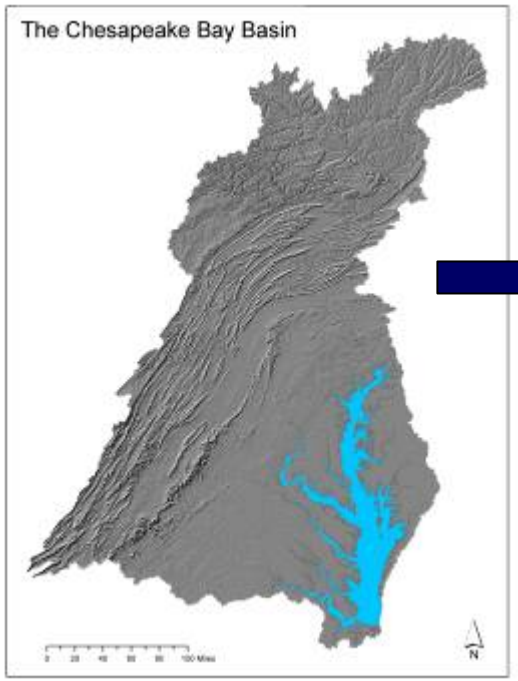
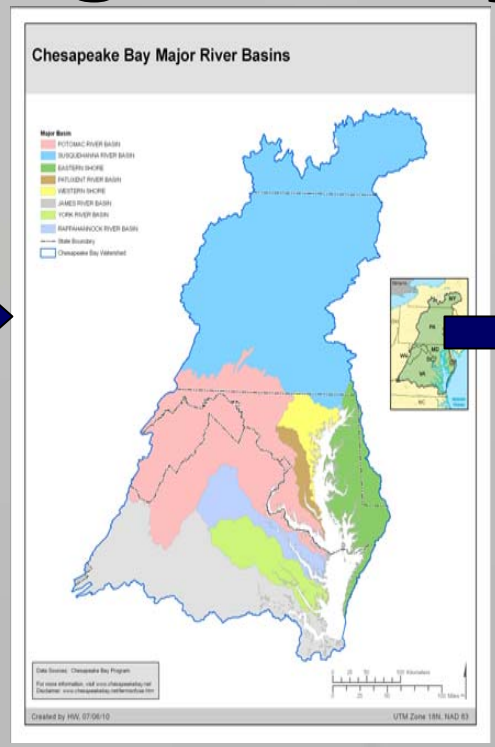
Deriving the proposed state nutrient allocations

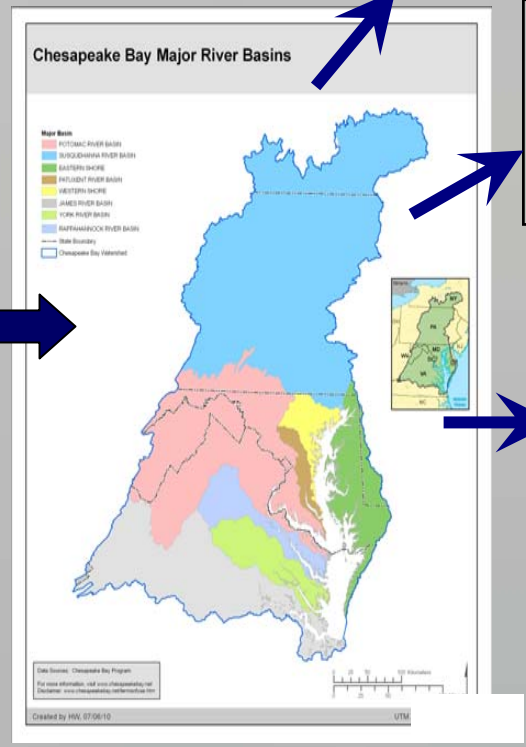
Bob Koroncai, Rich Batiuk

Lewis Linker, Gary Shenk, Jeni Keisman

Reminder: Steps for Establishing the Bay TMDL







Identify basinwide target loads

EPA, States, DC

Identify major basin by jurisdiction target loads

EPA, States, DC

Identify tidal segment watershed (2010), county (2011) and source sector target loads

States, DC, local governments & local partners

Proposed Jurisdiction/Major Basin Allocations are Based on…

- Anticipated amendments to MD, VA, DE and DC's Chesapeake Bay WQ Standards:
  - Reference EPA's May 2010 Bay criteria addendum (5th published by EPA since 2003): MD, VA, DE, DC
  - Deep-water use designations for the South, Severn and Magothy rivers: MD
  - Site-specific dissolved oxygen criterion for the upper/middle Pocomoke River: MD, VA
  - Restoration variance for the Chester River deep-channel dissolved oxygen criterion: MD

Nitrogen Deposition Air Allocations

- Based on addressing the federal requirements of the Clean Air Act
- Projected reductions in nitrogen atmospheric deposition loads to Bay watershed are credited to states as a land-based control
- Atmospheric deposition direct to Bay tidal waters is the air allocation
- Air allocation is 15.7 million pounds per year of total nitrogen

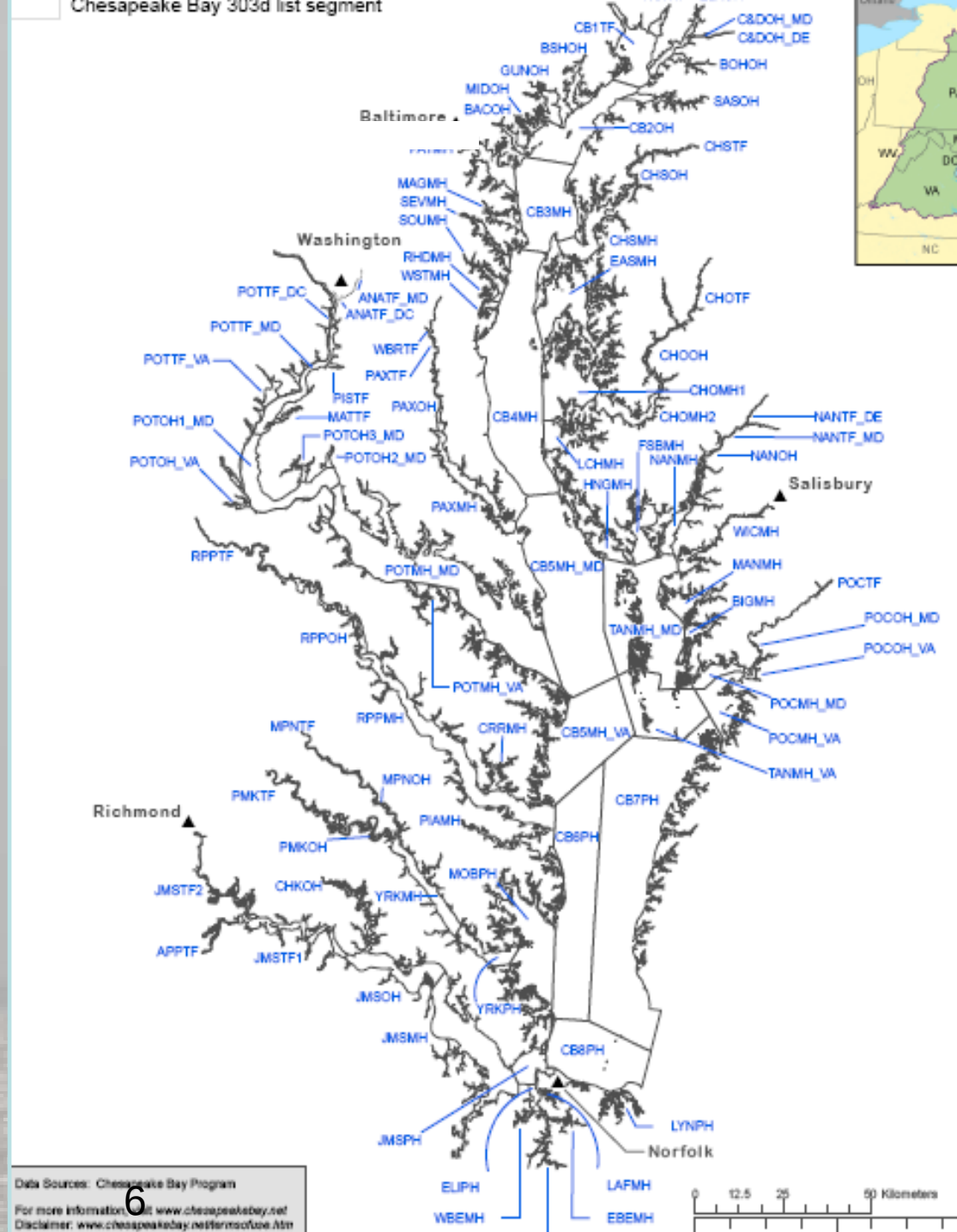
Air Allocation Scenario

- CAA regulations implemented through 2020 to meet national air quality standards

- This 2020 scenario includes the following:
  - On-Road mobile sources: Tier 2 vehicle emissions standards and the Gasoline Sulfur Program
  - On-Road Heavy Duty Diesel Rule – Tier 4
  - Clean Air Non-Road Diesel Rule – Tier 2
  - EGUs: CAIR, Regional Haze, Clean Air Mercury Rule (CAMR) and Best Available Retrofit Technology (BART)
  - Non-EGUs: Hospital/Medical Waste Incinerator Regulations

Step 1:

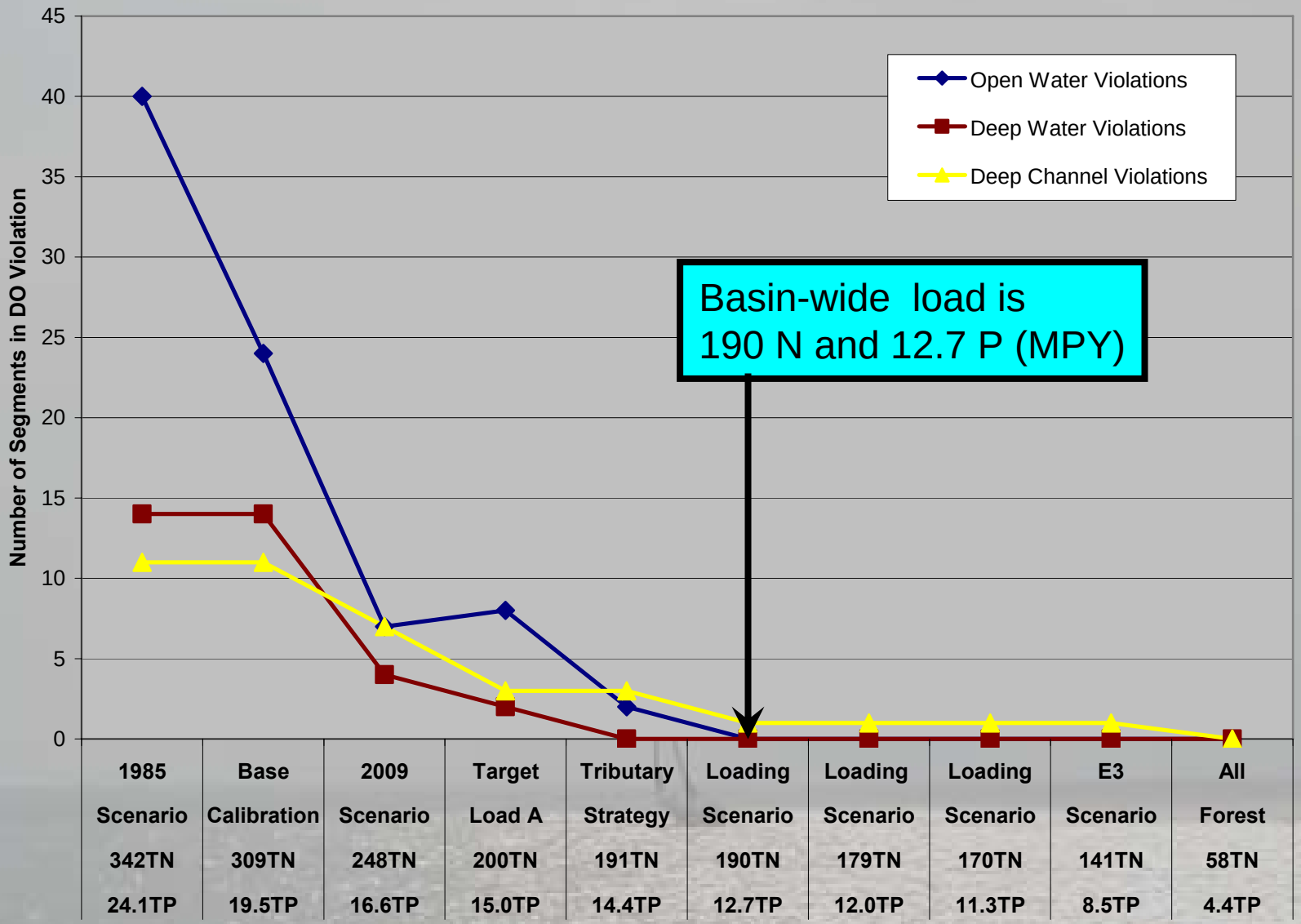
Set the basin-wide nutrient loads based on attaining dissolved oxygen in the main bay, lower river and major embayment segments (those who's water quality is influenced by loads from multiple jurisdictions)



Key Loading Scenarios Evaluated

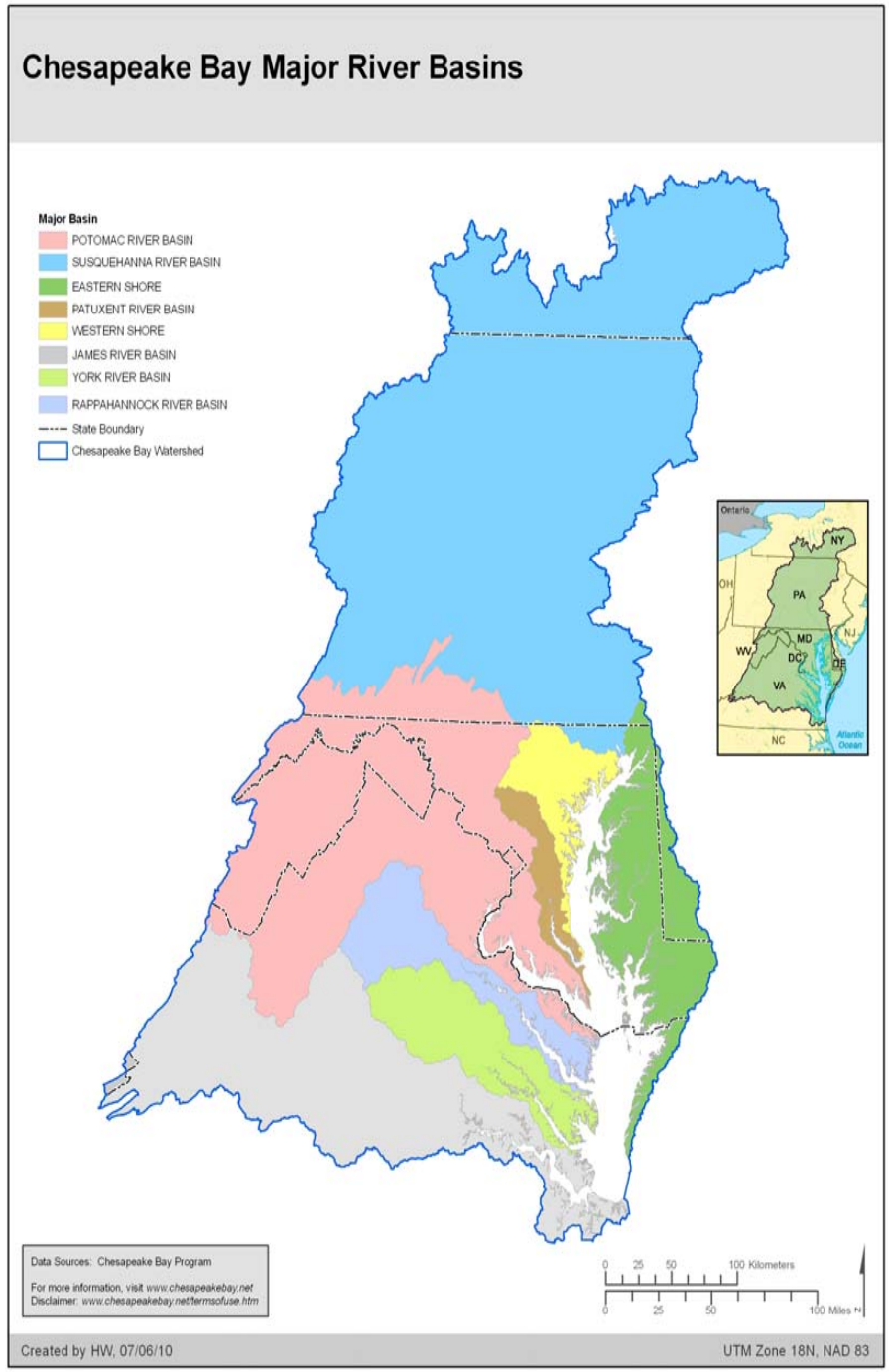
• 1985 Scenario	342 TN	24.1TP
• 1991-2000 Base Scenario	309 TN	19.5 TP
• 2009 Scenario	248 TN	16.6 TP
• Target Load Option A	200 TN	15.0 TP
• Tributary Strategy	191 TN	14.4 TP
• 191/13 Loading Scenario	191 TN	13.0 TP
• 190/13 Loading Scenario	190 TN	13.0 TP
• 190/12.7 Loading Scenario	190 TN	12.7 TP
• 179/12 Loading Scenario	179 TN	12.0 TP
• 170/11.3 Loading Scenario	170 TN	11.3 TP
• E3 2010 Scenario	141 TN	8.5 TP
• 1/3 Between E3 and All Forest	113 TN	7.1 TP
• 2/3 Between E3 and All Forest	85 TN	5.7 TP
• All Forest Scenario	58 TN	4.4 TP

Dissolved Oxygen Criteria Attainment



Step 2:

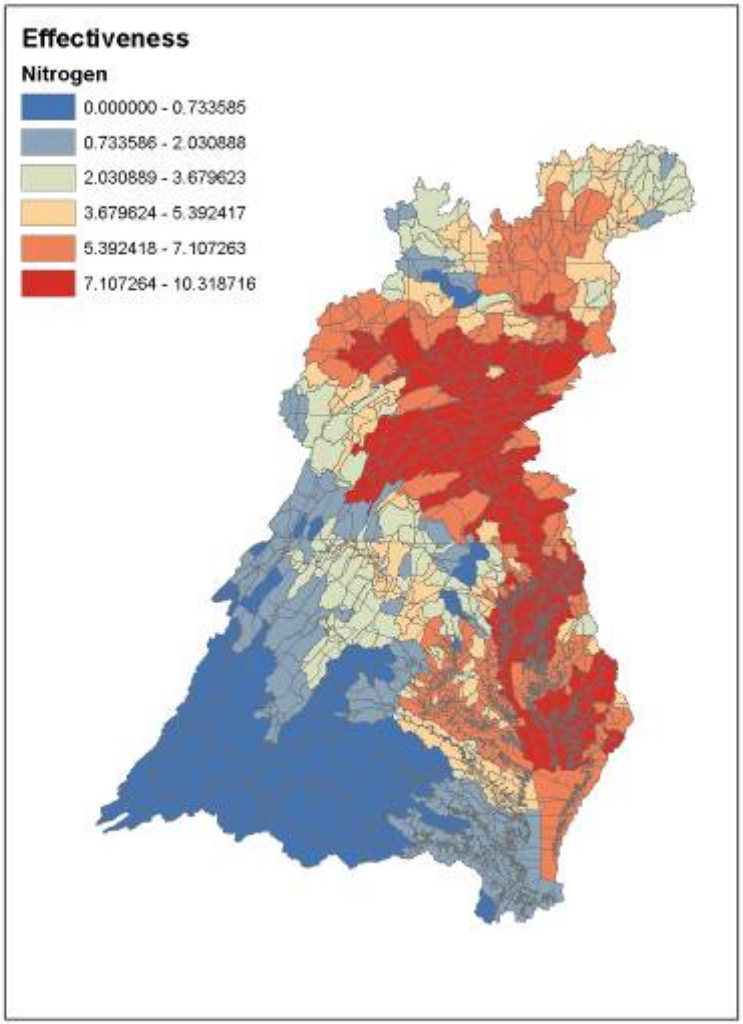
Distribute the basin-wide nutrient loads (based on attaining dissolved oxygen) by jurisdiction and major river basin following the methodology agreed upon by the partnership

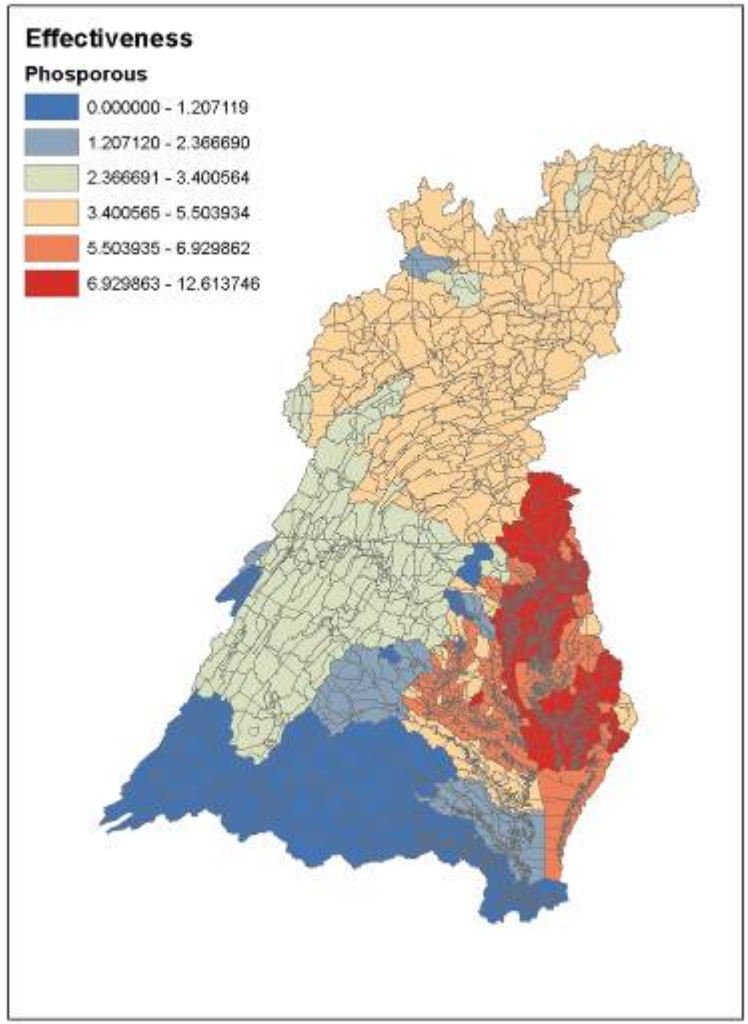


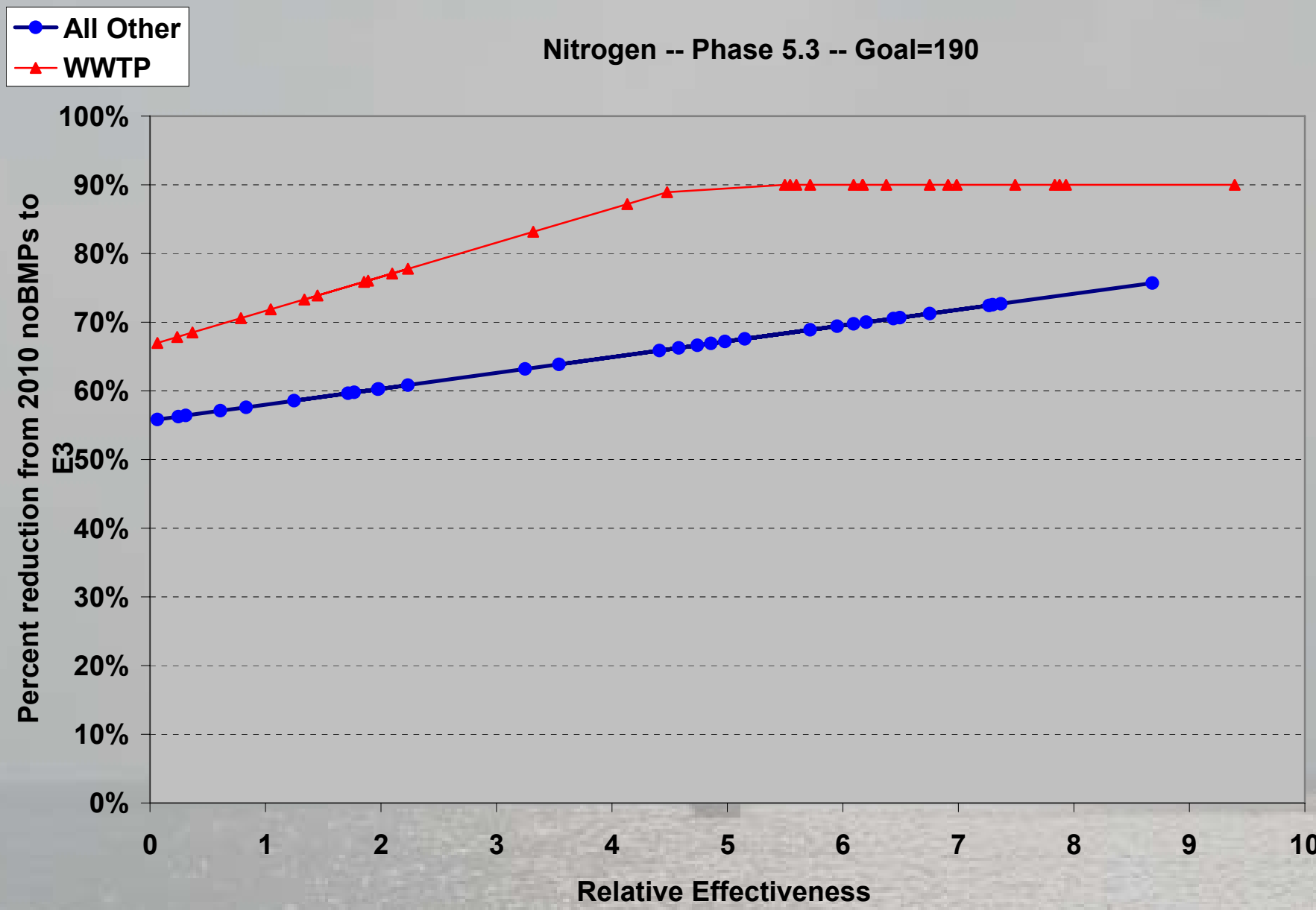
Guidelines for Distributing the Basinwide Target Loads

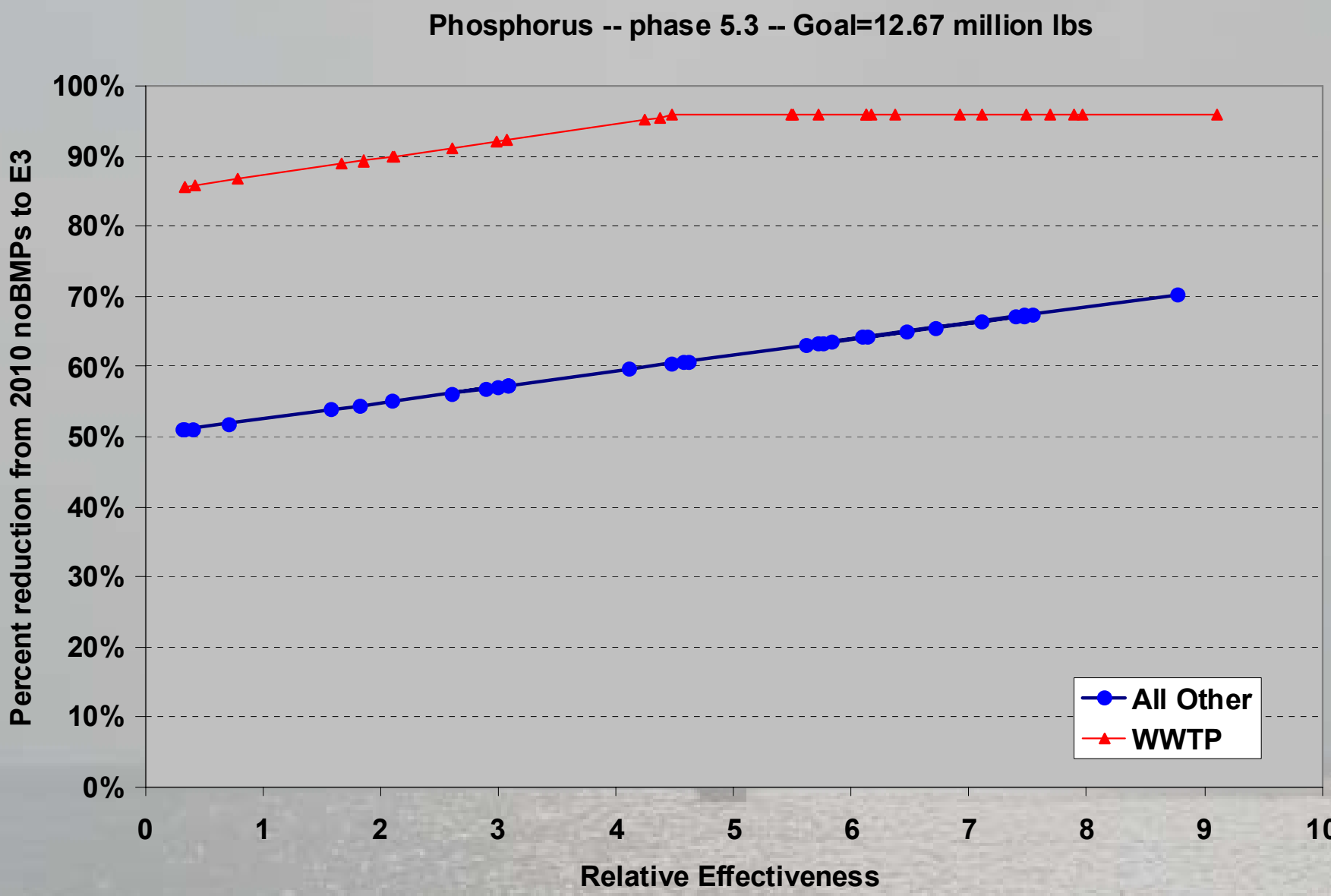
- Water quality and living resource goals should be achieved.
- Waters that contribute the most to the problem should achieve the most reductions.
- All previous reductions in nutrient loads are credited toward achieving final cap loads.

Nutrient Impacts on Bay WQ



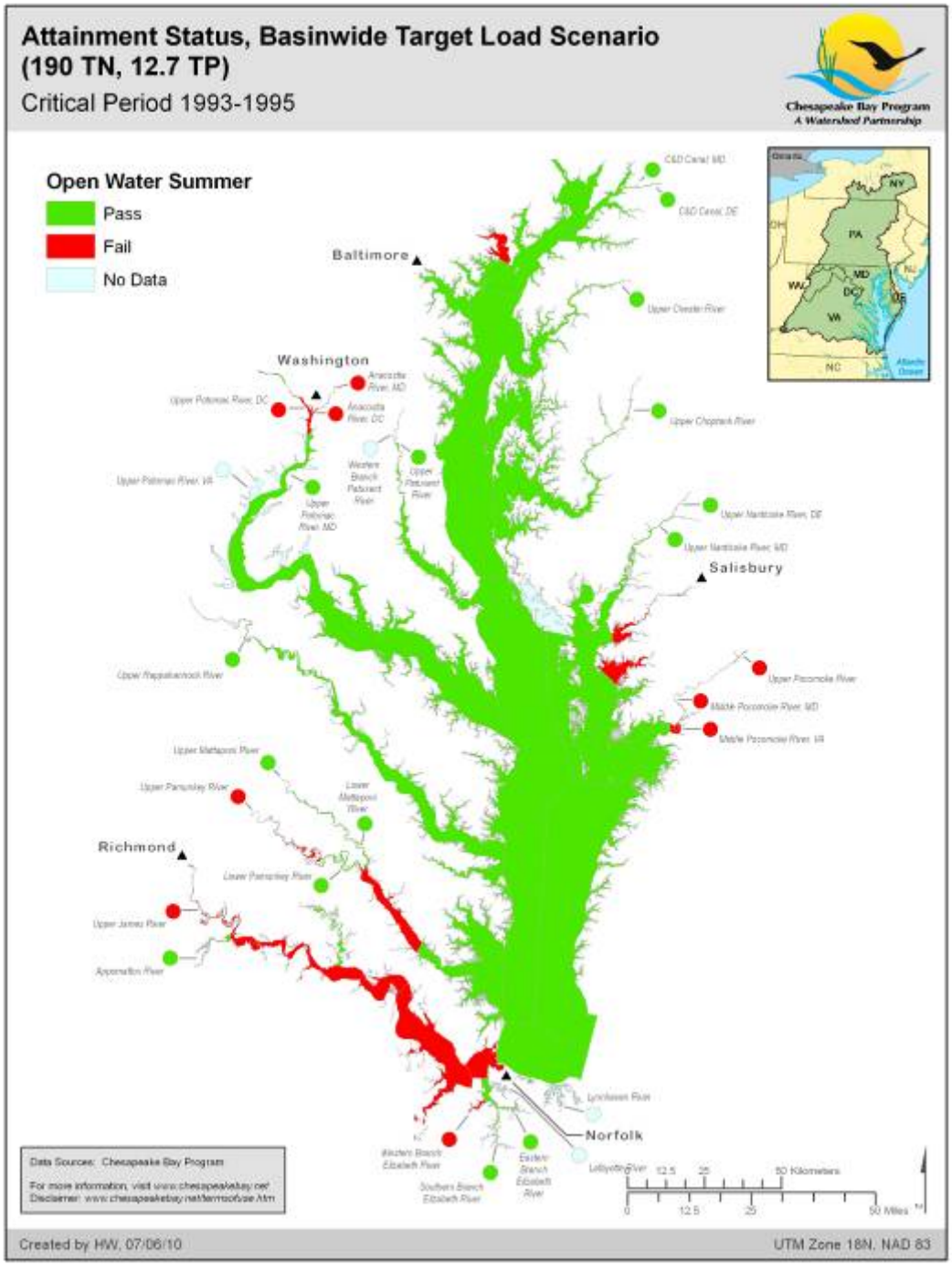



All Other
WWTP
Nitrogen -- Phase 5.3 -- Goal=190
Percent reduction from 2010 noBMPs to E3
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
1
2
3
4
5
6
7
8
9
10
Relative Effectiveness


Phosphorus -- phase 5.3 -- Goal=12.67 million lbs
Percent reduction from 2010 noBMPs to E3
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
1
2
3
4
5
6
7
8
9
10
Relative Effectiveness
All Other
WWTP

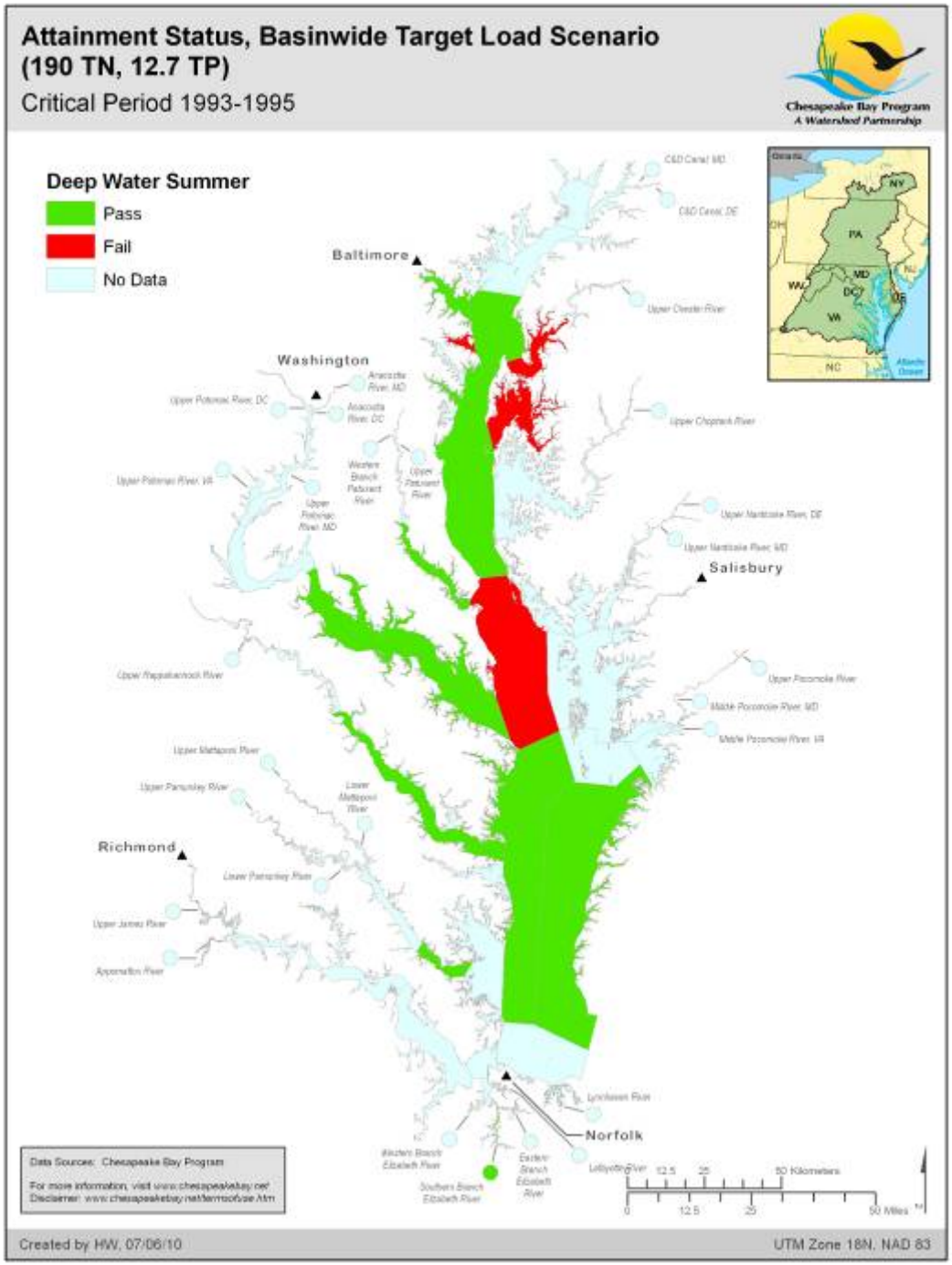
Step 2 continued:

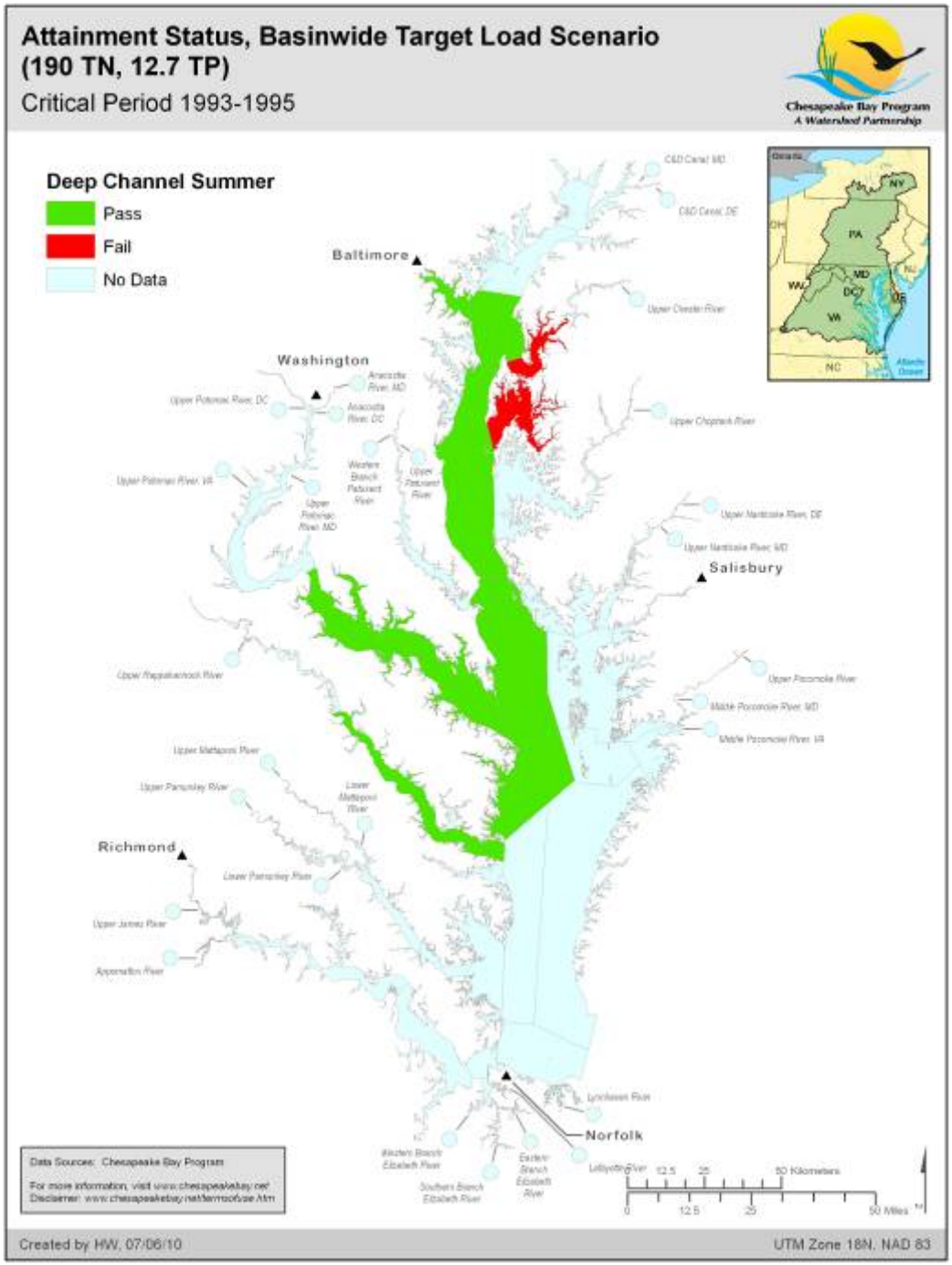
Address tidal segments still not attaining their applicable dissolved oxygen/ chlorophyll *a* criteria at the basin-wide nutrient loads of 190 TN and 12.7 TP


Attainment Status, Basinwide Target Load Scenario
(190 TN, 12.7 TP)
Critical Period 1993-1995
Chesapeake Bay Program
A Watershed Partnership
Open Water Summer
Pass
Fail
No Data
Baltimore
Washington
Salisbury
Richmond
Norfolk
Data Sources: Chesapeake Bay Program
Created by HW, 07/06/10
UTM Zone 18N, NAD 83
50 Kilometers
50 Miles

Attainment Status, Basinwide Target Load Scenario (190 TN, 12.7 TP)

Critical Period 1993-1995




Attainment Status, Basinwide Target Load Scenario
(190 TN, 12.7 TP)
Critical Period 1993-1995
Chesapeake Bay Program
A Watershed Partnership
Deep Channel Summer
Pass
Fail
No Data
Baltimore
Washington
Salisbury
Richmond
Norfolk
NY
PA
MD
WV
DC
DE
VA
NJ
NC
Data Sources: Chesapeake Bay Program
For more information, visit www.chesapeakebay.net
Disclaimer: www.chesapeakebay.net/terms/fs/use.htm
0 12.5 25 50 Kilometers
0 12.5 25 50 Miles
Created by HW, 07/06/10
UTM Zone 18N, NAD 83

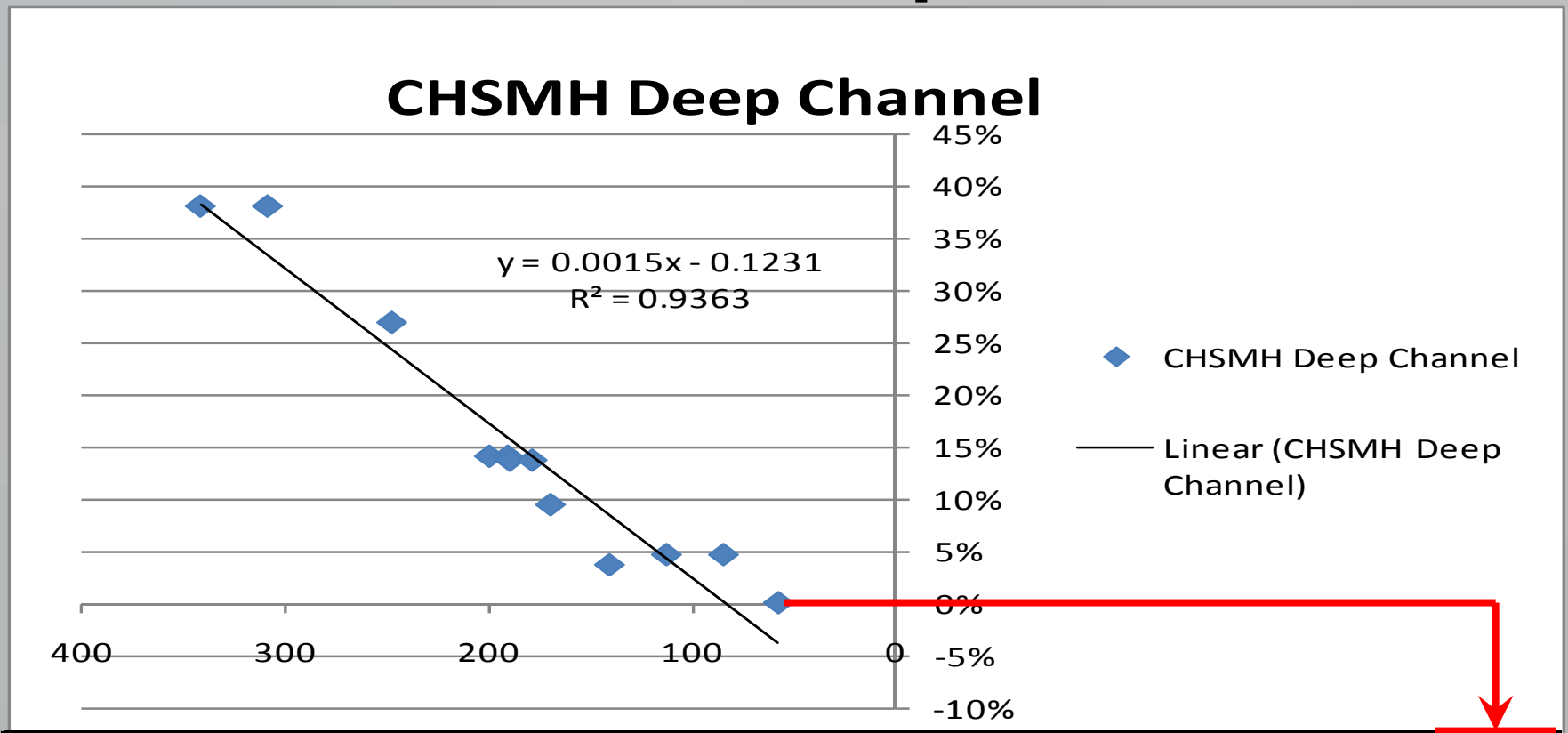
Getting to Attainment—Oxygen

For 123 designated use-segments[1]:

- **Full attainment (92) at 190 TN, 12.7 TP**
- **1% non-attainment → attainment (17)**
  - Not sensitive to further load reductions below 1%
- **Other lines of evidence (10)**
  - Supplemental information beyond Bay WQ model
- **Add a new designated use (3)**
  - Apply deep-water use to Maryland's South, Severn, Magothy rivers where a pycnocline is observed
- **Restoration variance (1)**
  - Maryland's lower Chester River—deep channel use

1. There are 92 open water, 21 deep-water and 10 deep-channel designated use-segments.

Lower Chester River Deep Channel Load and Response



	1985 Scenario 342TN, 24.1TP, 9790TSS '93-'95	"91 -'00 Base Scenario 309TN, 19.5TP, 8950TSS '93-'95	2009 Scenario 248TN, 16.6TP, 8110TSS '93-'95	Target Load Option A 200TN, 15TP, 6390TSS '93-'95	Tributary Stategy 191TN 14.4TP, 6462 TSS '93-'95	190 Loading Scenario 190TN 12.6TP, 6030TSS '93-'95	179 Loading Scenario 179TN 12.0TP, 5510TSS '93-'95	170 Loading Scenario 170TN 11.3TP, 5650TSS '93-'95	E3 2010 Scenario 141TN 8.5TP, 5060TSS '93-'95	1/3 Between E3 & Forest 113TN 7.1TP 4450TSS '93-'95	2/3 Between E3 & Forest 85TN 5.7TP 3840TSS '93-'95	All Forest Scenario '93-'95
CHSMH	38%	38%	27%	14%	14%	14%	14%	9%	4%	5%	5%	0%
TN Loads	342	309	248	200	191	190	179	170	141	113	85	68

Getting to Attainment—Chlorophyll *a*

- **Numerical chlorophyll a criteria apply only to tidal James River in Virginia and the District's tidal waters (Potomac, Anacostia)**

- **District's Potomac tidal waters currently attain the chlorophyll *a* criteria**
  - District's tidal Anacostia River is at 4% non-attainment
  - Will come into attainment at nutrient load reductions required for dissolved oxygen attainment

- **Tidal James in non-attainment under the basinwide target loads of 190 TN, 12.7 TP**
  - Further reductions within the James River basin required to reach attainment of the season and segment specific chlorophyll *a* criteria

Basinwide and James River Basin Specific Scenario Loads

Total Nitrogen Loads in Millions of Pounds

Scenario→	1985 Scenario 342TN, 24.1TP, 9790TSS	"91 -'00 Base Scenario 309TN, 19.5TP, 8950TSS	2009 Scenario 248TN, 16.6TP, 8110TSS	Target Load Option A 200TN, 15TP, 6390TSS	Tributary Strategy 191TN, 14.4TP, 6462TSS	190/13 Loading Scenario 190TN, 13TP, 6123TSS	190 Loading Scenario 190TN, 12.7TP, 6030TSS	James Between LoE as Potomac and 170 TN 11.3 TP	James At Same LoE As Potomac	179 Loading Scenario 179TN, 12.0TP, 5510TSS	170 Loading Scenario 170TN, 11.3TP, 5650TSS	E3 2010 Scenario 141TN, 8.5TP, 5060TSS	1/3 Between E3 & Forest 113TN 7.1TP 4450TSS	2/3 Between E3 & Forest 85TN 5.7TP 3840TSS	All Forest Scenario 58TN 4.4TP 3240TSS
Total Bay TN Loads	342	309	248	200	191	190	190	187	185	179	170	141	113	85	58
James Basin TN Loads	42.6	36.8	30.4	27.1	27.5	26.6	26.6	23.5	21.5	26.0	25.5	16.1	13.2	10.2	*

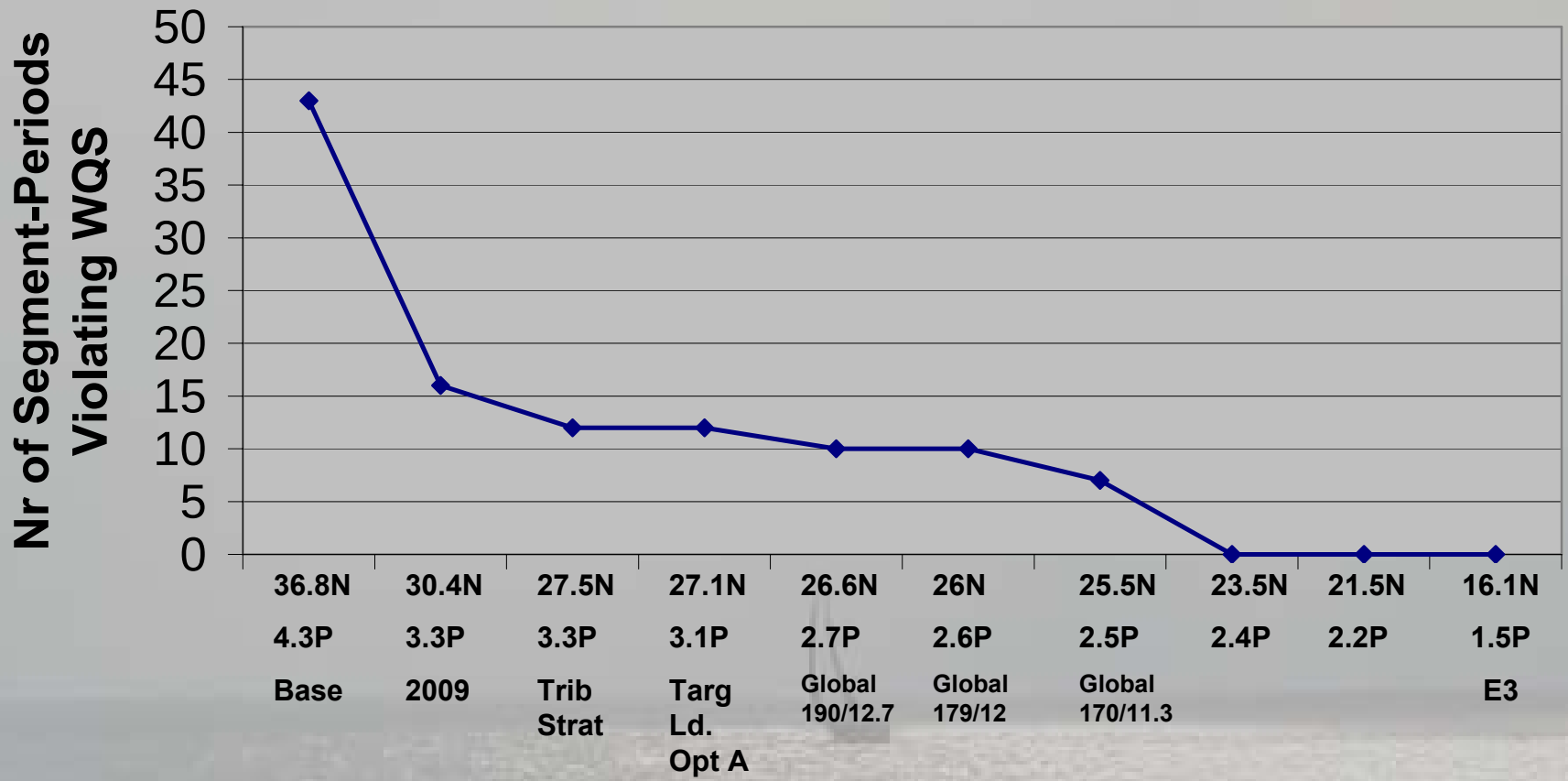
Total Phosphorus Loads in Millions of Pounds

Scenario→	1985 Scenario 342TN, 24.1TP, 9790TSS	"91 -'00 Base Scenario 309TN, 19.5TP, 8950TSS	2009 Scenario 248TN, 16.6TP, 8110TSS	Target Load Option A 200TN, 15TP, 6390TSS	Tributary Strategy 191TN, 14.4TP, 6462TSS	190/13 Loading Scenario 190TN, 13TP, 6123TSS	190 Loading Scenario 190TN, 12.7TP, 6030TSS	James Between LoE as Potomac and 170 TN 11.3 TP	James At Same LoE As Potomac	179 Loading Scenario 179TN, 12.0TP, 5510TSS	170 Loading Scenario 170TN, 11.3TP, 5650TSS	E3 2010 Scenario 141TN, 8.5TP, 5060TSS	1/3 Between E3 & Forest 113TN 7.1TP 4450TSS	2/3 Between E3 & Forest 85TN 5.7TP 3840TSS	All Forest Scenario 58TN 4.4TP 3240TSS
Total Bay TP Loads	24.1	19.5	16.6	15.0	14.4	13.0	12.7	12.3	12.2	12.0	11.3	8.5	7.1	5.7	4.4
James Basin TP Loads	6.51	4.34	3.32	3.05	3.29	*	2.68	2.35	2.22	2.58	2.47	1.50	1.30	1.11	*

James River basin equitable portion of basinwide target load

Achieved attainment of James River chlorophyll *a* water quality standards

James River Chlorophyll *a* Response to Load Reductions



James River Basin TN/TP Load

Chlorophyll *a* Attainment at 190 TN, 12.7 TP Basinwide Loads with James River Basin at 23.5 TN, 2.35 TP

Cbseg	jlp_2CL '91-'93 CL Spring Seasonal	jlp_2CL '92-'94 CL Spring Seasonal	jlp_2CL '93-'95 CL Spring Seasonal	jlp_2CL '94-'96 CL Spring Seasonal	jlp_2CL '95-'97 CL Spring Seasonal	jlp_2CL '96-'98 CL Spring Seasonal	jlp_2CL '97-'99 CL Spring Seasonal	jlp_2CL '98-'00 CL Spring Seasonal
JMSTFL	0%	0%	0%	0%	0%	0%	0%	0%
JMSTFU	0%	0%	0%	0%	0%	0%	0%	0%
JMSOH	0%	0%	0%	0%	0%	0%	0%	0%
JMSMH	1%	0%	0%	0%	0%	0%	0%	0%
JMSPH	0%	0%	0%	0%	0%	0%	0%	0%

Cbseg	jlp_2CL '91-'93 CL Summer Seasonal	jlp_2CL '92-'94 CL Summer Seasonal	jlp_2CL '93-'95 CL Summer Seasonal	jlp_2CL '94-'96 CL Summer Seasonal	jlp_2CL '95-'97 CL Summer Seasonal	jlp_2CL '96-'98 CL Summer Seasonal	jlp_2CL '97-'99 CL Summer Seasonal	jlp_2CL '98-'00 CL Summer Seasonal
JMSTFL	0%	0%	0%	0%	~~2%~~	~~6%~~	~~6%~~	~~2%~~ *
JMSTFU	0%	0%	0%	0%	0%	0%	0%	0%
JMSOH	0%	0%	0%	0%	0%	0%	0%	0%
JMSMH	0%	0%	0%	0%	0%	0%	1%	1%
JMSPH	0%	0%	0%	0%	0%	0%	~~9%~~	~~9%~~ *

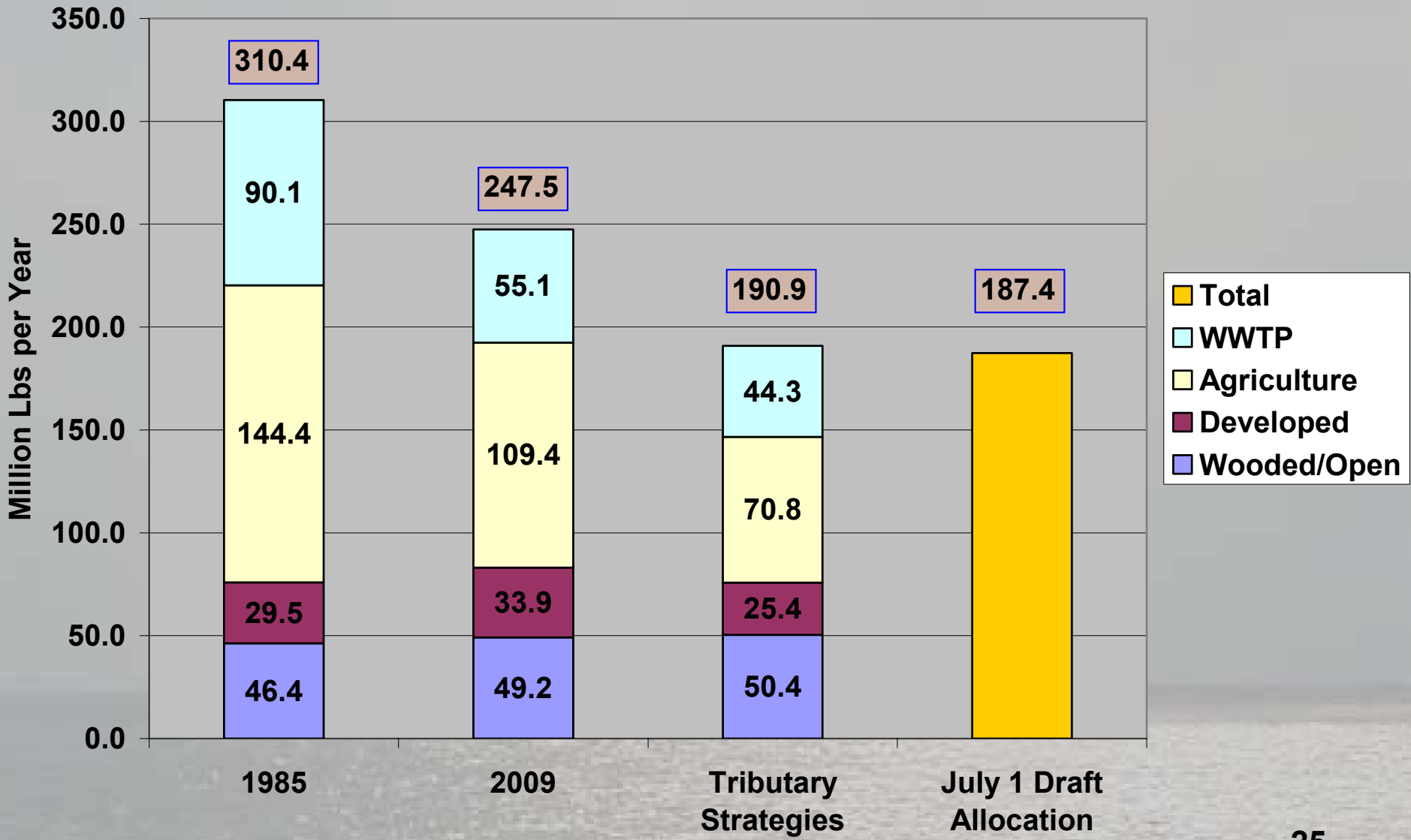
* For these two segments and select years, observed data outside (higher) then the range of model calibration.

NY and WV Allocations

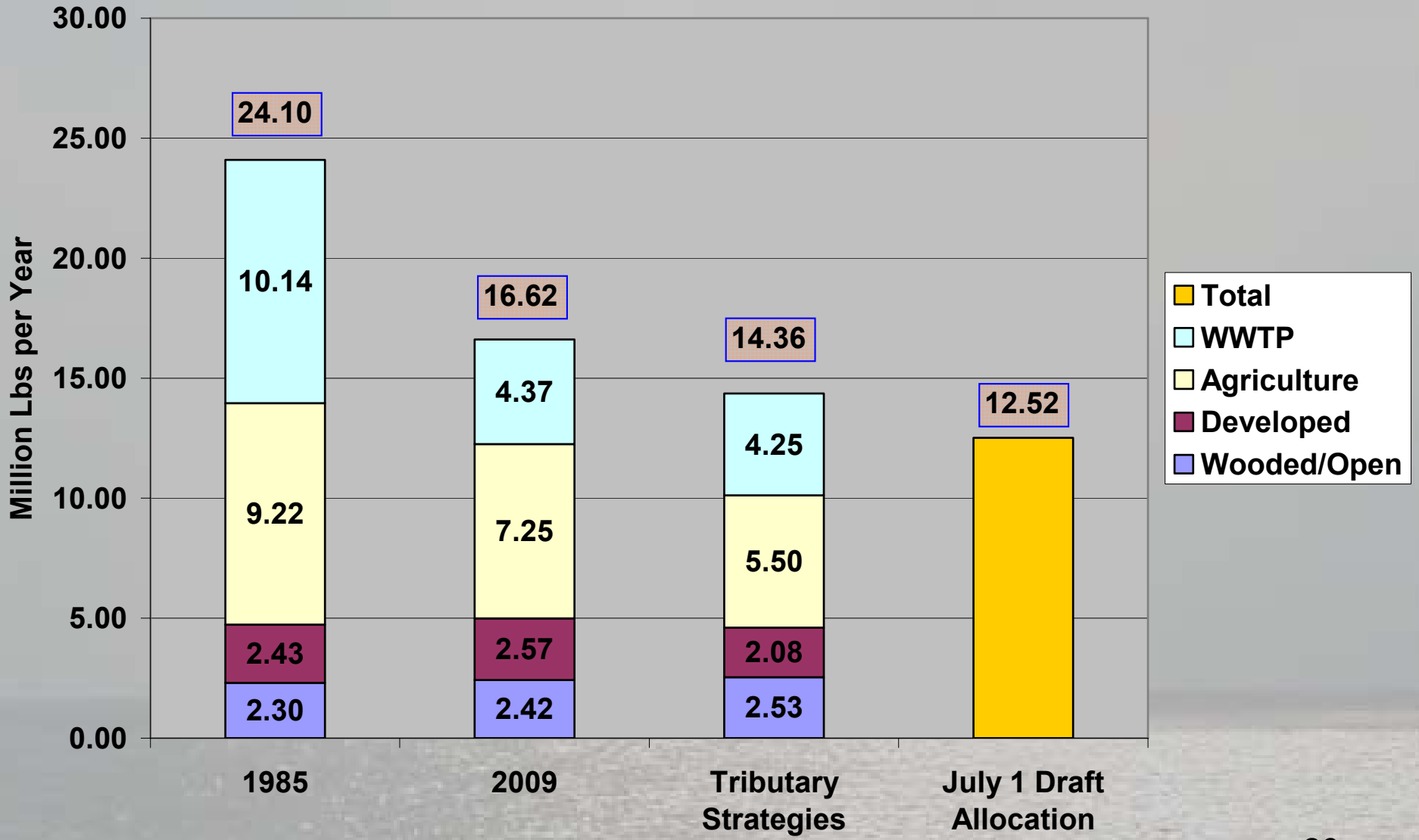
- Both are headwater states, hundreds of river miles from the tidal waters
- Small load contributions to tidal waters (2% TN, 5% TP)
- Little to negative population growth in NY
- Expressed strong concerns about equity in the allocations
- Working from the 190/12.7 based allocations, EPA increased:
  - New York's nitrogen allocation load by 0.75 million pounds/year[1]
  - West Virginia's phosphorus allocation load by 0.2 million pounds/year[1]

1. The 191 TN, 13 TP scenario confirmed attainment; enabled a 1 million lbs TN and 0.3 million lbs TP reserve.

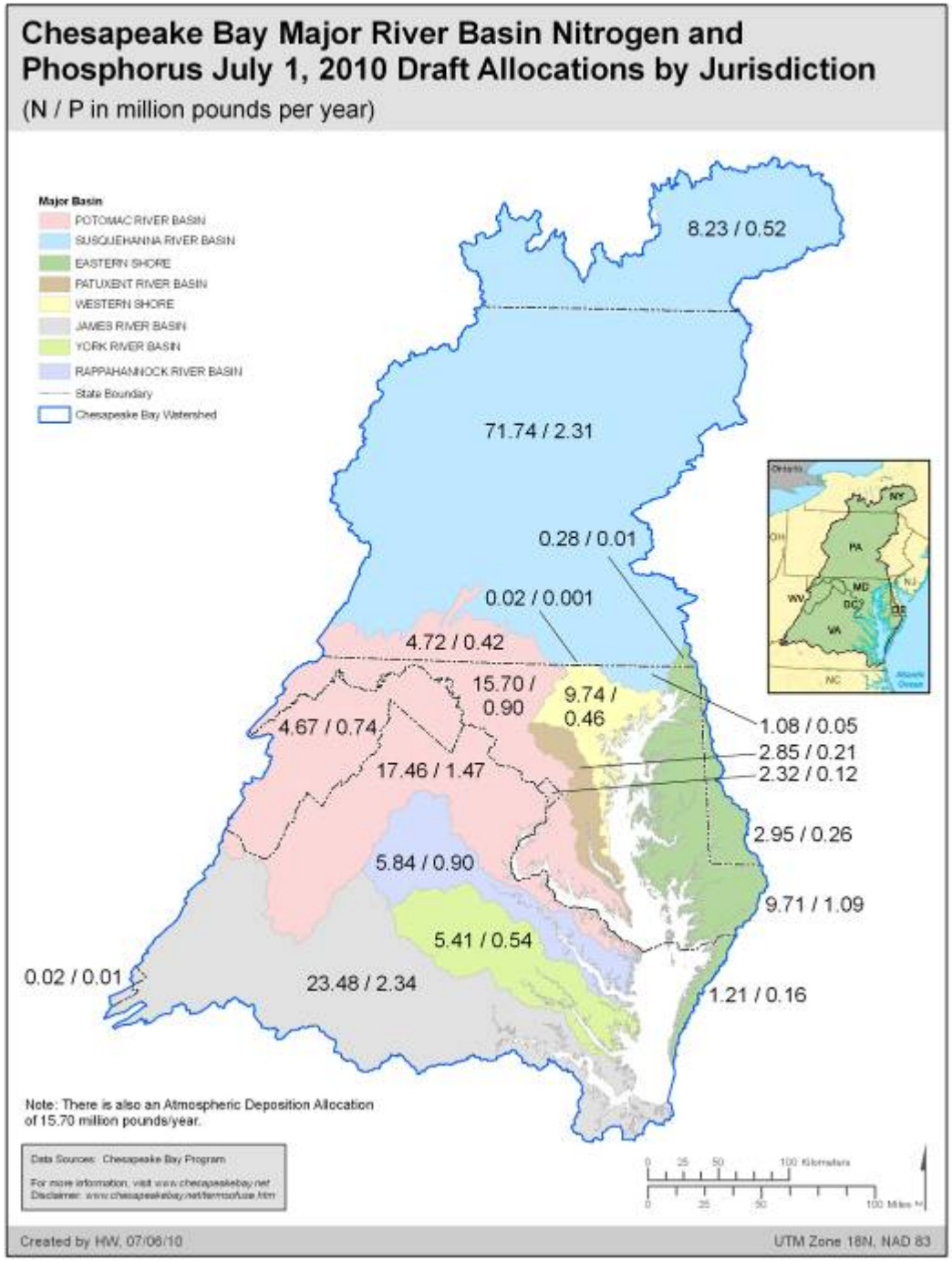
Nitrogen Loads by Sector and Scenario - CBP Watershed Model p5.3



Phosphorus Loads by Sector and Scenario - CBP Watershed Model p5.3



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



Temporary Reserve

- Prepare for potential allocation changes
- Set at 5% of allocated load
- Not used in TMDL loads
- States to identify ‘contingency actions’ to achieve the TR load reductions