Chesapeake Bay 2017 Midpoint Assessment— Policy Issues for Partnership Decisions

Chesapeake Bay Program Principals' Staff Committee
December 19, 2017

Overview of Meeting and Policy Decision Recommendations

Teresa Koon, WV DEP, CBP Water Quality Goal Implementation Team Vice Chair

Day 1 Requested PSC Decisions

1. Adoption of the **Phase 6 suite of modeling tools** for finalizing the draft Phase III planning targets and for management application in the Phase III WIPs and two-year milestones through 2025

2. Approval of the proposed **Bay's assimilative capacity**

3. Approval of the **process for the 4-month Partnership review** of the draft Phase III WIP planning targets, including how special cases are addressed

4. Base Phase III WIP development on **2025 current zoning conditions**

Day 2 Requested PSC Decisions

5. Develop a Partnership implementation plan to address **Conowingo infill**

6. Adopt a dual approach to factor **climate change** into the Phase III WIPs

7. Approval of the **draft Phase III WIP planning targets** as a <u>starting point</u> of the 4-month Partnership review period

Overview of PSC Meeting

Today

Focus on building understanding and answering questions

Focus on consensus building and collaborative decision-making on foundational midpoint assessment issues

Opportunity for evening jurisdictional caucuses

Tomorrow

Focus on consensus building and collaborative decision-making on key policy issues

WQGIT & Modeling Workgroup Recommendations: Nitrogen

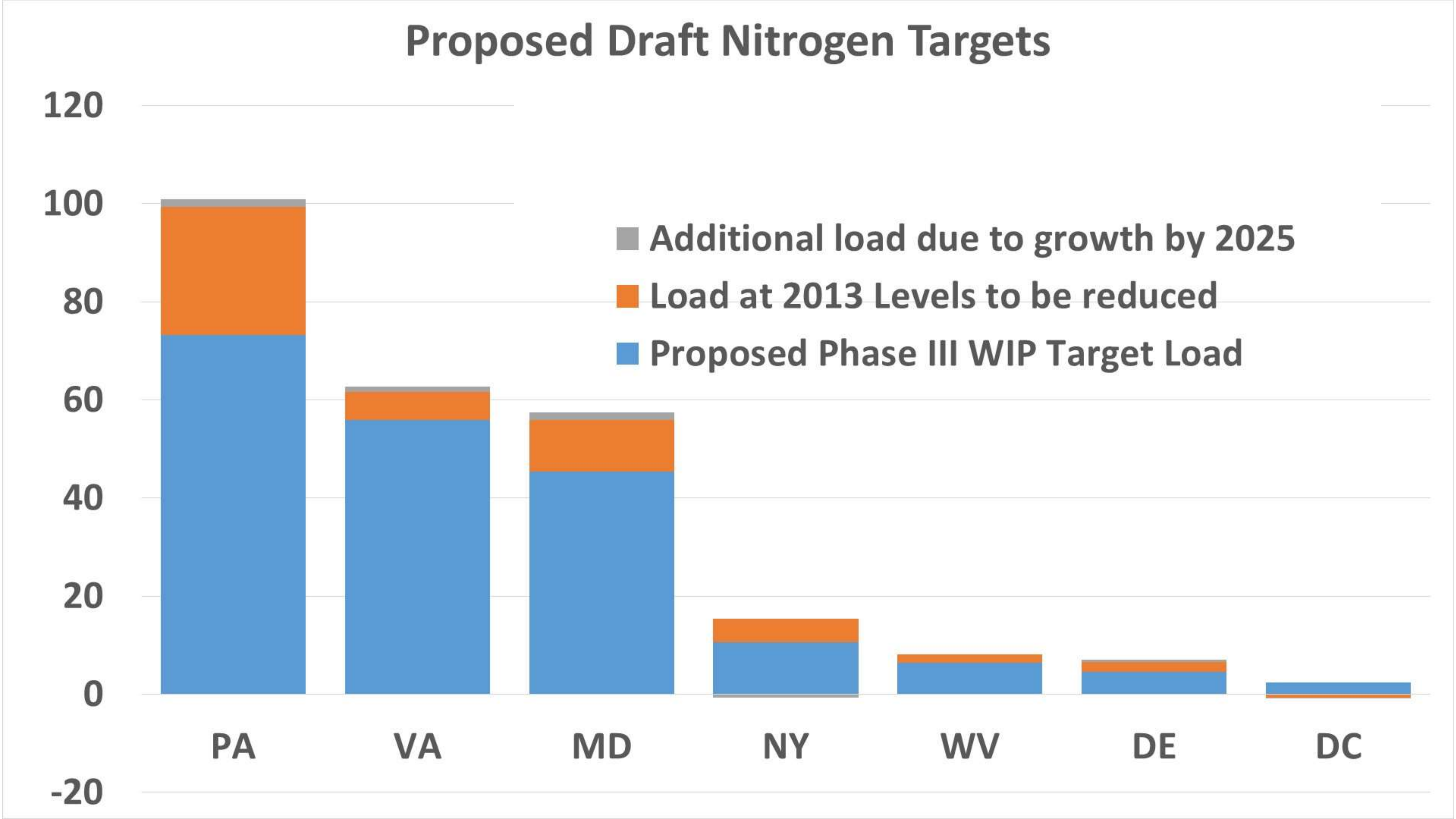
Jurisdiction	1985 Baseline	2013 Progress	Growth in Load to 2025	Phase III Planning Target
NY	18.71	15.44	-0.74	10.59
PA	122.41	99.28	1.66	73.18
MD	83.56	55.89	1.52	45.30
WV	8.73	8.06	-0.02	6.35
DC	6.48	1.75	0.00	2.43
DE	6.97	6.59	0.48	4.59
VA	84.29	61.53	1.09	55.82
Basinwide	331.15	248.54	4.00	198.25

*Units: millions of pounds

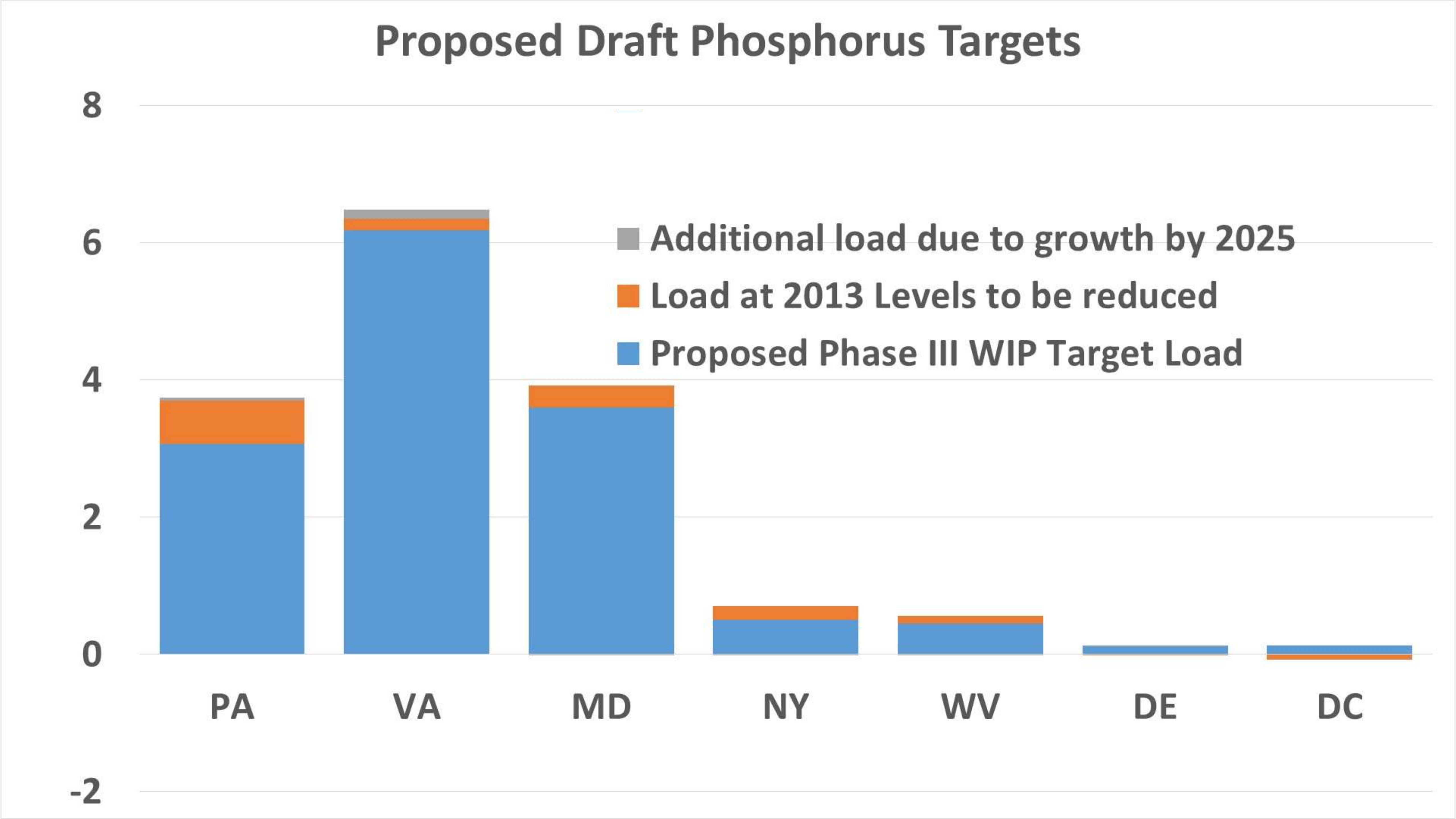
WQGIT & Modeling Workgroup Recommendations: Phosphorus

Jurisdiction	1985 Baseline	2013 Progress	Growth in Load to 2025	Phase III Planning Target
NY	1.198	0.710	-0.005	0.506
PA	6.115	3.696	0.044	3.073
MD	7.419	3.919	-0.015	3.604
WV	0.793	0.560	-0.017	0.456
DC	0.090	0.062	0.000	0.130
DE	0.225	0.115	0.007	0.120
VA	13.545	6.345	0.140	6.186
Basinwide	29.384	15.408	0.154	14.073

*Units: millions of pounds



Proposed Draft Nitrogen Targets
120
100
80
60
40
20
0
-20
Additional load due to growth by 2025
Load at 2013 Levels to be reduced
Proposed Phase III WIP Target Load
PA
VA
MD
NY
WV
DE
DC


Proposed Draft Phosphorus Targets
8
6
4
2
0
-2
Additional load due to growth by 2025
Load at 2013 Levels to be reduced
Proposed Phase III WIP Target Load
PA
VA
MD
NY
WV
DE
DC

Cautions About Comparisons Back to Phase II WIPs

Be cautious with comparing the proposed draft Phase III planning targets with the jurisdictions' Phase II WIP loads

- Different watershed models – more BMPs, different land uses and loading rates
- State-driven changes between Phase II and Phase III
- Phase II WIP planning targets were not derived using the Bay TMDL allocation methodology—they were based on a similar level of effort to the Phase I WIPs

What's Changed, the Implications, and Our Improved Models

Lee Currey, MDE, CBP Modeling Workgroup Co-Chair

What's Changed, Why, and Implications

A lot has changed since 2010 and our Phase I and Phase II WIPs

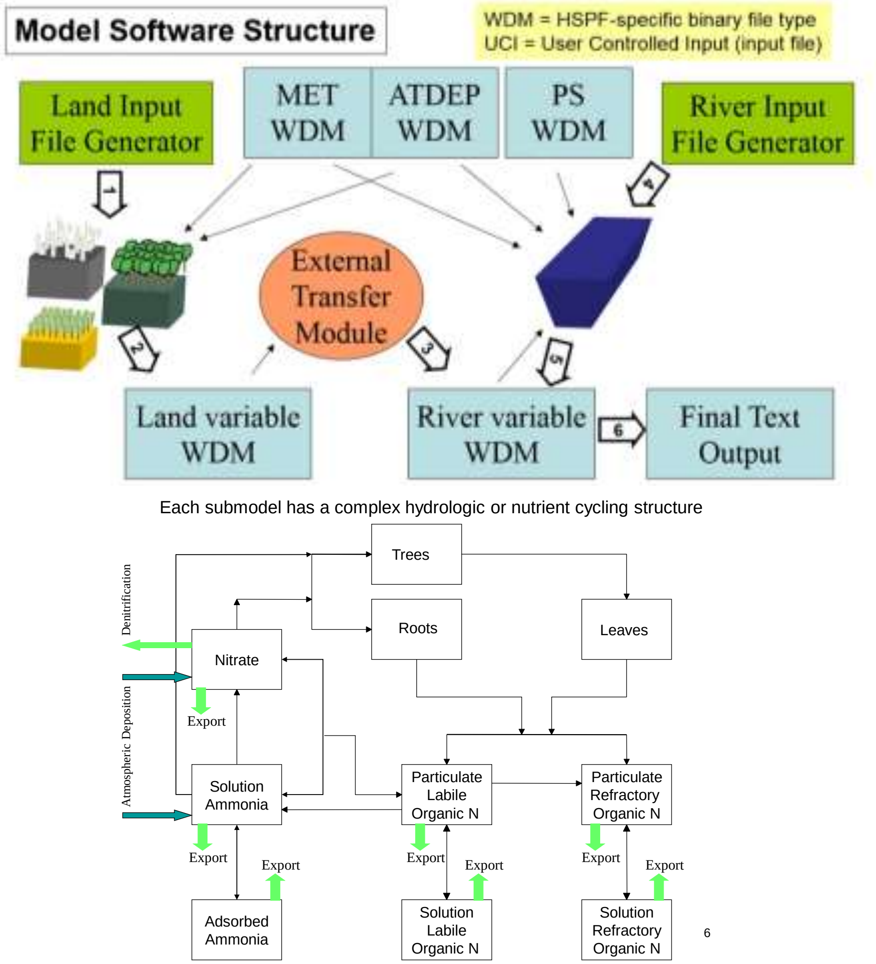
- Much improved modeling and other decision support tools
- High resolution land cover data for entire watershed
- Hundreds more BMPs available for crediting
- Significant data gathered from local agricultural and municipality partners incorporated into our models and other decision support tools

Improved Partnership Models

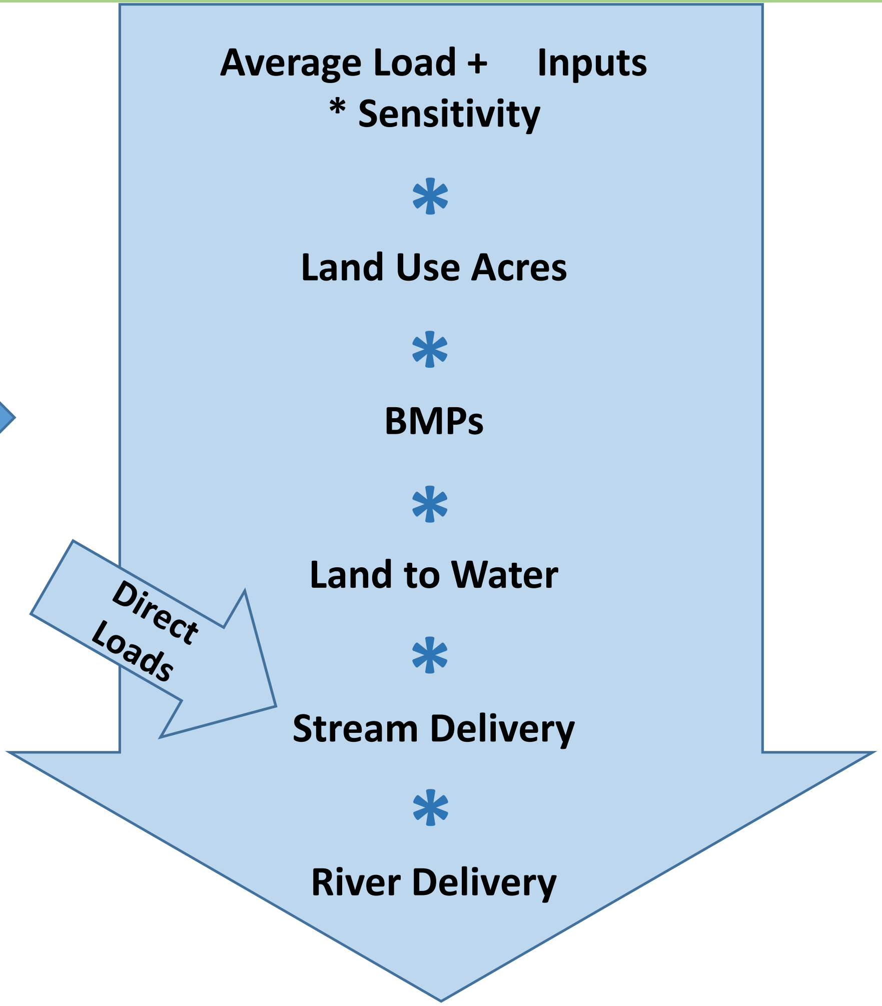
- 5 years of collaborative Partnership decision-making on every aspect of every model
- Multiple STAC-sponsored technical workshops from soil phosphorus to Conowingo
- Independent scientific peer reviews of every Partnership model
- Comprehensive fatal flaw review and issue resolution by the partners

Phase 6 Bay Watershed Model

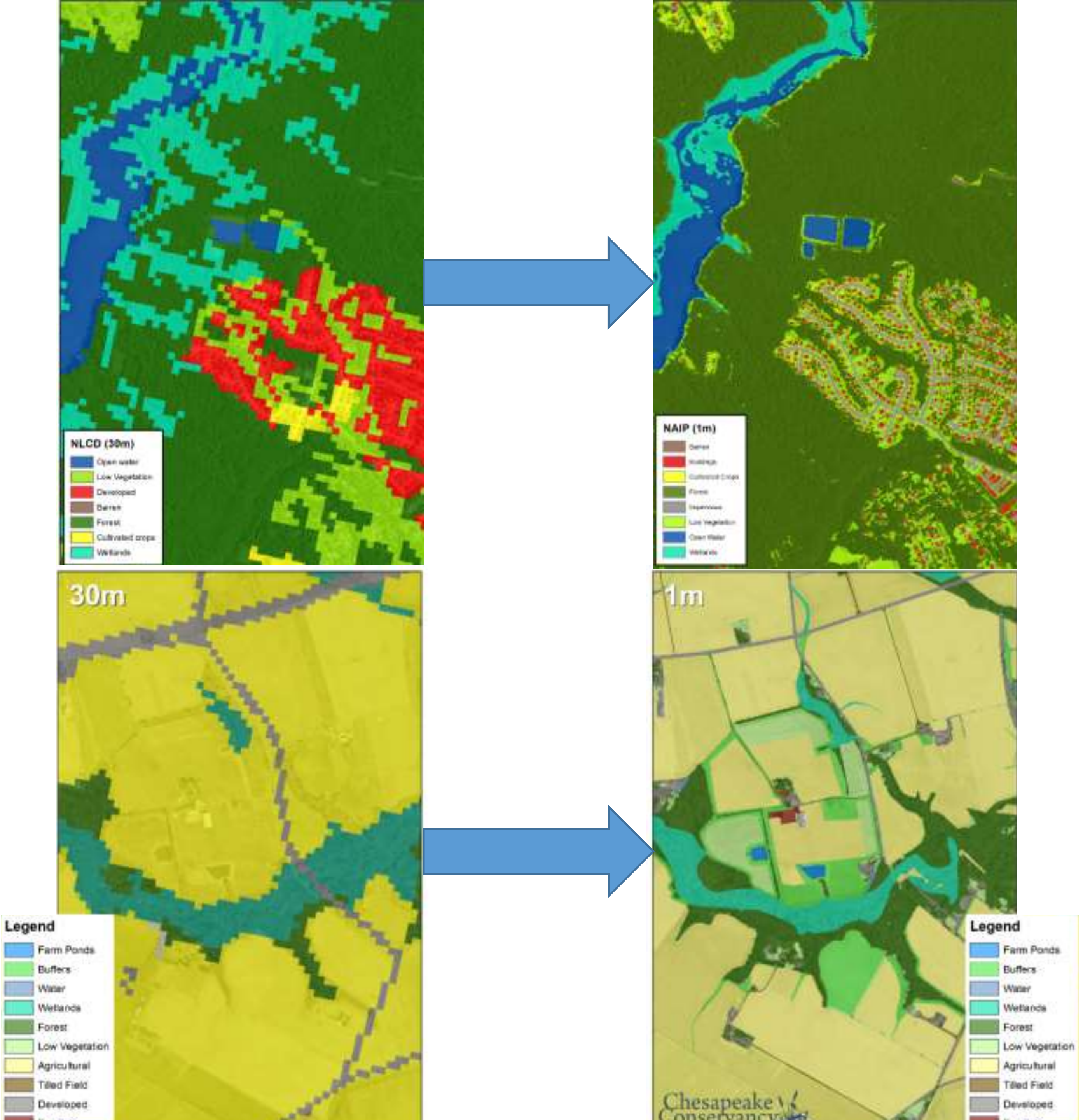
Prior Bay Watershed Models



Phase 6 Watershed Model



Phase 5
30-Meter
Resolution
Land
Use/Land
Cover Data



Phase 6
1-Meter
Resolution
Land
Use/Land
Cover Data

Hundreds More BMPs

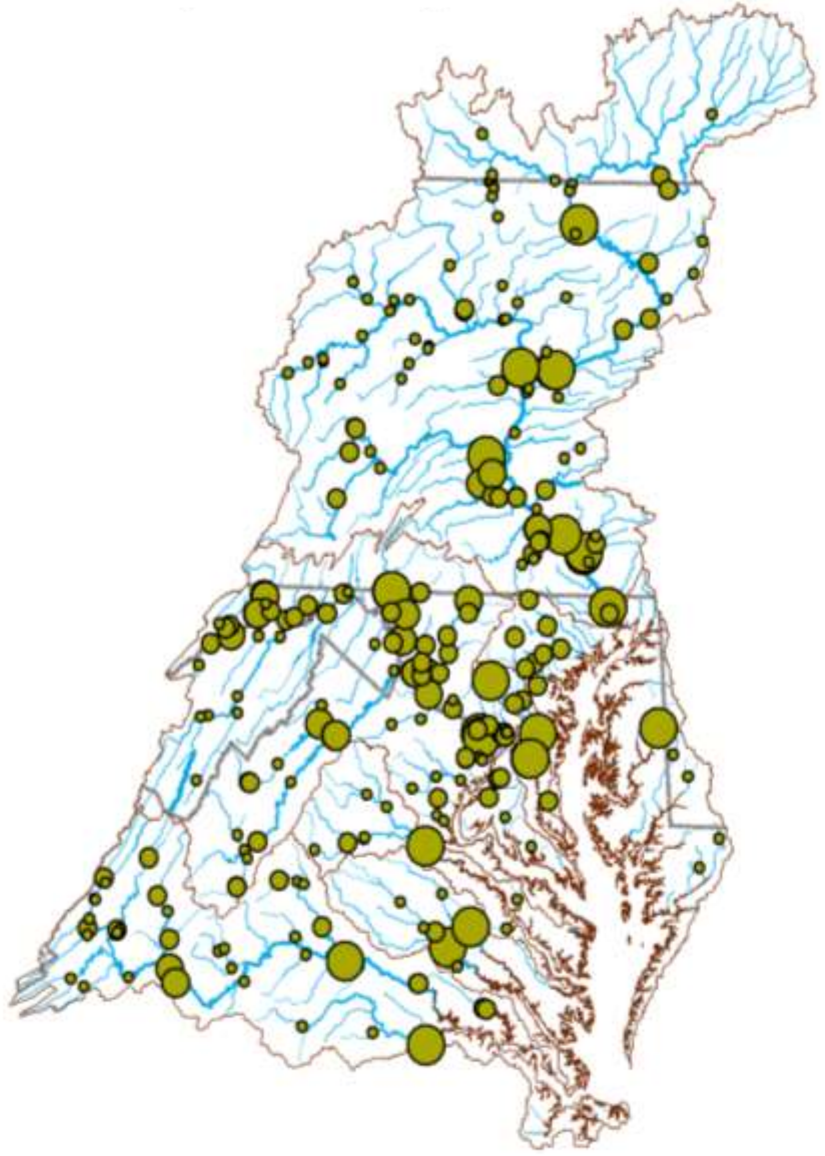
Advanced Grey Infrastructure Nutrient Discovery Program	Dry Waste Storage Structure RI	Headwater Wetland Gains - Reestablished	Nutrient Management P Placement	Stream Restoration Urban	Waste Treatment - Dairy	Cover Crop Traditional - FED	Cover Crop Traditional - NutRND
Ag Shoreline Management	Dry Well	Headwater Wetland Restoration	Nutrient Management P Rate	Streambank and Shoreline Protection	Waste Treatment - Horse	Cover Crop Traditional - FEO	Cover Crop Traditional - NutRNO
Ag Shoreline Non-Vegetated	Erosion & Sediment Control	High Residue Tillage Management	Nutrient Management P Timing	Streambank Restoration	Waste Treatment - Layer	Cover Crop Traditional - FPEA	Cover Crop Traditional - NutTED
Ag Shoreline Vegetated	Erosion and Sediment Control Level 1	Horse Pasture Management	Pasture and Hay Planting	Streambank Stabilization	Waste Treatment - Other Cattle	Cover Crop Traditional - FPED	Cover Crop Traditional - NutTEO
Alternative Crop/Switchgrass RI	Erosion and Sediment Control Level 2	Hydrodynamic Structures	Permanent wildlife habitat, non-easement	Street Cleaning Practice 1	Waste Treatment - Poultry	Cover Crop Traditional - FPEO	Cover Crop Traditional - NutTLD
Alternative Crops	Erosion and Sediment Control Level 3	IFAS	Permeable Pavement - NoSVNoUDAB	Street Cleaning Practice 2	Waste Treatment - Pullet	Cover Crop Traditional - FPND	Cover Crop Traditional - NutTLO
Alternative Water System	Establishment of permanent introduced grasses and legumes	IFAS Elevated Mound	Permeable Pavement - NoSVUDAB	Street Cleaning Practice 3	Waste Treatment - Swine	Cover Crop Traditional - FPNO	Cover Crop Traditional - NutTND
Amendments for the Treatment of Agricultural Waste	Exclusion Fence with Forest Buffer	IFAS Shallow Pressure	Permeable Pavement - NoSVUDCD	Street Cleaning Practice 4	Waste Treatment - Turkey	Cover Crop Traditional - LEA	Cover Crop Traditional - NutTNO
Animal Compost Structure RI	Exclusion Fence with Forest Buffer RI	IMF	Permeable Pavement - SVNoUDAB	Street Cleaning Practice 5	Waste Treatment Lagoon	Cover Crop Traditional - LED	Cover Crop Traditional - NutWED
Animal Mortality Facility	Exclusion Fence with Grass Buffer	IMF Elevated Mound	Permeable Pavement - SVUDAB	Street Cleaning Practice 6	Wastewater Treatment Strip	Cover Crop Traditional - LEO	Cover Crop Traditional - NutWEO
Animal Trails and Walkways	Exclusion Fence with Grass Buffer RI	IMF Shallow Pressure	Permeable Pavement - SVUDCD	Street Cleaning Practice 7	Water Control Structure	Cover Crop Traditional - LGHEA	Cover Crop Traditional - NutWLD
Animal Waste Management Systems (All Types)	Exclusion Fence with Narrow Forest Buffer	Impervious Disconnection	Prescribed Grazing	Street Cleaning Practice 8	Water Control Structure RI	Cover Crop Traditional - LGHED	Cover Crop Traditional - NutWLO
Barnyard Clean Water Diversion RI	Exclusion Fence with Narrow Forest Buffer RI	Infiltration Basin	Proprietary Ex Situ	Street Cleaning Practice 9	Watering Facility	Cover Crop Traditional - LGHEO	Cover Crop Traditional - NutWND
Barnyard Runoff Controls	Exclusion Fence with Narrow Grass Buffer	Infiltration Practices	Proprietary Ex Situ Elevated Mound	Street Cleaning Practice 10	Watering Trough RI	Cover Crop Traditional - LGHND	Cover Crop Traditional - NutWNO
Biofiltration	Exclusion Fence with Narrow Grass Buffer RI	Infiltration Trench	Proprietary Ex Situ Shallow Pressure	Street Cleaning Practice 11	Wet Extended Detention	Cover Crop Traditional - LGHNO	Cover Crop Traditional - OHEA
Bioretention - A/B soils, no underdrain	Extension of CREP Watering System	Land Reclamation, Abandoned Mined Land	Rain Garden	Street Sweeping	Wet Pond	Cover Crop Traditional - LGLEA	Cover Crop Traditional - OHED
Bioretention - C/D soils, underdrain	Feed Management	Land Retirement to Mixed Open	Reduced Tillage	Structure for Water Control	Wet Ponds & Wetlands	Cover Crop Traditional - LGLED	Cover Crop Traditional - OHEO
Bioswale	Field Border	Land Retirement to Pasture	Reduction of Impervious Surface	Surface Sand Filter	Wet Swale	Cover Crop Traditional - LGLEO	Cover Crop Traditional - OHND
Channel Bed Stabilization	Filter Strip	Loafing Lot Management System	Reforestation of Erodible Crop and Pastureland	Tidal Algal Flow-way	Wetland Creation	Cover Crop Traditional - LGLND	Cover Crop Traditional - OHNO
Cisterns & Rain Barrels	Filtering Practices	Manure Incorporation High Disturbance	Regenerative Stormwater Conveyance	Tree Planting	Wetland Functional Gains - Enhanced	Cover Crop Traditional - LGLNO	Cover Crop Traditional - OKEA
Composter Facilities	Filtration	Manure Incorporation High Disturbance Immediate	Retirement of Highly Erodible Land	Tree/Shrub Establishment	Wetland Gains - Established	Cover Crop Traditional - LND	Cover Crop Traditional - OKED
Conservation Cover	Floating Treatment Wetland 1	Manure Incorporation High Disturbance Late	Retrofit Runoff Reduction	Underground Infiltration System	Wetland Gains - Reestablished	Cover Crop Traditional - LNO	Cover Crop Traditional - OKEO
Conservation Plans	Floating Treatment Wetland 2	Manure Incorporation Low Disturbance	Retrofit Stormwater Treatment	Urban Filter Strip Runoff Reduction	Wetland Rehabilitation	Cover Crop Traditional - NutARED	Cover Crop Traditional - REA
Conservation Tillage	Floating Treatment Wetland 3	Manure Incorporation Low Disturbance Immediate	Ridge Tillage	Urban Filter Strip Stormwater Treatment	Wetland Restoration	Cover Crop Traditional - NutAREO	Cover Crop Traditional - RED
Constructed Wetland	Floating Treatment Wetland 4	Manure Incorporation Low Disturbance Late	Riparian Forest Buffer	Urban Forest Buffer	Windbreak/Shelterbelt Establishment	Cover Crop Traditional - NutARND	Cover Crop Traditional - REO
Constructed Wetland Elevated Mound	Floating Treatment Wetland 5	Manure Injection	Riparian Herbaceous Cover	Urban Forest Planting	Woodland Buffer Filter Area	Cover Crop Traditional - NutARNO	Cover Crop Traditional - RLD
Constructed Wetland Septic	Forest Buffer on Watercourse RI	Manure Transport	RMF	Urban Infiltration Practices	Commodity Cover Crop - Early	Cover Crop Traditional - NutBED	Cover Crop Traditional - RLO
Constructed Wetland Shallow Pressure	Forest Buffers	Monitored Non-Tidal Algal Flow-way	RMF Elevated Mound	Urban Nutrient Management Plan	Commodity Cover Crop - Standard	Cover Crop Traditional - NutBEO	Cover Crop Traditional - RND
Conversion to Hayland RI	Forest Conservation	Monitored Tidal Algal Flow-way	RMF Shallow Pressure	Urban Nutrient Management Plan - MDCA	Cover Crops	Cover Crop Traditional - NutBND	Cover Crop Traditional - RNO
Conversion to Pasture RI	Forest Harvesting Practices	Mulch Tillage	Roof runoff management	Urban Nutrient Management Plan - MDDIY	CoverCropComLate	Cover Crop Traditional - NutBNO	Cover Crop Traditional - TEA
CREP Riparian Forest Buffer	Forest Nutrient Exclusion Area on Watercourse Narrow RI	Narrow Forest Buffers	Roof Runoff Structure	Urban Nutrient Management Plan - PlanHR	Cover Crop Traditional - AREA	Cover Crop Traditional - NutBRED	Cover Crop Traditional - TED
CREP Wetland Restoration	Forest Stand Improvement	Narrow Urban Forest Buffer	Rotational Grazing RI	Urban Nutrient Management Plan - PlanLR	Cover Crop Traditional - ARED	Cover Crop Traditional - NutBREO	Cover Crop Traditional - TEO
CREP Wildlife Habitat	Grass Buffer on Watercourse RI	New Runoff Reduction	SCWQP	Urban Shoreline Management	Cover Crop Traditional - AREO	Cover Crop Traditional - NutFPED	Cover Crop Traditional - TLD
Critical Area Planting	Grass Buffer Strip	New Stormwater Treatment	Septic Connections	Urban Shoreline Non-Vegetated	Cover Crop Traditional - ARND	Cover Crop Traditional - NutFPEO	Cover Crop Traditional - TLO
D&G Road - E&S Control and Outlets	Grass Buffers	No Tillage	Septic Denitrification	Urban Shoreline Vegetated	Cover Crop Traditional - ARNO	Cover Crop Traditional - NutFPND	Cover Crop Traditional - TND
D&G Road - Outlets Only	Grass Filter Strips	Non-Tidal Algal Flow-way	Septic Effluent Elevated Mound	Urban stream restoration	Cover Crop Traditional - BEA	Cover Crop Traditional - NutFPNO	Cover Crop Traditional - TNO
D&G Road - Surface Aggragate and Rasied Roadbed	Grass Nutrient Exclusion Area on Watercourse Narrow RI	NSF 40	Septic Effluent Shallow Pressure	Vegetated Open Channels	Cover Crop Traditional - BED	Cover Crop Traditional - NutOHED	Cover Crop Traditional - WEA
Dead Bird Composting Facility	Grassed Waterway	NSF 40 Elevated Mound	Septic Tank Advanced Treatment	Vegetated Treatment Area	Cover Crop Traditional - BEO	Cover Crop Traditional - NutOHEO	Cover Crop Traditional - WED
Default - Bioretention - A/B soils, underdrain	Grazing Land Protection	NSF 40 Shallow Pressure	Septic Tank Pumpout	Waste Control Facilities	Cover Crop Traditional - BND	Cover Crop Traditional - NutOHND	Cover Crop Traditional - WEO
Disconnection of Rooftop Runoff	Green Roofs	Nutrient Management Core N	Solid/Liquid Waste Separation Facility	Waste Storage Facility	Cover Crop Traditional - BNO	Cover Crop Traditional - NutOHNO	Cover Crop Traditional - WLD
Dry Detention Ponds	Hardwood tree planting	Nutrient Management Core P	Storm Drain Cleaning	Waste Storage Pond	Cover Crop Traditional - BREA	Cover Crop Traditional - NutRED	Cover Crop Traditional - WLO
Dry Detention Ponds & Hydrodynamic Structures	Headwater CREP Wetland Restoration	Nutrient Management N Placement	Stream Channel Stabilization	Waste Storage Structure	Cover Crop Traditional - BRED	Cover Crop Traditional - NutREO	Cover Crop Traditional - WND
Dry Extended Detention Ponds	Headwater Wetland Creation	Nutrient Management N Rate	Stream Improvement for Fish Habitat	Waste Treatment - Beef	Cover Crop Traditional - BREO	Cover Crop Traditional - NutRLD	Cover Crop Traditional - WNO
Dry Swale	Headwater Wetland Gains - Established	Nutrient Management N Timing	Stream Restoration Ag	Waste Treatment - Broiler	Cover Crop Traditional - FEA	Cover Crop Traditional - NutRLO	

Local Agricultural and Municipality Data

- Municipal Separate Storm Sewer Systems
- Combined Sewer Systems
- Sewer Service Areas
- Land Cover
- Land Use
- Parcels
- Roads
- Beaches
- Institutional lands
- Federal lands
- Golf courses
- Surface mines
- Landfills
- Protected lands
- Streams
- Wetlands
- Tidal zones
- Floodplains
- Frequently flooded soils
- Livestock populations
- Poultry populations
- Crop, hay and pasture acreages
- Crop yields
- Soil P concentrations
- BMPs

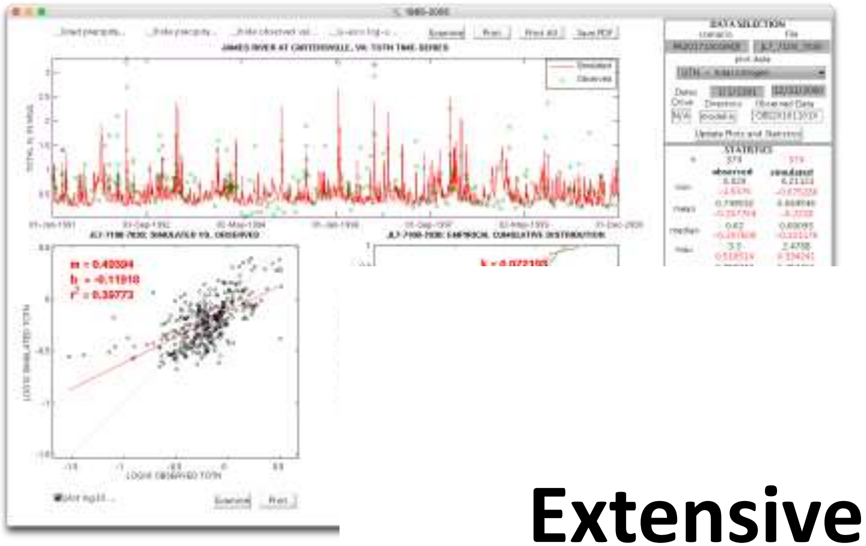
Our Models are Tested using Decades of Monitoring Data

- Hundreds of thousands of water quality monitoring data points
- Hundreds of monitoring stations
- Nitrogen, phosphorus, and sediment
- Data records lasting up to 3 decades

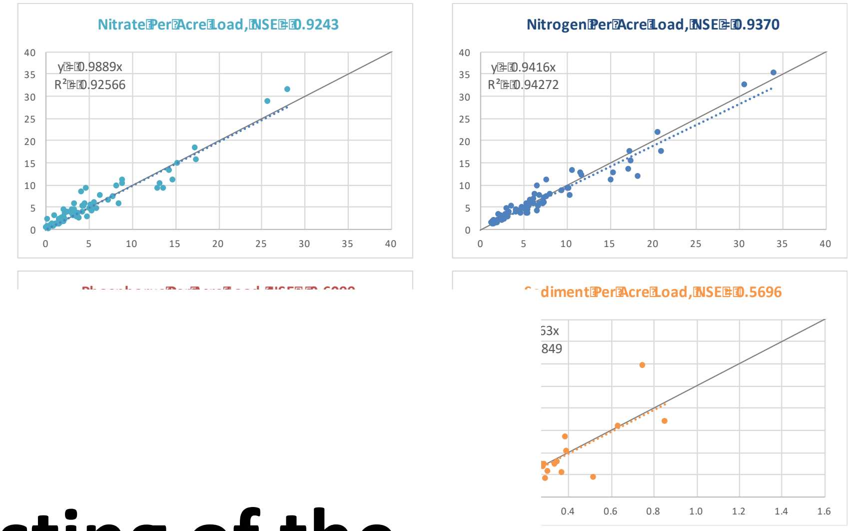


Size of circle denotes relative number of data points: 100s to 1,000s

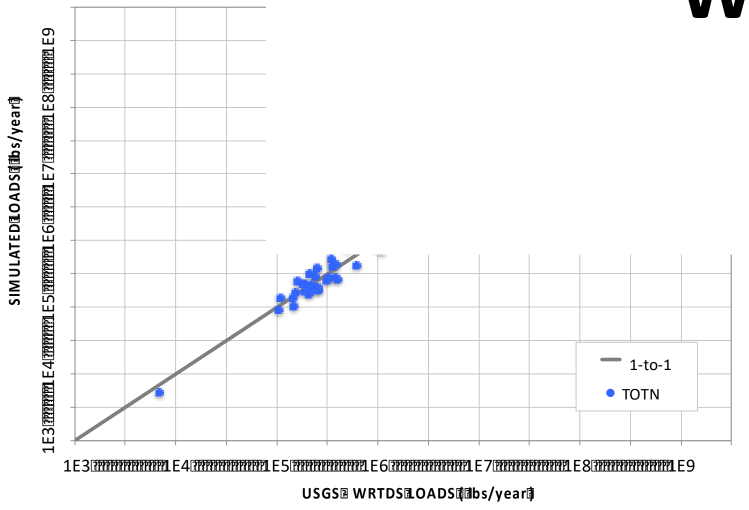
Extensive Testing of the Models Throughout the Watershed



[1] Model calibration is mad

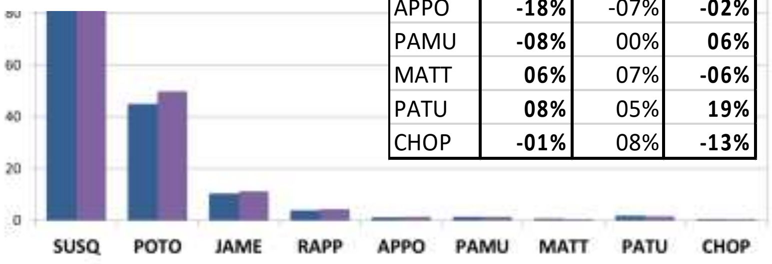


Geographic Efficiencies



[3] Simulated vs. WRTDS loads

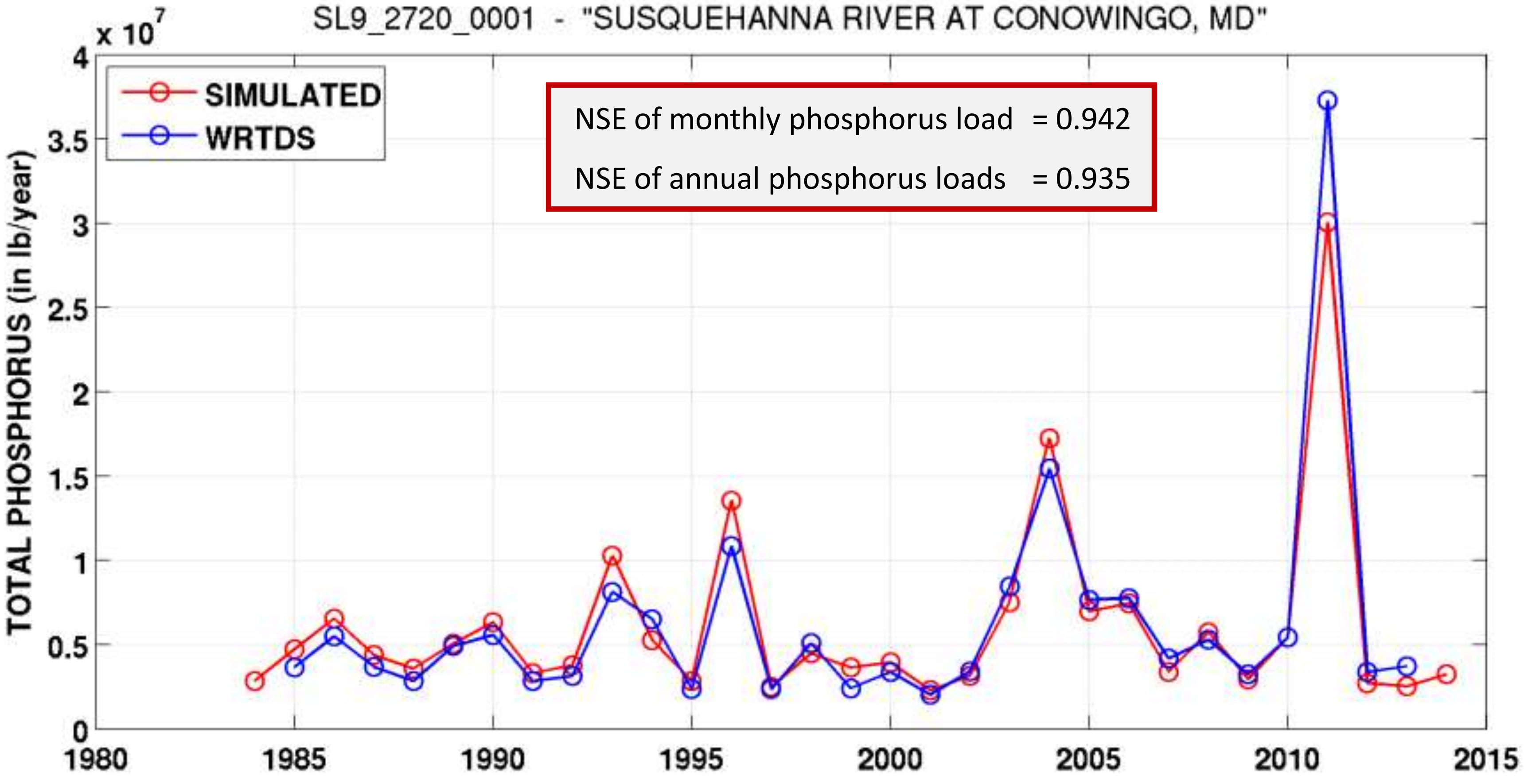
BASIN	Sept	June	Phase 5
SUSQ	-01%	-03%	-01%
POTO	-09%	-09%	-22%
JAME	-09%	-02%	-07%
RAPP	-11%	-07%	-10%
APPO	-18%	-07%	-02%
PAMU	-08%	00%	06%
MATT	06%	07%	-06%
PATU	08%	05%	19%
CHOP	-01%	08%	-13%



[4] Agreement between the simulated and WRTDS loads at the RIM sites

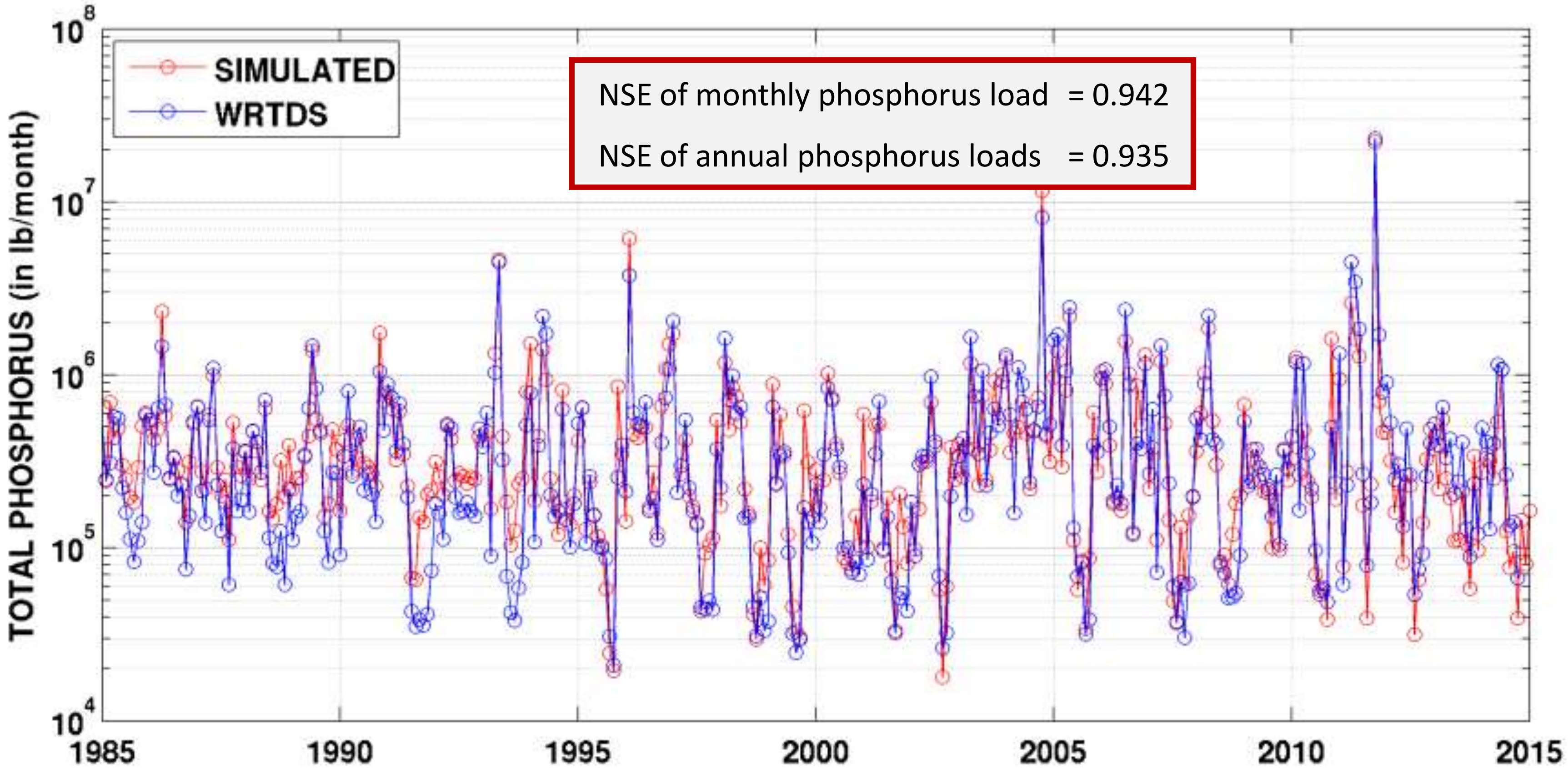
Best Match with Monitoring Data Ever!

Conowingo Phase 6 Simulation Compared to Annual WRTDS Loads



Best Match with Monitoring Data Ever!

Conowingo Phase 6 Simulation Compared to Monthly WRTDS Loads



Today's Requested Policy Decision

Adoption of the **Phase 6 suite of modeling tools** for finalizing the Phase III planning targets and for management application in the Phase III WIPs and two-year milestones through 2025

Phase III WIP Planning Targets Methodology

Gary Shenk, USGS, CBP Phase 6 Watershed Model Coordinator

Review of the Phase III Planning Targets Methodology

- A step by step walk through of the agreed-to Phase III planning targets methodology
- How it works to allocate updated cap loads equitably among the jurisdictions

Three Partnership Principals

- Allocated loads must result in achievement of the states' Bay water quality standards

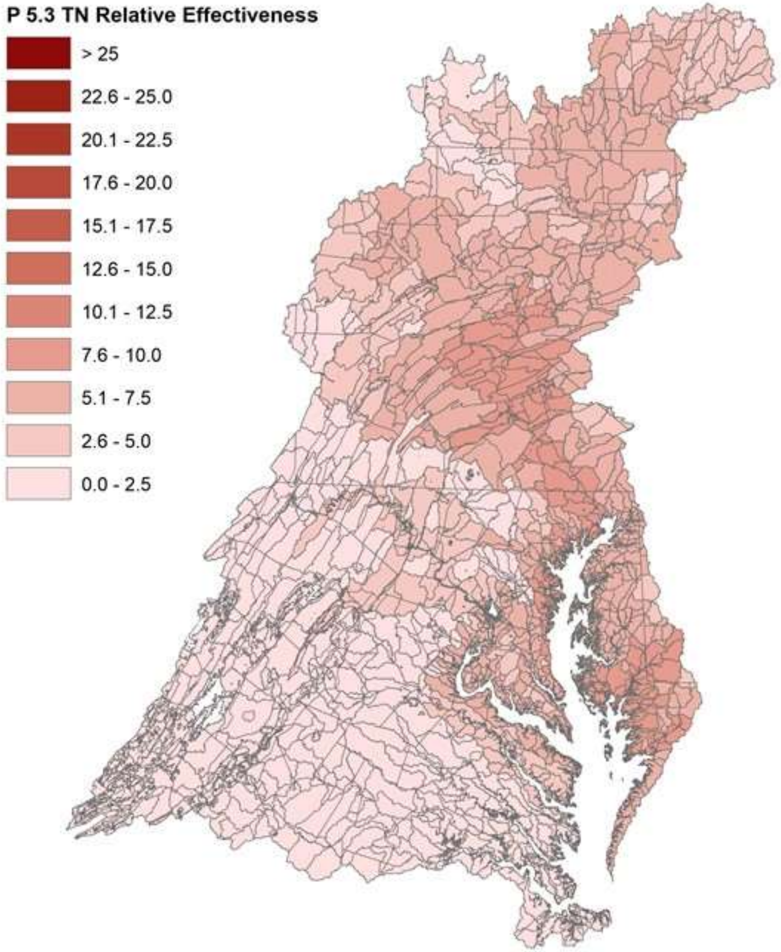
- Major river basins that contribute the most to Bay water quality problems must do the most to resolve those problems

- All tracked and reported reductions in loads are credited toward achieving assigned loads

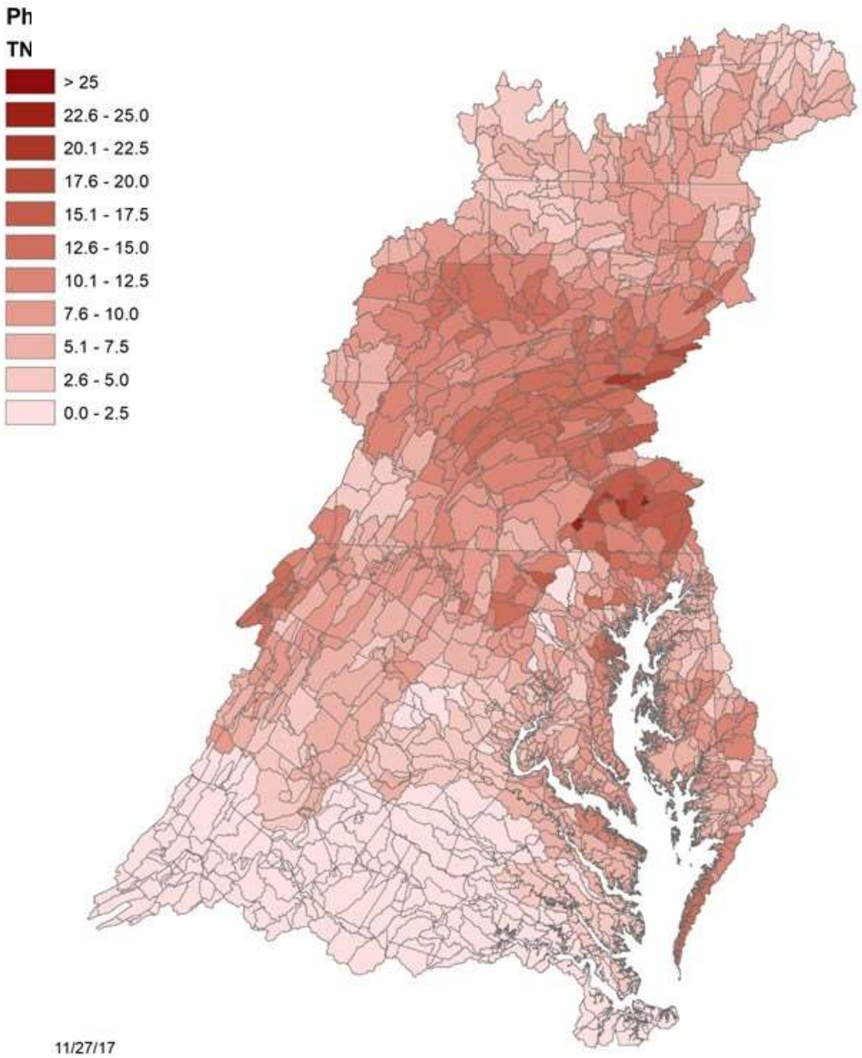
Source: 2010 Chesapeake Bay TMDL

More Impact, Do More

Phase 5 Nitrogen

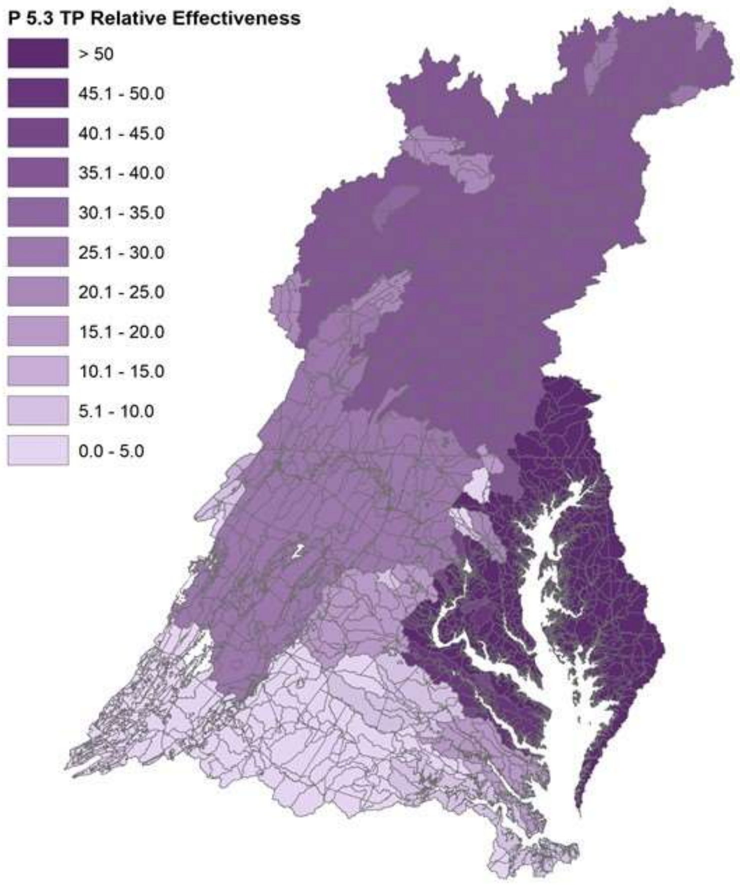


Phase 6 Nitrogen

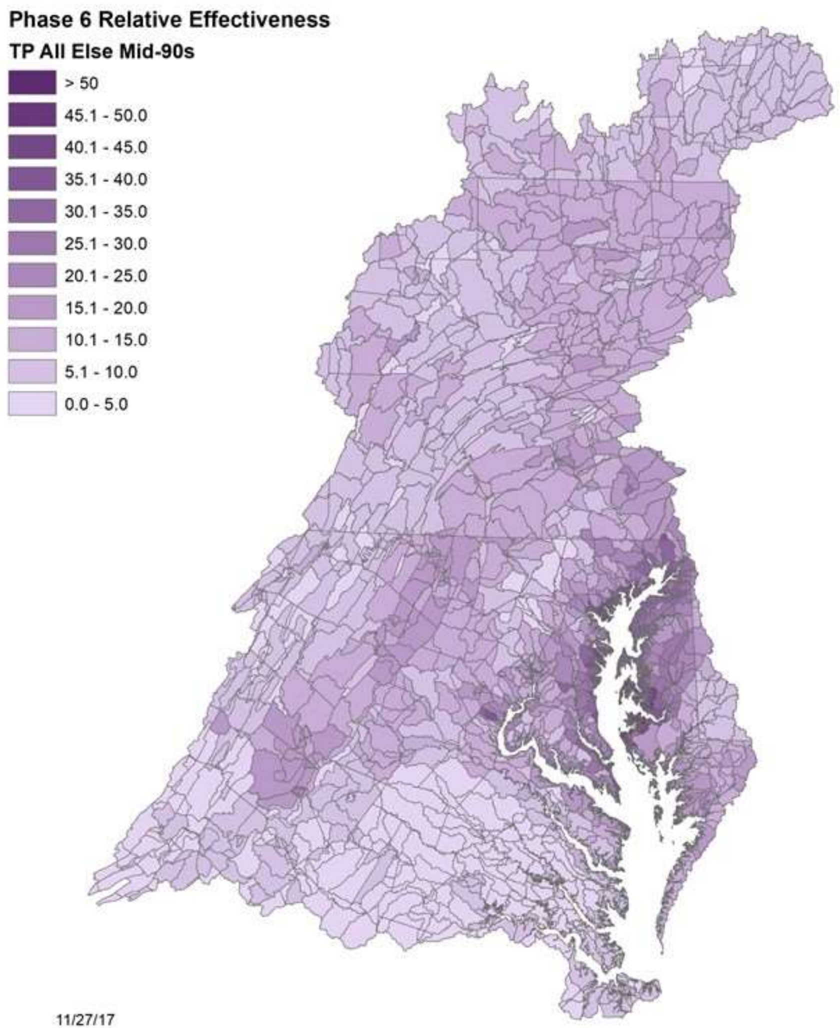


More Impact, Do More

Phase 5 Phosphorus



Phase 6 Phosphorus



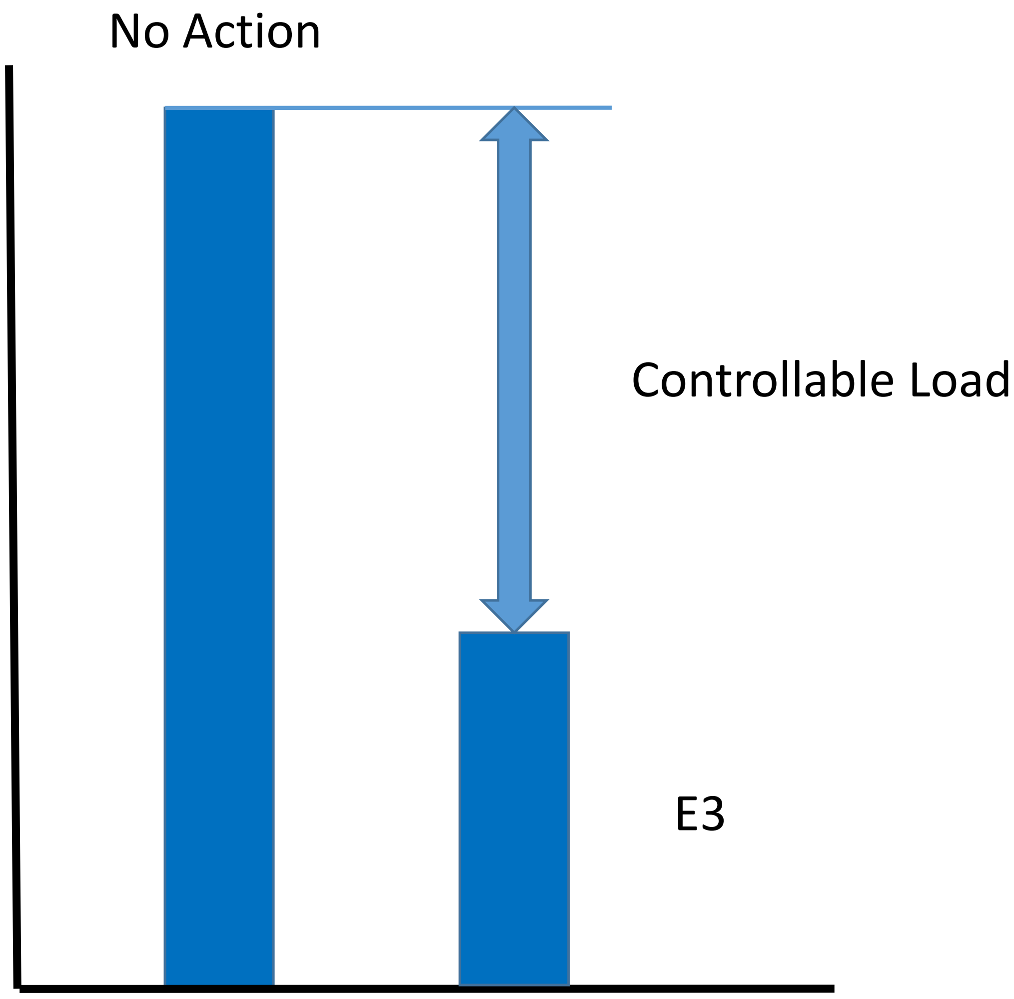
Defining the Controllable Load

No Action:

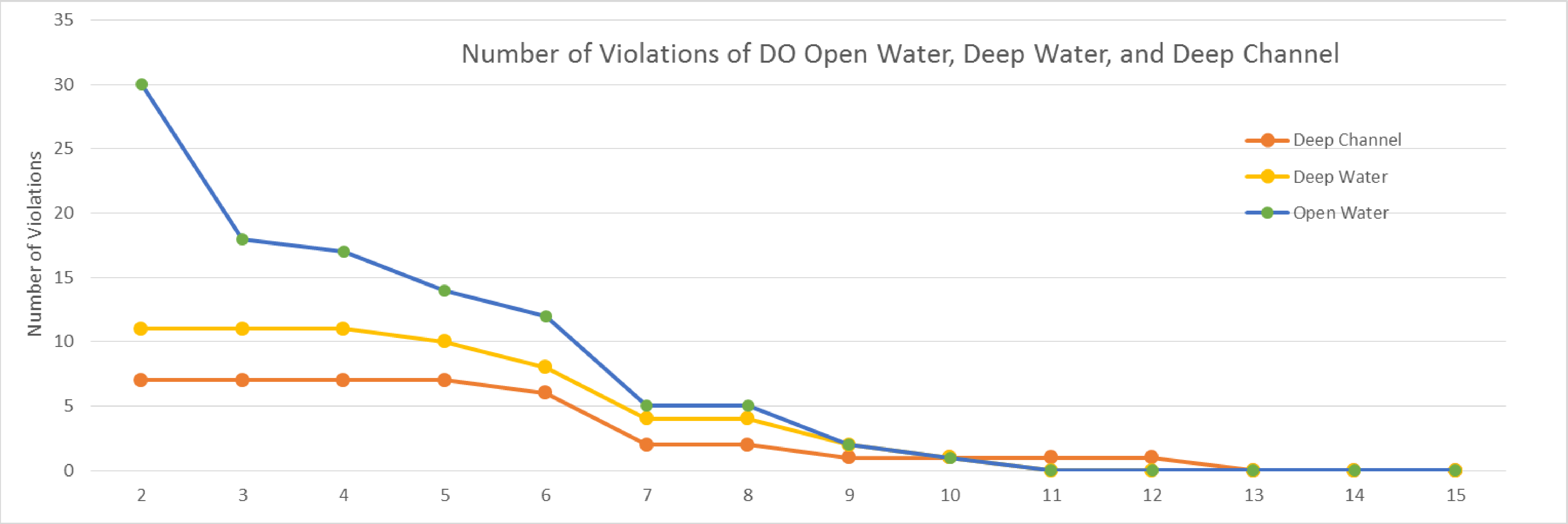
- Watershed conditions with minimal to no controls on load
- Wastewater at primary treatment

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



Determining the Bay's Ability to Absorb Pollutants



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

Allowing for Special Cases

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

Nitrogen and Phosphorus Exchanges

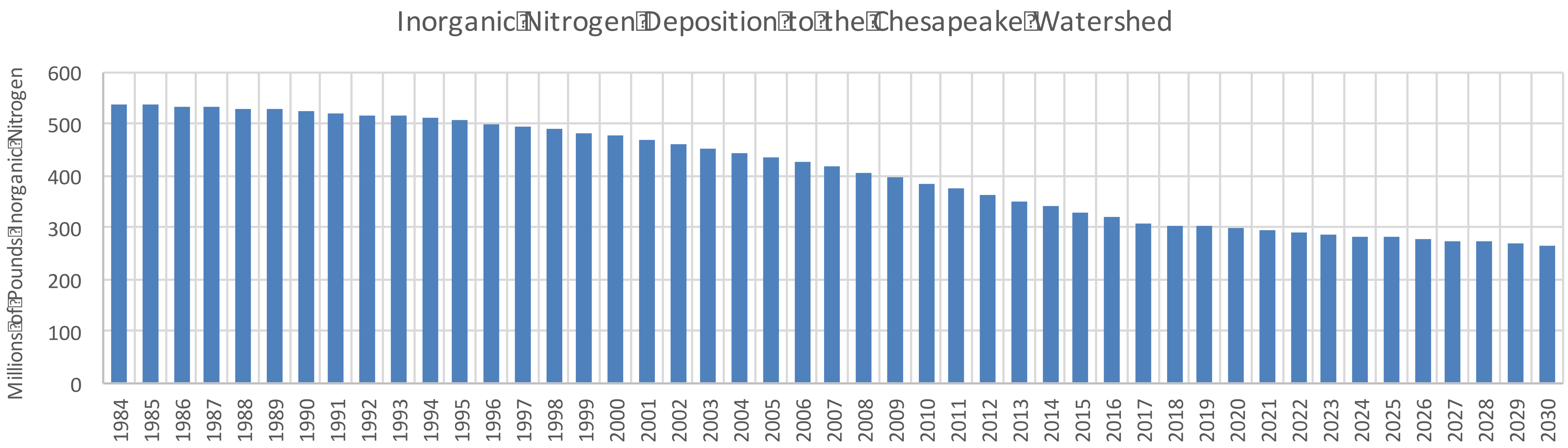
- Science supports exchanges in nitrogen and phosphorus load reductions

- Better science has resulted in changes to our existing exchange ratios
  - Better simulation of observed nutrient limitation in the Bay
  - Inclusion of new P sources from Conowingo and Shoreline makes each pound of P less important

	Phase 5	Phase 6
Nitrogen for Phosphorus:	5	1.34 – 3.84
Phosphorus for Nitrogen:	0.067	0.26 – 0.75

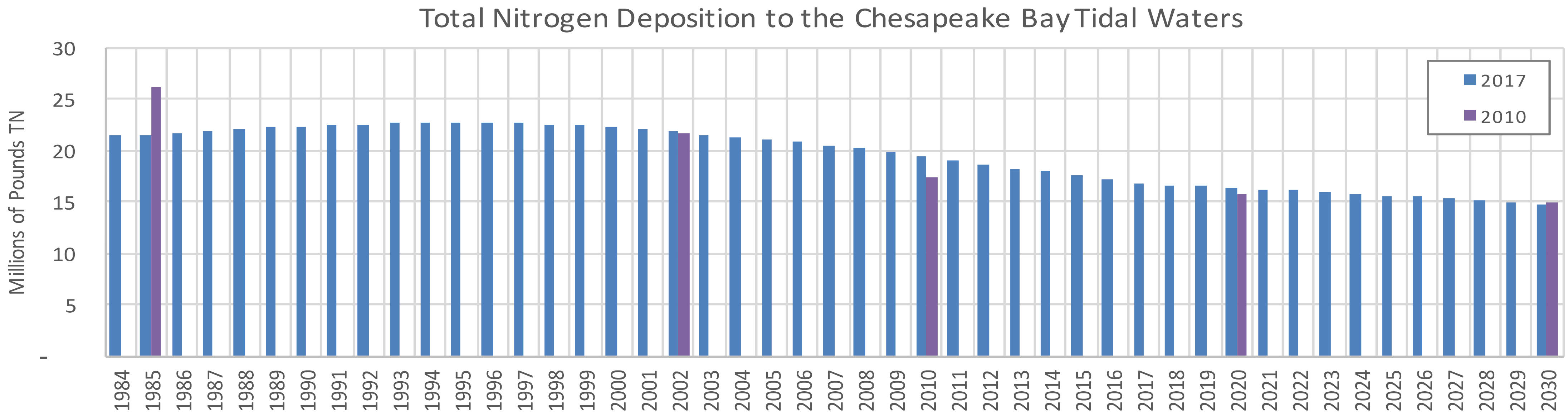
Accounting for Nitrogen Air Deposition to Bay Watershed

- Updated estimated benefits to Bay and watershed from clear air actions.
- From 1985 through 2025, the jurisdictions will receive an estimated 254 million lbs. less nitrogen on their lands and rivers.



Accounting for Nitrogen Air Deposition to Bay Tidal Waters

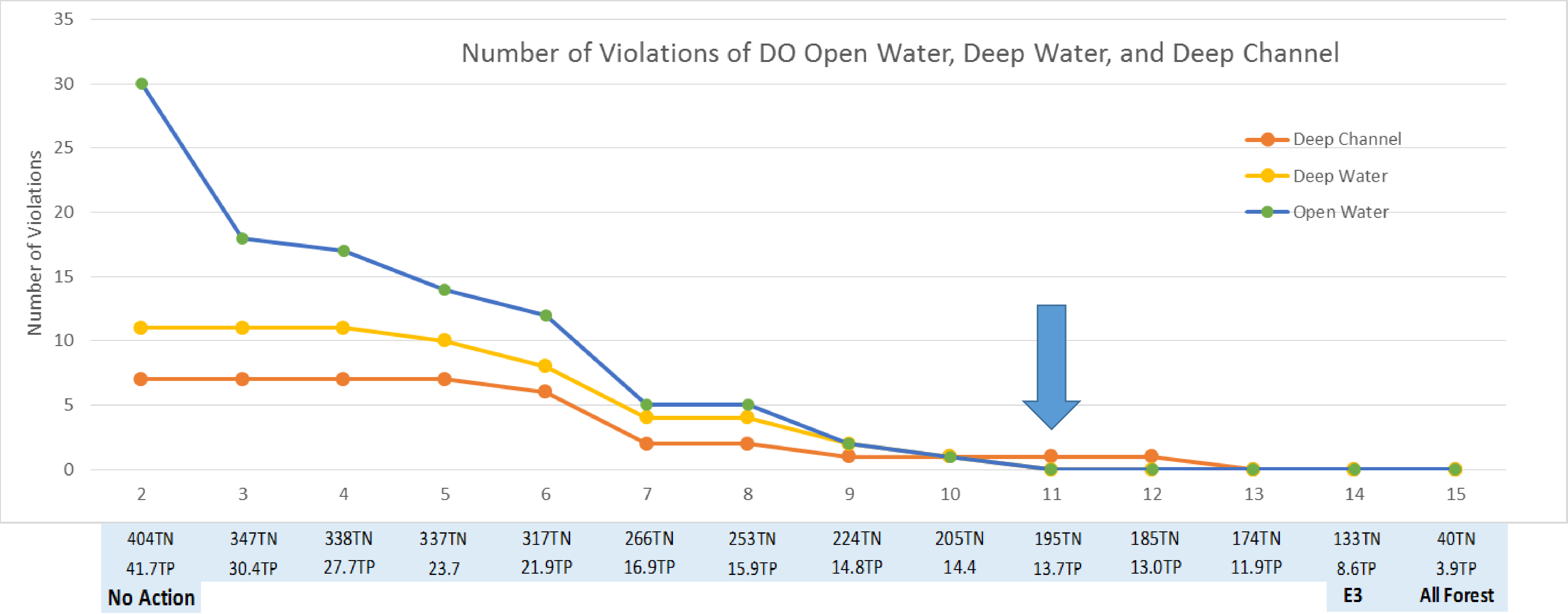
- From 1985 through 2025, loads will be reduced from 21.5 to 15.6 million lbs.
- By 2025, 0.1 million pounds below EPA's Bay TMDL allocation (15.7 million lbs.)
- By 2030, load drops to 14.9 millions lbs., 0.8 million pounds below EPA's Bay TMDL allocation



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

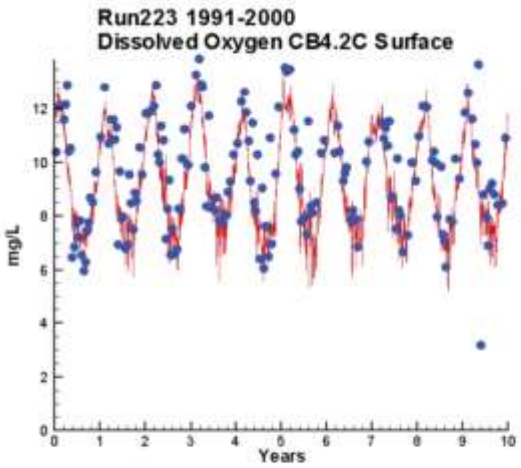
Rich Batiuk, U.S. EPA CBPO Associate Director for Science, Analysis and Implementation

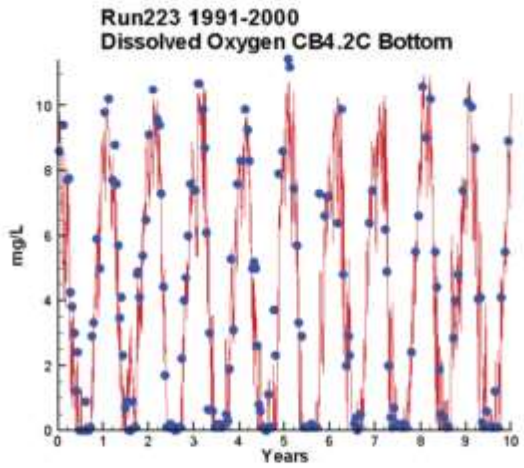
Here's Where We Want to Get to

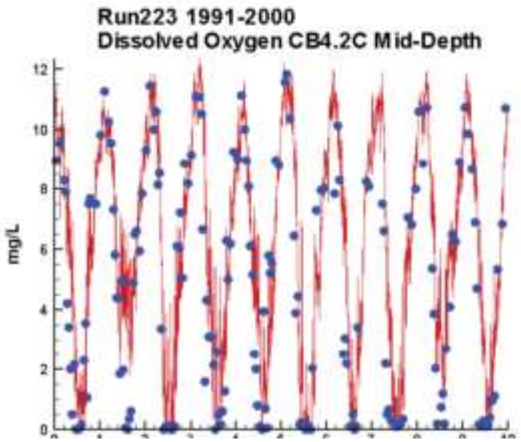


What’s Changed and the Implications

An improved Water Quality and Sediment Transport Model (WQSTM) is providing a better simulation of dissolved oxygen in the tidal Bay affording higher confidence in implementation planning for 2025.





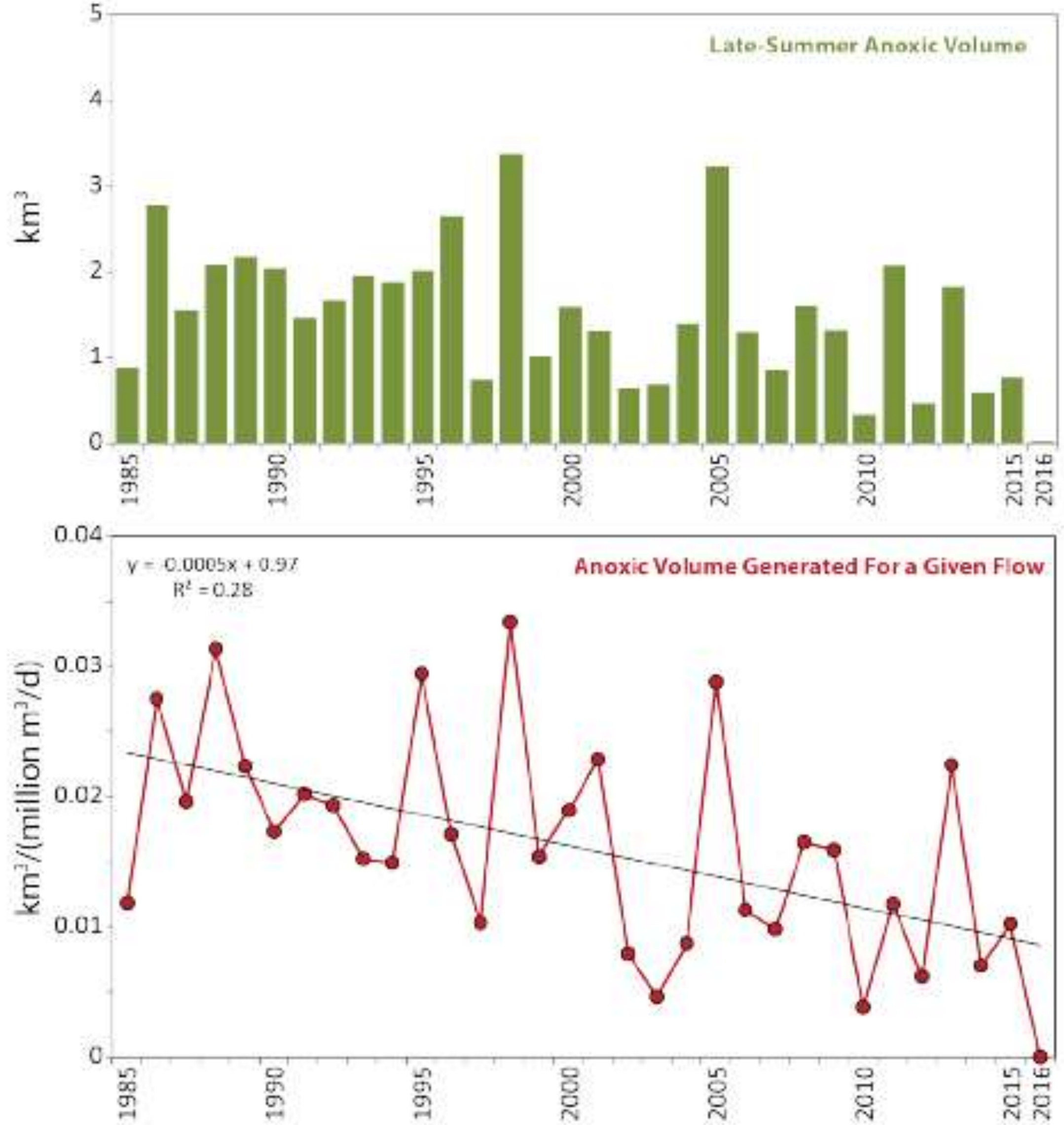


	Mean Difference	Absolute Mean Differen
Top DO	-0.5205	0.9002
Mid DO	1.0038	1.4866
Bot DO	-0.4165	0.9393

Good simulation of DO concentrations of Open Water, Deep Water, and Deep Channel (CB4 shown here)

What’s Changed and the Implications

The Chesapeake Bay’s summertime dead zone is decreasing in size!



Source: Testa et al. 2017

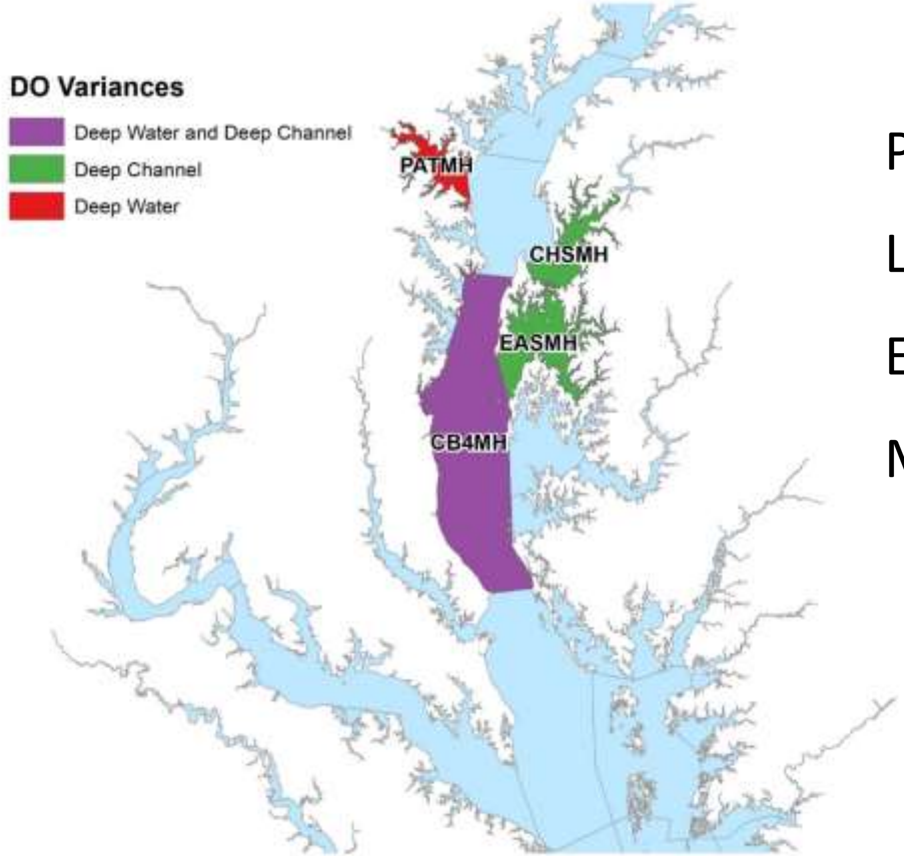
What Hasn't Changed

Delaware, District of Columbia, Maryland and Virginia's Chesapeake Bay water quality standards regulations have not changed since 2012

- Five tidal habitat-based designated uses
- Dissolved oxygen, SAV, water clarity and chlorophyll *a* criteria to protect those uses
- Fully consistent criteria attainment assessment procedures
- How we use model output to assess criteria attainment under model-simulated load conditions

Maryland's Restoration Variances

Maryland's water quality standards regulations still contain restoration variances agreed to by the Partners/approved by EPA in 2010 and updated in 2012



Patapsco River Deep-water 7%

Lower Chester River Deep-channel 16%

Eastern Bay Deep-channel 2%

Middle Central Chesapeake Bay

- Deep-water 7%
- Deep-channel 2%

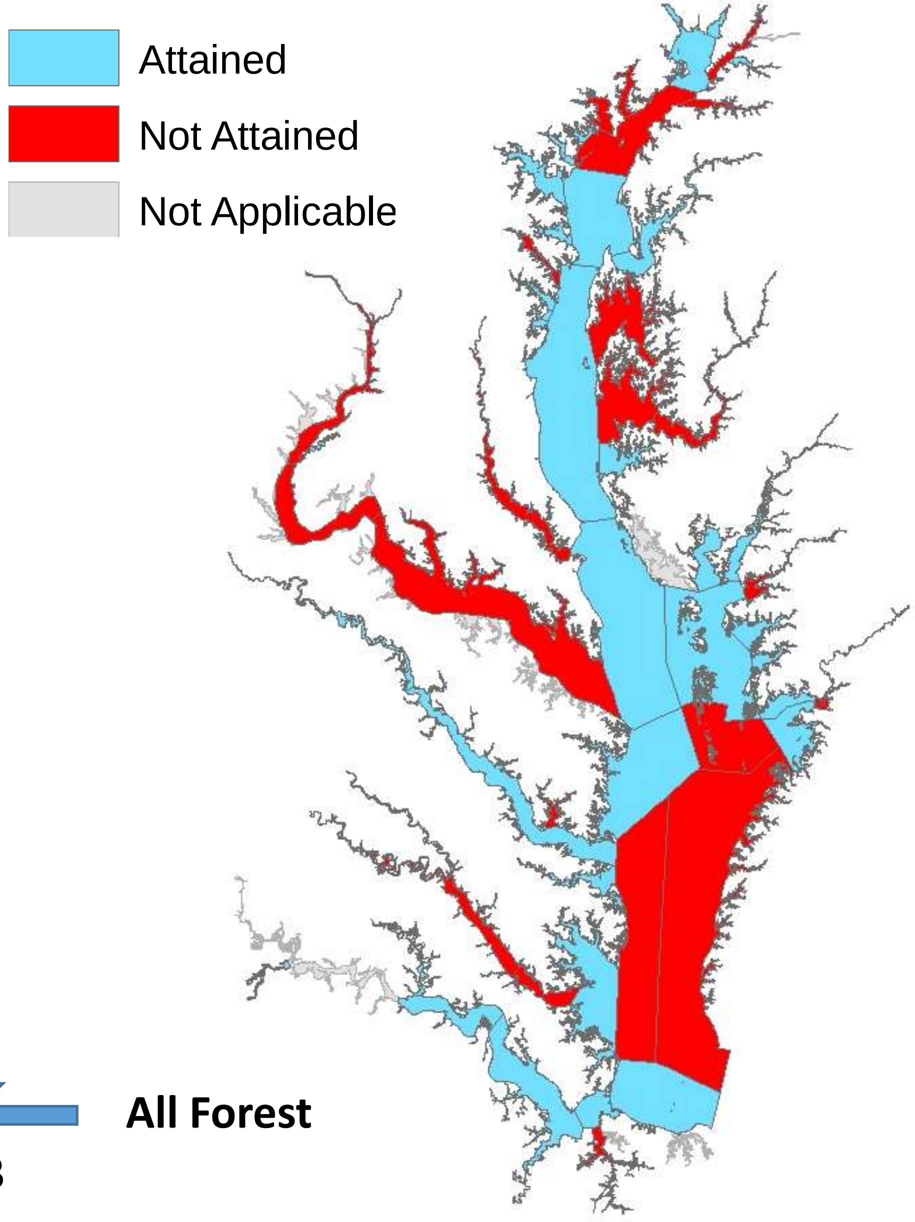
Segments Attaining Oxygen Standards: Open-Water Use

Segments NOT in Attainment

- CB2OH
- CB6PH
- CB7PH
- BSHOH
- SEVMH
- PAXOH
- PAXMH
- POTTF_DC
- POTTF_MD
- ANATF_DC
- ANATF_MD
- PISTF
- POTOH1_MD
- POTOMH_MD
- PMKOH
- YRKMH
- YRKPH
- ELIPH
- C&Dcanal
- ELKOH
- SASOH
- EASMH
- CHOTF
- CHOOH
- CHOMH2
- CHOMH1
- POCTF
- POCOH_MD
- POCOH_VA
- TANMH_VA

404 TN
41.7 TP

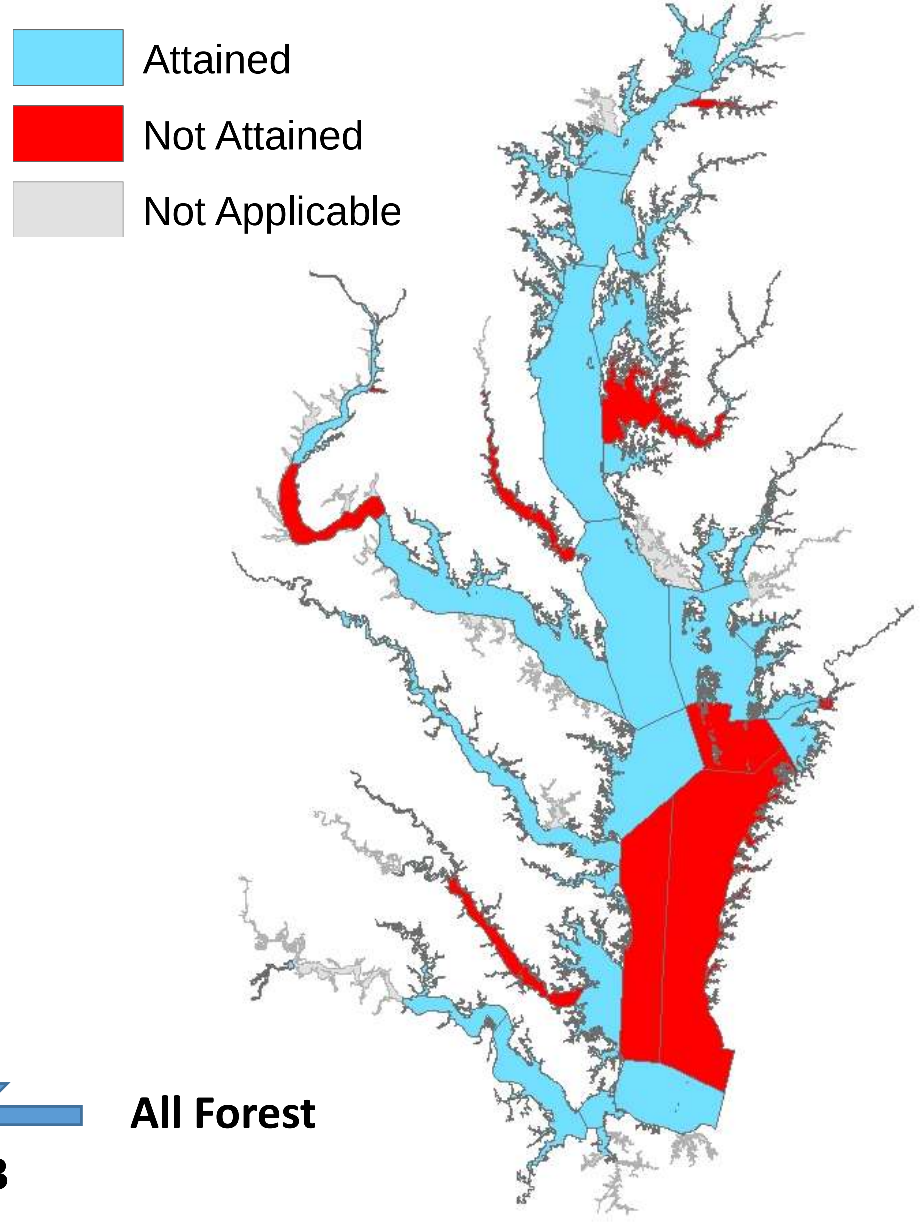
No Action — **E3** — **All Forest**



Segments Attaining Oxygen Standards: Open-Water Use

Segments NOT in Attainment

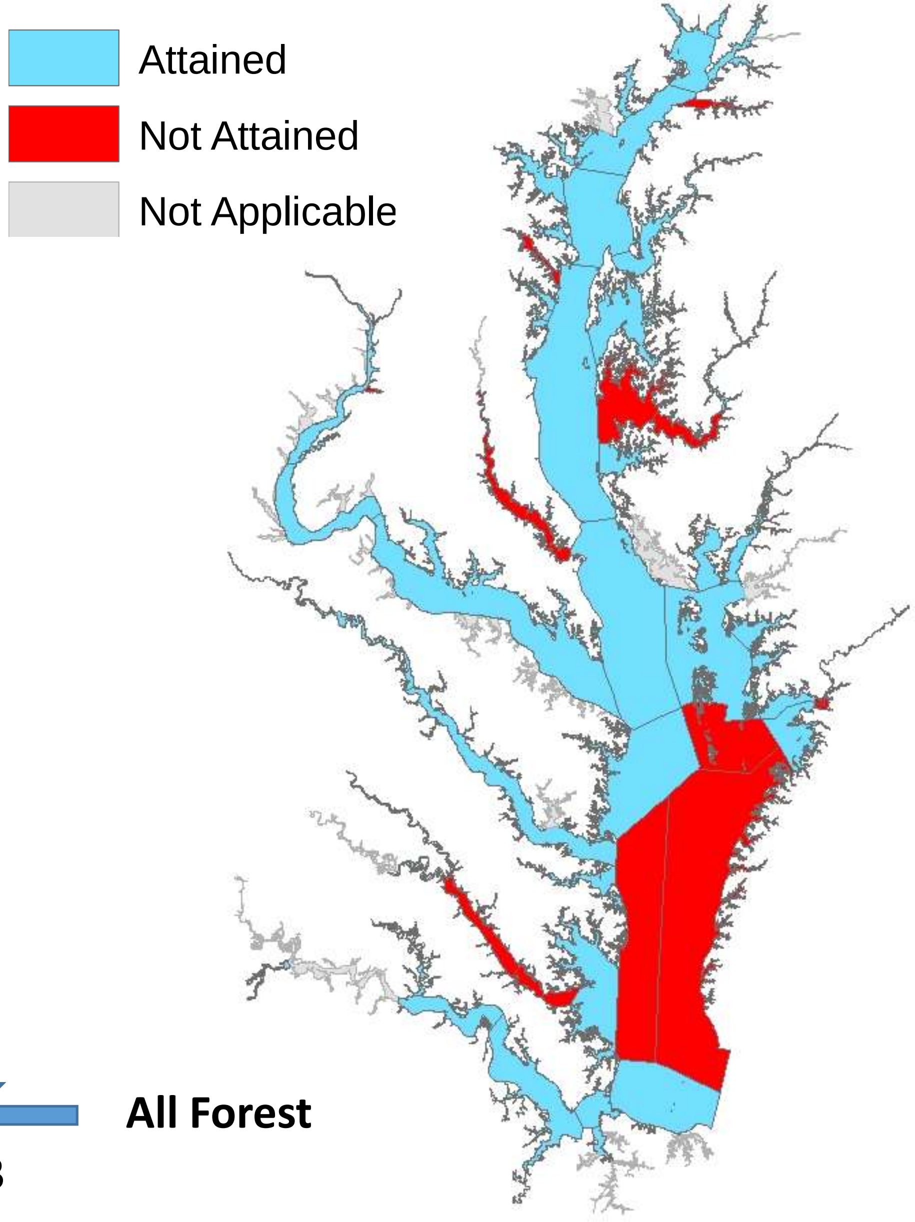
- CB6PH
- CB7PH
- PAXOH
- PAXMH
- ANATF_DC
- ANATF_MD
- PISTF
- POTOH1_MD
- YRKMH
- YRKPH
- C&Dcanal
- SASOH
- CHOMH2
- CHOMH1
- POCTF
- POCOH_MD
- POCOH_VA
- TANMH_VA



Segments Attaining Oxygen Standards: Open-Water Use

Segments NOT in Attainment

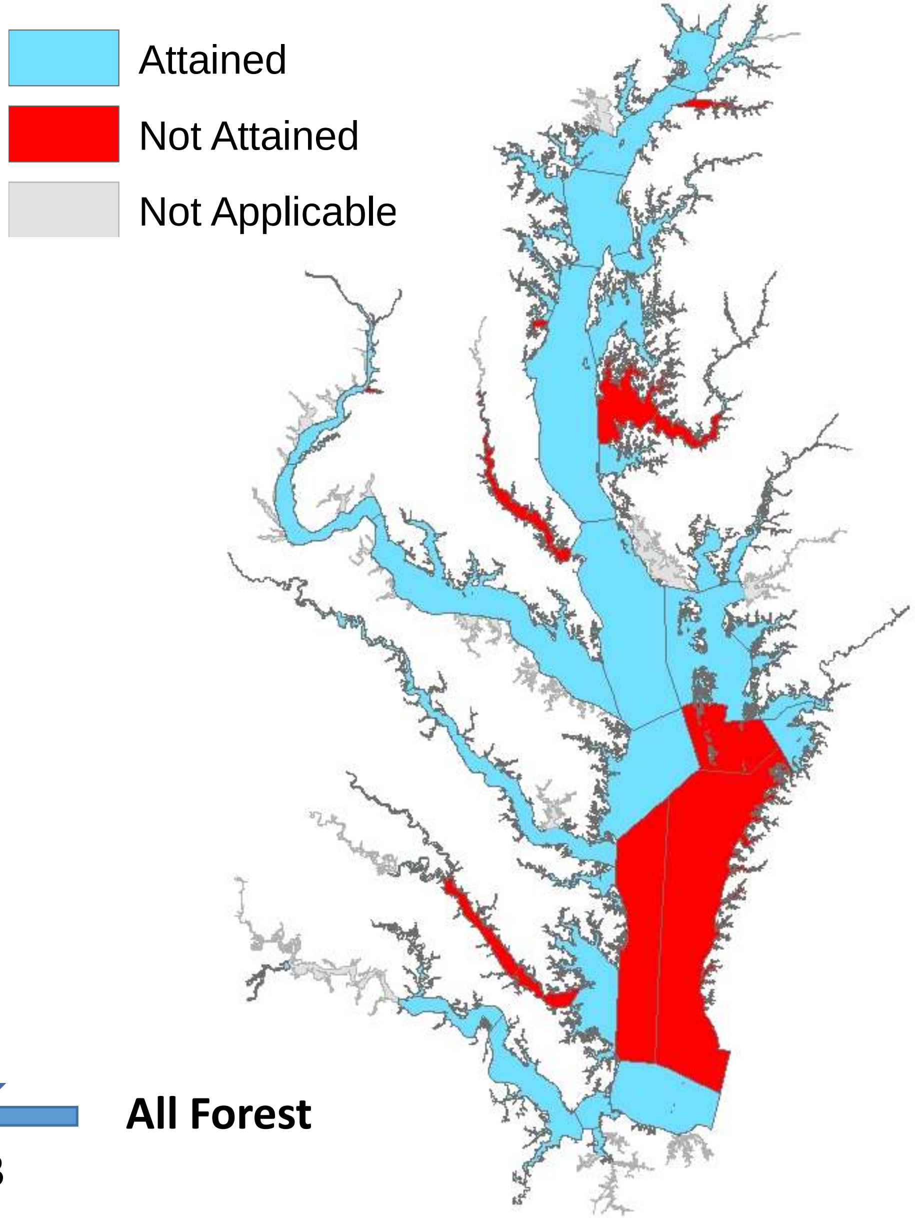
- CB6PH
- CB7PH
- PAXOH
- PAXMH
- ANATF_DC
- ANATF_MD
- PISTF
- POTOH1_MD
- YRKMH
- YRKPH
- C&Dcanal
- SASOH
- CHOMH2
- CHOMH1
- POCTF
- POCOH_MD
- POCOH_VA
- TANMH_VA



Segments Attaining Oxygen Standards: Open-Water Use

Segments NOT in Attainment

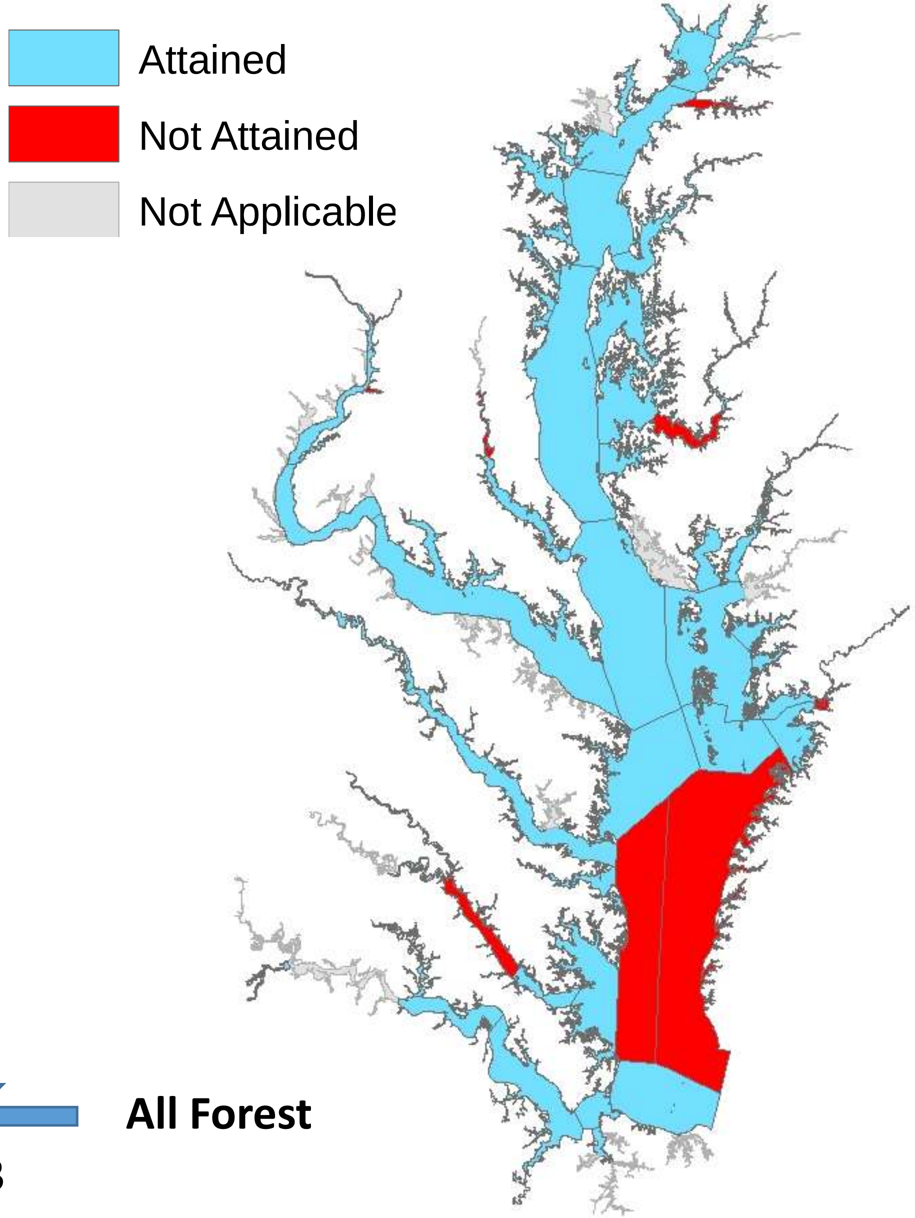
- CB6PH
- CB7PH
- WSTMH
- PAXOH
- PAXMH
- ANATF_DC
- ANATF_MD
- PISTF
- YRKMH
- YRKPH
- SASOH
- CHOMH2
- CHOMH1
- TANMH_VA



Segments Attaining Oxygen Standards: Open-Water Use

Segments NOT in Attainment

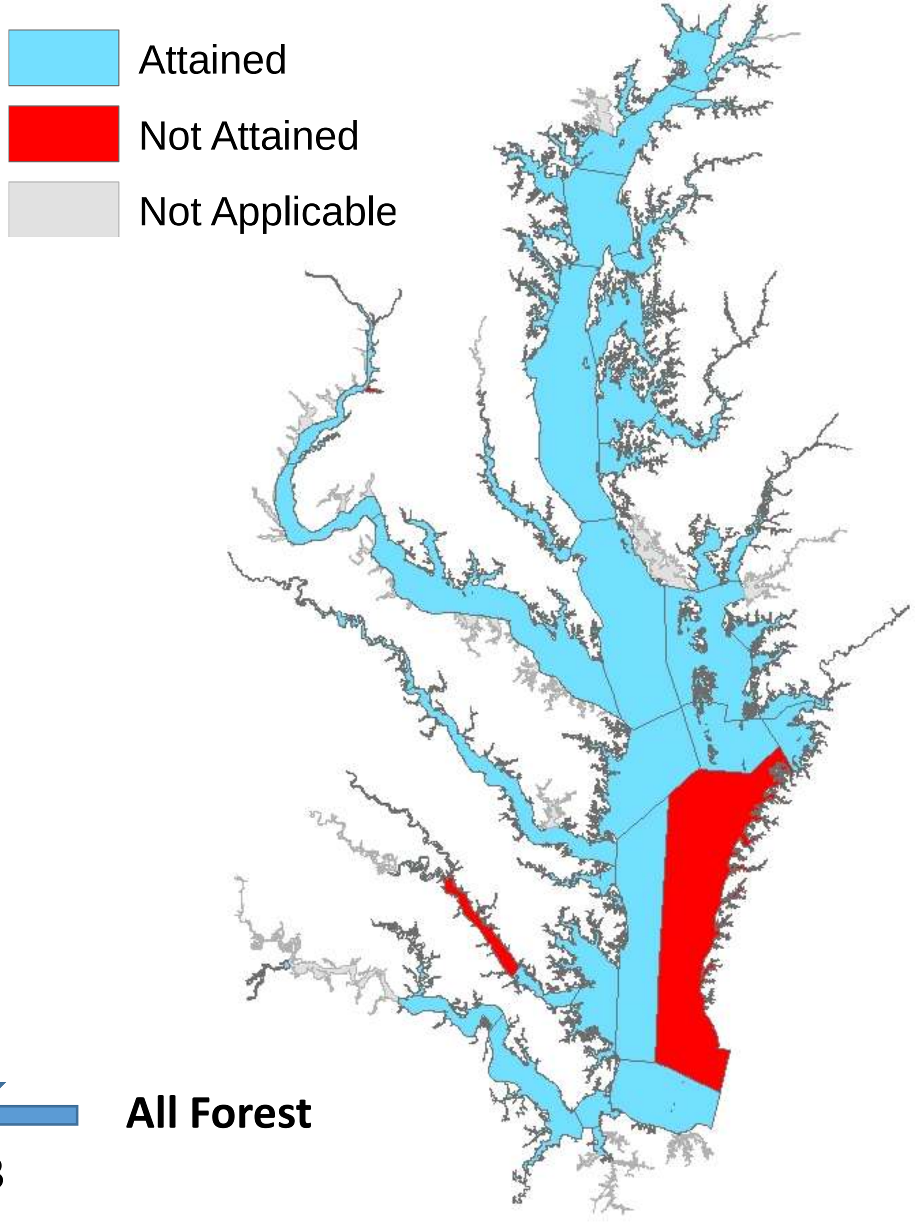
- CB6PH
- CB7PH
- PAXOH
- ANATF_DC
- ANATF_MD
- PISTF
- YRKMH
- SASOH
- CHOMH2
- POCTF
- POCOH_MD
- POCOH_VA



Segments Attaining Oxygen Standards: Open-Water Use

Segments NOT in Attainment

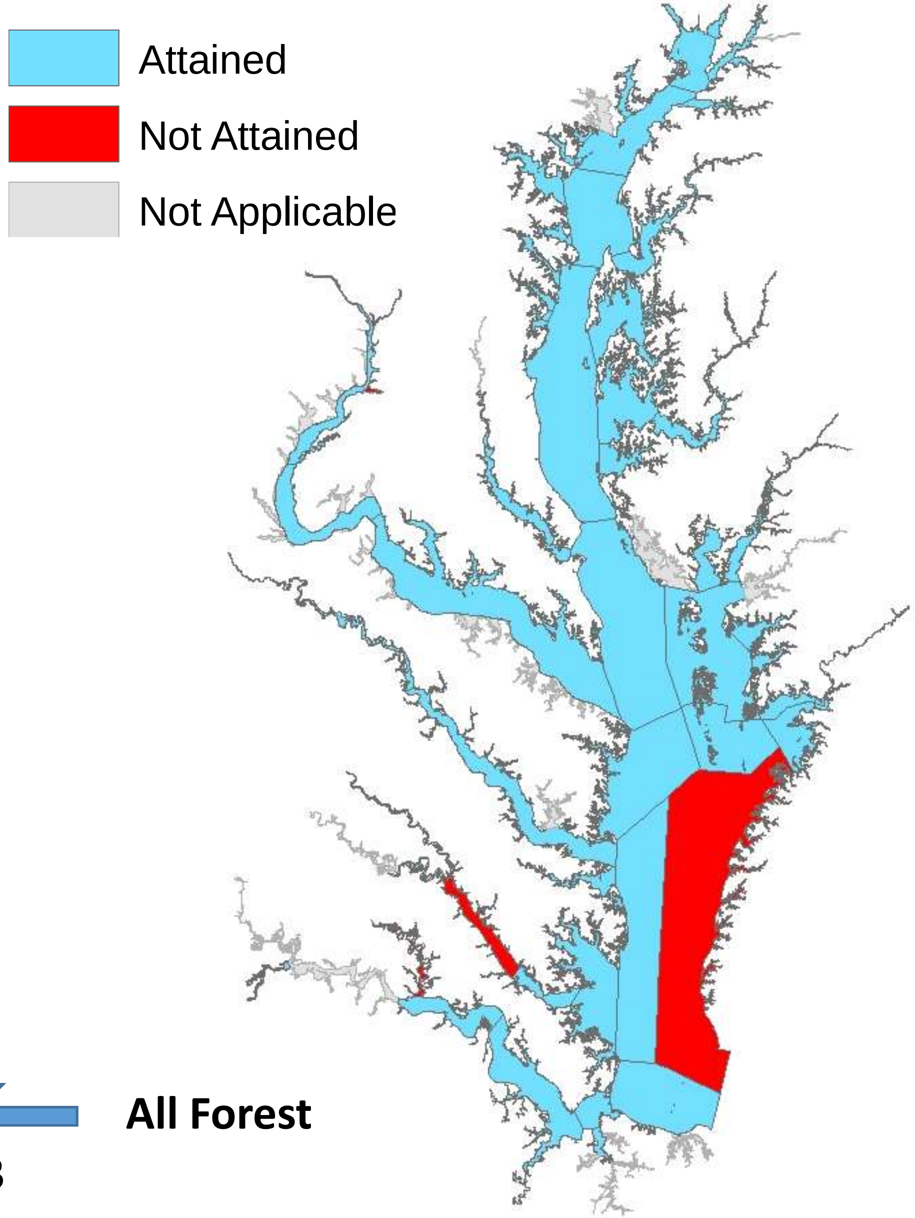
- CB6PH
- CB7PH
- PAXOH
- ANATF_DC
- ANATF_MD
- PISTF
- YRKMH
- SASOH
- CHOMH2
- POCTF
- POCOH_MD
- POCOH_VA



Segments Attaining Oxygen Standards: Open-Water Use

Segments NOT in Attainment

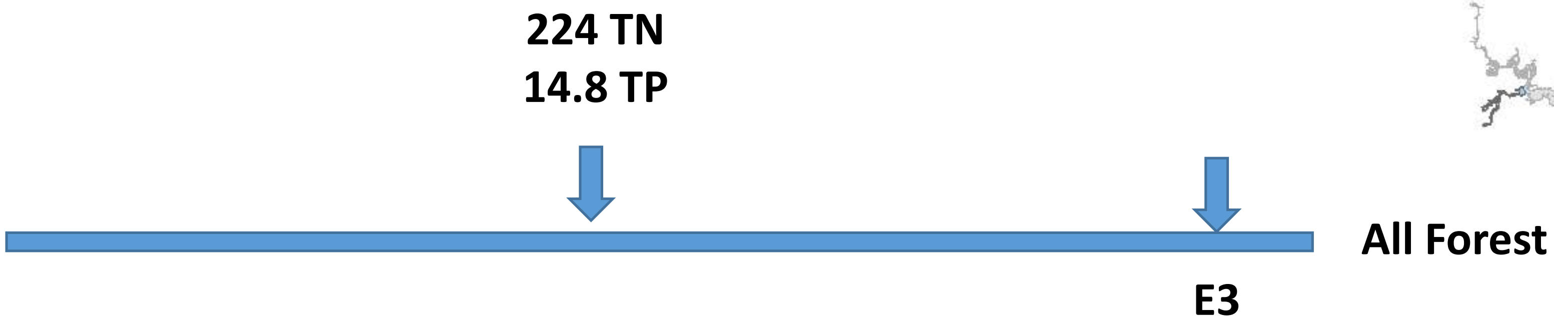
- CB7PH
- ANATF_DC
- ANATF_MD
- PISTF
- YRKMH
- CHKOH

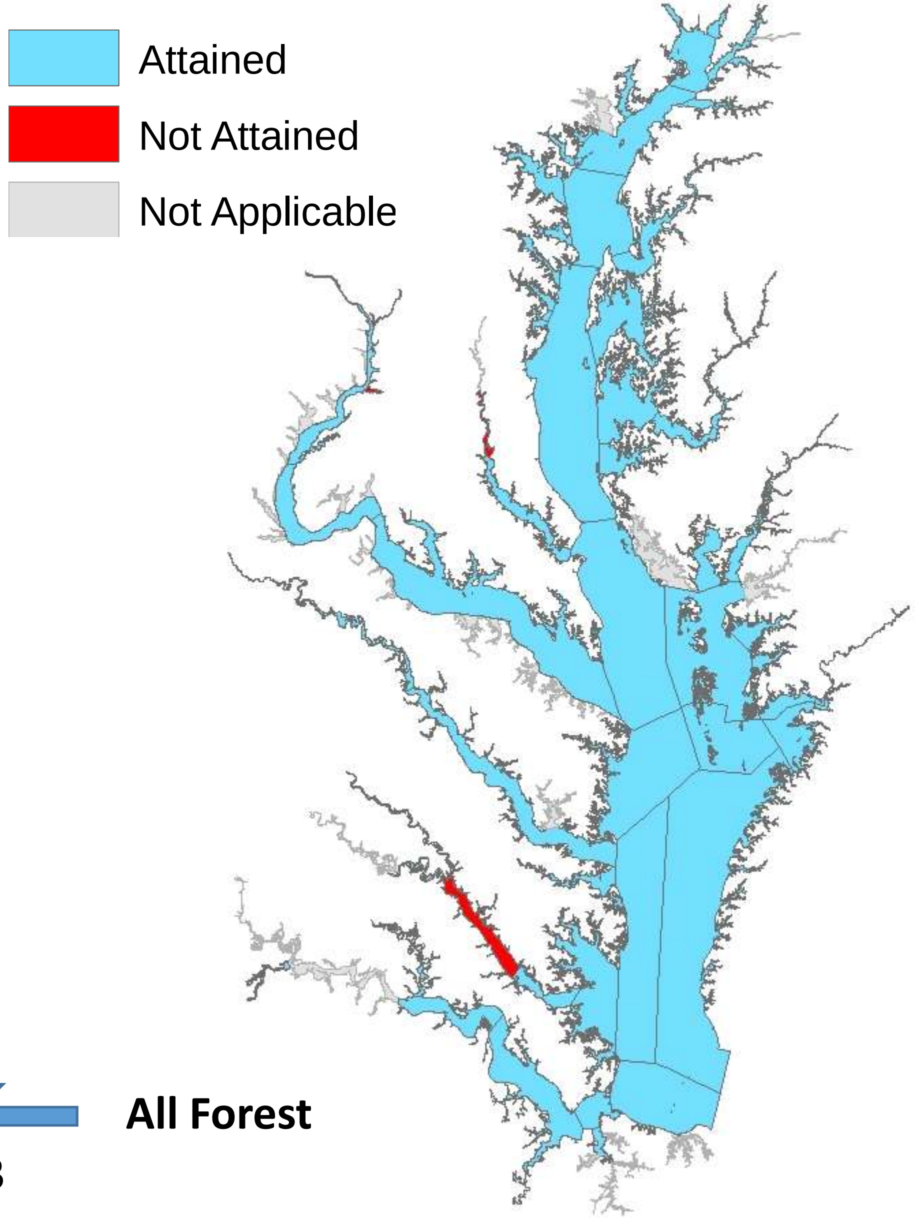


Segments Attaining Oxygen Standards: Open-Water Use

Segments NOT in Attainment

- PAXOH
- ANATF_DC
- ANATF_MD
- PISTF
- YRKMH

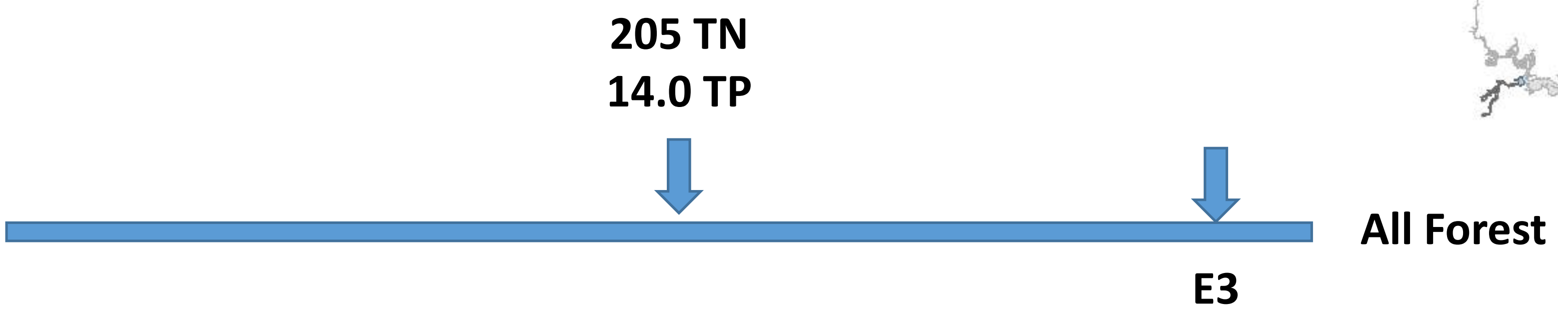


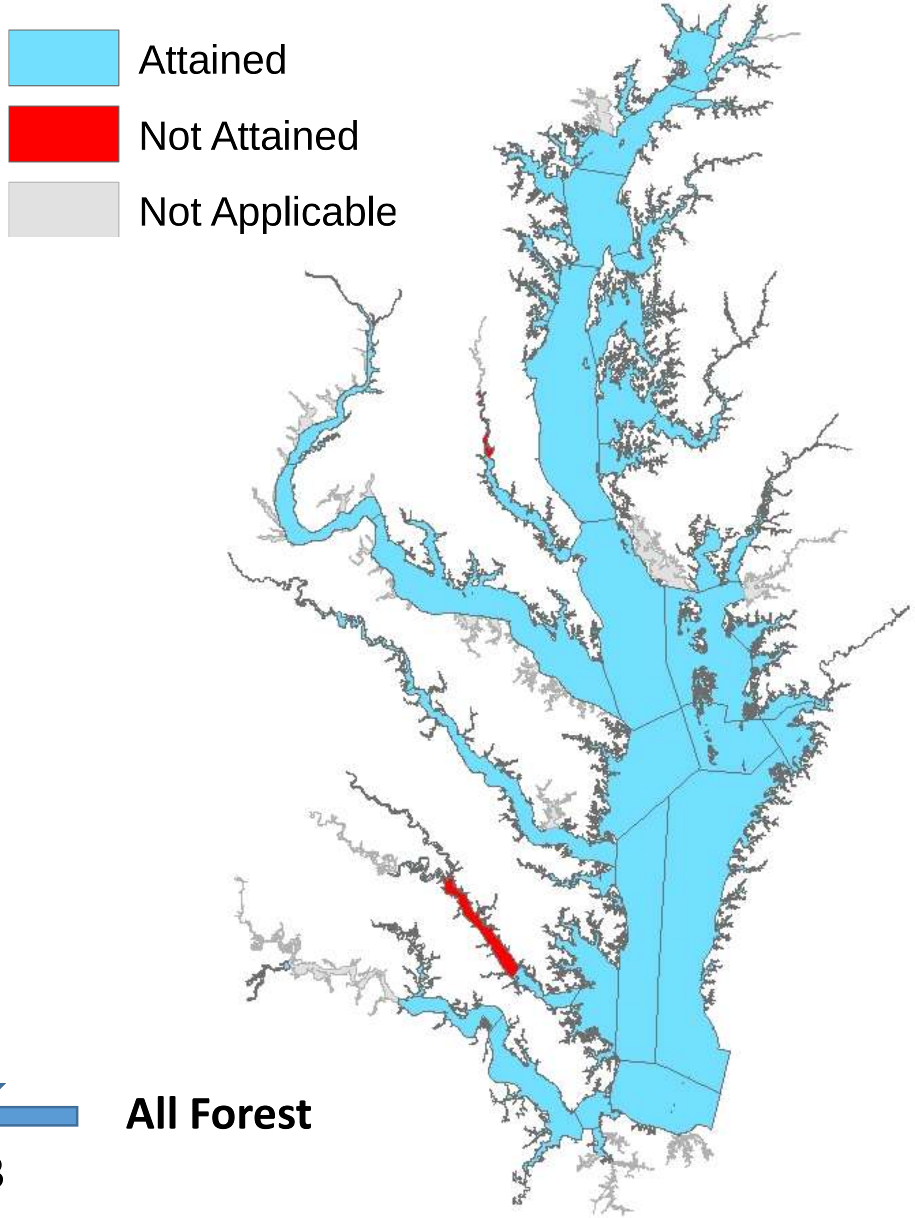


Segments Attaining Oxygen Standards: Open-Water Use

Segments NOT in Attainment

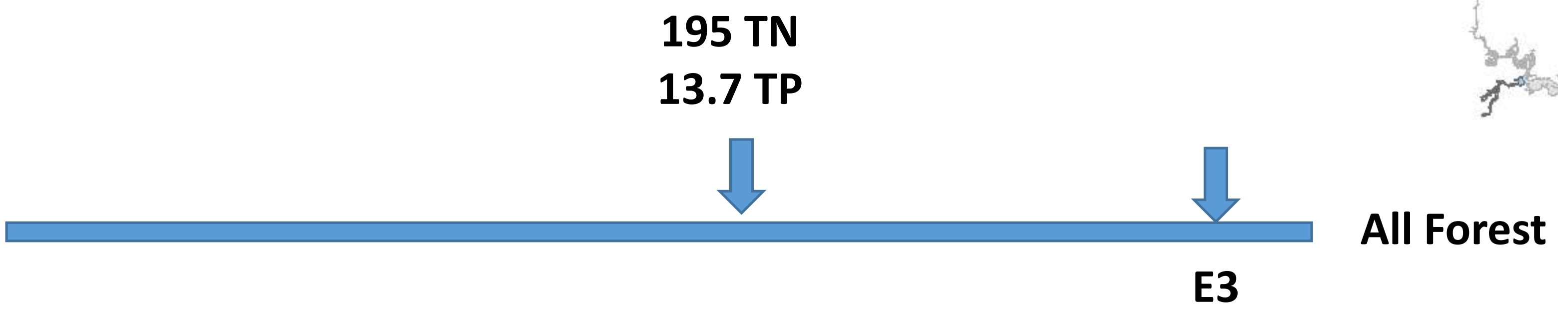
- ANATF_MD
- YRKMH

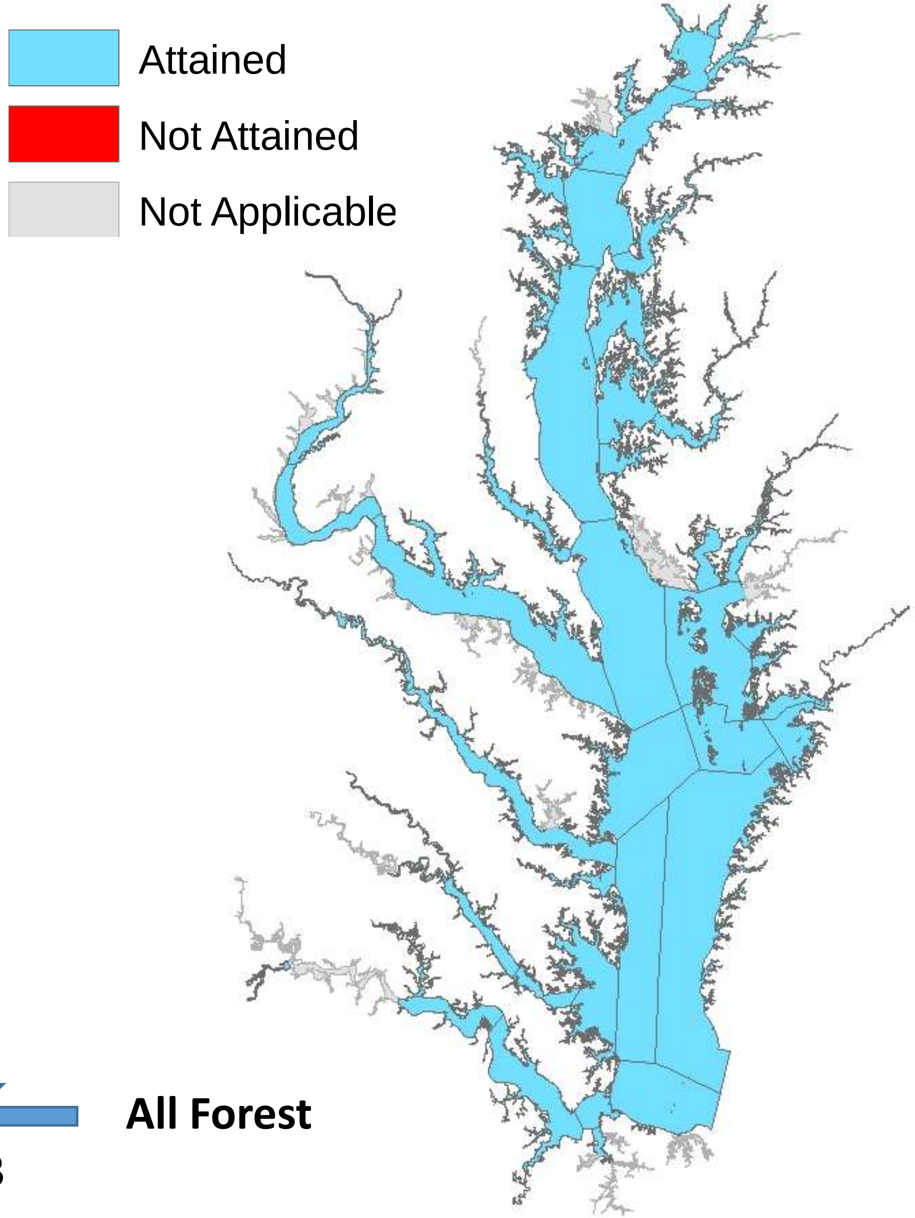




Segments Attaining Oxygen Standards: Open-Water Use

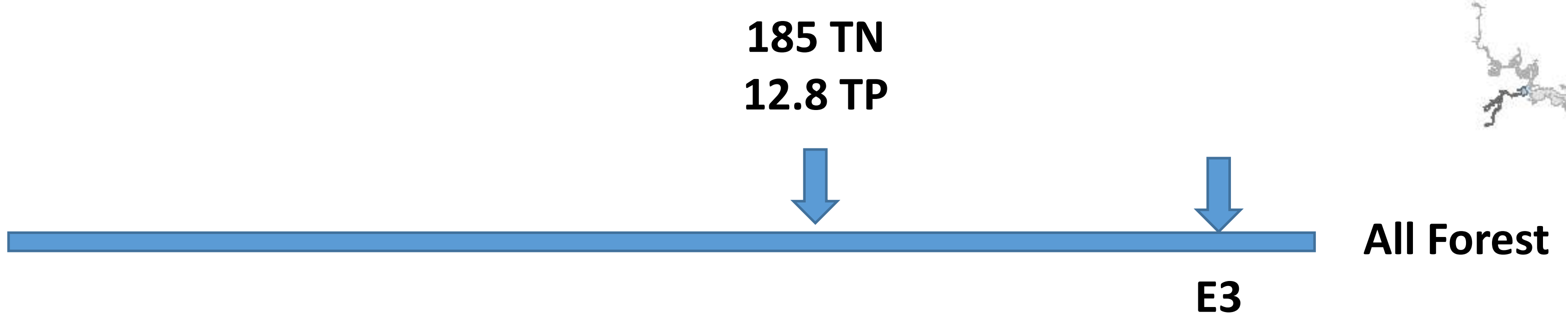
Segments NOT in Attainment

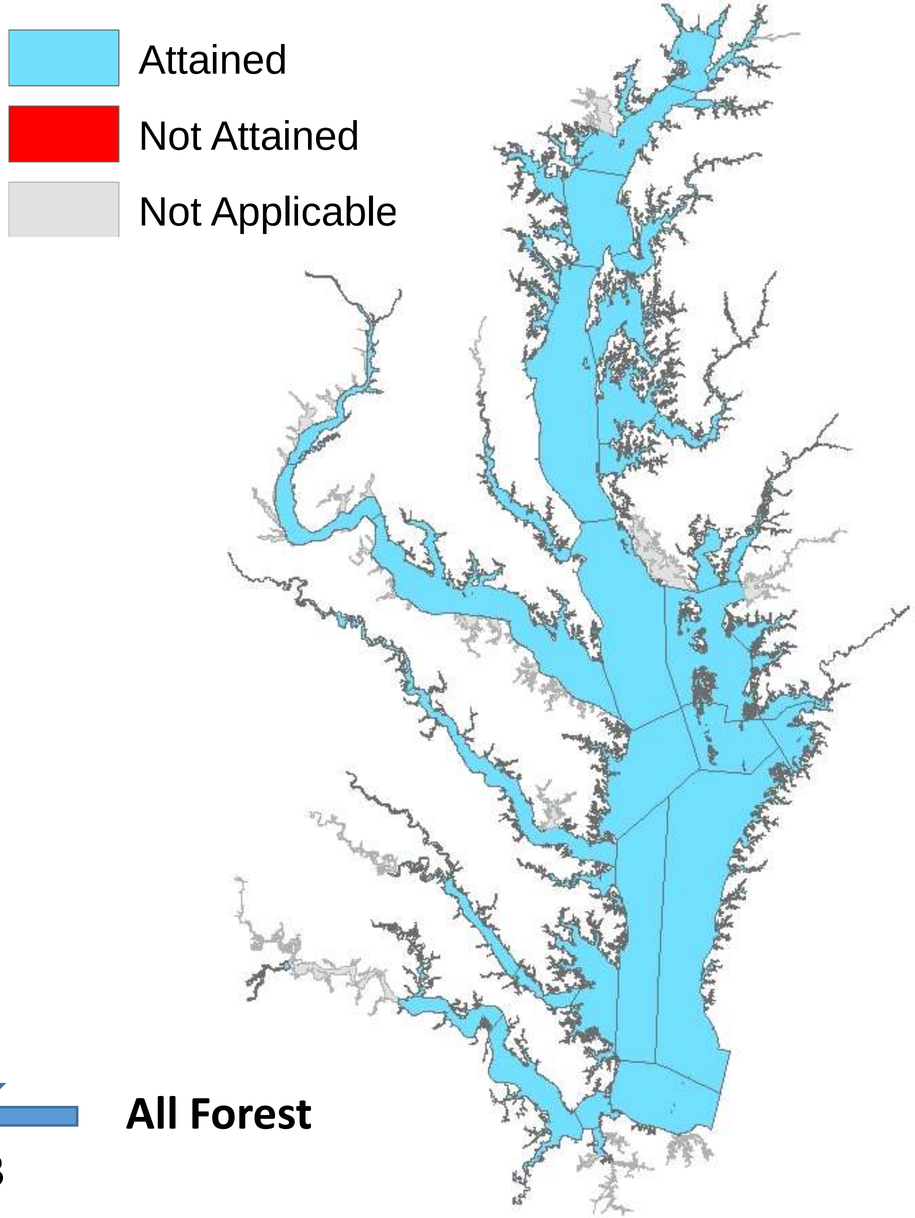




Segments Attaining Oxygen Standards: Open-Water Use

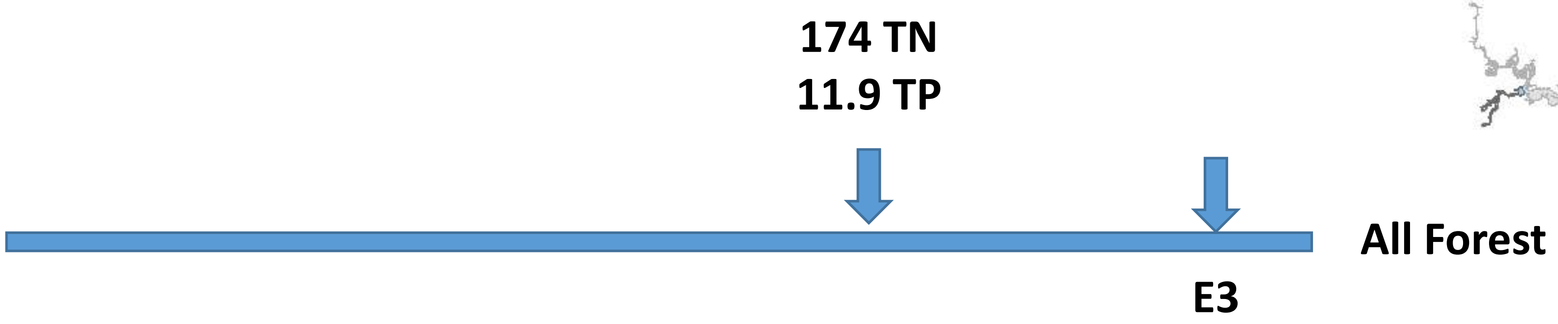
Segments NOT in Attainment

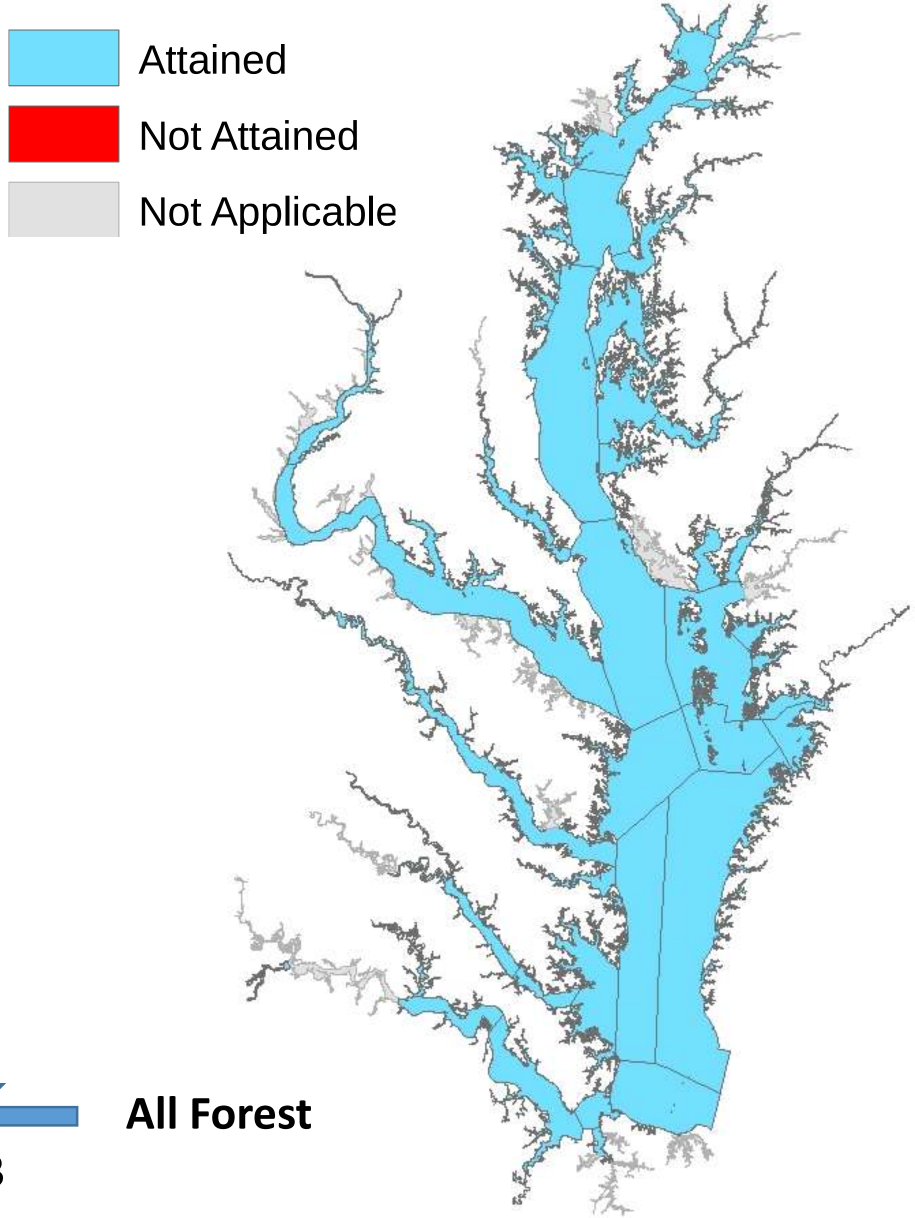




Segments Attaining Oxygen Standards: Open-Water Use

Segments NOT in Attainment





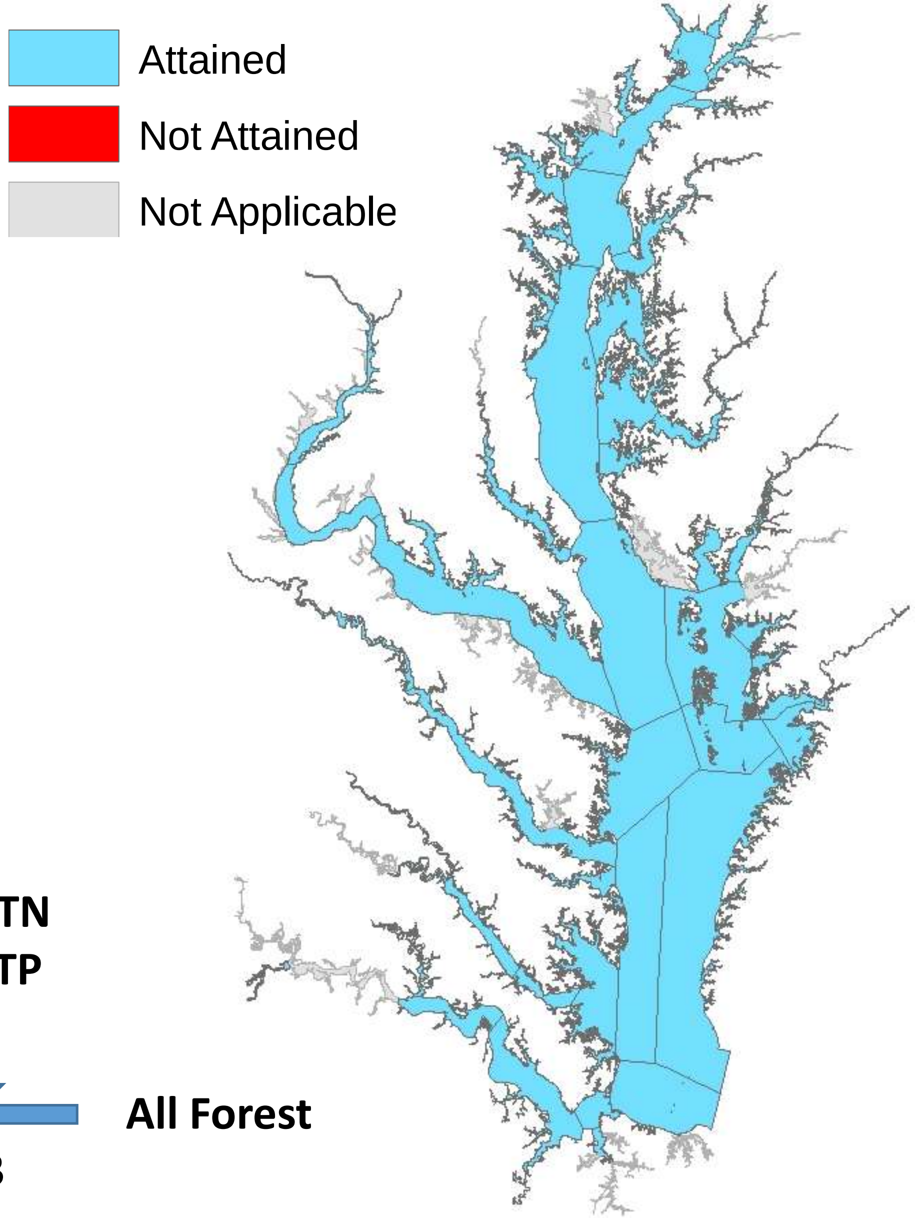
Segments Attaining Oxygen Standards: Open-Water Use

Segments NOT in Attainment

133 TN
8.6 TP

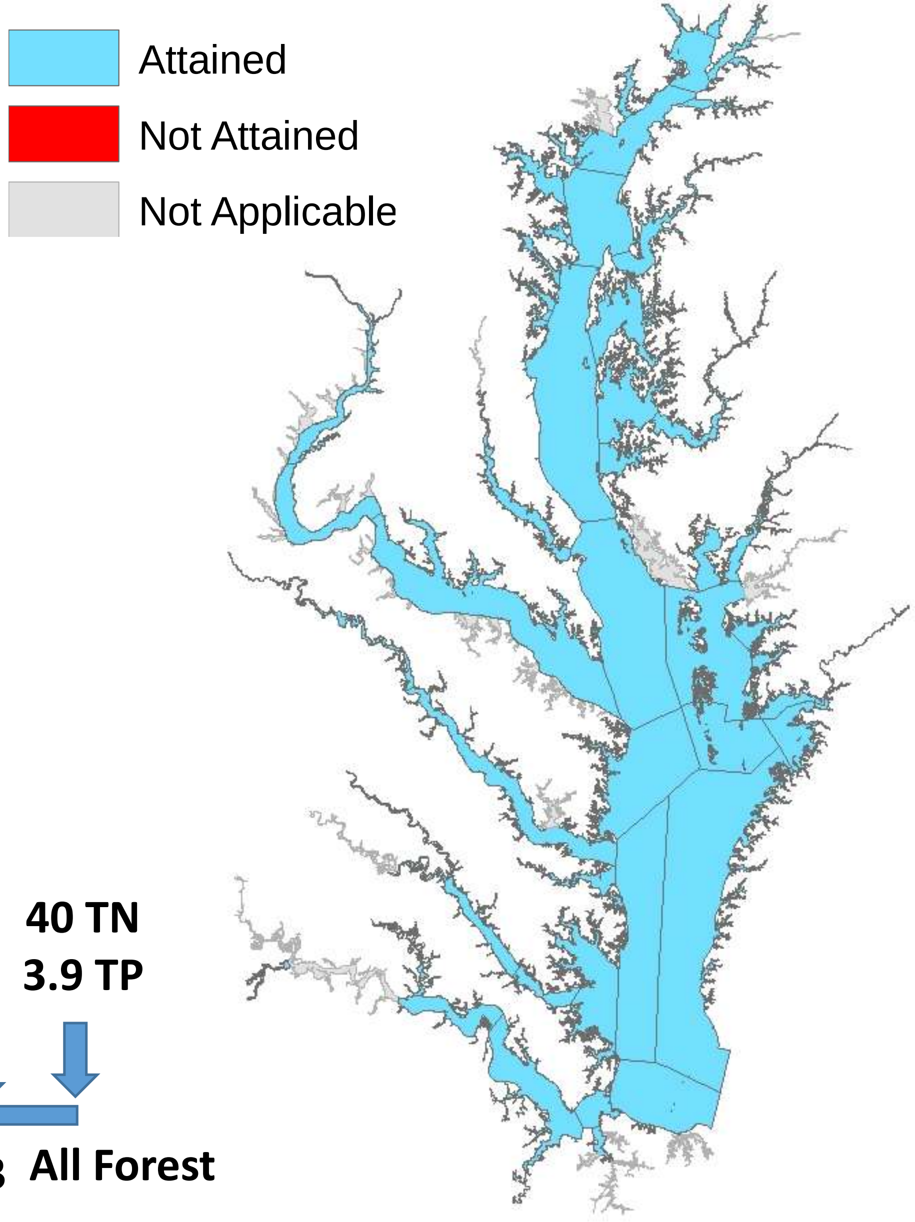
All Forest

E3

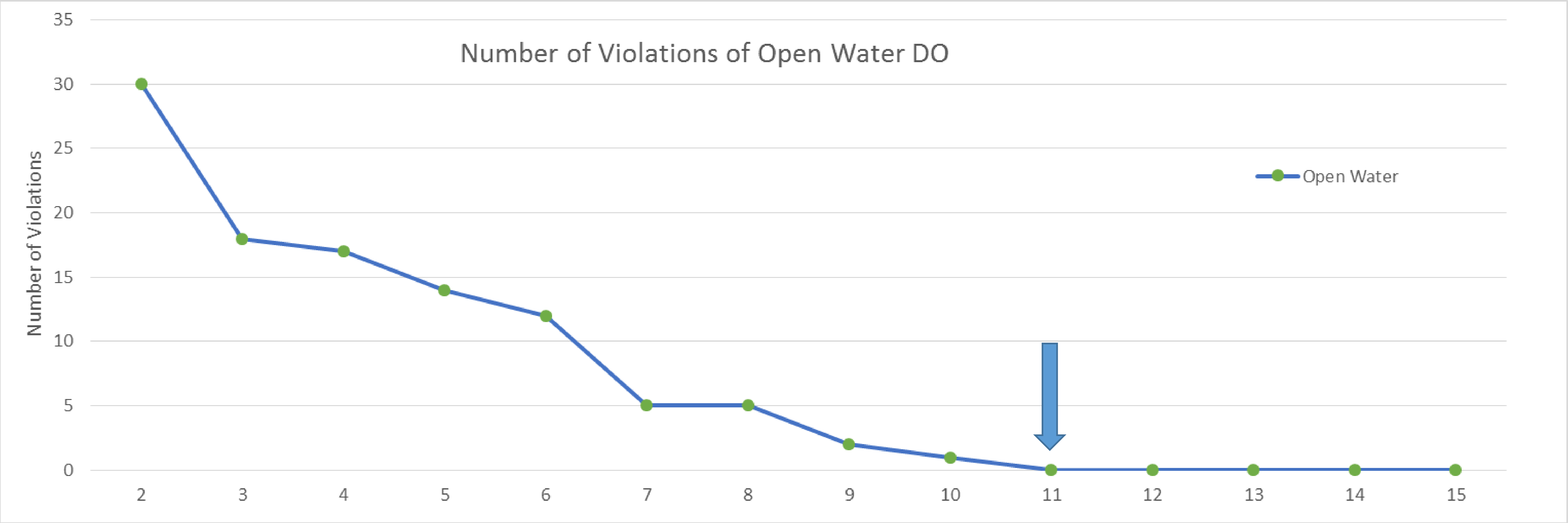


Segments Attaining Oxygen Standards: Open-Water Use

Segments NOT in Attainment



Segments Attaining Oxygen Standards: Open-Water Use



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
No Action												**E3**	**All Forest**

Segments Attaining Oxygen Standards: Deep-Water Use

Segments NOT in Attainment

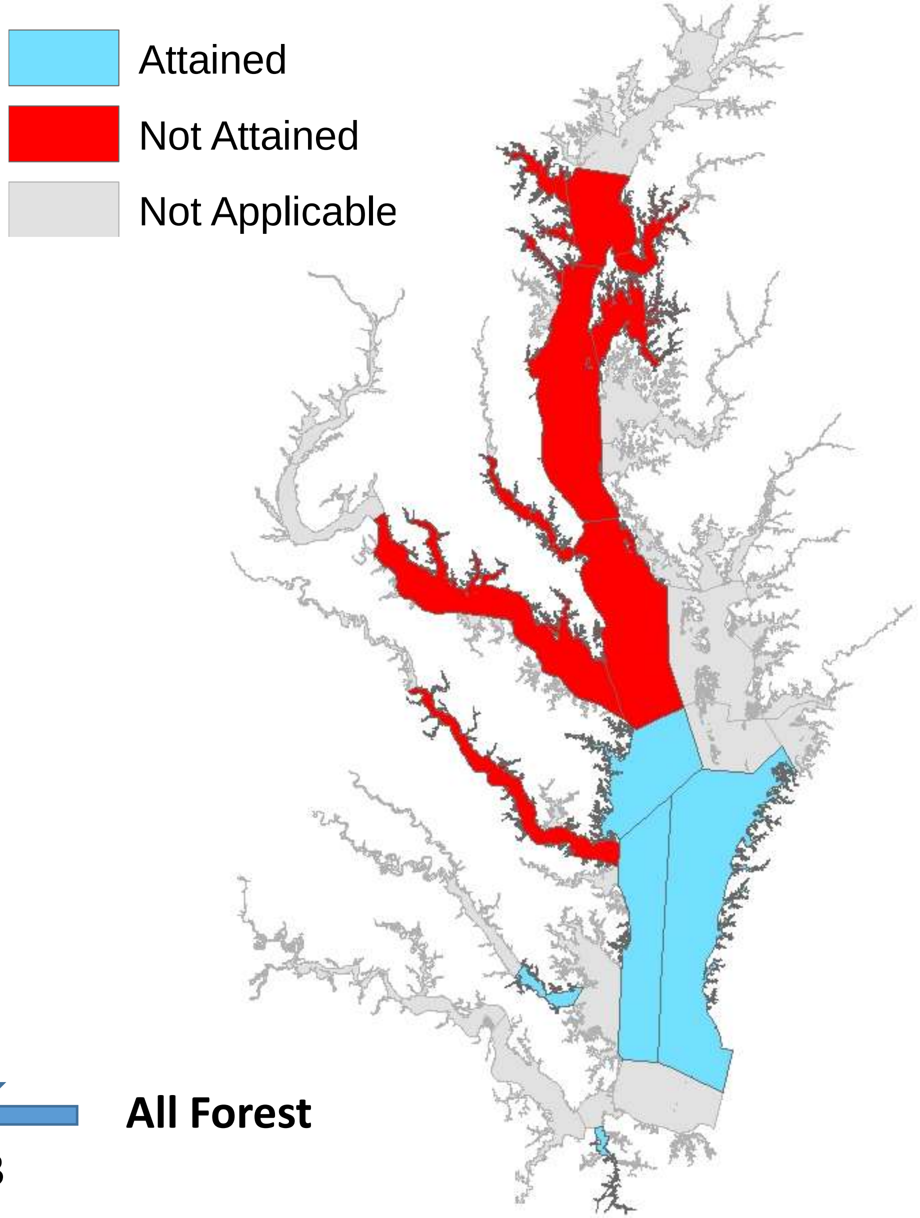
- CB3MH
- CB4MH
- CB5MH_MD
- PATMH
- MAGMH
- SEVMH
- PAXMH
- POTMH
- RPPMH
- CHSMH
- EASMH

404 TN
41.7 TP

No Action

E3

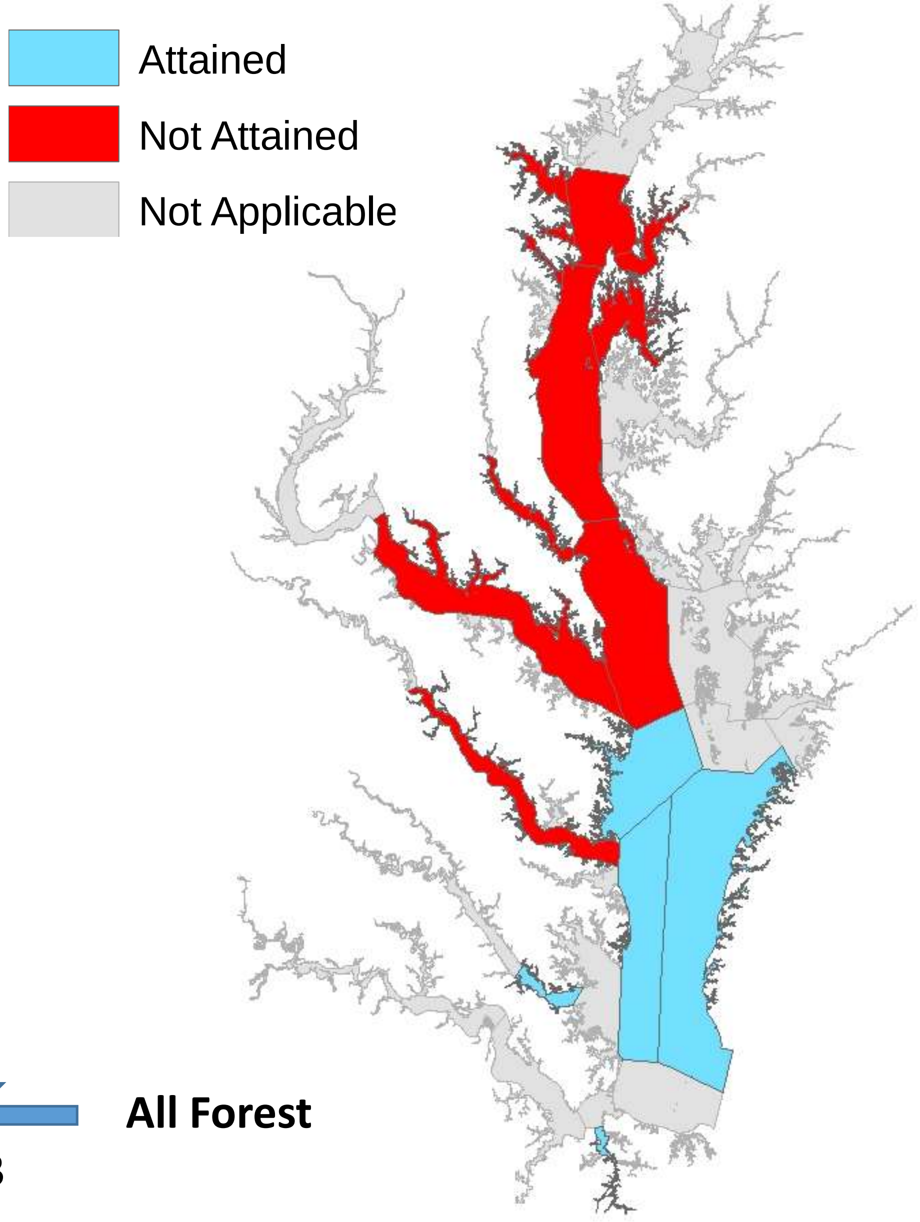
All Forest



Segments Attaining Oxygen Standards: Deep-Water Use

Segments NOT in Attainment

- CB3MH
- CB4MH
- CB5MH_MD
- PATMH
- MAGMH
- SEVMH
- PAXMH
- POTMH
- RPPMH
- CHSMH
- EASMH



347 TN
30.4 TP

All Forest

E3

Segments Attaining Oxygen Standards: Deep-Water Use

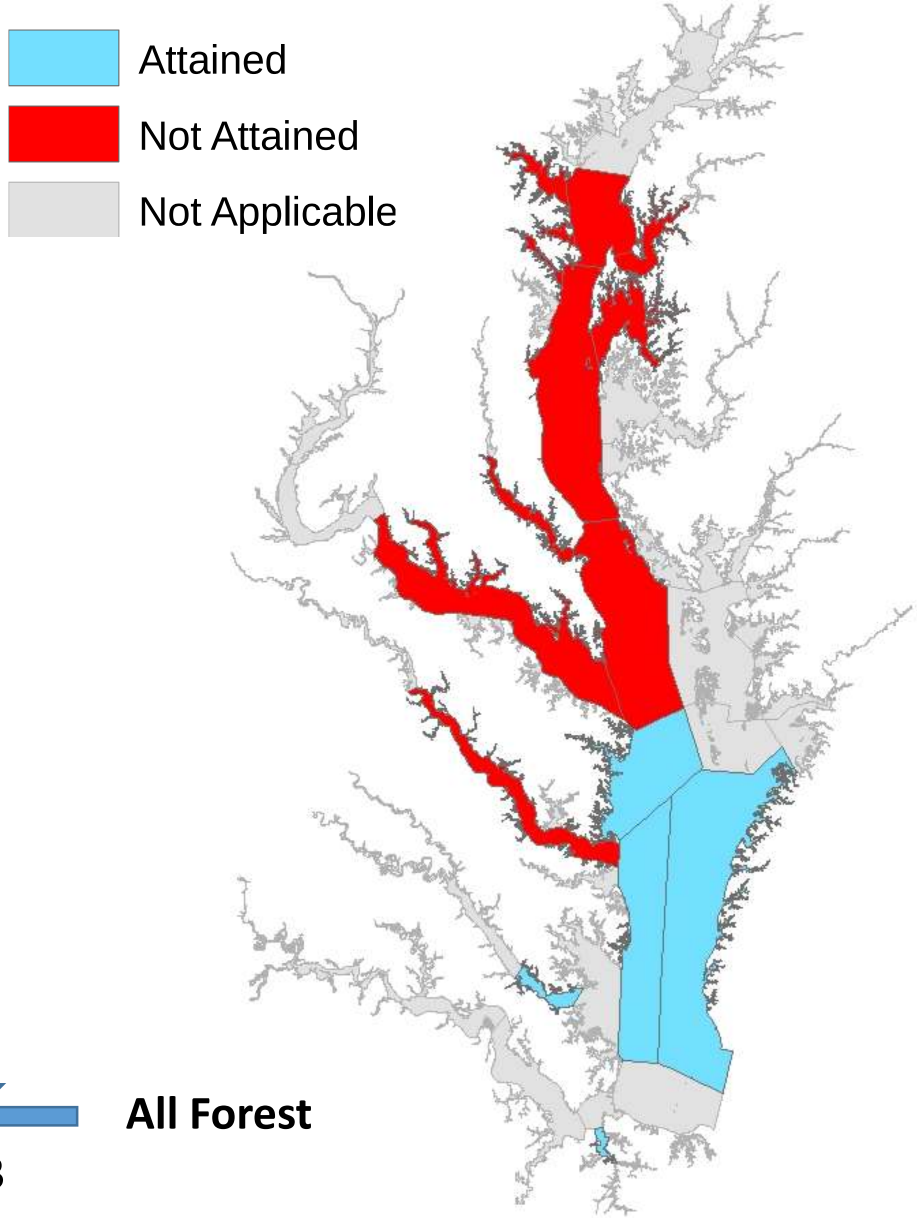
Segments NOT in Attainment

- CB3MH
- CB4MH
- CB5MH_MD
- PATMH
- MAGMH
- SEVMH
- PAXMH
- POTMH
- RPPMH
- CHSMH
- EASMH

338 TN
27.7 TP

All Forest

E3



Segments Attaining Oxygen Standards: Deep-Water Use

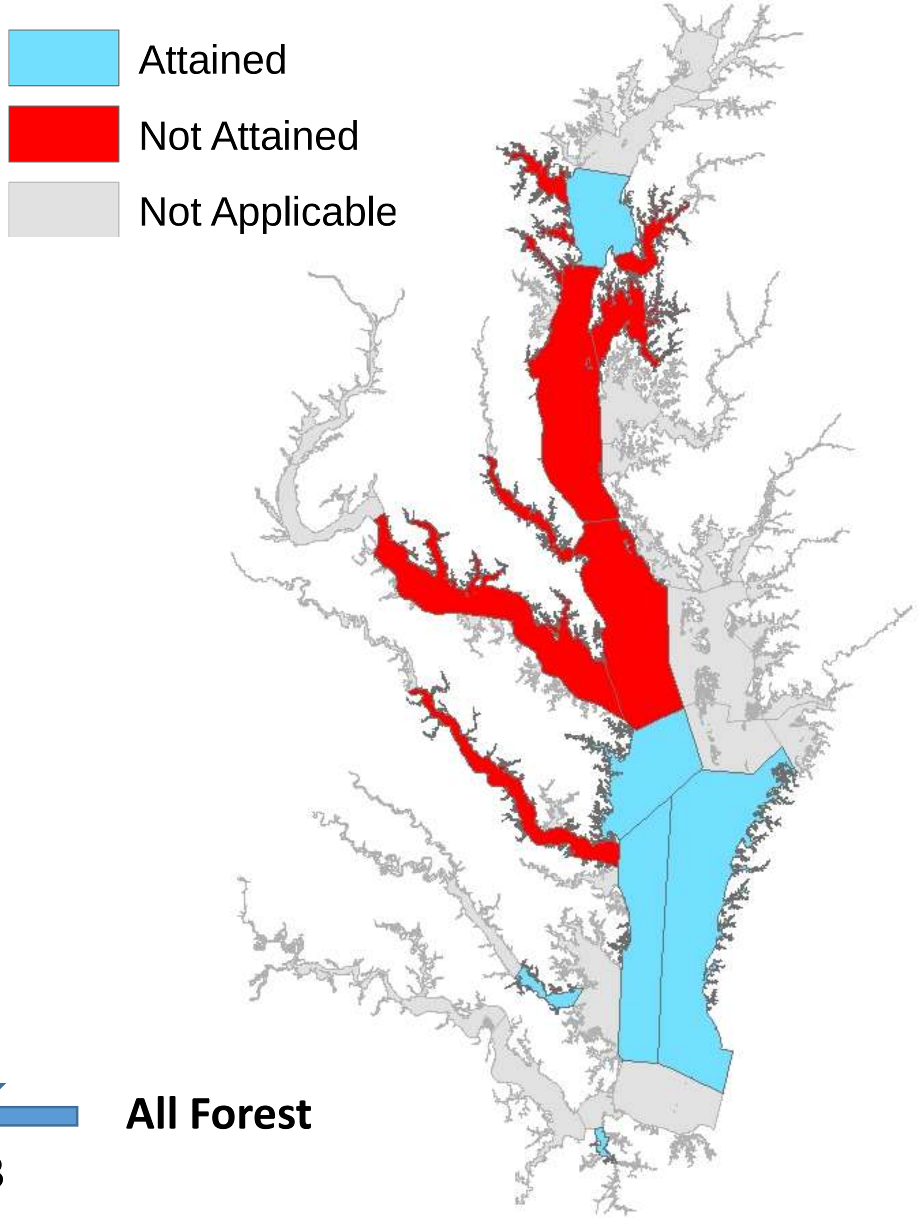
Segments NOT in Attainment

- CB4MH
- CB5MH_MD
- PATMH
- MAGMH
- SEVMH
- PAXMH
- POTMH
- RPPMH
- CHSMH
- EASMH

337 TN
23.7 TP

E3

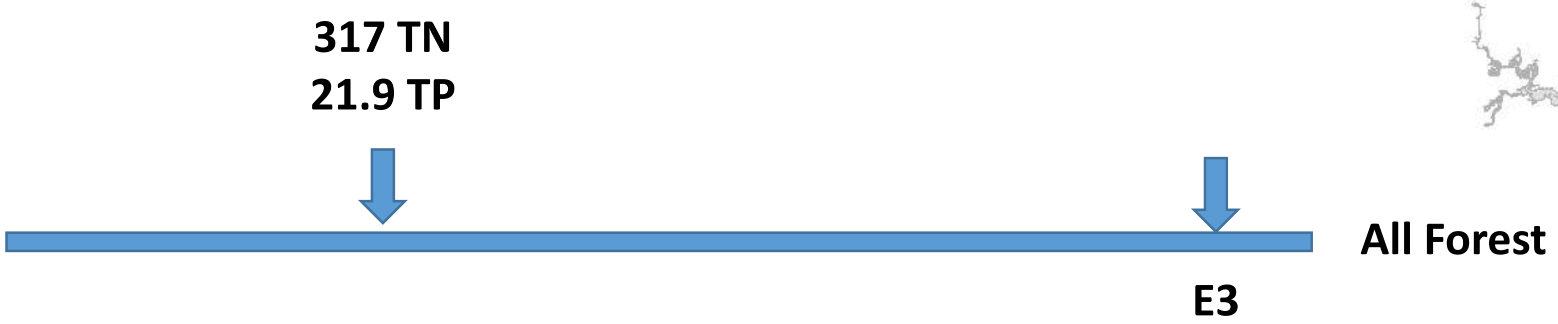
All Forest

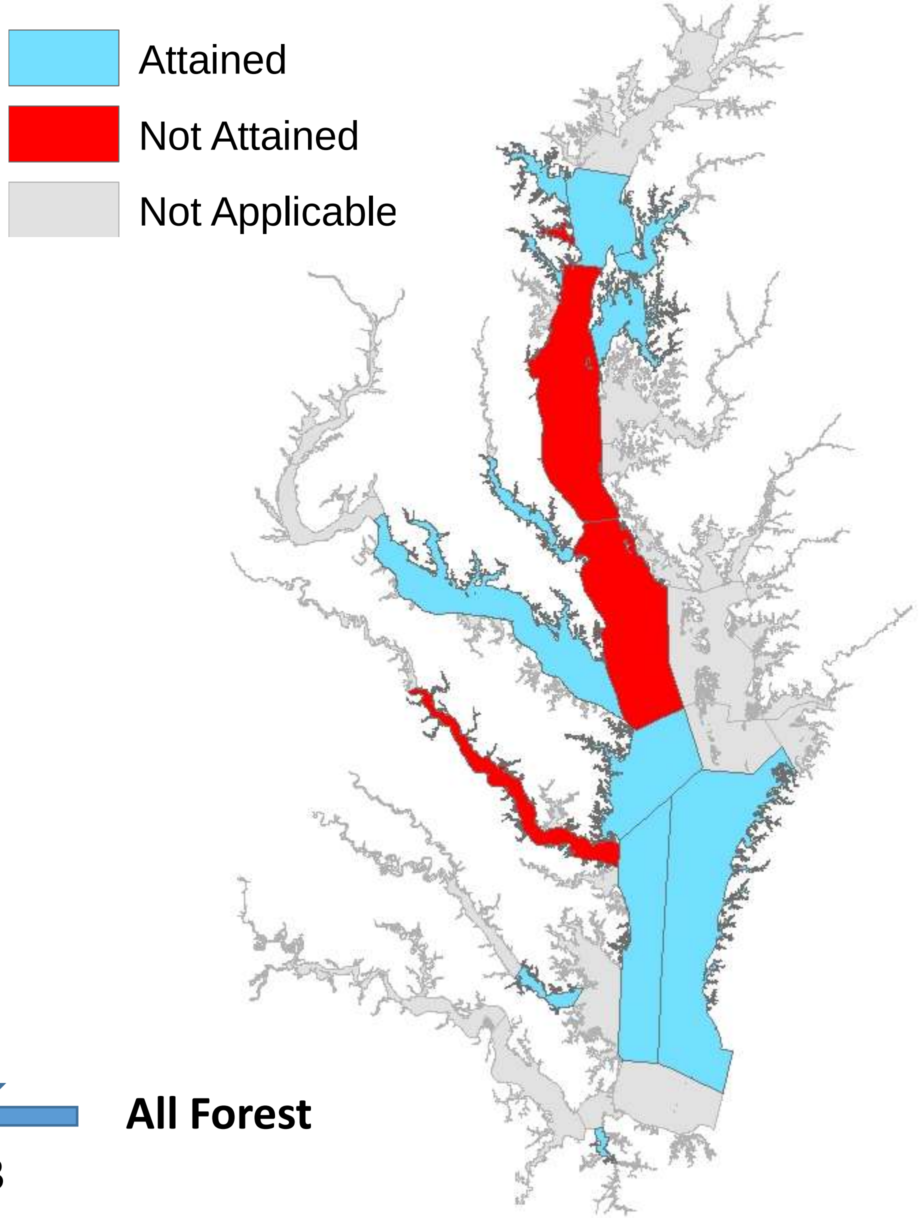


Segments Attaining Oxygen Standards: Deep-Water Use

Segments NOT in Attainment

- CB4MH
- CB5MH_MD
- PATMH
- MAGMH
- PAXMH
- POTMH
- RPPMH
- CHSMH

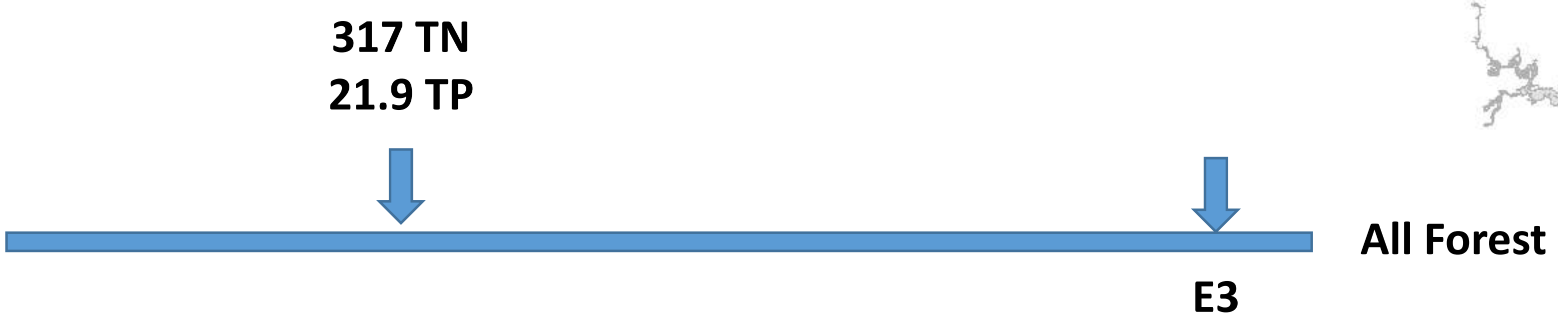


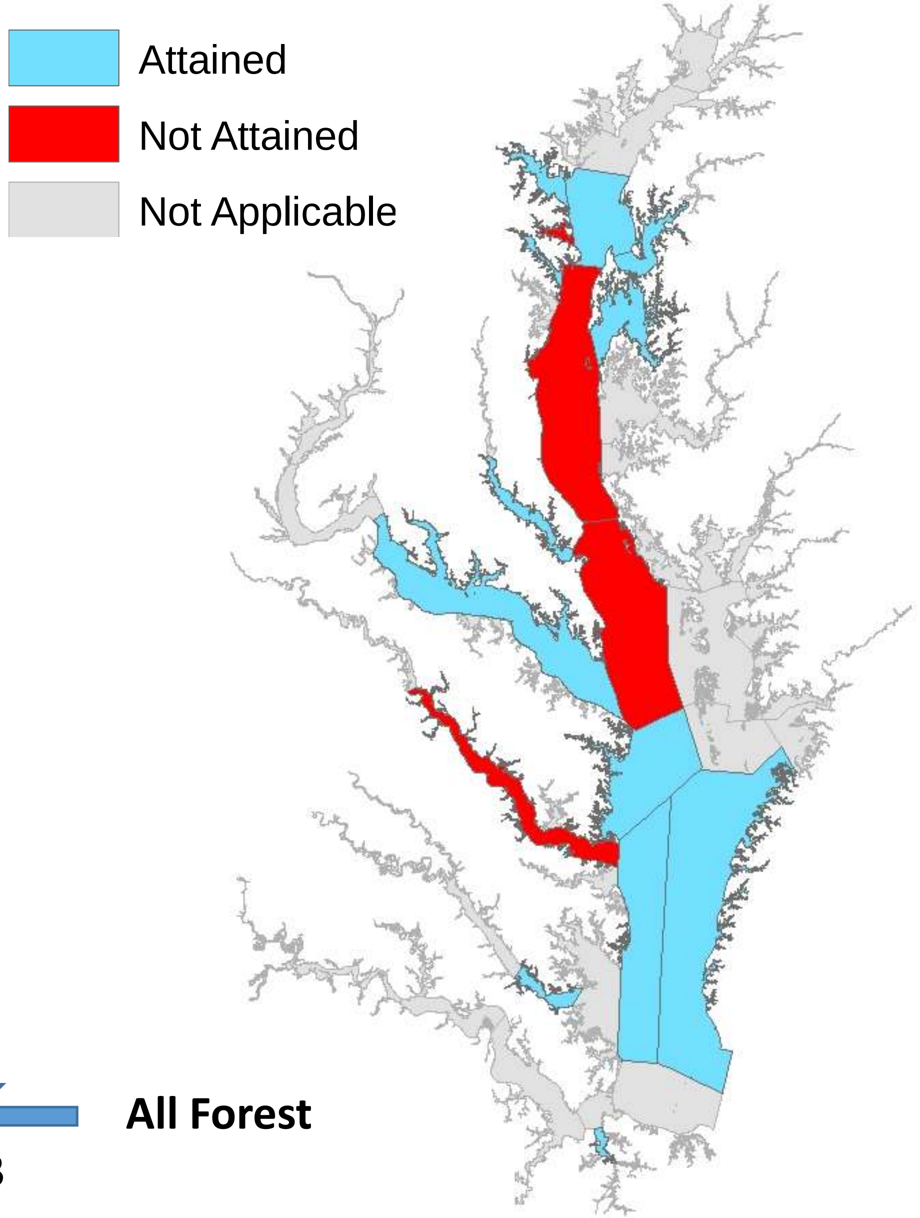


Segments Attaining Oxygen Standards: Deep-Water Use

Segments NOT in Attainment

- CB4MH
- CB5MH_MD
- MAGMH
- RPPMH

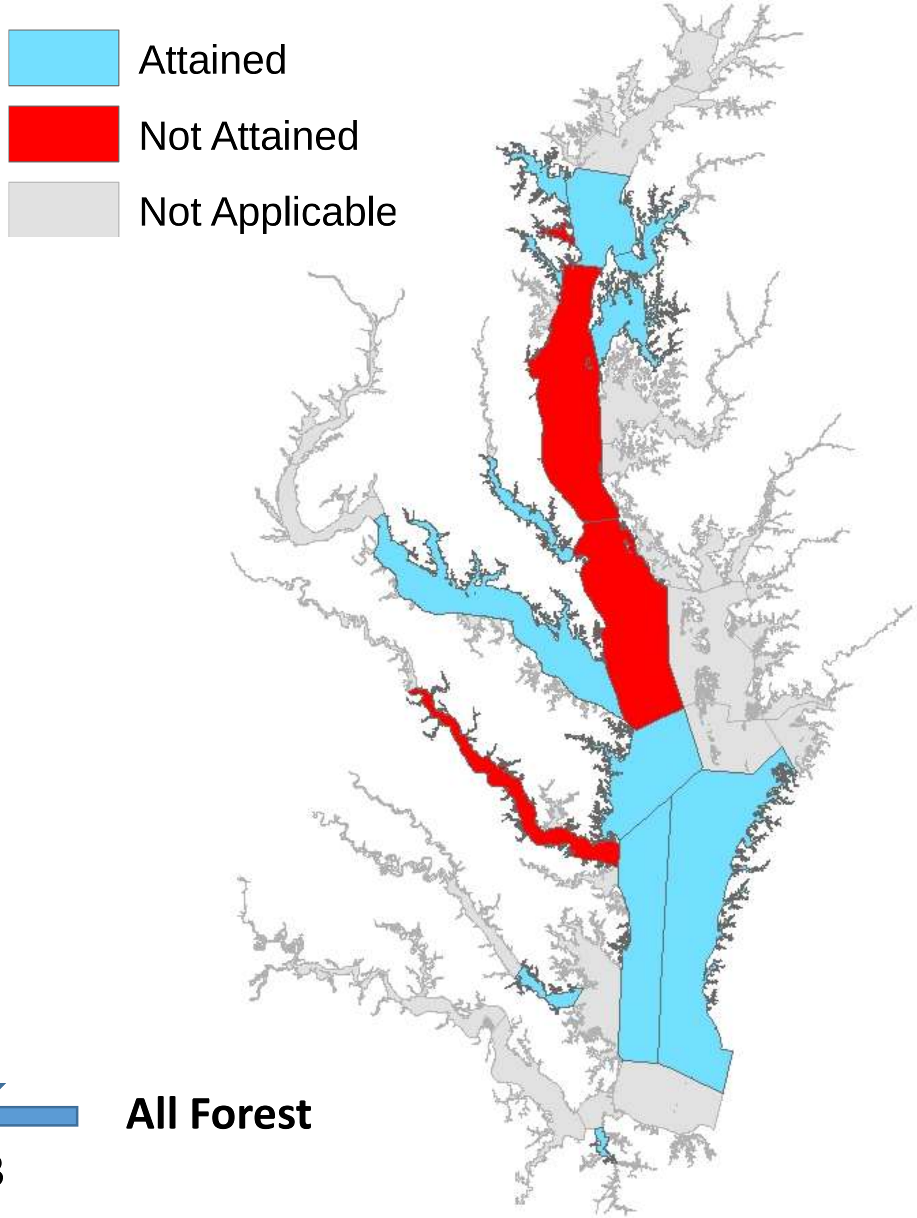




Segments Attaining Oxygen Standards: Deep-Water Use

Segments NOT in Attainment

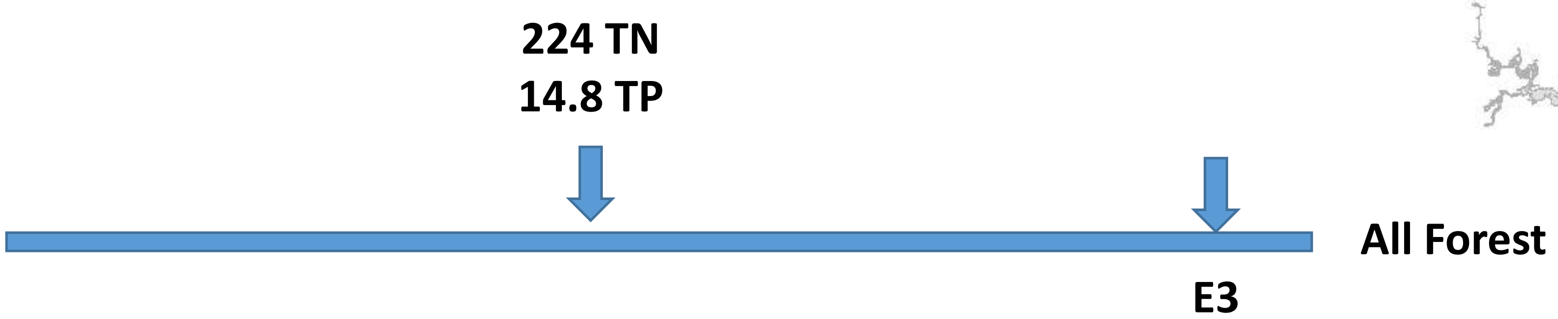
- CB4MH
- CB5MH_MD
- MAGMH
- RPPMH

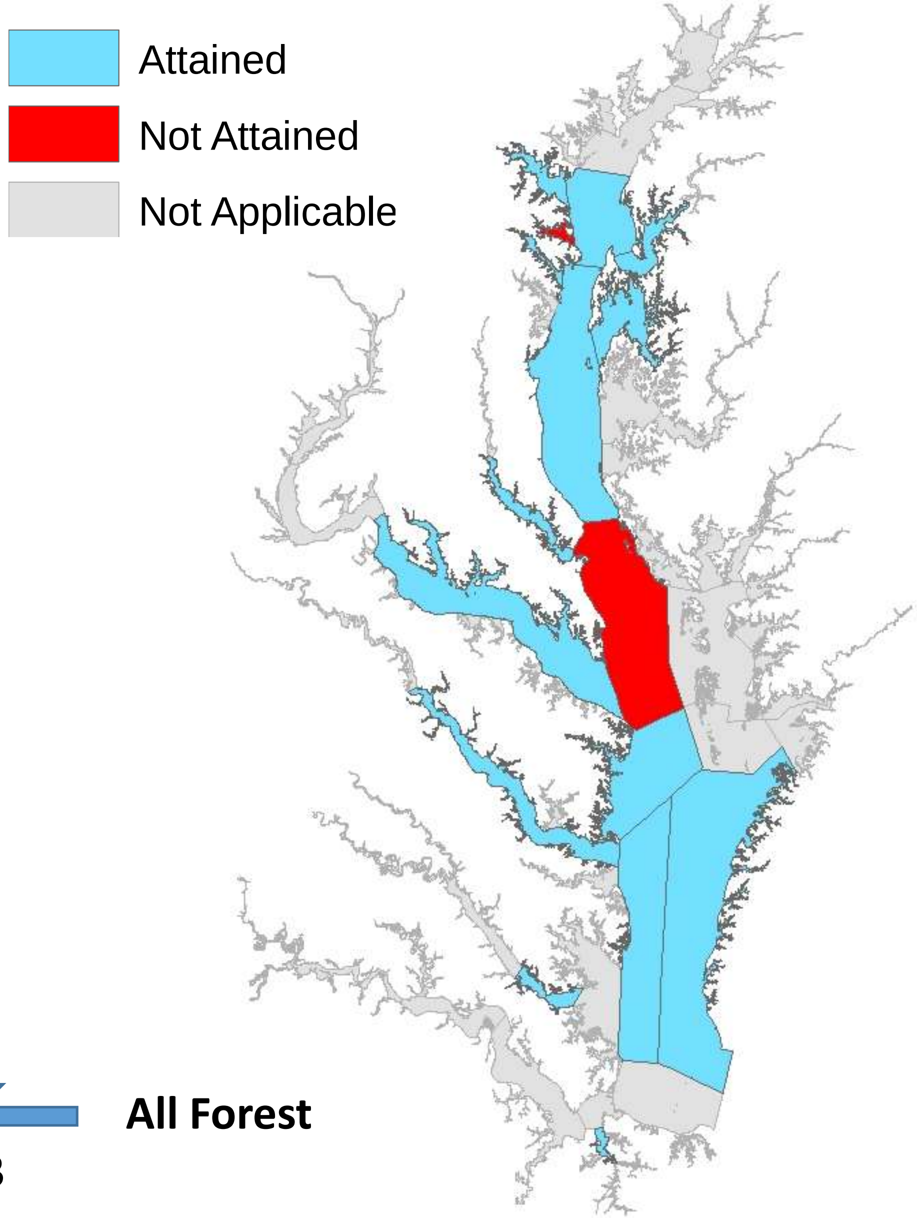


Segments Attaining Oxygen Standards: Deep-Water Use

Segments NOT in Attainment

- CB5MH_MD
- MAGMH

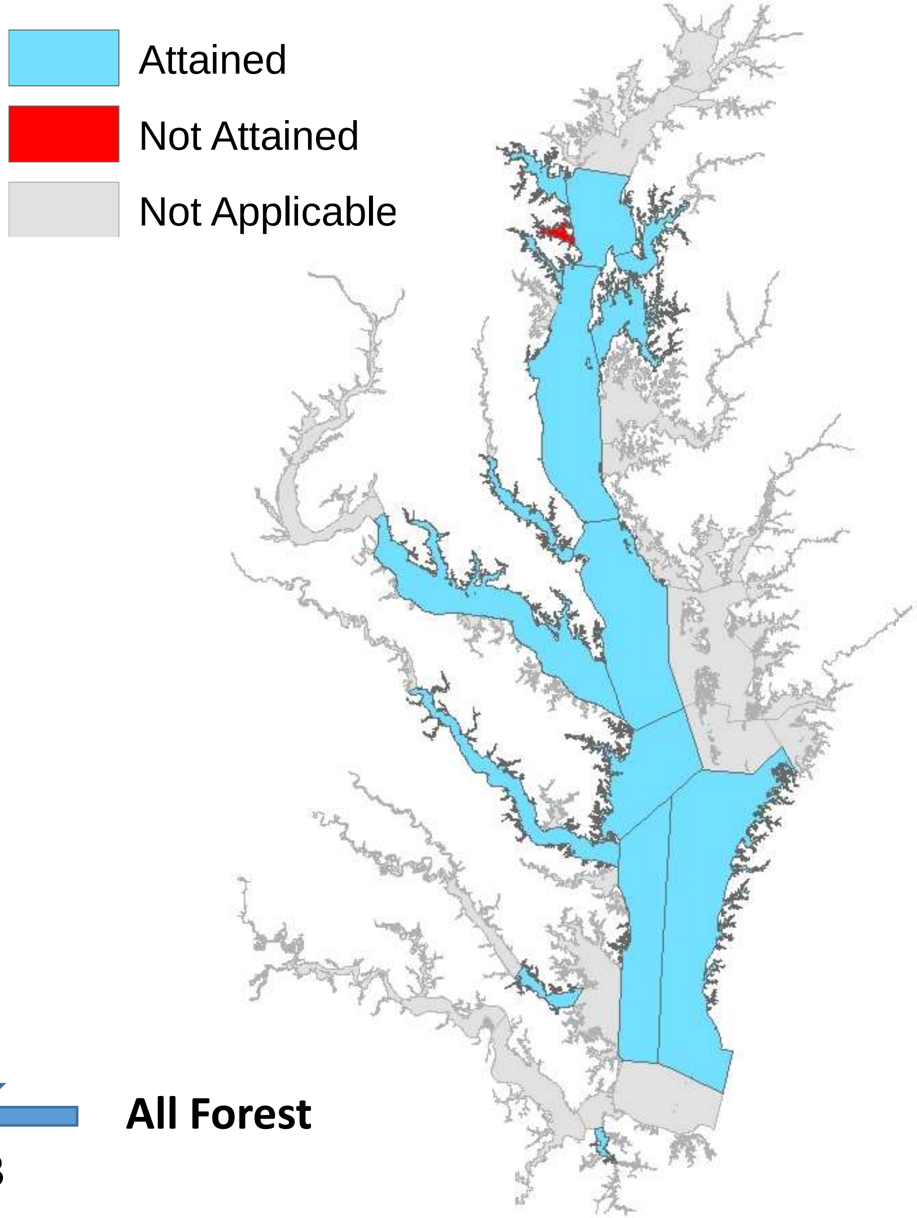




Segments Attaining Oxygen Standards: Deep-Water Use

Segments NOT in Attainment

- MAGMH



205 TN
14.0 TP

All Forest

E3

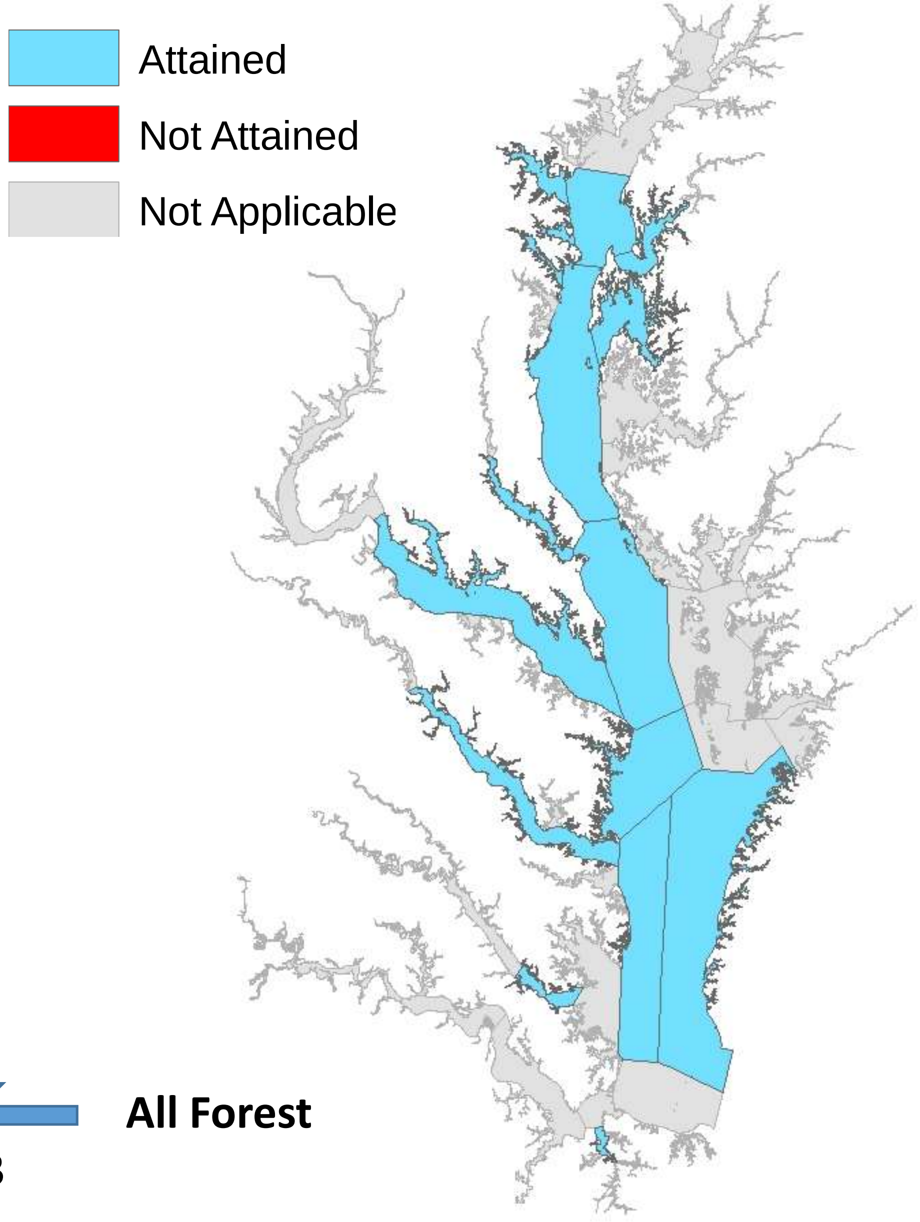
Segments Attaining Oxygen Standards: Deep-Water Use

Segments NOT in Attainment

195 TN
13.7 TP

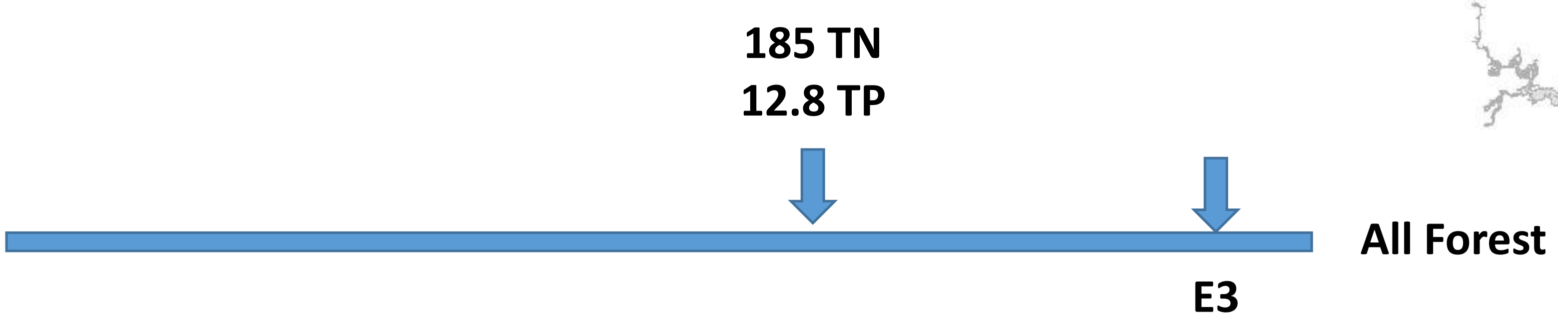
All Forest

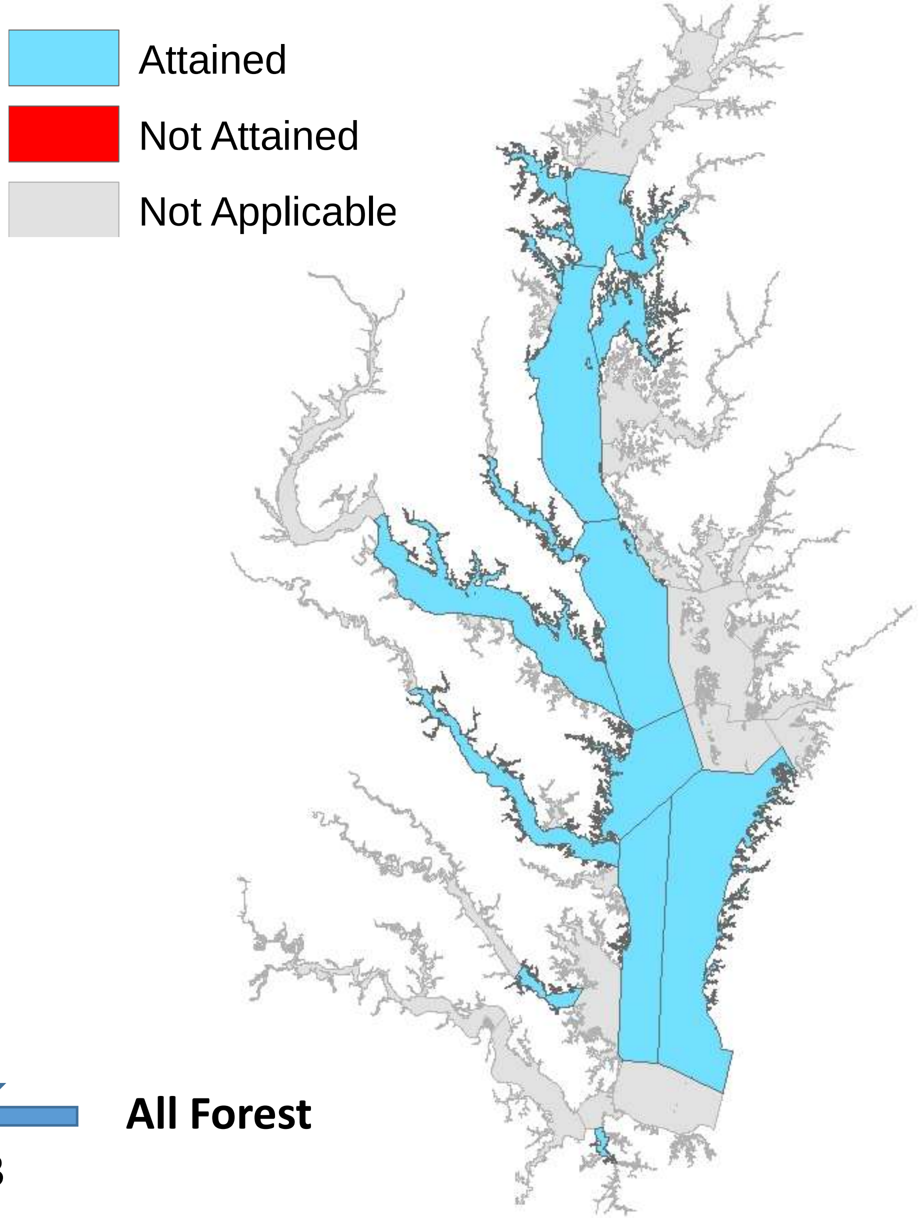
E3



Segments Attaining Oxygen Standards: Deep-Water Use

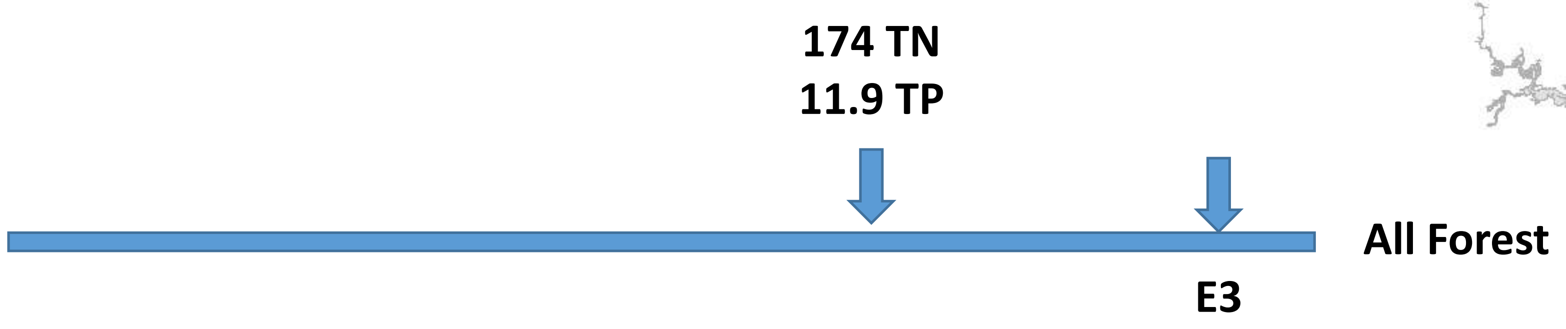
Segments NOT in Attainment

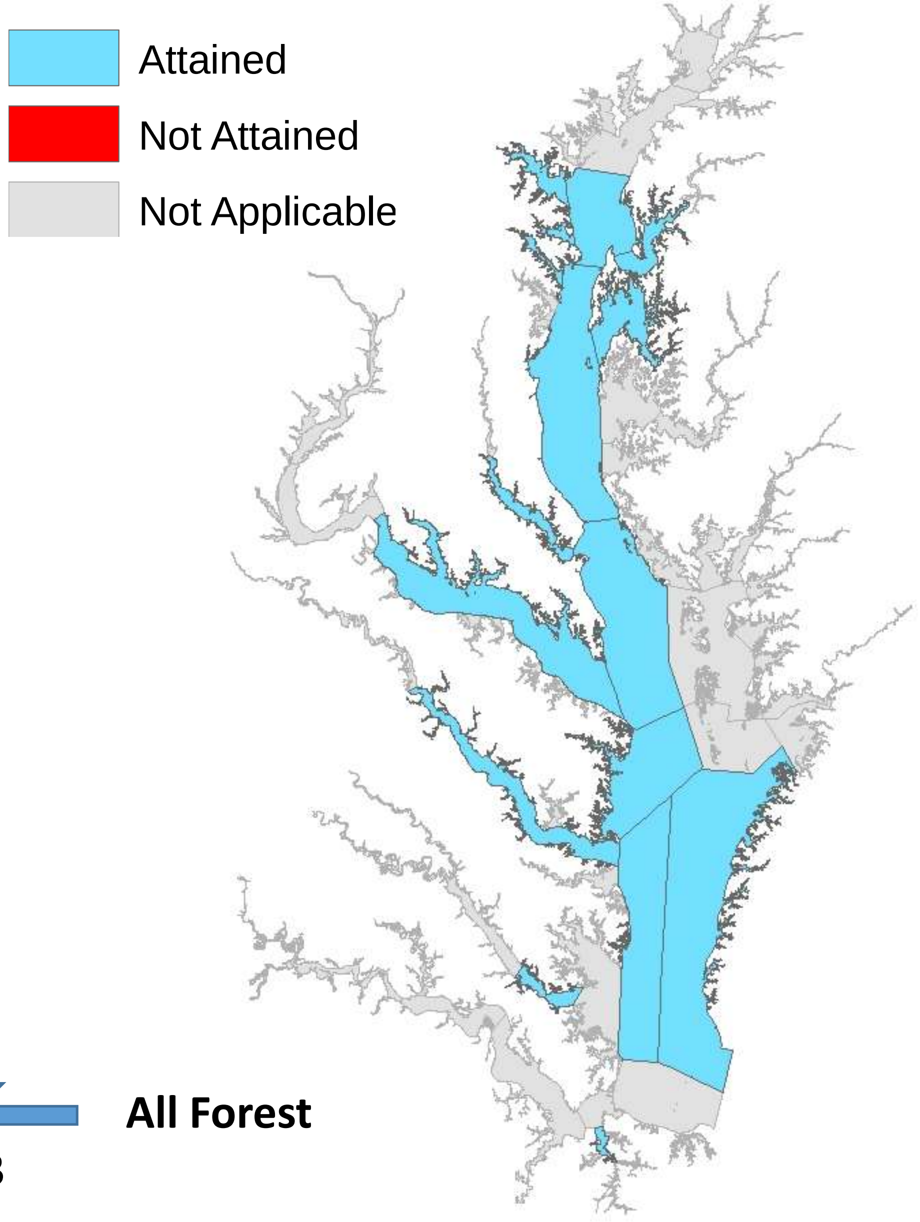




Segments Attaining Oxygen Standards: Deep-Water Use

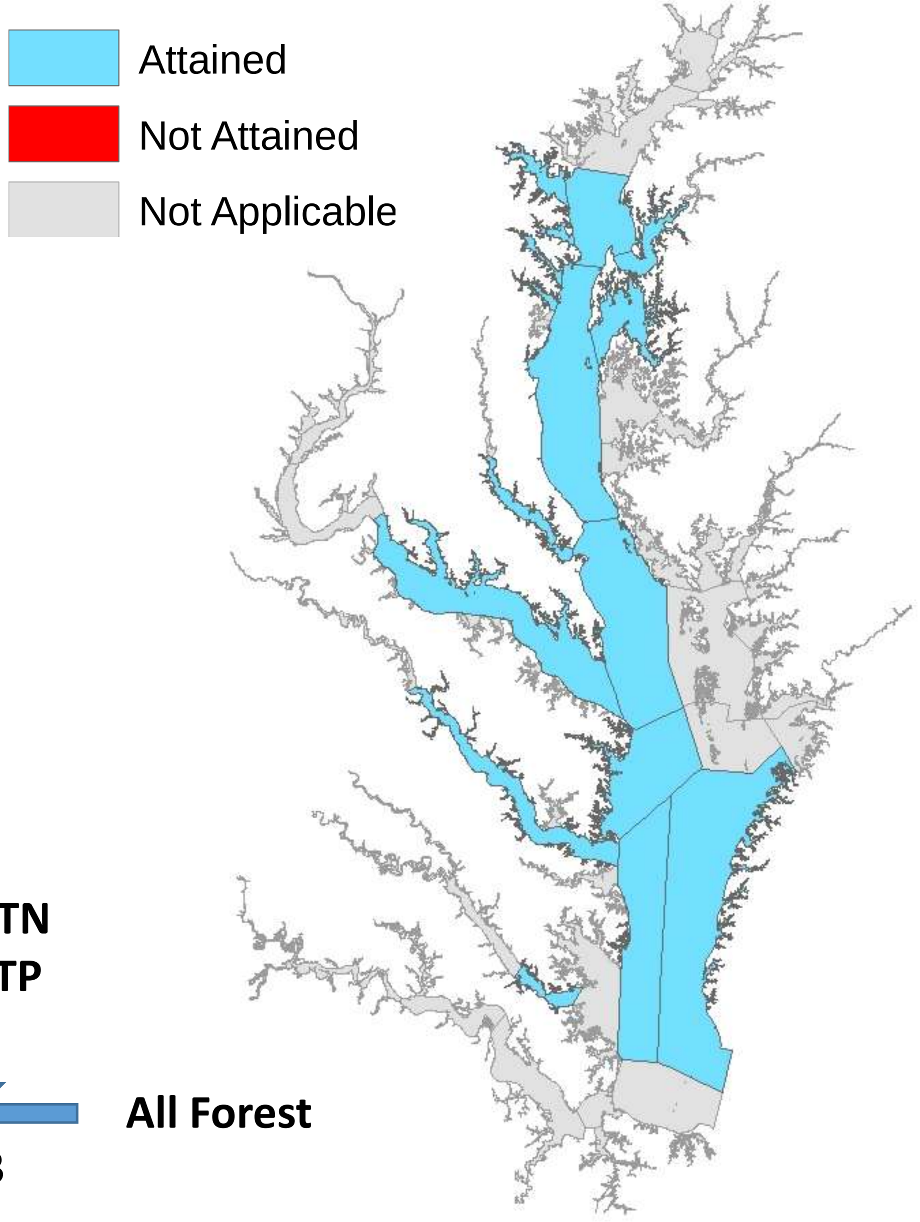
Segments NOT in Attainment





Segments Attaining Oxygen Standards: Deep-Water Use

Segments NOT in Attainment



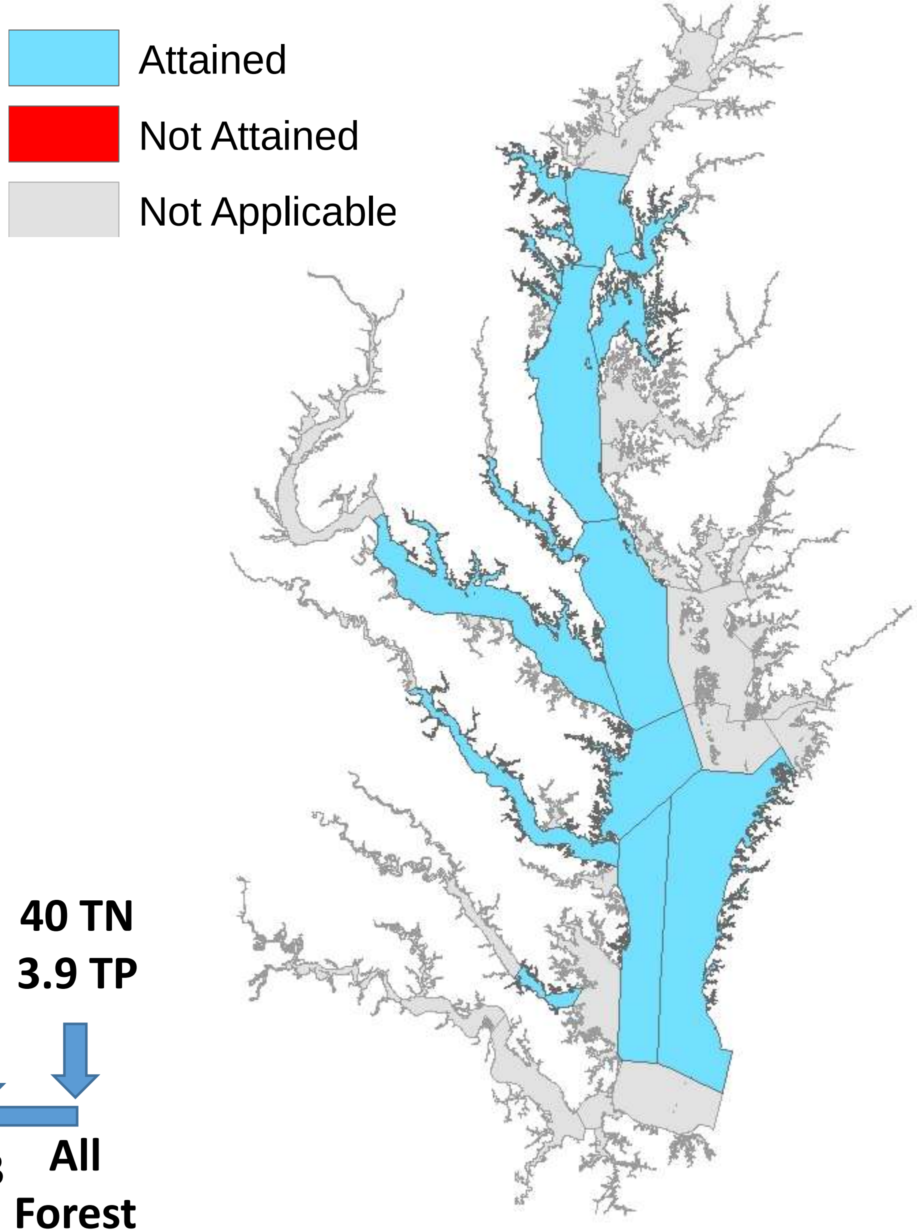
133 TN
8.6 TP

All Forest

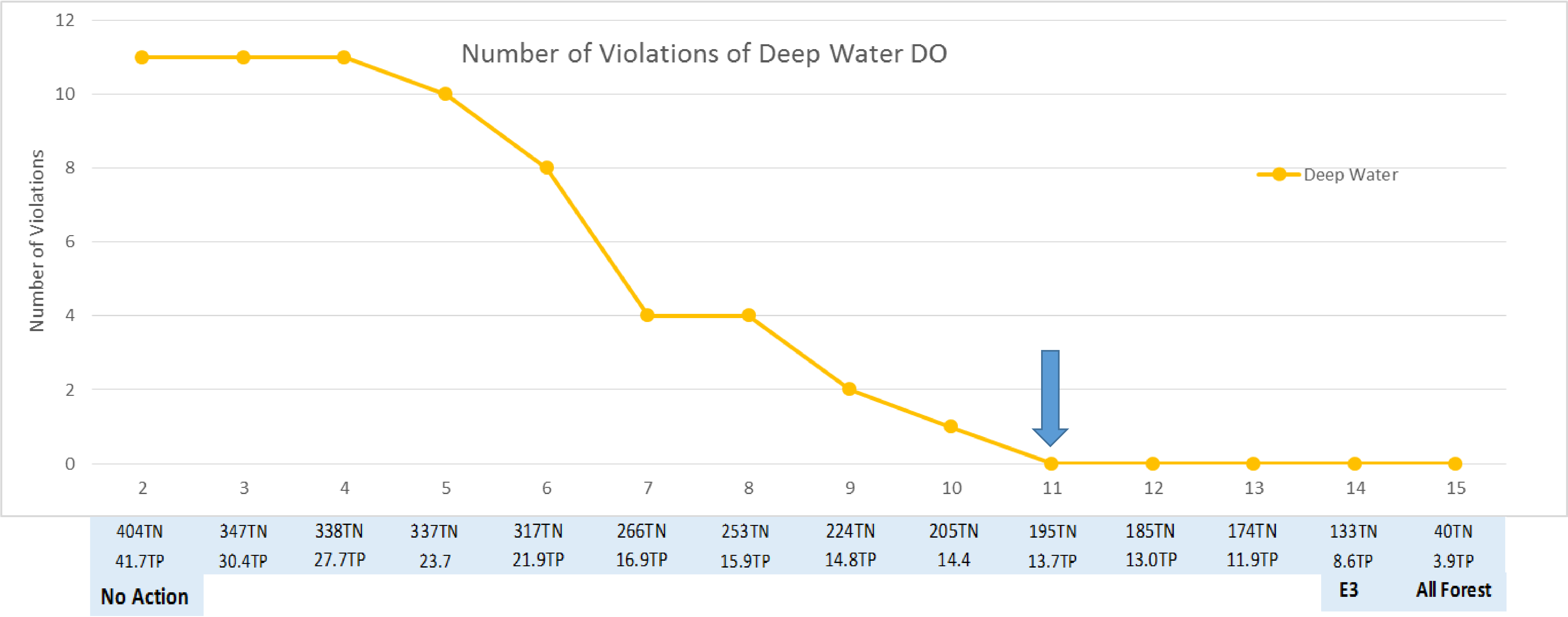
E3

Segments Attaining Oxygen Standards: Deep-Water Use

Segments NOT in Attainment



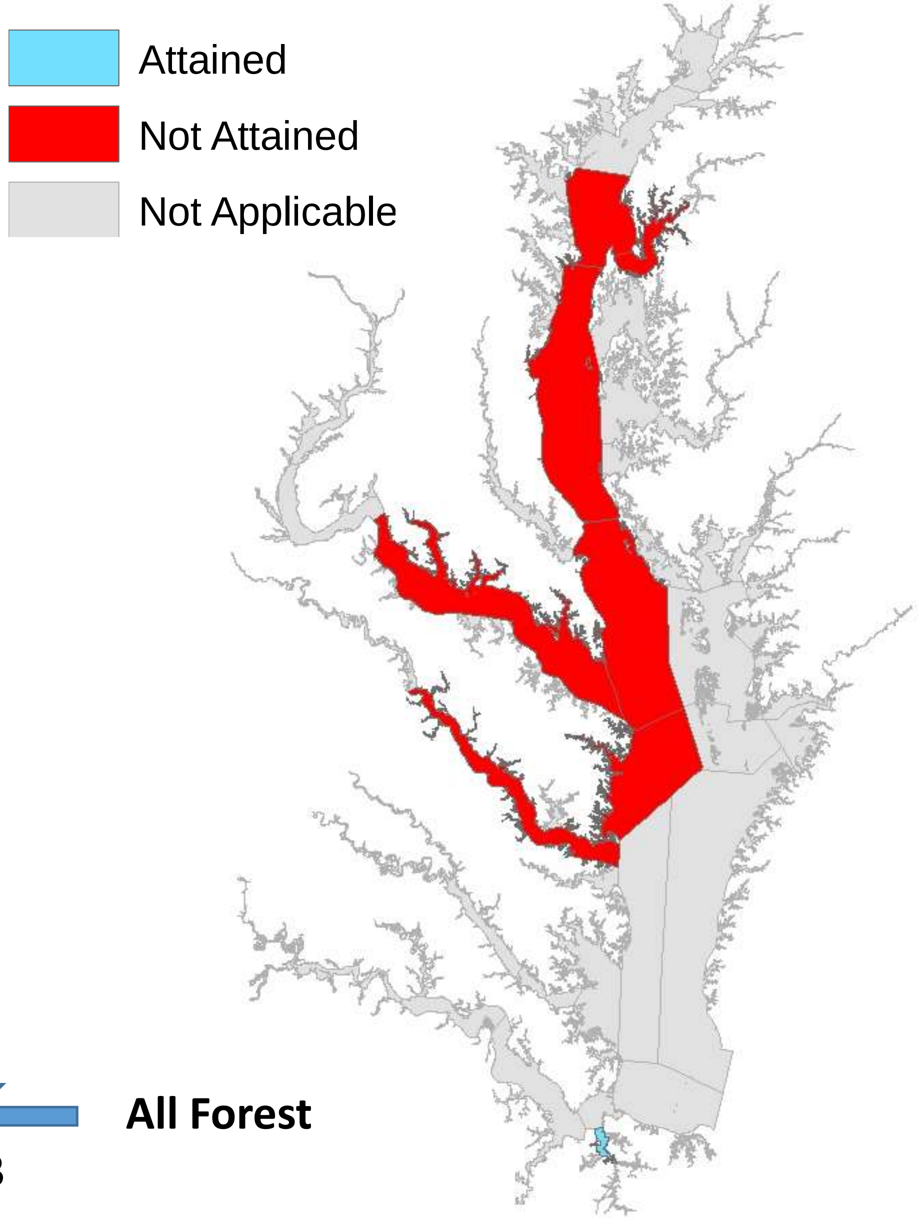
Segments Attaining Oxygen Standards: Deep-Water Use



Segments Attaining Oxygen Standards: Deep-Channel Use

Segments NOT in Attainment

- CB3MH
- CB4MH
- CB5MH_MD
- CB5MH_VA
- PATMH
- POTMH
- RPPMH
- CHSMH



404 TN
41.7 TP

No Action

E3

All Forest

Segments Attaining Oxygen Standards: Deep-Channel Use

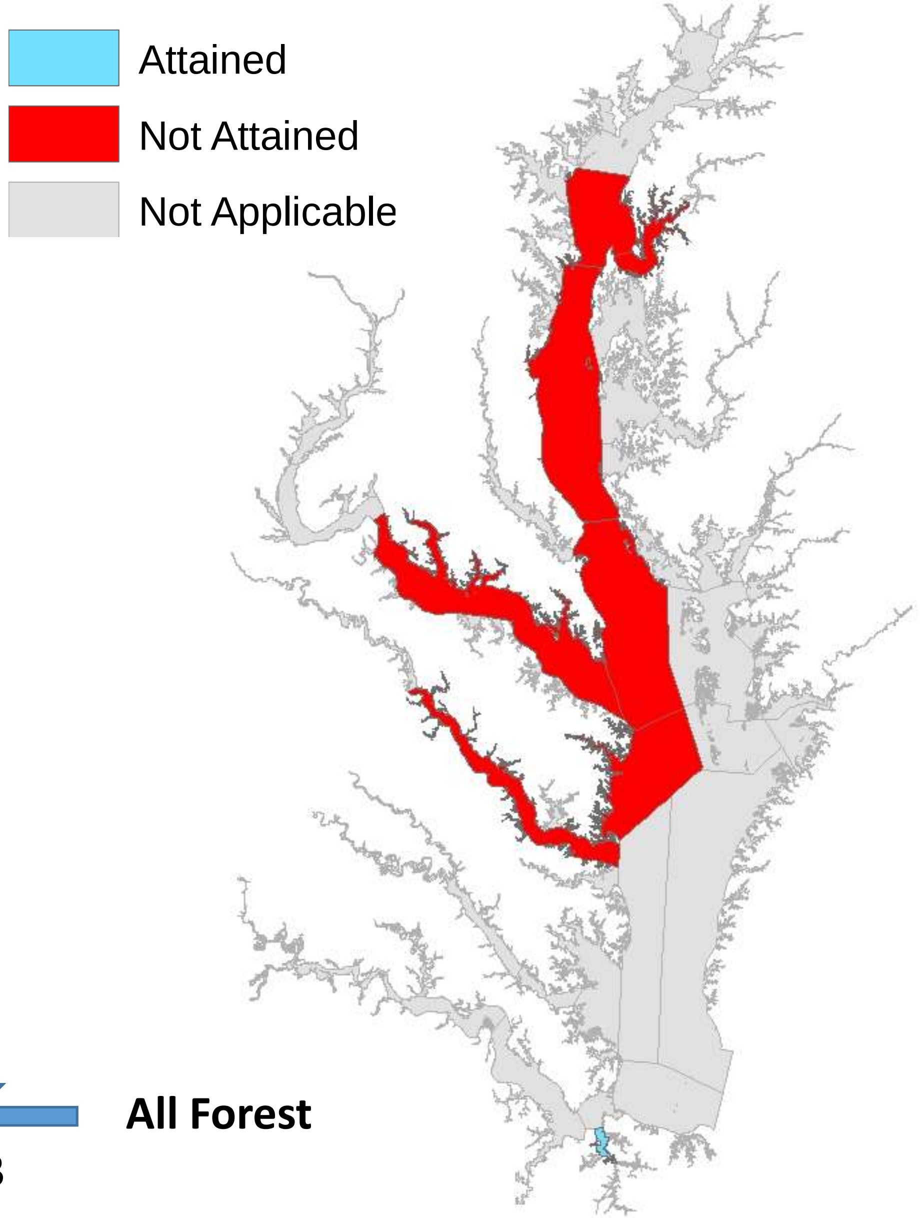
Segments NOT in Attainment

- CB3MH
- CB4MH
- CB5MH_MD
- CB5MH_VA
- PATMH
- POTMH
- RPPMH
- CHSMH

347 TN
30.4 TP

All Forest

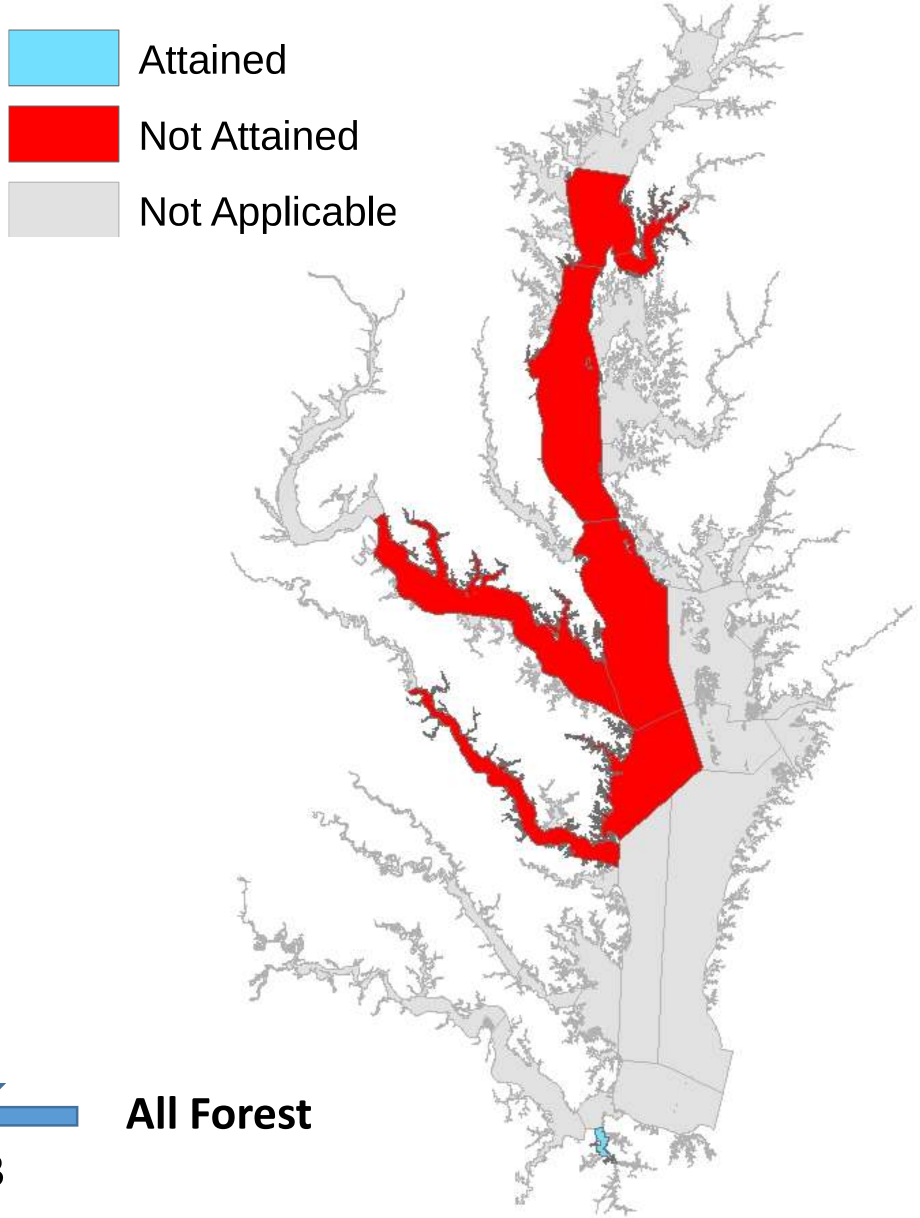
E3



Segments Attaining Oxygen Standards: Deep-Channel Use

Segments NOT in Attainment

- CB3MH
- CB4MH
- CB5MH_MD
- CB5MH_VA
- PATMH
- POTMH
- RPPMH
- CHSMH



338 TN
27.7 TP

E3

All Forest

Segments Attaining Oxygen Standards: Deep-Channel Use

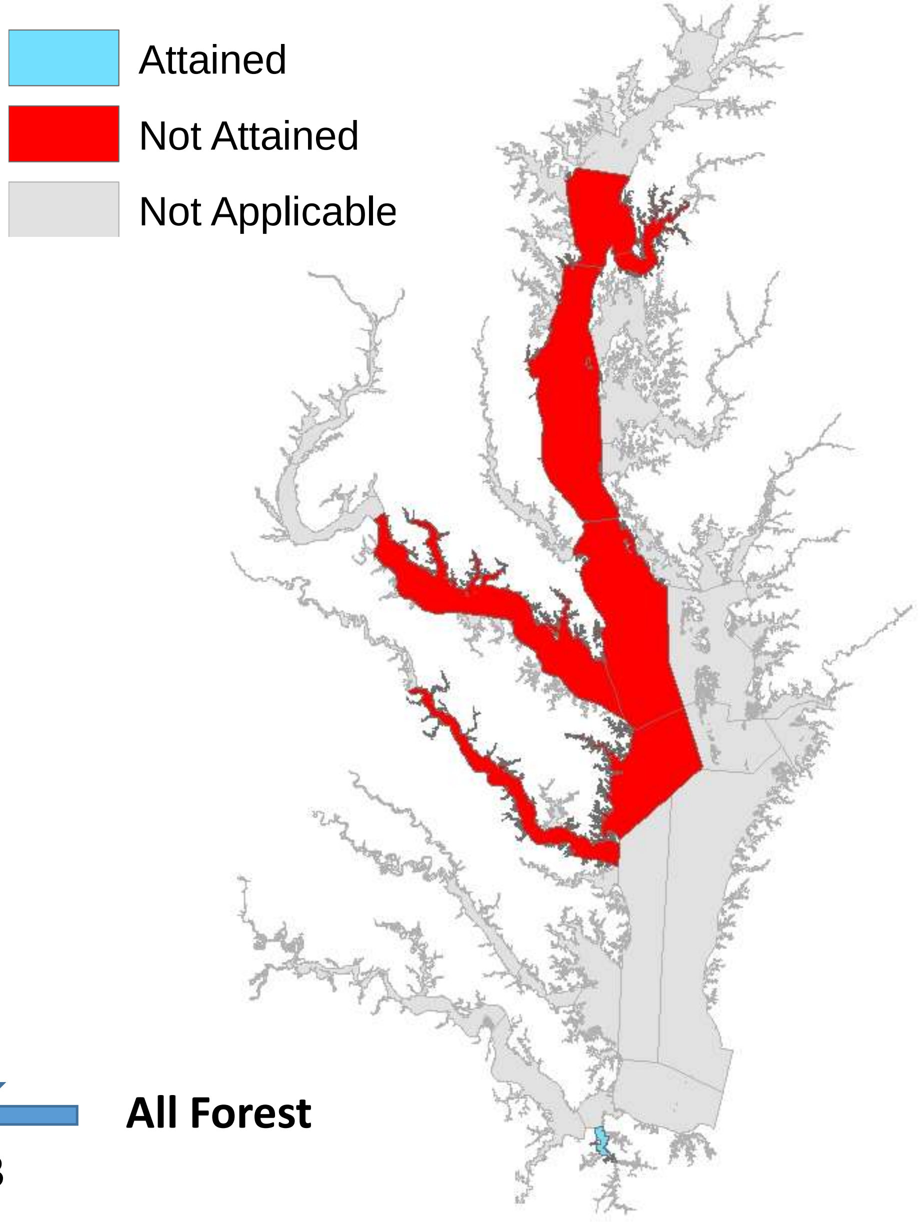
Segments NOT in Attainment

- CB3MH
- CB4MH
- CB5MH_MD
- CB5MH_VA
- POTMH
- RPPMH
- CHSMH

337 TN
23.7 TP

E3

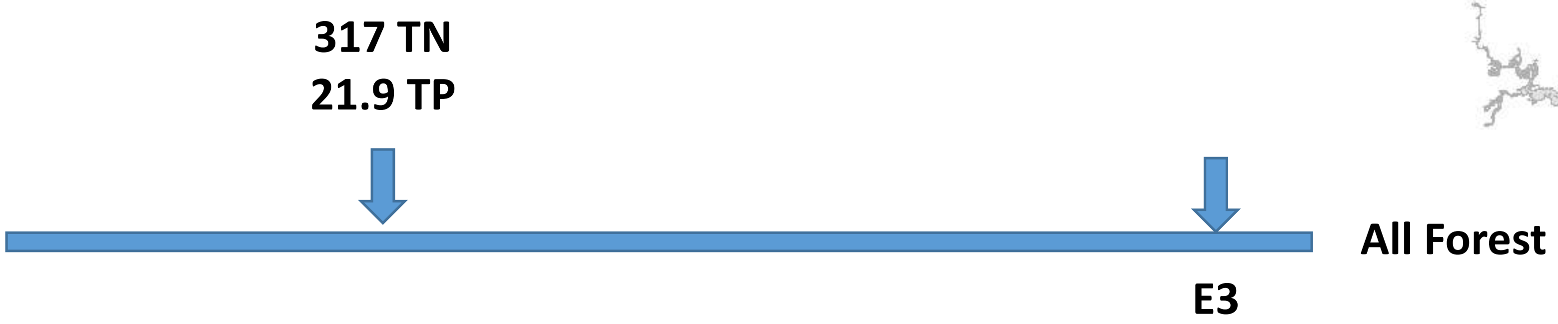
All Forest

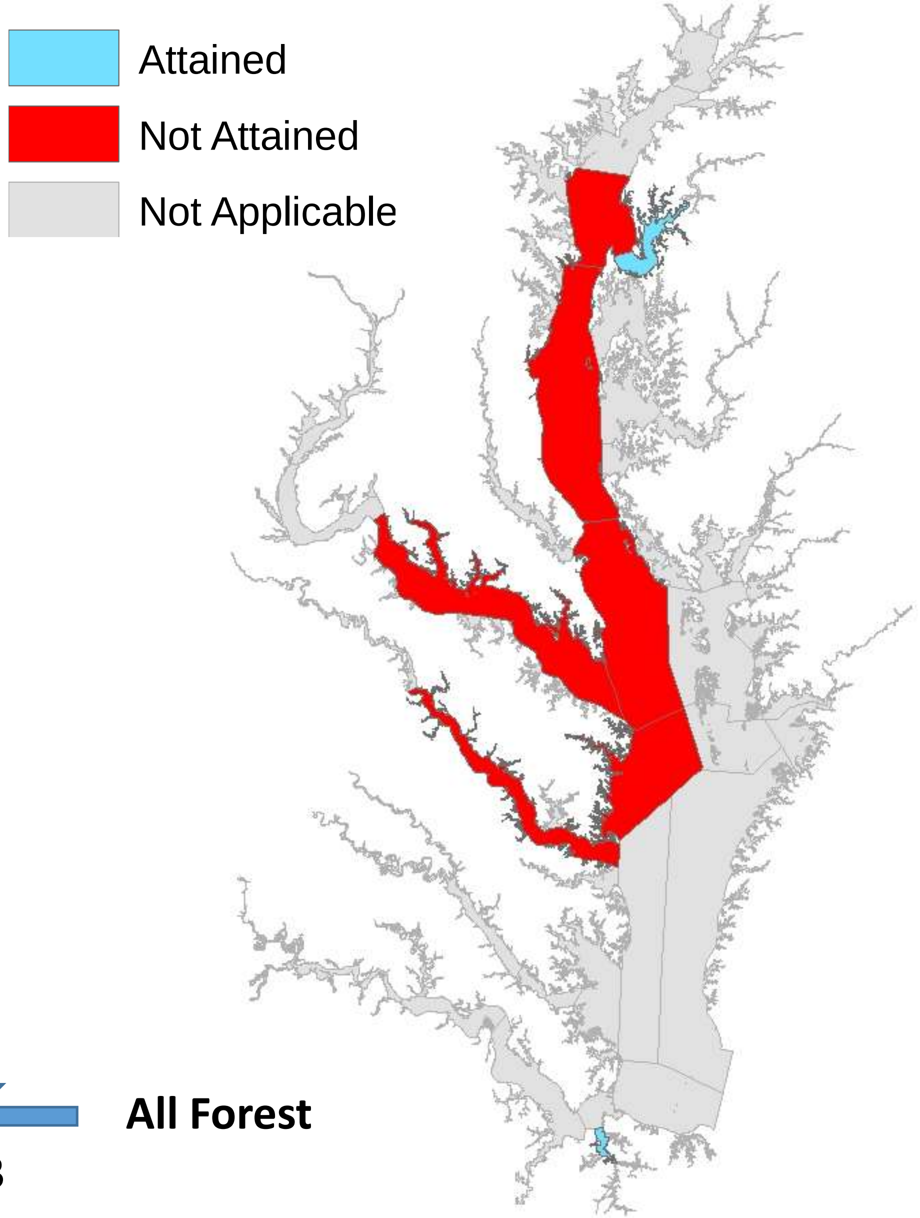


Segments Attaining Oxygen Standards: Deep-Channel Use

Segments NOT in Attainment

- CB3MH
- CB4MH
- CB5MH_MD
- CHSMH
- POTMH
- RPPMH

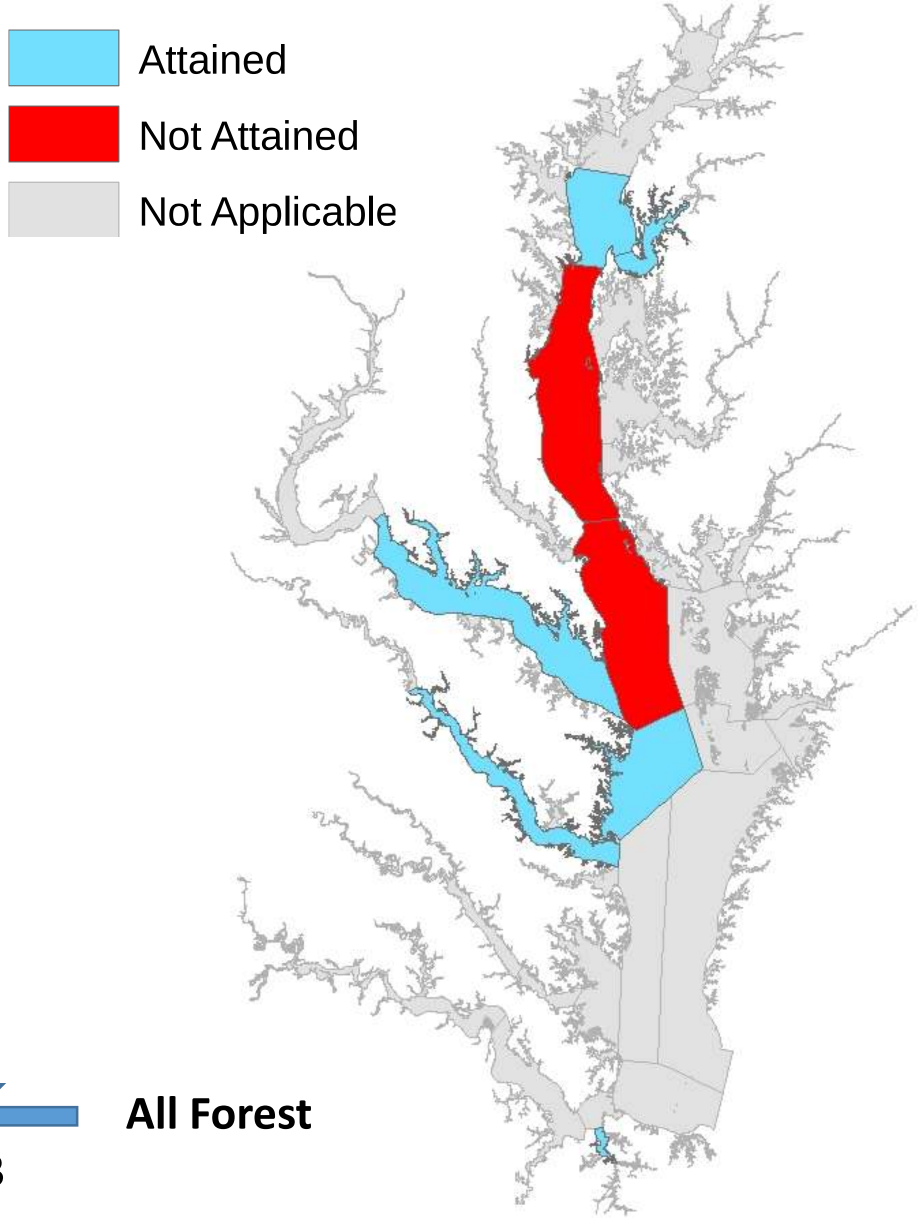


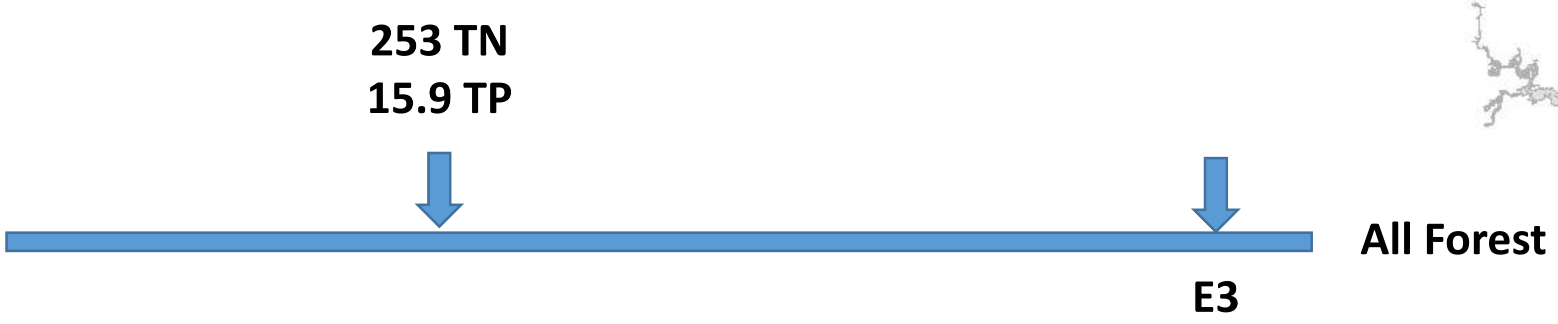


Segments Attaining Oxygen Standards: Deep-Channel Use

Segments NOT in Attainment

- CB4MH
- CB5MH_MD

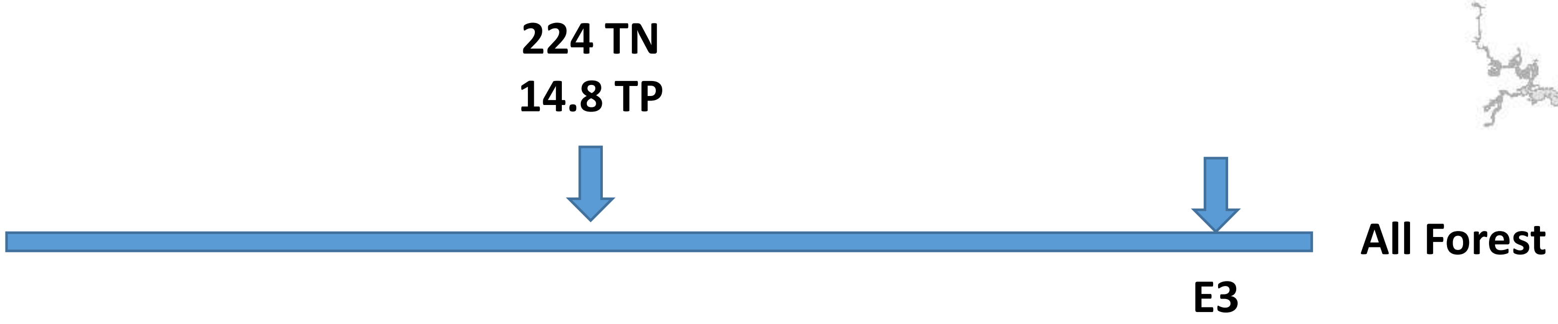


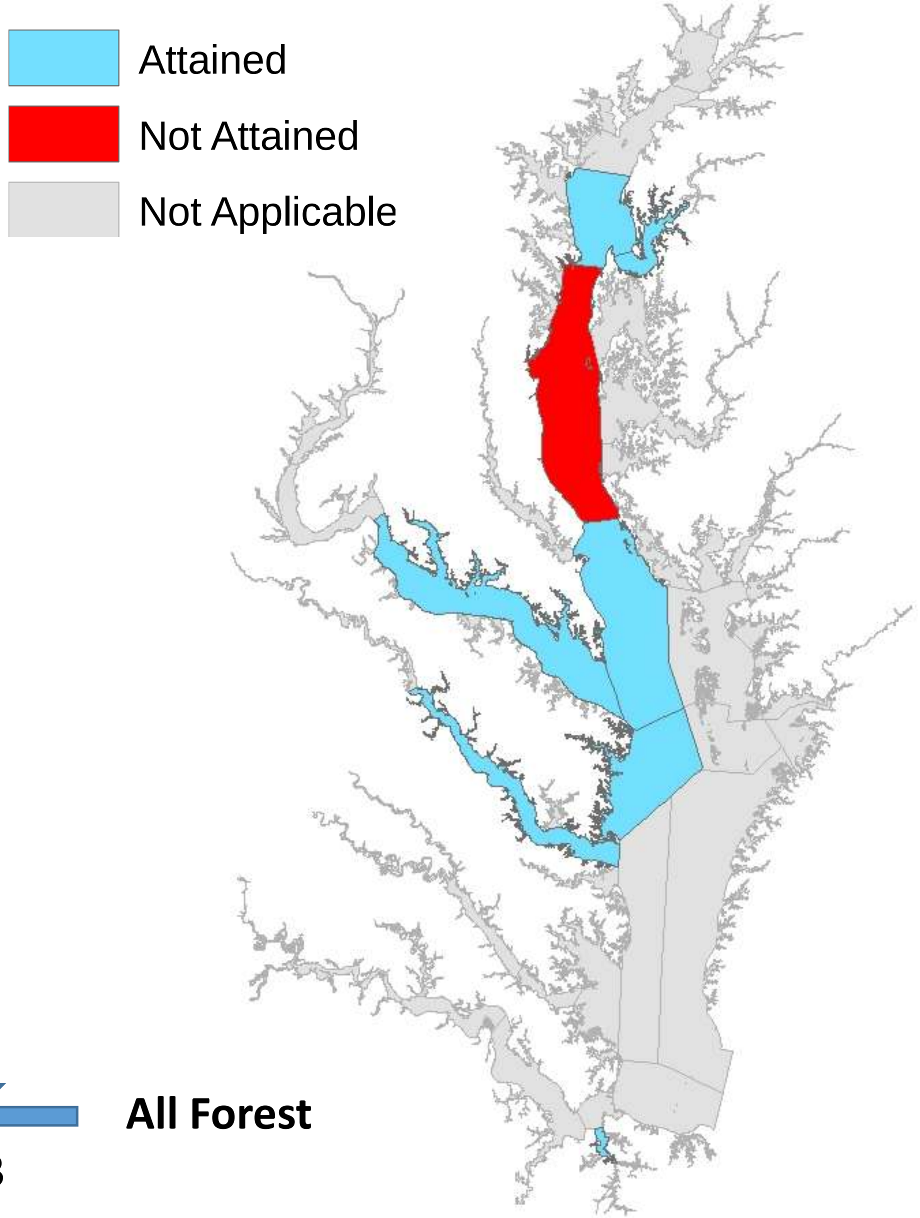


Segments Attaining Oxygen Standards: Deep-Channel Use

Segments NOT in Attainment

- CB4MH

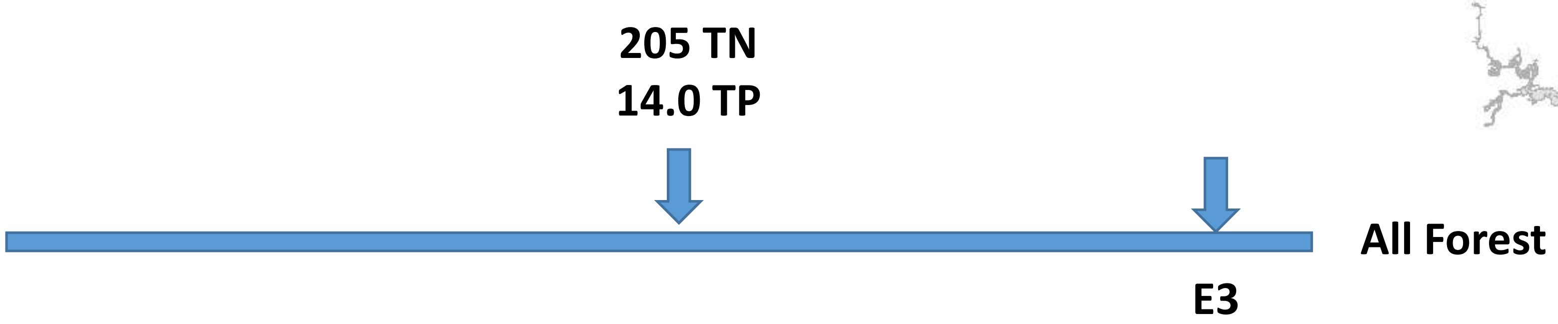


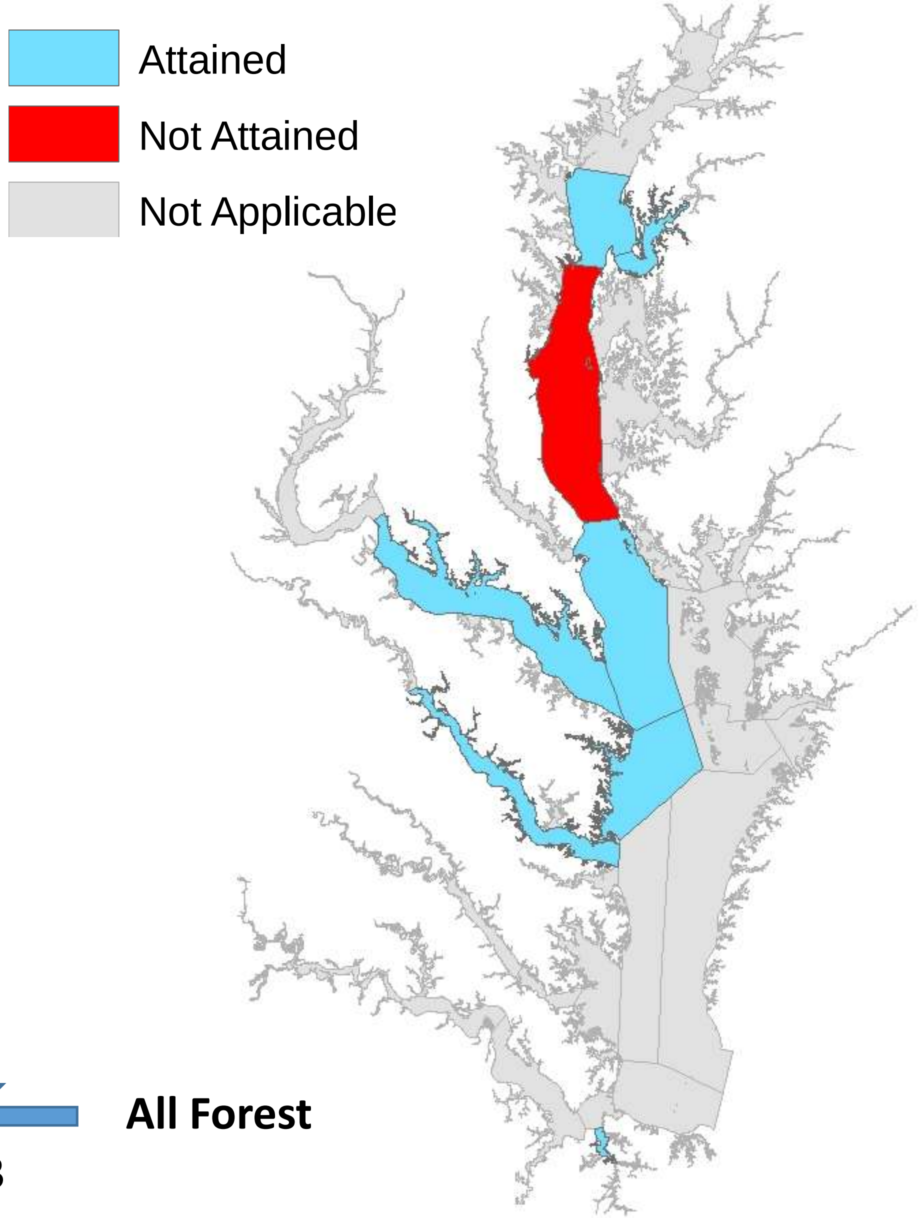


Segments Attaining Oxygen Standards: Deep-Channel Use

Segments NOT in Attainment

- CB4MH

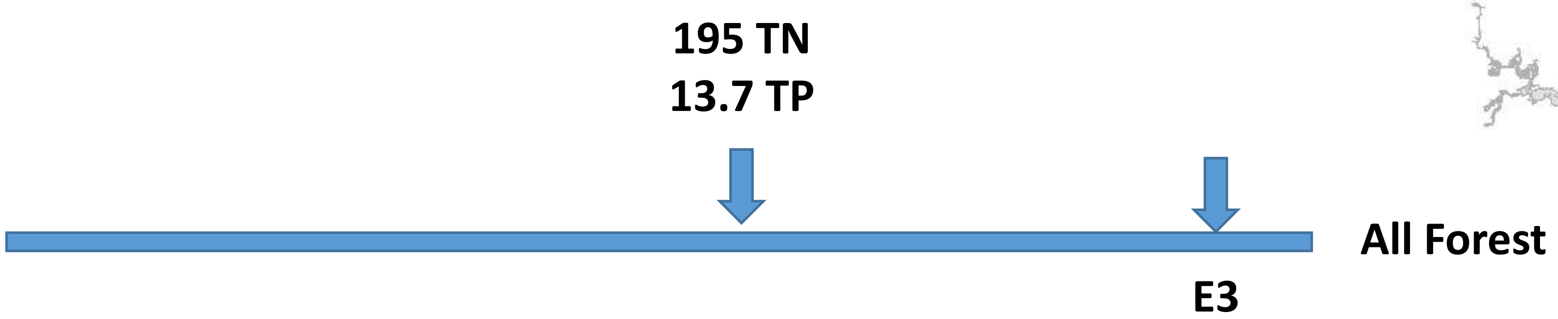


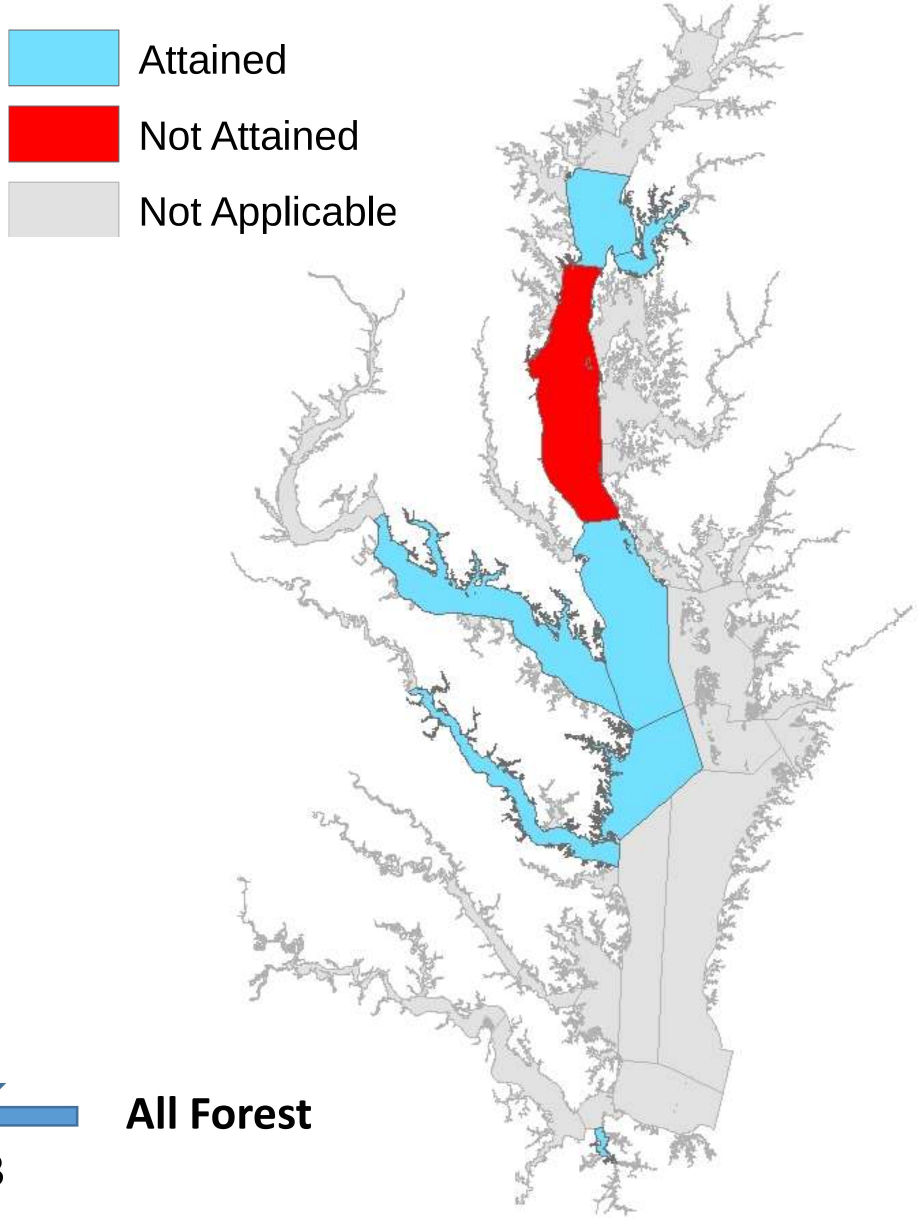


Segments Attaining Oxygen Standards: Deep-Channel Use

Segments NOT in Attainment

- CB4MH





Segments Attaining Oxygen Standards: Deep-Channel Use

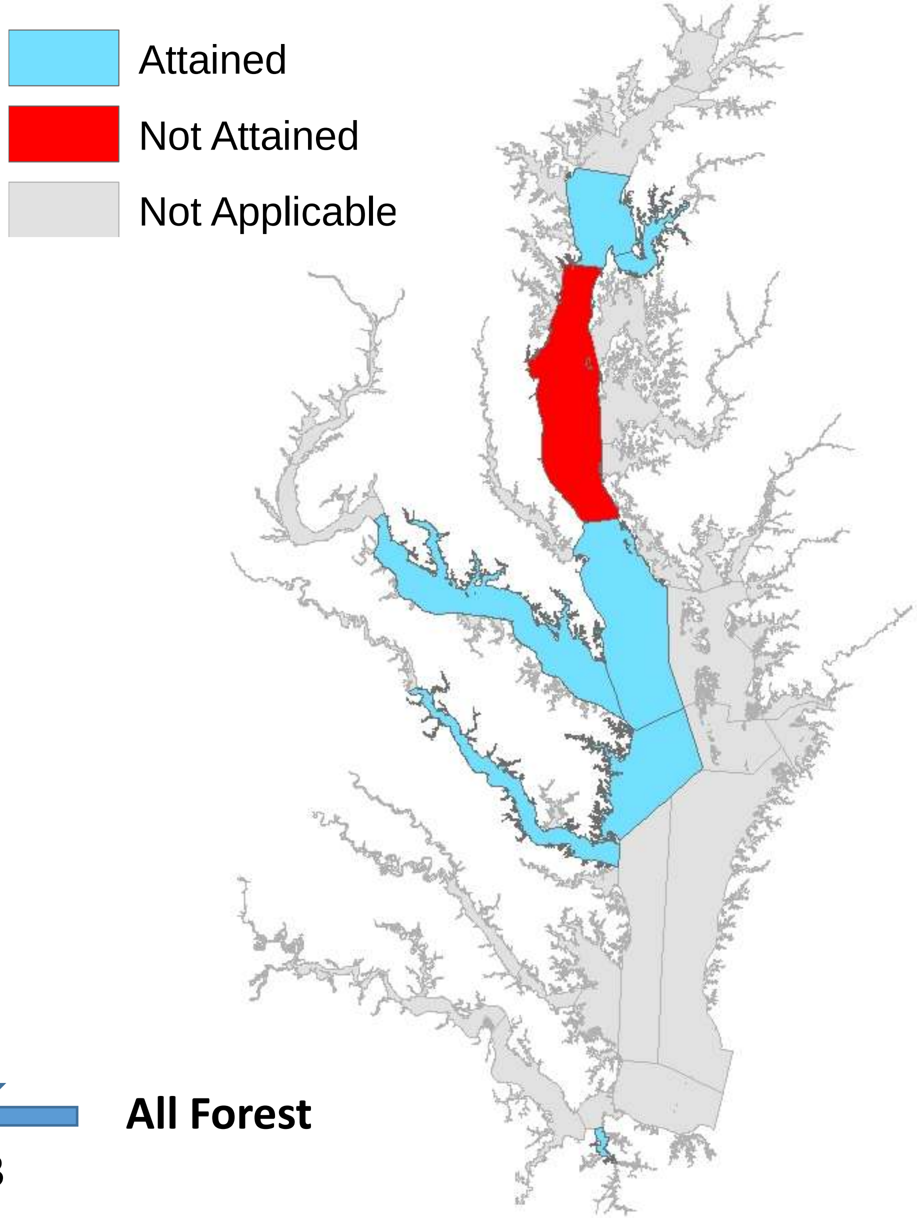
Segments NOT in Attainment

- CB4MH

185 TN
12.8 TP

All Forest

E3



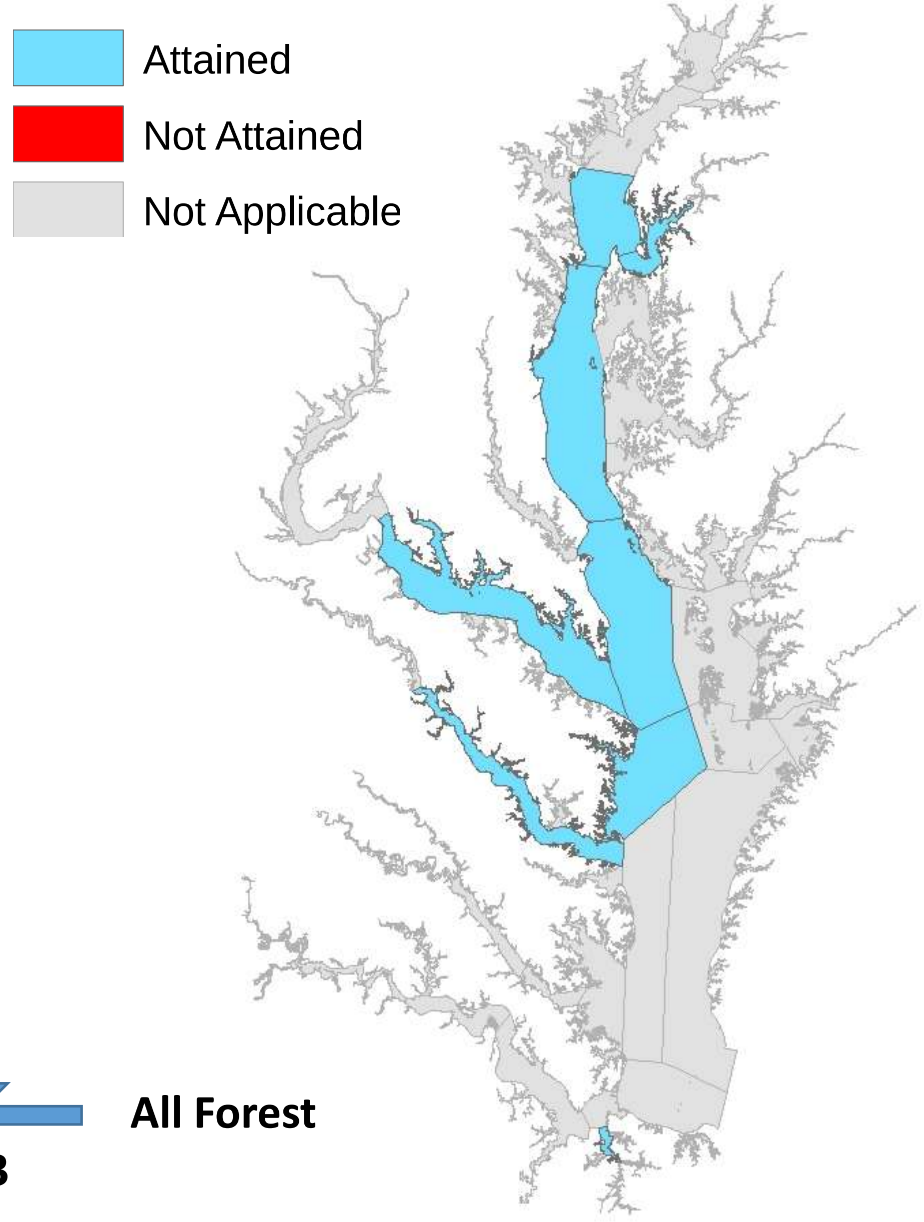
Segments Attaining Oxygen Standards: Deep-Channel Use

Segments NOT in Attainment

174 TN
11.9 TP

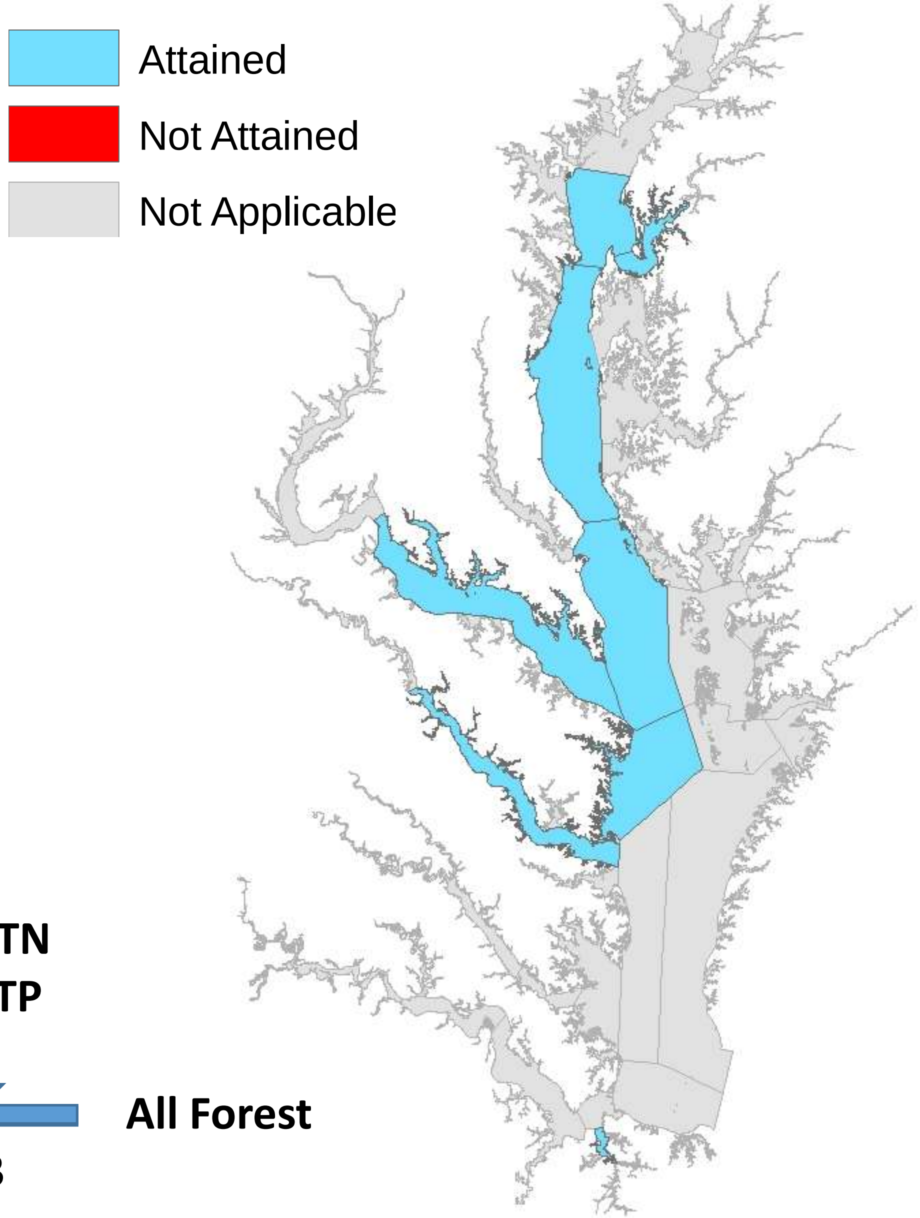
All Forest

E3



Segments Attaining Oxygen Standards: Deep-Channel Use

Segments NOT in Attainment



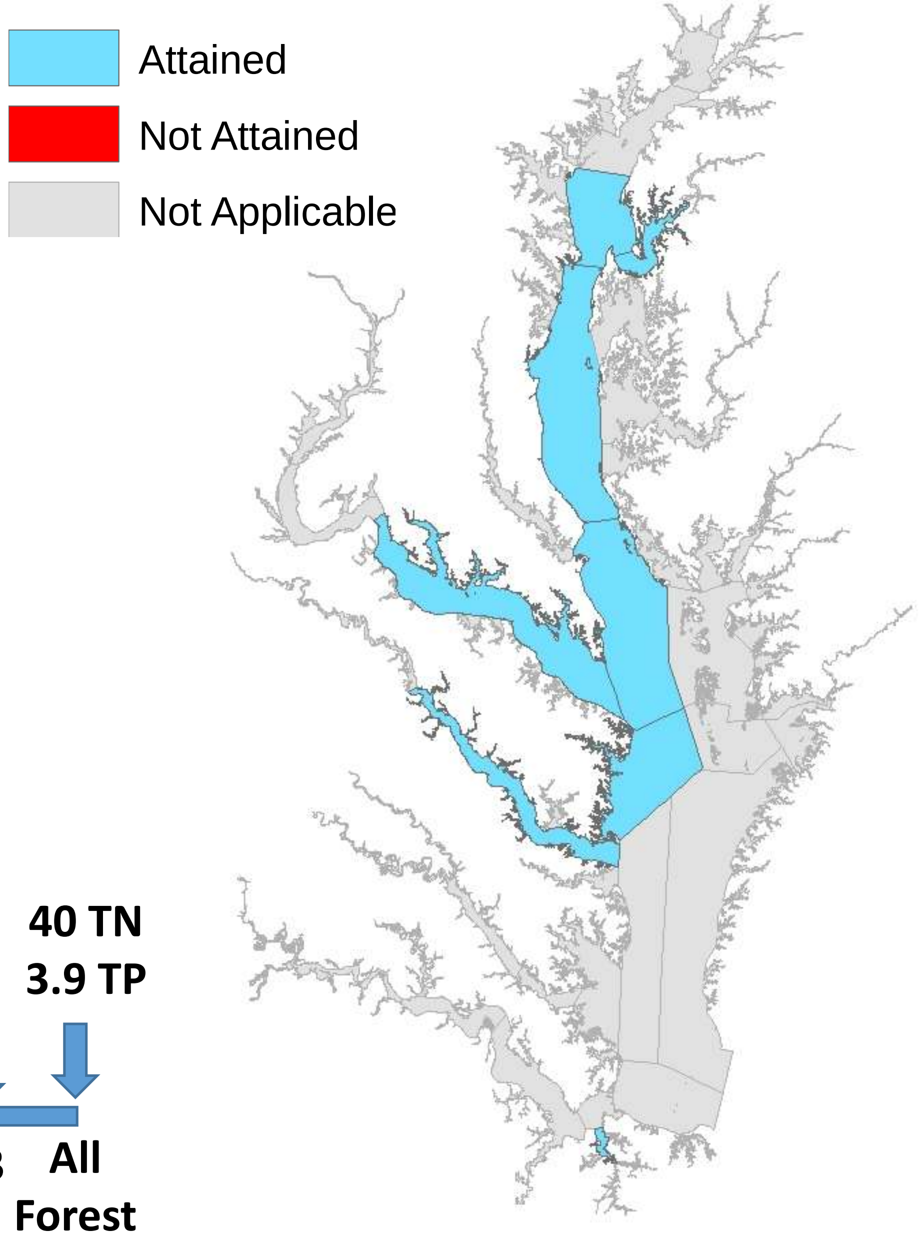
133 TN
8.6 TP

All Forest

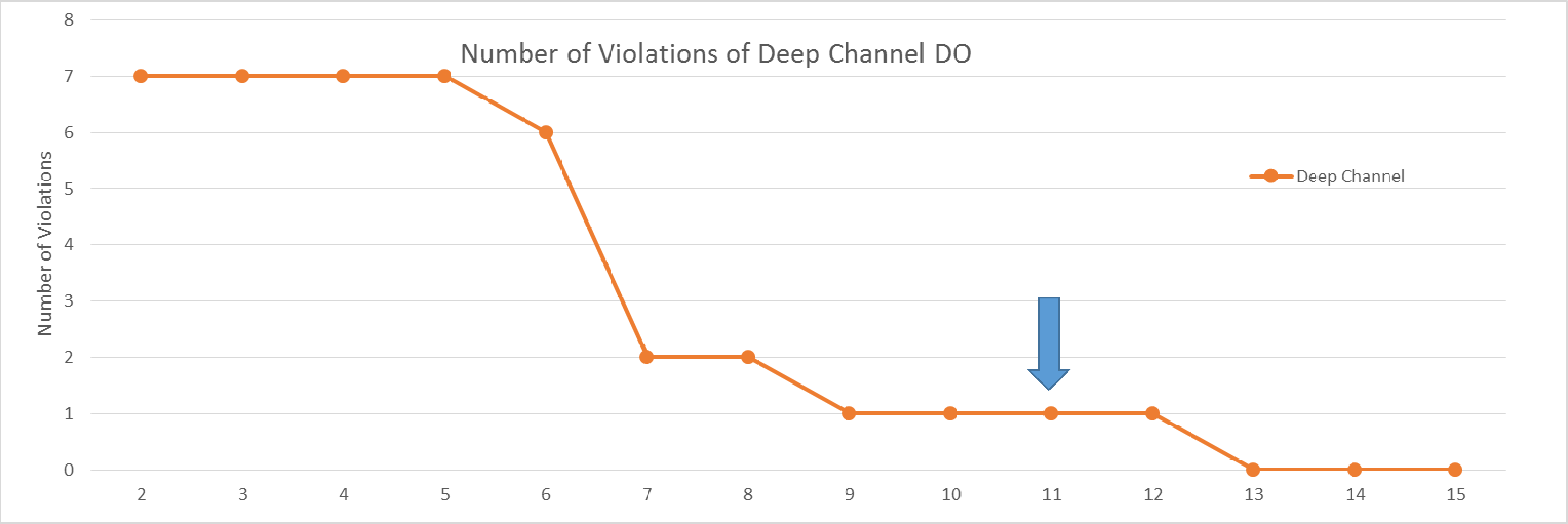
E3

Segments Attaining Oxygen Standards: Deep-Channel Use

Segments NOT in Attainment

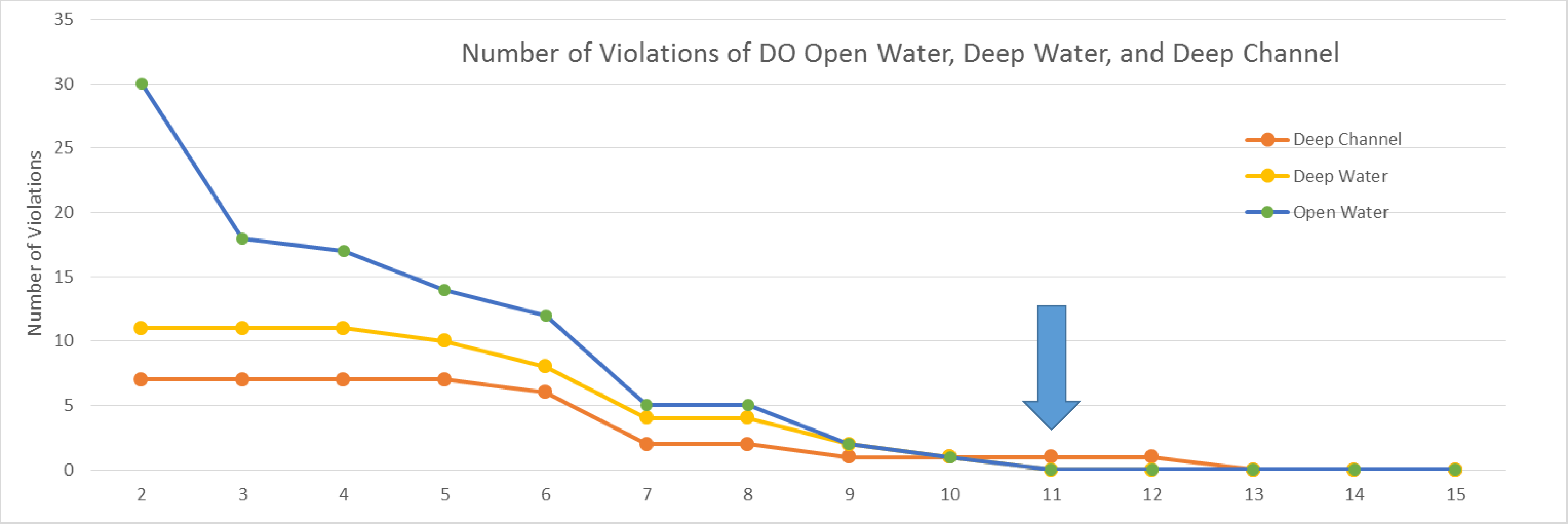


Segments Attaining Oxygen Standards: Deep-Channel Use



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
No Action												**E3**	**All Forest**

Determining the Bay's Ability to Absorb Pollutants



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
No Action												**E3**	**All Forest**

Rationale for Pollutant Loads Bay Can Absorb

- Clear monitoring-based evidence of reductions on volumes of low/no oxygen in deeper waters observed in Bay and tidal tributaries

- 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

Diminishing Return for Additional Reductions

										+19M lbs TN	+10M lbs TN		- 9M lbs TN	-21M lbs TN		
Run 223		325TN	404TN	347TN	338TN	337TN	317TN	266TN	253TN	224TN	205TN	195TN	185TN	174TN	133TN	40TN
11/29/17		21.9TP	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
CAST Loads		1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995
Cbseg	State	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel	Deep Channel
CB4MH	MD	46%	53%	48%	47%	46%	43%	30%	27%	16%	9%	6%	3%	1%	0%	0%

Scoping Scenarios to explore water quality attainment at loads around 195N and 13.7P

Proposed Path Forward

- 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 Path Forward

- **Agreement to a common set of Partnership communication messages**
  - Reflects application of an additional decade of new data and scientific understanding along with improved models
  - Approach followed is fully consistent with approach taken during development of the 2010 Bay TMDL
  - Fully consistent with Maryland's existing water quality standards regulations requirement for regular check-ins and modifications based on new data or assumptions incorporated into the Partnership's Chesapeake Bay water quality model

WQGIT Recommendations to the PSC

Recommends establishing the Bay's assimilative capacity as 195 million pounds of nitrogen and 13.7 million pounds of phosphorus

Recommends supporting necessary adjustments to Maryland's water quality standards regulations' restoration variances (subject to EPA approval) in order to meet the assimilative capacity for nitrogen and phosphorus

Recommends the development of Partnership communication messages for the public over the next four months, in time for the release of the final Phase III WIP planning targets in May 2018

Today's Requested Policy Decisions

Approval of the Bay's assimilative capacity as 195 million pounds of nitrogen and 13.7 million pounds of phosphorus

Support the necessary adjustments to Maryland's restoration variances

Approval for the development of the Partnership's public communication messages

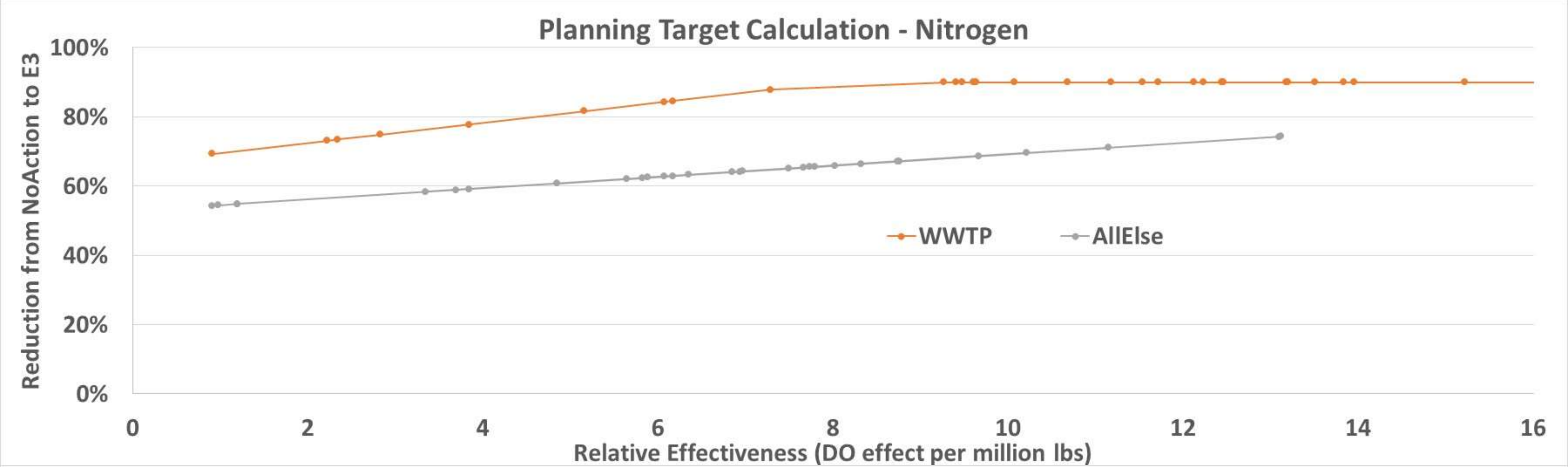
Proposed Draft Phase III Planning Targets

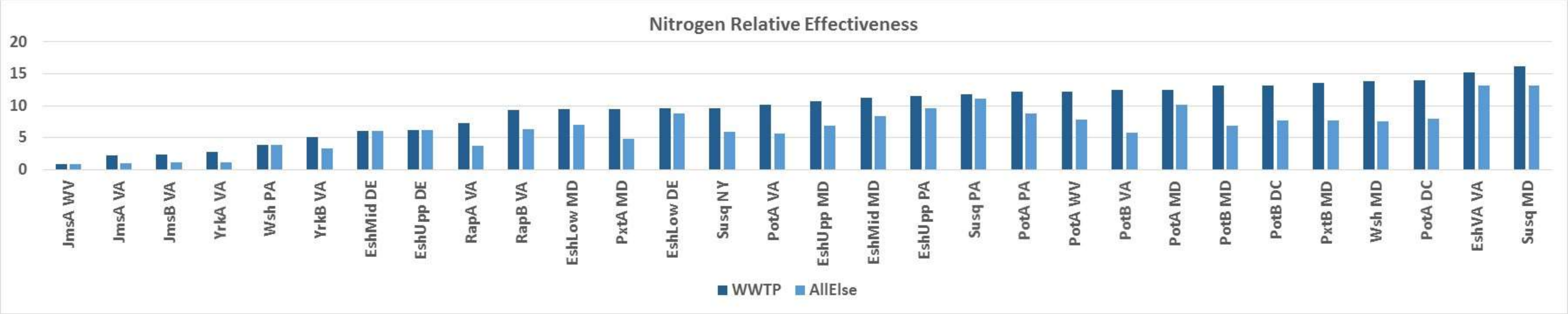
Gary Shenk, USGS, CBP Phase 6 Watershed Model Coordinator

We Have All the Needed Components

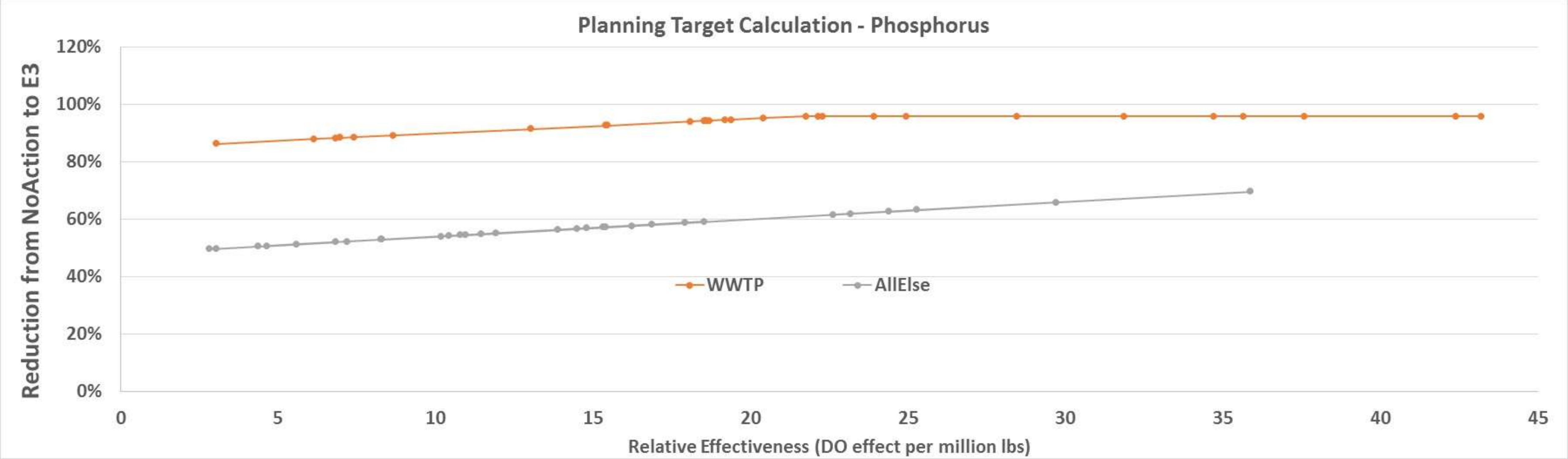
- ✓ Agreed-to methodology
- ✓ No Action scenario
- ✓ E3 scenario
- ✓ Watershed and estuarine relative effectiveness
- ✓ Assimilative capacity of the Bay
- ✓ Accounting for projected atmospheric deposition load reductions

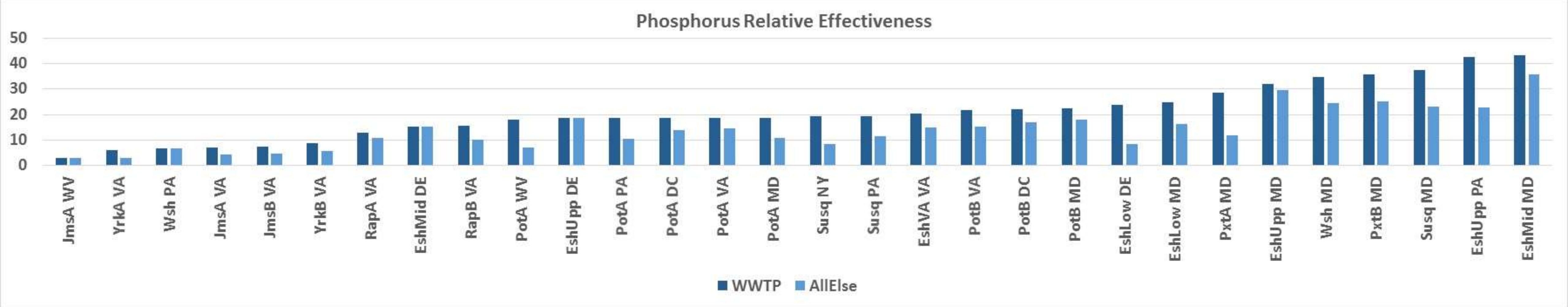
Deriving the Draft Phase III Planning Targets: Nitrogen





Deriving the Draft Phase III Planning Targets: Phosphorus





Proposed Draft Phase III Planning Targets: Nitrogen

Jurisdiction	1985 Baseline	2013 Progress	Growth in Load to 2025	Phase III Planning Target
NY	18.71	15.44		10.59
PA	122.41	99.28		73.18
MD	83.56	55.89		45.30
WV	8.73	8.06		6.35
DC	6.48	1.75		2.43
DE	6.97	6.59		4.59
VA	84.29	61.53		55.82
Basinwide	331.15	248.54		198.25

*Units: millions of pounds

Proposed Draft Phase III Planning Targets with Special Cases: Nitrogen

Jurisdiction	Special Cases	With Special Cases	Phase III Planning Target
NY	1.00	11.59	10.59
PA	-0.58	72.60	73.18
MD	-0.31	44.99	45.30
WV	-0.03	6.31	6.35
DC	0.00	2.42	2.43
DE	-0.06	4.53	4.59
VA	-0.24	55.58	55.82
Basinwide	-0.22	198.03	198.25

*Units: millions of pounds

Proposed Draft Phase III Planning Targets: Phosphorus

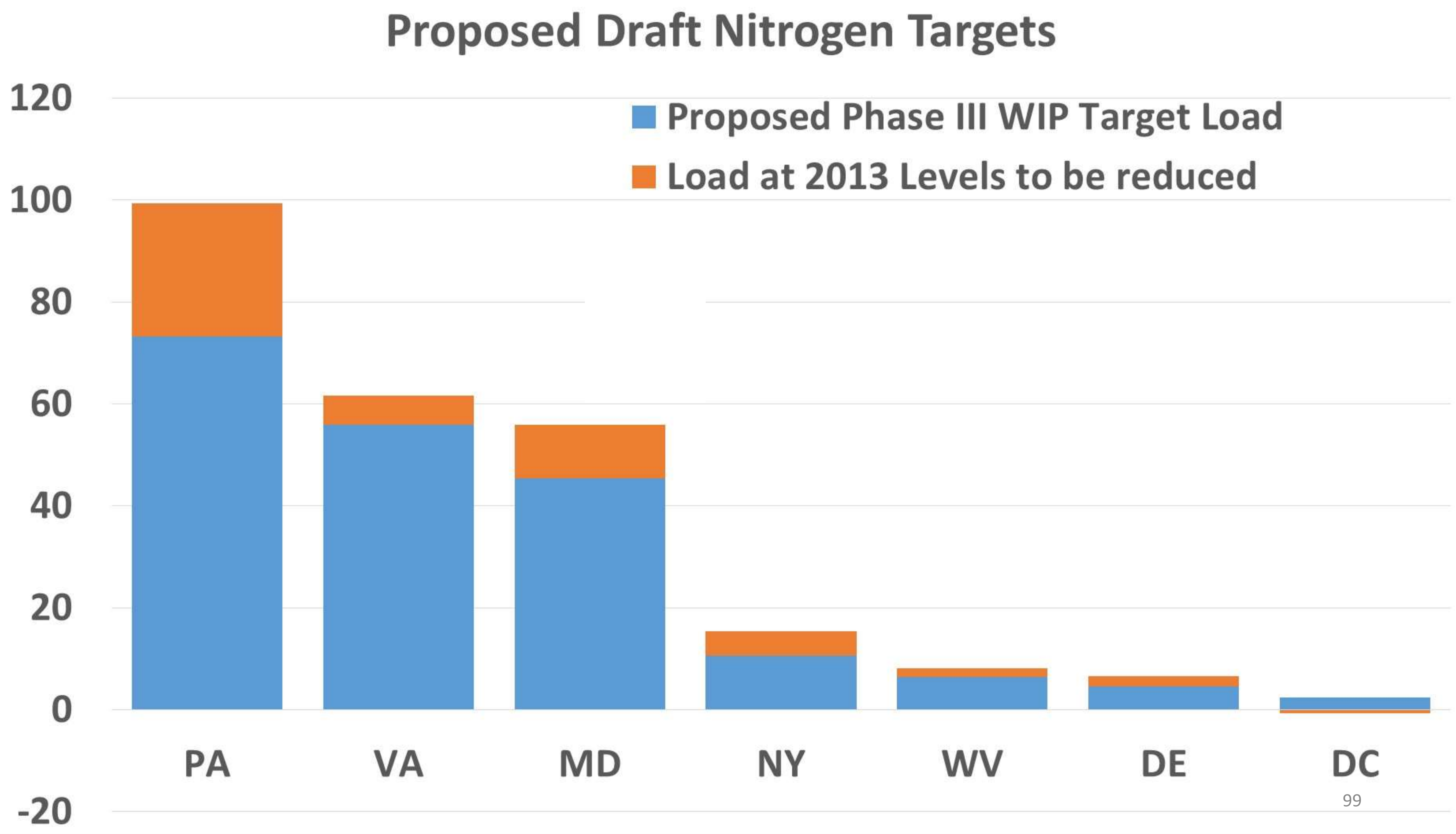
Jurisdiction	1985 Baseline	2013 Progress	Growth in Load to 2025	Phase III Planning Target
NY	1.198	0.710		0.506
PA	6.115	3.696		3.073
MD	7.419	3.919		3.604
WV	0.793	0.560		0.456
DC	0.090	0.062		0.130
DE	0.225	0.115		0.120
VA	13.545	6.345		6.186
Basinwide	29.384	15.408		14.073

*Units: millions of pounds

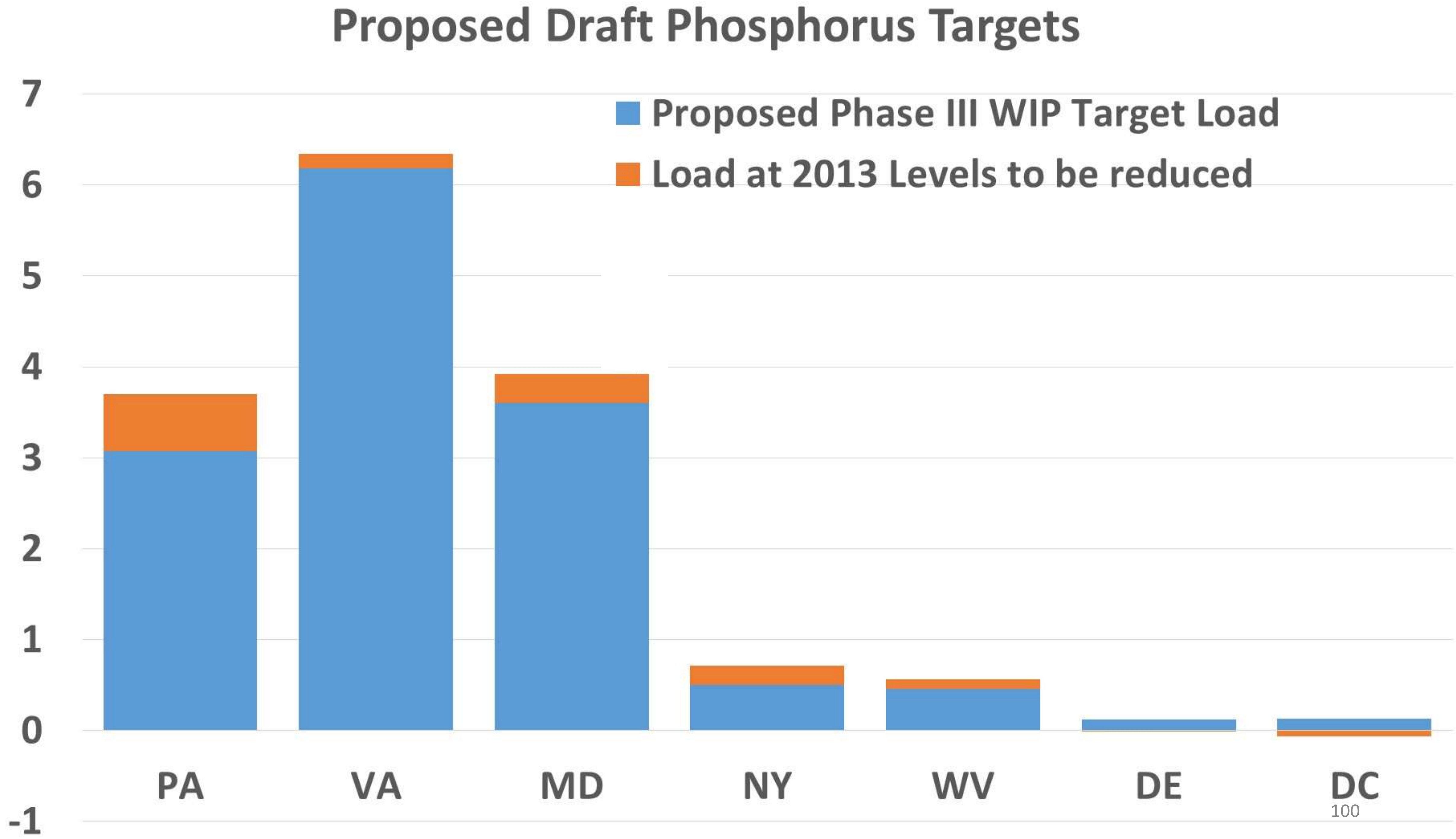
Proposed Draft Phase III Planning Targets with Special Cases: Phosphorus

Jurisdiction	Special Cases	With Special Cases	Phase III Planning Target
NY	0.100	0.606	0.506
PA	-0.102	2.971	3.073
MD	-0.083	3.521	3.604
WV	0.200	0.656	0.456
DC	-0.001	0.129	0.130
DE	-0.004	0.115	0.120
VA	-0.133	6.053	6.186
Basinwide	-0.023	14.05	14.073

*Units: millions of pounds



Proposed Draft Nitrogen Targets
Proposed Phase III WIP Target Load
Load at 2013 Levels to be reduced
120
100
80
60
40
20
0
-20
PA
VA
MD
NY
WV
DE
DC


Proposed Draft Phosphorus Targets
Proposed Phase III WIP Target Load
Load at 2013 Levels to be reduced
7
6
5
4
3
2
1
0
-1
PA
VA
MD
NY
WV
DE
DC

Jurisdiction-Specific Proposed Draft Phase III WIP Planning Targets

Teresa Koon, WV DEP CBP Water Quality Goal Implementation Team Vice Chair
and
WQGIT Jurisdictional Representations

Draft Phase III Planning Targets

WQGIT jurisdictional representatives will present their respective profiles to the PSC

Day Two Requested Policy Decision

Approval of **draft** Phase III Planning Targets as the starting point for the Partnership's 4-month review process

Proposed Process and Schedule for 4-Month Review Period

Lucinda Power, U.S. EPA, CBP Water Quality Goal Implementation Team Coordinator

PSC Approved Schedule

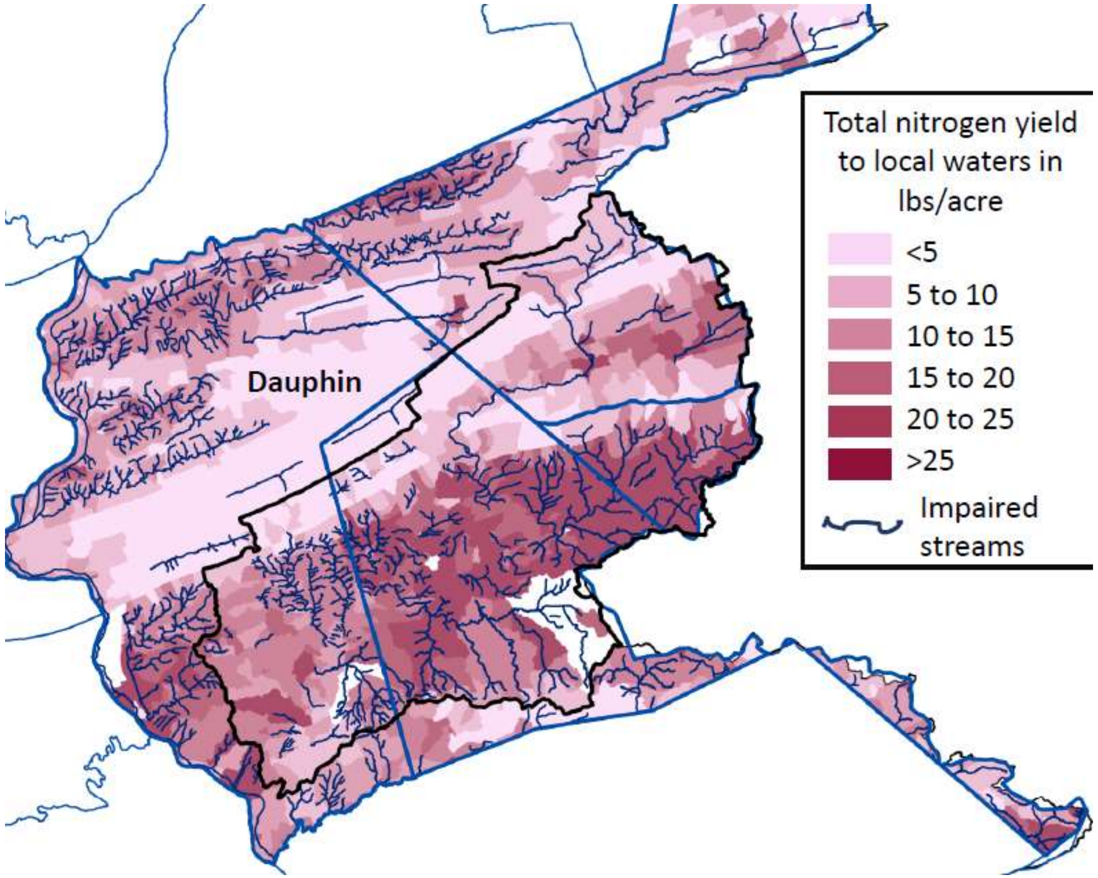
- **December 19-20, 2017**: PSC 2-day retreat and decision making
- **December 22, 2017**: Release of draft Phase III WIP planning targets
- **December 22, 2017 – April 20, 2018**: Partnership's review of the draft Phase III WIP planning targets, including consideration of special case requests
- **Late 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

During the 4-Month Review Period

- Analyze level of effort to achieve the draft planning targets
- Evaluate effects of accounting for growth, Conowingo infill, and climate change on level of effort
- Assess the need for exchanges of nitrogen and/or phosphorus loads between a jurisdiction’s major river basins
- Assess the need for exchanges of nitrogen for phosphorus or phosphorus for nitrogen within a jurisdiction’s major river basins
- Determine if any special cases are needed

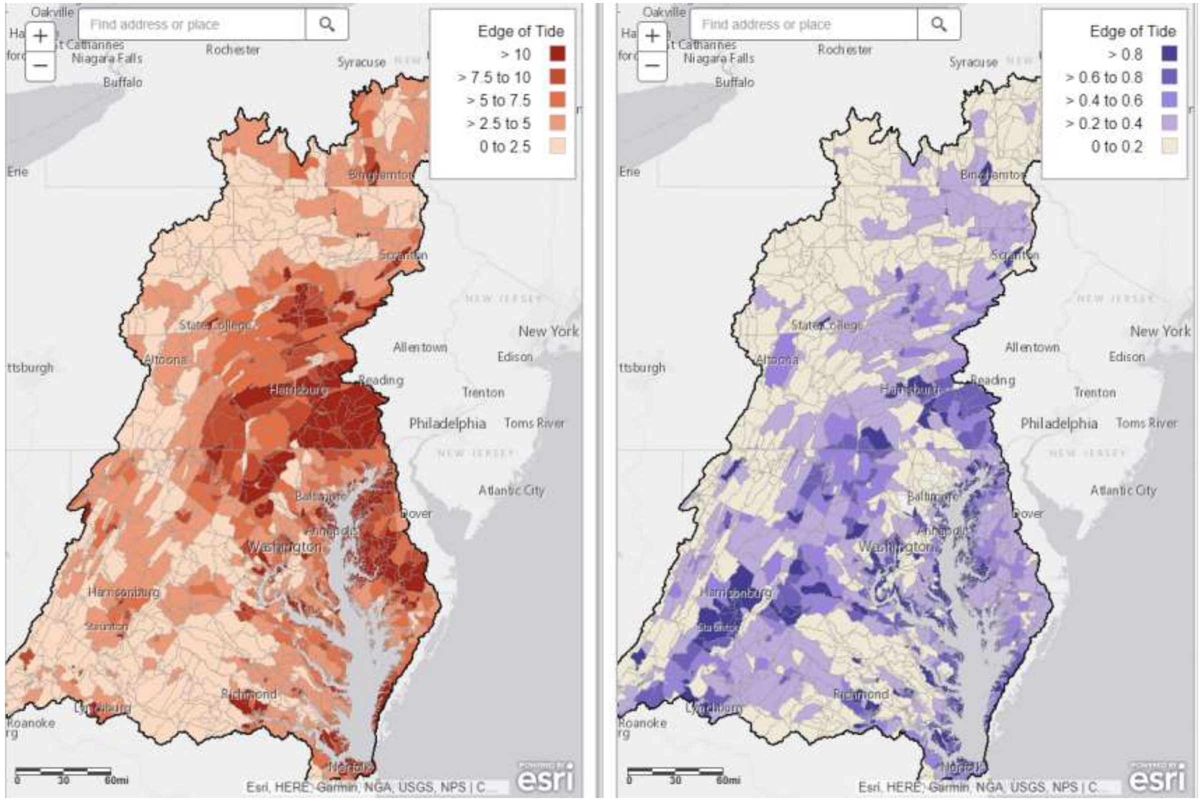
Further Analyses for Consideration

Testing out preliminary development of measurable, local planning goals below the major state-basin level



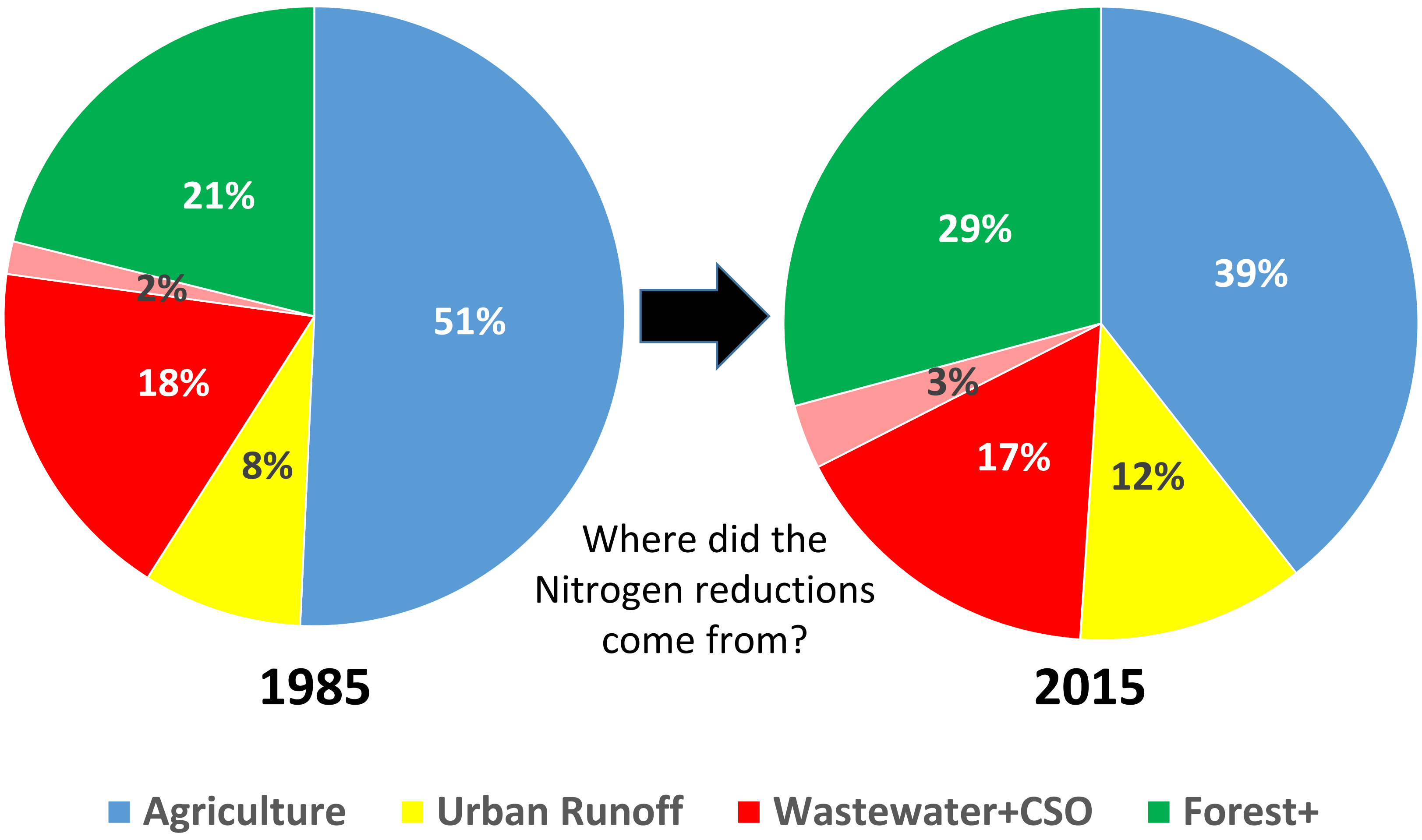
Further Analyses for Consideration

Apply the results of the geographic isolation runs to help inform implementation planning and targeting



Further Analyses for Consideration

Evaluate potential changes needed to a jurisdiction's Phase I and Phase II WIP source sector goals



Support to Jurisdictions During their Reviews

- The Partnership Office in Annapolis can support the jurisdictions by helping:
  - Test out possible N for P and P for N exchanges
  - Test out possible major river basin to basin exchanges
  - Test for possible water quality/load reduction impacts on upstream and down tide neighboring jurisdictions
  - Think through and help test possible approaches to developing local area planning goals
  - Evaluate feasibility of achieving the draft planning targets and what are the opportunities for further reductions by source sector, geography

Possible Changes Between Now and April 2018

- Requests for special conditions
- Conducting basin to basin exchanges of N, P, and sediment loads
- Conducting significant N for P and P for N exchanges

What are Special Cases?

Special cases are requests by the jurisdictions for any:

1) Changes to their draft Phase III WIP planning targets

2) Changes to the methodology used to establish the draft Phase III WIP planning targets

Who Can Submit a Special Case Request?

- Any one of the seven Bay watershed jurisdictions to the CBP Water Quality Goal Implementation Team (WQGIT) Chair and the CBP WQGIT Coordinator

Notification of Special Case Requests

March 16, 2018

Final deadline for submitting the special case request(s), along with the justification and nutrient and basin exchanges that have multi-jurisdictional impacts, to the Partnership for consideration

Process for Addressing Special Cases

1. **CBPO staff will work with the jurisdictions to address and identify potential resolutions for special cases during the 4-month review period**

2. **For transparency, updates will be provided to the WQGIT during each conference call during the 4-month review period communicating:**

   - Who has submitted special case requests
   - Proposed options for resolving the special case request(s)

3. **PSC will approve any special case requests submitted to the Partnership for review and consideration**

Options for Resolving Special Cases

- In the event the PSC cannot reach consensus on the resolution of special case requests, the PSC can either:

  1. Resolve the issue by a supermajority vote, per the Partnership's governance procedures, or

  2. Request that EPA make the final decision

Today’s Requested Policy Decision

Approval of proposed process for the Partnership’s 4-month review of the draft Phase III WIP planning targets, including addressing special case requests

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 Equitably Across Jurisdictions

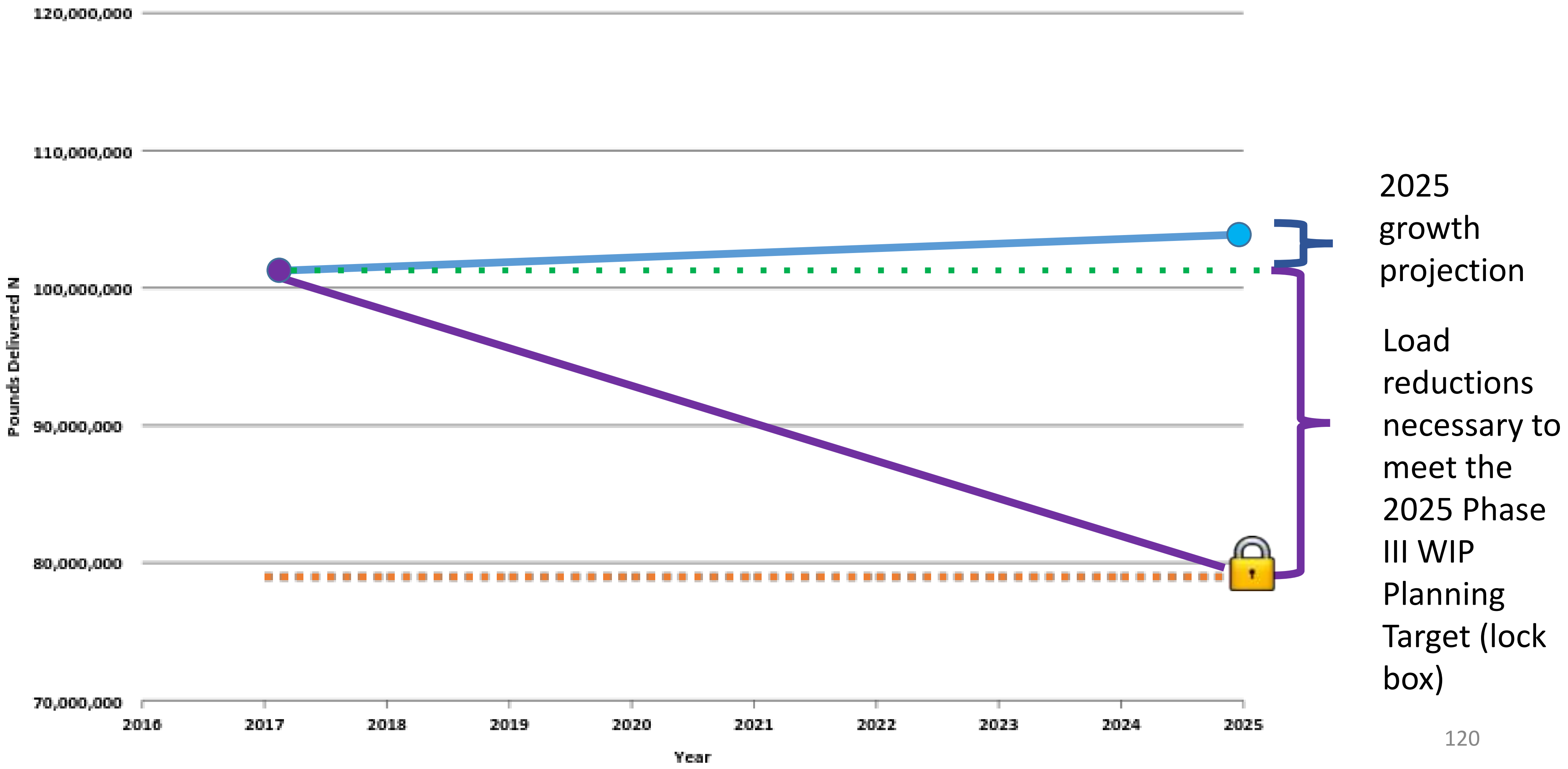
1. **Watershed population is increasing by over 1 million persons/decade**
    - Population change from 2010 -2025 = 2.0 million persons

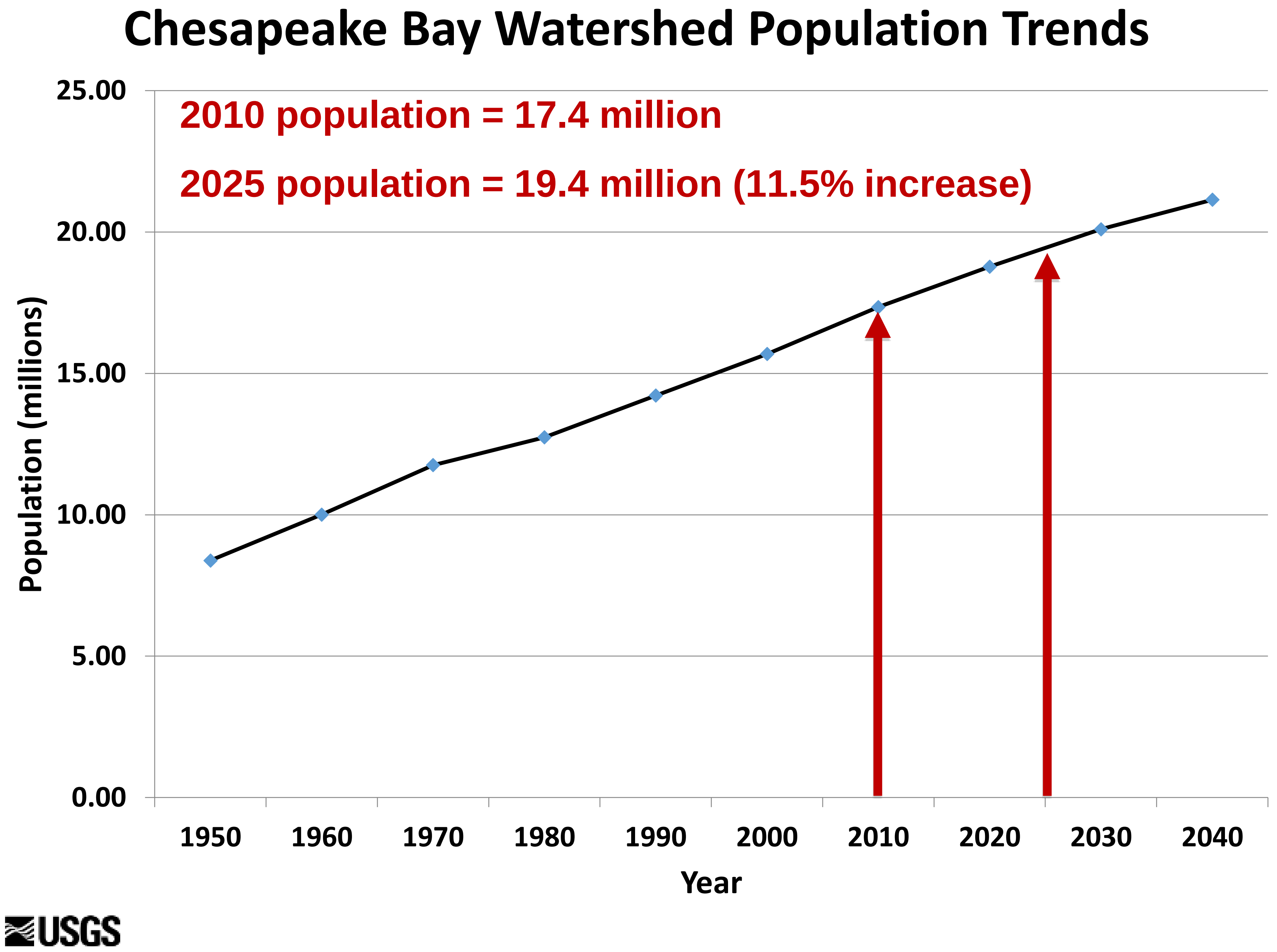
2. **Chesapeake Bay Land Change Model (CBLCM) estimates land use and wastewater impacts of future population growth.**
    - Parameterized uniquely for every state/county/city in the Bay watershed.
    - Accounts for uncertainty at sub-county scales.

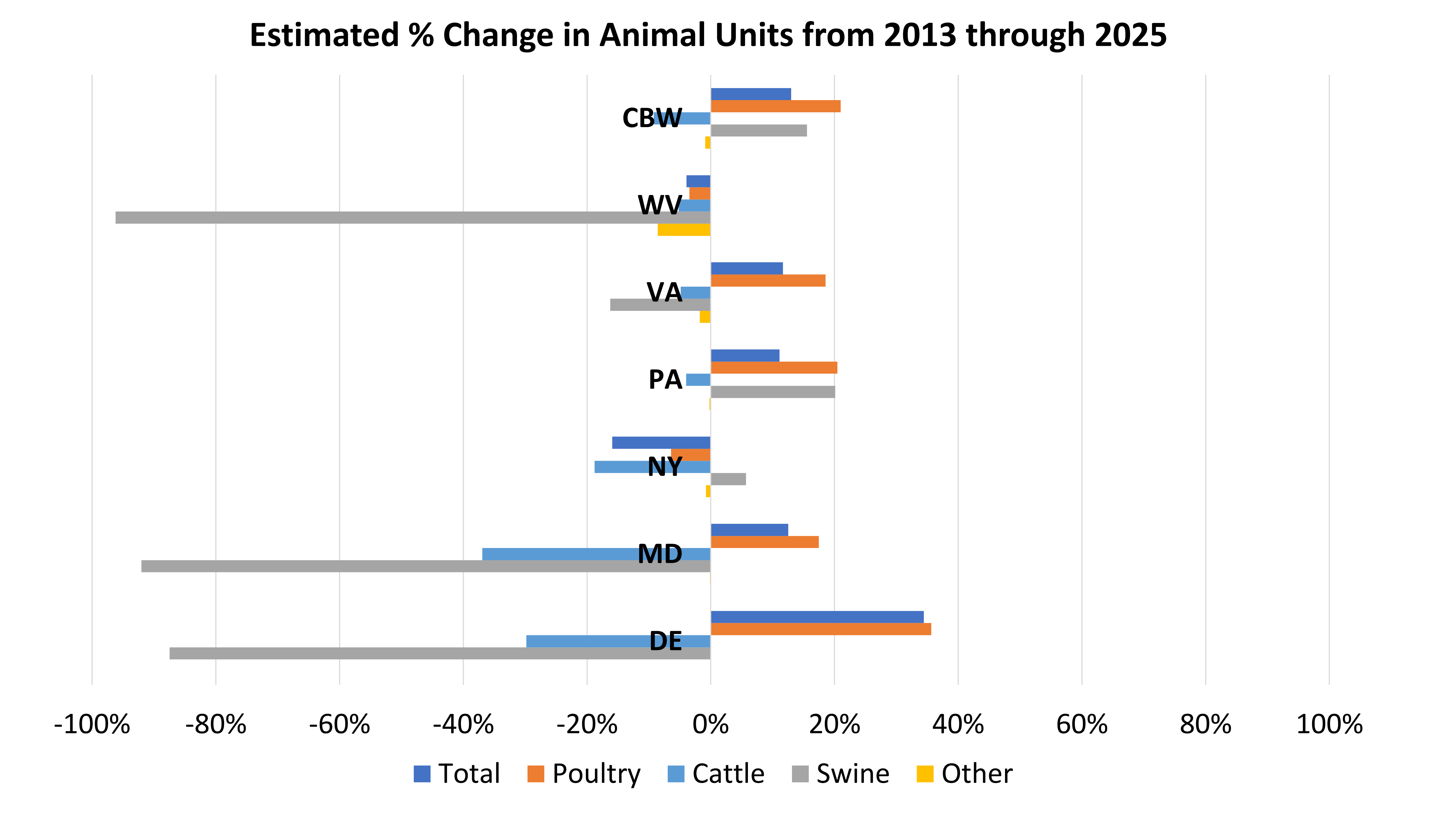
3. **Partnership agreement on future land use scenarios reflecting a range of planning and conservation efforts.**

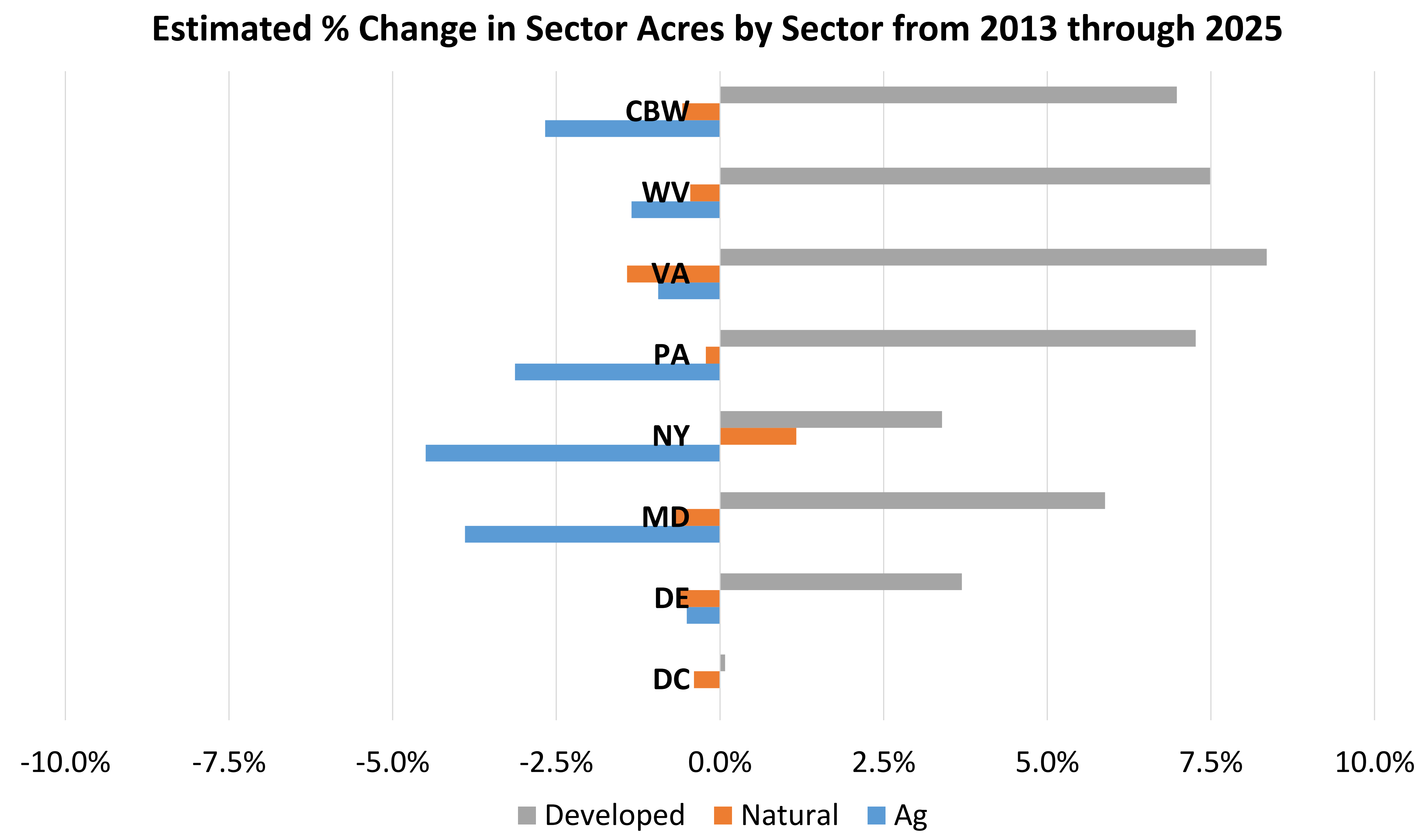
4. **Developing the WIPs on 2025 land use conditions enable the use of planning and conservation efforts to help "account for growth" for the TMDL.**

Why Account for Growth?

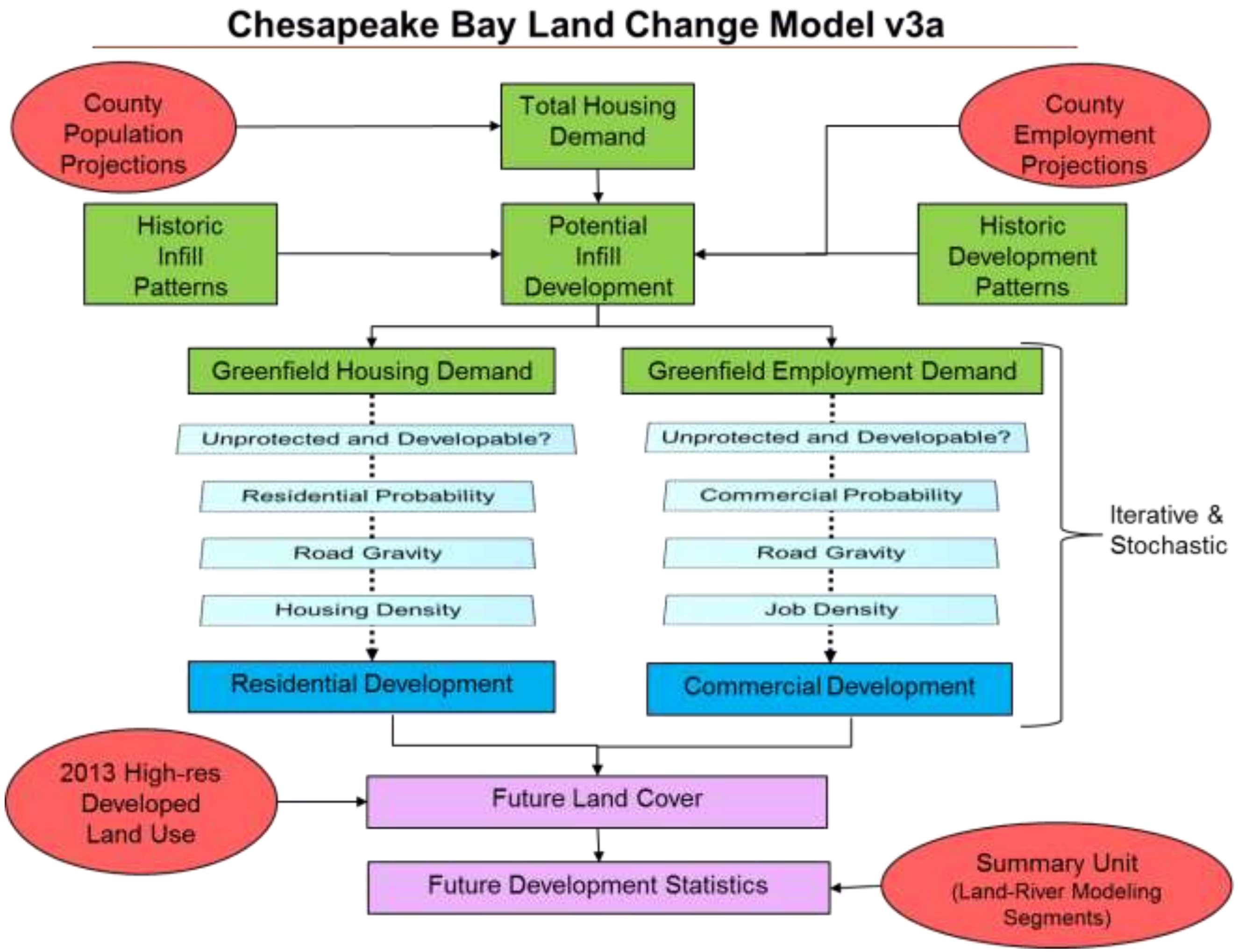


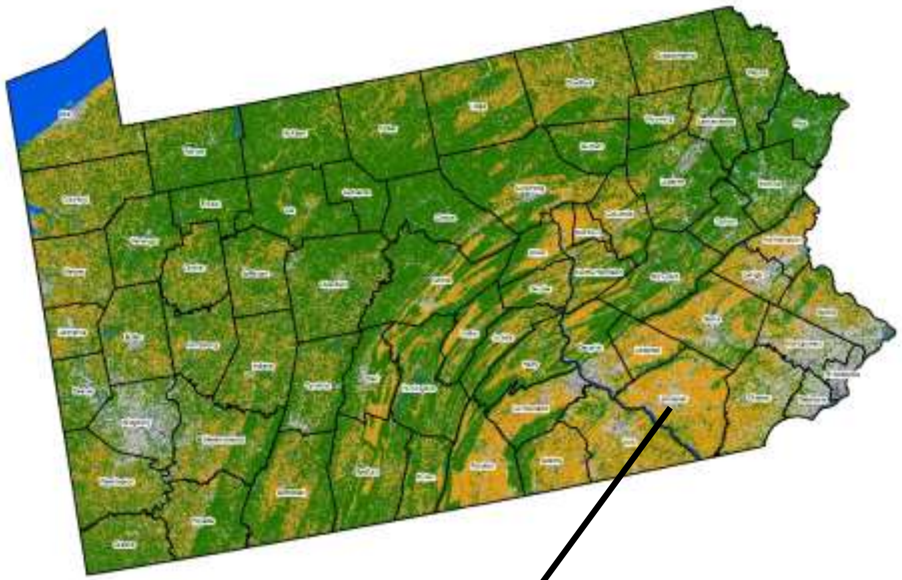

Chesapeake Bay Watershed Population Trends
2010 population = 17.4 million
2025 population = 19.4 million (11.5% increase)
Population (millions)
25.00
20.00
15.00
10.00
5.00
0.00
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
Year
USGS

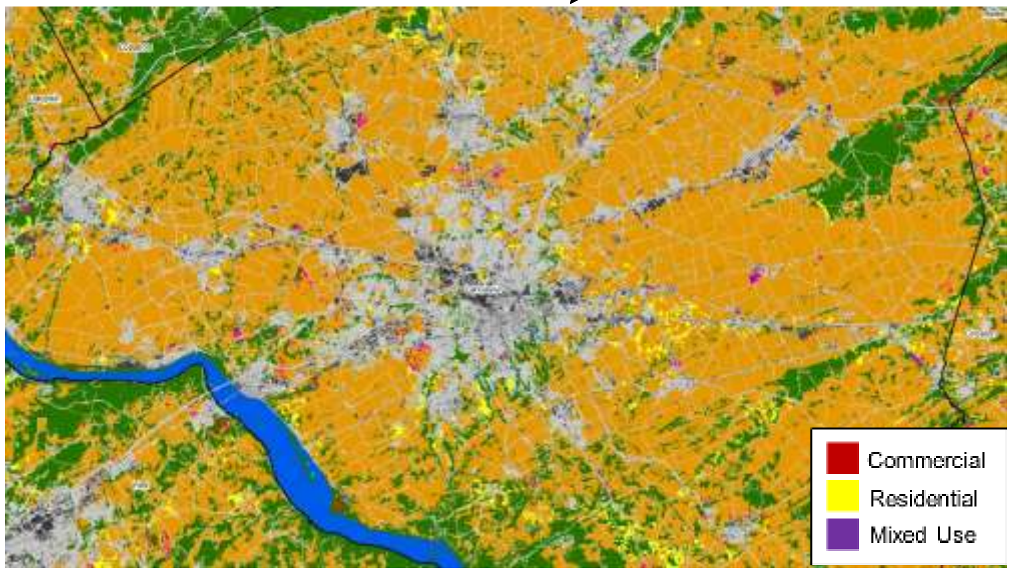

Estimated % Change in Animal Units from 2013 through 2025
CBW
WV
VA
PA
NY
MD
DE
-100%
-80%
-60%
-40%
-20%
0%
20%
40%
60%
80%
100%
Total
Poultry
Cattle
Swine
Other


Estimated % Change in Sector Acres by Sector from 2013 through 2025
CBW
WV
VA
PA
NY
MD
DE
DC
-10.0%
-7.5%
-5.0%
-2.5%
0.0%
2.5%
5.0%
7.5%
10.0%
Developed
Natural
Ag

Partnership's Chesapeake Bay Land Change Model

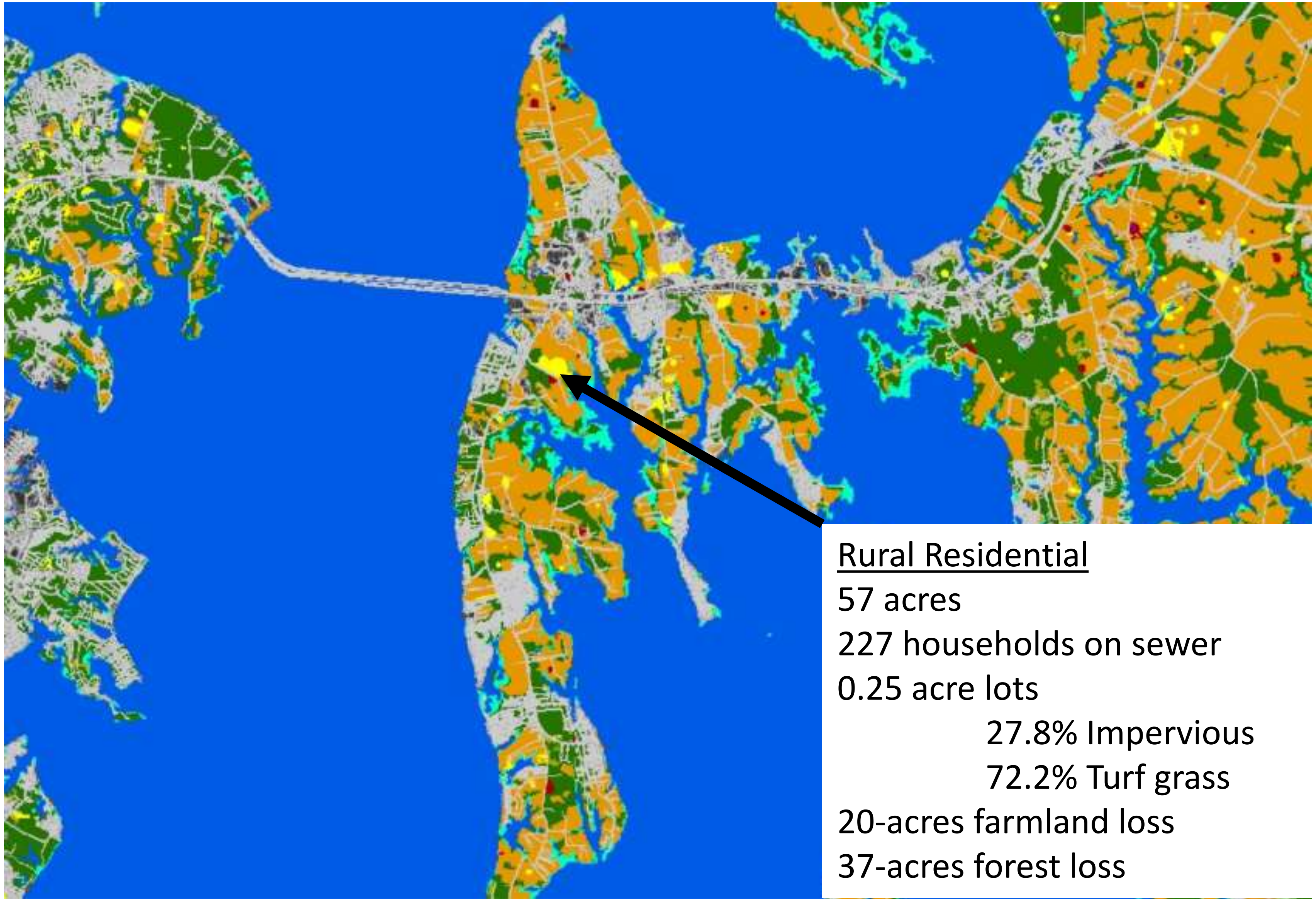






Land Change Model Outputs

- Impervious surface and turf grass expansion
- Forest conversion to development
- Farmland conversion to development
- Future population on sewer and septic



Future Growth Scenarios: 2025

Purpose:

To provide information to state and local partners to account for the effects of land use planning and conservation actions for reducing future pollutant loads in their Phase III WIPs and two-year milestones.

Current Zoning Scenario: 2025 Baseline for Phase III WIPs

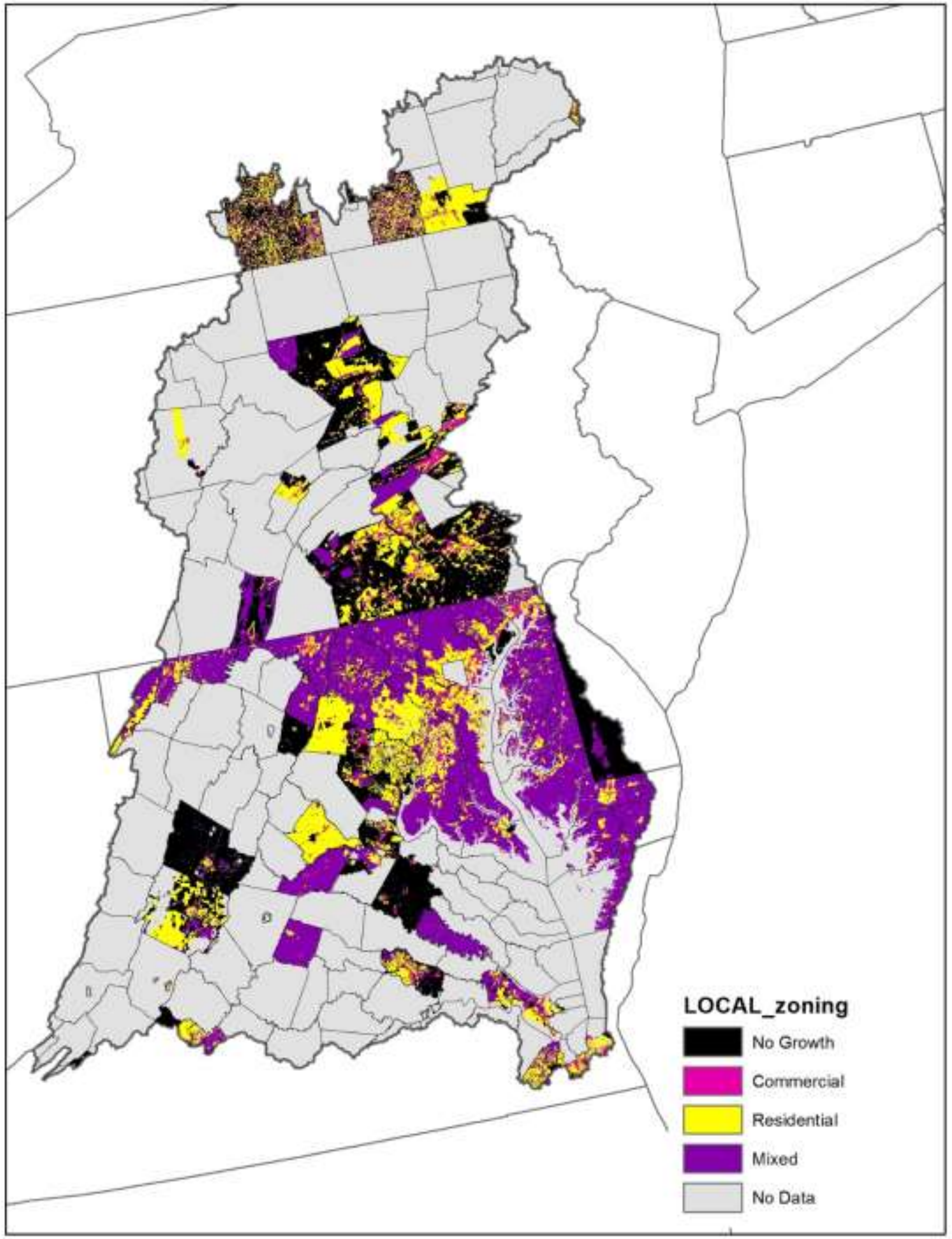
- Continuation of historic trends constrained by existing local zoning
- Includes the best available regional and local data representing current conditions

Future Growth Scenarios

Conservation Plus Scenario: Package of Planning & Conservation "BMP's"

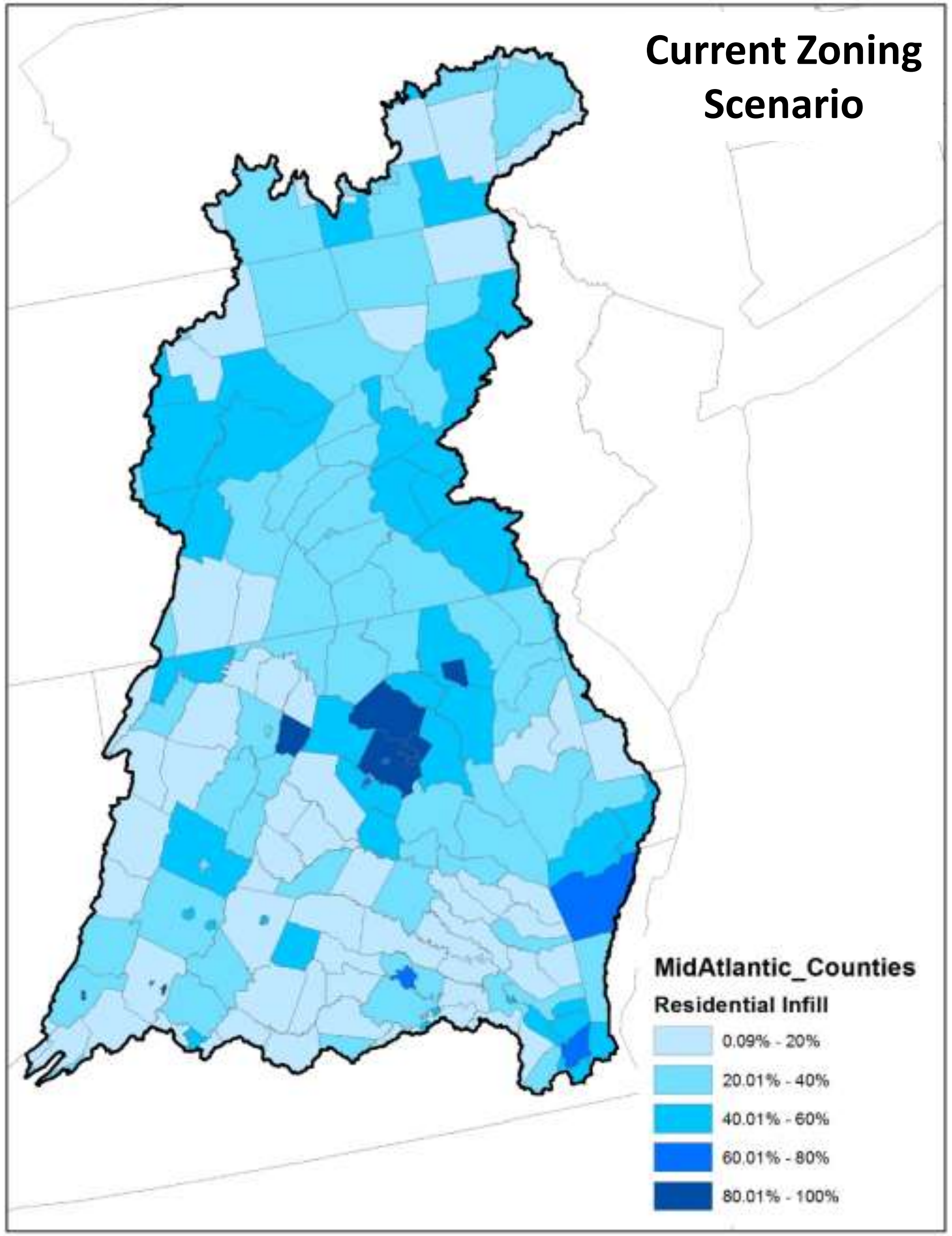
- Protect 100-year floodplain and frequently-flooded soils
- Protect riparian zones (35-ft, 100-ft, 300-ft)
- Protect large forest tracts (250+ acres, 1000+ acres) or green infrastructure
- Protect shoreline forests (all contiguous tracts 1000-ft from shoreline)
- Adjusting demand script:
  - Increase percent of infill/redevelopment (e.g., 5%, 10%, 15%)
  - Increase proportion of urban vs rural growth (e.g., 5%, 10%, 15%)
- Protect Agricultural Districts
- Avoid growth on soils unsuitable for septic systems
- Expand sewer service areas layer (e.g., 1-mile buffer, 2-mile buffer)
- Avoid growth in areas subject to category 3 Hurricane storm surge
- Protect highly productive farms, prime farmlands, farmland of state importance
- Protect state-designated "Healthy watersheds"
- Protect areas subject to marsh migration (e.g., upland buffer around tidal wetlands and National Wildlife refuges)

Extent of Local Zoning Data

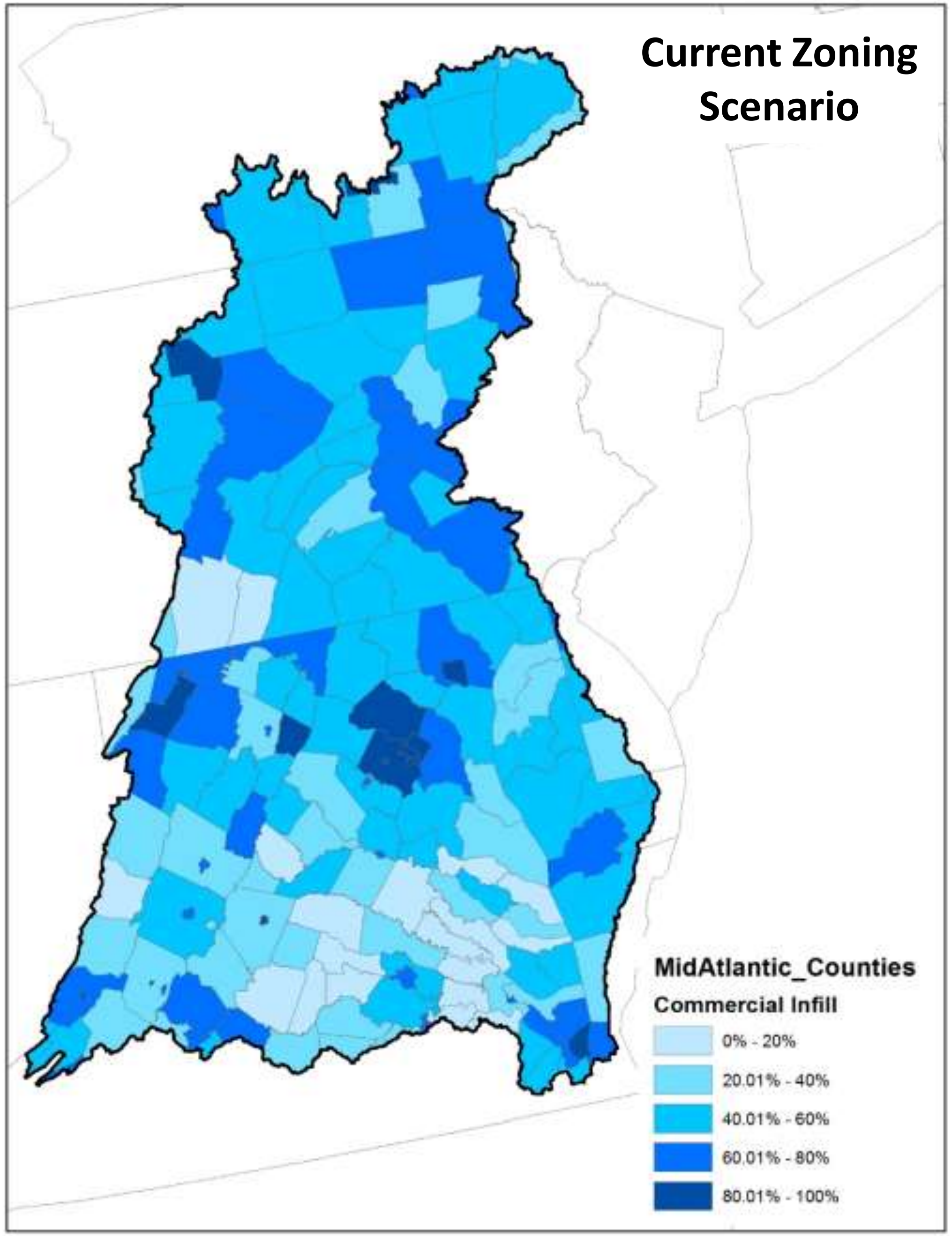


Collected by CBP from local and state agencies, 2013 - 2017

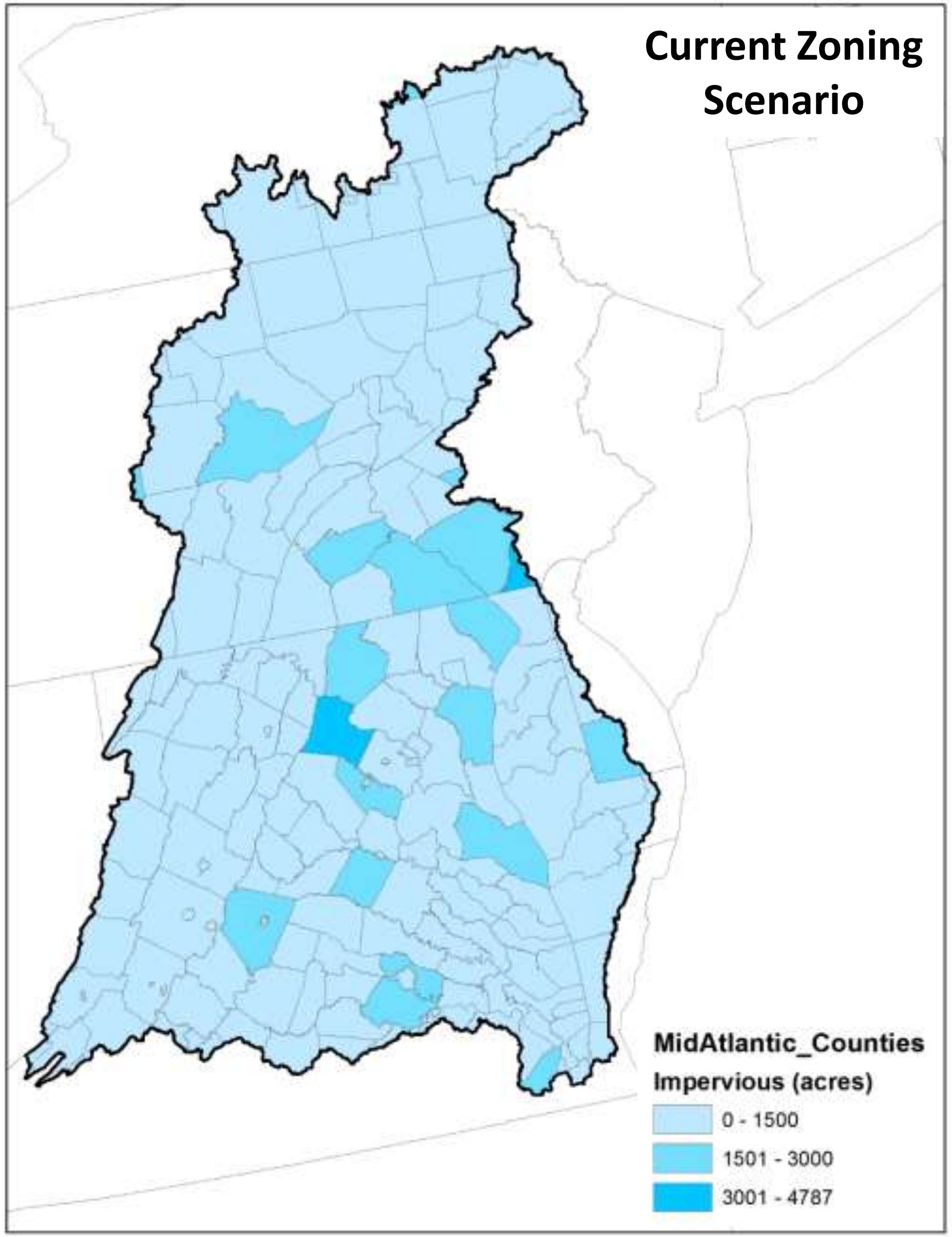
Residential Infill/Redevelopment



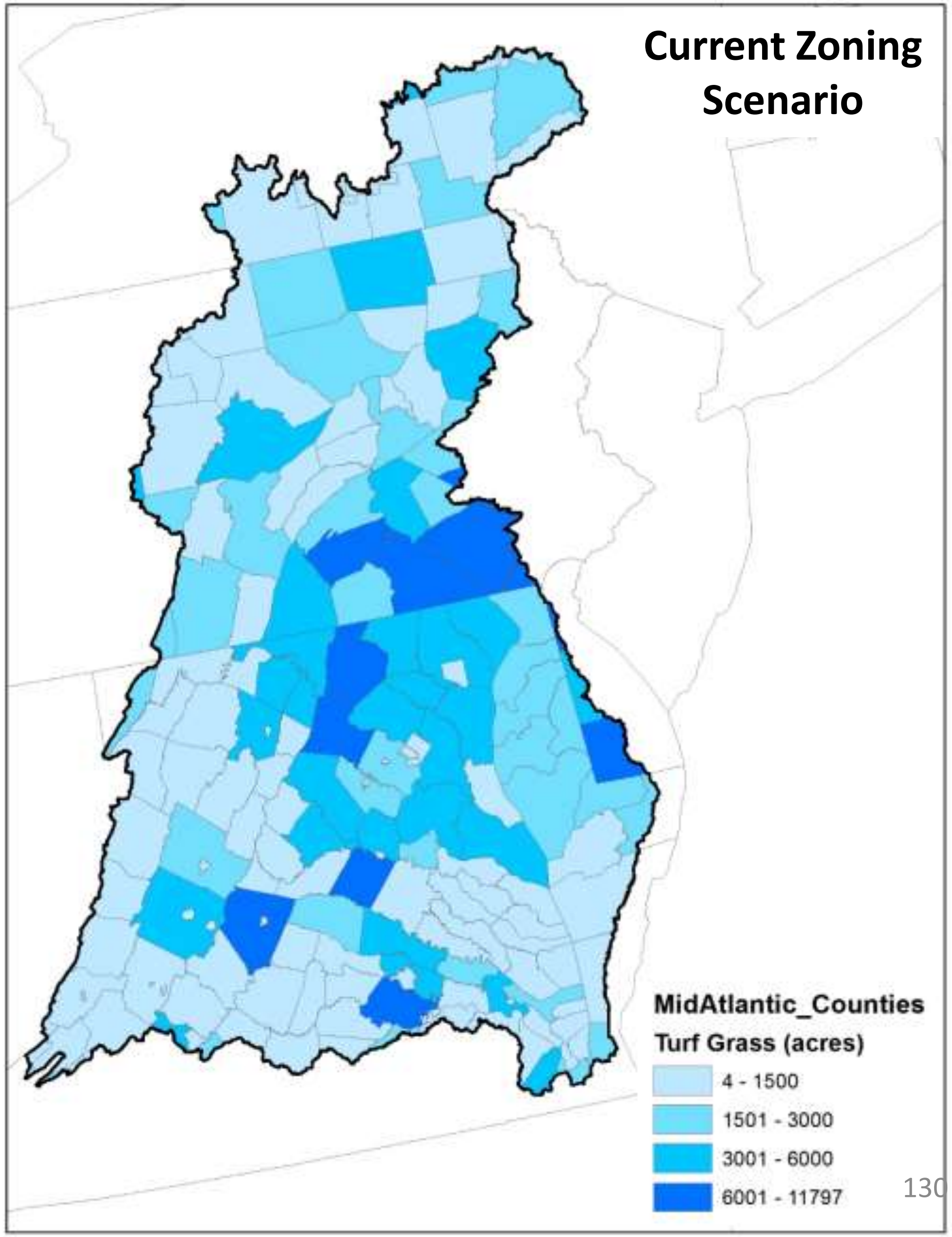
Commercial Infill/Redevelopment



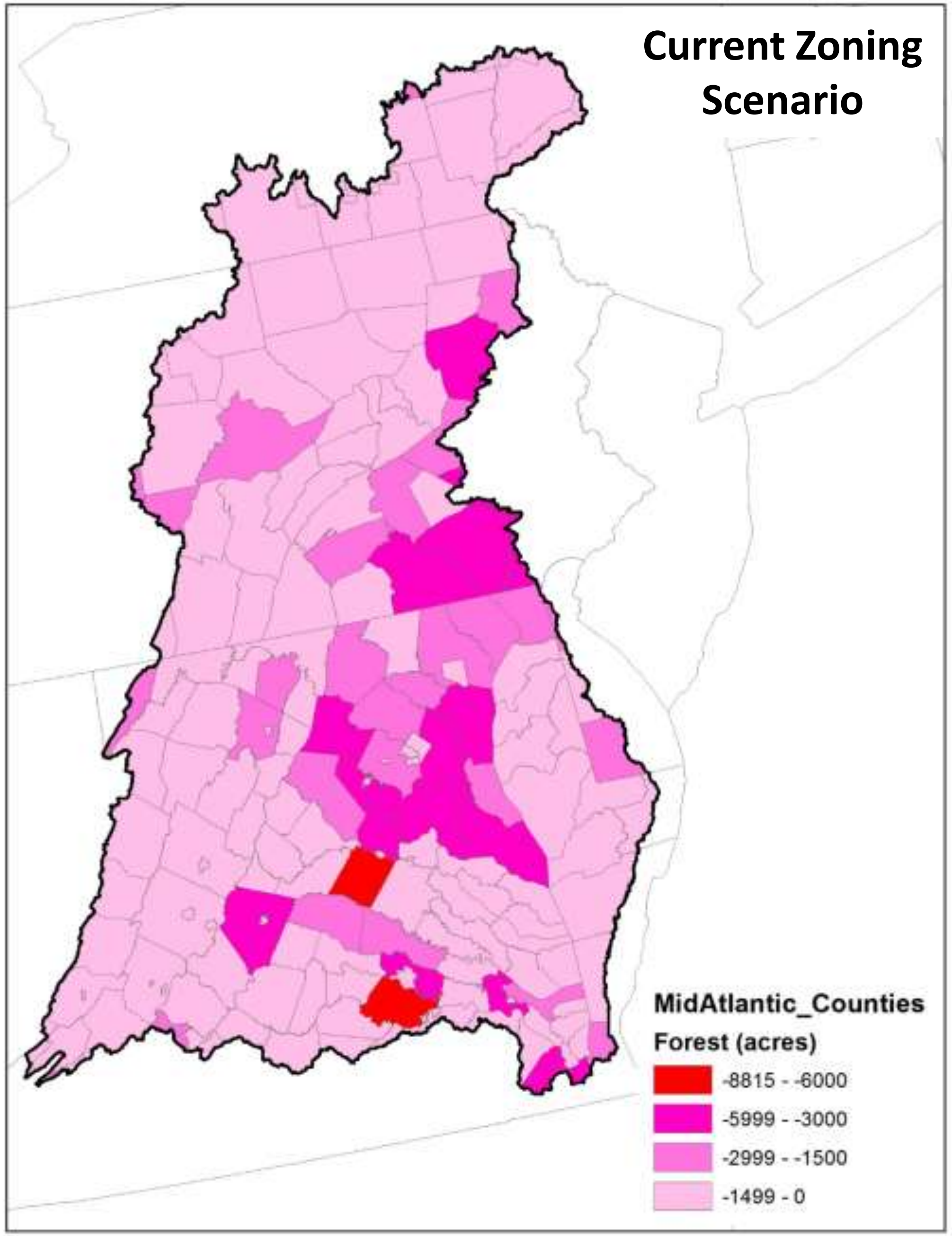
Increase in Impervious Surfaces



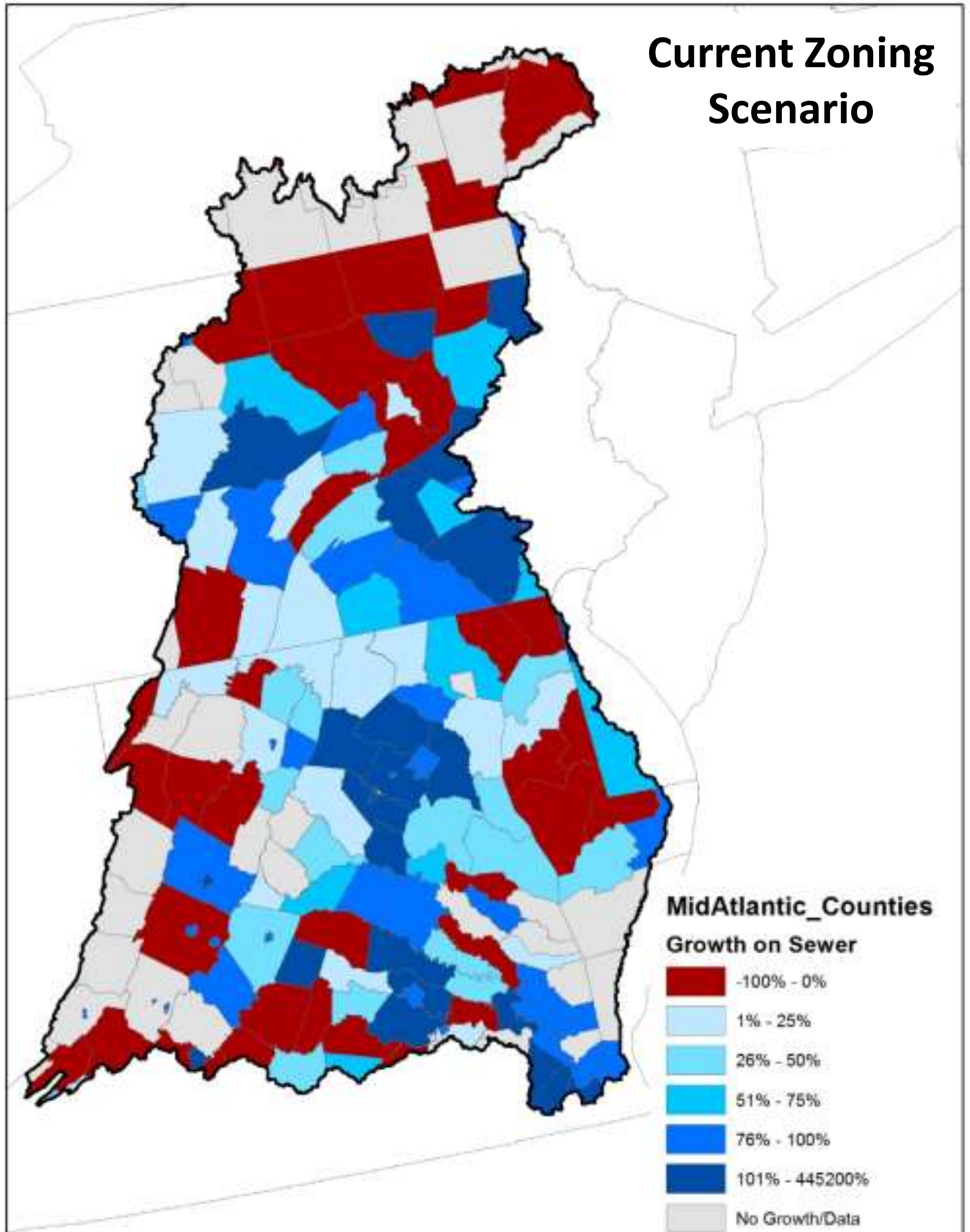
Increase in Turf Grass



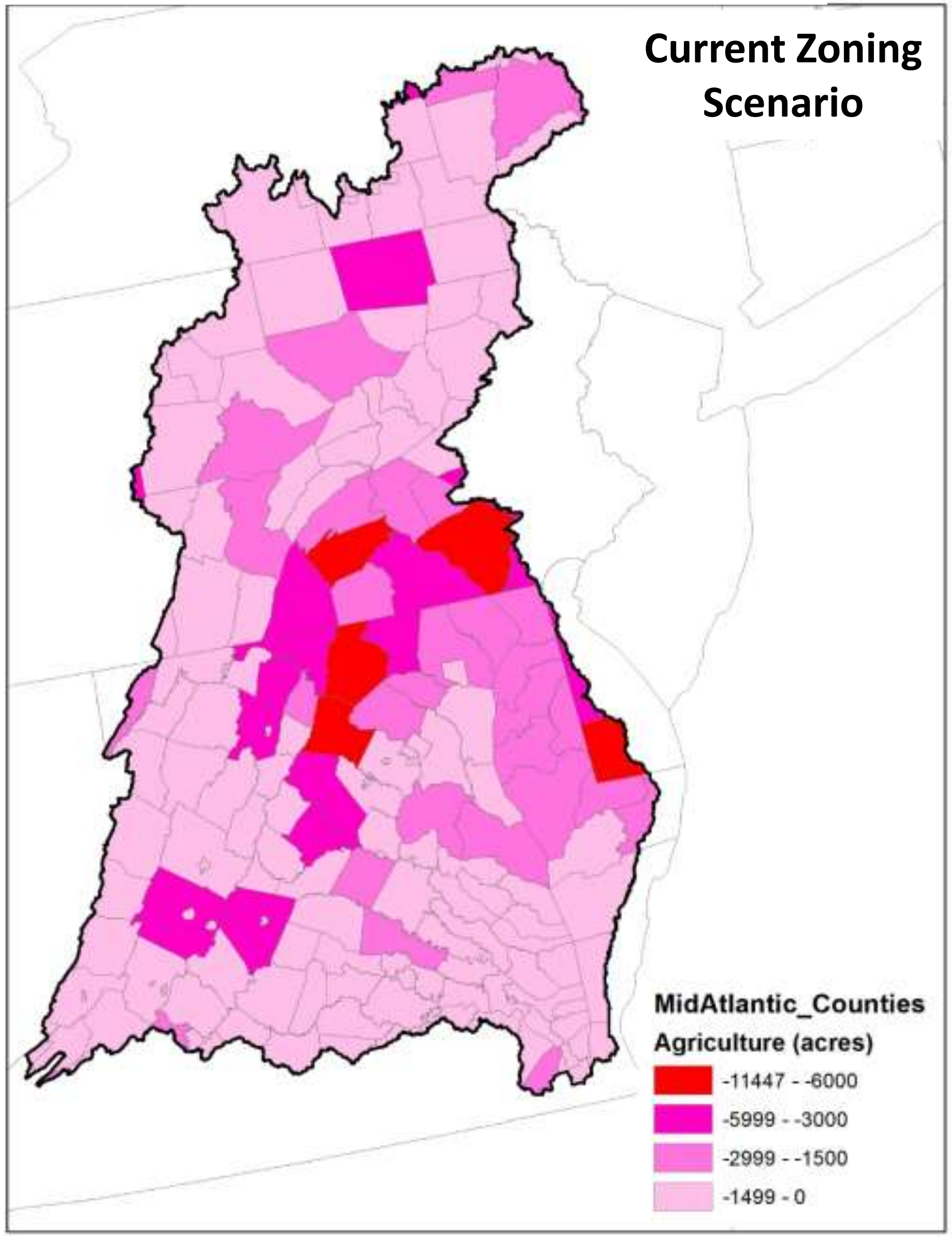
Forest Conversion to Development



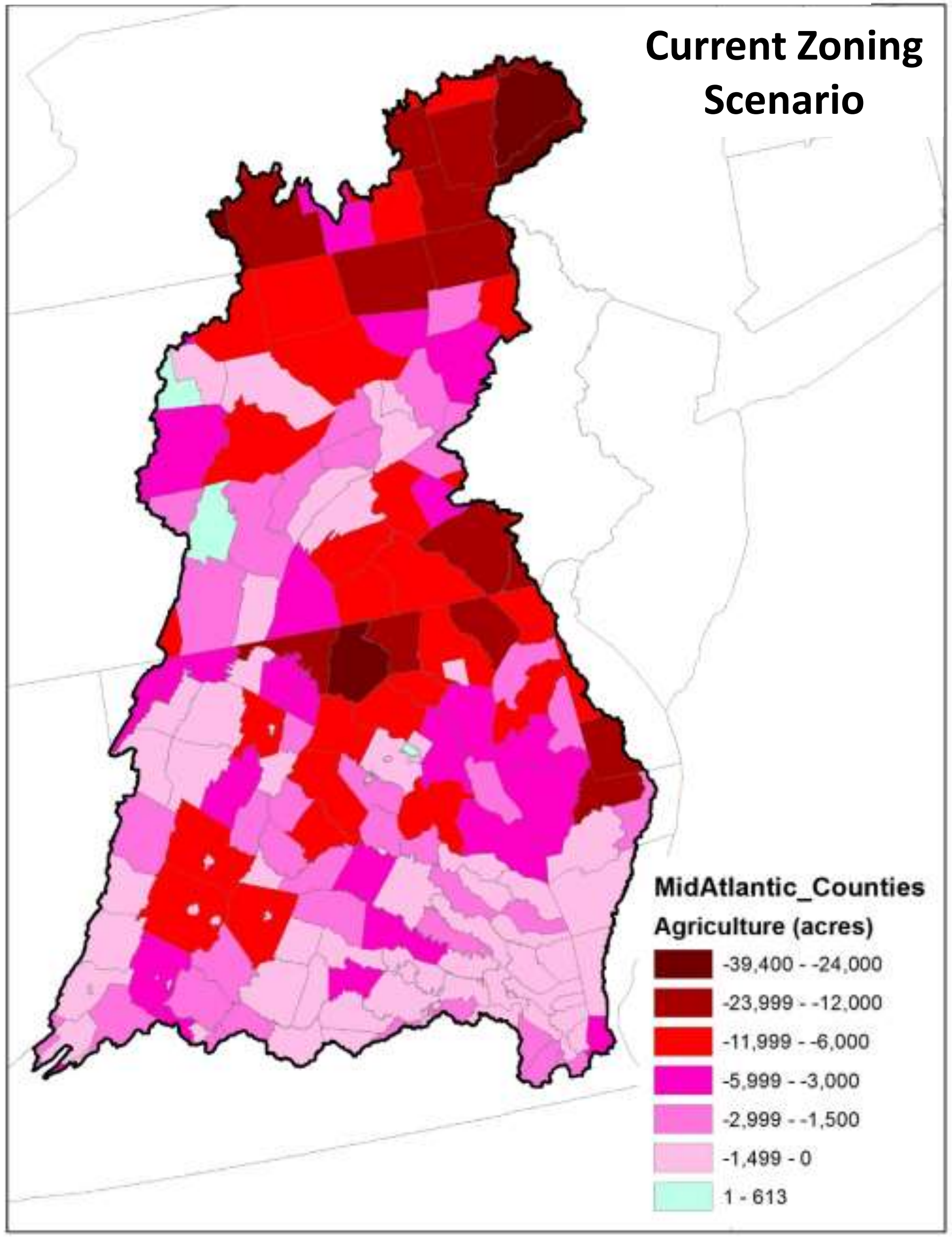
Growth on Sewer and Septic



Farmland Conversion to Development



Farmland Conversion + Land Retirement



WQGIT & Modeling Workgroup Recommendations: Nitrogen

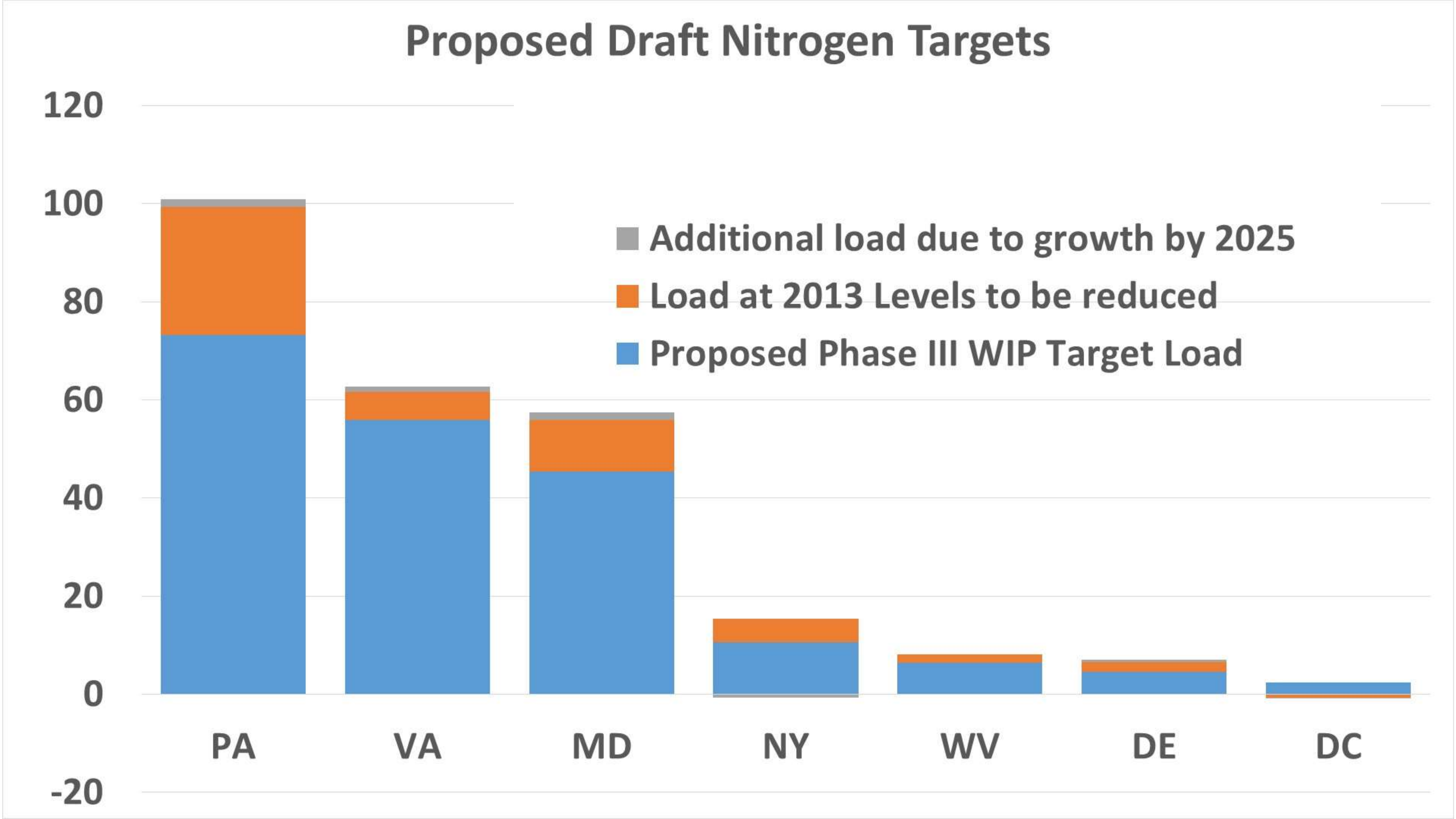
Jurisdiction	1985 Baseline	2013 Progress	Growth in Load to 2025	Phase III Planning Target
NY	18.71	15.44	-0.74	10.59
PA	122.41	99.28	1.66	73.18
MD	83.56	55.89	1.52	45.30
WV	8.73	8.06	-0.02	6.35
DC	6.48	1.75	0.00	2.43
DE	6.97	6.59	0.48	4.59
VA	84.29	61.53	1.09	55.82
Basinwide	331.15	248.54	4.00	198.25

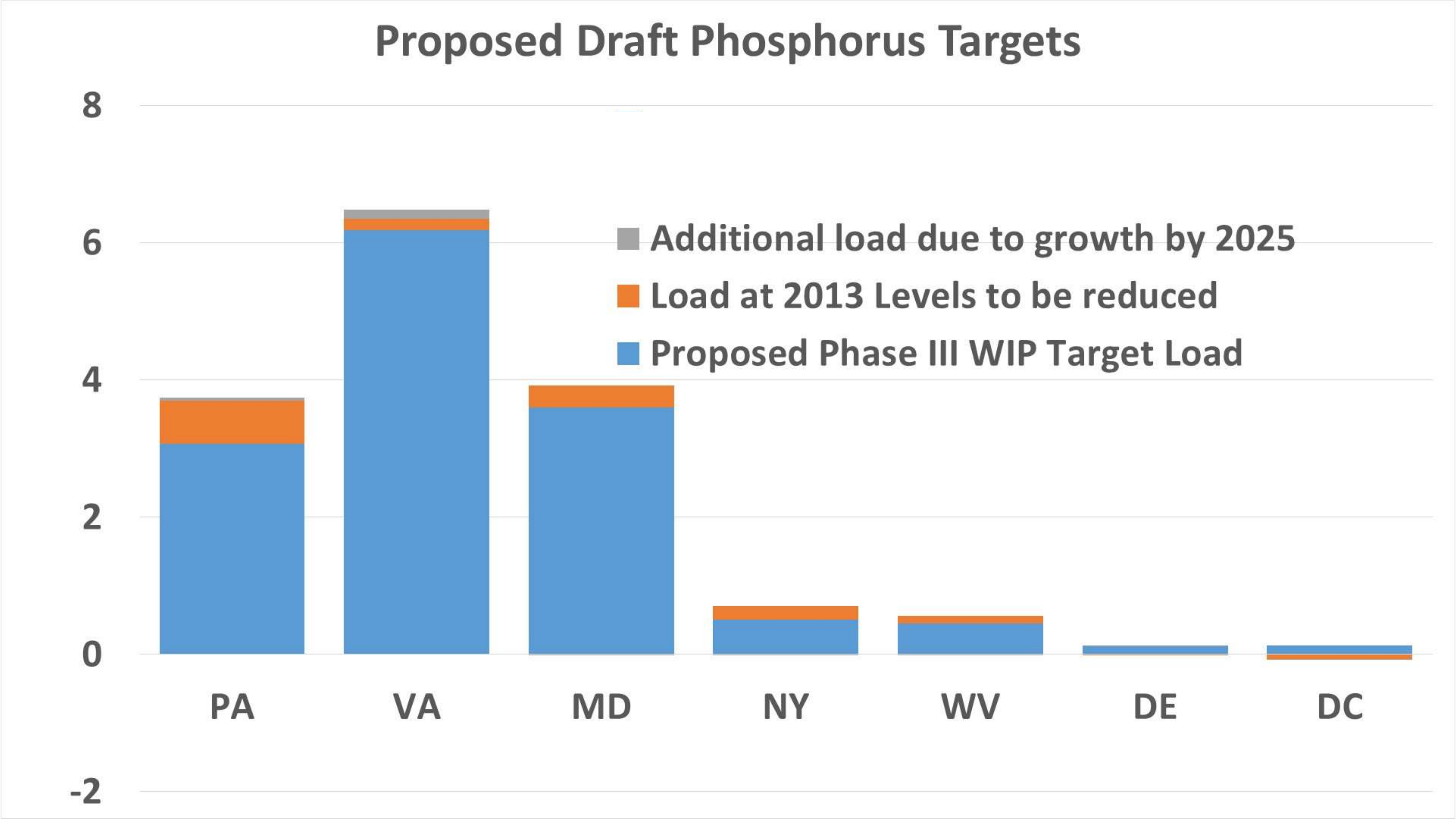
*Units: millions of pounds

WQGIT & Modeling Workgroup Recommendations: Phosphorus

Jurisdiction	1985 Baseline	2013 Progress	Growth in Load to 2025	Phase III Planning Target
NY	1.198	0.710	-0.005	0.506
PA	6.115	3.696	0.044	3.073
MD	7.419	3.919	-0.015	3.604
WV	0.793	0.560	-0.017	0.456
DC	0.090	0.062	0.000	0.130
DE	0.225	0.115	0.007	0.120
VA	13.545	6.345	0.140	6.186
Basinwide	29.384	15.408	0.154	14.073

*Units: millions of pounds


Proposed Draft Nitrogen Targets
120
100
80
60
40
20
0
-20
Additional load due to growth by 2025
Load at 2013 Levels to be reduced
Proposed Phase III WIP Target Load
PA
VA
MD
NY
WV
DE
DC


Proposed Draft Phosphorus Targets
8
6
4
2
0
-2
Additional load due to growth by 2025
Load at 2013 Levels to be reduced
Proposed Phase III WIP Target Load
PA
VA
MD
NY
WV
DE
DC

WQGIT Recommendations to the PSC

- Use the Partnership's Land Change Model to establish growth projections, with the opportunity for states (e.g., Maryland) to provide data or alternative modeling approaches in future years, which will be vetted through the Partnership approval process

- Use 2025 growth projections based on current zoning as base conditions for the Phase III WIPs

- Update the growth projections every 2 years with the best available data to inform the development of the two-year milestones

Today's Requested Policy Decisions

Approval of the Water Quality Goal Implementation Team's recommended use of 2025 projected conditions (based on the current zoning scenario) to account for growth in the development and implementation of the jurisdictions' Phase III WIPs

Today's Requested Policy Decisions

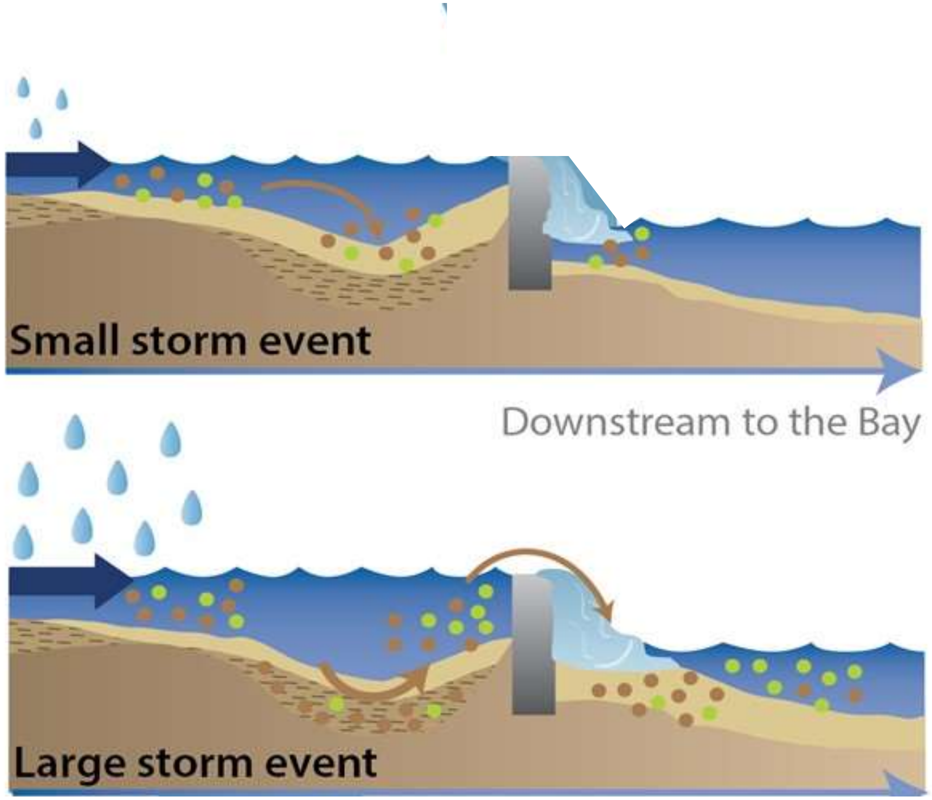
Approval of the Water Quality Goal Implementation Team's proposed approach to continued Partnership accounting for growth into the future by:

- Updating the Partnership's projection of future growth every two years
- Factoring these updated future projections into next round of the jurisdictions' two-year milestones
- Factoring in future (every 4 years) updates to the Partnership's high resolution land use/cover data across the entire watershed
- Ensuring local partner review of the future growth forecasts with each 2-year update

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

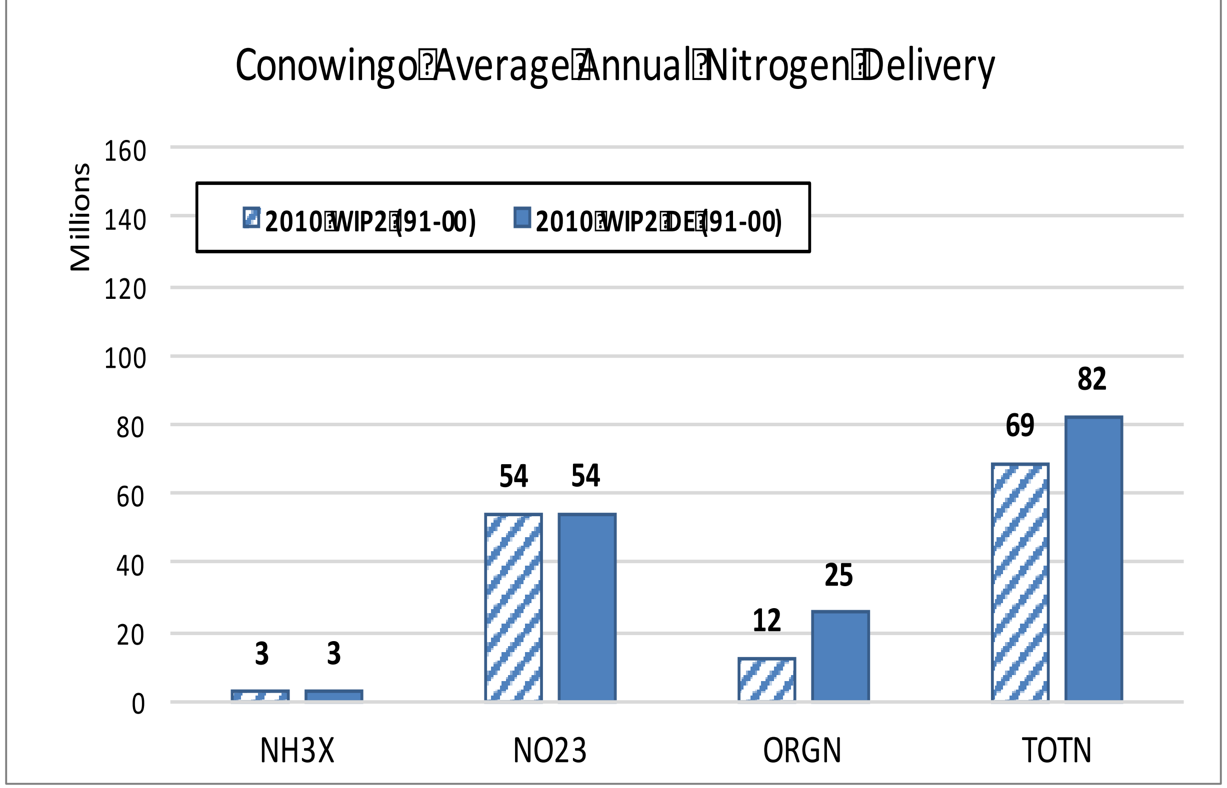


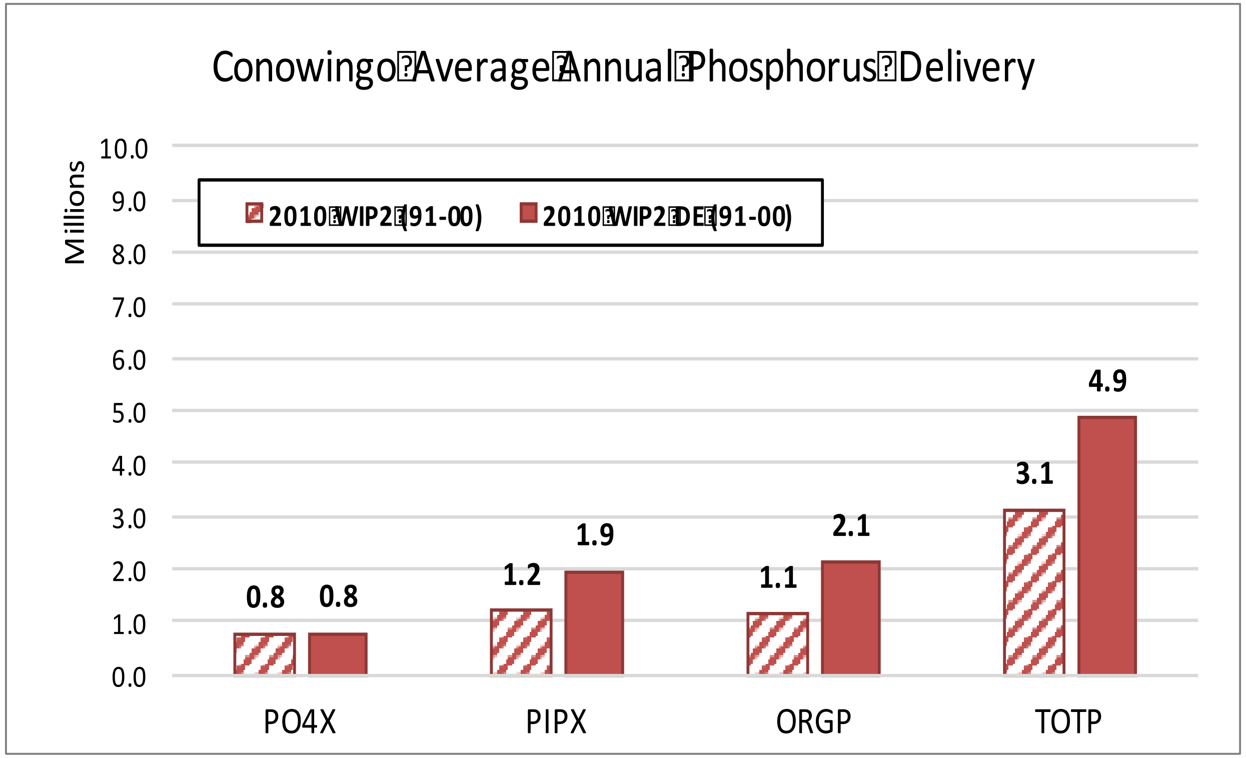
- Almost all of the nutrients are from upstream sources
- Much of the nutrients are biologically available to algae when they enter tidal waters

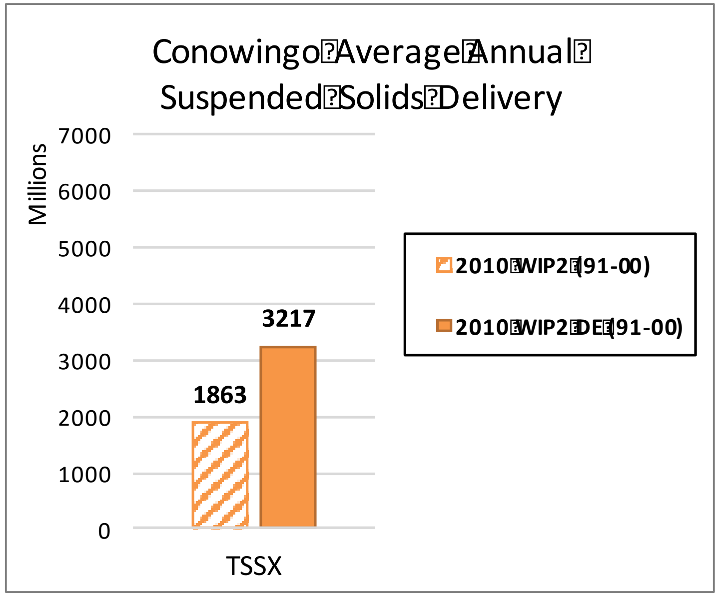
- Some of the nutrients are scoured from the bottom sediments behind the dam
- Much of these scoured nutrients are not biologically available to algae when they enter tidal waters

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



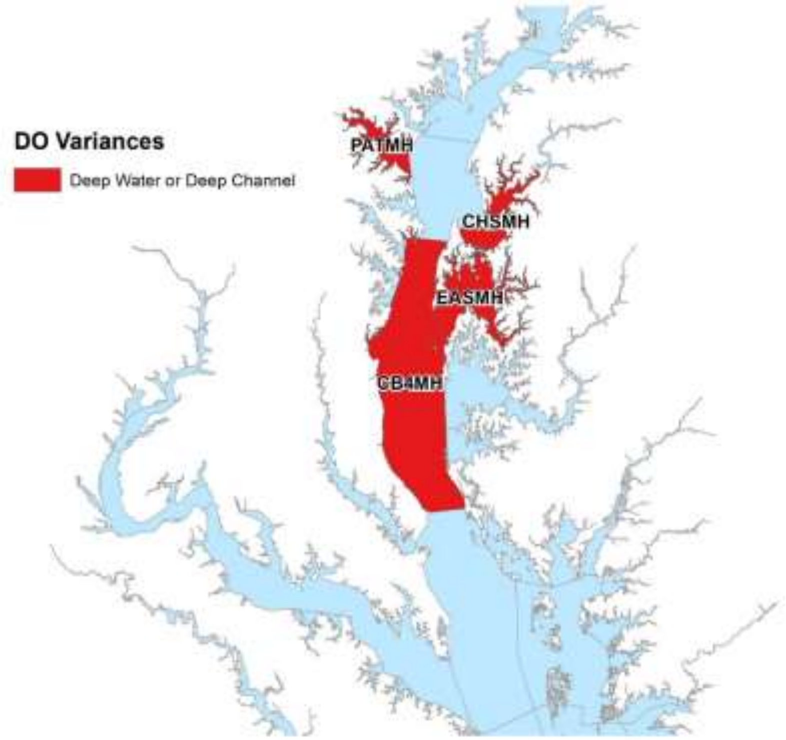




Estimated Loads to the Bay with Conowingo Dam and Reservoir at Infill Conditions

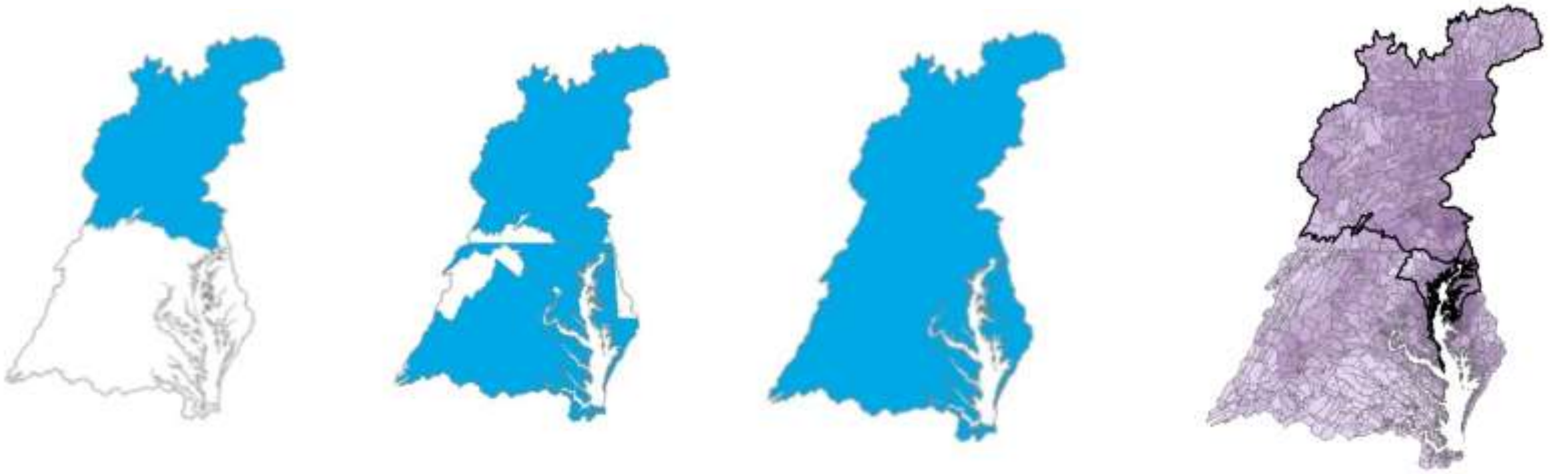
Additional **Nitrogen** Loads to be Addressed:
6 million pounds

Additional **Phosphorus** Loads to be Addressed:
0.26 million pounds



Original Options: How to Offset the Additional Loads Due to Conowingo Dam Infill

Who?



How?

Allocation equity rules used in the Bay TMDL

Assign additional load as local planning goal

When?

By 2025

Post-2025 with agreed-upon date

Beyond 2025 – no future date identified

WQGIT Jurisdictions' Positions on Who is Responsible for Addressing Conowingo Infill & By When

Who?

WV, DE & VA

WV & DE

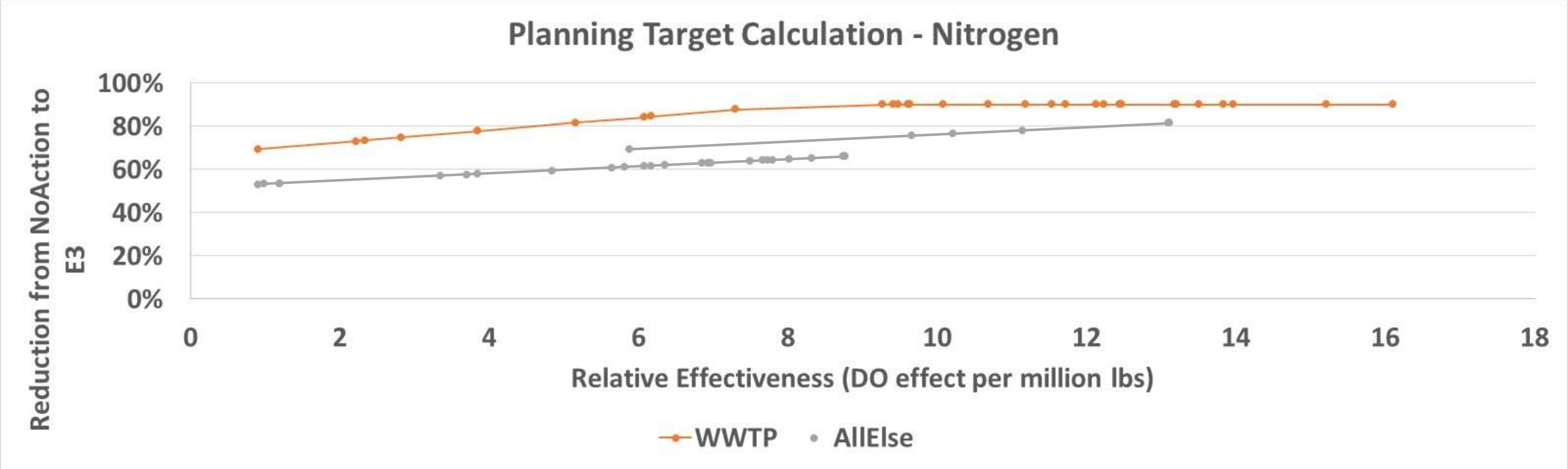
MD

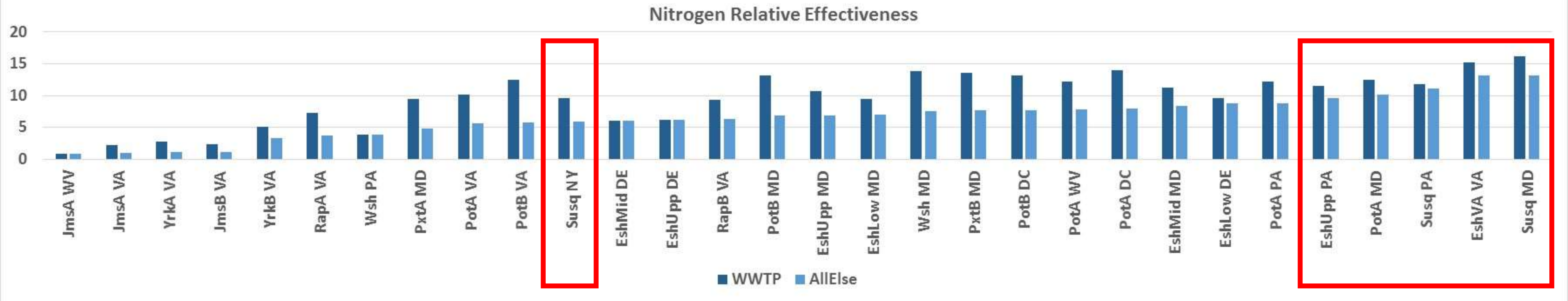
PA, WV, DC, & NY

When?

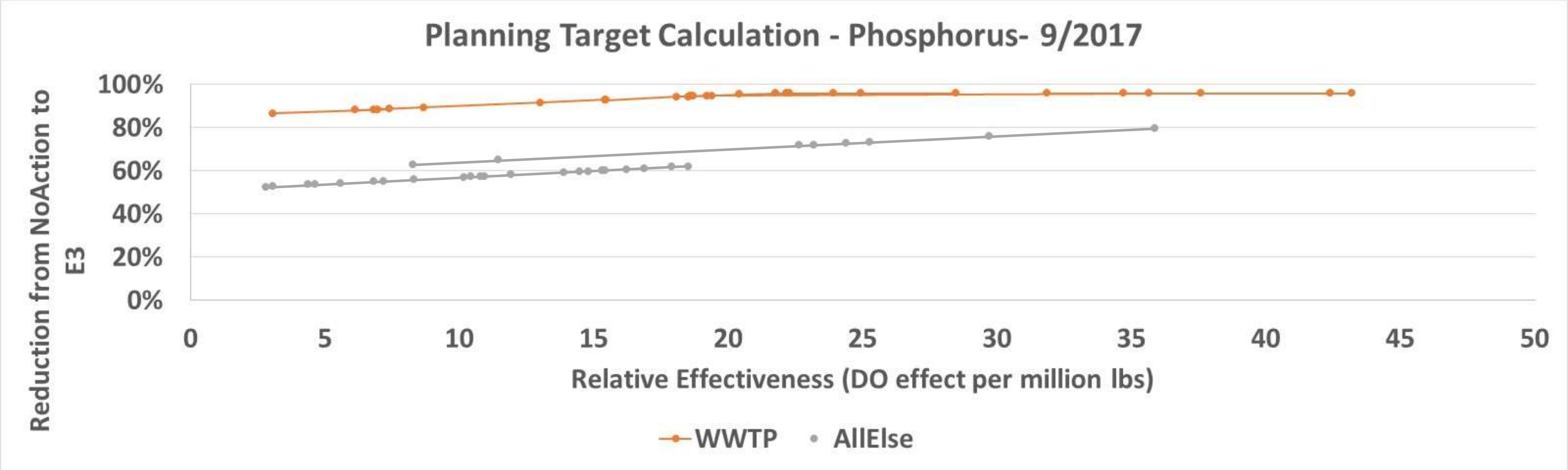
By 2025

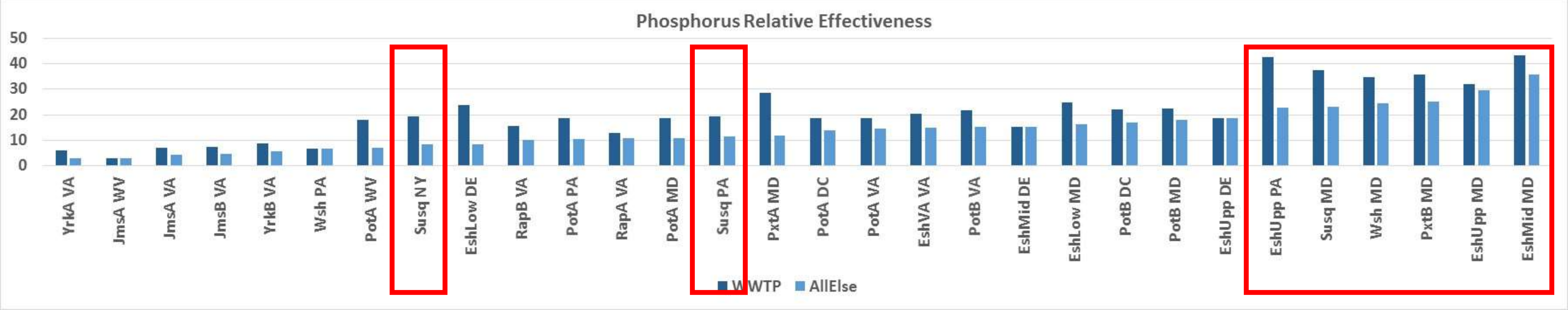
Deriving the Draft Phase III Planning Targets: Nitrogen



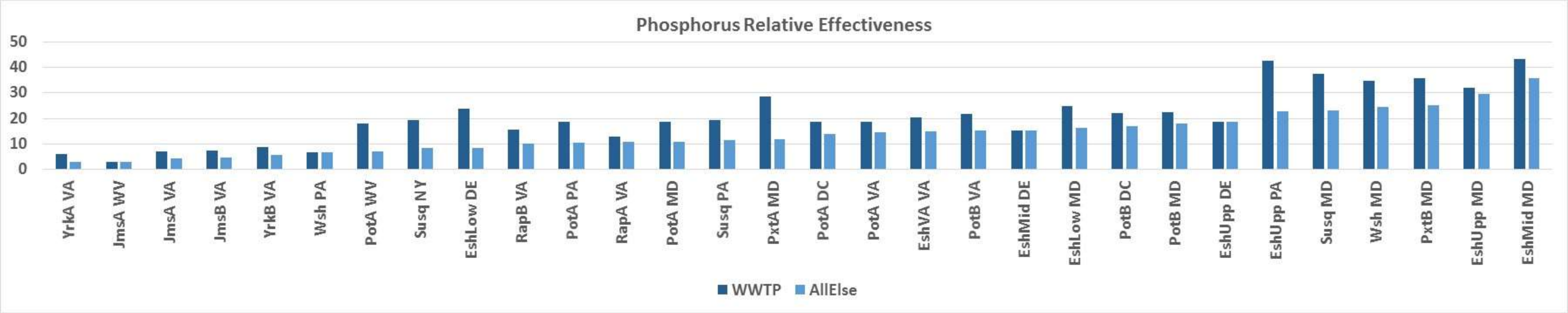


Deriving the Draft Phase III Planning Targets: Phosphorus

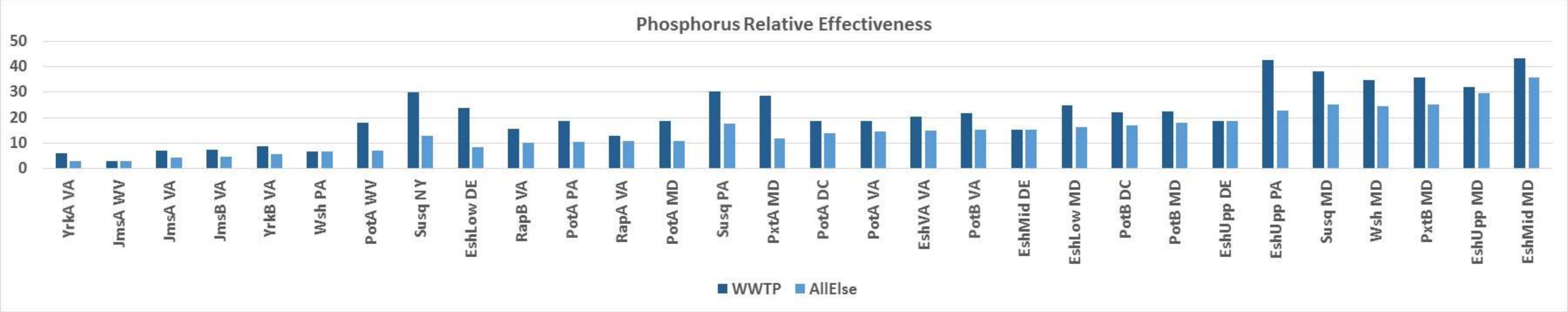




Relative Effectiveness with Conowingo in 1990s condition



Relative Effectiveness with Conowingo in current condition



Note changes in Susquehanna relative effectiveness only

Estimated Additional Nitrogen Reductions Required Under the Four Options

Jurisdiction	Susquehanna Only	Susquehanna + Effective Basins	Susquehanna + MD and VA	Entire Watershed
NY	0.57	0.50	0.36	0.32
PA	5.31	4.71	3.34	3.31
MD	0.12	0.78	1.97	1.76
WV	0.00	0.00	0.00	0.19
DC	0.00	0.00	0.00	0.00
DE	0.00	0.00	0.00	0.32
VA	0.00	0.14	1.54	1.38
Basinwide	6.01	6.12	7.21	7.28

*Units: millions of pounds

Estimated Additional Nitrogen Reductions Required Under the Four Options

Jurisdiction	Susquehanna Only	Susquehanna + Effective Basins	Susquehanna + MD and VA	Entire Watershed
NY	5.4%	4.7%	3.4%	3.0%
PA	7.3%	6.4%	4.6%	4.5%
MD	0.3%	1.7%	4.3%	3.9%
WV	0.0%	0.0%	0.0%	3.0%
DC	0.0%	0.0%	0.0%	0.2%
DE	0.0%	0.0%	0.0%	6.9%
VA	0.0%	0.2%	2.8%	2.5%

Estimated Additional Phosphorus Reductions Required Under the Four Options

Jurisdiction	Susquehanna Only	Susquehanna + Effective Basins	Susquehanna + MD and VA	Entire Watershed
NY	0.027	0.020	0.013	0.012
PA	0.230	0.176	0.109	0.115
MD	0.005	0.070	0.101	0.093
WV	0.000	0.000	0.000	0.013
DC	0.000	0.000	0.000	0.001
DE	0.000	0.000	0.000	0.005
VA	0.000	0.000	0.162	0.150
Basinwide	0.262	0.266	0.385	0.389

*Units: millions of pounds

Estimated Additional Phosphorus Reductions Required Under the Four Options

Jurisdiction	Susquehanna Only	Susquehanna + Effective Basins	Susquehanna + MD and VA	Entire Watershed
NY	5.3%	4.0%	2.5%	2.3%
PA	7.5%	5.7%	3.5%	3.7%
MD	0.1%	1.9%	2.8%	2.6%
WV	0.0%	0.0%	0.0%	2.9%
DC	0.0%	0.0%	0.0%	0.6%
DE	0.0%	0.0%	0.0%	4.1%
VA	0.0%	0.0%	2.6%	2.4%

WQGIT Recommendations to the PSC

WQGIT-recommended approach recognizes that all jurisdictions have benefited from the Conowingo reservoir and its nutrient and sediment pollution trapping and that there is a less costly approach than assignment of allocations that achieves water quality objectives and does not require reductions by all jurisdictions

- **Develop a separate implementation plan, which is a Partnership collaboration to address the additional reductions needed as a result of infill**
  - Address impacts in a way that makes the most scientific and economic sense, and supports those that can reduce pollution more effectively

WQGIT Recommendations to the PSC

WQGIT-recommended approach recognizes that all jurisdictions have benefited from the Conowingo reservoir and its nutrient and sediment pollution trapping and that there is a less costly approach than assignment of allocations that achieves water quality objectives and does not require reductions by all jurisdictions

- **Create approach that pools resources**
  - Pooled resources, which may include funding, technical assistance, advocacy, intellectual property, etc., from all jurisdictions would be managed (both in terms of allocation of funds and verification / tracking of reductions) by a third party under Partnership oversight
  - Pooling of resources and implementation would be phased in over time as appropriate

WQGIT Recommendations to the PSC

- **Necessary steps to implement proposed approach**
  - Reach Partnership consensus on the approach
  - PSC to send letter to Exelon
  - All jurisdictions and other partners develop the plan
  - Determine the role of Exelon in plan implementation based on Maryland's decisions regarding 401 certification
  - Finalize plan and determine gaps and contingencies
  - Begin plan implementation

WQGIT Recommendations to the PSC

- **Necessary steps to implement proposed approach (Continued)**
  - Evaluate, as is currently done with the milestones, the effectiveness and progress of the plan on an annual basis
  - Reevaluate the plan and make any necessary adjustments based on jurisdictional WIP implementation and any other factors that might influence plan success

- **Need to develop timelines to develop and implement the plan (by 2025?)**
  - Includes conducting a gap analysis to determine if the plan could be fully implemented by 2025

- **Conowingo Plan development likely to occur concurrently with Phase III WIP development**

Day Two Requested Policy Decisions

Approval of the WQGIT-proposed approach to account for the additional nutrient loads delivered to the Bay due to the Conowingo infill

Approval of the timeframe by which the jurisdictions have to address the additional nutrient loads

Factoring in Climate Change into the Jurisdictions' Phase III WIPs

Mark Bennett, USGS, CBP Climate Resiliency Workgroup Chair

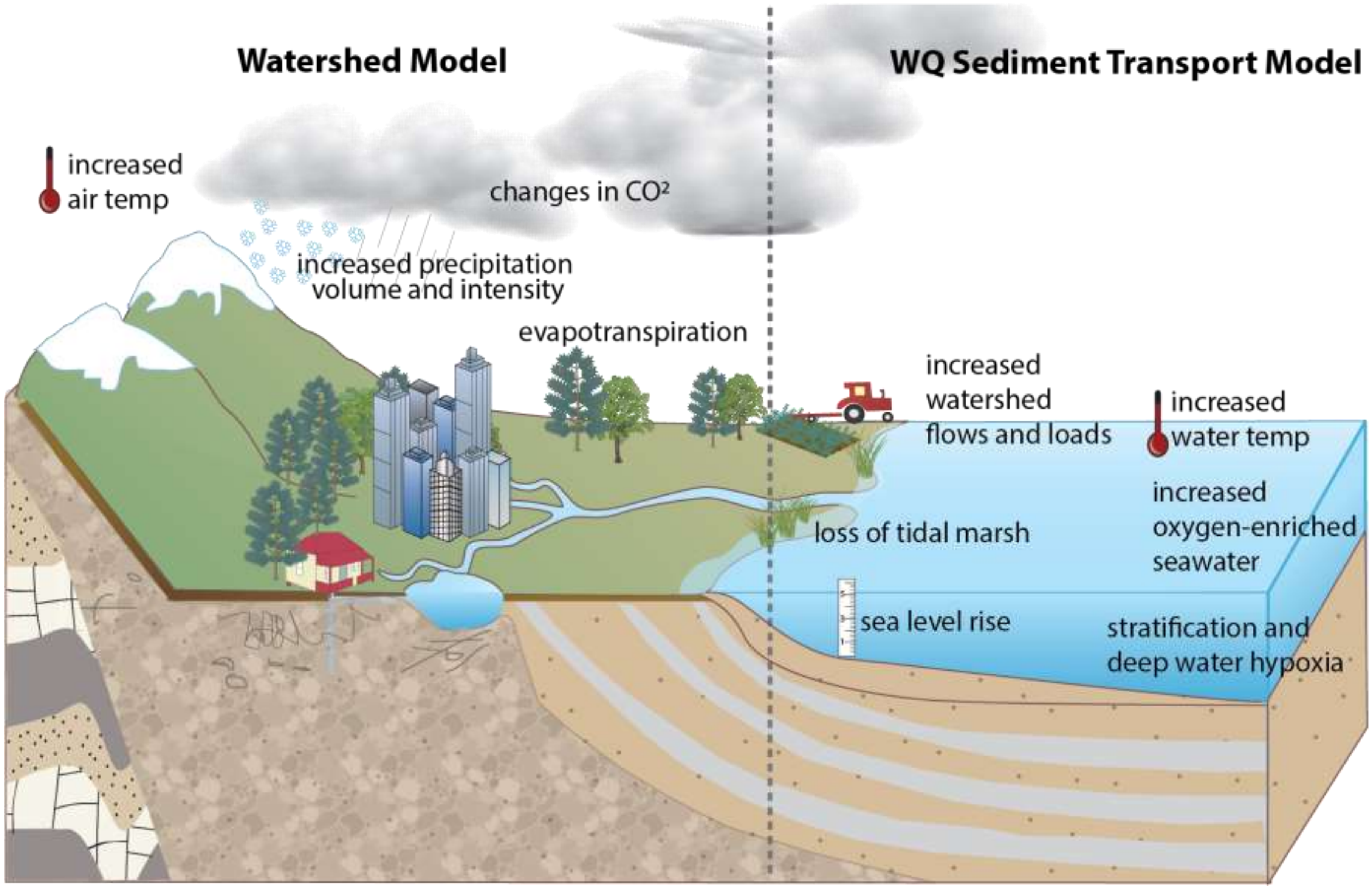
PSC-Approved Guiding Principles
Phase III WIP Development

- **Capitalize on "Co-benefits"** – maximize BMP selection to increase climate resiliency
- **Account for and integrate planning and consideration of existing stressors** – consider existing stressors in establishing reduction targets or BMP selection
- **Align with existing climate resilient plans and strategies** – document jurisdictions' action plans and strategies to address climate change
- **Manage for risk and plan for uncertainty** – employ risk management and flexible implementation strategies to achieve and maintain water quality standards
- **Engage Local Agencies and Leaders** – work cooperatively with local partners to provide best available data on local impacts

PSC-Approved Guiding Principles Phase III WIP Implementation

- **Reduce vulnerability** – use "Climate Smart" principles to site and design BMPs
- **Build in flexibility and adaptability** – allow for adjustments in BMP implementation to consider potential uncertainties and response options
- **Adaptive manage** – allow for changes in BMP selection or WIP implementation over-time

Accounting for Changing Conditions



Impact of Changing Conditions on Bay and Watershed Increase Through Time

- Based on STAC guidance[1], the Partnership is using projections for 2025 that have a high level of confidence
  - Selection of projections for sea level rise and precipitation change were based on past records of observed climatic and resultant river flow conditions.
  - There is less uncertainty in downscaled temperature projections for 2025.
- According to the National Climate Assessment[2], impacts associated with precipitation, temperature and sea level are all expected to increase beyond 2025

1. CBP Scientific and Technical Advisory Committee. 2016. The Development of Climate Projections for Use in Chesapeake Bay Program Assessments. March 2016 Workshop.
2. 4th National Climate Assessment (November 2017)

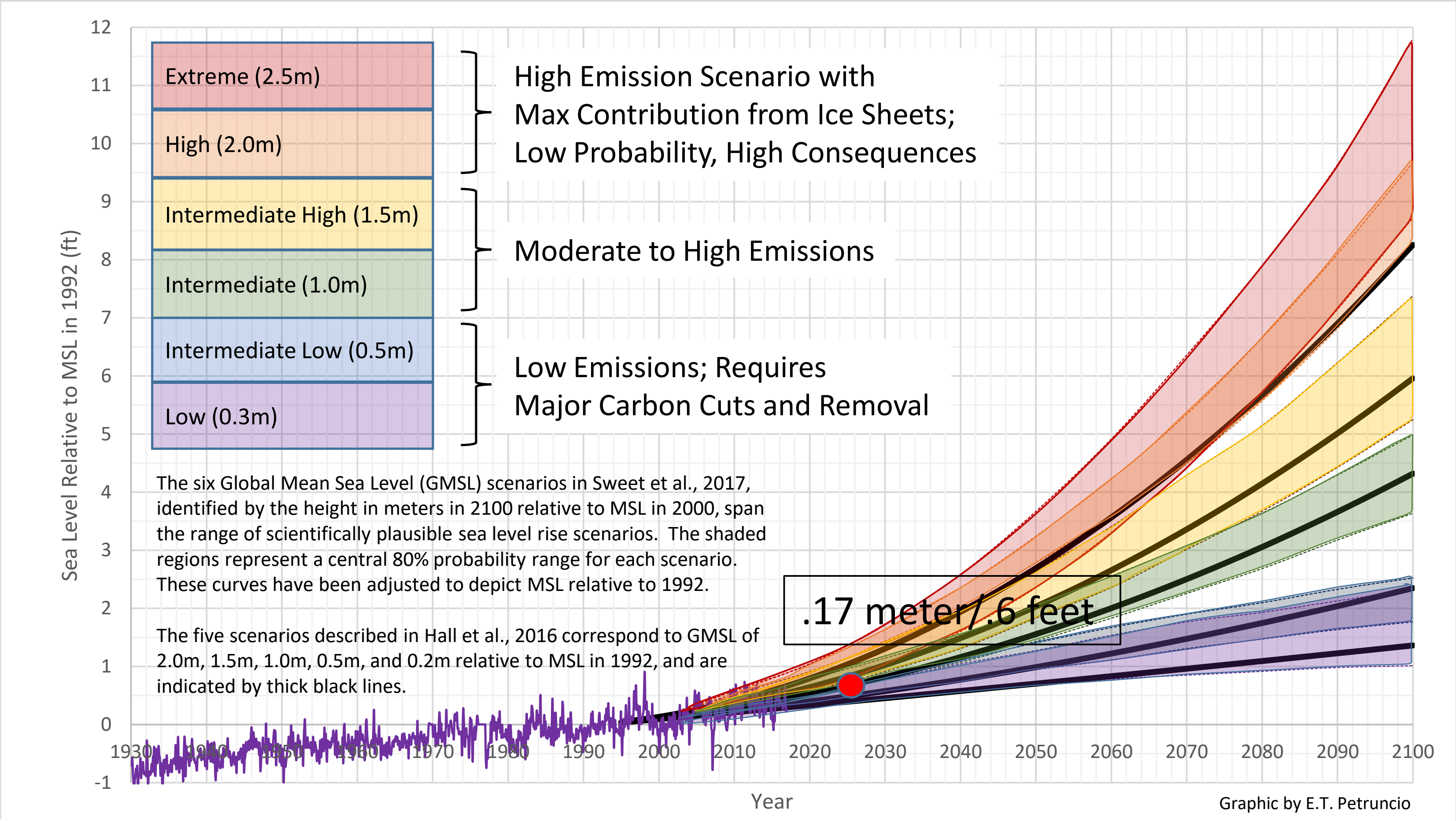
Impact of Changing Conditions on Bay and Watershed Increase Through Time

- "The Chesapeake Bay Watershed is already experiencing impacts associated with sea level rise (e.g., coastal storm impacts and nuisance flooding) as well as heavy precipitation events[1]"

- "Heavy precipitation events in most parts of the United States have increased in both intensity and frequency since 1901 (high confidence). There are important regional differences in trends, with the largest increases occurring in the northeastern United States (high confidence).[2]"

1. CBP Scientific and Technical Advisory Committee. 2016. The Development of Climate Projections for Use in Chesapeake Bay Program Assessments. March 2016 Workshop.
2. 4th National Climate Assessment (November 2017)

Relative Sea Level Rise



Relative Sea Level Rise Scenarios for Annapolis

with Annapolis Monthly Mean Sea Level Data for 1930-2016

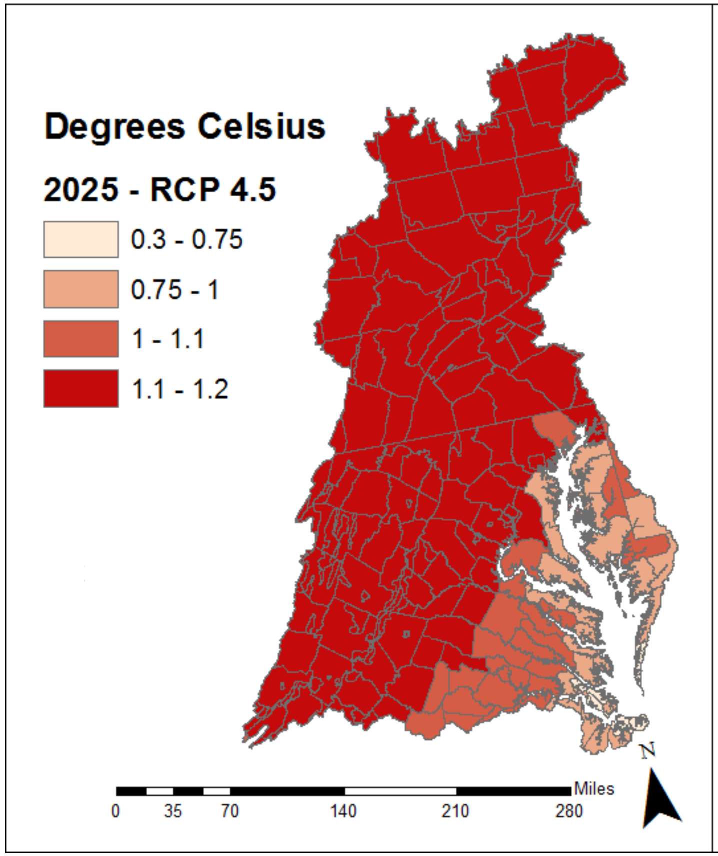
CBP Climate Resiliency Workgroup recommended 2025 projection: .17 meter/.6 feet

Sources: Hall et al. (2016) and Sweet et al. (2017)

Temperature Change

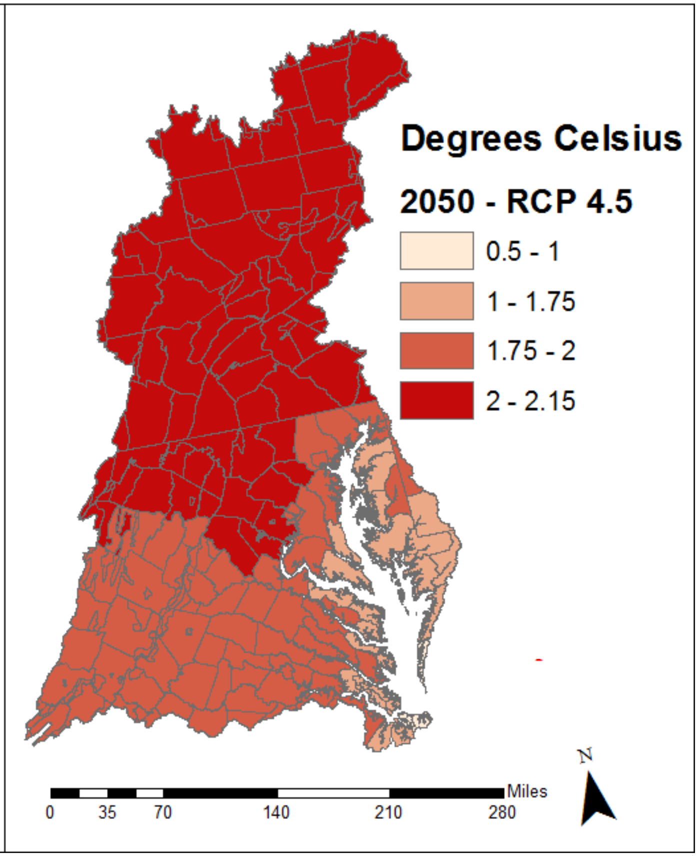
2025/2050 STAC Recommended Projections

1995-2025



1.98° F / 1.1° C Increase in Average Annual Temp

1995-2050

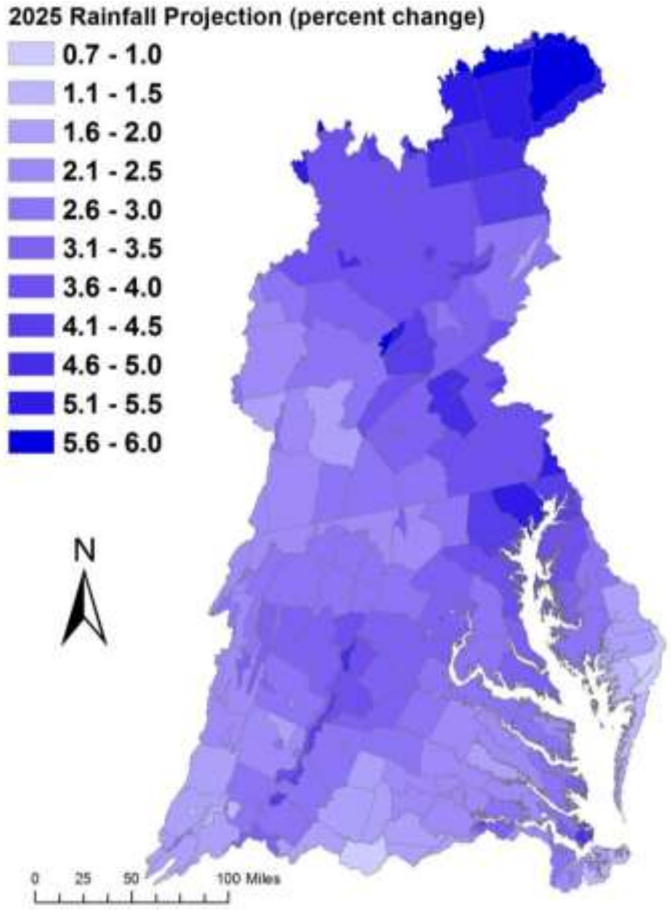


3.5° F / 1.94° C Increase in Average Annual Temp

Source: Kyle Hinson, CRC/CBPO

Precipitation Change

2025 STAC Recommended Projection: Trends in 88-years of annual PRISM[1] data



Change in Rainfall Volume
2021-2030 vs. 1991-2000

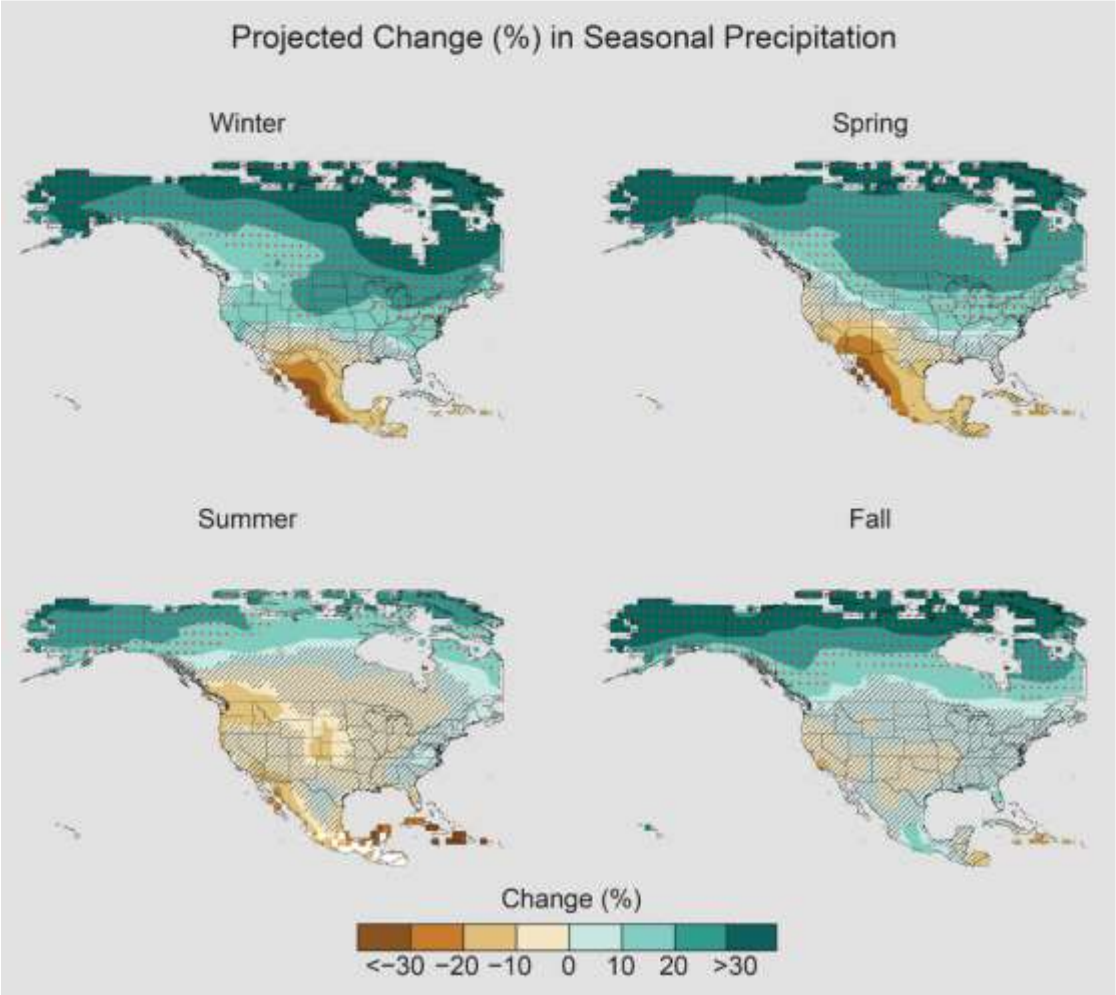
Major Basins	PRISM Trend
Youghiogheny River	2.1%
Patuxent River Basin	3.3%
Western Shore	4.1%
Rappahannock River Basin	3.2%
York River Basin	2.6%
Eastern Shore	2.5%
James River Basin	2.2%
Potomac River Basin	2.8%
Susquehanna River Basin	3.7%
Chesapeake Bay Watershed	**3.1%**

Source: Kyle Hinson, CRC/CBPO

[1] Parameter-elevation Relationships on Independent Slopes Model

Precipitation Change

4th NCA Future Seasonal Patterns (2070 – 2099)

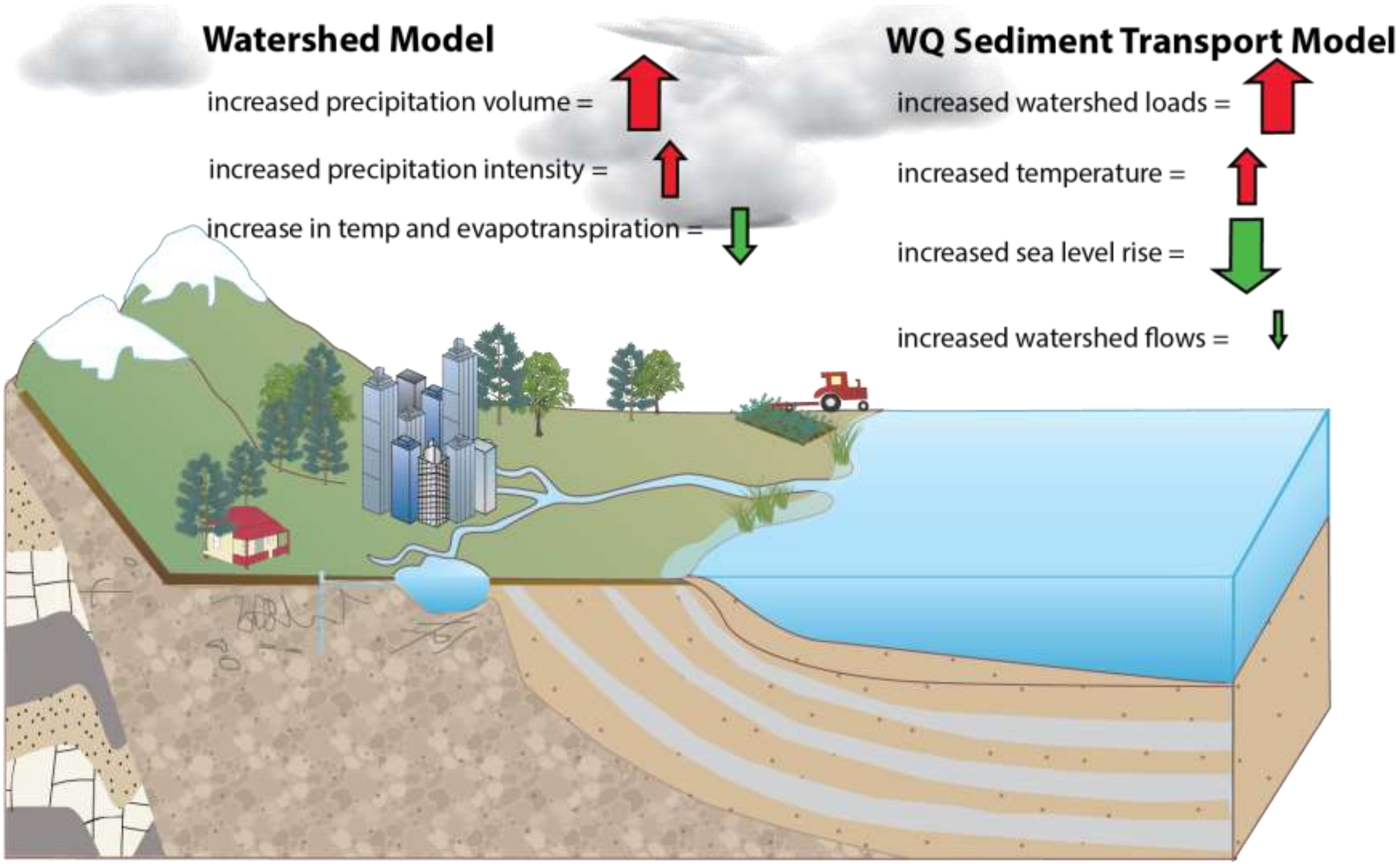


Projected change (%) in total seasonal precipitation from CMIP5 simulations for 2070–2099. The values are weighted multimodel means and expressed as the percent change relative to the 1976–2005 average. These are results for the higher scenario (RCP8.5).

Source: NOAA NCEI (NCA 2017)

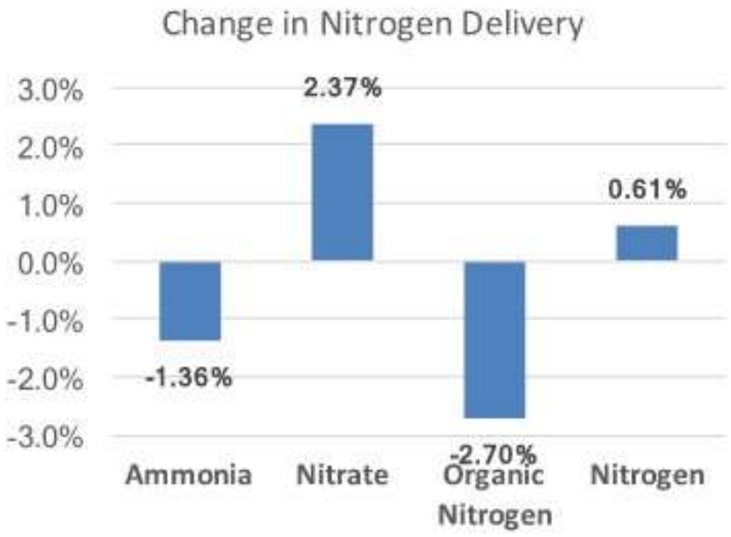
Accounting for Changing Conditions

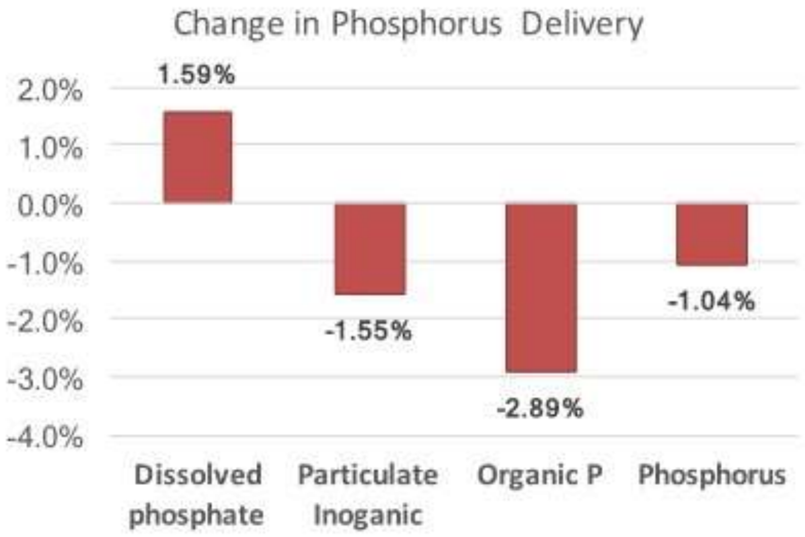
Cumulative Assessment of Bay Low Dissolved Oxygen Impacts



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





Climate Change Loads: Nitrogen

Jurisdiction	1985 Baseline	2013 Progress	Climate Change	Phase III Planning Target
NY	18.710	15.440	0.400 (3.8%)	10.594
PA	122.414	99.275	4.135 (5.7%)	73.181
MD	83.556	55.893	2.194 (4.8%)	45.296
WV	8.727	8.065	0.236 (3.7%)	6.347
DC	6.481	1.754	0.006 (0.2%)	2.425
DE	6.968	6.587	0.397 (8.7%)	4.587
VA	84.295	61.530	1.722 (3.1%)	55.822
Basinwide	331.151	248.544	9.089 (4.6%)	198.253

*Units: millions of pounds

Climate Change Loads: Phosphorus

Jurisdiction	1985 Baseline	2013 Progress	Climate Change	Phase III Planning Target
NY	1.198	0.710	0.015 (2.9%)	0.506
PA	6.115	3.696	0.143 (4.7%)	3.073
MD	7.419	3.919	0.117 (3.2%)	3.604
WV	0.793	0.560	0.017 (3.7%)	0.456
DC	0.090	0.062	0.001 (0.8%)	0.130
DE	0.225	0.115	0.006 (5.1%)	0.120
VA	13.545	6.345	0.187 (3.0%)	6.186
Basinwide	29.384	15.408	0.485 (3.4%)	14.073

*Units: millions of pounds

Policy Options for Accounting for Climate Change in the Jurisdictions' Phase III WIPs

Mark Bennett, USGS, CBP Climate Resiliency Workgroup Co-Chair

Two Policy Approaches

Numeric

and/or

Programmatic

Numerical Approach

- A quantitative, numerical approach will result in a changed level of effort necessary to meet water quality standards
- Account for the increased pollutant loads to each jurisdiction's portion of the Bay watershed
- Accounts for feedbacks to the Bay's assimilative capacity
- This approach would treat the estimated cumulative effect of changed conditions due to climate change similarly to the approach being taken to account for growth
- Jurisdictions would develop Phase III WIPs which account for the estimated increased pollutant loads

Numerical Approach: Pros & Cons

Pros	Cons
• Comprehensive, straight-forward approach • Demonstrates Partnership's commitment to Chesapeake Bay Agreement Climate Resiliency Goal • Near-term response • Implemented in sequence with development of Phase III WIPs	• Increased level of effort required to meet water quality standards • If implemented in isolation, would not address the anticipated impacts of climate change on BMPs

Programmatic Approach

- An "adaptive management approach" that would be implemented through the two-year milestone process
- Would not change a jurisdictions' planning targets
- Directs the Partnership to collect and consider new information on the performance of BMPs, including the contribution of seasonal, inter-annual climate variability, and weather extremes.
  - Jurisdictions would assess this information and adjust plans, over-time, to better mitigate anticipated changes in loads and impacts on the performance of BMPs.
- Would require the inclusion of a narrative strategy in Phase III WIPs, describing a jurisdictions' programmatic commitments to address climate change.
  - A sample "*narrative strategy*" would be provided to jurisdictions to guide implementation.

Programmatic Approach: Pros & Cons

Pros	Cons
• Adaptively managing for long-term change • Allows for use of local expertise and knowledge • Provides for learning across jurisdictions about methods and results • Allows for flexibility in jurisdictions' approaches to addressing climate change • Provides standard elements to be addressed	• If implemented in isolation (w/o numeric approach), delays substantive action to address climate change in the near-term • Lack of specific technical understanding to guide implementation • Requires additional monitoring and assessment efforts • Inconsistency in implementation across jurisdictions

WQGIT Recommendations to the PSC: Adopt a dual approach to factor climate change into the Phase III WIPs

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 (derived using the planning targets methodology)

    - Incorporate local priorities (e.g., flooding) and actions to address climate change impacts

WQGIT Recommendations to the PSC: Adopt a dual approach to factor climate change into the Phase III WIPs

1. **Adopt a programmatic approach to address climate change (Continued)**

   - Document the current understanding of the science and identify the research gaps and needs, and what we hope to learn over time given the current state of uncertainty (e.g., a better understanding of the BMP responses, including new or other emerging BMPs, to climate change conditions)

   - Identify a date by which the Partnership will provide additional science and information to help inform implementation efforts to address climate change (early 2021 to inform 2022-2023 milestones?)

WQGIT Recommendations to the PSC: Adopt a dual approach to factor climate change into the Phase III WIPs

2. **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, including the methodology used to develop jurisdiction-specific nutrient pollutant loads due to 2025 climate change conditions

WQGIT Recommendations to the PSC: Adopt a dual approach to factor climate change into the Phase III WIPs

2. **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 (Continued)**

    - 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

WQGIT Recommendations to the PSC

Provide the jurisdictions with the **flexibility** to explicitly account for additional nutrient pollutant loadings due to 2025 climate change impacts in their Phase III WIPs and/or 2-year milestones **prior to the Partnership agreed-upon date**

Day Two Requested Policy Decisions

Approval of the WQGIT-proposed dual approach to factor climate change into the Phase III WIPs

Approval of WQGIT recommendation to provide flexibility among jurisdictions and a commitment for CBP programmatic support (e.g., guidance, data, funding, etc.) for implementation of climate change policies that exceed the Partnership approved policies

Accounting for Changed Conditions in the Jurisdictions' Phase III WIPs

Teresa Koon, WV DEP, CBP Water Quality Goal Implementation Team Vice Chair

and

Lee Currey, MDE, CBP Modeling Workgroup Co-Chair

Summary of “All the Numbers”: Nitrogen

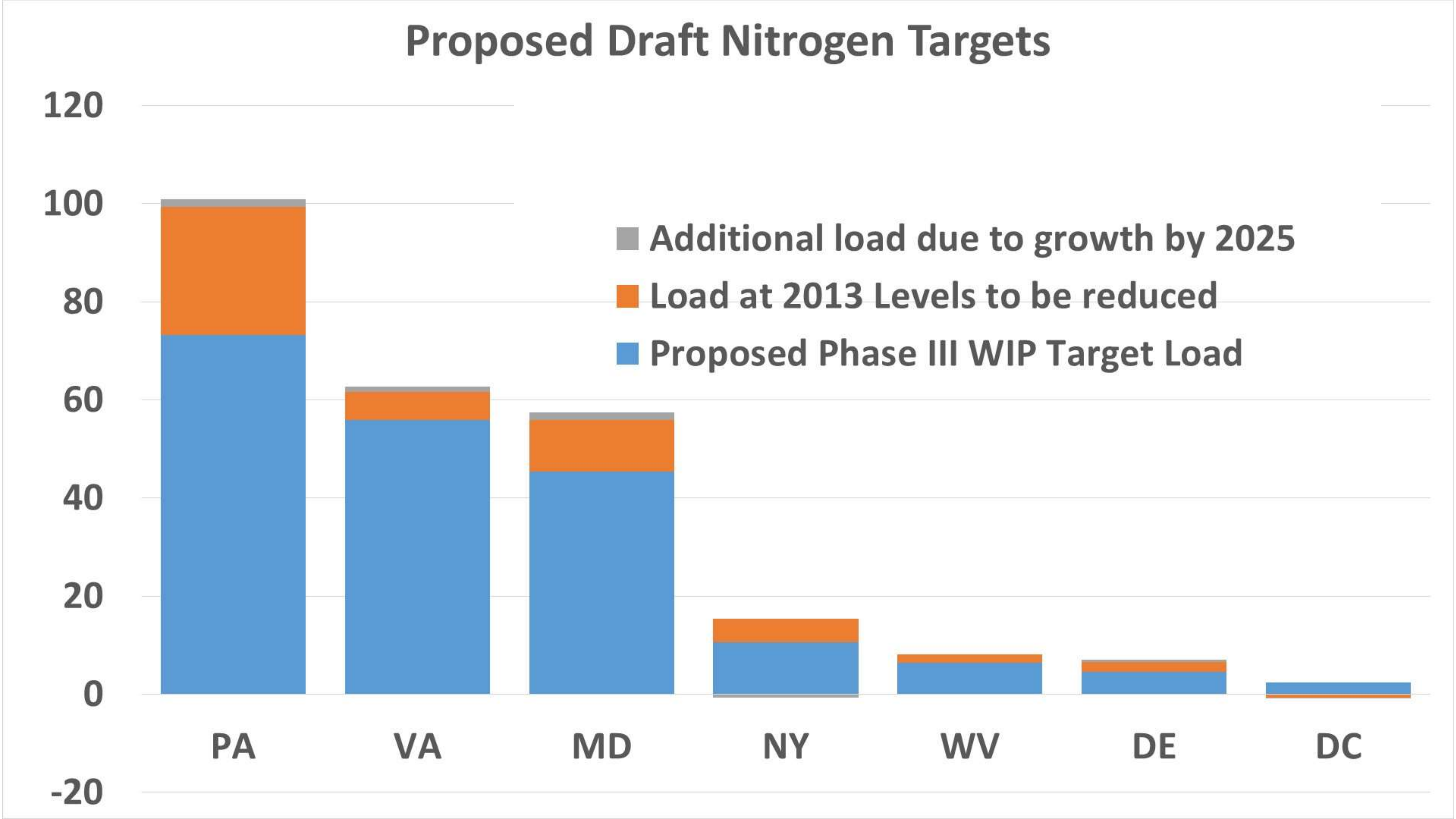
Jurisdiction	1985 Baseline	2013 Progress	Growth in Load to 2025	Phase III Planning Target
NY	18.71	15.44	-0.74	10.59
PA	122.41	99.28	1.66	73.18
MD	83.56	55.89	1.52	45.30
WV	8.73	8.06	-0.02	6.35
DC	6.48	1.75	0.00	2.43
DE	6.97	6.59	0.48	4.59
VA	84.29	61.53	1.09	55.82
Basinwide	331.15	248.54	4.00	198.25

*Units: millions of pounds

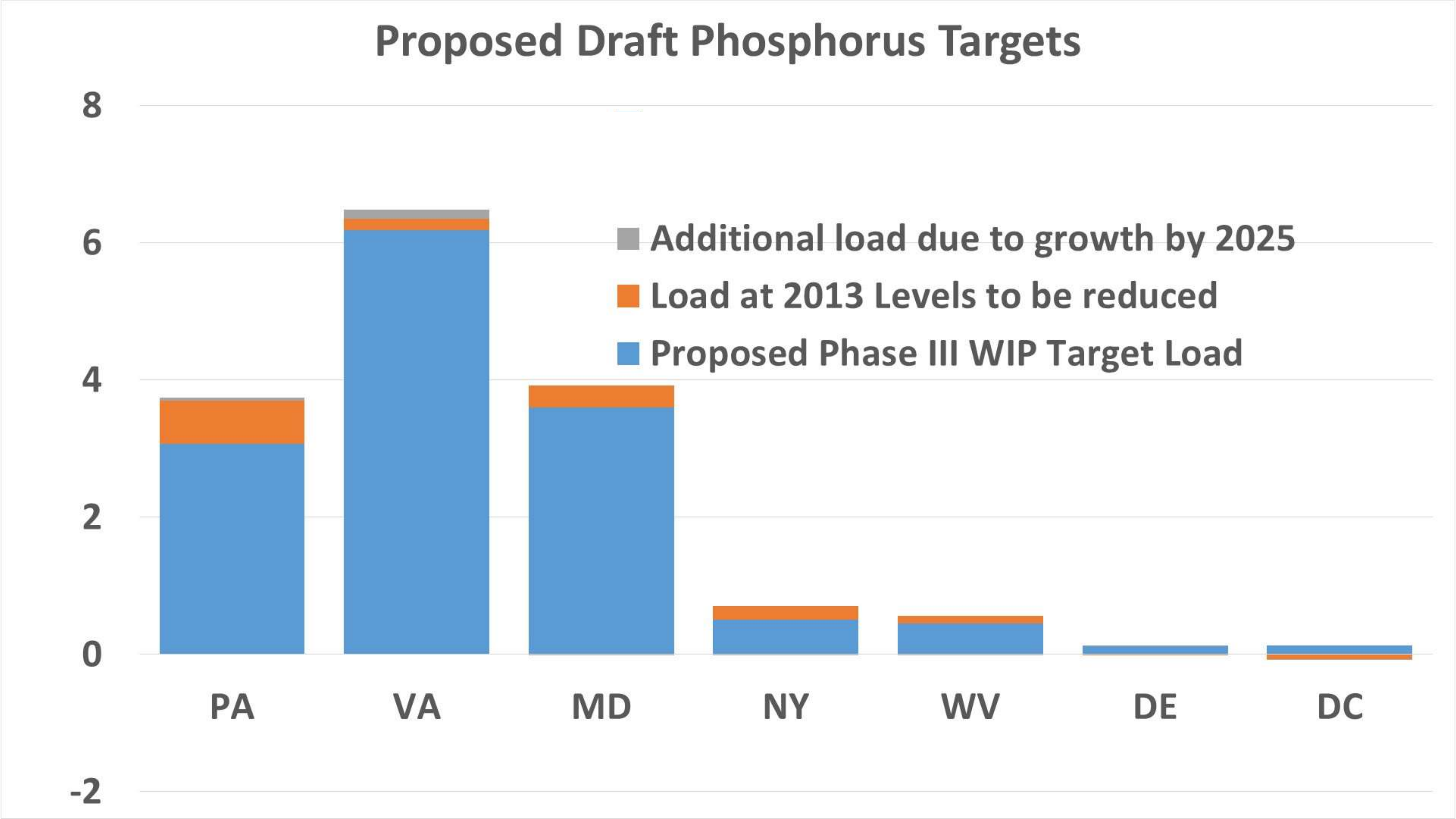
Summary of “All the Numbers”: Phosphorus

Jurisdiction	1985 Baseline	2013 Progress	Growth in Load to 2025	Phase III Planning Target
NY	1.198	0.710	-0.005	0.506
PA	6.115	3.696	0.044	3.073
MD	7.419	3.919	-0.015	3.604
WV	0.793	0.560	-0.017	0.456
DC	0.090	0.062	0.000	0.130
DE	0.225	0.115	0.007	0.120
VA	13.545	6.345	0.140	6.186
Basinwide	29.384	15.408	0.154	14.073

*Units: millions of pounds



Proposed Draft Nitrogen Targets
120
100
80
60
40
20
0
-20
Additional load due to growth by 2025
Load at 2013 Levels to be reduced
Proposed Phase III WIP Target Load
PA
VA
MD
NY
WV
DE
DC



Proposed Draft Phosphorus Targets
8
6
4
2
0
-2
Additional load due to growth by 2025
Load at 2013 Levels to be reduced
Proposed Phase III WIP Target Load
PA
VA
MD
NY
WV
DE
DC

Day Two Requested Policy Decisions

1) Approval of the **draft Phase III Planning Targets** as the starting point for the 4-month review process

2) Approval of the approach to account for the additional loads delivered to the Bay due to the **Conowingo infill**

3) Approval of how to factor **climate change** into the Phase III WIPs