



Chesapeake Bay 2017 Midpoint Assessment— Policy Issues for Partnership Decisions

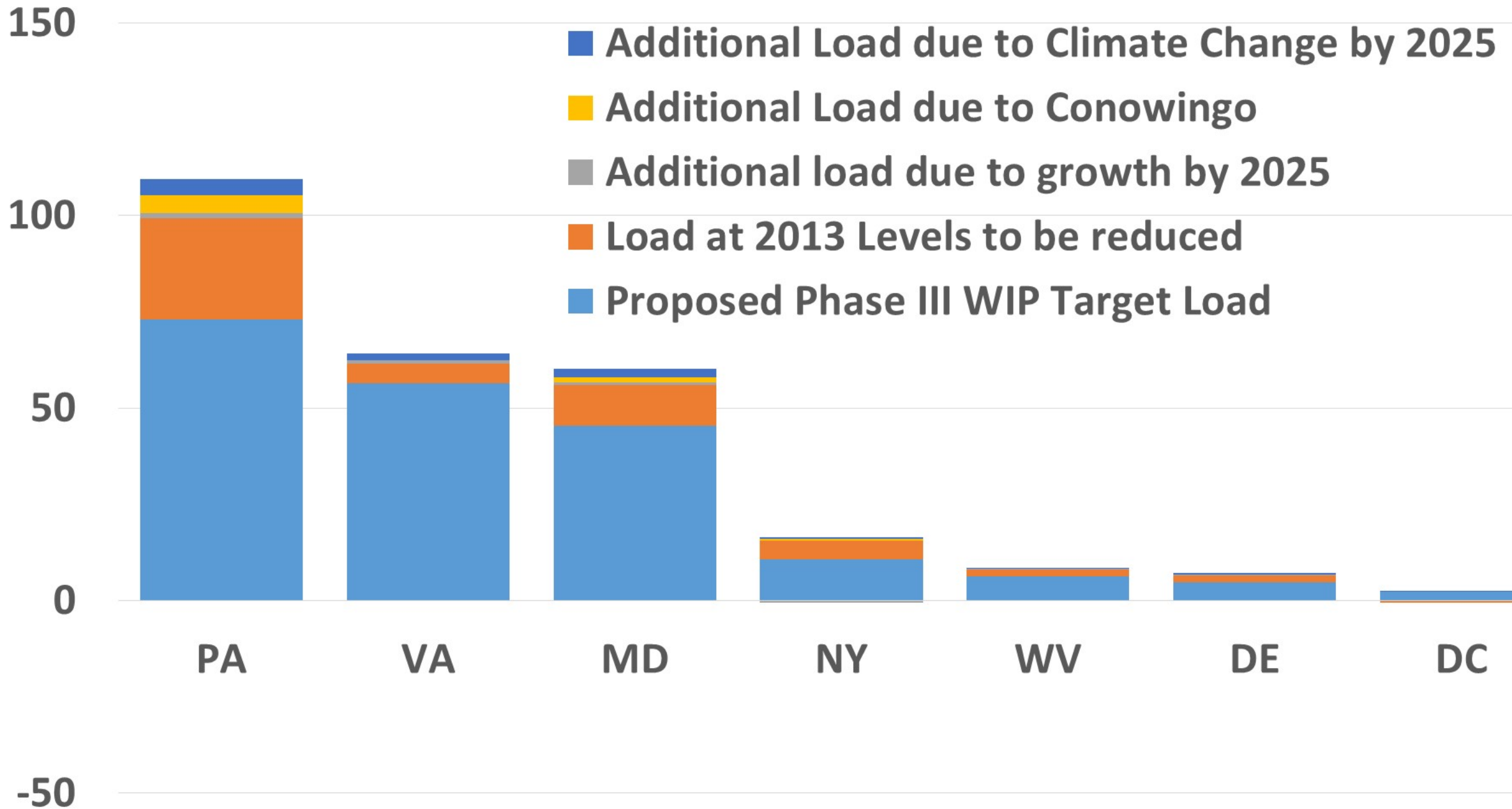


**Water Quality Goal Implementation Team Meeting
December 4-5, 2017**

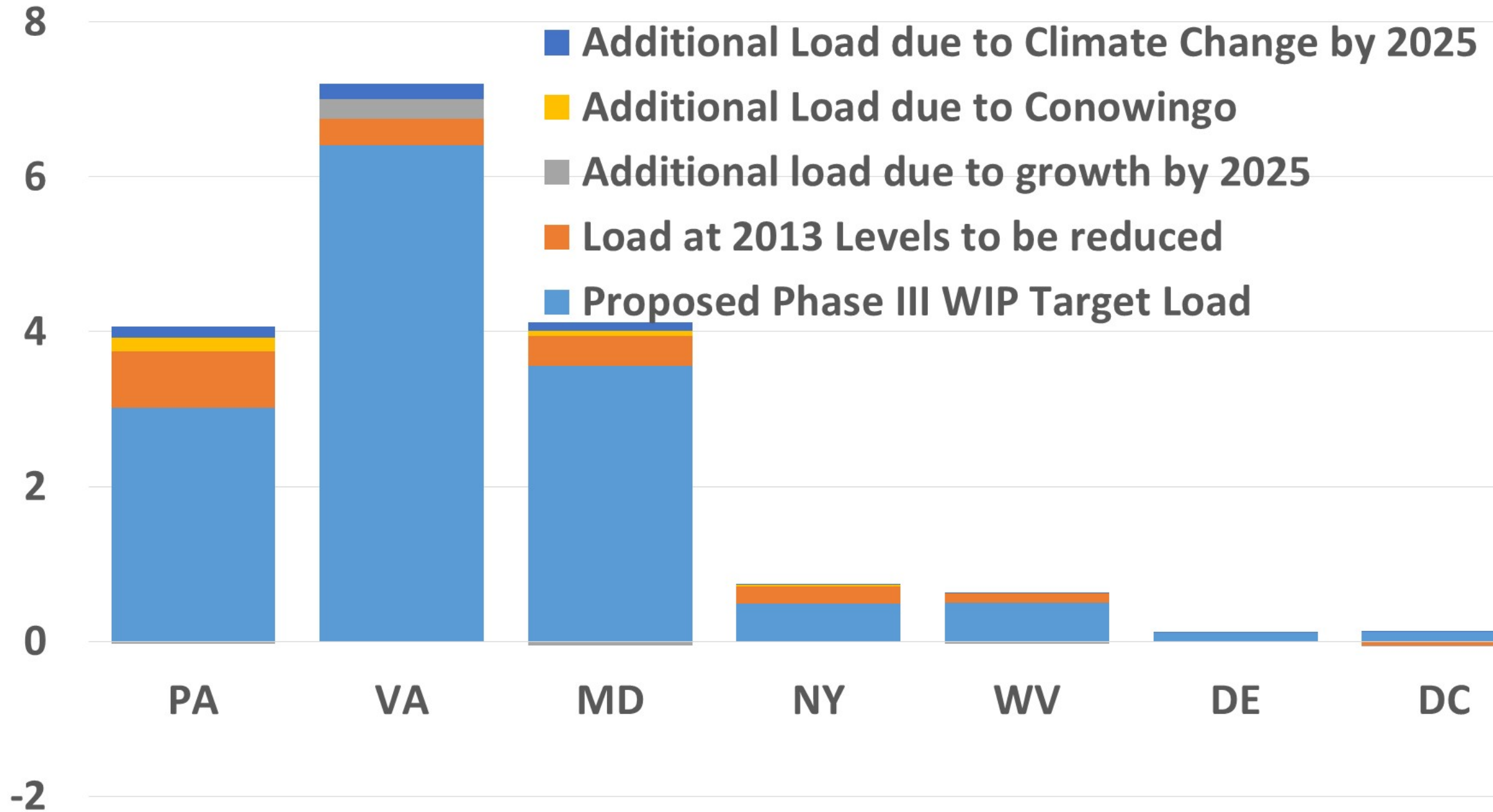
PSC Approved Schedule

- **December 19-20, 2017:** PSC 2-day retreat and decision making
- **December 22, 2017:** Release of draft Phase III WIP planning targets
- **December 22, 2017 – April 20, 2018:** Partnership's review of the draft Phase III WIP planning targets
- **Late April/Early May 2018:** PSC approval of the final Phase III WIP planning targets with any agreed-to special cases
- **May 7, 2018:** Release of the final Phase III WIP planning targets

Proposed Draft Nitrogen Targets



Proposed Draft Phosphorus Targets



Decisions – Recommendations to the PSC

- Formally Adopt the Phase 6 Suite of Models
- Determine the Assimilative Capacity of the Bay
- Accounting for Climate Change
- Accounting for Growth
- Accounting for Conowingo

Adoption of the Phase 6 Suite of Models

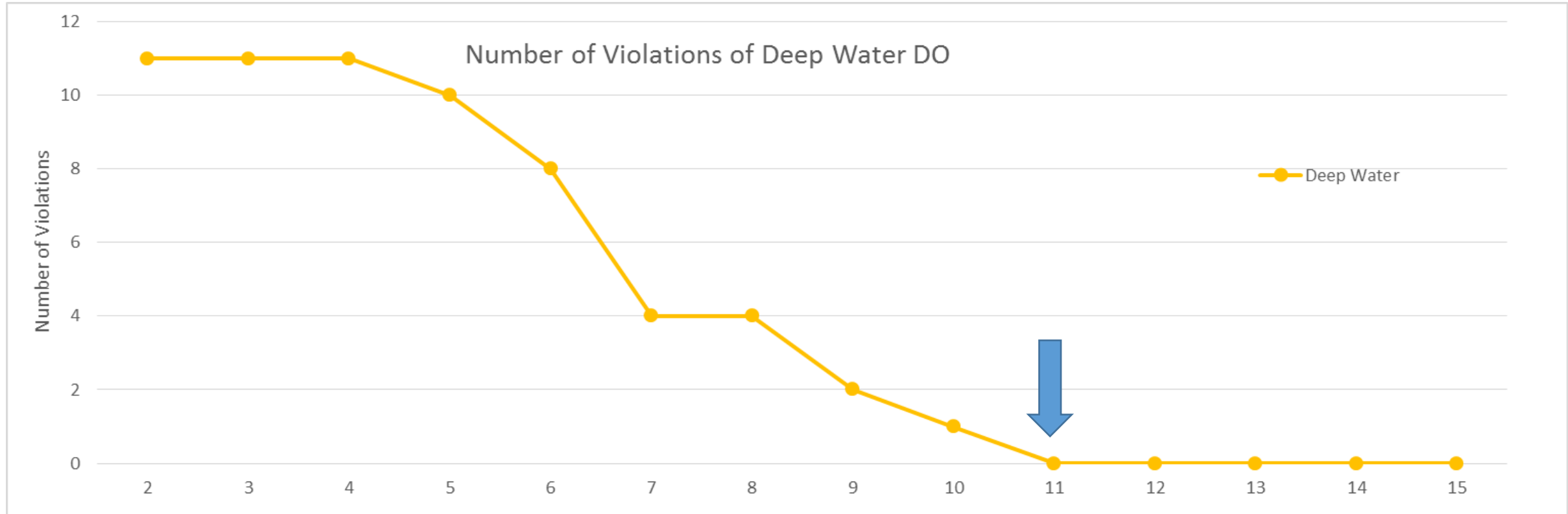
- **Approved** with one **caveat**
 - Approved for purposed of calibration and setting planning targets
 - Future scenarios have one minor detail to be sorted out this week

Determining the Bay's Ability to Absorb Pollutants (Assimilative Capacity)

**Dave Montali, WV, CBP Modeling Workgroup Co-Chair
and**

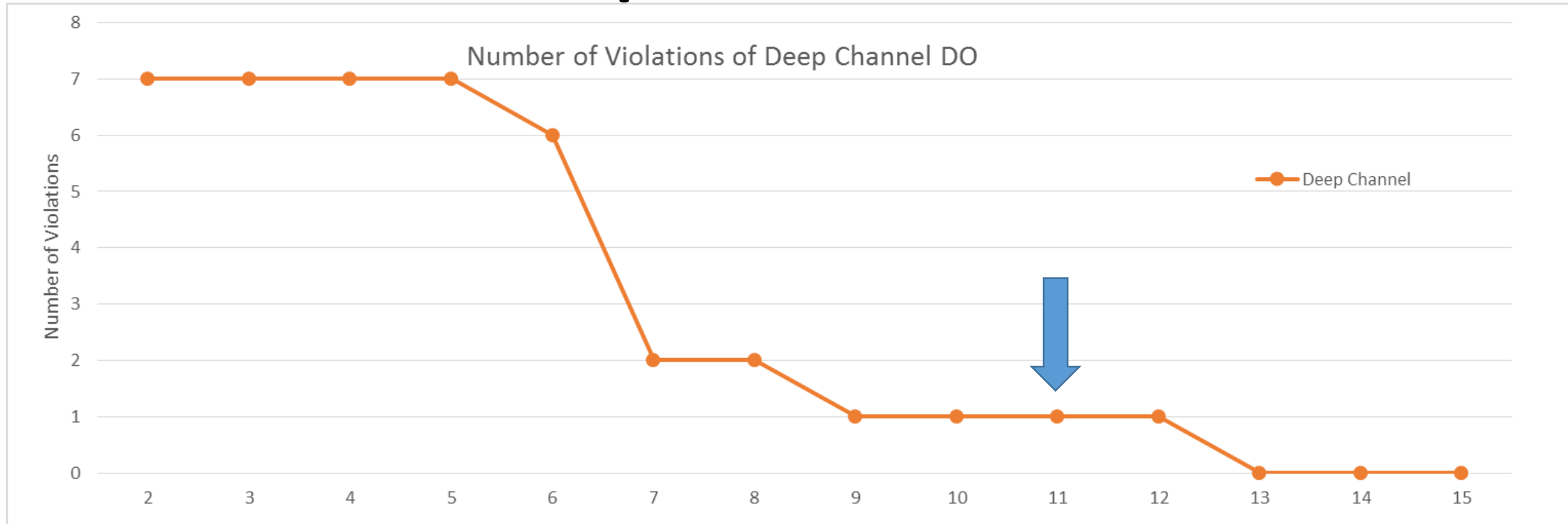
**Rich Batiuk, U.S. EPA CBPO Associate Director for Science,
Analysis and Implementation**

Segments Attaining Oxygen Standards: Deep-Water Use



	1985	1990	1993	2000	2010	2013	WIP+18%TN & +12%TP	WIP+6%TN & +4%TP	WIP2	WIP-6%TN & -8%TP	WIP-11%TN & -16%TP	E3	All Forest
No Action	Progress	Progress	Progress	Progress	Progress	Progress							
404TN	347TN	338TN	337TN	317TN	266TN	253TN	224TN	205TN	195TN	185TN	174TN	133TN	40TN
41.7TP	30.4TP	27.7TP	23.7	21.9TP	16.9TP	15.9TP	14.8TP	14.4	13.7TP	13.0TP	11.9TP	8.6TP	3.9TP

Segments Attaining Oxygen Standards: Deep-Channel Use



	1985	1990	1993	2000	2010	2013	WIP+18%TN & +12%TP	WIP+6%TN & +4%TP	WIP2	WIP-6%TN & -8%TP	WIP-11%TN & -16%TP	E3	All Forest
No Action	Progress	Progress	Progress	Progress	Progress	Progress							
404TN	347TN	338TN	337TN	317TN	266TN	253TN	224TN	205TN	195TN	185TN	174TN	133TN	40TN
41.7TP	30.4TP	27.7TP	23.7	21.9TP	16.9TP	15.9TP	14.8TP	14.4	13.7TP	13.0TP	11.9TP	8.6TP	3.9TP

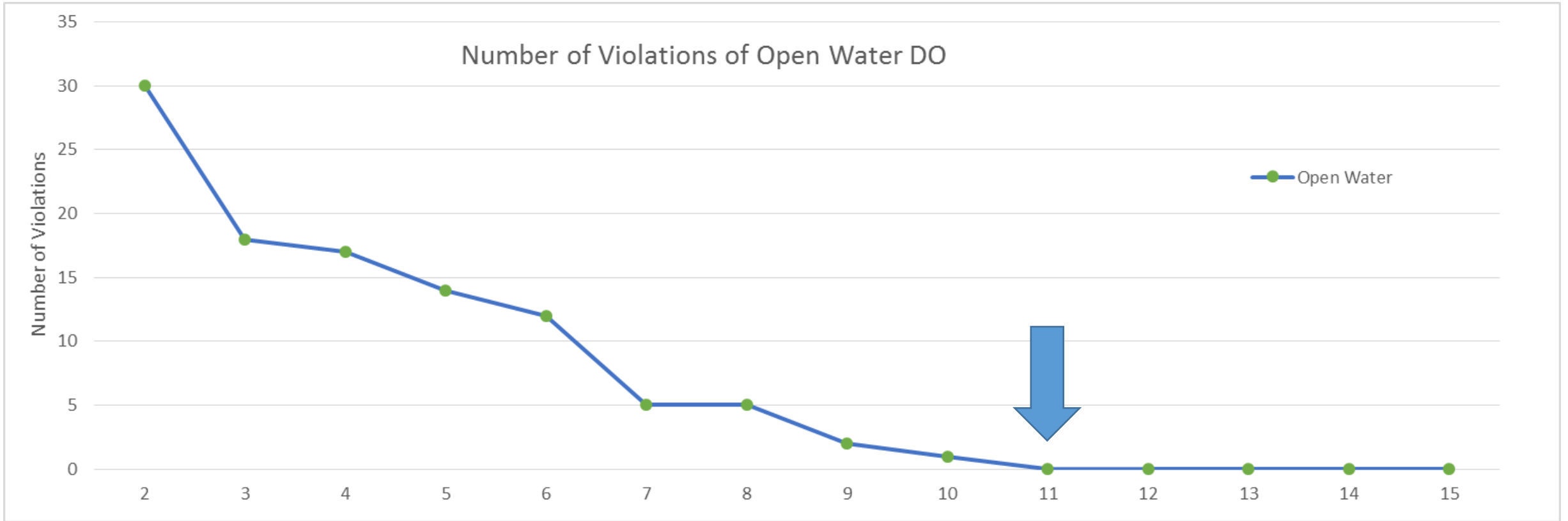
Addressing Open-Water Problem Segments

Segment Name	Segment Code	Bay TMDL ¹	Rationale for Designation as Problem Segment ²
Gunpowder River	GUNOH	Yes	Not well represented in WQSTM, non-responsive to load reductions
Upper Patuxent River	PAXTF	No	Extensive tidal wetlands, non-responsive to load reductions
Western Branch Patuxent River	WBRTF	No	Not well represented in WQSTM, non-responsive to load reductions
Upper Pamunkey River	PMKTF	Yes	Extensive tidal wetlands, non-responsive to load reductions
Corrotoman River	CRRMH	No	Not well represented in WQSTM, non-responsive to load reductions
East Branch Elizabeth River	EBEMH	No	Not well represented in WQSTM, non-responsive to load reductions
South Branch Elizabeth River	SBEMH	No	Not well represented in WQSTM, non-responsive to load reductions
West Branch Elizabeth River	WBEMH	Yes	Not well represented in WQSTM, non-responsive to load reductions
Wicomico River	WICMH	Yes	Not well represented in WQSTM, non-responsive to load reductions

1. Chesapeake Bay segment previously identified and documented in the 2010 Chesapeake Bay TMDL report as a problem segment, defined as a segment where changes in model simulated water quality standards non-attainment are essentially non-responsive to significant changes in nitrogen and phosphorus load reductions over a very wide range of loads.

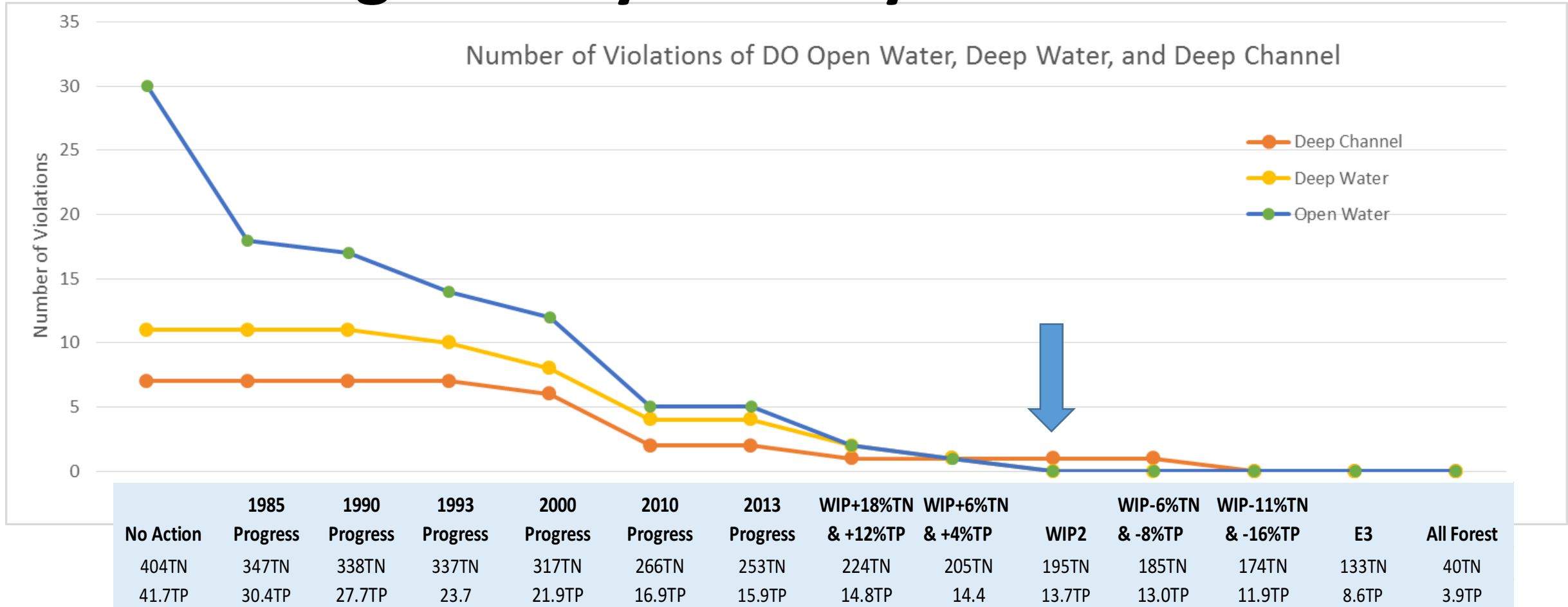
2. More detailed documentation on the rationale for identification of these specific nine segments as problem segments and why they were not considered in calculation of the Bay's assimilative capacity will be provided in the Partnership's Midpoint Assessment report in spring 2018.

Segments Attaining Oxygen Standards: Open-Water Use



	1985	1990	1993	2000	2010	2013	WIP+18%TN & +12%TP	WIP+6%TN & +4%TP	WIP2	WIP-6%TN & -8%TP	WIP-11%TN & -16%TP	E3	All Forest
No Action	Progress	Progress	Progress	Progress	Progress	Progress							
404TN 41.7TP	347TN 30.4TP	338TN 27.7TP	337TN 23.7	317TN 21.9TP	266TN 16.9TP	253TN 15.9TP	224TN 14.8TP	205TN 14.4	195TN 13.7TP	185TN 13.0TP	174TN 11.9TP	133TN 8.6TP	40TN 3.9TP

Determining the Bay's Ability to Absorb Pollutants



Agreement for WIP II as Assimilative Capacity

- At 195 million lbs. nitrogen and 13.7 million lbs. phosphorus, we reach:
 - Loading levels where all segments' designated uses, except CB4 deep-channel, come into attainment
 - Point of diminishing returns for the increased level of reductions approaching E3

Agreement to support WQ Standards Variances

- Support Maryland updating their water quality standards regulations' existing restoration variances
 - Change CB4 deep-channel from 2 percent to 6 percent
 - Change CB4 deep-water from 7 percent to 5 percent
 - No change to the Eastern Bay restoration variance of 2 percent
 - Remove the lower Chester River deep-channel restoration variance of 16 percent
 - Remove the Patapsco River deep-water restoration variance of 7 percent

Proposed Draft Phase III Planning Targets

**Gary Shenk, USGS, CBP Phase 6 Watershed Model
Coordinator**

Three Partnership Principals for Planning Targets

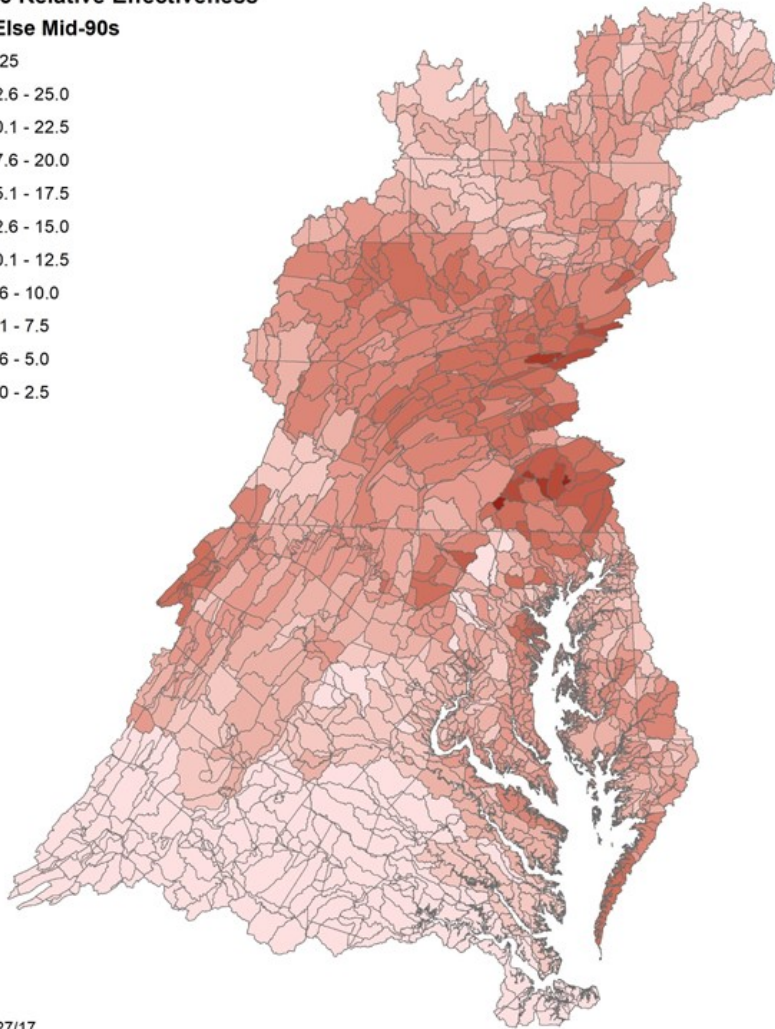
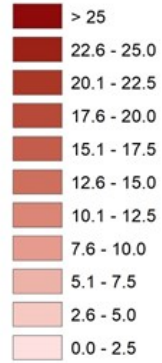
- Allocated loads must result in achievement of the states' Bay water quality standards
- Major river basins that contribute the most to Bay water quality problems must do the most to resolve those problems
- All tracked and reported reductions in loads are credited toward achieving assigned loads

More Impact, Do More

Nitrogen

Phase 6 Relative Effectiveness

TN All Else Mid-90s

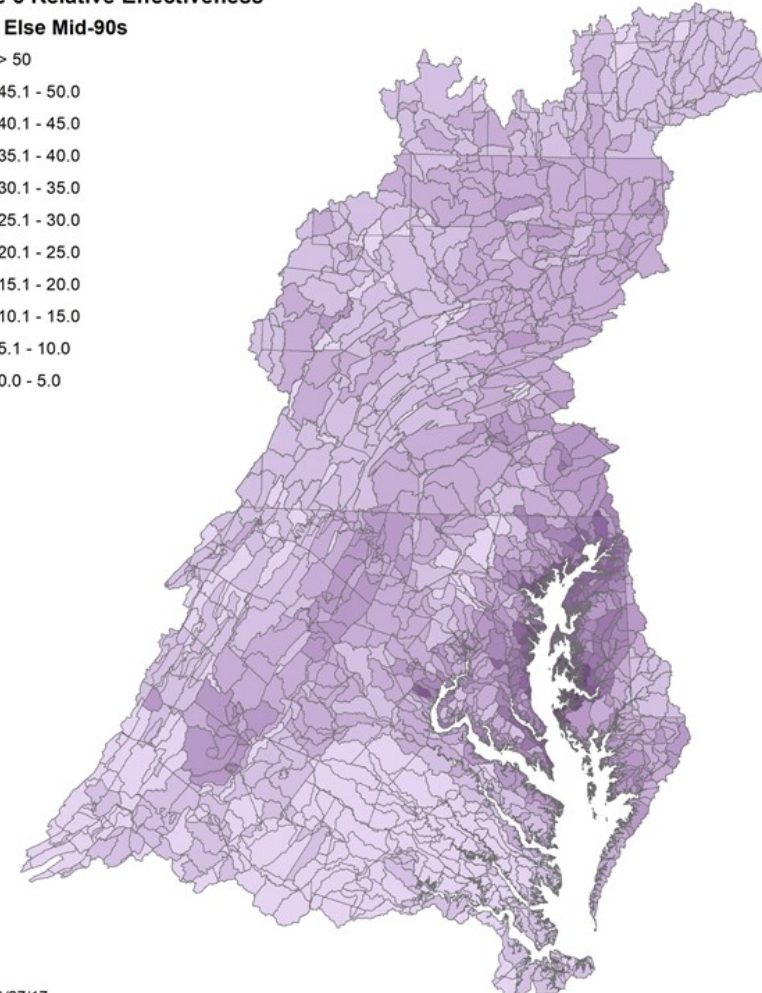


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Phosphorus

Phase 6 Relative Effectiveness

TP All Else Mid-90s



11/27/17

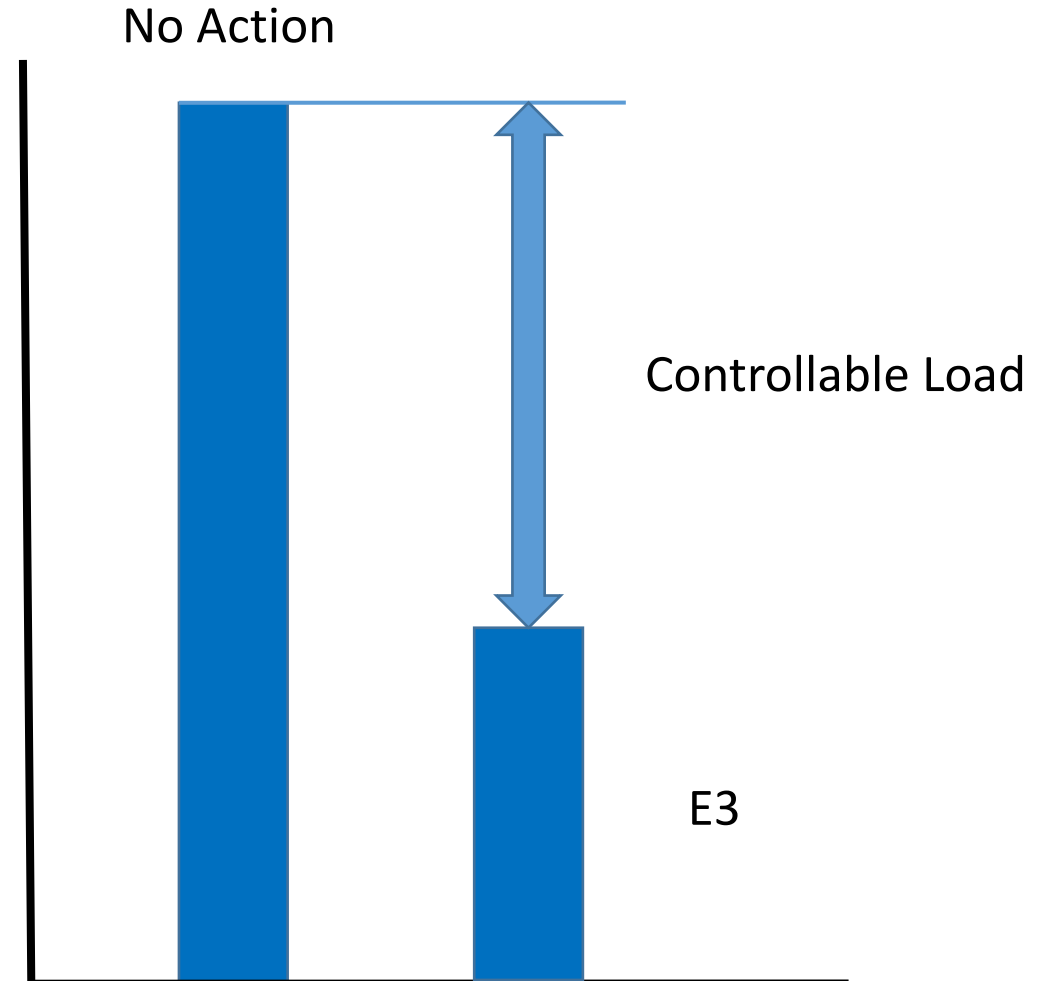
Defining the Controllable Load

No Action:

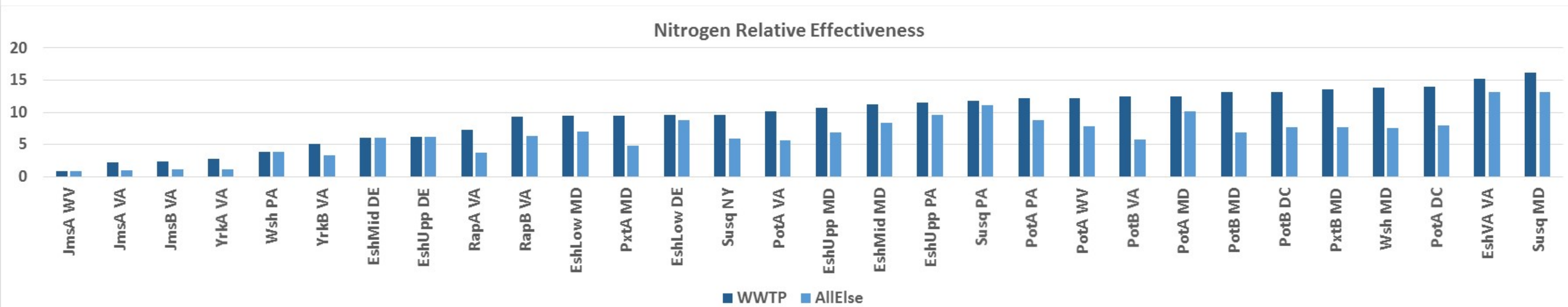
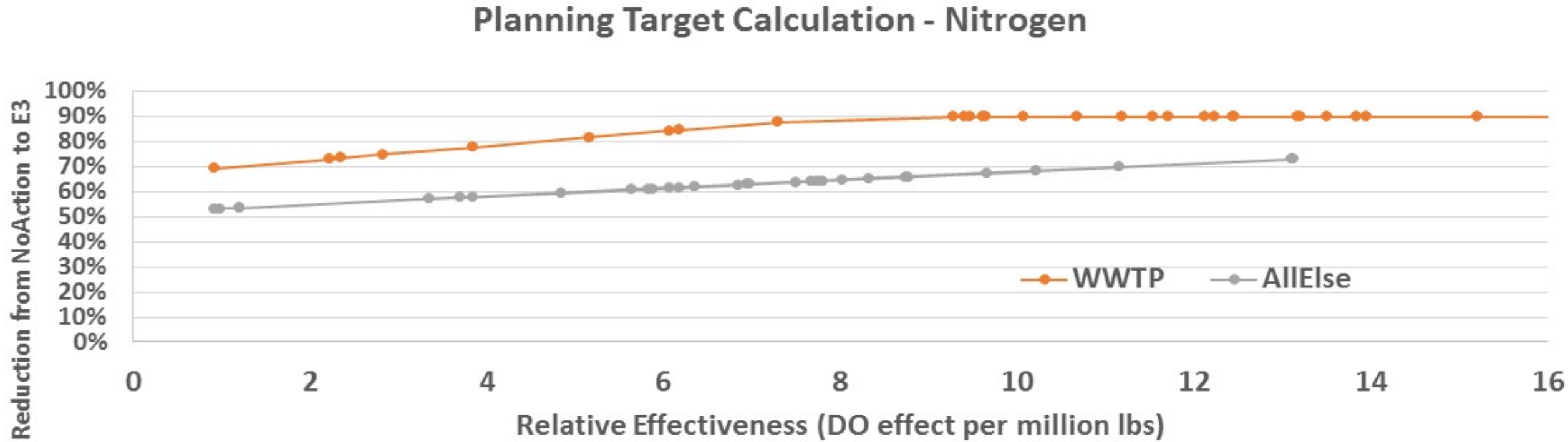
- Watershed conditions with minimal to no controls on load,
- Wastewater at primary treatment

E3 or “Everything by Everyone, Everywhere”:

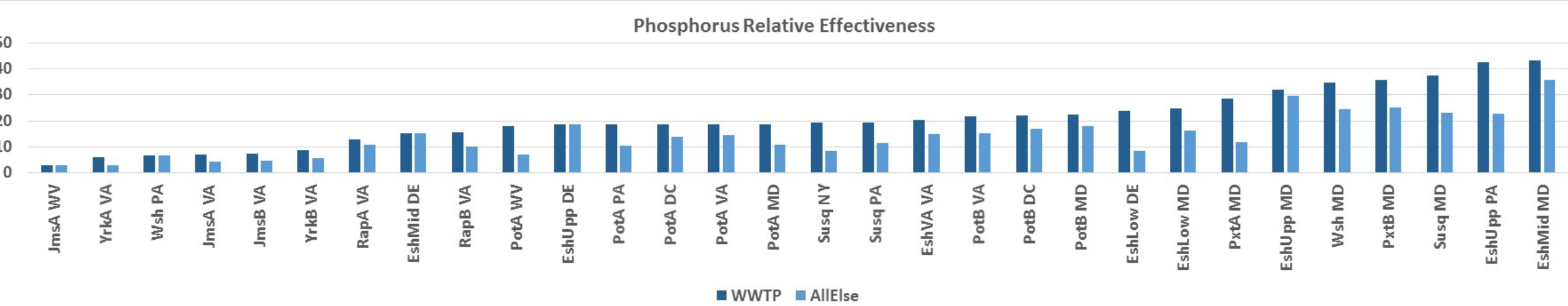
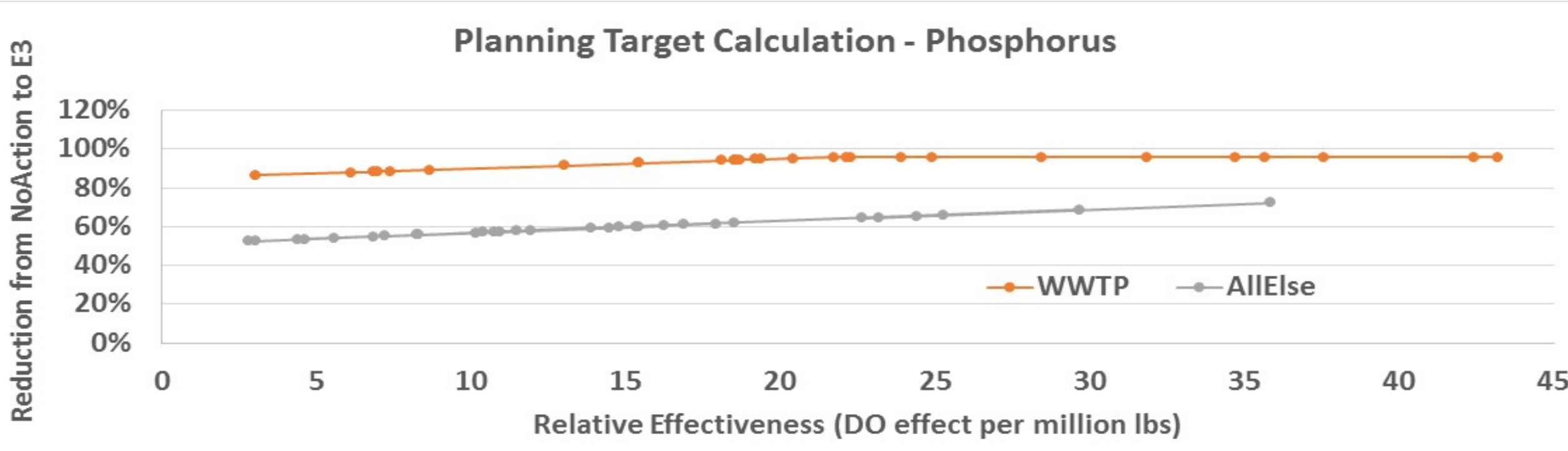
- Watershed conditions with maximum controls on loads, regardless of cost
- Wastewater at high level of nutrient control
 - 3mg/l TN, 0.1 mg/l TP



Deriving the Draft Phase III Planning Targets: Nitrogen



Deriving the Draft Phase III Planning Targets: Phosphorus



Proposed Draft Phase III Planning Targets: Nitrogen

Jurisdiction	1985 Baseline	2013 Progress	Climate Change	Growth in Load to 2025	Conowingo Load Responsibility	2013 Progress +	Phase III Planning Target
NY	18.71	15.44					10.62
PA	122.41	99.28					72.99
MD	83.56	55.89					45.39
WV	8.73	8.06					6.36
DC	6.48	1.75					2.25
DE	6.97	6.59					4.66
VA	84.29	61.53					56.37
BasinWide	331.15	248.54					198.64

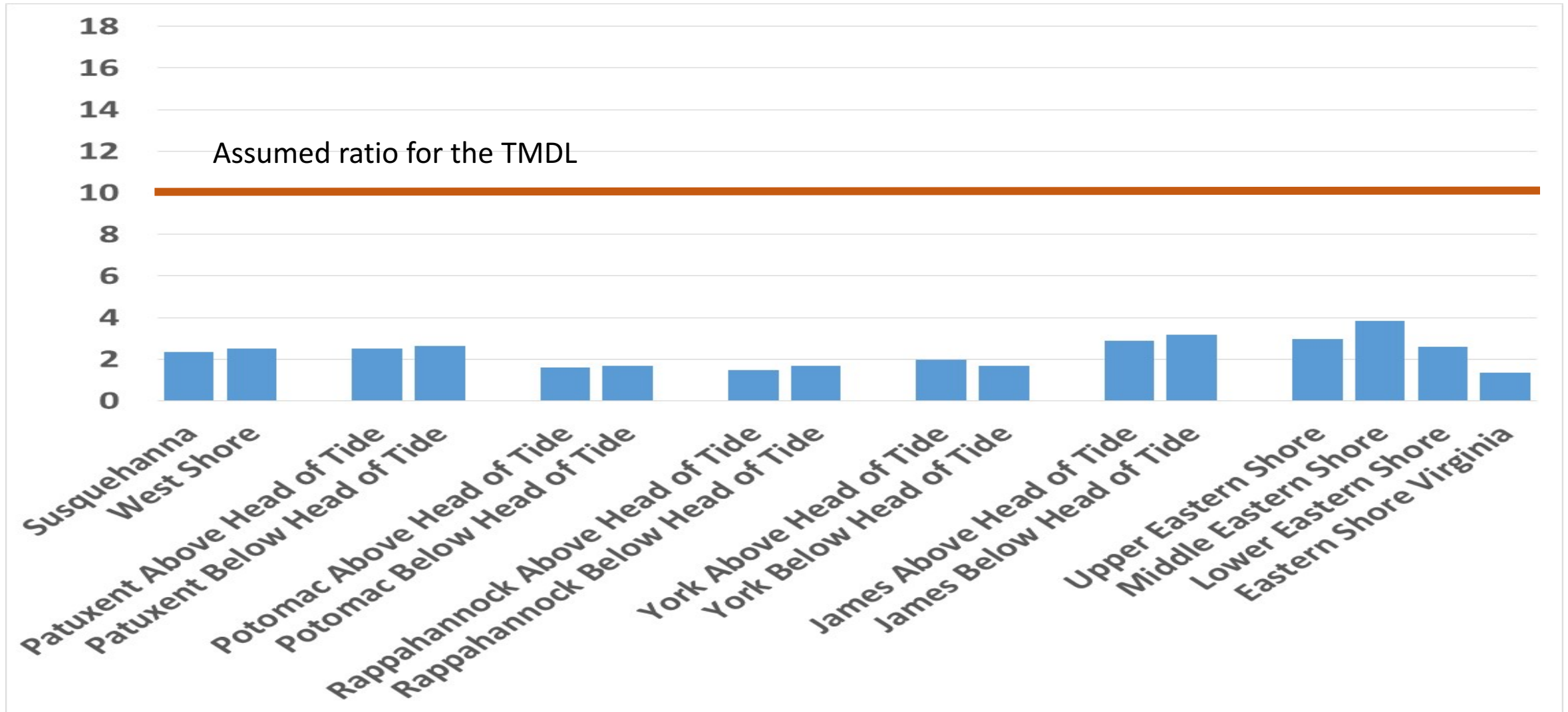
*Units = millions of pounds

Proposed Draft Phase III Planning Targets: Phosphorus

Jurisdiction	1985 Baseline	2013 Progress	Climate Change	Growth in Load to 2025	Conowingo Load Responsibility	2013 Progress +	Phase III Planning Target
NY	1.198	0.710					0.491
PA	6.282	3.749					3.012
MD	7.495	3.942					3.553
WV	0.902	0.617					0.493
DC	0.090	0.062					0.120
DE	0.225	0.116					0.116
VA	14.244	6.751					6.411
BasinWide	30.44	15.95					14.20

*Units = millions of pounds

Nitrogen and Phosphorus Exchanges



Allowing for Special Cases

- Previously agreed to consider special cases put forth by jurisdictions
- Consideration of special cases factored into four-month review process
- Final decisions on allowance of special cases will be made by the PSC in April 2018

Proposed Draft Phase III Planning Targets: Nitrogen

Jurisdiction	1985 Baseline	2013 Progress			Special Case	With Special Cases	Phase III Planning Target
NY	18.71	15.44			1.00	11.62	10.62
PA	122.41	99.28			-0.58	72.41	72.99
MD	83.56	55.89			-0.31	45.08	45.39
WV	8.73	8.06			-0.03	6.33	6.36
DC	6.48	1.75			0.00	2.24	2.25
DE	6.97	6.59			-0.06	4.61	4.66
VA	84.29	61.53			-0.24	56.13	56.37
BasinWide	331.15	248.54			-0.22	198.41	198.64

*Units = millions of pounds

Proposed Draft Phase III Planning Targets: Phosphorus

Jurisdiction	1985 Baseline	2013 Progress			Special Case	With Special Cases	Phase III Planning Target
NY	1.198	0.710			0.100	0.591	0.491
PA	6.282	3.749			-0.101	2.911	3.012
MD	7.495	3.942			-0.081	3.472	3.553
WV	0.902	0.617			0.200	0.693	0.493
DC	0.090	0.062			-0.001	0.120	0.120
DE	0.225	0.116			-0.004	0.112	0.116
VA	14.244	6.751			-0.138	6.273	6.411
BasinWide	30.436	15.947			-0.025	14.17	14.20

*Units = millions of pounds

Planning Targets

- Previous **agreement** that CBP would use the planning target method with the new models to calculate planning targets
- **Discussion** at yesterday's WQGIT suggesting that planning targets could be calculated based on running Phase II WIPs in the Phase 6 model
- **No agreement** on how special cases will be handled

Accounting for Growth in the Jurisdictions' Phase III WIPs

**Karl Berger, MWCOG, CBP Land Use Workgroup Chair
and
Peter Claggett, USGS, CBP Land Use Workgroup
Coordinator**

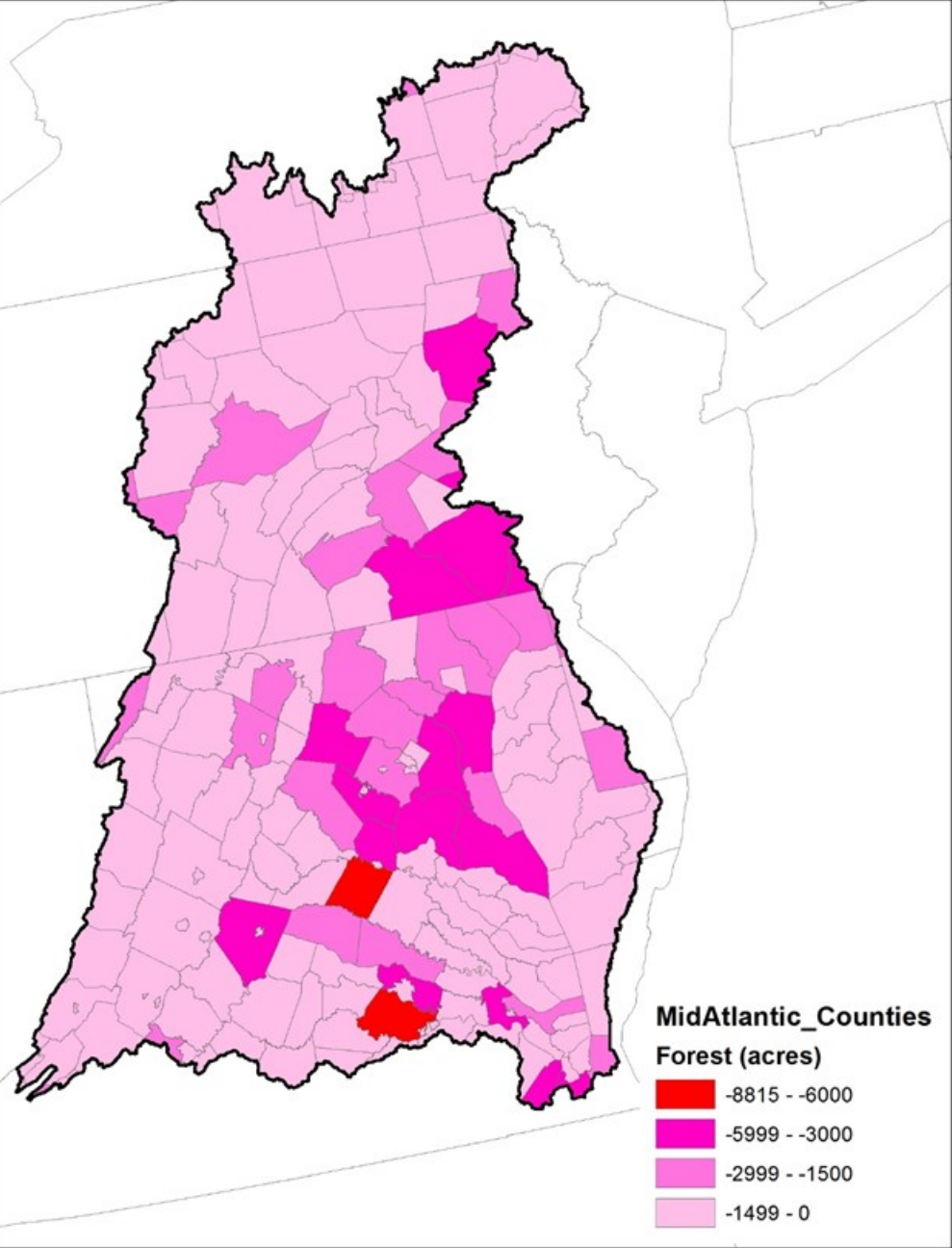
Accounting for Growth

- Watershed population is increasing by over 1 million persons/decade
- The Partnership's Chesapeake Bay Land Change Model estimates land use and wastewater impacts of future population growth.
- Previous **agreement**: Develop the WIPs on 2025 land use conditions which enabled the use and crediting of planning and conservation efforts to help “account for growth”

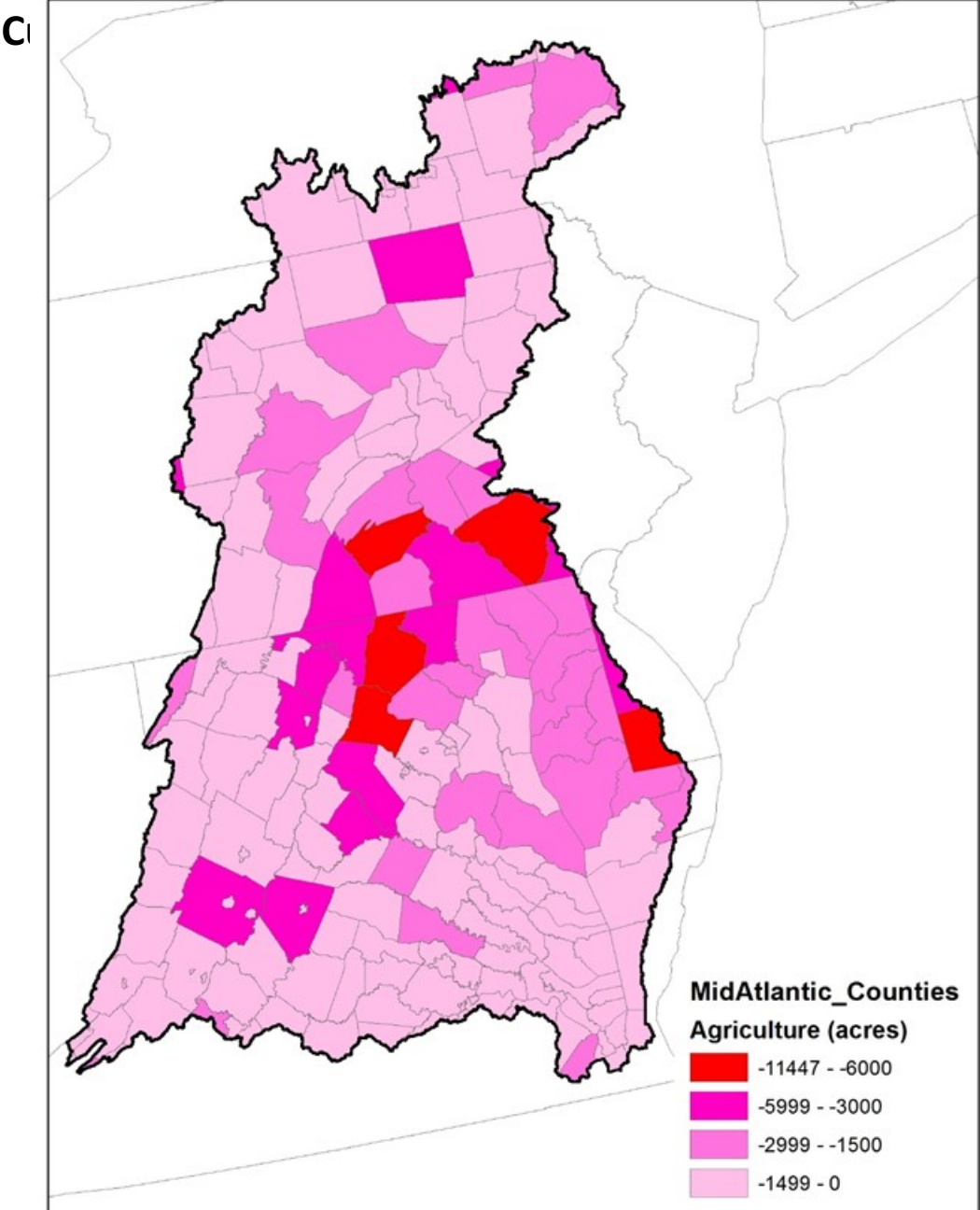
Future Growth Scenarios

- 1. Historic Trends:** Continuation of historic trends (Available now)
- 2. Current Zoning:** continuation of historic trends constrained by existing local zoning. Includes the best available regional and local data representing current conditions (available in January)
- 3. Conservation Plus:** continuation of historic trends constrained by local zoning, aggressive land conservation, accelerated infill/redevelopment, densification of urban areas, avoidance of riparian areas, 100-year floodplains, frequently flooded soils, areas subject to sea-level rise and storm surge, and soils unsuitable for on-site septic systems (available in March 2018)

Forest Conversion to Development



Farmland Conversion to Development



Proposed Draft Phase III WIP Planning Targets: Nitrogen

Jurisdiction	1985 Baseline	2013 Progress	Growth in Load to 2025	Conowingo Load Responsibility	Climate Change	2013 Progress +	Phase III Planning Target
NY	18.71	15.44	-0.52			14.92	10.62
PA	122.41	99.28	1.38			100.66	72.99
MD	83.56	55.89	0.76			56.65	45.39
WV	8.73	8.06	0.20			8.26	6.36
DC	6.48	1.75	0.00			1.76	2.25
DE	6.97	6.59	0.22			6.81	4.66
VA	84.29	61.53	0.86			62.39	56.37
BasinWide	331.15	248.54	2.91			251.45	198.64

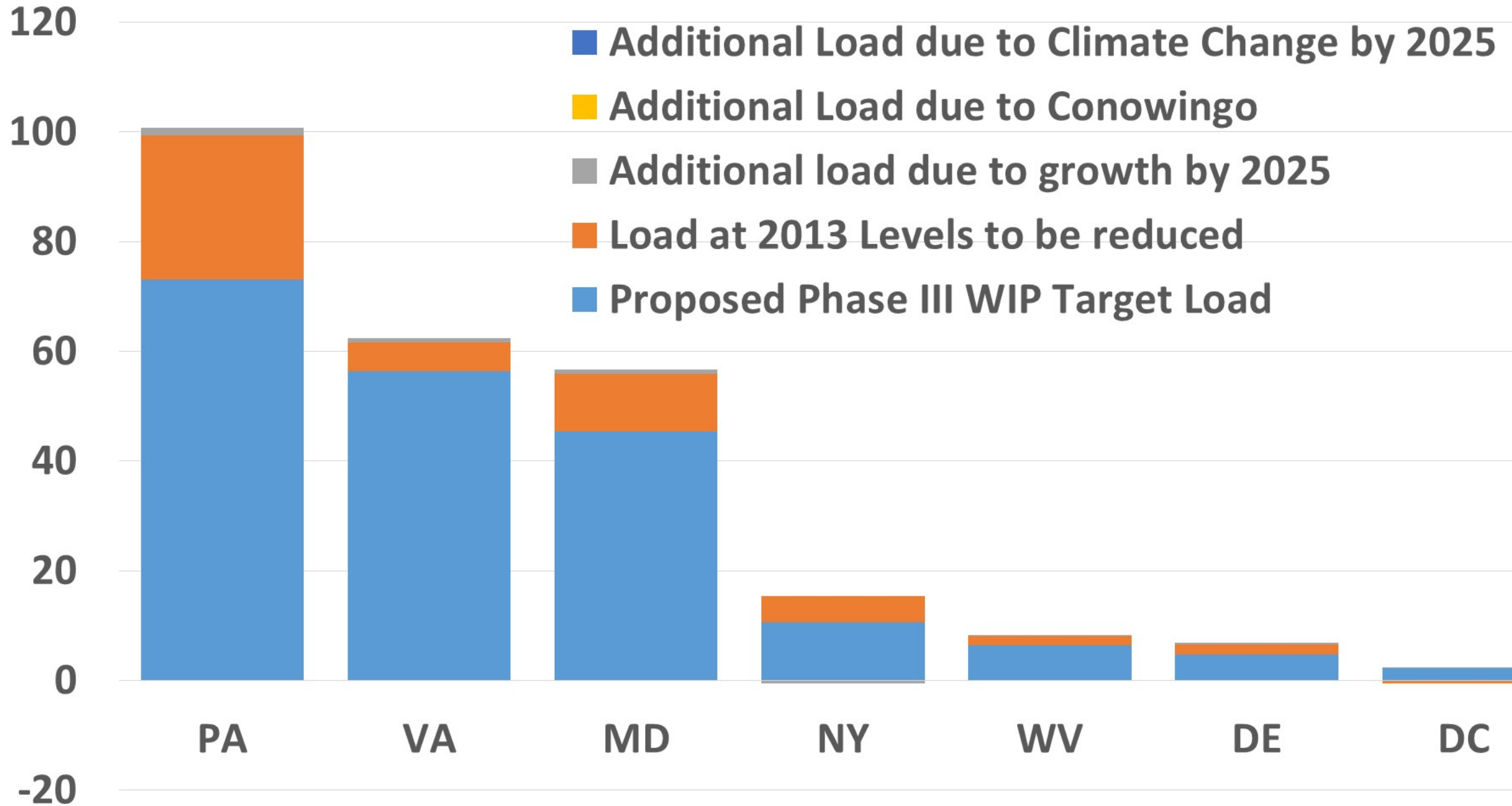
Increase in load running Phase II WIPs on 2025 rather than 2010 using historic trends

Proposed Draft Phase III WIP Planning Targets: Phosphorus

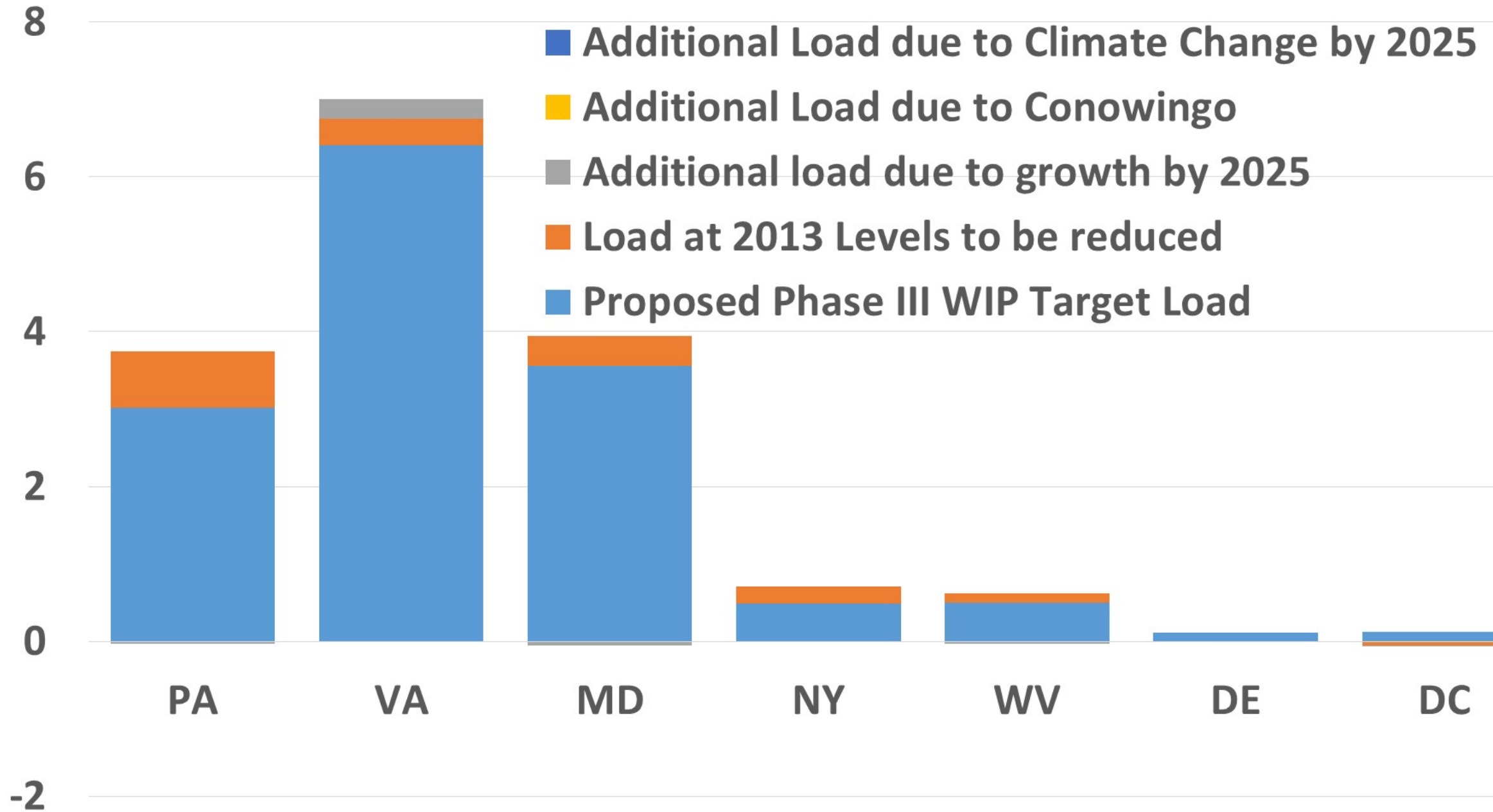
Jurisdiction	1985 Baseline	2013 Progress	Growth in Load to 2025	Conowingo Load Responsibility	Climate Change	2013 Progress +	Phase III Planning Target
NY	1.198	0.710	-0.010			0.700	0.491
PA	6.282	3.749	-0.034			3.716	3.012
MD	7.495	3.942	-0.053			3.888	3.553
WV	0.902	0.617	-0.027			0.591	0.493
DC	0.090	0.062	-0.001			0.062	0.120
DE	0.225	0.116	-0.004			0.111	0.116
VA	14.244	6.751	0.254			7.005	6.411
BasinWide	30.44	15.95	0.125			16.072	14.20

Increase in load running Phase II WIPs on 2025 rather than 2010 using historic trends

Proposed Draft Nitrogen Targets



Proposed Draft Phosphorus Targets



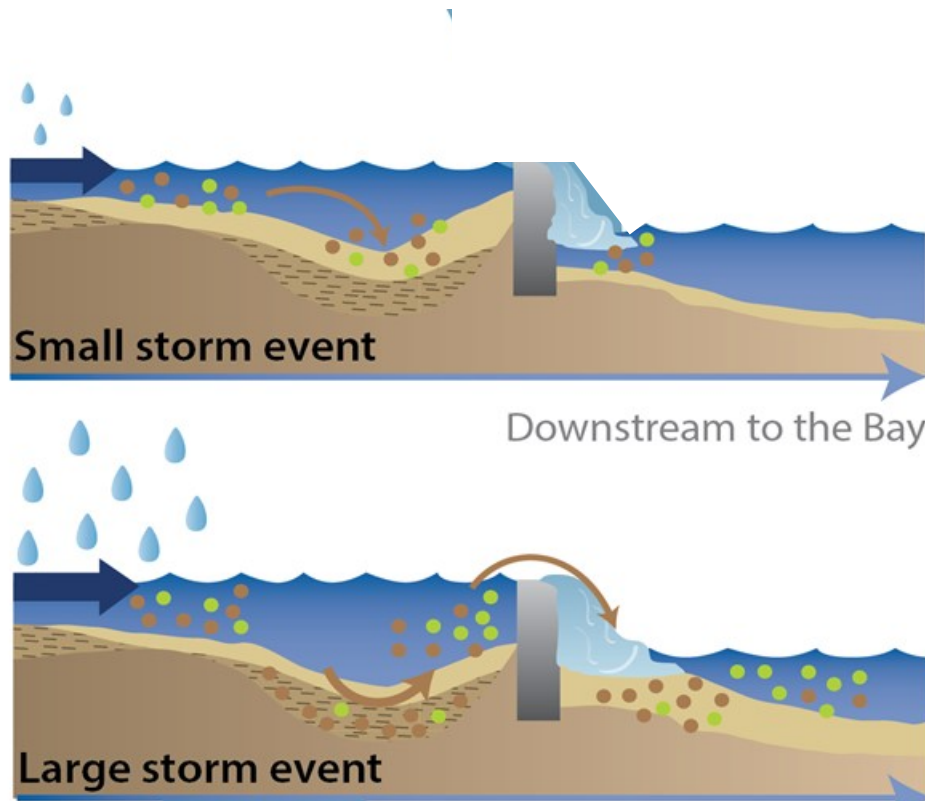
Accounting for Growth

- Jurisdictions develop WIPs on projected 2025 land uses
- Jurisdictions can choose:
 - Historic Trends
 - Current Zoning
 - Conservation Plus
 - Subset of Conservation Plus

Conowingo Dam Infill: How Much, Who, How, and By When

Lee Currey, MDE, CBP Modeling Workgroup Co-Chair

Estimated Loads to the Bay with Conowingo Dam and Reservoir at Infill Conditions

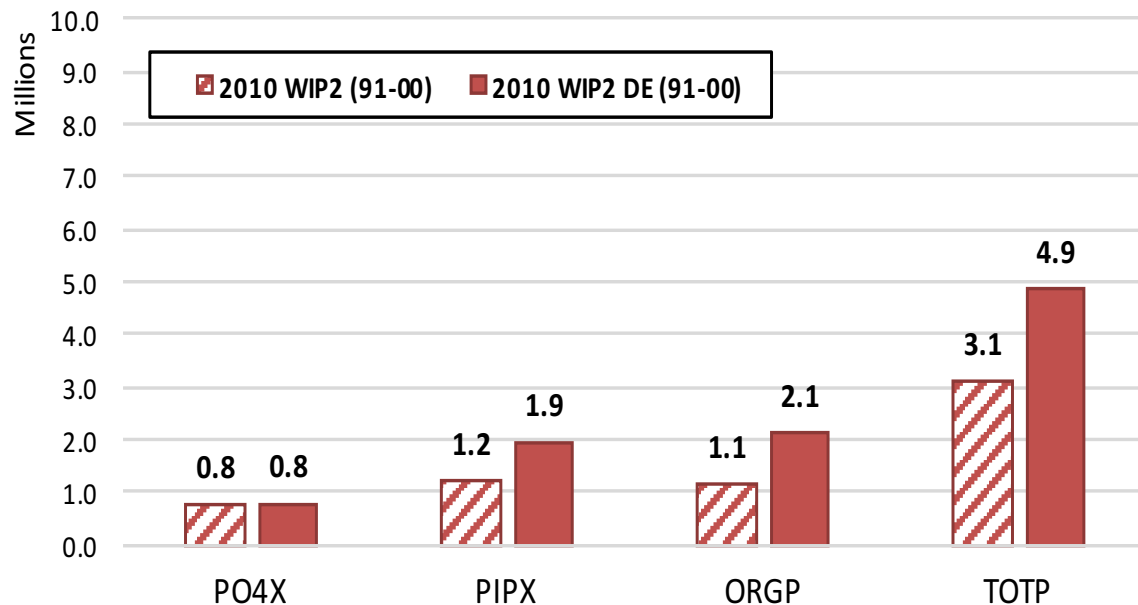


- Almost all of the nutrients are from upstream sources
- Much of the nutrients are biologically available to algae when they enter tidal waters
- Some of the nutrients are scoured from the bottom sediments behind the dam
- Much of these scoured nutrients are not biologically available to algae when they enter tidal waters

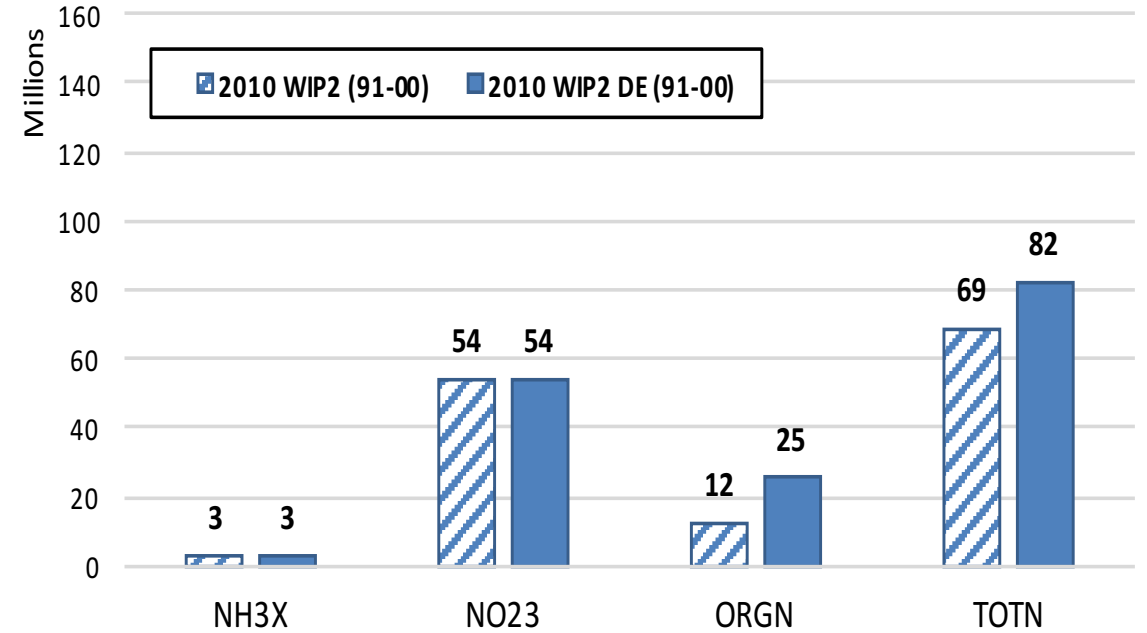
Therefore, the determination of nutrient loads to be reduced to account for Conowingo infill must factor in the type of nutrients and the timing of delivery

Conowingo Effect on Loads at the WIP2 condition

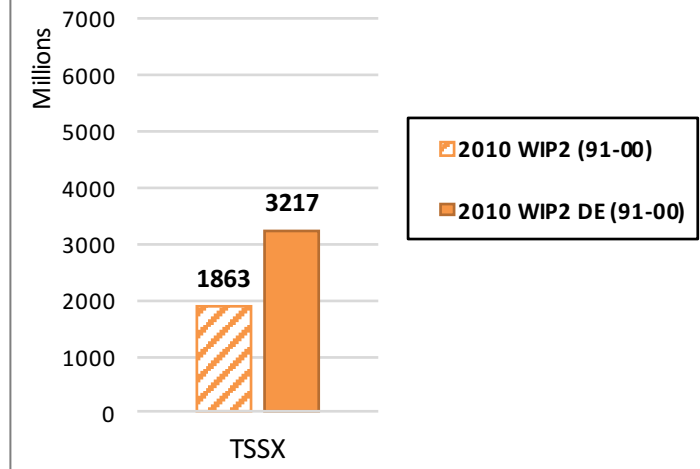
Conowingo Average Annual Phosphorus Delivery



Conowingo Average Annual Nitrogen Delivery



Conowingo Average Annual Suspended Solids Delivery



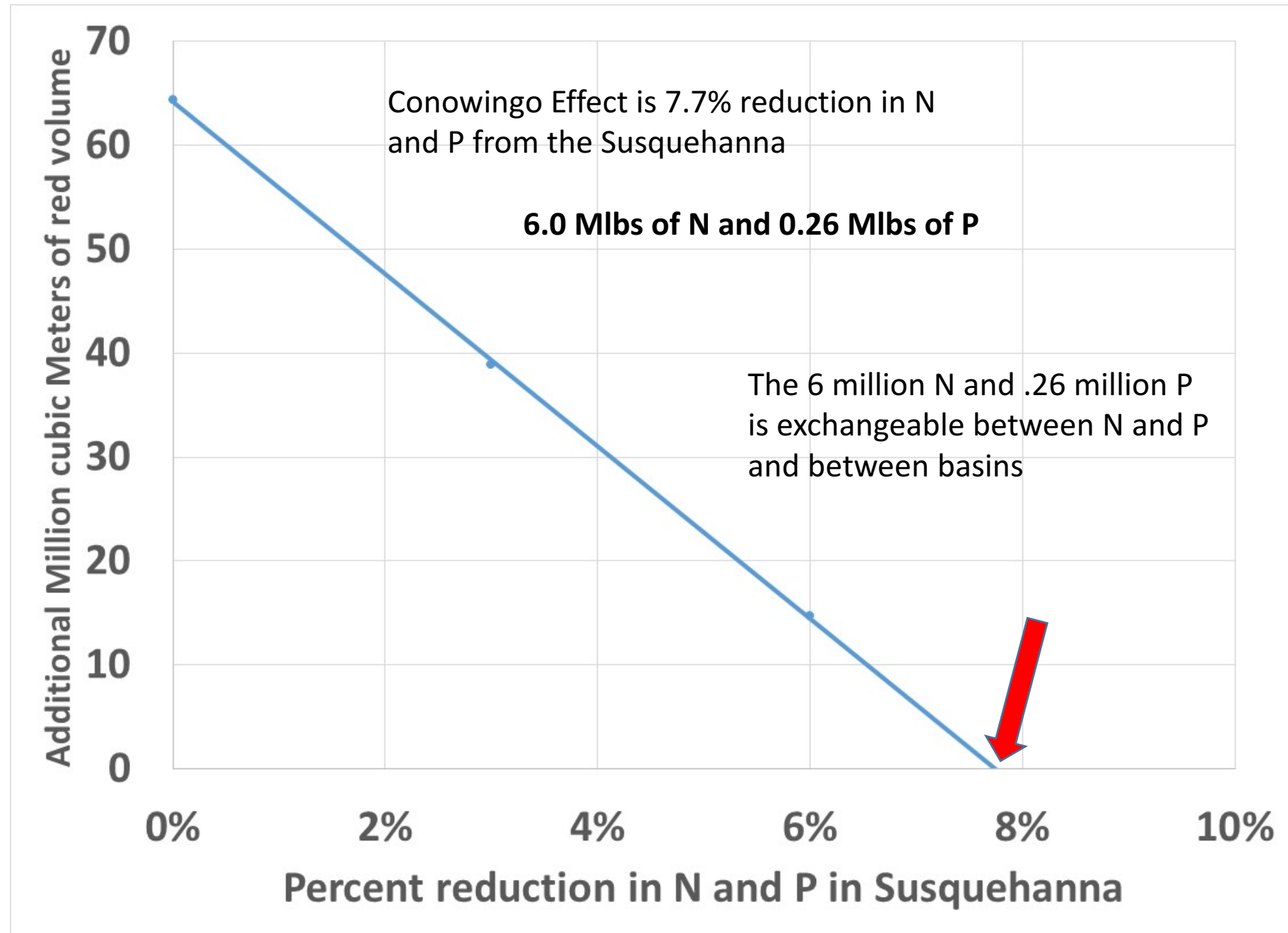
Calculate Conowingo Effect

Deep Water	Designated Use	Volume	WIP Red Percent	WIP red volume	WIP + Conowingo	WIP+C red volume
CB3MH	DW	864	0.05%	0	0.05%	0
CB4MH	DW	2854	5.00%	143	5.52%	158
MD5MH	DW	2097	0.94%	20	1.09%	23
VA5MH	DW	1605	0.00%	0	0.00%	0
POMMH	DW	1839	0.00%	0	0.00%	0
CB3MH	DC	390	0.00%	0	0.00%	0
CB4MH	DC	2126	5.87%	125	8.04%	171
MD5MH	DC	2875	0.00%	0	0.00%	0
VA5MH	DC	1848	0.00%	0	0.00%	0
				288		352
					Conowingo Difference	64

Volume Weighted means a 'red area' increase of 64 million cubic meters

Estimating the Conowingo effect

Lower than the estimated additional loads



Viewpoints

- Why should states that are not part of the Susquehanna have to do additional work because of the Conowingo?
- All states have benefitted from the existence of the Conowingo in the past. Allocations would have been lower for all had it not been trapping nutrients.
- It may not be feasible for the Susquehanna states to make all reductions
- Reductions are more effective in the upper bay than elsewhere
- What responsibility does Exelon have?

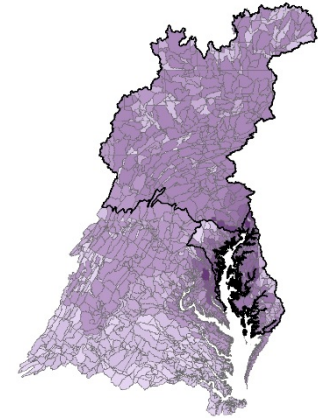
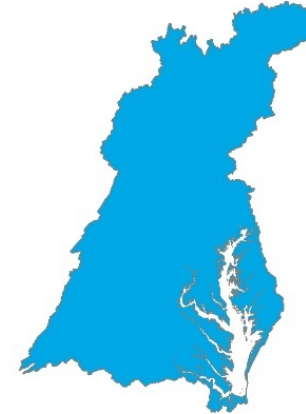
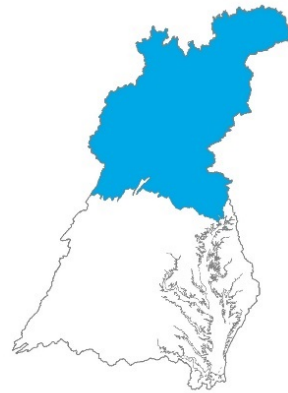
How to Offset the Additional Loads Due to Conowingo Dam Infill

How much?

Who?

How?

When?



Allocation equity rules used in the Bay TMDL

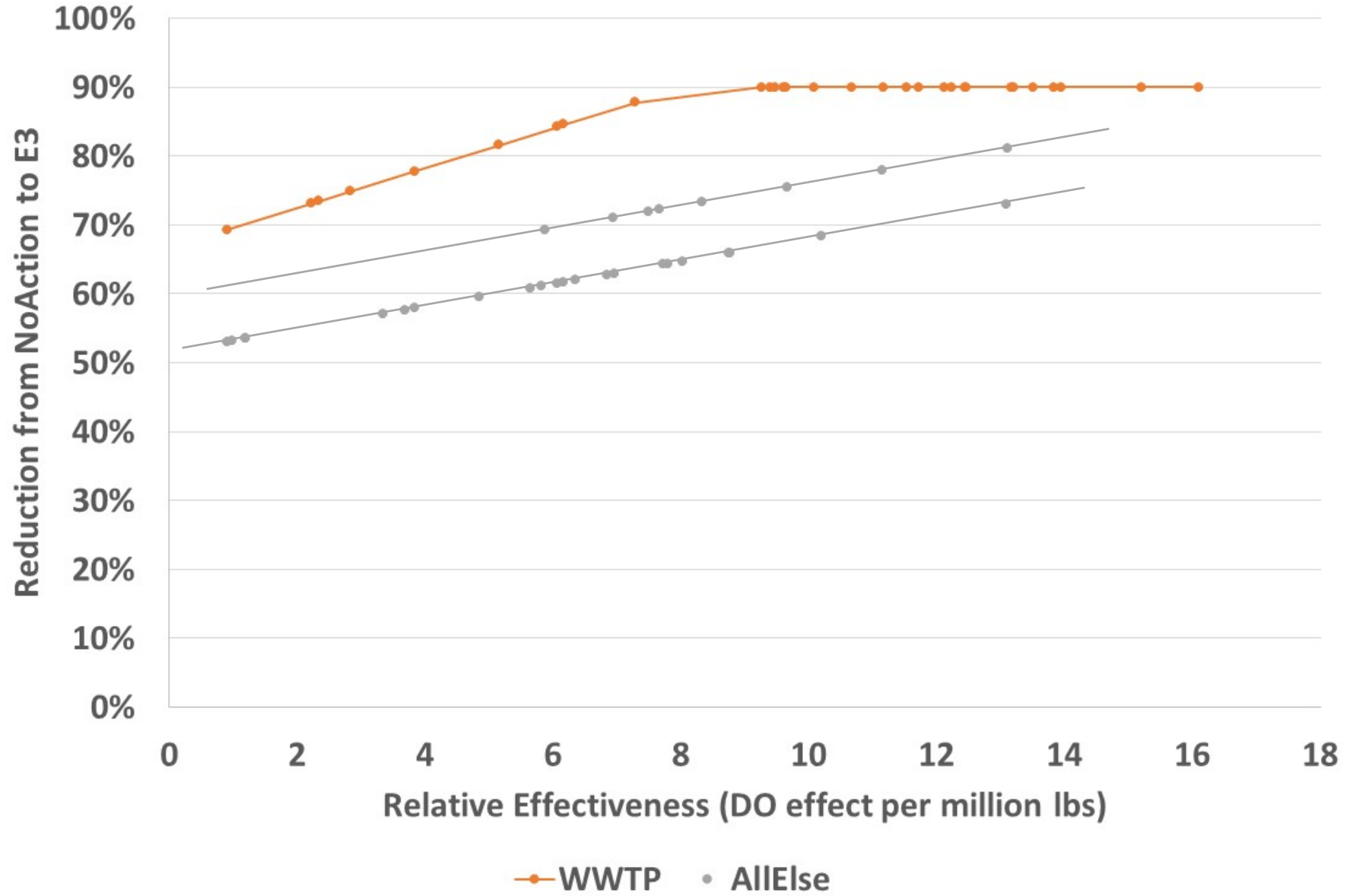
Assign additional load as local planning goal

By 2025

Post-2025 with agreed-upon date

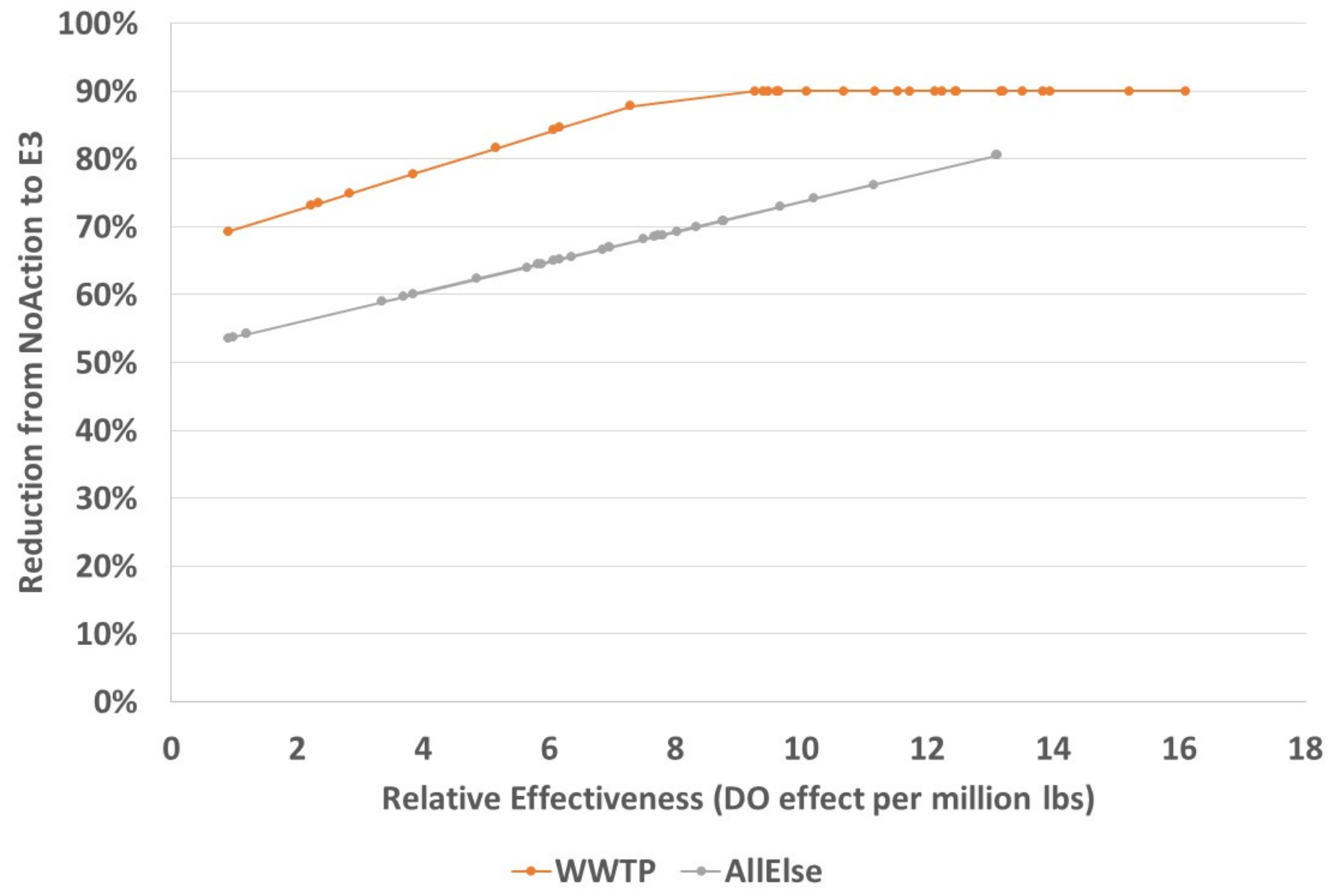
Beyond 2025 – no future date identified

Planning Target Calculation - Nitrogen



Some basins on higher line to make up for the Conowingo effect

Planning Target Calculation - Nitrogen



New proposal:
Increase slope of the line to
account for Conowingo

Estimated Additional Nitrogen Reductions Required Under the Five Options

Jurisdiction	Susquehanna Only	Susquehanna plus effective basins	Susquehanna plus MD and VA	Entire Watershed	Increased Slope
NY	0.57	0.49	0.36	0.32	0.20
PA	5.31	4.56	3.34	3.31	3.88
MD	0.12	1.30	1.97	1.76	1.55
WV	0.00	0.00	0.00	0.19	0.16
DC	0.00	0.00	0.00	0.00	0.00
DE	0.00	0.00	0.00	0.32	0.29
VA	0.00	0.00	1.54	1.38	0.65
Basinwide	6.01	6.34	7.21	7.28	6.74

*Units: millions of pounds

Estimated Additional Phosphorus Reductions Required Under the Five Options

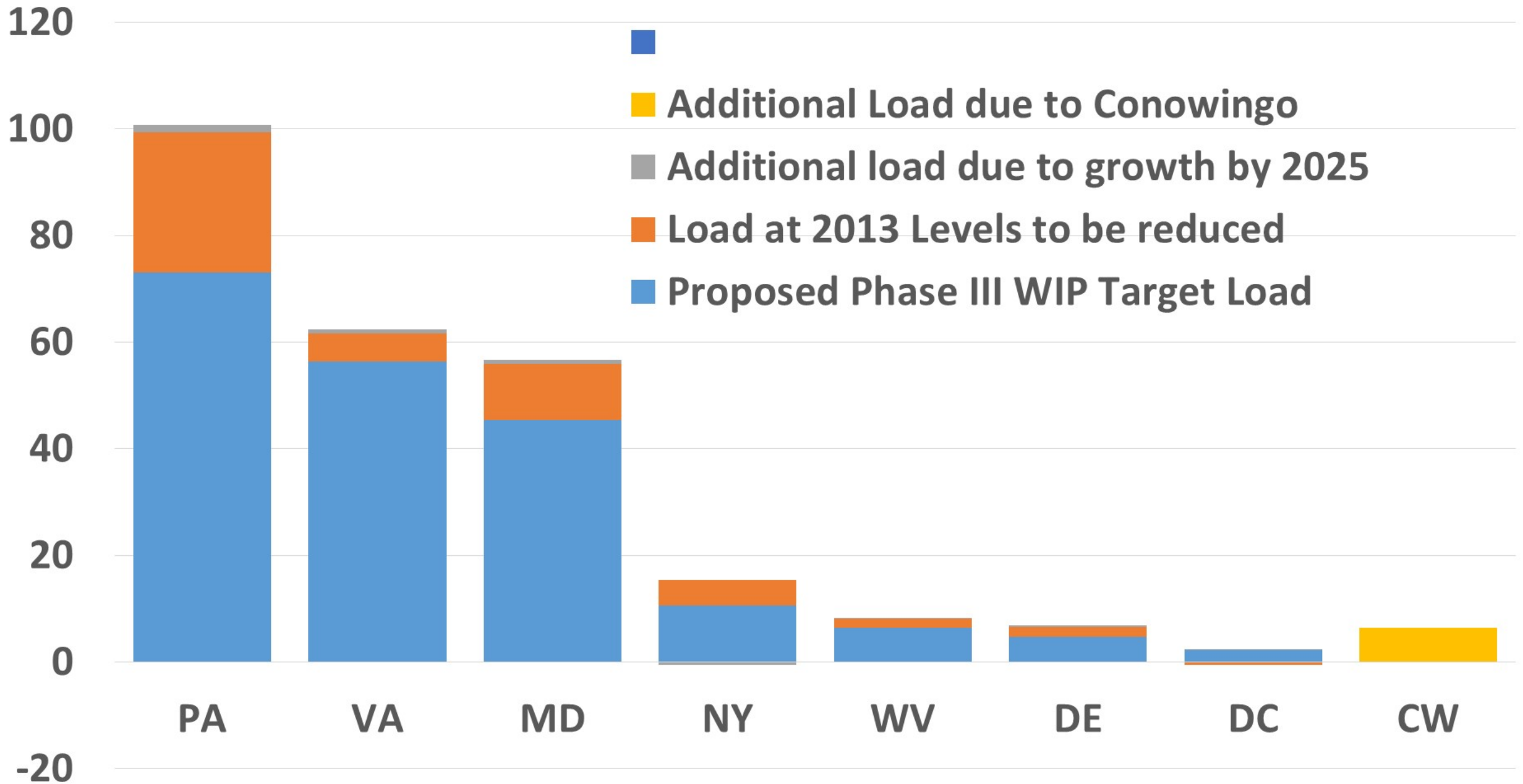
Jurisdiction	Susquehanna Only	Susquehanna plus effective basins	Susquehanna plus MD and VA	Entire Watershed	Increased Slope
NY	0.026	0.020	0.012	0.011	0.007
PA	0.231	0.177	0.108	0.113	0.092
MD	0.005	0.069	0.099	0.091	0.131
WV	0.000	0.000	0.000	0.015	0.008
DC	0.000	0.000	0.000	0.001	0.001
DE	0.000	0.000	0.000	0.005	0.003
VA	0.000	0.000	0.168	0.155	0.112
Basinwide	0.262	0.266	0.388	0.392	0.353

*Units: millions of pounds

Proposed Recommendation to PSC

- Assign the Conowingo Load to a separate implementation plan with a goal of zero
- Identify a source of pooled resources to implement BMPs in a cost-effective manner
- Pooled resources from participating jurisdictions would be managed (both in terms of allocation of funds and verification / tracking of reductions) by a third party under partnership oversight.

Proposed Draft Nitrogen Targets

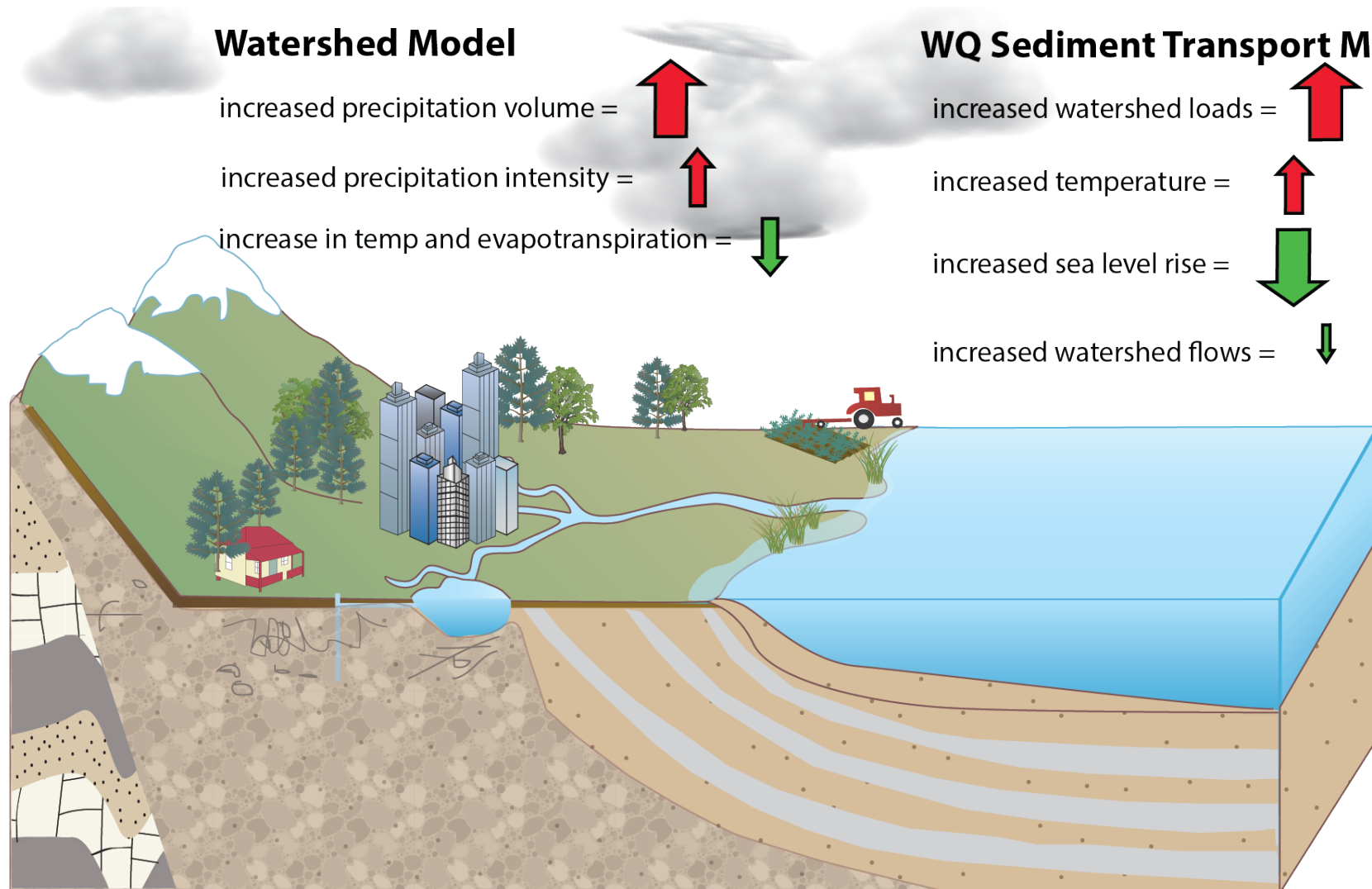


Factoring in Climate Change into the Jurisdictions' Phase III WIPs

**Mark Bennett, USGS, CBP Climate Resiliency
Workgroup Chair**

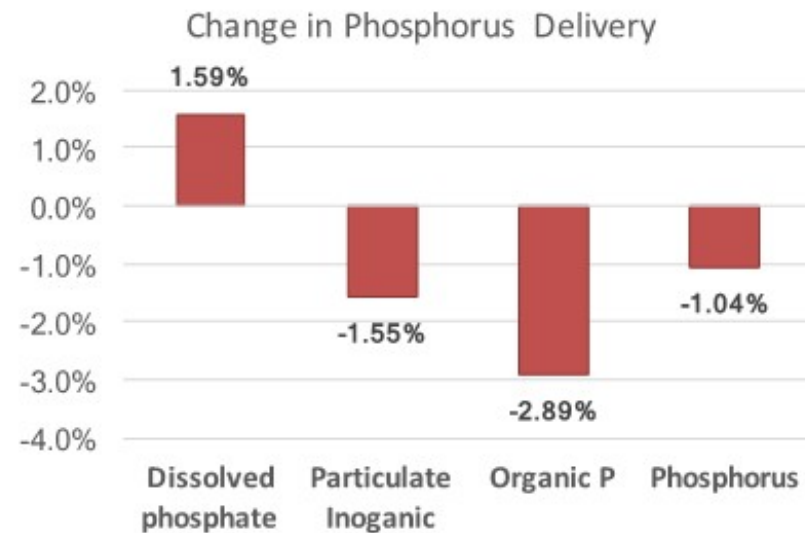
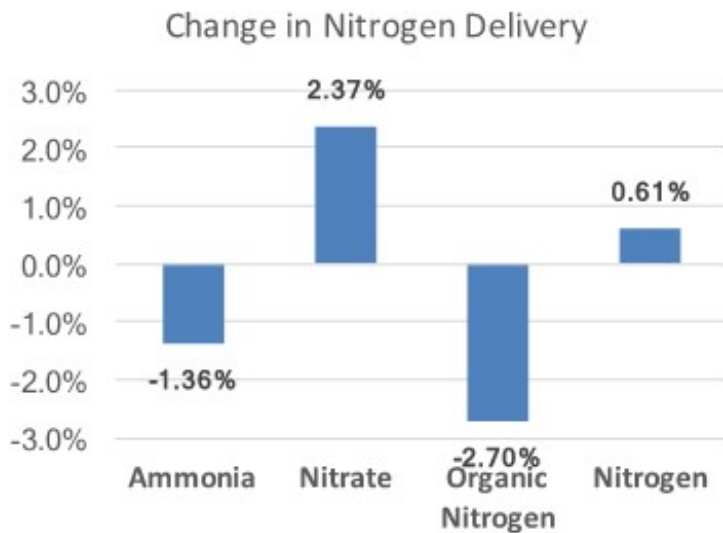
Accounting for Changing Conditions

Cumulative Assessment of Bay Low Dissolved Oxygen Impacts



Estimated Changes in Watershed and Bay Loads by 2025 Due to Climate Change

- Inorganic nutrients are increased with climate change
- Organic nutrients are decreased
- Inorganic nutrients have a higher effect on dissolved oxygen



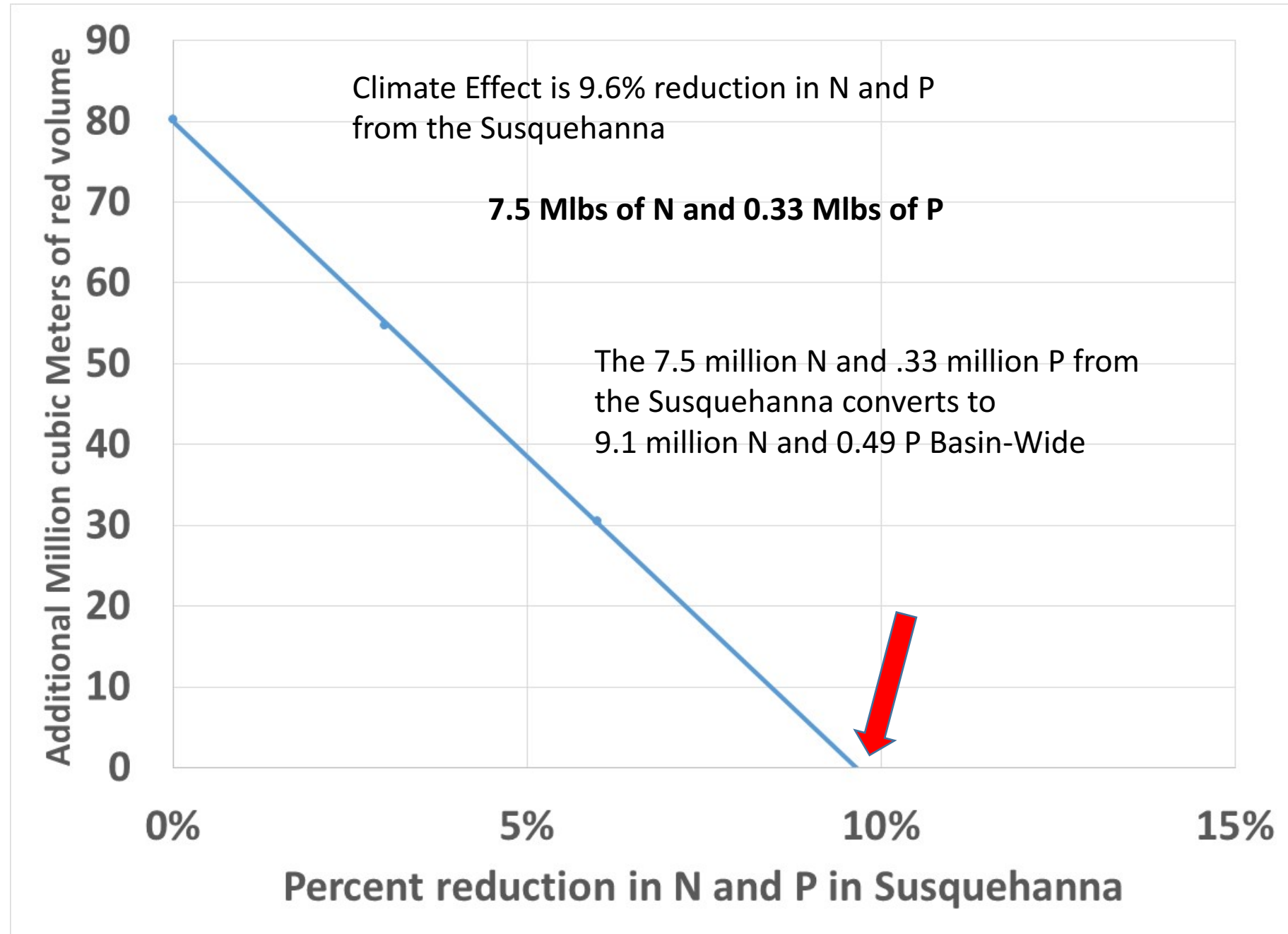
Calculate Climate Effect

CB Seg	Designated Use	Designated Use Total Volume	Red Percent WIP + Conow	Red Volume WIP + Conow	Red Percent WIP + Conow + CC	Red Volume WIP + Conow + CC
CB3MH	DW	864	0.05%	0	0.05%	0
CB4MH	DW	2854	5.52%	158	6.50%	186
MD5MH	DW	2097	1.09%	23	1.51%	32
VA5MH	DW	1605	0.00%	0	0.00%	0
POMMH	DW	1839	0.00%	0	0.00%	0
CB3MH	DC	390	0.00%	0	0.00%	0
CB4MH	DC	2126	8.04%	171	10.09%	215
MD5MH	DC	2875	0.00%	0	0.00%	0
VA5MH	DC	1848	0.00%	0	0.00%	0
				352		432
					CC Difference	80

Volume Weighted means a 'red area' increase of 80 million cubic meters

Estimating Climate Effect

Greater than the watershed TN and TP effect



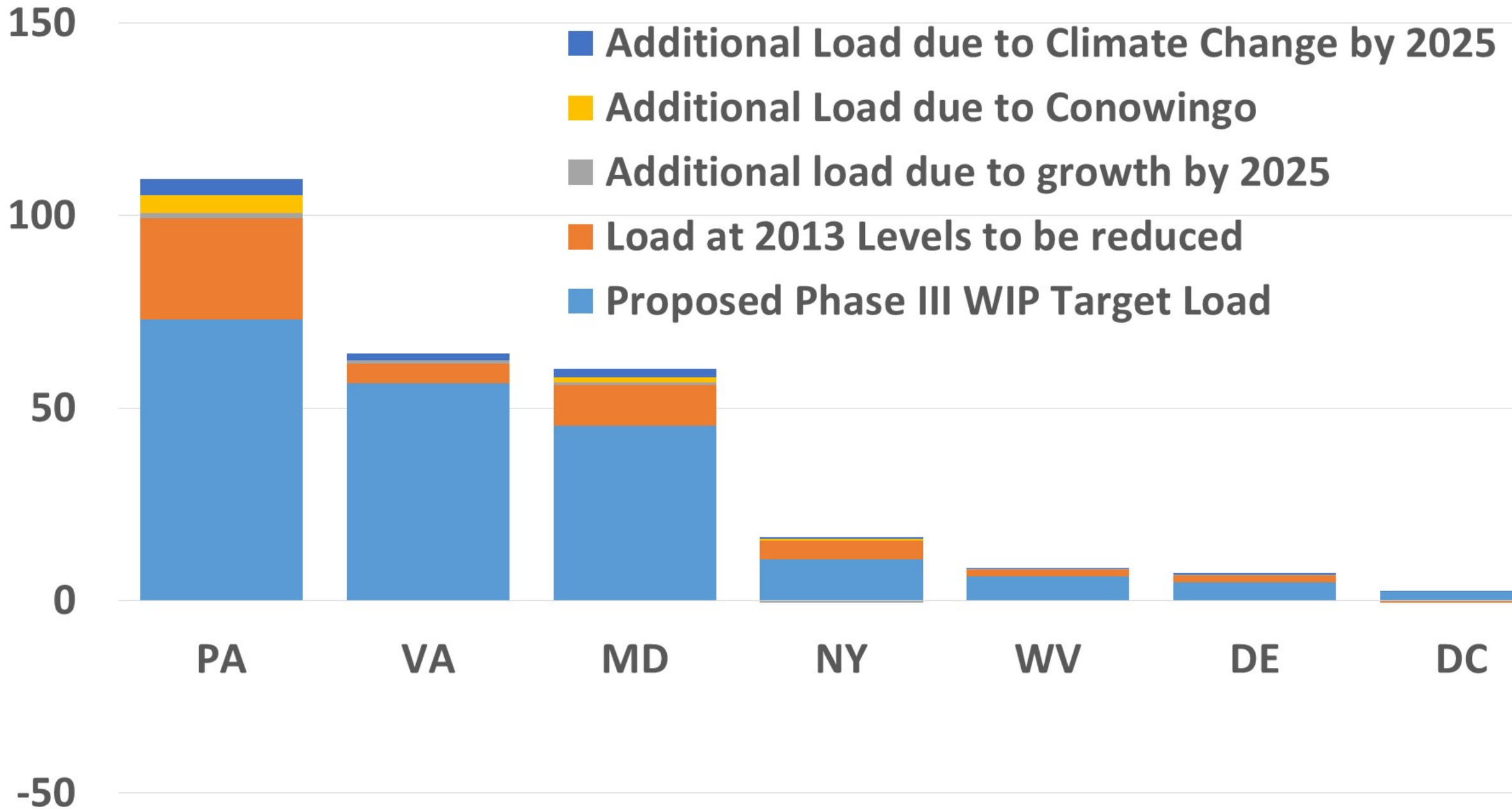
WQGIT & Modeling Workgroup Recommendations: Nitrogen

Jurisdiction	1985 Baseline	2013 Progress	Growth in Load to 2025	Conowingo Load Responsibility	Climate Change	2013 Progress +	Phase III Planning Target
NY	18.71	15.44	-0.52	0.49	0.400	15.80	10.62
PA	122.41	99.28	1.38	4.56	4.135	109.35	72.99
MD	83.56	55.89	0.76	1.30	2.194	60.15	45.39
WV	8.73	8.06	0.20	0.00	0.236	8.50	6.36
DC	6.48	1.75	0.00	0.00	0.006	1.76	2.25
DE	6.97	6.59	0.22	0.00	0.397	7.21	4.66
VA	84.29	61.53	0.86	0.00	1.722	64.11	56.37
BasinWide	331.15	248.54	2.91	6.34	9.09	266.89	198.64

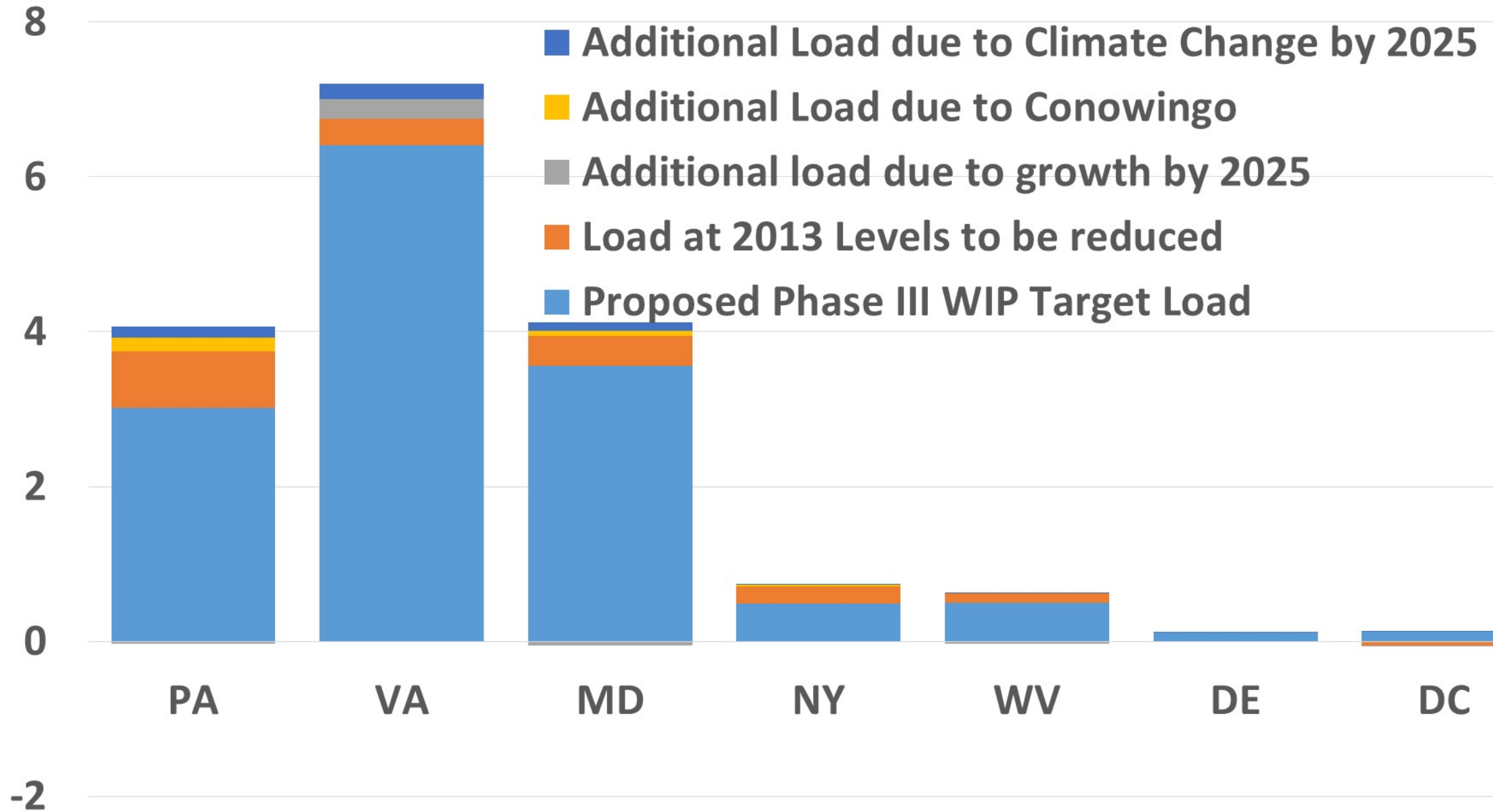
WQGIT & Modeling Workgroup Recommendations: Phosphorus

Jurisdiction	1985 Baseline	2013 Progress	Growth in Load to 2025	Conowingo Load Responsibility	Climate Change	2013 Progress +	Phase III Planning Target
NY	1.198	0.710	-0.010	0.020	0.014	0.734	0.491
PA	6.282	3.749	-0.034	0.177	0.141	4.034	3.012
MD	7.495	3.942	-0.053	0.069	0.114	4.071	3.553
WV	0.902	0.617	-0.027	0.000	0.019	0.610	0.493
DC	0.090	0.062	-0.001	0.000	0.001	0.063	0.120
DE	0.225	0.116	-0.004	0.000	0.006	0.117	0.116
VA	14.244	6.751	0.254	0.000	0.193	7.198	6.411
BasinWide	30.44	15.95	0.125	0.266	0.489	16.827	14.20

Proposed Draft Nitrogen Targets



Proposed Draft Phosphorus Targets



Two Policy Approaches



Numeric

and/or



Programmatic

Agreement to Recommendation a dual approach on climate change

- **1. Adopt a programmatic approach to address climate change**
- Include a narrative strategy in the Phase III WIPs that describes the jurisdictions' current action plans and strategies to address climate change, as well as the jurisdiction-specific nutrient pollutant loadings due to 2025 climate change conditions
- Incorporate local priorities (e.g., flooding) and actions to address climate change impacts
- Document the current understanding of the science and identify the research gaps and needs, and what we hope to learn over time
- Identify a date by which the Partnership will provide additional science and information to help inform implementation efforts to address climate change

Agreement to Recommendation a dual approach on climate change

- **Document and communicate additional nutrient pollutant loads of up to 9 million pounds of nitrogen and 0.5 million pounds of phosphorus due to 2025 climate change conditions**
- Continue to understand the nature and effect of climate change impacts in the watershed and estuary to inform management strategies (e.g., WIP/2-year milestones)
- By [insert date], develop recommendations for new and/or refined methods and modeling techniques to better assess projected impacts on watershed loads and estuarine impacts for a range of future scenarios
- By [insert date], consider results of updated methods, techniques, and studies and revisit whether to explicitly account for those additional nutrient pollutant loads due to 2025 climate change conditions in the Phase III WIPs and/or 2-year milestones
- Identify a date (post-2025) by which the Partnership will fully address the additional nutrient pollutant loads in a Phase III WIP addendum and/or 2-year milestones

PSC Approved Schedule

- **December 19-20, 2017:** PSC 2-day retreat and decision making
- **December 22, 2017:** Release of draft Phase III WIP planning targets
- **December 22, 2017 – April 20, 2018:** Partnership's review of the draft Phase III WIP planning targets
- **Late April/Early May 2018:** PSC approval of the final Phase III WIP planning targets with any agreed-to special cases
- **May 7, 2018:** Release of the final Phase III WIP planning targets