Exhibit 17

Results of Latest Phase 6 Conowingo Analysis

STAC Quarterly Meeting
September 13, 2017

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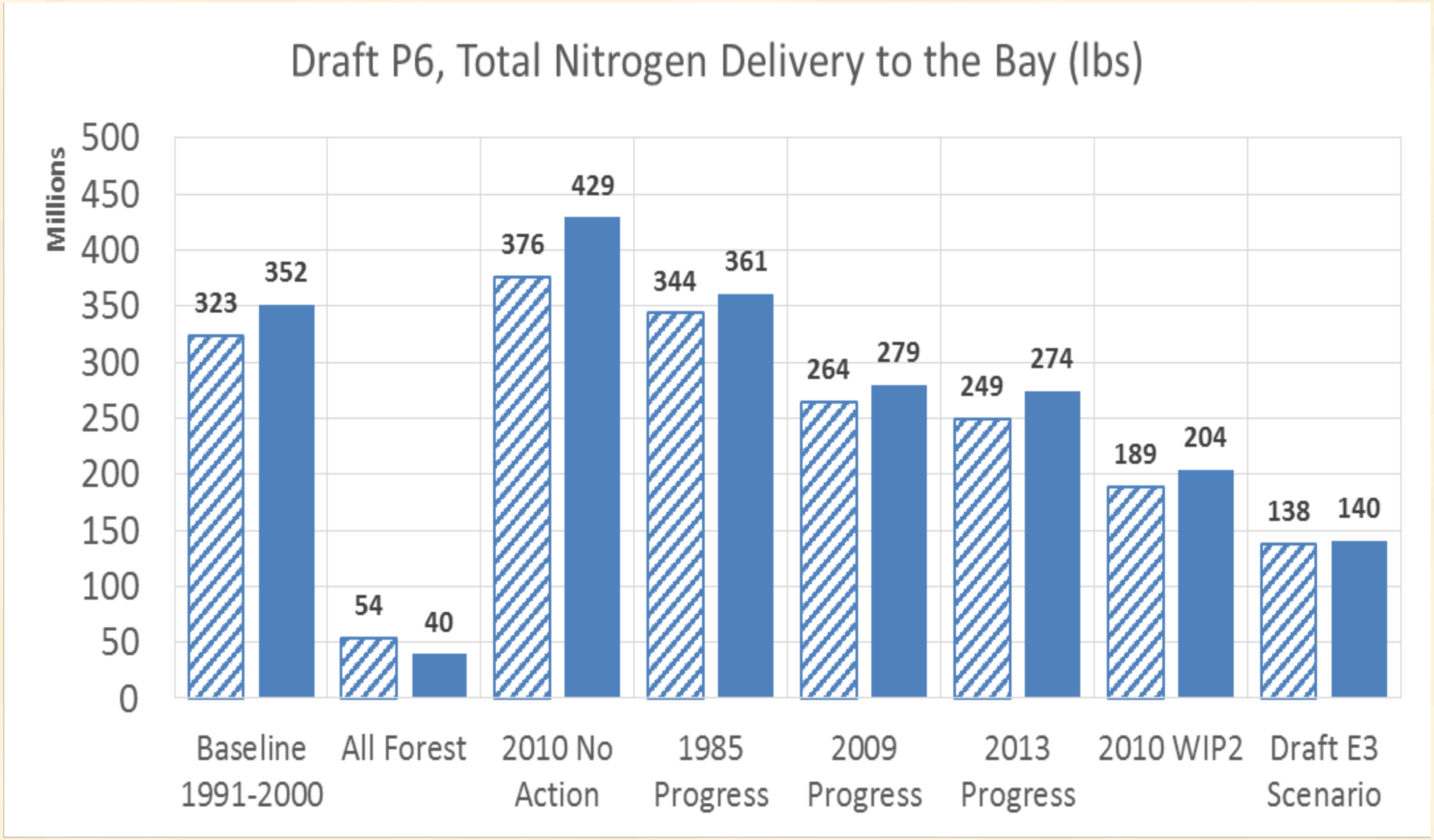
and the CBP Modeling Team

Chesapeake Bay Program
Science, Restoration, Partnership

Overview

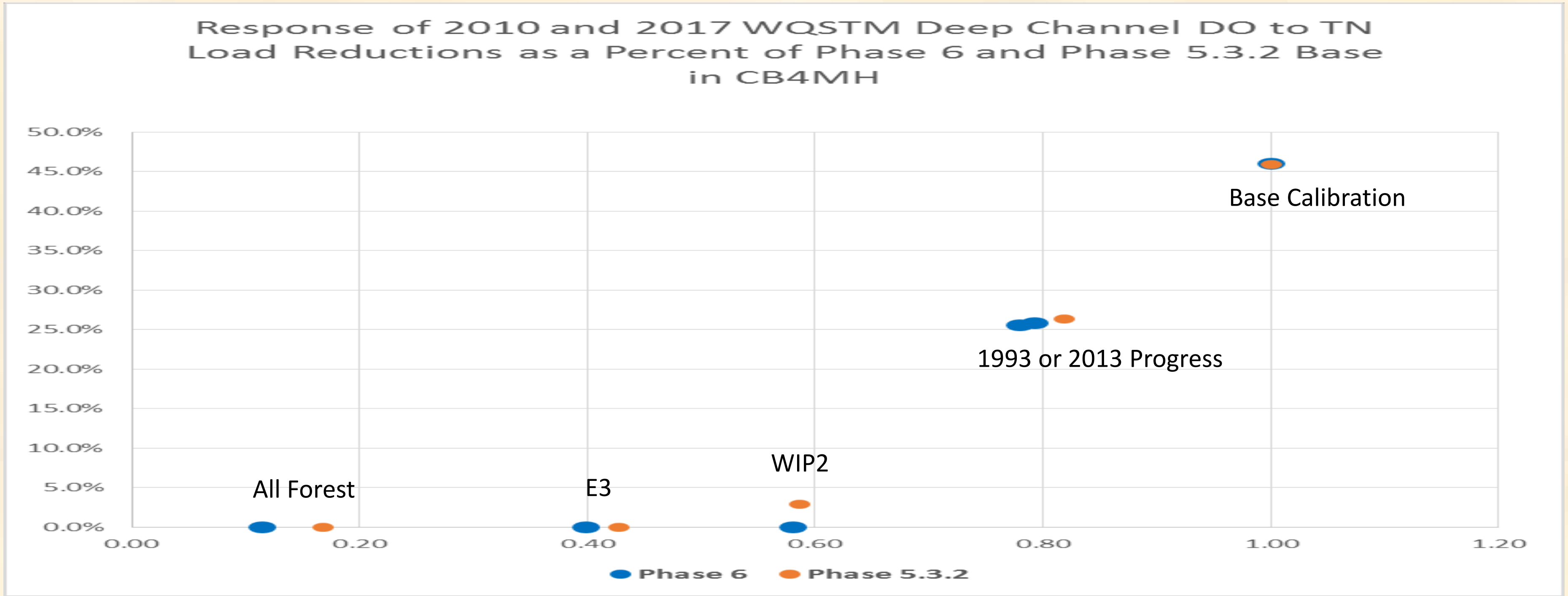
- Current Phase 6 Watershed (WS) and Water Quality and Sediment Transport (WQST) models have findings consistent with the 2010 simulations and with earlier representations of Conowingo infill's influence on Chesapeake tidal water quality.
- Application of the technical direction and guidance from STAC on Conowingo infill simulation.
- Conclusions and next steps.

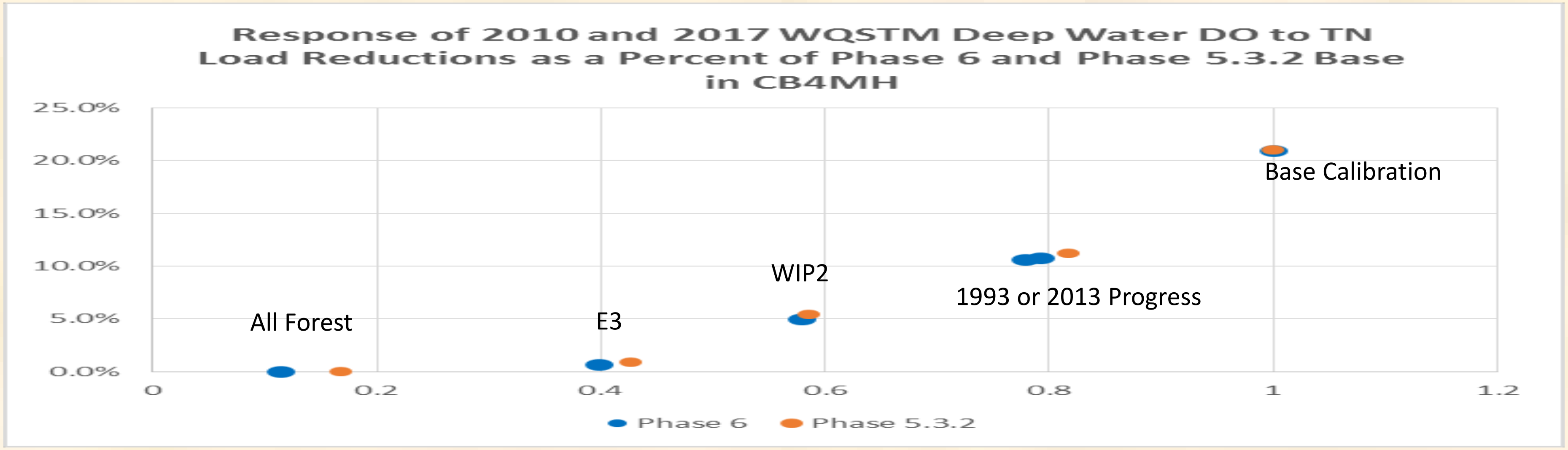
The Phase 6 Loads are Consistent with Phase 5.3.2 (With the Exception of Higher Progress and No Action Scenario Loads Because of Improved Historical Inputs)



2017 Draft Phase 6 in solid blue bars. Phase 5.3.2 in stippled bars. Units in millions of pounds.

The Degree of Water Quality Attainment In Deep Channel and Deep Water DO with Nutrient Reductions are Consistent with the 2010 Model.





JEQ Estimated Deep Channel Nonattainment under Conowingo Infill Conditions

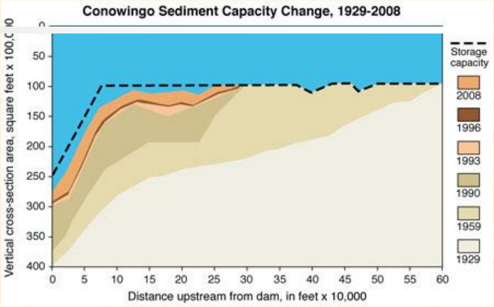
Table 1. Model-estimated level of time and space nonattainment of deep-channel dissolved oxygen (DO) in all Chesapeake Bay segments that have a deep-channel designated use. The first four scenarios (columns 2–5) are key milestone scenarios and are ordered from the highest to the lowest nutrient and sediment loads for the entire Chesapeake watershed. The nutrient and sediment scenario loads are under the scenario title and have units of millions of kilograms for total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS). The last four columns (columns 6–9) are different Conowingo infill scenarios. Deep-channel variances of 2% are applied in the central mainstem (CB4MH) and Eastern Bay (EASMH) and 16% in the lower Chester River (CHSMH). (A variance is an allowable exceedance of an established water quality standard based on the best available data on achievable water quality conditions.) The estimated degree of nonattainment of the deep-channel DO water quality standard is shown in bold type for each deep-water segment of the Chesapeake. Once attainment is estimated to be achieved, the value is shown in italic type.

Scenario / CB segment	1985 Scenario 160 TN 11.2 TP 5480 TSS	2010 Scenario 119 TN 8.8 TP 3790 TSS	TMDL WIP† Scenario 87 TN 6.8 TP 3030 TSS	All Forest Scenario 24 TN 1.2 TP 610 TSS	Increase of nonattainment under Conowingo scour conditions in January storm	Increase of nonattainment under January storm conditions compared with No Storm Scenario	Increase of nonattainment under June storm conditions compared with No Storm Scenario	Increase of nonattainment under Moderate High Flow conditions
	%							
CB3MH	**17**	**5**	*0*	*0*	*0*	**1**	**1**	*0*
CB4MH	**49**	**23**	*1*	*0*	**1**	**1**	**4**	**2**
CB5MH	**17**	*0*	*0*	*0*	*0*	*0*	*0*	*0*
CHSMH	**39**	**28**	*15*	*0*	**1**	**2**	**8**	**1**
EASMH	**29**	**14**	*1*	*0*	**1**	**2**	**3**	**3**
PATMH	**42**	**18**	*0*	*0*	*0*	*0*	*0*	*0*
POTMH	**20**	*0*	*0*	*0*	*0*	*0*	*0*	*0*
RPPMH	**23**	*0*	*0*	*0*	*0*	*0*	*0*	*0*

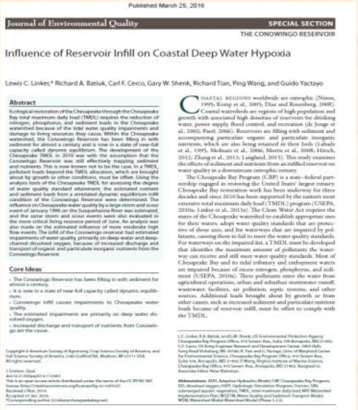
† Total maximum daily load Watershed Implementation Plan.

Brief Review of Conowingo Infill

- Conowingo is nearing dynamic equilibrium, which has reduced its ability to trap sediment and nutrients.
- Numerous research articles have documented and quantified the process and they provide estimates of changes in Conowingo transport, which are incorporated in this analysis.



Source: Graph, Michael Langland, U.S. Geological Survey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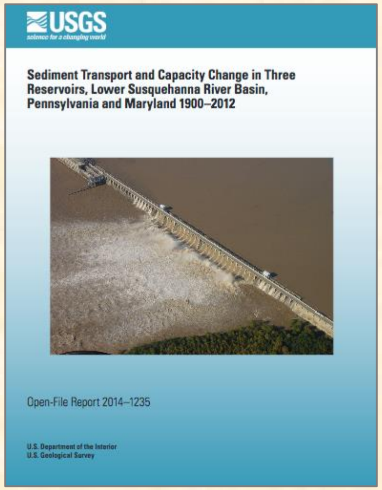
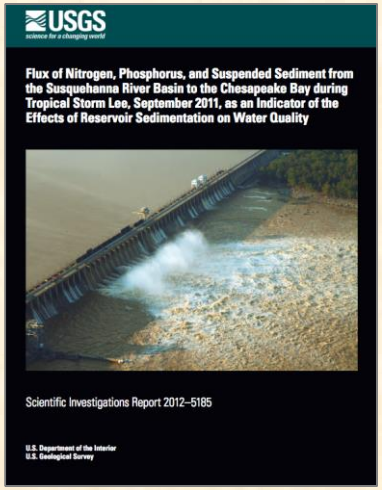
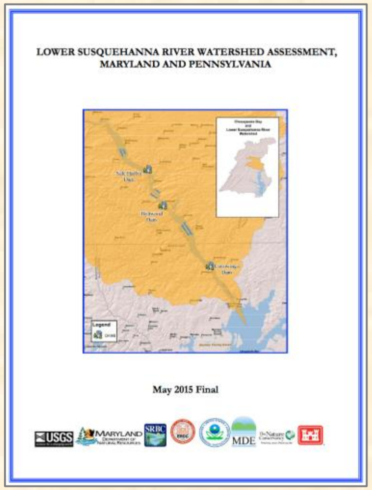
THE CONOWINGO RESERVOIR

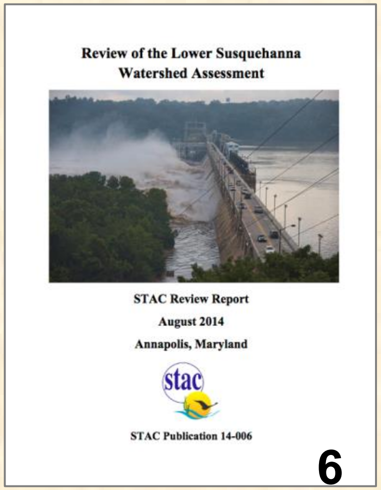
Influence of Reservoir Infill on Coastal Deep Water Hypoxia

Lewis C. Linker, Richard A. Batiuk, Carl F. Cerco, Gary W. Shenk, Richard Tian, Ping Wang, and Guido Yactayo

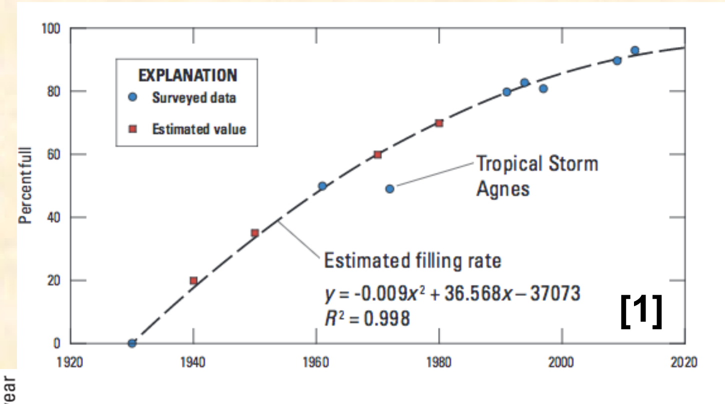


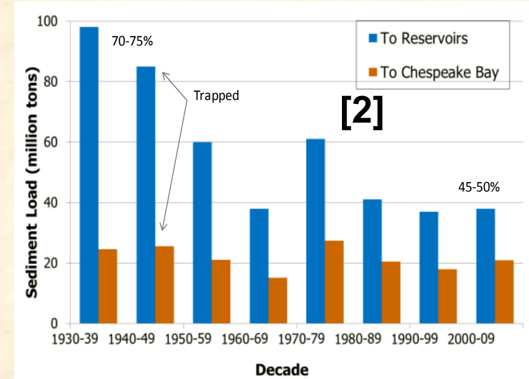


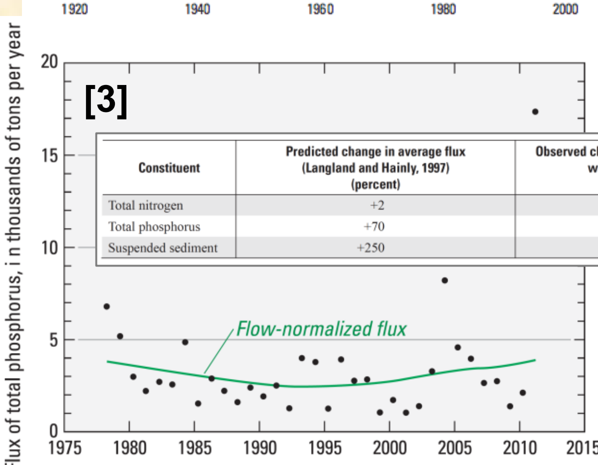




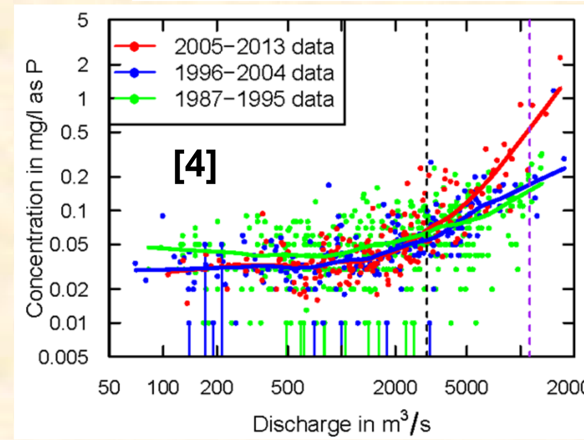
The multiple lines of evidence

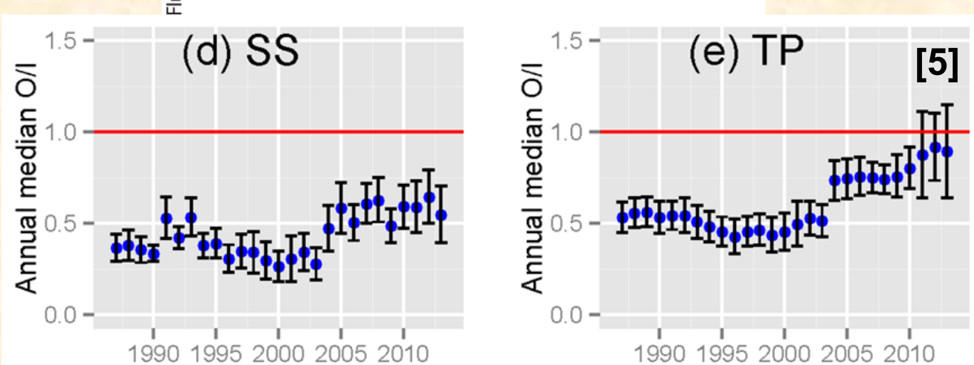


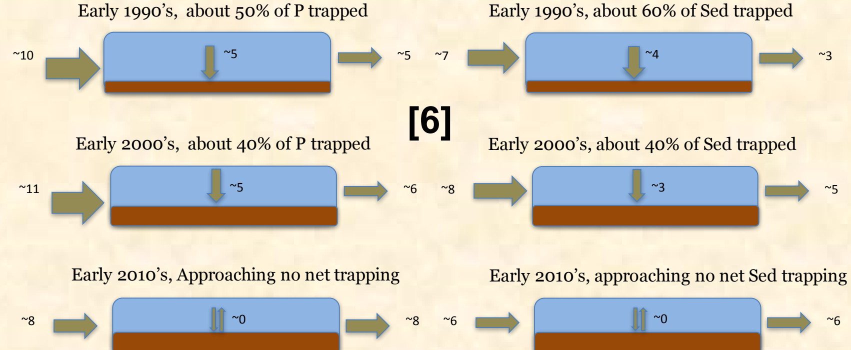




Constituent	Predicted change in average flux (Langland and Hainly, 1997) (percent)	Observed change in flow-normalized flux, water years 1996–2011 (percent)
Total nitrogen	+2	-3.2
Total phosphorus	+70	+55
Suspended sediment	+250	+97







[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

Conowingo Infill

- The Modeling Workgroup, with guidance from STAC, and the recent Conowingo infill research has made four key state-of-the-science decisions for the simulation of Conowingo infill:
  - The Lower Susquehanna Reservoirs are now in the state of dynamic equilibrium (no long-term trapping) [1][2][3].
  - The information on changes the trapping capacity provided by USGS-WRTDS should be used in the the model calibration [1][2][3].
  - Constant delivery factors should be used for scenarios involving both increases or decreases in the sediment and phosphorus inputs [4].
  - Use of a flow dependent dynamic G-series response for the organic- nitrogen, phosphorus, and carbon [5].

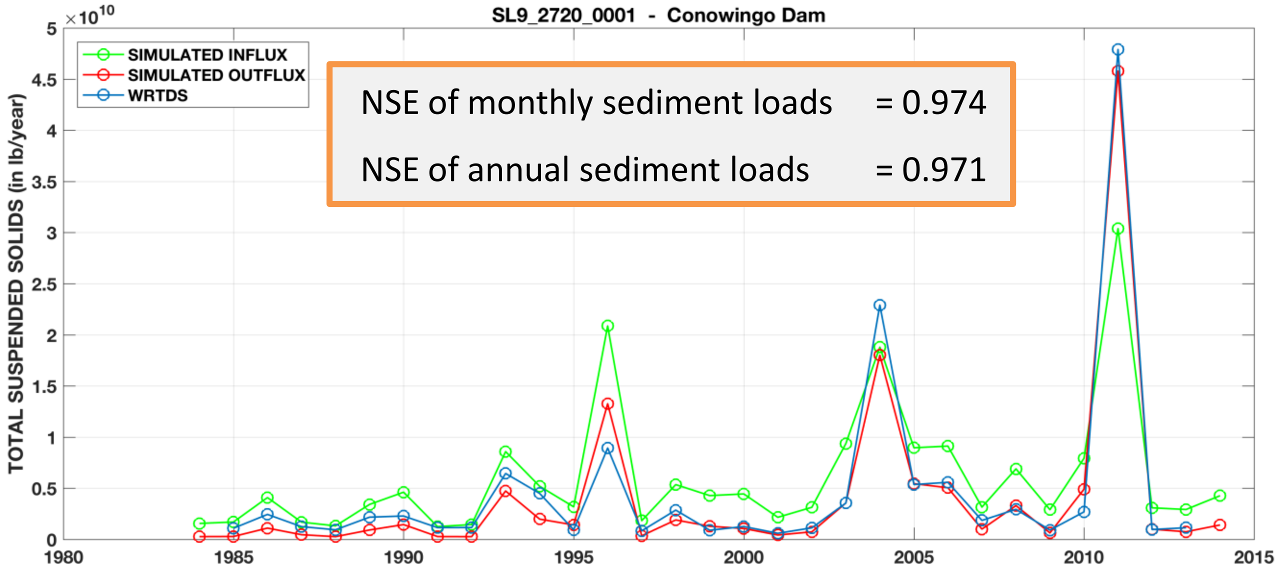
[1] Hirsch, R.M., 2012, Flux of nitrogen, phosphorus, and suspended sediment from the Susquehanna River Basin to the Chesapeake Bay during Tropical Storm Lee, September 2011, as an indicator of the effects of reservoir sedimentation on water quality: U.S. Geological Survey Scientific Investigations Report 2012–5185, 17 p.
[2] Zhang, Q., D.C. Brady, and W.P. Ball, 2013. Long-term Seasonal Trends of Nitrogen, Phosphorus, and Suspended Sediment Load from the Non-tidal Susquehanna River Basin to Chesapeake Bay, Science of the Total Environment, 452–453: 208–221
[3] Zhang, Q., R.M. Hirsch, and W. Ball. 2016a. Long-Term Changes in Sediment and Nutrient Delivery from Conowingo Dam to Chesapeake Bay: Effects of Reservoir Sedimentation. Environmental Science & Technology 50(4): 1877-1886
[4] HDR Inc. Coupled Sediment Flux Model and Conowingo Pond Mass Balance Model (2017) - http://www.chesapeakebay.net/channel_files/24718/2017-02-14_conowingo_hdr_models_2.pdf
[5] HDR Inc. Coupled Sediment Flux Model and Conowingo Pond Mass Balance Model (2017) - http://www.chesapeakebay.net/channel_files/24719/2017-04-04_conowingo_hdr_g1g2g3_2.pdf

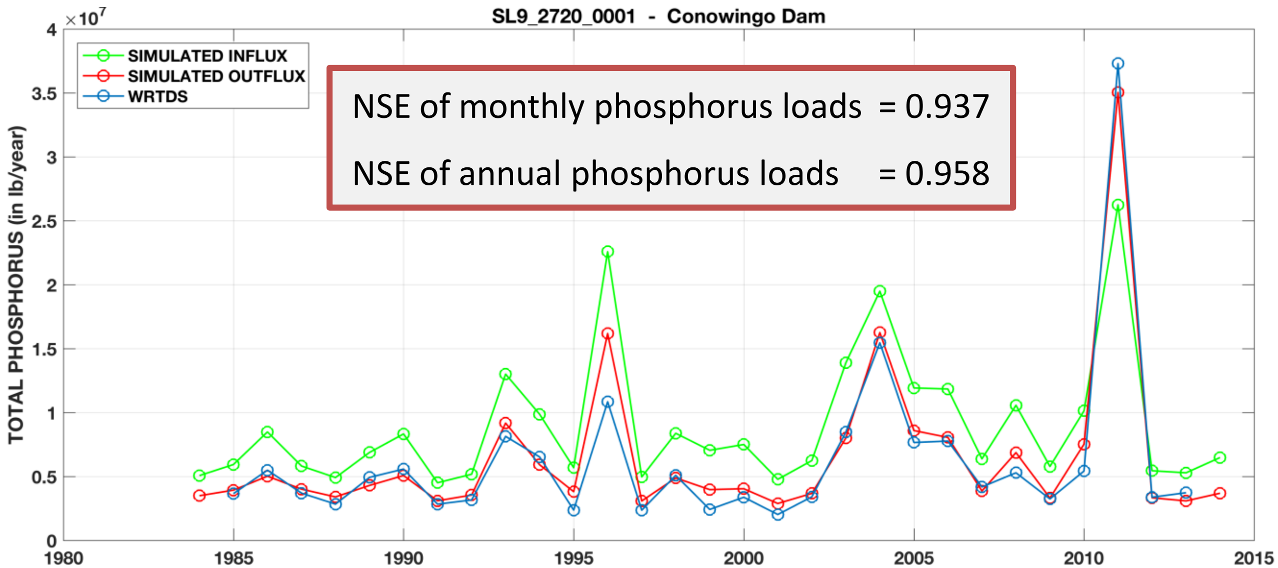
Simulation of Conowingo infill in Phase 6

- In the June modeling workgroup conference call, a detailed presentation was made to describe the elements of Conowingo reservoir calibration [1].
- In this work, an assessment of the delivery of nutrients and sediment under different infill conditions, including dynamic equilibrium, was made using the Draft Phase 6 watershed model.
- The model was used for estimating the nutrients and sediment delivery for the following infill states –
  - True-condition (calibration)
  - 1990s infill condition
  - 2010s infill condition
  - Dynamic equilibrium (no net trapping)
- The results are ***preliminary*** as they are based on currently available information that is subject to revisions by the partnership.

[1] http://www.chesapeakebay.net/channel_files/25164/20170615_-_bhatt_kh_-_cbp_-_mwcc_-_draft_phase_6.pdf

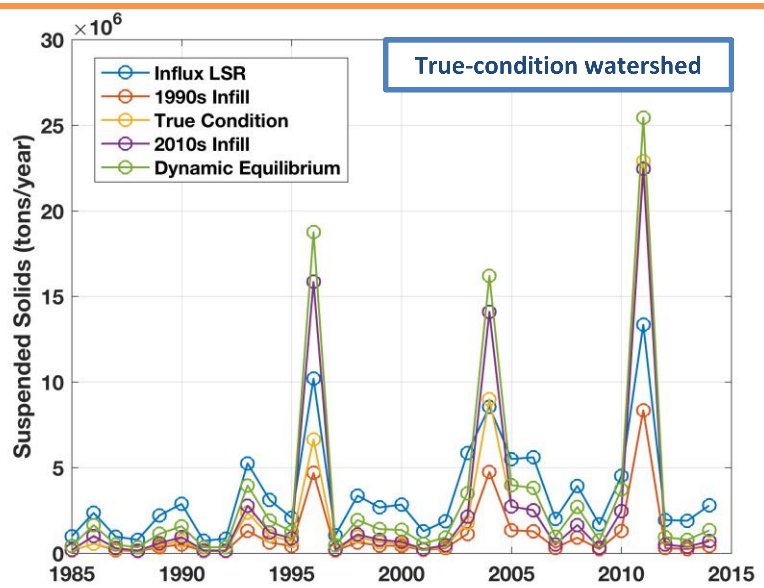
The simulated vs. USGS-WRTDS estimates

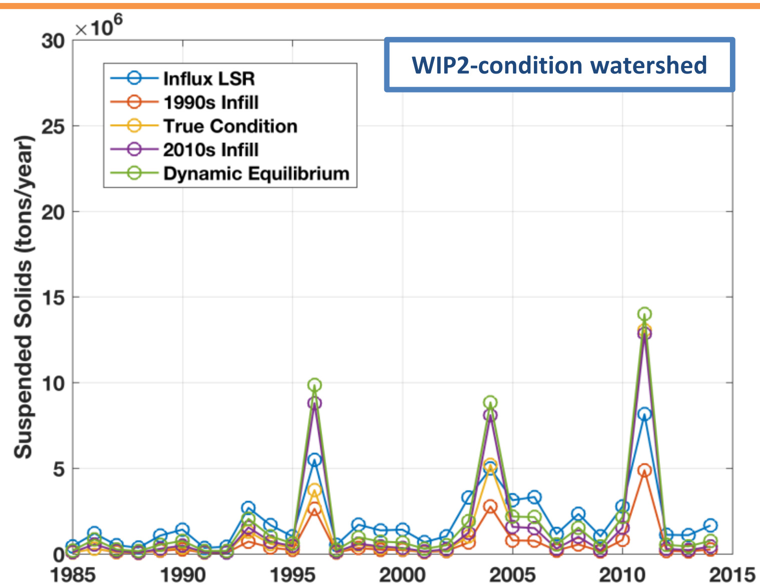


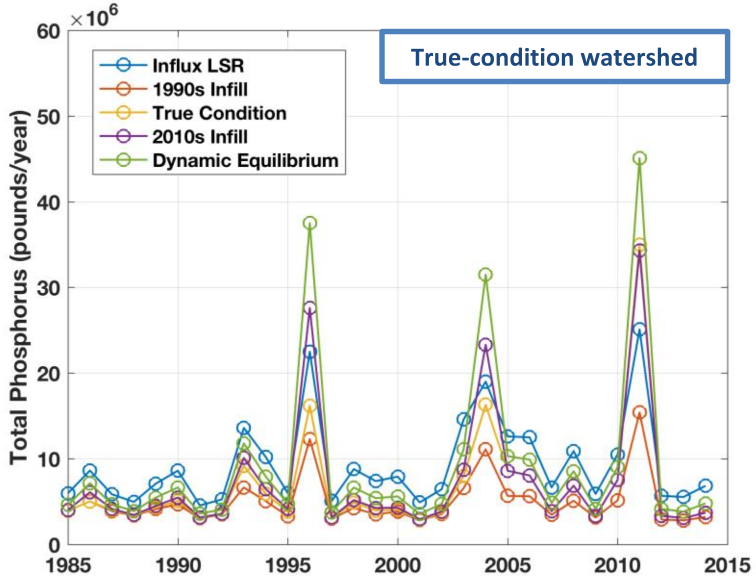


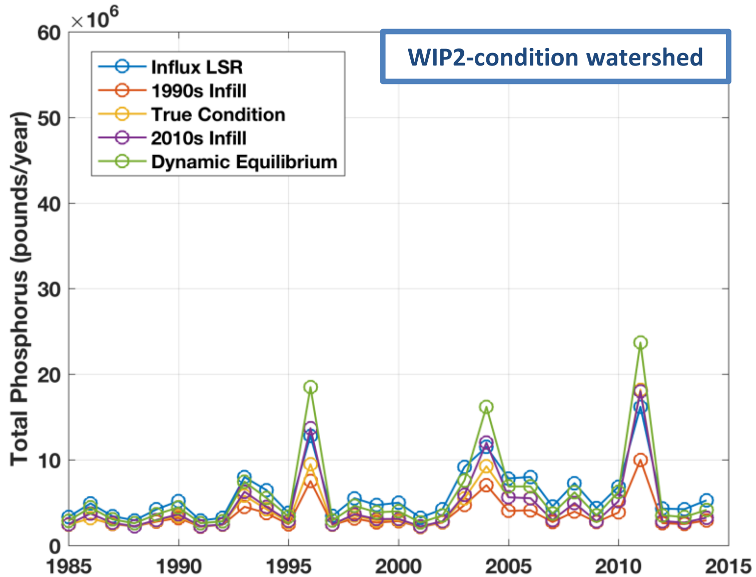
The annual and monthly Nash-Sutcliffe efficiencies (NSE) for the suspended solids and phosphorus confirm good model performance.

Simulated responses for different infill conditions



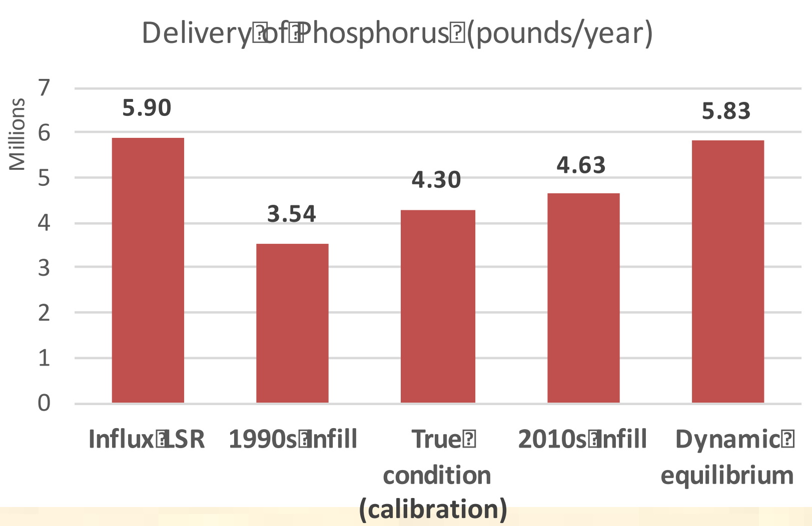


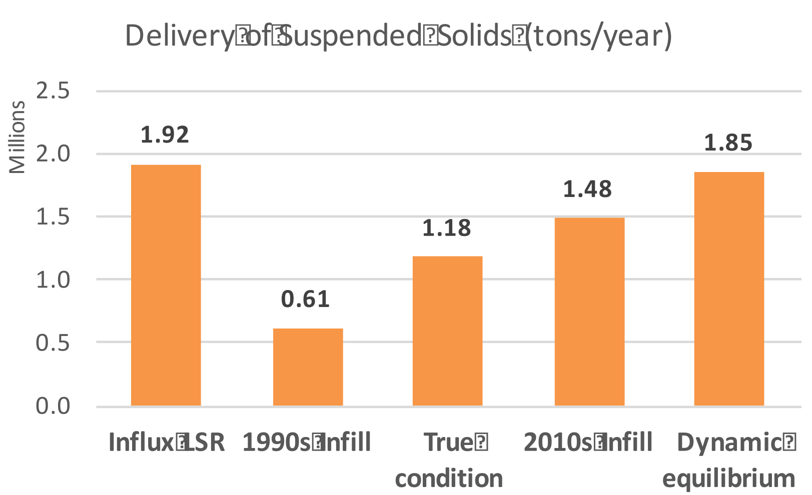




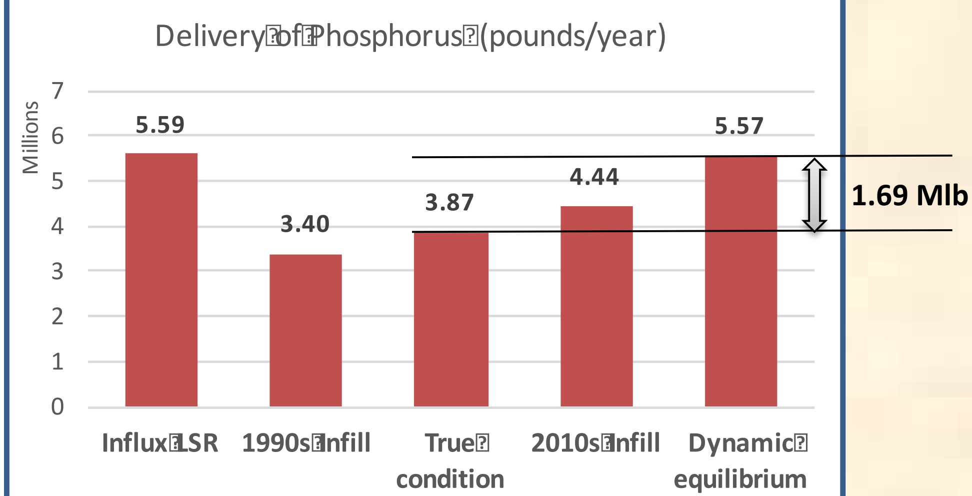
Lower Susquehanna Reservoirs – 2010 WIP2

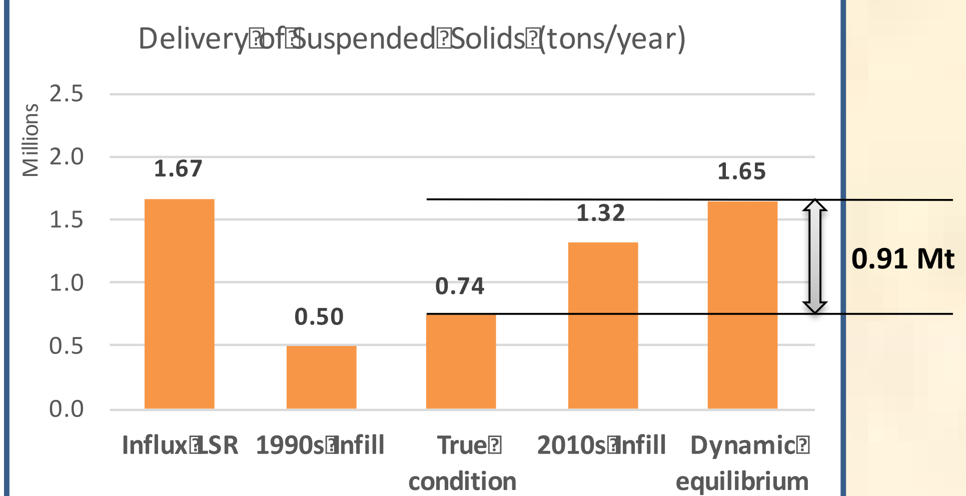
1985 – 2014





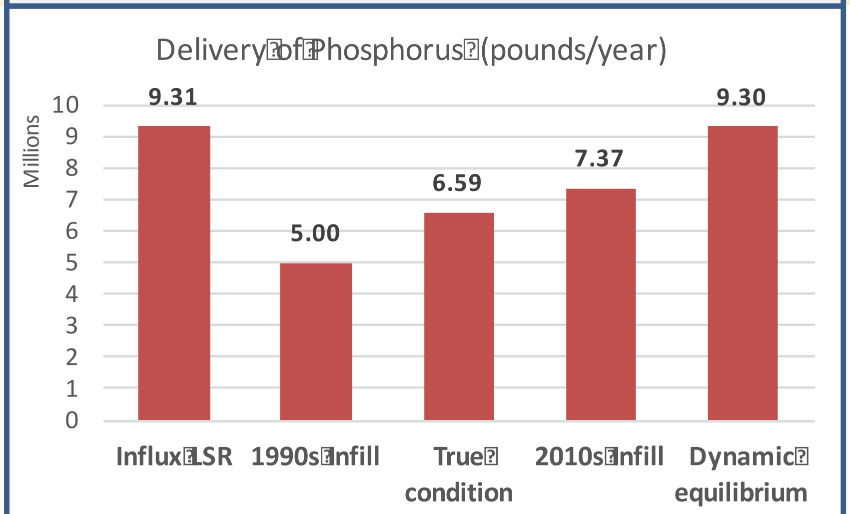
1991 – 2000

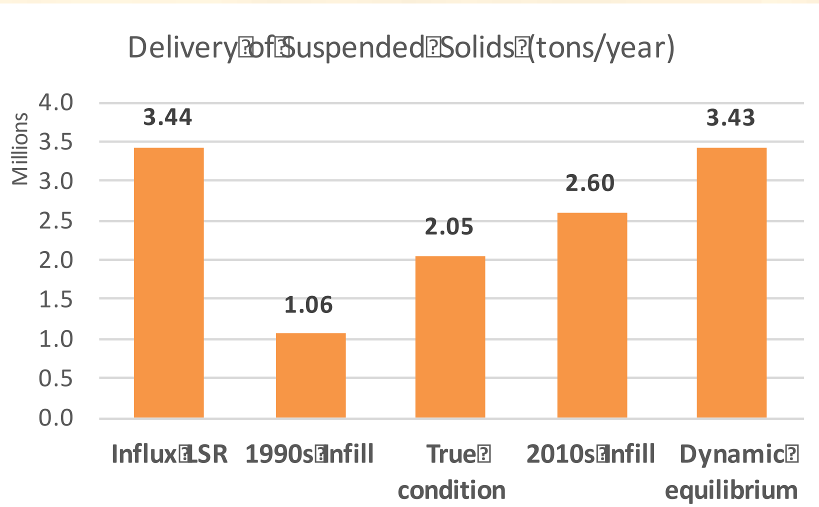




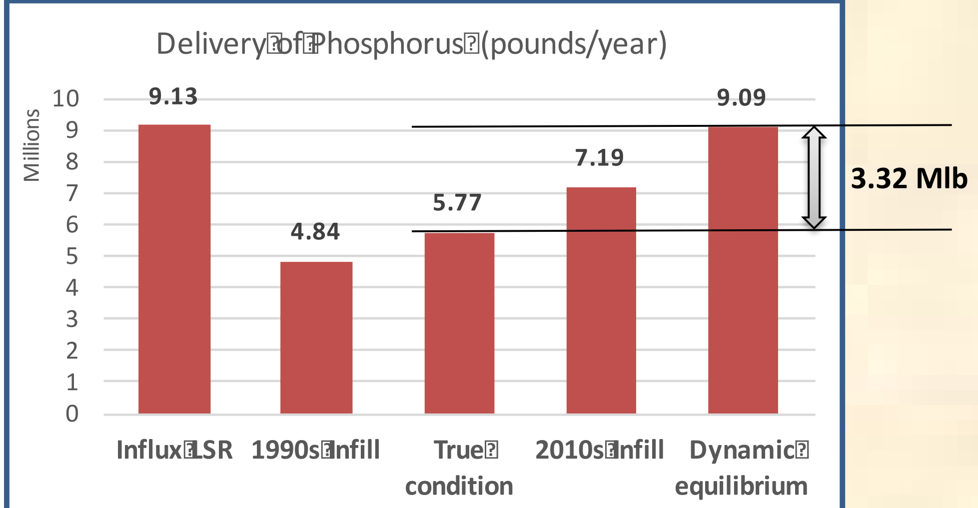
Lower Susquehanna Reservoirs – True Condition

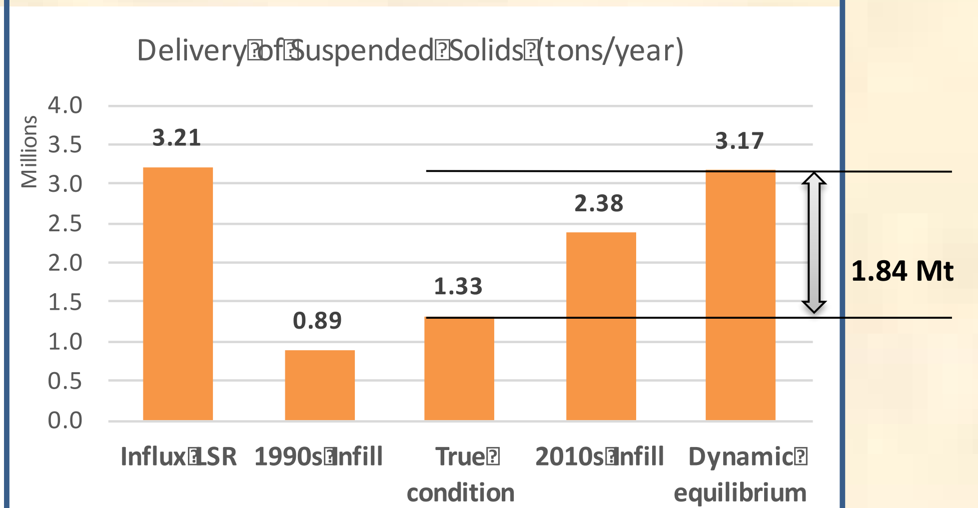
1985 – 2014





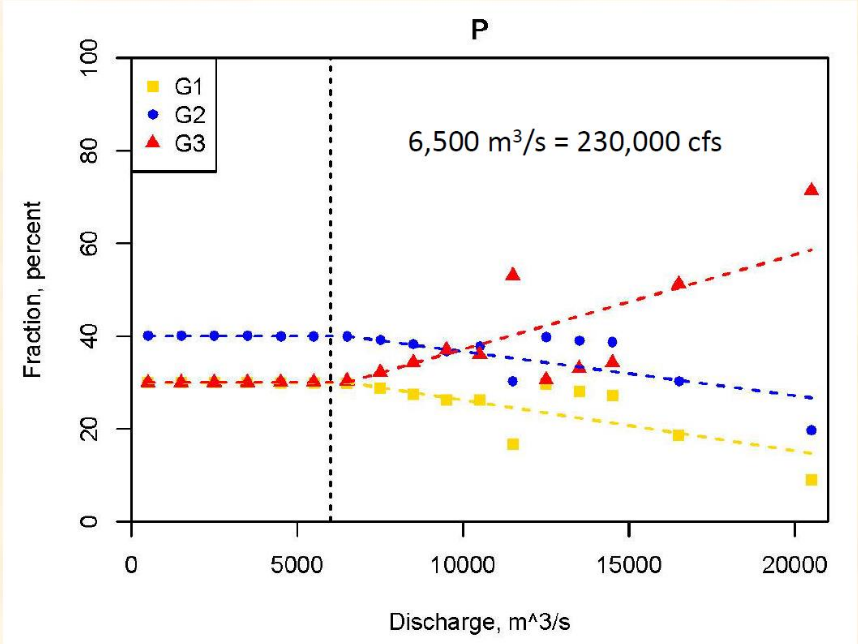
1991 – 2000



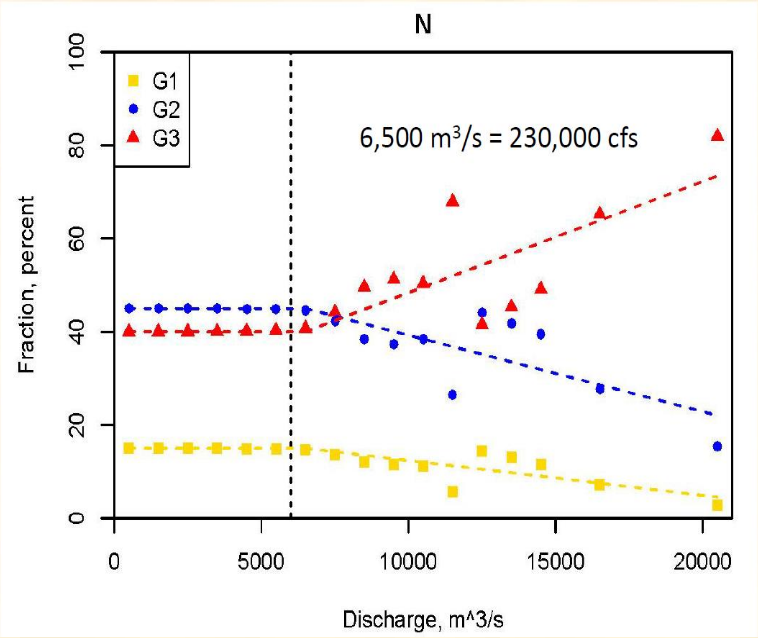


Fractions of Conowingo G1, G2, & G3 Delivered to Tidal Waters Under Different Flows

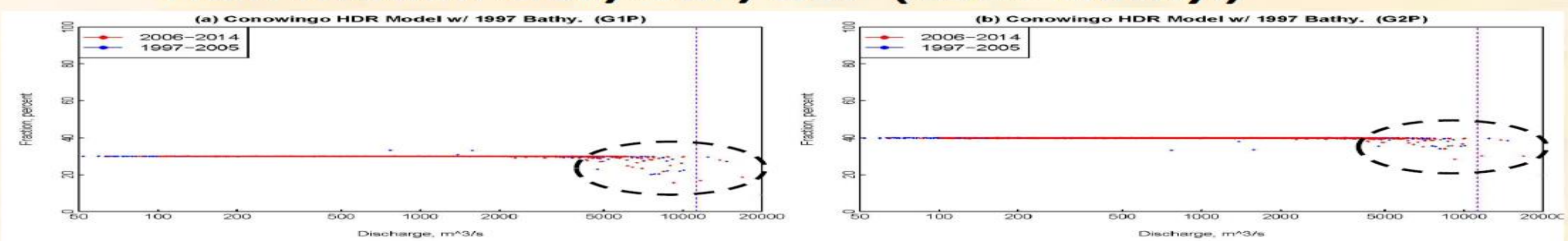
G1, G2, and G3 Organic Phosphorus

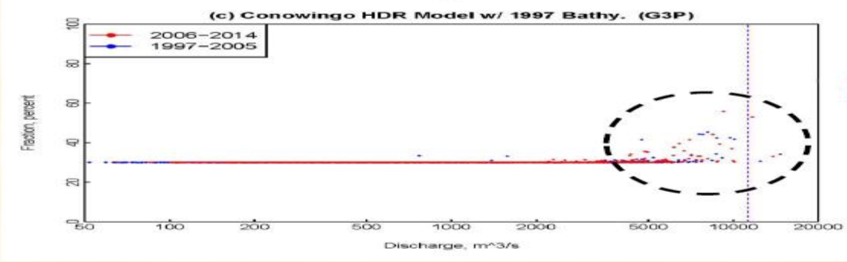


G1, G2, and G3 Organic Nitrogen



HDR Model: G1P/G2P/G3P (1997 Bathy.)





G1/G2 fractions decrease at high flows
G3 fraction increases at high flows

11,300 m³/s = 400,000 cfs

Lower Susquehanna Reservoirs – Transport Factors

$$Transport\ Factor = \frac{Output}{Input}$$

1985 – 2014	1990s Infill	True Condition	2010s Infill	Dynamic Equilibrium
Suspended Solids	0.31	0.60	0.76	**0.998**
Phosphorus	0.54	0.71	0.79	**0.998**

1991 – 2000	1990s Infill	True Condition	2010s Infill	Dynamic Equilibrium
Suspended Solids	0.28	0.41	0.74	**0.987**
Phosphorus	0.53	0.63	0.79	**0.996**

The dynamic equilibrium transport factor for the 1991-2000 average hydrology is slightly lower than that for 1985-2014.

Initial, Preliminary Conclusions:

- The 2017 CBP Models have findings consistent with the 2010 CBP Models.
- The increase of about 1.7 million pounds phosphorus is consistent with the previous analyses (2 million pounds) going back to 2015 [1].
- The current best estimates of the increase in net transport of phosphorus loads to the Chesapeake due to Conowingo infill is about 1.7 million pounds which results in an estimated ~1% increase in nonattainment of the Deep Channel DO water quality standard under WIP levels of nutrient loads.
- The results shown were based on the Draft Phase 6 Watershed Model of August 2017.

[1] Linker, L.C., Batiuk, R.A., Cerco, C.F., Shenk, G.W., Tian, R., Wang, P., Yactayo, G., 2016. Influence of Reservoir Infill on Coastal Deep Water Hypoxia. Journal of Environmental Quality, 45: 887-893

Next Steps:

- Complete initial 2010 WIP2, 2010 WIP2 + Conowingo infill, and 2010 WIP2 + Conowingo infill + climate change.
- Finalize both Phase 6 WSM & WQSTM. Assess if recalibration is needed after all input changes are applied in September.
- Begin geo runs now with current WQSTM calibration (Run 199) using cloud supercomputing.
- Finalize E3 and No Action Scenarios. Redo all key scenarios.
- Complete initial 2010 targets, 2010 targets + Conowingo infill, and 2010 targets + Conowingo infill + climate change for WQGIT 9/25-26 F2F.
- In addition, complete initial 2025 targets (and targets based on 2013, 2017, and 2025 land use variants to the extent possible).

STAC's Guidance on Conowingo Infill Simulation

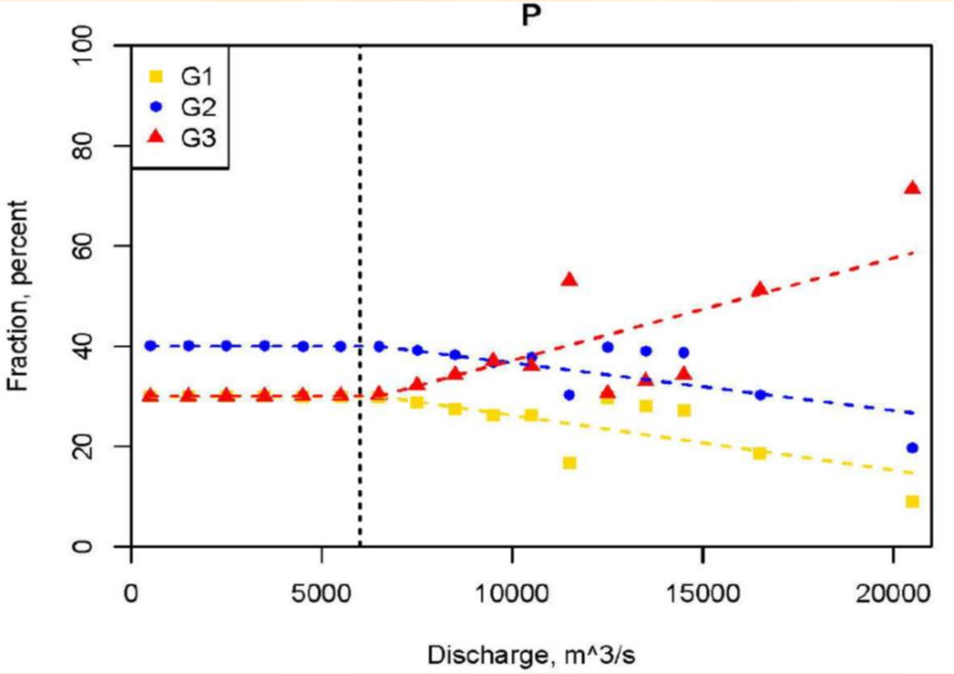
Workshop Recommendation 1: Efforts to model the effects of Conowingo on net accumulation or release of nutrients and sediment from the reservoir should be evaluated based on its ability to "hindcast" data from water quality observations and statistical analyses.

The Phase 6 Model has been supported by extensive Conowingo infill monitoring, research, and applications of multiple models since 2010. The improved understanding of the infill process and its consequences for increased nutrient transport to the tidal Bay has provided the necessary support for a dynamic Phase 6 simulation of the Conowingo Reservoir that changes with infill conditions, is calibrated to long-term river monitoring stations above and below the Conowingo, and has guidance from the latest research findings.

STAC's Guidance on Conowingo Infill Simulation

Workshop Recommendation 2a: Address biogeochemical processes related to sediment scour and nutrient cycling that may influence bioavailability in reservoir sediments, under variable flow ranges in the Conowingo Reservoir.

The Hydroqual-HDR simulation of the Conowingo Reservoir and the UMCES assessment of particulate organics in Conowingo sediment examined mass, shear stress, and the degree of reactivity of three classes of particulate organic material. The three classes of particulate organics were a labile, or highly reactive organic material with oxidation time scales of several weeks (G1), a refractory, less reactive material with time scales of several months (G2), and an effectively inert, largely non-reactive component (G3). The UMCES research and HydroQual- HDR simulation of the G1, G2, and inert G3 particulate organics in Conowingo Reservoir sediment provided essential information to simulate with the Phase 6 WSM the mobilization and relative reactivity of particulate organic nutrients from Conowingo.



STAC's Guidance on Conowingo Infill Simulation

Workshop Recommendation 2a: Ensure representation of effects of Conowingo inputs to Chesapeake Bay for the full range of flow conditions including 'extreme' high-flow events.

The representation of the effects of Conowingo inputs to the tidal Chesapeake Bay for the full range of flow conditions including 'extreme' high-flow events was done using WRTDS guidance over the full range of flows, which were augmented with observations during the extreme high flow events to further guide the Phase 6 simulation of the Conowingo Reservoir. Decreased deposition over time with increasing infill was consistent with WRTDS and other observations (Zhang et al., 2016a; 2016b; Langland, 2015). In addition, scour was calibrated with the critical shear stress of bottom scour from the Conowingo Reservoir increasing over time with increased infill. The approaches of decreased particle deposition and increased bottom critical shear stress with infill demonstrably improved the simulation's agreement with observation and was entirely consistent with reservoir infill theory and the recommendations of the STAC Conowingo workshop.

STAC's Guidance on Conowingo Infill Simulation

Workshop Recommendation 2c: Improve representation of reactivity of particulate organic matter in Conowingo outflow.

The 2017 version of the WQSTM included the full explicit simulation of the labile, reactive, and relatively unreactive particulate organics (G1, G2, G3, respectively) in the simulated WQSTM water column for the first time, which significantly improved the representation of particulate organic material throughout model domain.

In addition, to further address the fate of the particulate organic phosphorus, particulate inorganic phosphorus and particulate organic nitrogen scoured from the Conowingo and transported to tidal water, core studies with tidal Chesapeake sediments were conducted by UMCES. The tidal water sediment core studies provided insight as to what changes in nutrient flux would be expected from sediment cores that were capped by an influx of Conowingo sediment, similar to what would occur during scour from Conowingo during extreme high flows. A collection of cores from different regions of the upper Bay confirmed the simulated flux behavior of the WQSTM in the upper Bay downstream of Conowingo discharge.

STAC's Guidance on Conowingo Infill Simulation

Workshop Recommendation 3: Moving forward, an effort should be made to link the sediment transport and biogeochemical models in the 2010 Water Quality and Sediment Transport Model (WQSTM) to enhance modeling of the transport and fate of organic nutrients in the tidal Bay.

The Modeling Workgroup fully agrees that the next generation of tidal water quality and sediment transport model should have fully linked and integrated sediment transport and biogeochemical models. This is an active area of simulation research, and examples of the linkage of simulated sediment transport and sediment/water column biogeochemical processes are now operational, such as in the CPMBM used in the current Conowingo study. The linkage could be particularly important in regions of high estuarine deposition of sediment and particulate nutrients, with subsequent nutrient outflux determined by the presence and extent of bottom water hypoxia. Opportunities for examining the potential for this linkage will be in the January 2018 STAC workshop *Chesapeake Bay Program Modeling Beyond 2018: A Proactive Visioning Workshop.*