

# Planning Target Revisions Past and Future

Gary Shenk – CBPO

WQGIT 10/25/2021

# New Targets are Nothing 'New'

Year	Model Phase	Goal
• 1987	0	40% reduction
• 1992	2	40% of controllable loads
• 1997	4.1	Confirm 1992 loads
• 2003	4.3	Reallocation
• 2010	5.3.0	TMDL
• 2011	5.3.2	Phase 2 WIP targets
• 2017	6	Phase 3 WIP targets
• 2020	6	Phase 3 WIP targets adjusted for climate

# New Targets are Nothing 'New'

Year	Model Phase	Goal
• 1987	0	40% reduction
• 1992	2	40% of controllable loads
• 1997	4.1	Confirm 1992 loads
• 2003	4.3	Reallocation
• <b>2010</b>	<b>5.3.0</b>	<b>TMDL</b>
• <b>2011</b>	<b>5.3.2</b>	<b>Phase 2 WIP targets</b>
• <b>2017</b>	<b>6</b>	<b>Phase 3 WIP targets</b>
• <b>2020</b>	<b>6</b>	<b>Phase 3 WIP targets adjusted for climate</b>

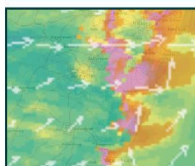
# CBP TMDL Modeling System

## Data and Model Inputs

Pollution Control Data  
Land Use Data  
Point Sources Data  
Septic Data  
U.S. Census Data  
Agricultural Data



Land Use  
Change  
Model



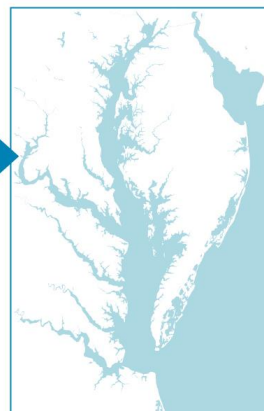
Airshed  
Model

Precipitation Data  
Meteorological Data  
Elevation Data  
Soil Data

Phase 5.3

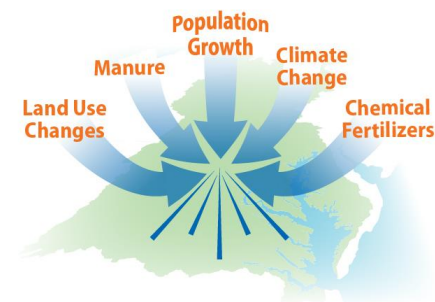


WQSTM  
v.2010

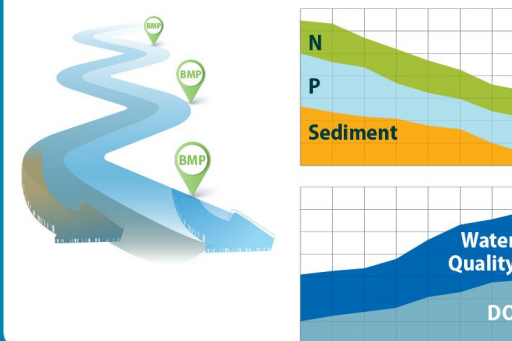


## Model Outputs

### Prediction of Impacts



### BMP Implementation Results



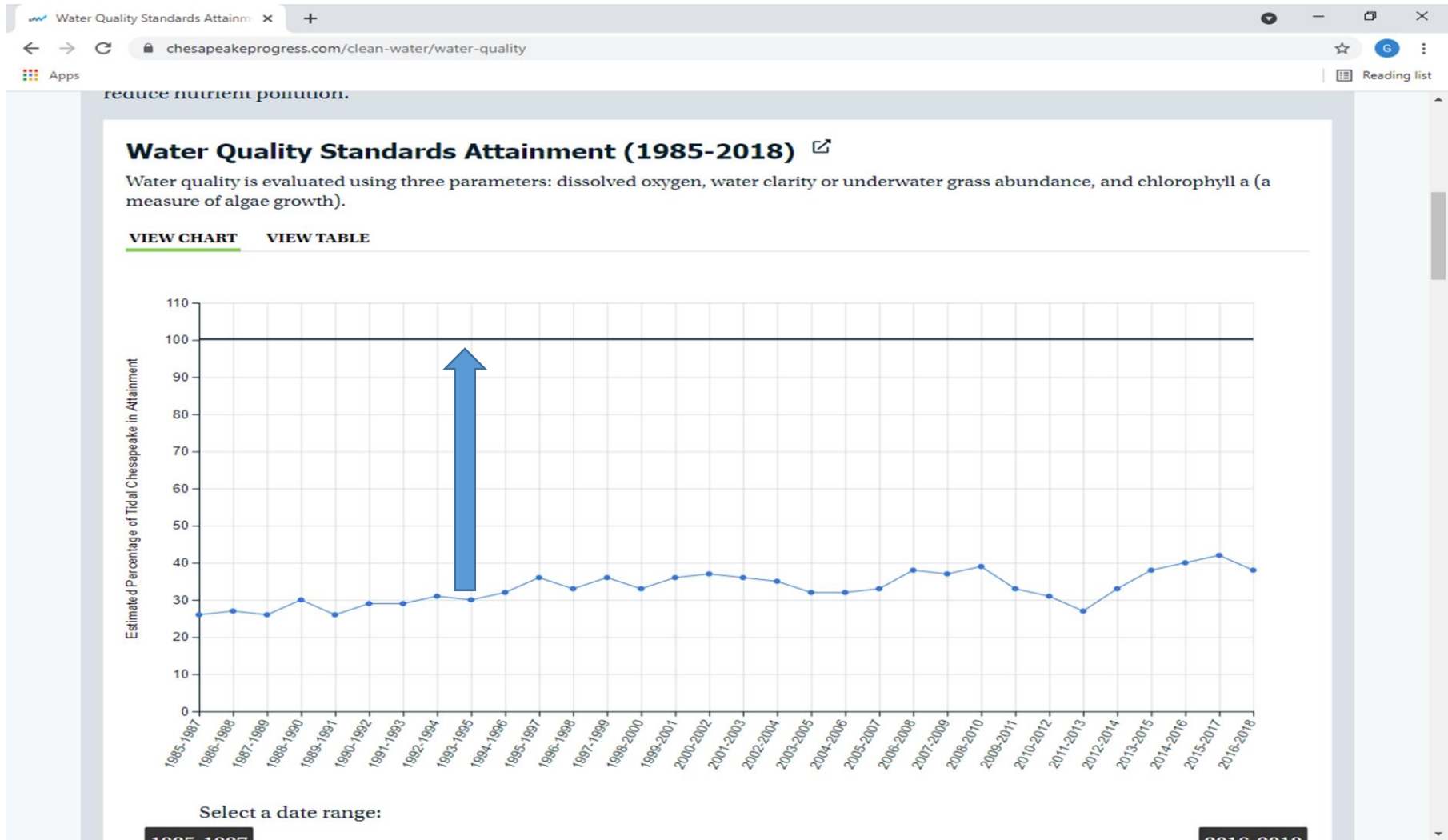
# Guidelines for Allocations

- Areas that contribute the most to the problem must do the most to resolve the problem.
- All tracked and reported reductions in nutrient loads are credited toward achieving final assigned loads.
- Allocated N and P loads must result in attainment of water quality standards

# Guidelines for Allocations

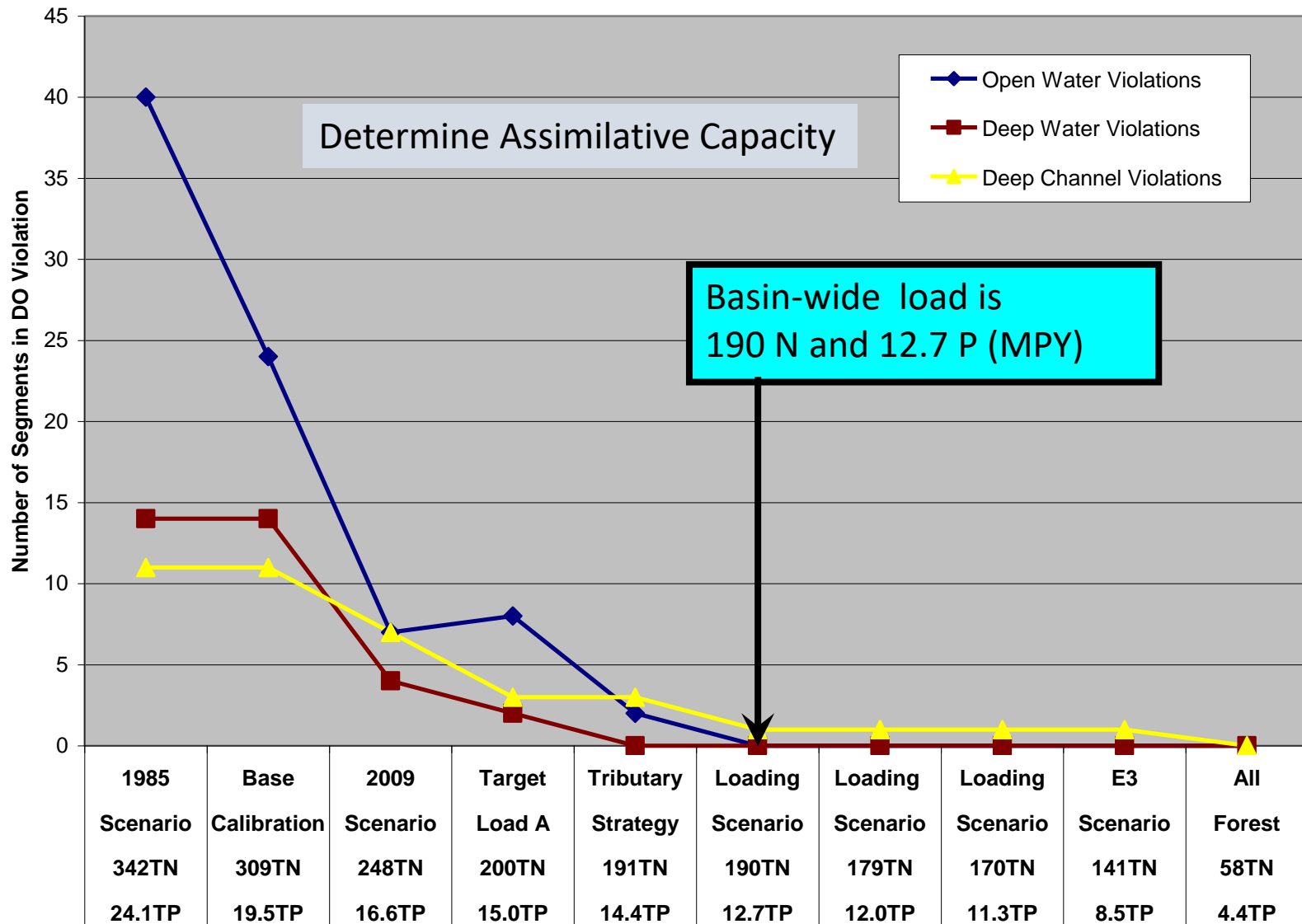
- Areas that contribute the most to the problem must do the most to resolve the problem.
- All tracked and reported reductions in nutrient loads are credited toward achieving final assigned loads.
- Allocated N and P loads must result in attainment of water quality standards

# TMDL question: What level of load reduction from 1995 will be necessary to meet water quality standards?



# Dissolved Oxygen Criteria Attainment

2010 allocation

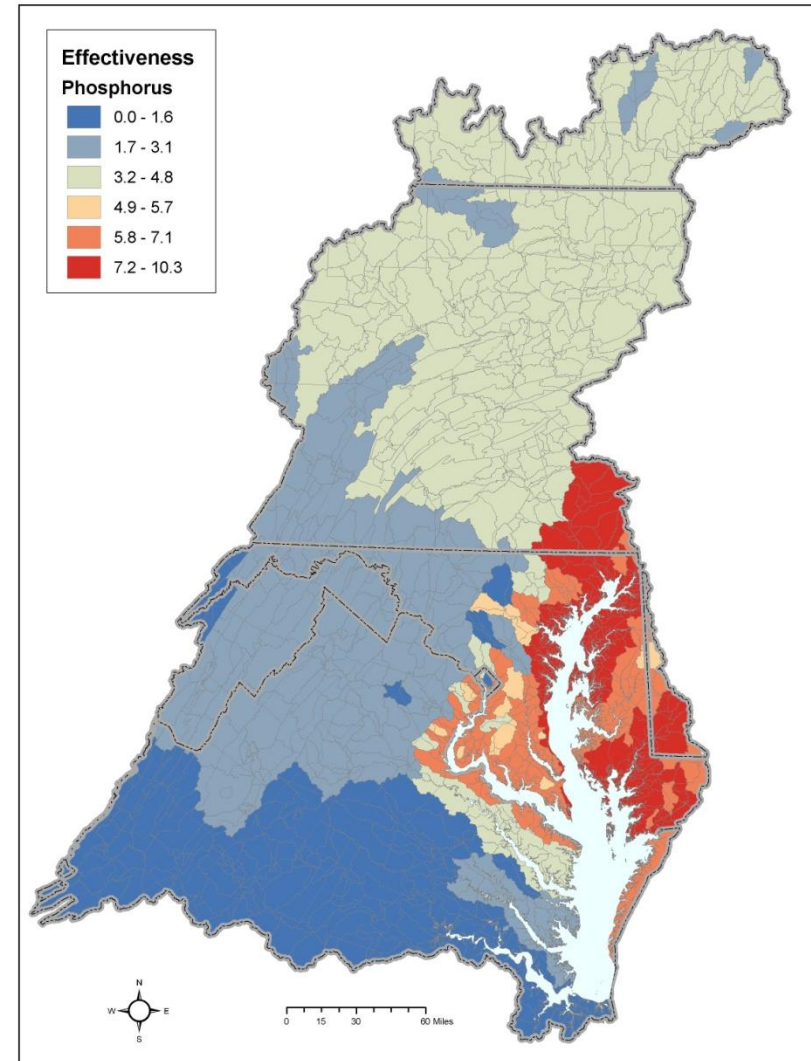
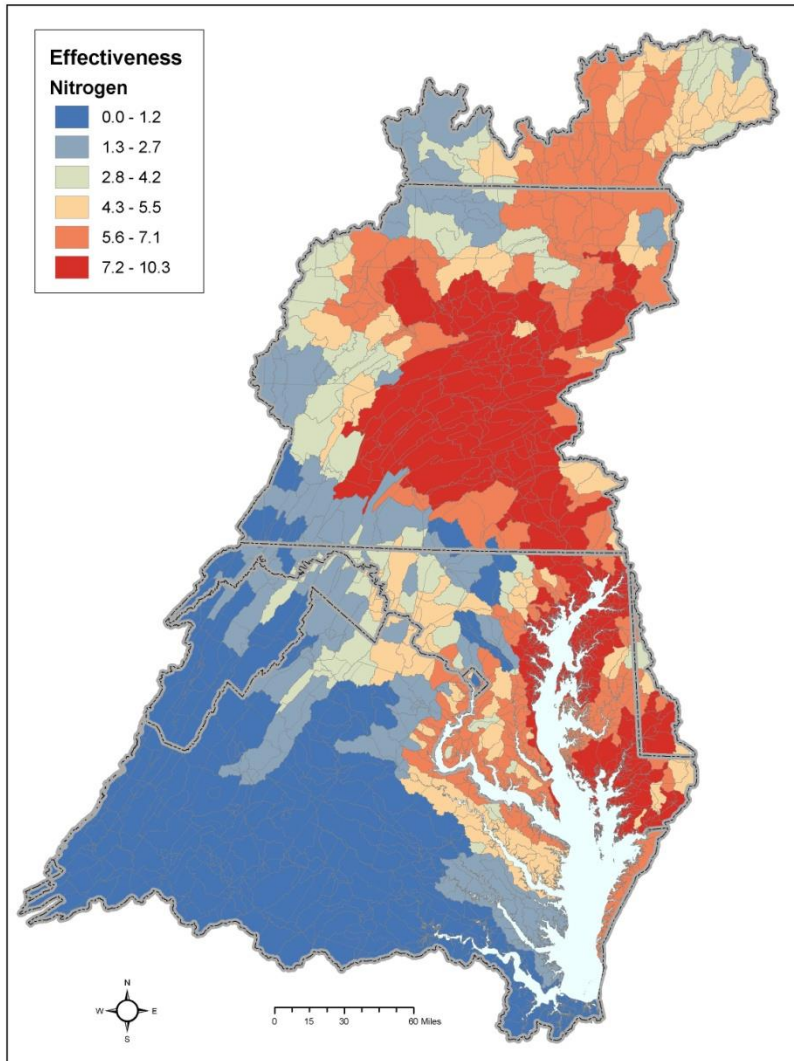




# Guidelines for Allocations

- Areas that contribute the most to the problem must do the most to resolve the problem.
- All tracked and reported reductions in nutrient loads are credited toward achieving final assigned loads.
- Allocated N and P loads must result in attainment of water quality standards

# Relative Effect of a Pound of Pollution on Bay Water Quality



Determine effective basins

# Guidelines for Allocations

- Areas that contribute the most to the problem must do the most to resolve the problem.
- All tracked and reported reductions in nutrient loads are credited toward achieving final assigned loads.
- Allocated N and P loads must result in attainment of water quality standards

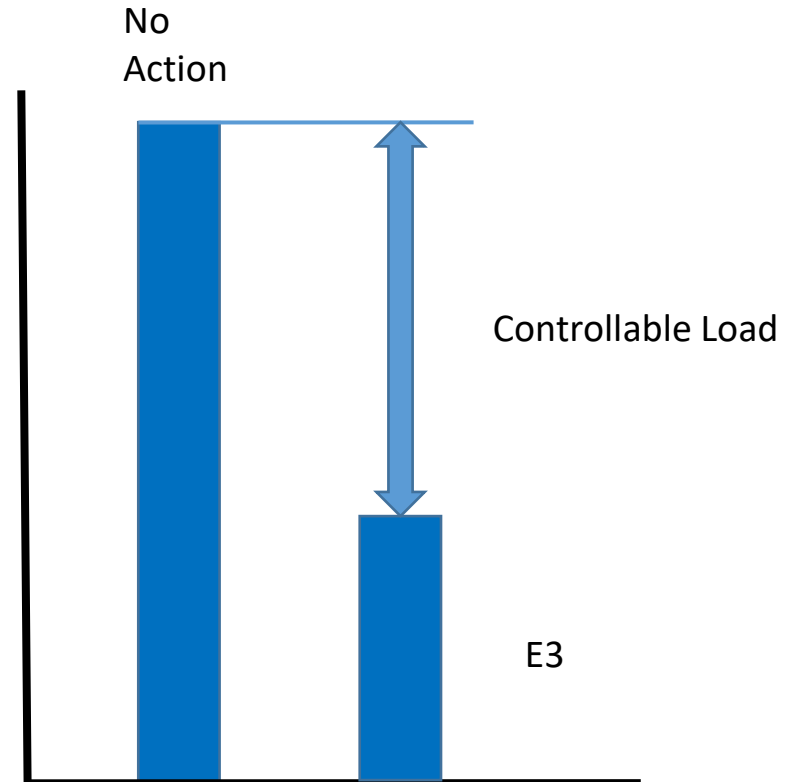
# Defining the Controllable Load

## No Action:

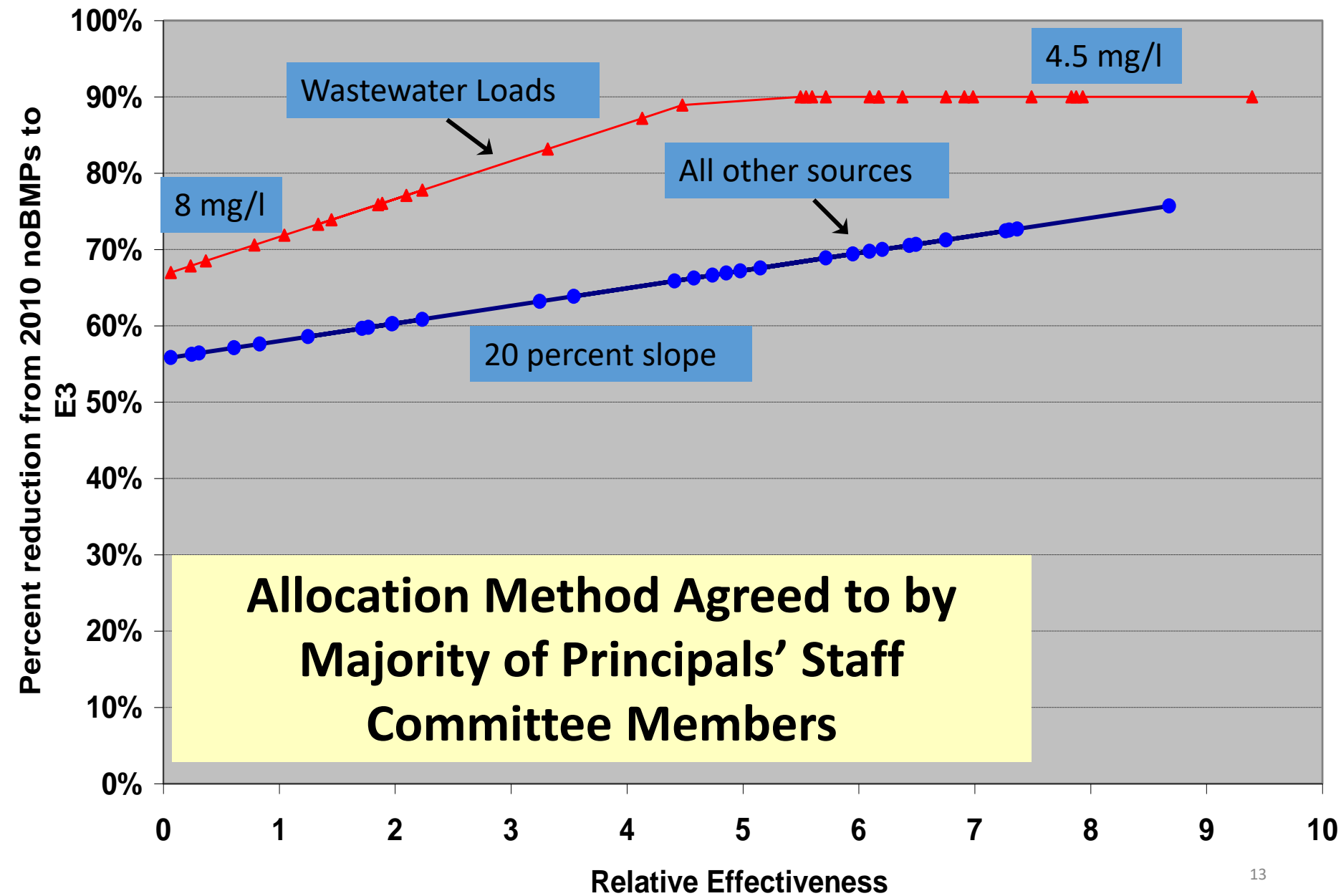
- Watershed conditions with minimal to no controls on load,
- Wastewater at primary treatment

## 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

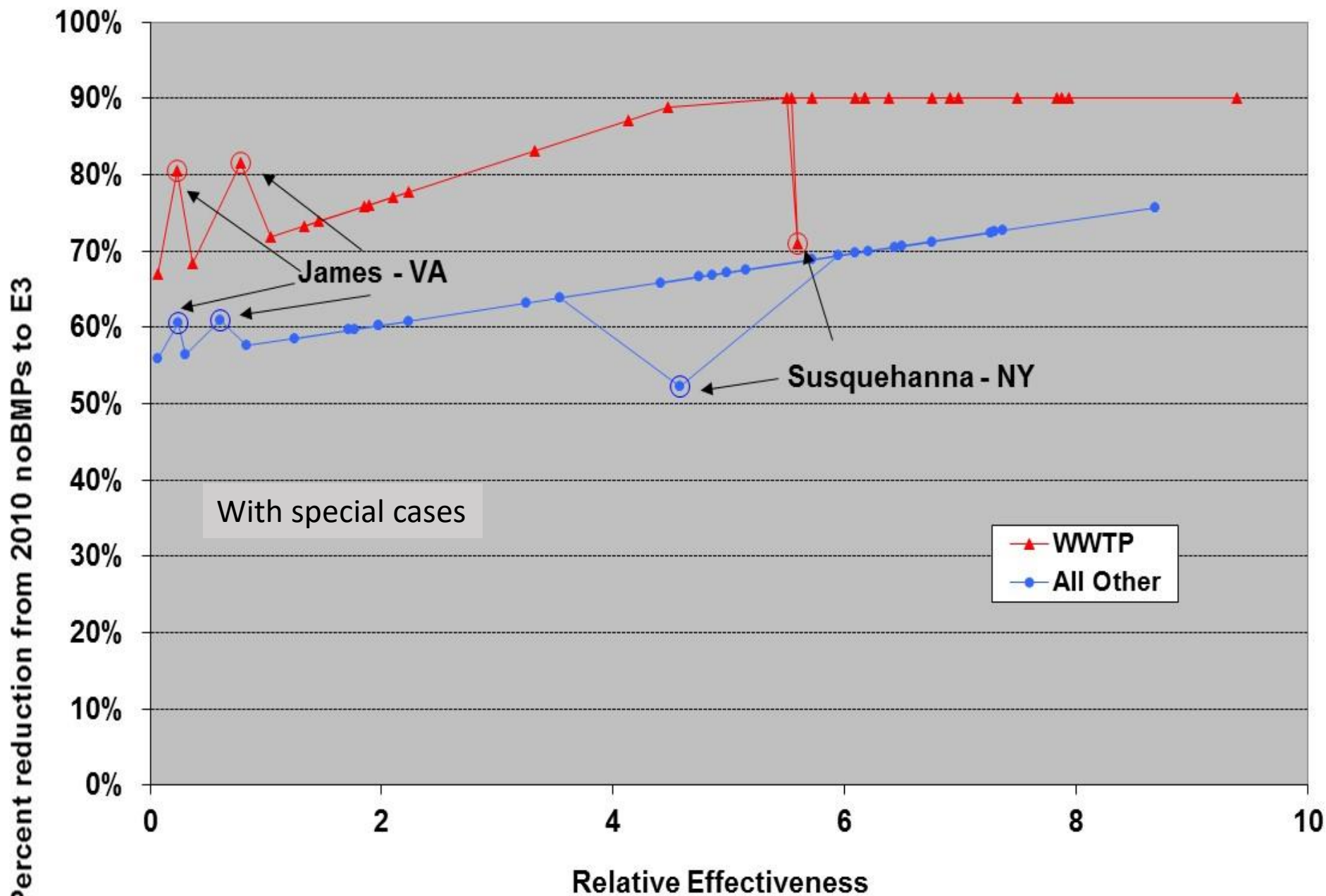


TN, p5.3, goal=190, WWTP = 4.5-8 mg/l, other: max=min+20%



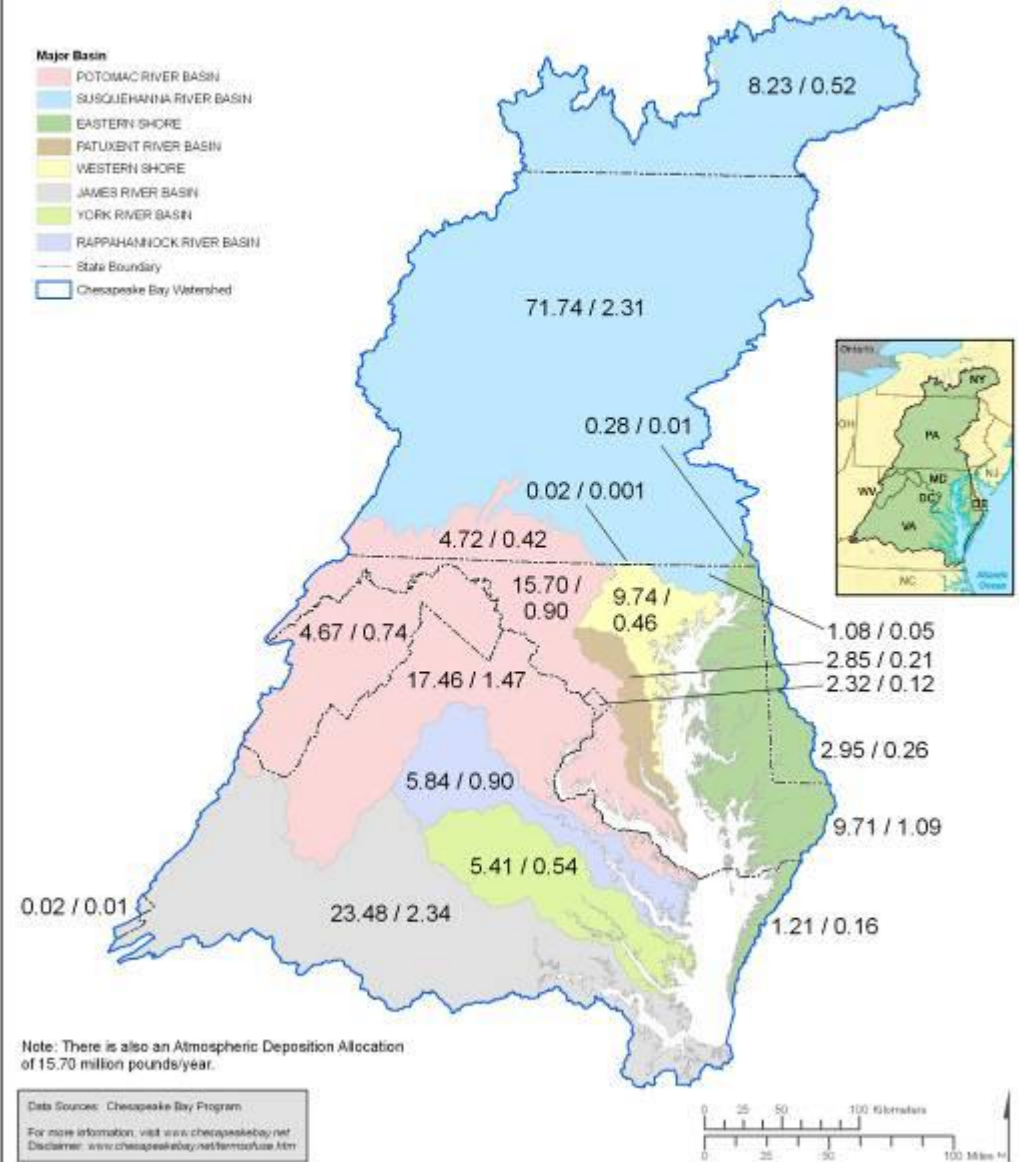
# Nitrogen -- Phase 5.3 -- Goal=190

2010 allocation



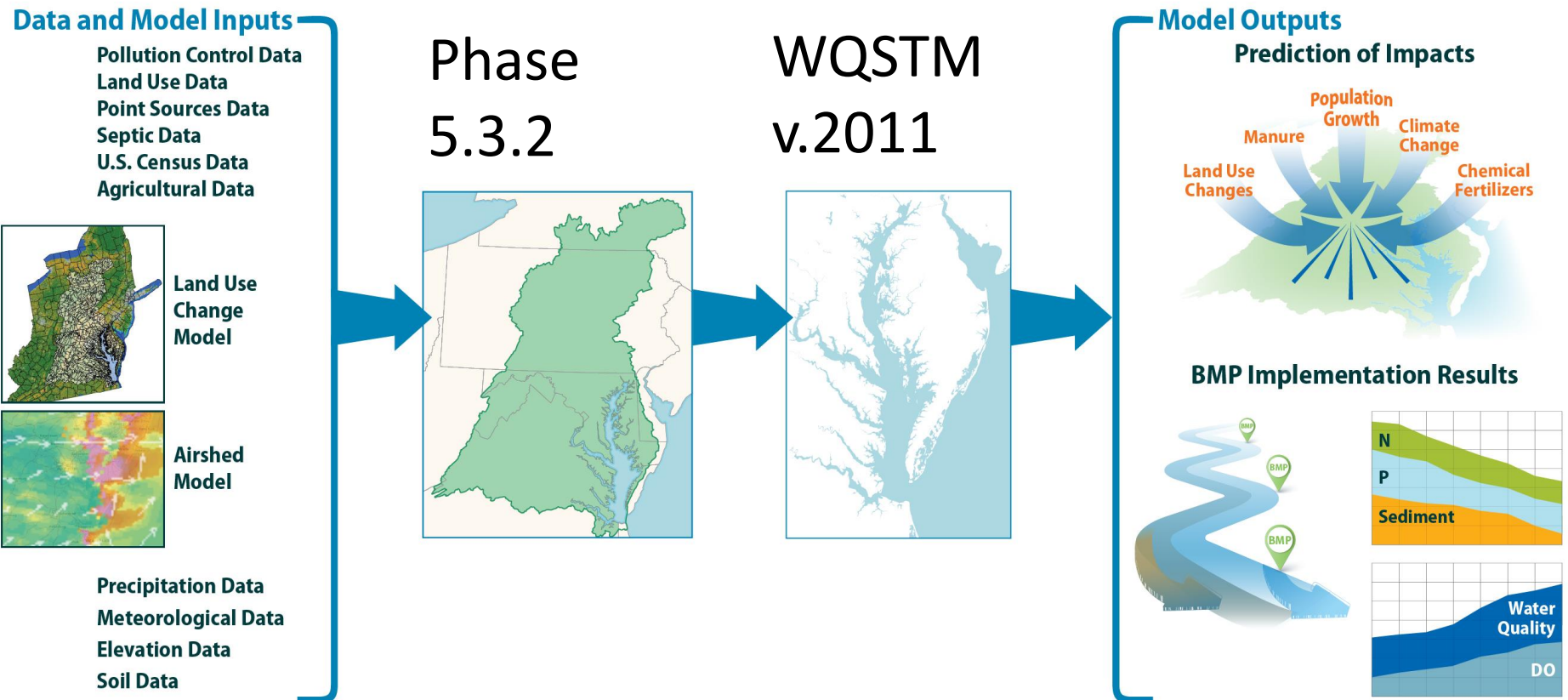
# State/basin allocations (N/P (MPY))

## Chesapeake Bay Major River Basin Nitrogen Phosphorus July 1, 2010 Draft Allocations by Jurisdiction (N / P in million pounds per year)





# 2011 Phase 2 WIP planning targets





# Changes Agreed to by AgWG/WQGIT/PSC

- **Updated land use with better urban coverage**
  - STAC reviewed and modifications incorporated
- **Modified nutrient management**
  - Increased non-NM application rates
  - Stop automatic transfer of manure
  - Dispose of excess manure in a sequence determined by the states
  - Count all manure phosphorus toward total
  - Refine nursery coverage
  - Double crop nutrient applications split
  - Update nutrient applications
  - Keep mass balance of manure with BMPs

# N and P Target Load Methodology

- Run Phase I WIPs (adjusted to exactly meet allocations) through the p5.3.2 watershed model
- Check to see if WQS are met
- Adjust all up or down if necessary

State	Basin	WIPs	2010 TMDL LOE	LOE ADJ to WQS
DC	Potomac	2.37	2.37	2.30
	<b>Total</b>	<b>2.37</b>	<b>2.37</b>	<b>2.30</b>
DE	Eastern Shore	3.31	3.39	3.31
	<b>Total</b>	<b>3.31</b>	<b>3.39</b>	<b>3.31</b>
MD	Eastern Shore	11.84	11.82	11.53
	Patuxent	3.12	3.10	3.01
	Potomac	15.31	15.29	14.83
	Susquehanna	1.19	1.19	1.16
	Western Shore	10.15	9.77	9.41
	<b>Total</b>	<b>41.62</b>	<b>41.17</b>	<b>39.95</b>
NY	Susquehanna	8.84	7.94	7.73
	<b>Total</b>	<b>8.84</b>	<b>7.94</b>	<b>7.73</b>
PA	Eastern Shore	0.31	0.32	0.31
	Potomac	3.44	3.85	3.76
	Susquehanna	76.55	74.63	73.29
	Western Shore	0.01	0.04	0.03
	<b>Total</b>	<b>80.32</b>	<b>78.83</b>	<b>77.39</b>
VA	Eastern Shore	1.46	1.41	1.37
	James	23.23	23.21	23.21
	Potomac	16.83	16.41	16.08
	Rappahannock	6.20	5.92	5.78
	York	5.75	5.51	5.40
	<b>Total</b>	<b>53.47</b>	<b>52.46</b>	<b>51.83</b>
WV	James	0.02	0.02	0.02
	Potomac	4.99	4.98	4.84
	<b>Total</b>	<b>5.01</b>	<b>5.00</b>	<b>4.86</b>
<b>All</b>	<b>Total</b>	<b>194.94</b>	<b>191.16</b>	<b>187.36</b>
	<b>Atmospheric deposition</b>	<b>15.70</b>	<b>15.70</b>	<b>15.70</b>
<b>All</b>	<b>Total</b>	<b>210.64</b>	<b>206.86</b>	<b>203.06</b>

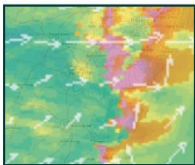
# 2017 Midpoint Assessment

## Data and Model Inputs

Pollution Control Data  
Land Use Data  
Point Sources Data  
Septic Data  
U.S. Census Data  
Agricultural Data



Land Use  
Change  
Model



Airshed  
Model

Precipitation Data  
Meteorological Data  
Elevation Data  
Soil Data

## Phase 6

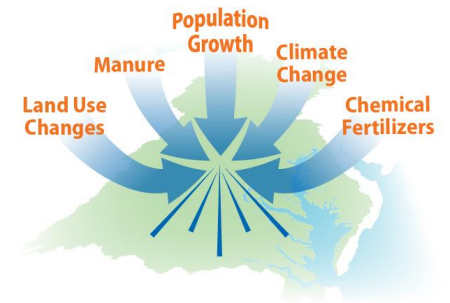


## WQSTM v.2017

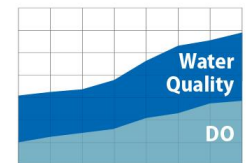
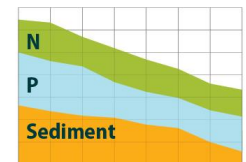


## Model Outputs

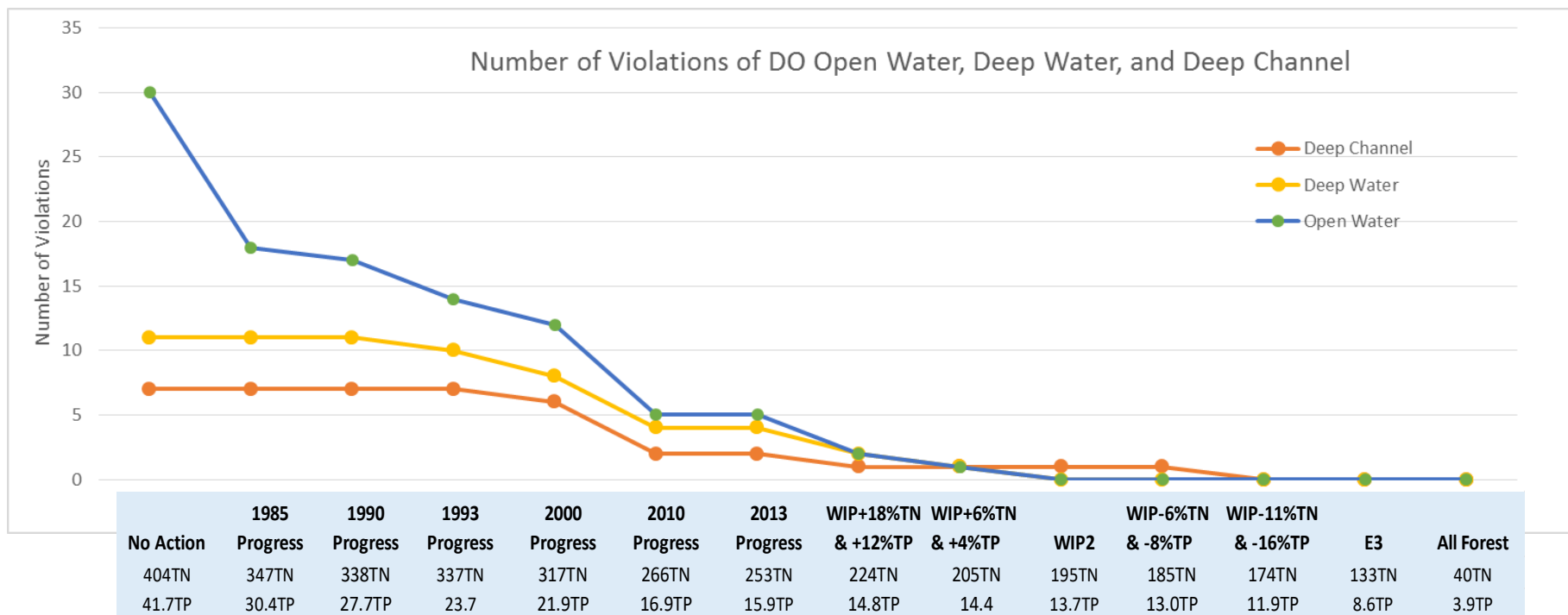
### Prediction of Impacts



### BMP Implementation Results



# Determining the Bay's Ability to Absorb Pollutants

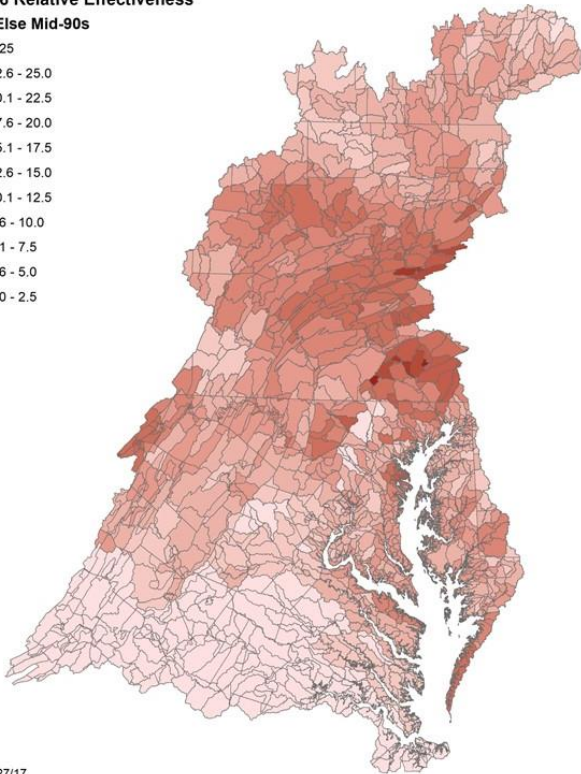
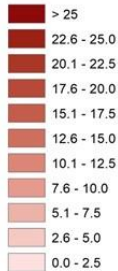


**New estuarine model, new assimilative capacity**

# More Impact, Do More

## Nitrogen

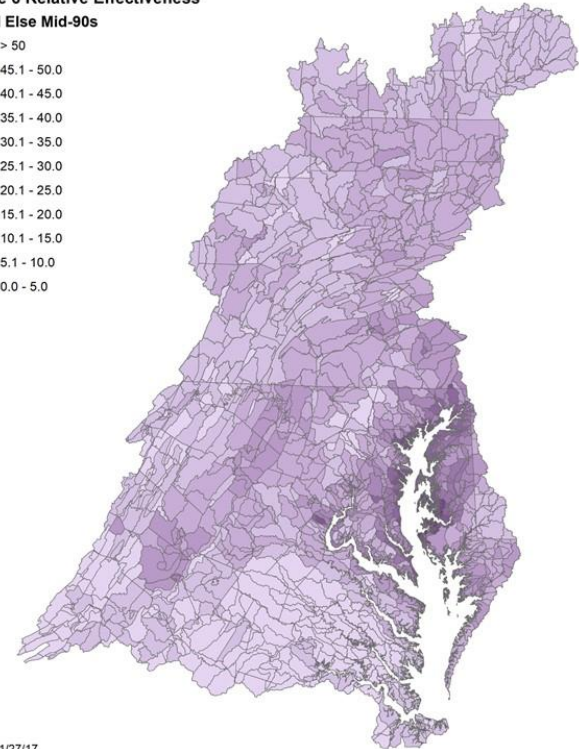
Phase 6 Relative Effectiveness  
TN All Else Mid-90s



11/27/17

## Ph6 Phosphorus

Phase 6 Relative Effectiveness  
TP All Else Mid-90s



11/27/17

# New watershed model, new effectiveness

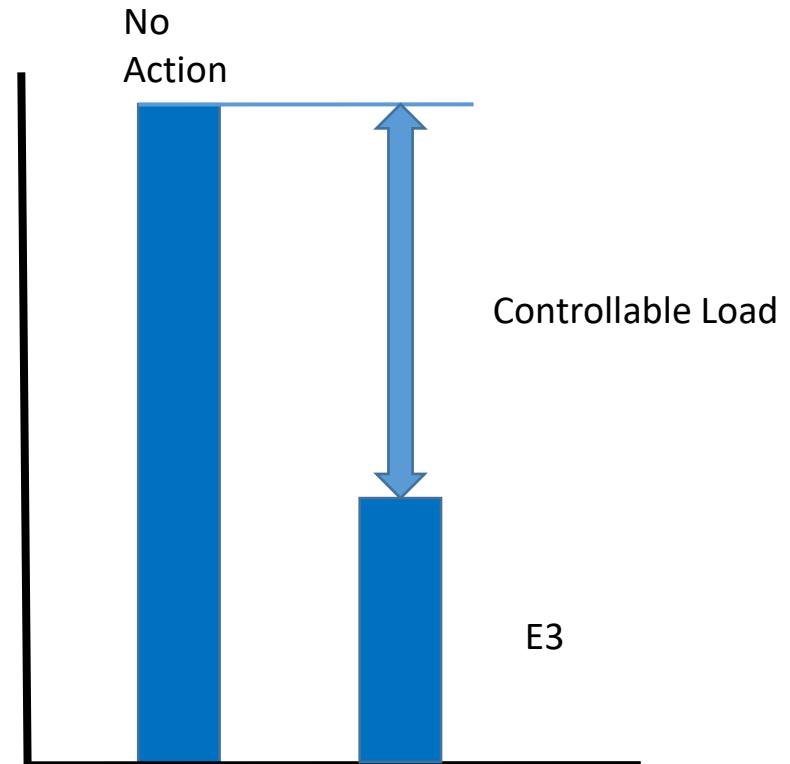
## Defining the Controllable Load

### No Action:

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

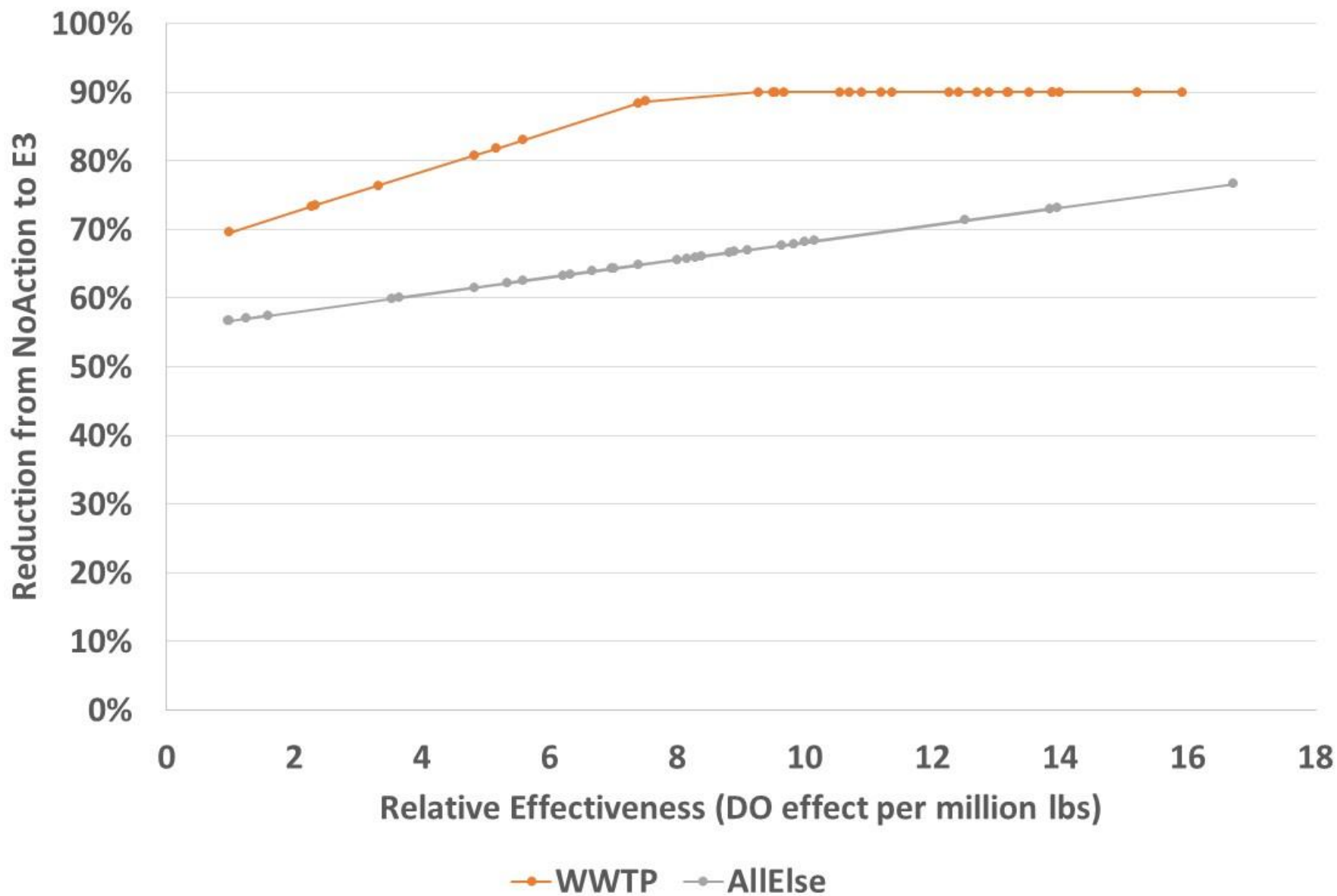
### E3 or “Everything by Everyone, Everywhere”:

- 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



## New model and scenario definitions

## Planning Target Calculation - Nitrogen - 10/2017

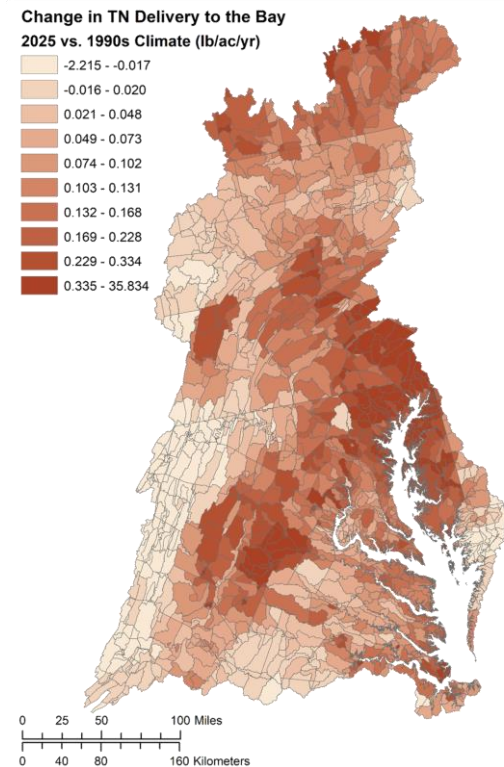




			2017 planning targets				
			2018 Planning Targets approved by PSC		2019 Planning Targets with Exchanges and Sediment		
Major	State	StateBasin	Nitrogen	Phosphorus	Nitrogen	Phosphorus	Sediment
Potomac	DC	DC Potomac	2.42	0.130	2.42	0.130	41.9
Eastern Shore	DE	DE Eastern Shore	4.55	0.108	4.55	0.108	26.7
Eastern Shore	MD	MD Eastern Shore	15.21	1.286	15.60	1.290	2903.4
Patuxent	MD	MD Patuxent	3.21	0.301	3.21	0.300	437.7
Potomac	MD	MD Potomac	15.30	1.092	15.80	1.090	1928.0
Susquehanna	MD	MD Susquehanna	1.18	0.053	1.60	0.050	113.8
Western Shore	MD	MD Western Shore	10.89	0.948	9.63	0.950	2959.9
Susquehanna	NY	NY Susquehanna	11.53	0.587	11.53	0.587	532.7
Eastern Shore	PA	PA Eastern Shore	0.45	0.025	0.46	0.022	27.4
Potomac	PA	PA Potomac	6.11	0.357	6.14	0.338	295.5
Susquehanna	PA	PA Susquehanna	66.59	2.661	66.87	2.544	1838.2
Western Shore	PA	PA Western Shore	0.02	0.001	0.02	0.001	0.3
Eastern Shore	VA	VA Eastern Shore	1.43	0.164	1.83	0.152	473.3
James	VA	VA James	25.92	2.731	21.81	2.241	2015.2
Potomac	VA	VA Potomac	16.00	1.892	16.51	1.823	1929.7
Rappahannock	VA	VA Rappahannock	6.85	0.849	7.09	0.819	1505.1
York	VA	VA York	5.52	0.556	5.71	0.548	949.1
James	WV	WV James	0.04	0.005	0.05	0.006	13.0
Potomac	WV	WV Potomac	8.18	0.437	8.18	0.437	525.0

# Principles' Staff Committee 12/17/2020

- Approved **reductions based on where increases have occurred**
  - Stipulated that this decision does not set a precedent
- Commitment to continue to improve understanding of climate effects
- Reassess in 2025 for effects to 2035



			2018 Planning Targets approved by PSC		2019 Planning Targets with Exchanges and Sediment			2020 Climate Adjustments		2020 Planning Targets with Climate	
Major	State	StateBasin	Nitrogen	Phosphorus	Nitrogen	Phosphorus	Sediment	Nitrogen	Phosphorus	Nitrogen	Phosphorus
Potomac	DC	DC Potomac	2.42	0.130	2.42	0.130	41.9	0.01	0.001	2.42	0.129
Eastern Shore	DE	DE Eastern Shore	4.55	0.108	4.55	0.108	26.7	0.04	0.003	4.51	0.105
Eastern Shore	MD	MD Eastern Shore	15.21	1.286	15.60	1.290	2903.4	0.37	0.032	15.23	1.258
Patuxent	MD	MD Patuxent	3.21	0.301	3.21	0.300	437.7	0.11	0.019	3.09	0.281
Potomac	MD	MD Potomac	15.30	1.092	15.80	1.090	1928.0	0.21	0.033	15.59	1.057
Susquehanna	MD	MD Susquehanna	1.18	0.053	1.60	0.050	113.8	0.14	0.007	1.46	0.043
Western Shore	MD	MD Western Shore	10.89	0.948	9.63	0.950	2959.9	0.31	0.020	9.32	0.929
Susquehanna	NY	NY Susquehanna	11.53	0.587	11.53	0.587	532.7	0.40	0.044	11.13	0.543
Eastern Shore	PA	PA Eastern Shore	0.45	0.025	0.46	0.022	27.4	0.05	0.005	0.41	0.017
Potomac	PA	PA Potomac	6.11	0.357	6.14	0.338	295.5	0.04	0.008	6.11	0.330
Susquehanna	PA	PA Susquehanna	66.59	2.661	66.87	2.544	1838.2	1.72	0.082	65.14	2.462
Western Shore	PA	PA Western Shore	0.02	0.001	0.02	0.001	0.3	0.00	0.000	0.02	0.001
Eastern Shore	VA	VA Eastern Shore	1.43	0.164	1.83	0.152	473.3	0.01	0.000	1.82	0.152
James	VA	VA James	25.92	2.731	21.81	2.241	2015.2	0.30	0.143	21.51	2.097
Potomac	VA	VA Potomac	16.00	1.892	16.51	1.823	1929.7	0.56	0.073	15.95	1.750
Rappahannock	VA	VA Rappahannock	6.85	0.849	7.09	0.819	1505.1	0.54	0.102	6.54	0.717
York	VA	VA York	5.52	0.556	5.71	0.548	949.1	0.17	0.018	5.54	0.530
James	WV	WV James	0.04	0.005	0.05	0.006	13.0	0.00	0.000	0.05	0.006
Potomac	WV	WV Potomac	8.18	0.427	8.18	0.427	595.9	0.00	0.008	8.18	0.418

# Number 9!

Year	Model Phase	Goal
• 1987	0	40% reduction
• 1992	2	40% of controllable loads
• 1997	4.1	Confirm 1992 loads
• 2003	4.3	Reallocation
• 2010	5.3.0	TMDL allocations
• 2011	5.3.2	Phase 2 WIP targets
• 2017	6	Phase 3 WIP targets
• 2020	6	Phase 3 WIP targets adjusted for climate
• <b>2025</b>	<b>7?</b>	<b>Readjust for climate? Phase 4 WIP targets?</b>

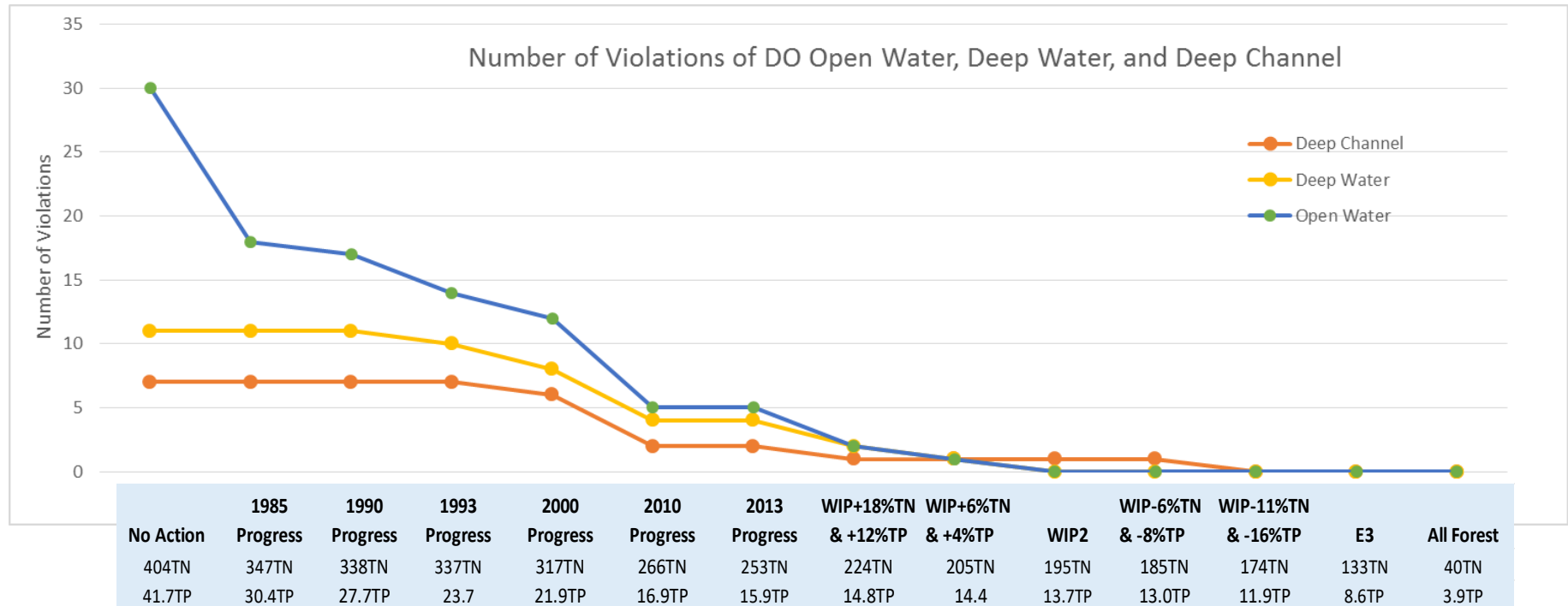
# Why might we need to change planning targets?

- Climate Change to 2035 will likely require more reductions

Major	State	StateBasin	2018 Planning Targets approved by PSC		2019 Planning Targets with Exchanges and Sediment			2020 Climate Adjustments		2020 Planning Targets with Climate	
			Nitrogen	Phosphorus	Nitrogen	Phosphorus	Sediment	Nitrogen	Phosphorus	Nitrogen	Phosphorus
Potomac	DC	DC Potomac	2.42	0.130	2.42	0.130	41.9	0.01	0.001	2.42	0.129
Eastern Shore	DE	DE Eastern Shore	4.55	0.108	4.55	0.108	26.7	0.04	0.003	4.51	0.105
Eastern Shore	MD	MD Eastern Shore	15.21	1.286	15.60	1.290	2903.4	0.37	0.032	15.23	1.258
Patuxent	MD	MD Patuxent	3.21	0.301	3.21	0.300	437.7	0.11	0.019	3.09	0.281
Potomac	MD	MD Potomac	15.30	1.092	15.80	1.090	1928.0	0.21	0.033	15.59	1.057
Susquehanna	MD	MD Susquehanna	1.18	0.053	1.60	0.050	113.8	0.14	0.007	1.46	0.043
Western Shore	MD	MD Western Shore	10.89	0.948	9.63	0.950	2959.9	0.31	0.020	9.32	0.929
Susquehanna	NY	NY Susquehanna	11.53	0.587	11.53	0.587	532.7	0.40	0.044	11.13	0.543
Eastern Shore	PA	PA Eastern Shore	0.45	0.025	0.46	0.022	27.4	0.05	0.005	0.41	0.017
Potomac	PA	PA Potomac	6.11	0.357	6.14	0.338	295.5	0.04	0.008	6.11	0.330
Susquehanna	PA	PA Susquehanna	66.59	2.661	66.87	2.544	1838.2	1.72	0.082	65.14	2.462
Western Shore	PA	PA Western Shore	0.02	0.001	0.02	0.001	0.3	0.00	0.000	0.02	0.001
Eastern Shore	VA	VA Eastern Shore	1.43	0.164	1.83	0.152	473.3	0.01	0.000	1.82	0.152
James	VA	VA James	25.92	2.731	21.81	2.241	2015.2	0.30	0.143	21.51	2.097
Potomac	VA	VA Potomac	16.00	1.892	16.51	1.823	1929.7	0.56	0.073	15.95	1.750
Rappahannock	VA	VA Rappahannock	6.85	0.849	7.09	0.819	1505.1	0.54	0.102	6.54	0.717
York	VA	VA York	5.52	0.556	5.71	0.548	949.1	0.17	0.018	5.54	0.530
James	WV	WV James	0.04	0.005	0.05	0.006	13.0	0.00	0.000	0.05	0.006
Potomac	WV	WV Potomac	8.18	0.427	8.18	0.427	595.9	0.00	0.008	8.18	0.418

# Why might we need to change planning targets?

- New estuarine model used to reassess reductions necessary to meet water quality standards

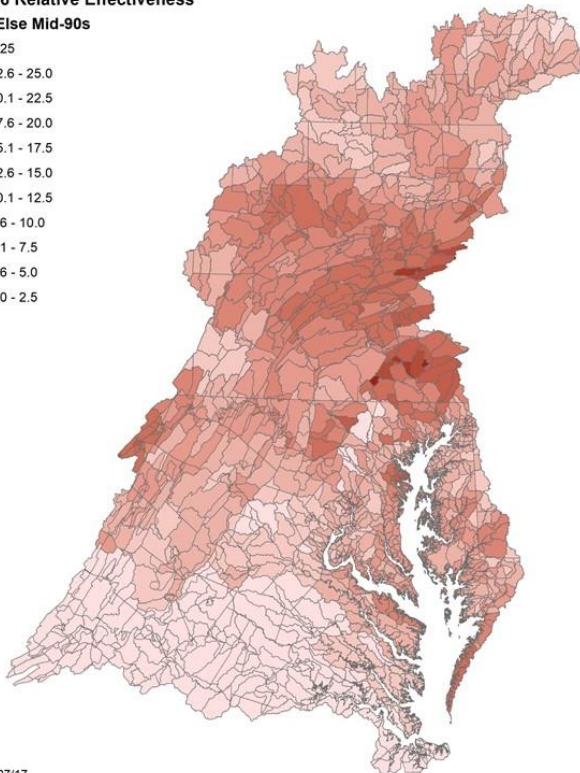
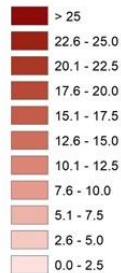


# Why might we need to change planning targets?

- New watershed model redefines effectiveness or 1995 baseline load

## Phase 6 Relative Effectiveness

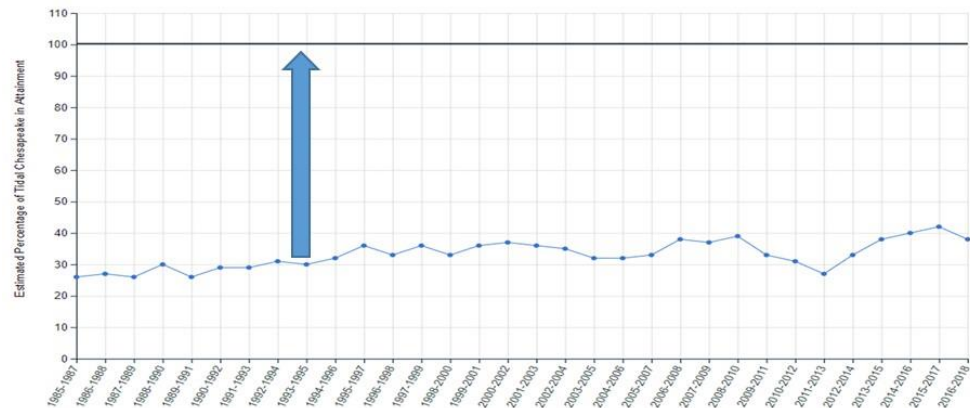
### TN All Else Mid-90s



## Water Quality Standards Attainment (1985-2018) [↗](#)

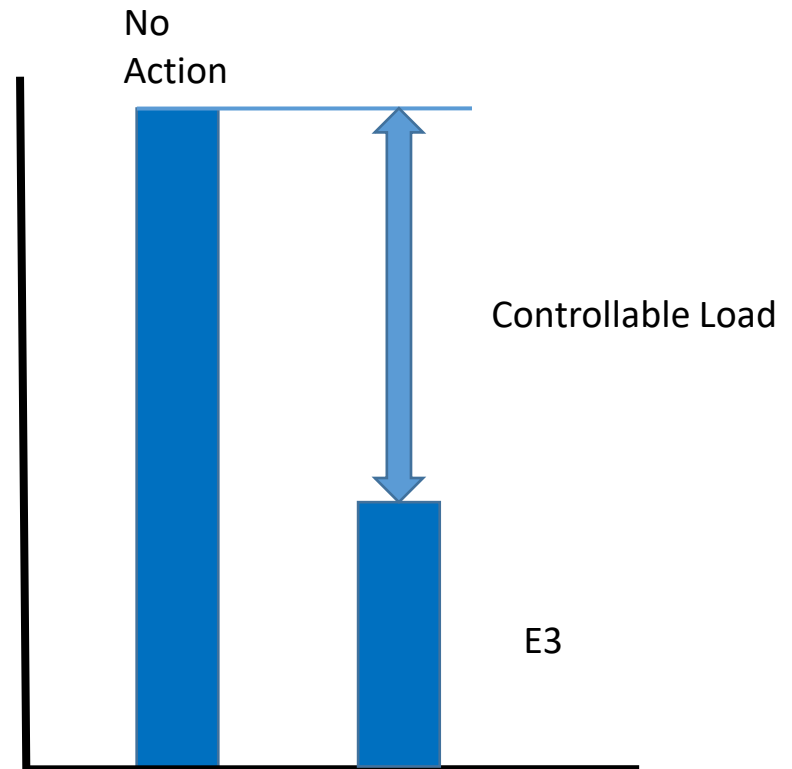
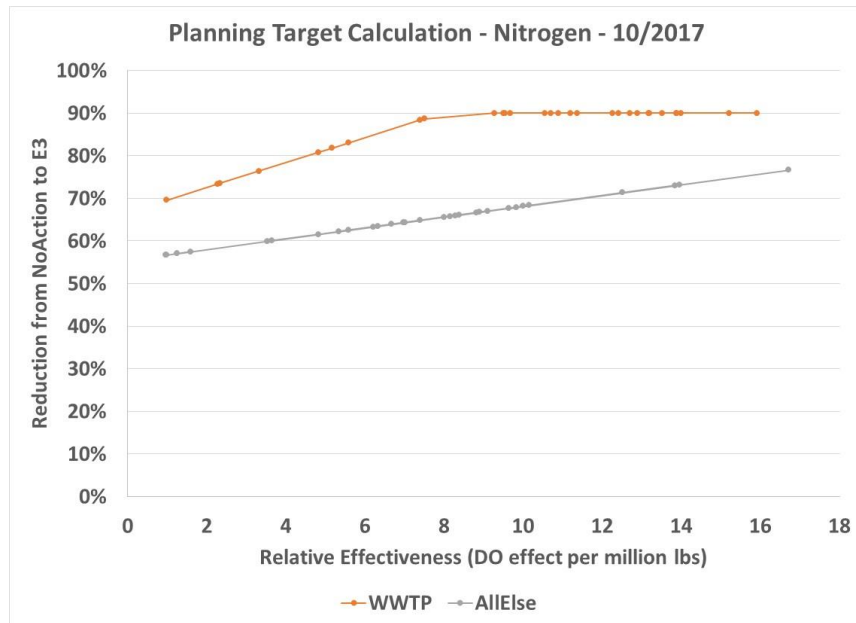
Water quality is evaluated using three parameters: dissolved oxygen, water clarity or underwater grass abundance, and chlorophyll a (a measure of algae growth).

[VIEW CHART](#) [VIEW TABLE](#)



# Why might we need to change planning targets?

- New expression of load allocation method





# Summary

- Load goals have been re-calculated six times in the past
  - Three times for the TMDL
- The PSC specified that 2035 climate would be handled in 2025
  - A climate adjustment can be made without a full re-calculation
- The PSC specified that planning targets would not change until 2025
- Re-calculation triggered by
  - Use of new estuarine model to calculate capacity
  - Significant change to the watershed model
    - Land use as an absolute value rather than change product
  - Change in important scenarios or expression of allocation rules