Moving Toward Final 2010 Nutrient and Sediment Targets

Information presented is draft and subject to change.

Water Quality Goal Implementation Team
Conference Call

June 1st, 2010

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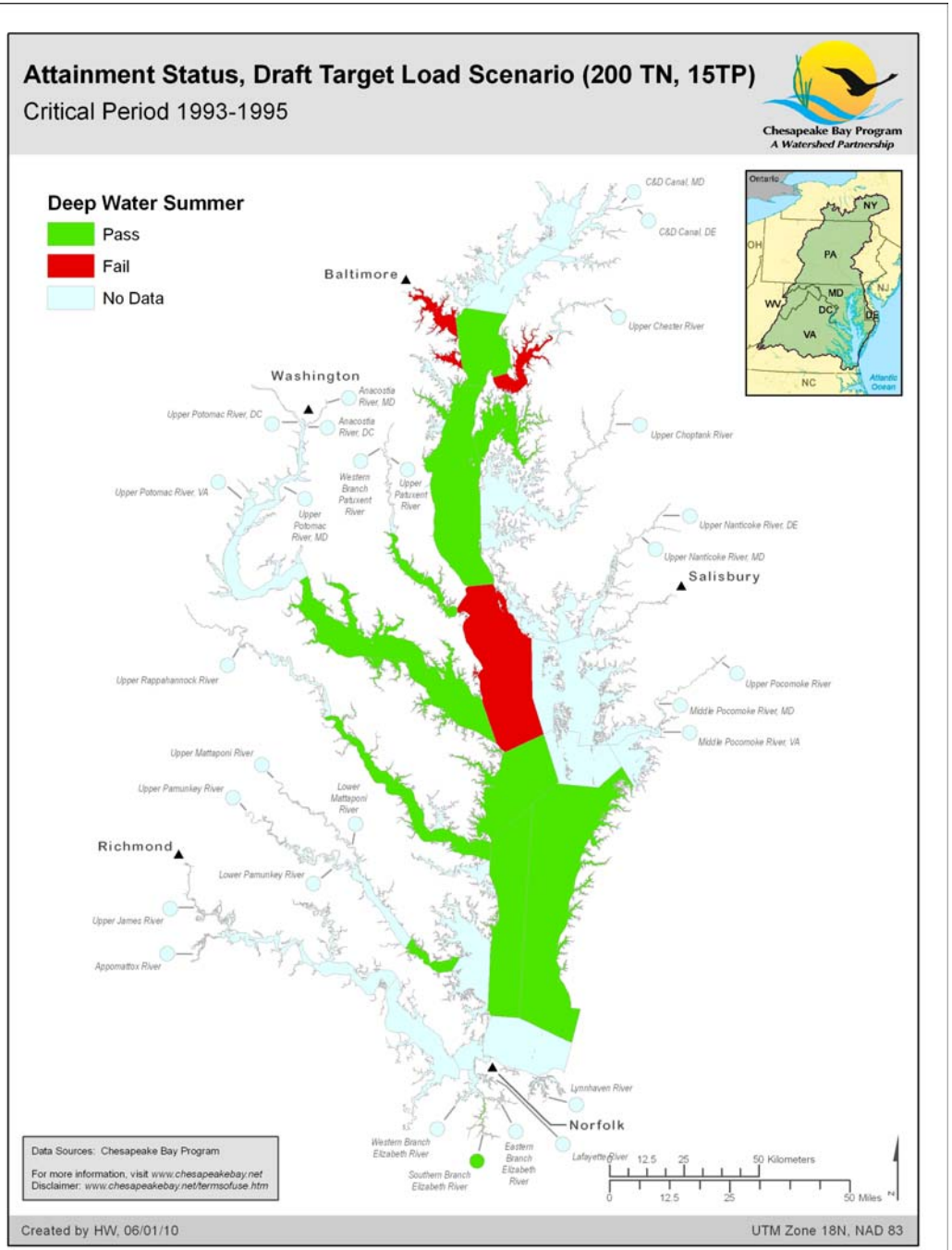
Process for Determining Loadings for Full attainment of DO and Chlorophyll

1. determine baywide cap that attains WQS in main bay
2. allocate that loading to the states/major basins
3. refine some watershed cap loads to achieve WQS in remaining non attaining segments

Issues to be Addressed

1. Starting Baywide Target Load for Nutrients
2. Non-attaining segments

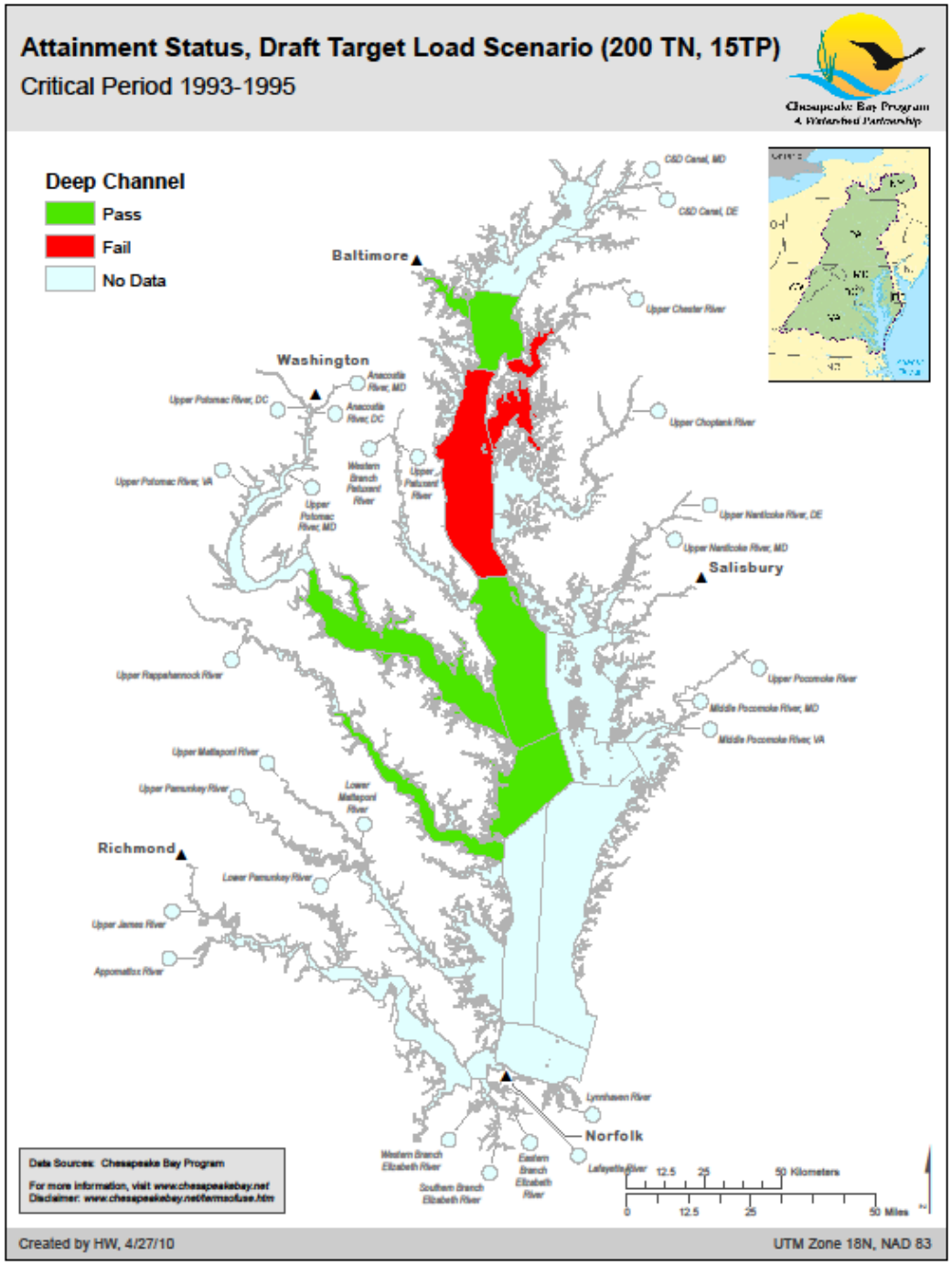
Starting Baywide Target Load is 180 million pounds per year total nitrogen and 12 million pounds per year total phosphorus.



Deep-Water Use Dissolved Oxygen at Current Target Loads

(200 TN, 15 TP+ 15.7 air allocation)

- Non-attainment in 4 segments (>1%)
  - Lower Chester River (2.7%)
  - Magothy (15.9%)
  - Maryland CB5 (1.9%)
  - Patapsco (1.1%)
- Reaching attainment will require further reductions in nutrient loads from basinwide and local watershed scales

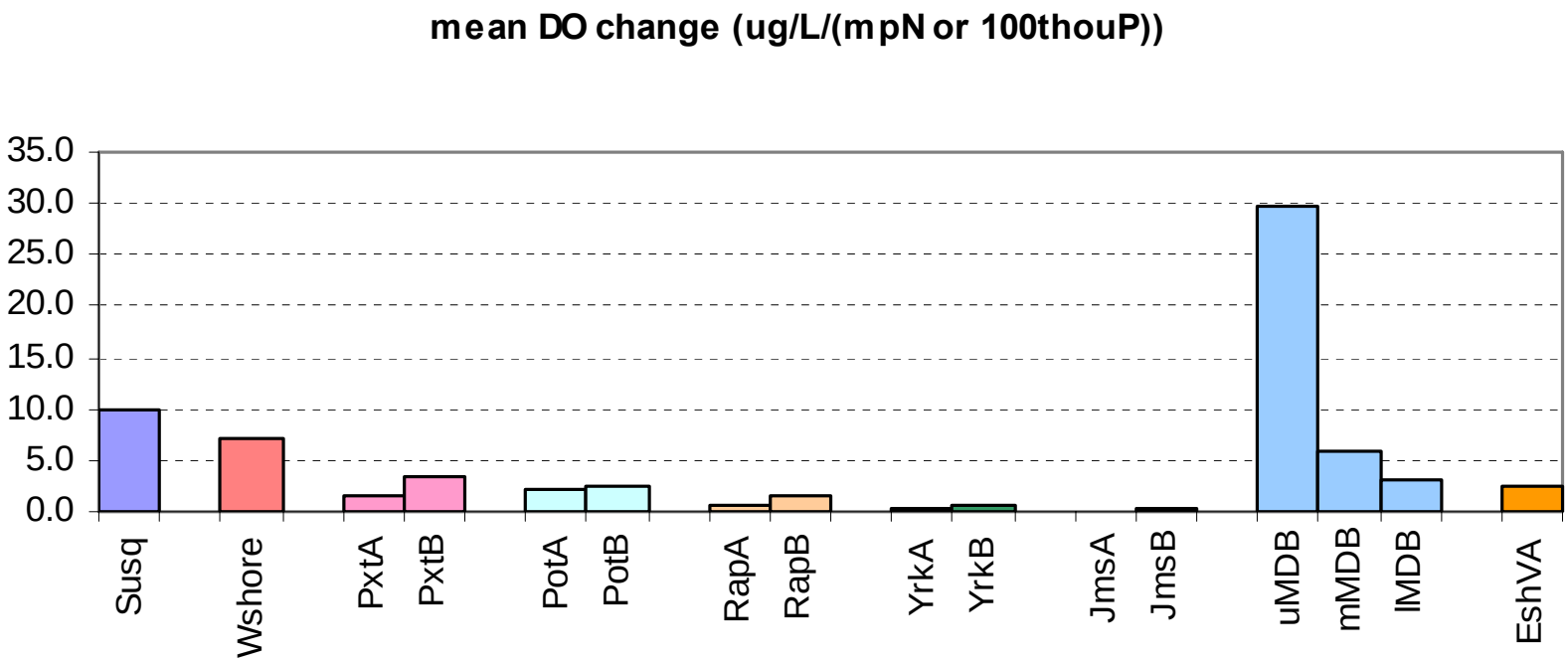


Deep-Channel Use Dissolved Oxygen at Current Target Loads

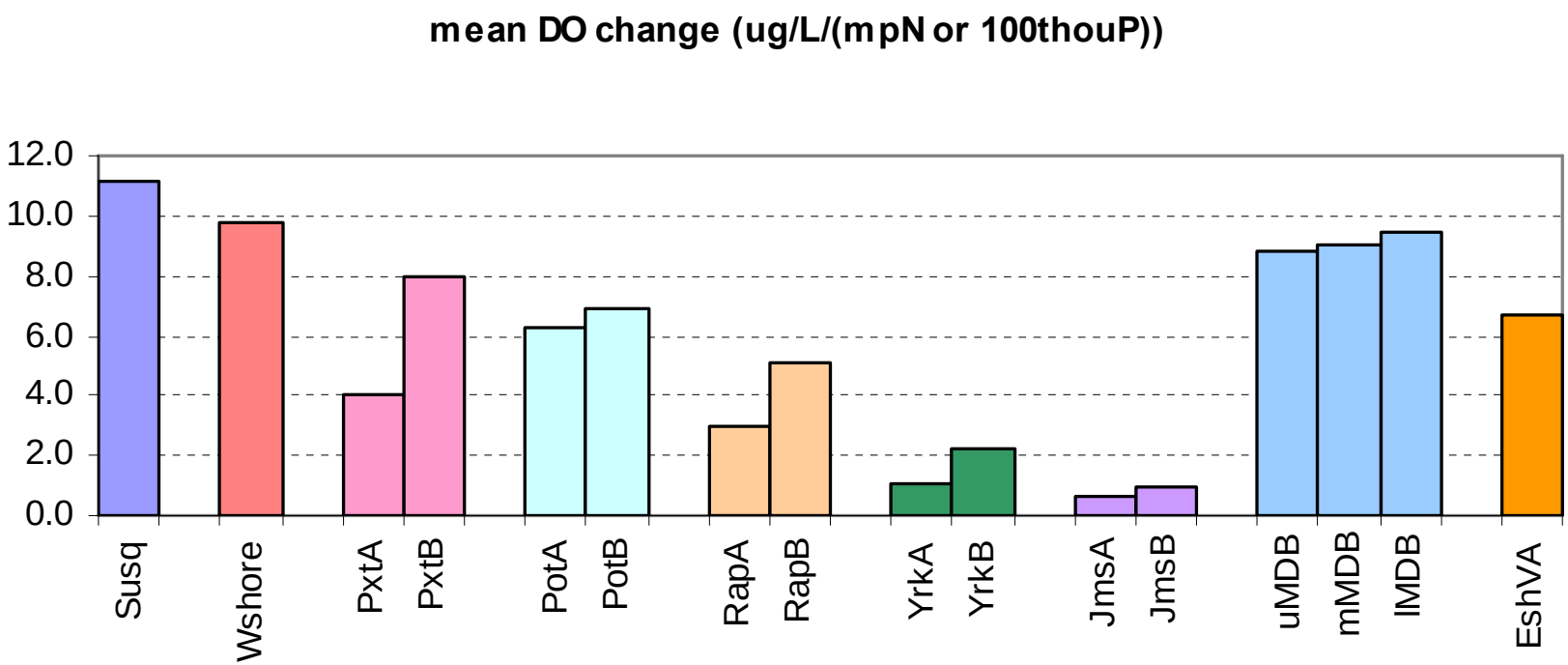
(200 TN, 15 TP+ 15.7 air allocation)

- Non-attainment in 3 segments (>1%)
  - CB4 (2%)
  - Lower Chester (14%)
  - Eastern Bay (4%)
- <u>Reaching attainment will require further reductions in nutrient loads from larger Bay watershed</u>

Basin Contributions: EASMH Deep Channel



Basin Contributions: MD5MH Deep Water



Deep Water Nonattainment

Cbseg	1985 Scenario 342TN, 24.1TP, 9790TSS '93-'95 DO Deep Water	"91 -'00 Base Scenario 309TN, 19.5TP, 8950TSS '93-'95 DO Deep Water	2007 Scenario 254TN, 17.1TP, 6498TSS '93-'95 DO Deep Water	Target Load Option A 200TN, 15TP, 6390TSS '93-'95 DO Deep Water	Tributary Stategy 191TN 14.4TP, 6462 TSS '93-'95 DO Deep Water	190 Loading Scenario 190TN 12.6TP, 6030TSS '93-'95 DO Deep Water	179 Loading Scenario 179TN 12.0TP, 5510TSS '93-'95 DO Deep Water	170 Loading Scenario 170TN 11.3TP, 5650TSS '93-'95 DO Deep Water	E3 2010 Scenario 141TN 8.5TP, 5060TSS '93-'95 DO Deep Water	All Forest Scenario 57TN 4.4TP 3240TSS '93-'95 DO Deep Water
CB4MH	23.8%	19.7%	9.9%	6.0%	5.2%	4.8%	4.1%	3.2%	2.0%	0.0%
CHSMH	35.5%	24.7%	15.6%	2.7%	1.8%	1.8%	1.6%	0.5%	0.4%	0.0%
EASMH	25.4%	5.7%	1.4%	0.8%	0.7%	0.7%	0.2%	0.2%	0.0%	0.0%
MAGMH	34.8%	34.8%	34.8%	15.9%	15.9%	3.4%	3.4%	0.5%	0.5%	0.0%
MD5MH	11.8%	9.1%	4.2%	1.9%	1.5%	1.3%	0.9%	0.6%	0.1%	0.0%
PATMH	16.2%	13.7%	5.3%	1.1%	1.1%	0.1%	0.0%	0.0%	0.0%	0.0%

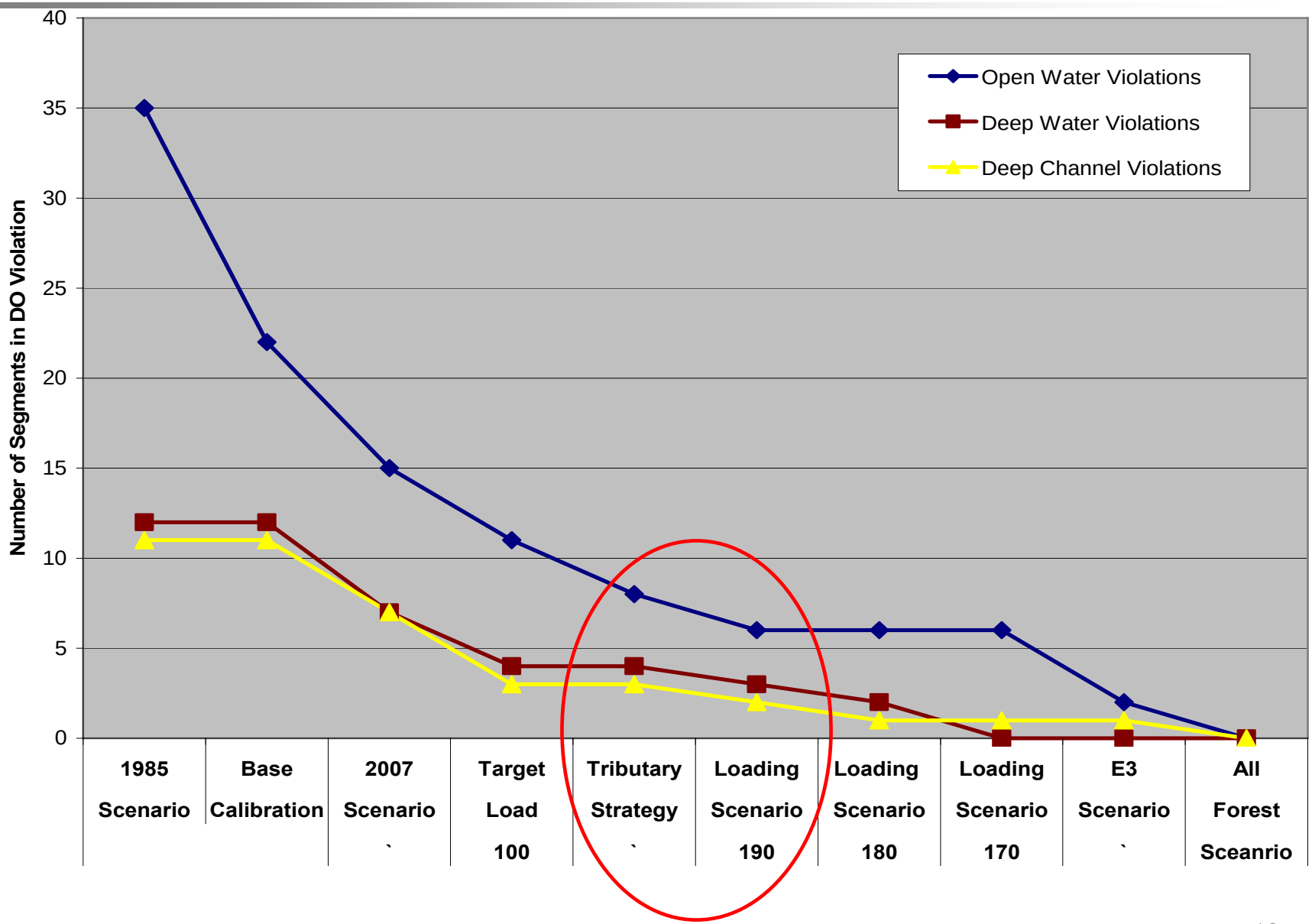
Deep Channel Nonattainment

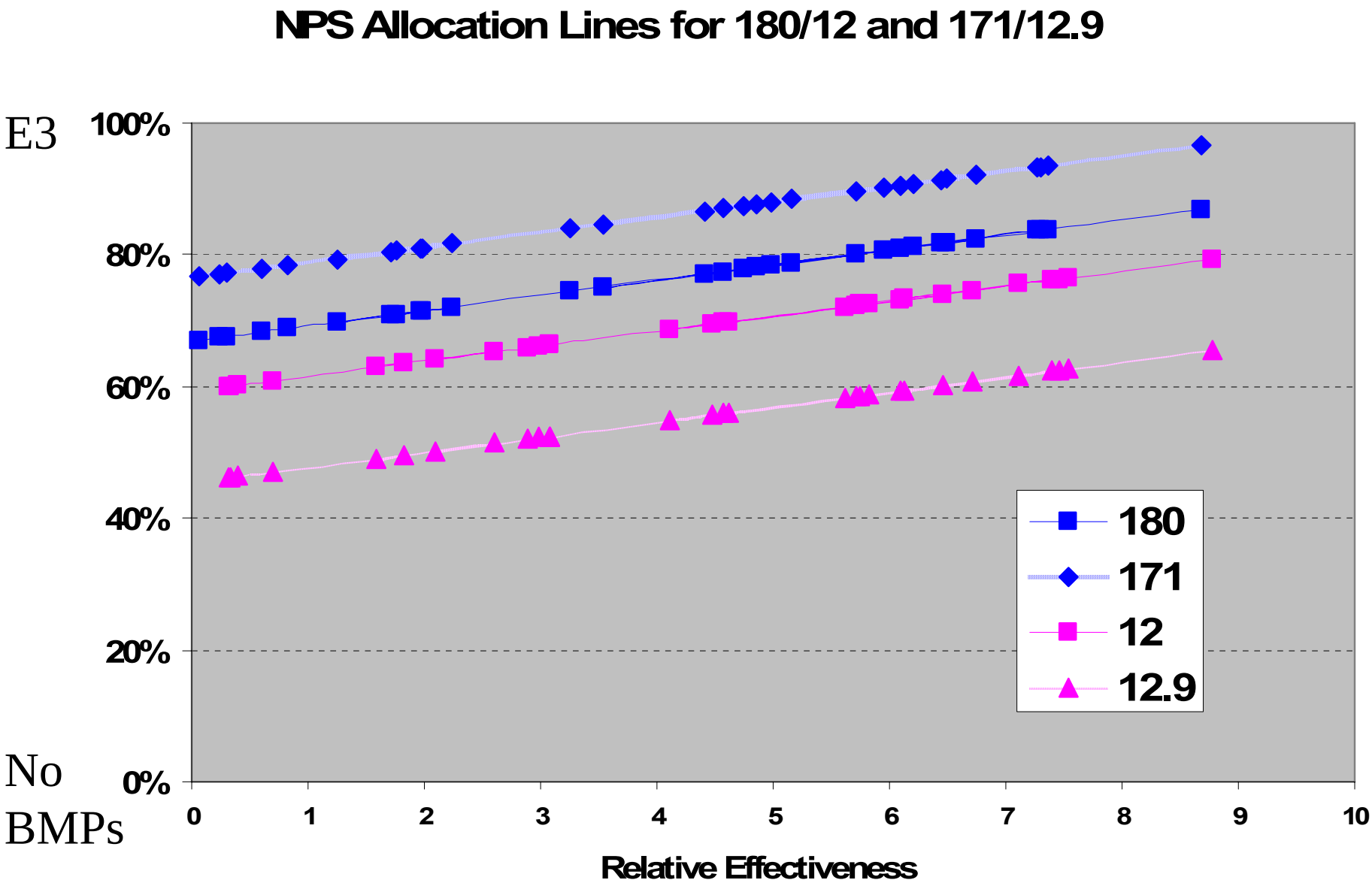
Cbseg	1985 Scenario 342TN, 24.1TP, 9790TSS '93-'95 DO Deep Channel	"91 -'00 Base Scenario 309TN, 19.5TP, 8950TSS '93-'95 DO Deep Channel	2007 Scenario 254TN, 17.1TP, 6498TSS '93-'95 DO Deep Channel	Target Load Option A 200TN, 15TP, 6390TSS '93-'95 DO Deep Channel	Tributary Stategy 191TN 14.4TP, 6462 TSS '93-'95 DO Deep Channel	190 Loading Scenario 190TN 12.6TP, 6030TSS '93-'95 DO Deep Channel	179 Loading Scenario 179TN 12.0TP, 5510TSS '93-'95 DO Deep Channel	170 Loading Scenario 170TN 11.3TP, 5650TSS '93-'95 DO Deep Channel	E3 2010 Scenario 141TN 8.5TP, 5060TSS '93-'95 DO Deep Channel	All Forest Scenario 57TN 4.4TP 3240TSS '93-'95 DO Deep Channel
CB4MH	51.5%	46.2%	20.9%	4.4%	2.6%	1.8%	0.2%	0.0%	0.0%	0.0%
CHSMH	38.0%	38.0%	29.4%	14.0%	14.0%	13.7%	13.7%	9.4%	3.6%	0.0%
EASMH	31.5%	26.1%	12.9%	4.2%	2.3%	1.3%	0.3%	0.0%	0.0%	0.0%
MD5MH	29.7%	24.4%	3.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PATMH	31.6%	27.0%	19.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Open Water Nonattainment

Cbseg	Scenario → Year → State	1985 Scenario 342TN, 24.1TP, 9790TSS '93-'95 DO Open Water Summer Monthly	"91 -'00 Base Scenario 309TN, 19.5TP, 8950TSS '93-'95 DO Open Water Summer Monthly	2007 Scenario 254TN, 17.1TP, 6498TSS '93-'95 DO Open Water Summer Monthly	Target Load Option A 200TN, 15TP, 6390TSS '93-'95 DO Open Water Summer Monthly	Tributary Stategy 191TN 14.4TP, 6462 TSS '93-'95 DO Open Water Summer Monthly	190 Loading Scenario 190TN 12.6TP, 6030TSS '93-'95 DO Open Water Summer Monthly	179 Loading Scenario 179TN 12.0TP, 5510TSS '93-'95 DO Open Water Summer Monthly	170 Loading Scenario 170TN 11.3TP, 5650TSS '93-'95 DO Open Water Summer Monthly	E3 2010 Scenario 141TN 8.5TP, 5060TSS '93-'95 DO Open Water Summer Monthly	All Forest Scenario 57TN 4.4TP 3240TSS '93-'95 DO Open Water Summer Monthly
APPTF	VA	0.0%	0.0%	4.7%	4.6%	4.6%	0.0%	0.0%	0.0%	0.0%	0.0%
CB7PH	VA	8.8%	7.0%	2.2%	0.5%	0.3%	0.2%	0.1%	0.1%	0.0%	0.0%
CHOMH1	MD	3.1%	1.8%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
DCATF	DC	37.6%	27.5%	22.2%	13.7%	1.2%	1.5%	0.1%	0.0%	0.0%	0.0%
MAGMH	MD	1.3%	1.3%	1.1%	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%
MDATF	MD	34.3%	38.7%	34.5%	18.5%	12.1%	12.1%	11.5%	11.3%	0.0%	0.0%
MPCOH	MD	33.1%	42.3%	32.3%	25.0%	25.0%	17.9%	4.6%	4.6%	4.6%	0.0%
PAXOH	MD	35.9%	19.6%	2.7%	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%
PAXTF	MD	36.5%	9.0%	6.4%	0.6%	7.1%	1.0%	0.6%	0.0%	0.0%	0.0%
PIAMH	VA	5.3%	0.1%	2.9%	4.8%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%
PMKTF	VA	11.0%	11.0%	4.6%	4.6%	4.6%	4.6%	4.6%	2.3%	0.7%	0.7%
POCOH	both	32.8%	41.7%	32.3%	25.0%	25.0%	17.9%	4.6%	4.6%	4.6%	0.0%
POCTF	MD	33.2%	43.1%	32.3%	25.0%	25.0%	17.9%	4.6%	4.6%	4.6%	0.0%
SBEMH	VA	30.3%	35.2%	16.9%	7.7%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
SEVMH	MD	20.5%	15.5%	9.0%	6.4%	6.4%	5.8%	5.8%	5.8%	1.4%	0.0%
VPCOH	VA	32.5%	40.9%	32.3%	25.0%	25.0%	17.9%	4.6%	4.6%	4.6%	0.0%
WBEMH	VA	15.3%	11.1%	15.3%	7.8%	7.8%	7.8%	7.8%	7.8%	0.0%	0.0%
WSTMH	MD	9.4%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
YRKMH	VA	17.6%	24.0%	6.6%	3.4%	1.0%	0.8%	0.7%	0.4%	0.0%	0.0%

Overall DO Standard Attainment

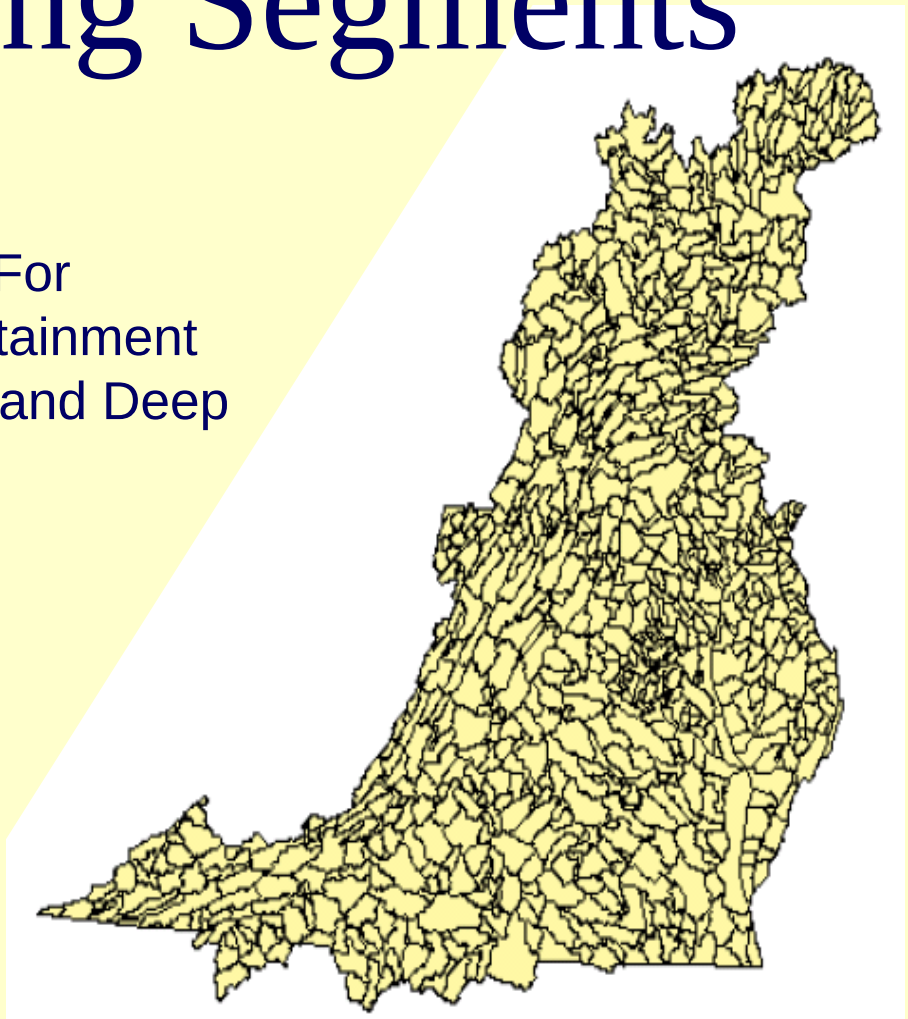



NPS Allocation Lines for 180/12 and 171/12.9
E3
No BMPs
100%
80%
60%
40%
20%
0%
0
1
2
3
4
5
6
7
8
9
10
Relative Effectiveness
180
171
12
12.9

Analysis of Persistently Non-Attaining Segments

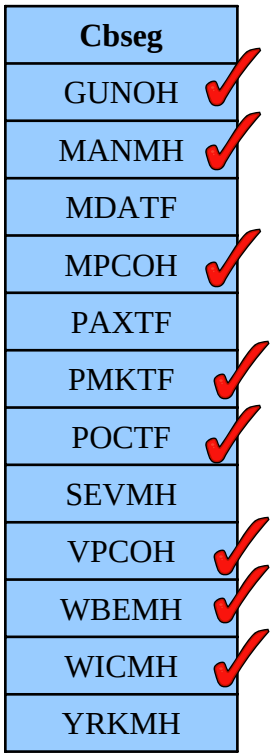
Additional Lines of Evidence For Anticipated Response and Attainment for Open Water, Deep Water and Deep Channel Segments

Jeni Keisman



Open Water “Problem” Segments

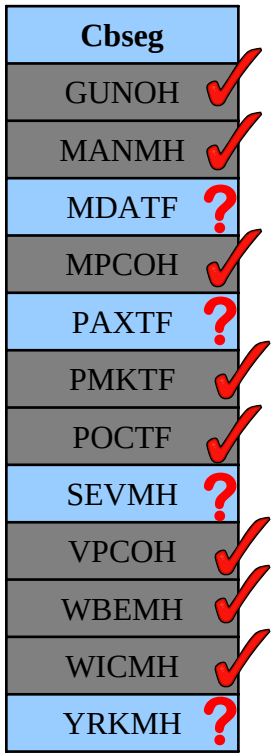
Additional Lines of Evidence For Anticipated Response and Attainment



- **GUNOH:** generally healthy DO conditions; 1 unusually low observation; poor local response to load reductions in estuarine model scenario (thus “poor regression response”); nearby regions attain with moderate load reductions
- **MANMH:** few observed DO violations; poor simulation and poor regression response; most nearby segments attain by 179 Load scenario or sooner
- **MPCOH/TF, VPCOH/TF**: represented by same monitoring station and model cell. Single month (June 1993) prevents attainment at 179TN; month shows marginal hypoxia (4.3 mg/L) and poor regression response
- **PMKTF**: single month (July 1995) prevents nonattainment at 179 TN; month shows marginal hypoxia (~ 3.6 mg/L) and poor regression response
- **WBEMH**: marginal-to-moderate hypoxia observed; outside range of estuarine model simulations; inconsistent regression response; nearby segments attain at 179 TN or sooner.
- **WICMH**: single month (June 1994) prevents attainment at 179 TN; month shows marginal hypoxia (~4.4 mg/L) and poor regression response

Open Water "Problem" Segments

Further Diagnostics and/or Actions May Be Needed



- **MDATF:** Moderate to severe hypoxia observed in critical period; not captured by estuarine model simulations. DCATF does attain (0.1% nonattainment) at 179TN. **More information is needed about the trajectory of response to load reductions in this local system.** Geographic influence is limited to Potomac River basin.

- **PAXTF**: Nonattainment < 1%; geographic influence is limited to Patuxent River basin

- **SEVMH**: Substantial violations in observed data; substantial reduction in violations with load reductions; very low bottom DO values outside range of estuarine model simulations; upper pycnocline observed in 6 out of 7 months with persistent violations. UPDATE: when Deep Water designated use is added, SEVMH attains both Open Water & Deep Water at 179 TN for the 1993-1995 time period.

- **YRKMH**: Nonattainment < 1%; geographic influence is dominated by York River basin

Deep Water & Deep Channel "Problem" Segments

Deep Water

Cbseg
CB3MH
CHSMH
EASMH
MAGMH
MD5MH
VA5MH

Deep Channel

Cbseg
CHSMH
EASMH

- CB3MH: nonattainment < 1%
- **CHSMH: Persistent violations are not a result of episodic pycnoclines. Some evidence of poor and/or inconsistent regression response; additional analyses underway.** Geographic influence is dominated by MD eastern shore, followed by Susquehanna and MD western shore
- EASMH: nonattainment < 1% for both Deep Water and Deep Channel
- **MAGMH:** Very low bottom DO values observed; not captured by estuarine model simulations. Moderate to substantial reduction in bottom DO with load reduction scenarios. **Lack of fit in estuarine model simulations reduces confidence in the regression response. More information needed about the trajectory of response to load reductions in this local system.** Geographical influence is dominated by MD western shore, followed by Susquehanna and MD upper eastern shore.
- MD5MH: nonattainment < 1%
- VA5MH: nonattainment < 1%

Chlorophyll *a* Attainment At 179 TN/12 TP

Cbseg	'91-'93 CL Spring Seasonal	'92-'94 CL Spring Seasonal	'93-'95 CL Spring Seasonal	'94-'96 CL Spring Seasonal	'95-'97 CL Spring Seasonal	'96-'98 CL Spring Seasonal	'97-'99 CL Spring Seasonal	'98-'00 CL Spring Seasonal
DCATF	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DCPTF	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
JMSTFL	0.0%	0.0%	1.6%	1.6%	1.6%	0.0%	0.0%	0.0%
JMSTFU	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
JMSOH	0.0%	0.0%	0.0%	2.9%	2.9%	2.9%	0.0%	3.5%
JMSMH	2.1%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
JMSPH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Cbseg	'91-'93 CL Summer Seasonal	'92-'94 CL Summer Seasonal	'93-'95 CL Summer Seasonal	'94-'96 CL Summer Seasonal	'95-'97 CL Summer Seasonal	'96-'98 CL Summer Seasonal	'97-'99 CL Summer Seasonal	'98-'00 CL Summer Seasonal
DCATF	NoData	NoData	NoData	NoData	NoData	NoData	0.0%	0.0%
DCPTF	28.2%	51.4%	44.5%	20.1%	21.8%	21.8%	21.8%	0.0%
JMSTFL	0.0%	0.0%	0.0%	0.0%	4.7%	14.3%	14.3%	7.1%
JMSTFU	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
JMSOH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
JMSMH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	13.5%	13.2%
JMSPH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.2%	10.2%

Chlorophyll *a* Attainment At Existing E3 (141TN,8.5TP)

Cbseg	'91-'93 CL Spring Seasonal	'92-'94 CL Spring Seasonal	'93-'95 CL Spring Seasonal	'94-'96 CL Spring Seasonal	'95-'97 CL Spring Seasonal	'96-'98 CL Spring Seasonal	'97-'99 CL Spring Seasonal	'98-'00 CL Spring Seasonal
DCATF	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DCPTF	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
JMSTFL	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
JMSTFU	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
JMSOH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
JMSMH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
JMSPH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Cbseg	'91-'93 CL Summer Seasonal	'92-'94 CL Summer Seasonal	'93-'95 CL Summer Seasonal	'94-'96 CL Summer Seasonal	'95-'97 CL Summer Seasonal	'96-'98 CL Summer Seasonal	'97-'99 CL Summer Seasonal	'98-'00 CL Summer Seasonal
DCATF	NoData	NoData	NoData	NoData	NoData	NoData	0.0%	0.0%
DCPTF	0.0%	2.3%	2.3%	2.3%	21.8%	21.8%	21.8%	0.0%
JMSTFL	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
JMSTFU	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
JMSOH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
JMSMH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
JMSPH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%