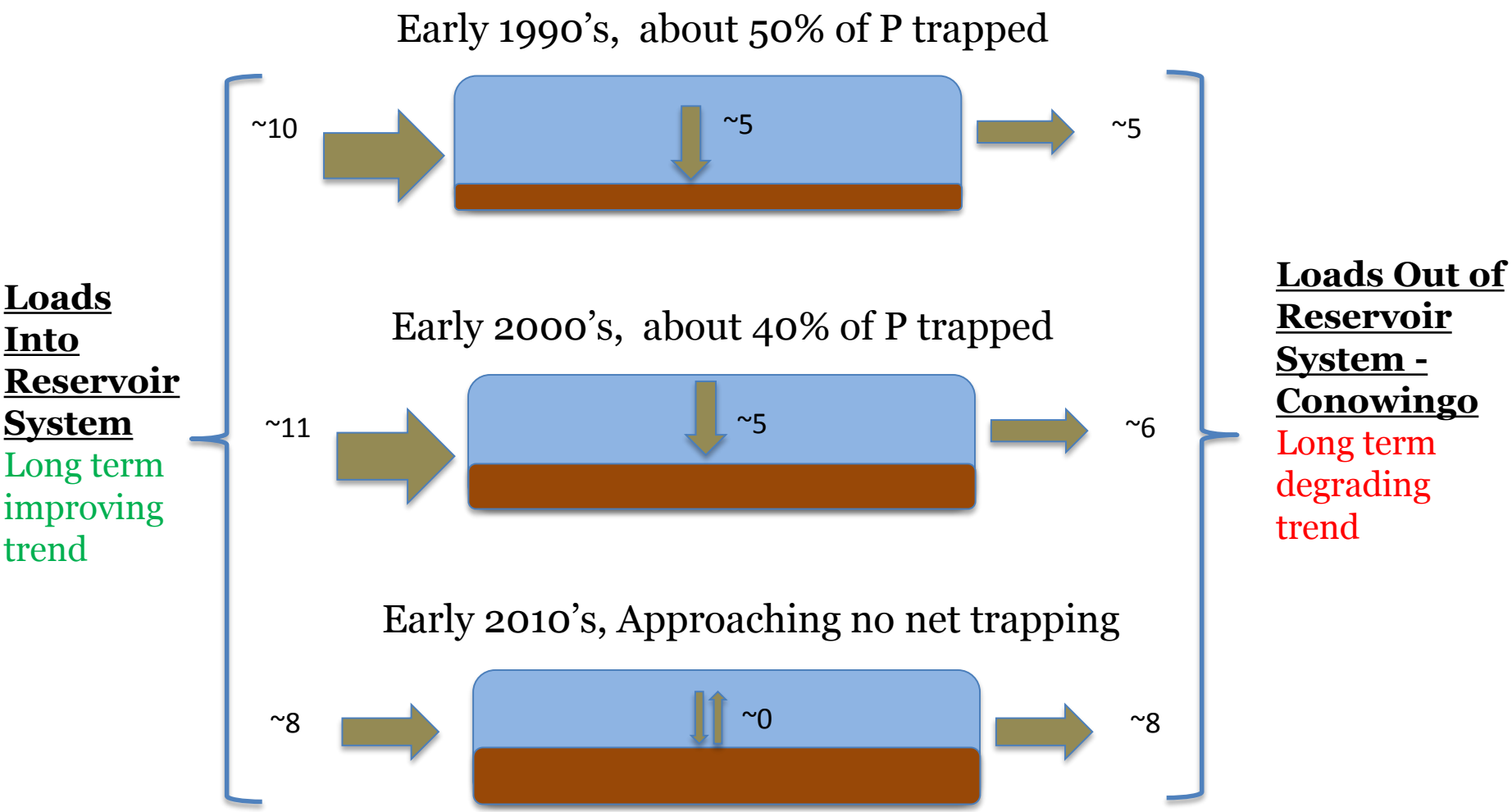
Source: Currey, MDE, Personal Communication

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



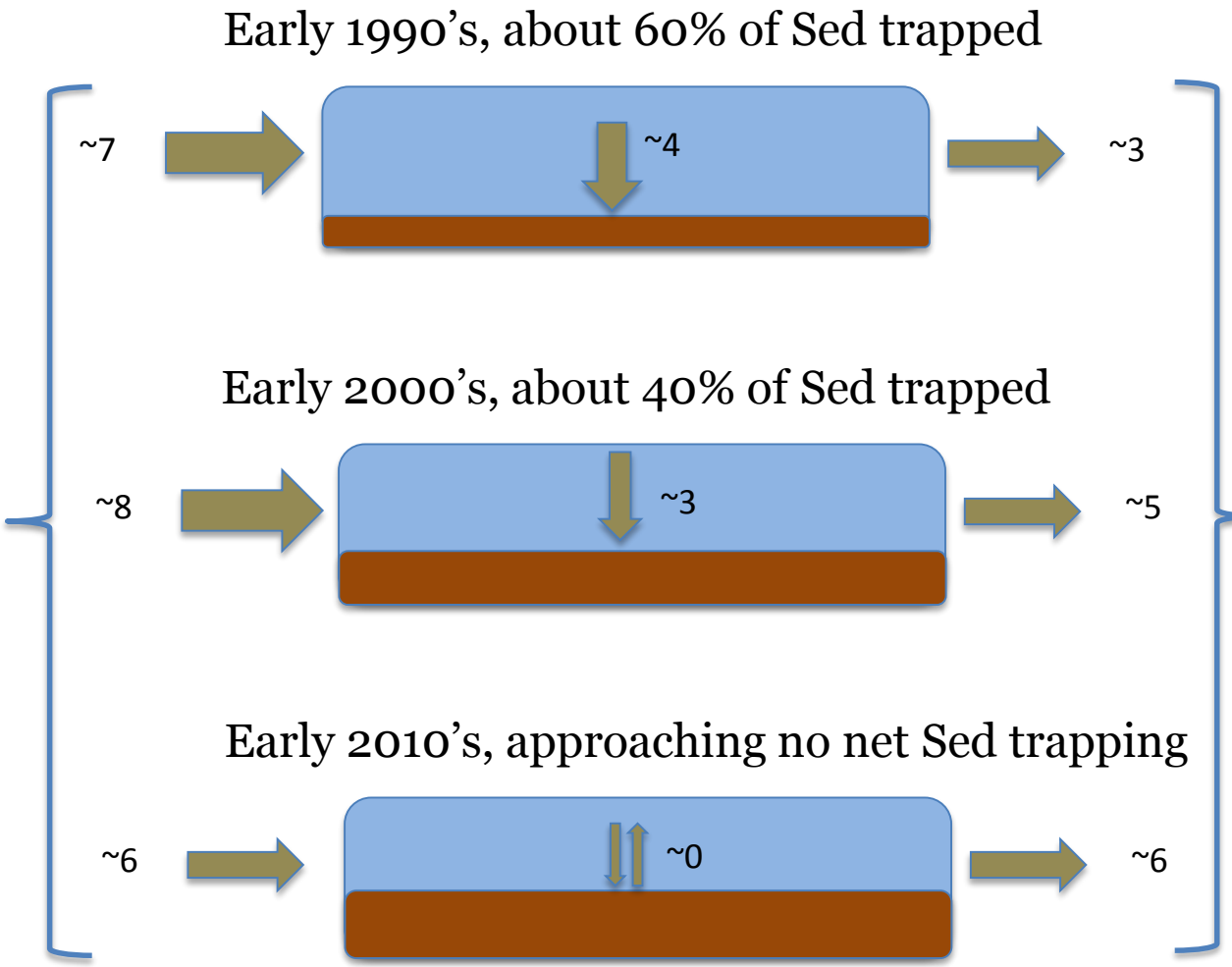

Source: Data from USGS (2016), http://cbrim.er.usgs.gov/loads_query.html
loads are approximate and in units of million lbs/year using estimates for 1992, 2002, and 2012

# 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
loads are approximate and in units of million lbs/year using estimates for 1992, 2002, and 2012

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

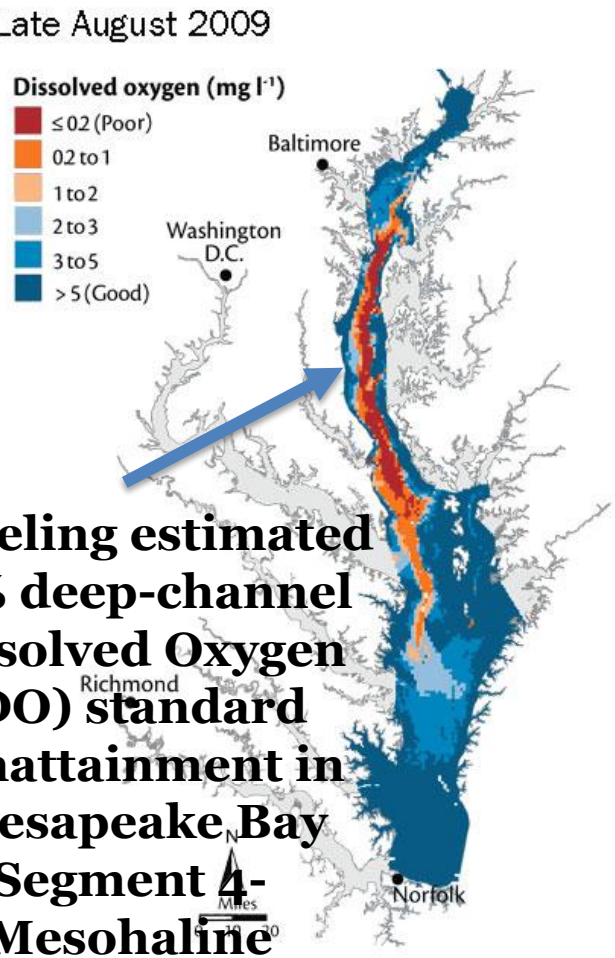



**Loads Into Reservoir System**
Long term improving trend

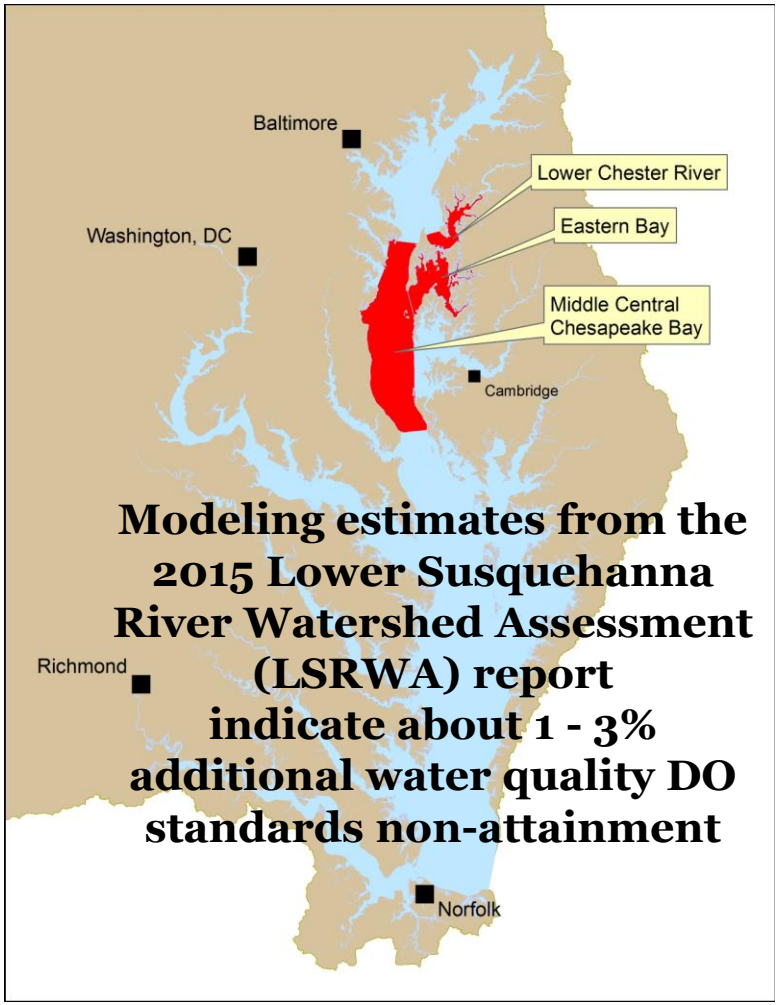
**Loads Out of Reservoir System - Conowingo**
Long term degrading trend

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

# Nutrients Associated with Sediments No Longer Trapped in the Conowingo Reservoir are Influencing Bay WQ




**Modeling estimated 23% deep-channel Dissolved Oxygen (DO) standard nonattainment in Chesapeake Bay Segment 4-Mesohaline**

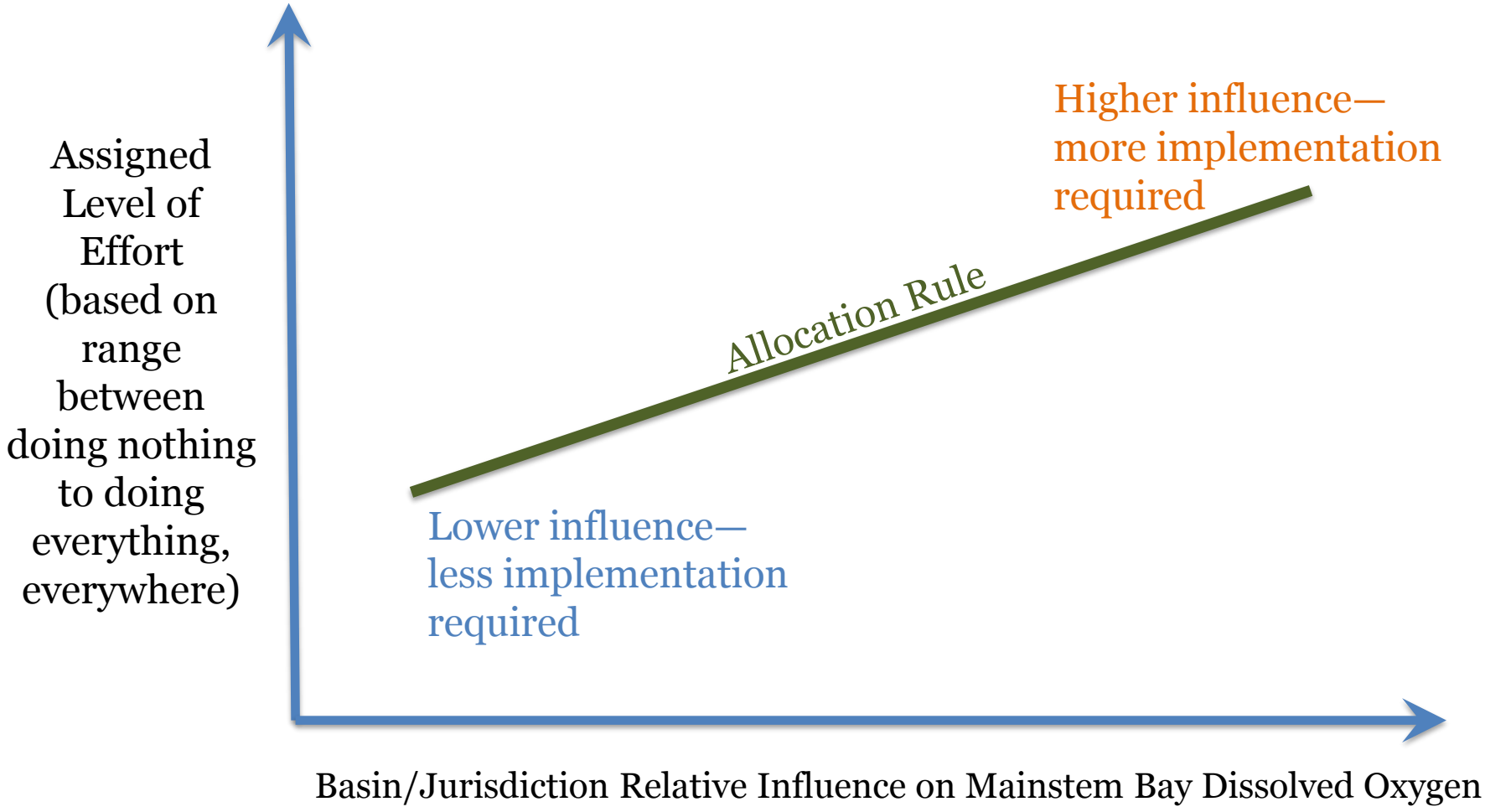



**Modeling estimates from the 2015 Lower Susquehanna River Watershed Assessment (LSRWA) report indicate about 1 - 3% additional water quality DO standards non-attainment**



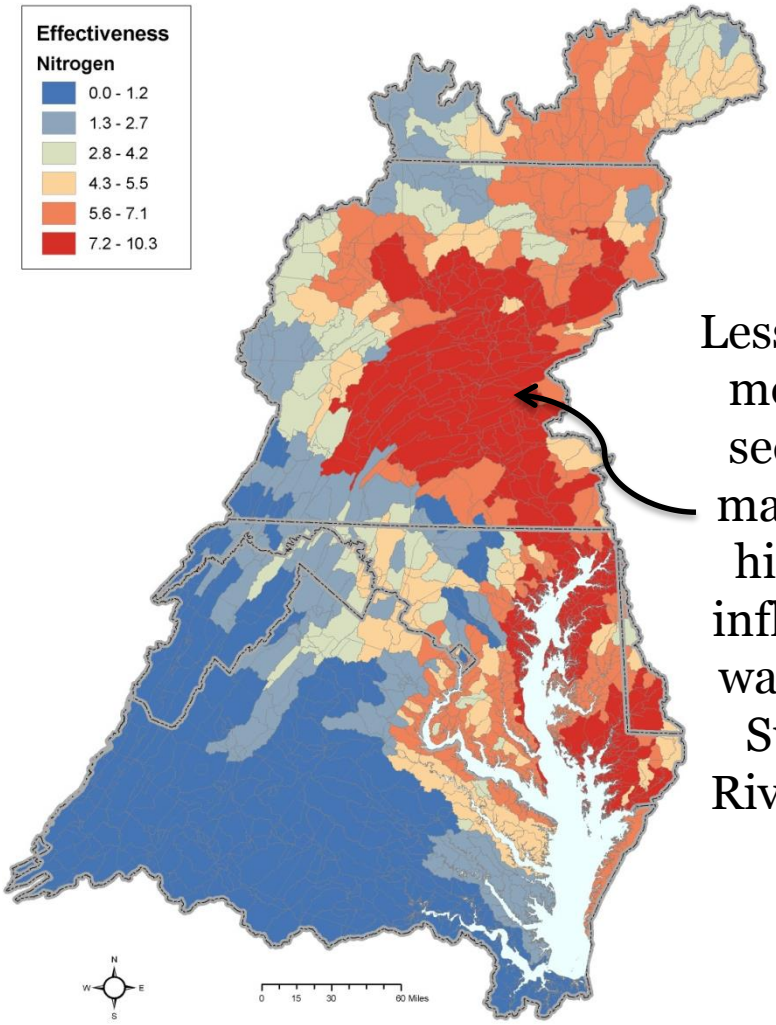
Source: Linker et al. (2016), LSRWA (2015)

# Allocation Methodology Used to Divide the Cap Loads Among Jurisdictions

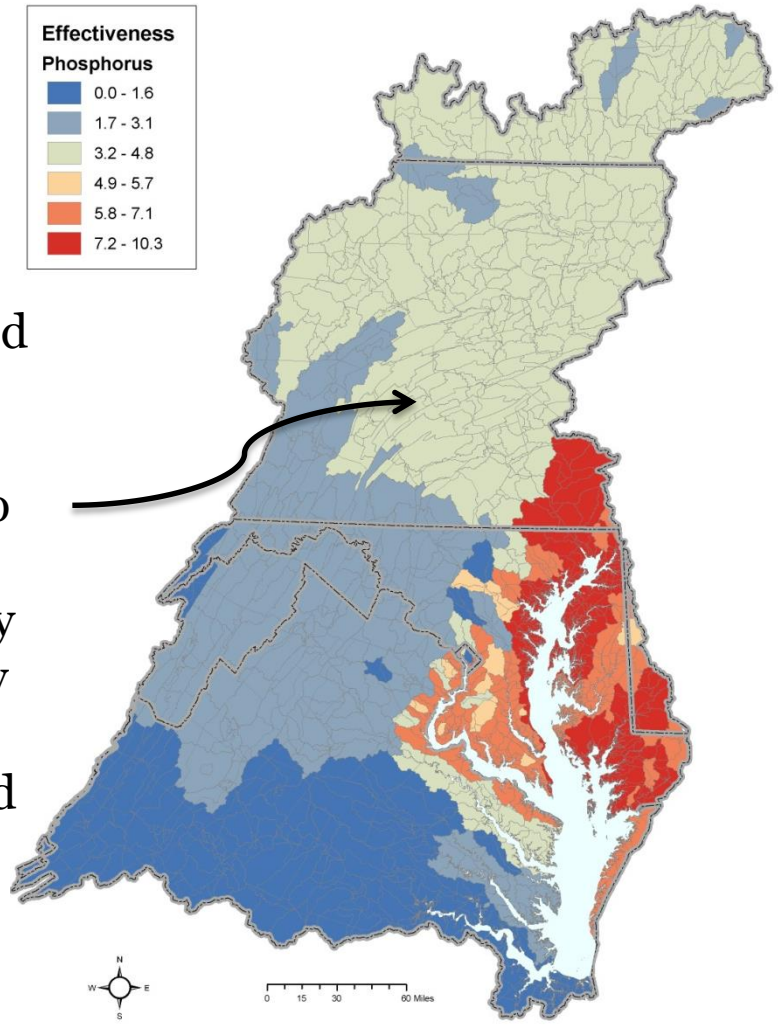



Source: U.S. EPA 2010

# Relative Influence on Bay Dissolved Oxygen Changing as a Result of Reservoir Infill




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

# Multiple Lines of Evidence for Simulating Conowingo Infill Conditions

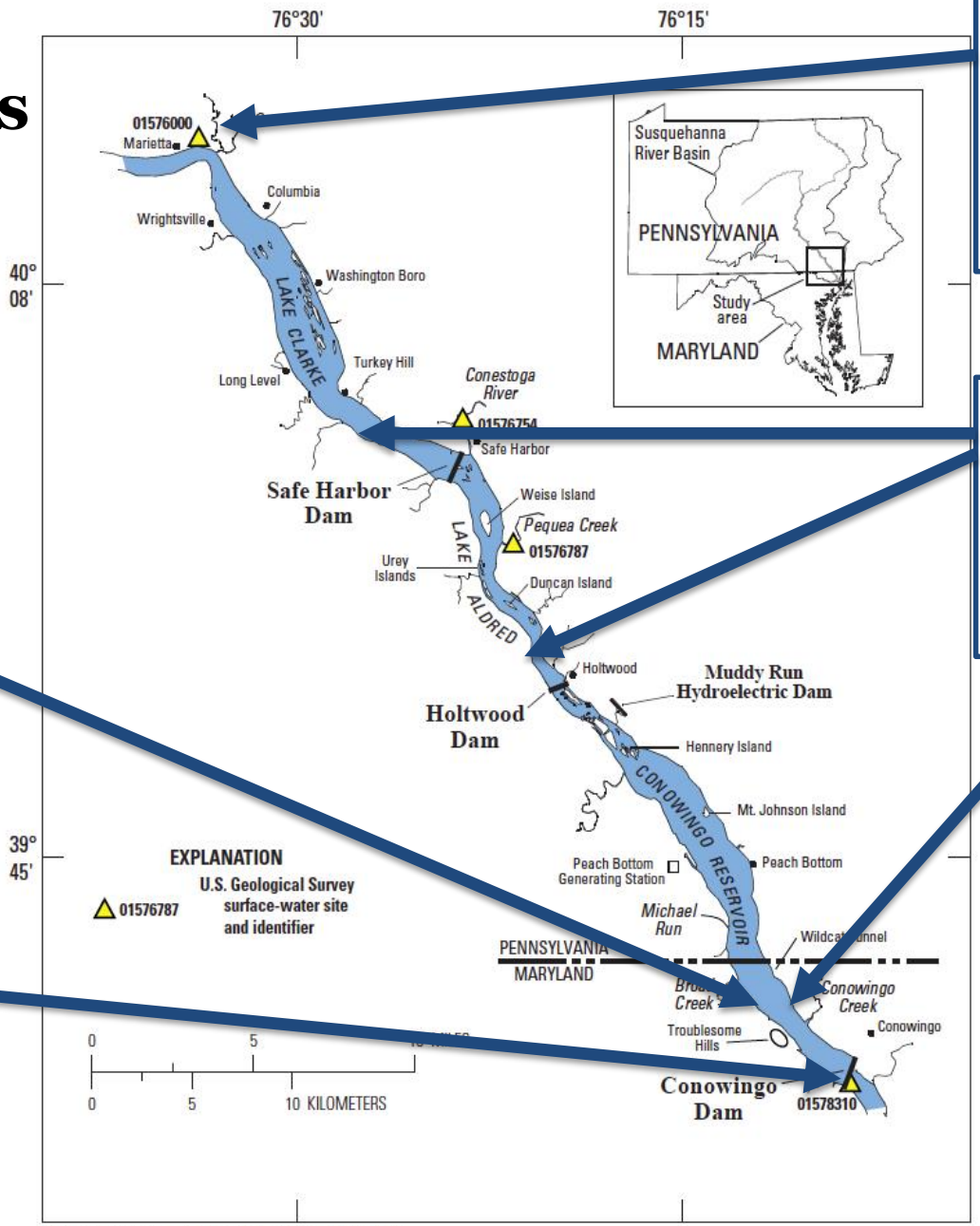
More data and new statistical model (WRTDS)

HEC-RAS2 Model of Holtwood and Safe Harbor

Five historic bathymetric surveys & recent core samples

Physically based Conowingo Pool Model (CPM)

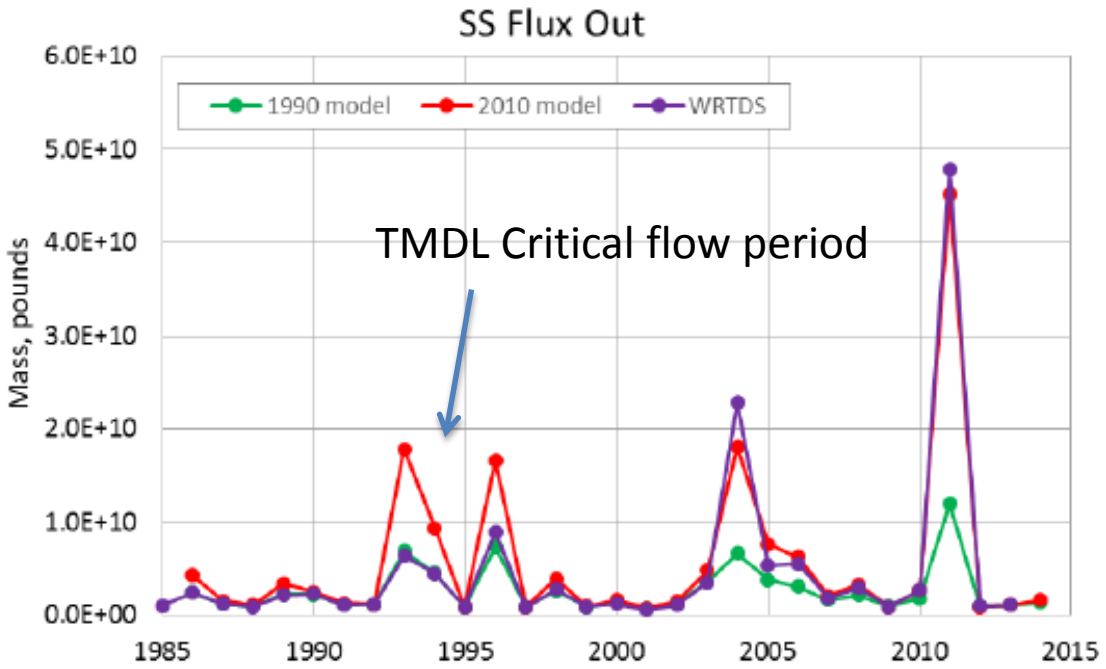
More data and new statistical model

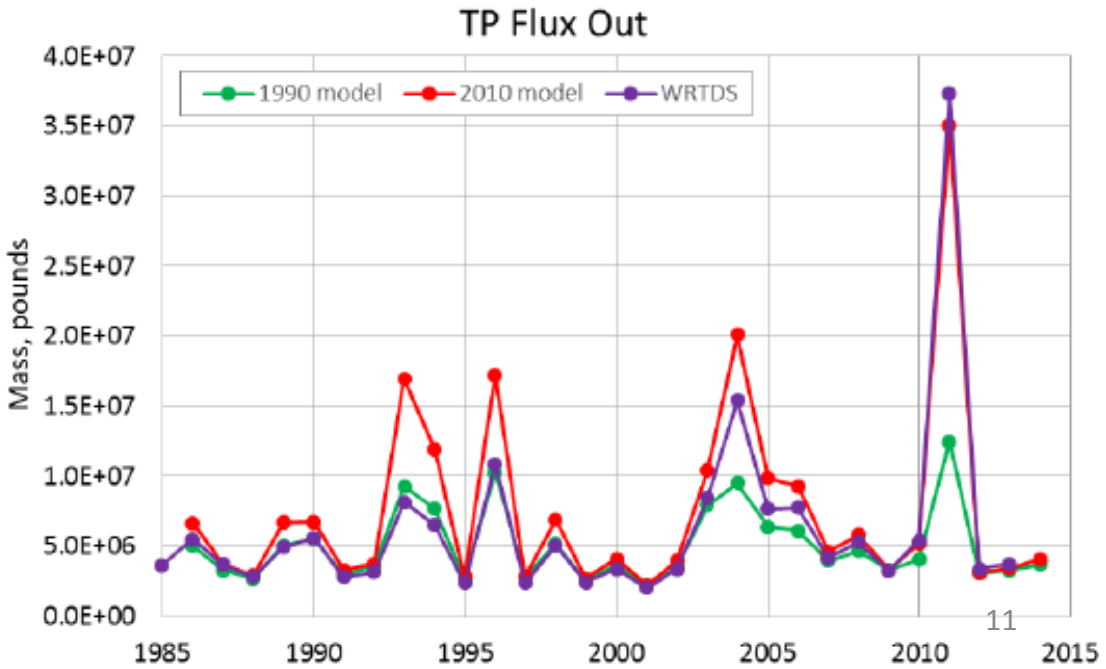



Source: Langland 2015

New Phase 6 reservoir model captures reservoir behavior under various flow & infill conditions.

In addition, the biogeochemical reactivity of scoured material is represented.



# Conowingo Reservoir Infill Decision-Making Timeline

Three Key Sets of Partnership Decisions:

- **December 2016***: Which jurisdictions will be responsible for addressing the additional nutrient and sediment loads resulting from infill of the Conowingo Reservoir

- **May 2017***: How much additional nutrient and sediment loads must be addressed resulting 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

* Date of PSC approval – WQGIT and MB recommendations will be made in preceding months