# Moving Toward Final 2010 Nutrient and Sediment Targets

Water Quality Goal Implementation Team Conference Call

May 24, 2010

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# Key points

- We need to achieve all water quality standards.
- At the PSC and in our May 10 meeting, we found continued nonattainment in key Deep Channel and Deep Water segments, such as CB4, which respond to global reductions in nutrient loads.
- Three new scenarios, with nutrient and sediment loads less than the Tributary Strategy Scenario, have been added to our library of model results.
- We'll assume the "1% Rule" in this analysis.

# Key points *(continued)*

- We are reaching the limits of what our analysis can achieve and are at the point of decision for the global load nutrient target.
- We need a global load target in order to finish our work on the remaining areas of Open Water and chlorophyll nonattainment designated uses that respond to local reductions beyond the global target.
- Achievement of three Open Water (POCTF, POCOH, SEVMH), and one chlorophyll (DCPTF) designated uses will require local reductions beyond E3.

# Key points *(continued)*

- In the problem segments we continue to test:
  - loads and model connections
  - model performance in the problem segments
  - assessment methodology and assessment code

- We've also found limitations in the simulation/analysis system of Open Water DO in some small embayments such as in GUNOH, MANMH, WICMH. These segments have been removed from this and subsequent analyses of Open Water nonattainment.

# WQSTM Scenarios We'll Examine Today:

- 1985 Scenario 342TN, 24.1TP, 9790TSS
- '91 -'00 Base Scenario 309TN, 19.5TP, 8950TSS
- 2007 Scenario - 254TN, 17.1TP, 6500TSS (completed, to be replaced with 2009 Scenario)
- Target Load Option A - 200TN, 15TP (completed, to be replaced with scenario of corrected sediment loads in Susquehanna)
- Tributary Strategy 191TN, 14.4TP, 6460TSS
- 190 Loading Scenario - 190TN, 12.7TP, 6030TSS
- 179 Loading Scenario 179TN, 12.0TP, 5510TSS
- 170 Loading Scenario 170TN, 11.3TP, 5650TSS
- E3 2010 Scenario 141TN, 8.5TP, 5060TSS
- All Forest Scenario 58TN, 4.4TP, 3240TSS

# WQSTM Scenarios Removed/Replaced:

- Target Load Option B -195 TN, 14.3 TP (removed, error in Susquehanna sediment loads)
- Loading Scenario - 190 TN, 13.4 TP (removed, error in Susquehanna sediment loads)
- Loading Scenario - 186 TN, 10.9 TP (removed, error in Susquehanna sediment loads)
- 2007 Scenario - 254 TN, 17.1 TP (pending-to be replaced with 2009 Scenario)
- Target Load Option A - 200 TN, 15 TP (pending-to be replaced with scenario of corrected sediment loads in Susquehanna)

# WQSTM Scenarios Pending:

- One scenario 1/3 the way between E3 and All Forest applied to local loads in 8 Open Water problem segments not achieving standards at E3. All other basin areas set at the chosen global target load.
- One scenario 2/3 the way between E3 and All Forest applied to local loads in 8 Open Water problem segments not achieving standards at E3. All other basin areas set at the chosen global target load.
- Corrected 2007 Scenario (replaced w/ 2009 Scenario) and Target Load Option A Scenario (200TN 15TP) for sediment load errors in the Susquehanna.
- Global Target Load with wetland DO demand removed.

# Loads of the Coupled Phase 5.3 and WQSTM Scenarios By Basin

## Total Nitrogen Loads by Basin (millions of pounds/year)

| Basins | 1985 Scenario 342TN, 24.1TP | Base Case Scenario 309TN, 19.5TP | 2007 Scenario 254TN, 17.1TP | Target Load Scenario A 200TN, 15.0TP | Target Load Scenario B 195TN, 14.3TP | Tributary Strategy 191TN, 14.4TP | Loading Scenario 186TN, 10.9TP | E3 Scenario 141TN, 8.5TP |
|---|---|---|---|---|---|---|---|---|
| Susquehanna | 146.4 | 135.9 | 115.0 | 85.9 | 83.3 | 81.9 | 76.5 | 65.3 |
| Western Shore | 27.0 | 17.8 | 14.4 | 9.8 | 9.7 | 9.9 | 13.0 | 5.6 |
| Patuxent | 4.2 | 3.9 | 3.1 | 2.9 | 2.9 | 2.8 | 2.5 | 1.9 |
| Potomac | 81.3 | 75.5 | 55.5 | 46.9 | 45.8 | 43.8 | 43.2 | 33.4 |
| Rappahannock | 8.9 | 8.4 | 7.5 | 6.2 | 5.9 | 5.6 | 5.3 | 4.5 |
| York | 7.6 | 7.4 | 6.9 | 5.6 | 5.5 | 5.1 | 5.3 | 3.8 |
| James | 42.6 | 36.8 | 31.4 | 27.1 | 26.9 | 27.5 | 26.6 | 16.1 |
| Eastern Shore | 23.9 | 23.9 | 20.4 | 15.5 | 14.6 | 14.3 | 14.0 | 10.6 |
| Total | 341.8 | 309.4 | 254.2 | 200.0 | 194.6 | 190.9 | 186.4 | 141.2 |

# Loads of the Coupled Phase 5.3 and WQSTM Scenarios By Basin

## Total Phosphorus Loads by Basin (millions of pounds/year)

| Basins | 1985 Scenario 342TN, 24.1TP | Base Case Scenario 309TN, 19.5TP | 2007 Scenario 254TN, 17.1TP | Target Load Scenario A 200TN, 15.0TP | Target Load Scenario B 195TN, 14.3TP | Tributary Strategy 191TN, 14.4TP | Loading Scenario 186TN, 10.9TP | E3 Scenario 141TN, 8.5TP |
|---|---|---|---|---|---|---|---|---|
| Susquehanna | 5.64 | 4.84 | 4.20 | 3.36 | 3.32 | 3.36 | 2.26 | 2.22 |
| Western Shore | 1.62 | 0.87 | 0.80 | 0.54 | 0.55 | 0.68 | 0.47 | 0.23 |
| Patuxent | 0.48 | 0.36 | 0.33 | 0.25 | 0.25 | 0.29 | 0.24 | 0.12 |
| Potomac | 5.21 | 4.90 | 4.49 | 4.10 | 4.01 | 3.76 | 2.83 | 2.33 |
| Rappahannock | 1.30 | 1.24 | 1.17 | 1.13 | 0.92 | 0.94 | 0.77 | 0.61 |
| York | 1.03 | 0.76 | 0.70 | 0.64 | 0.58 | 0.59 | 0.48 | 0.34 |
| James | 6.51 | 4.34 | 3.56 | 3.05 | 2.92 | 3.29 | 2.49 | 1.50 |
| Eastern Shore | 2.36 | 2.23 | 1.85 | 1.92 | 1.78 | 1.45 | 1.43 | 1.14 |
| Total | 24.14 | 19.54 | 17.11 | 15.00 | 14.32 | 14.36 | 10.98 | 8.49 |

# Loads of the Coupled Phase 5.3 and WQSTM Scenarios By Basin

## Sediment (TSS) Loads by Basin (millions of pounds/year)

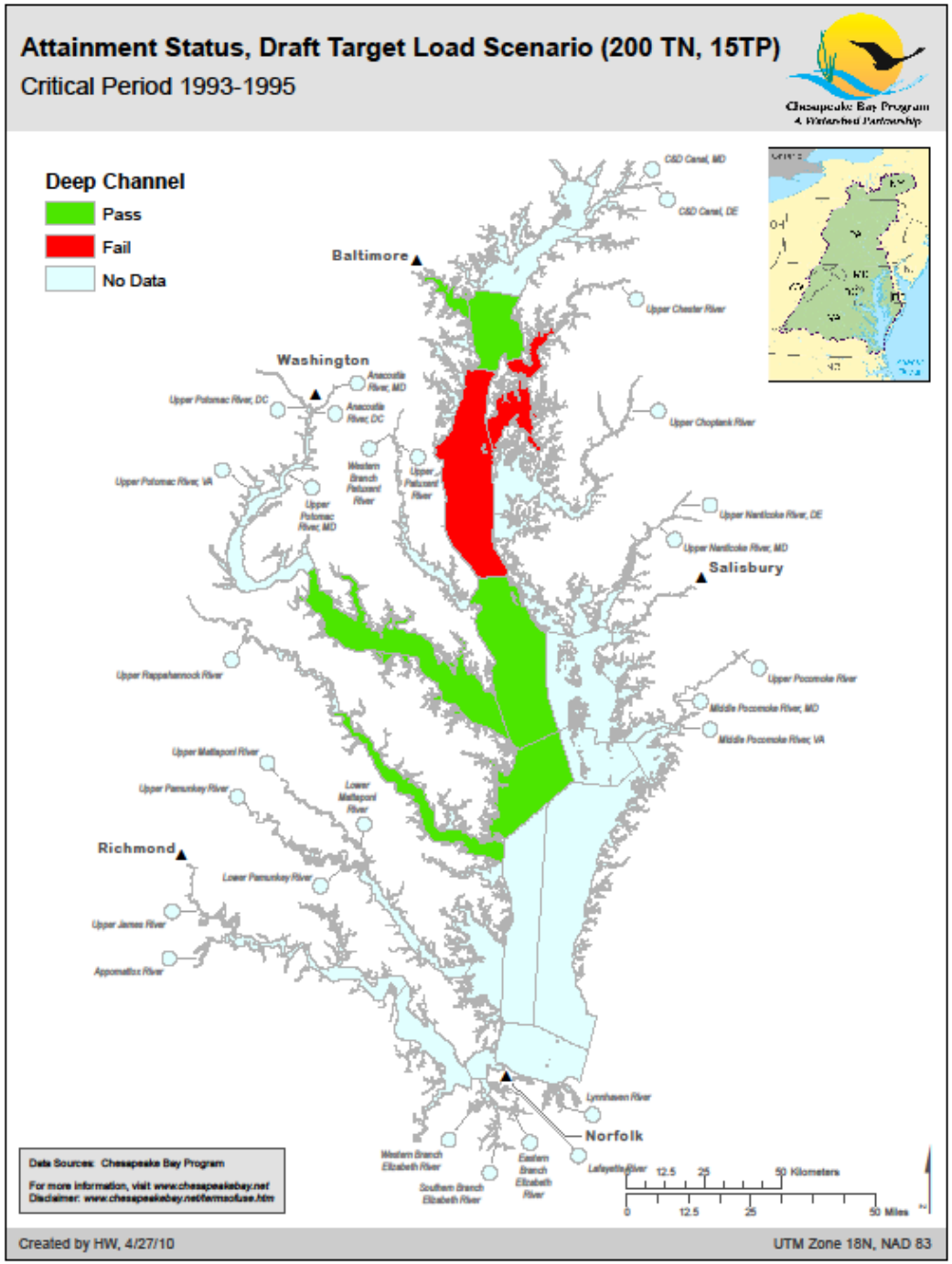
| Basins | 1985 Scenario 342TN, 24.1TP | Base Case Scenario 309TN, 19.5TP | 2007 Scenario 254TN, 17.1TP | Target Load Scenario A 200TN, 15.0TP | Target Load Scenario B 195TN, 14.3TP | Tributary Strategy 191TN, 14.4TP | Loading Scenario 186TN, 10.9TP | E3 Scenario 141TN, 8.5TP |
|---|---|---|---|---|---|---|---|---|
| Susquehanna | 3,187 | 2,820 | 1,183 | 1,459 | 1,462 | 2,130 | 706 | 1,829 |
| Western Shore | 314 | 268 | 253 | 182 | 185 | 206 | 163 | 99 |
| Patuxent | 190 | 171 | 131 | 104 | 105 | 104 | 101 | 60 |
| Potomac | 3,009 | 2,788 | 2,444 | 2,265 | 2,217 | 1,956 | 2,132 | 1,464 |
| Rappahannock | 888 | 841 | 761 | 752 | 700 | 688 | 1,064 | 629 |
| York | 213 | 180 | 167 | 153 | 137 | 114 | 115 | 82 |
| James | 1,587 | 1,502 | 1,297 | 1,155 | 1,108 | 1,022 | 1,002 | 713 |
| Eastern Shore | 399 | 378 | 316 | 330 | 295 | 242 | 228 | 182 |
| Total | 9,786 | 8,947 | 6,552 | 6,399 | 6,210 | 6,462 | 5,510 | 5,058 |

Problems with some of the initial scenarios have also been identified. The sediment loads in the Susquehanna basin for for the scenarios of 2007, Target Loads A & B, and other loading scenarios are in error due to a BMP unit problem.

# An Estimate of the Deep Channel DO Response

- At the ~180 TN, 12.0TP level Eastern Bay comes into attainment, leaving only one segment in non-attainment, Chester Mesohaline.
- Chester Mesohaline comes into attainment only at the All Forest level.

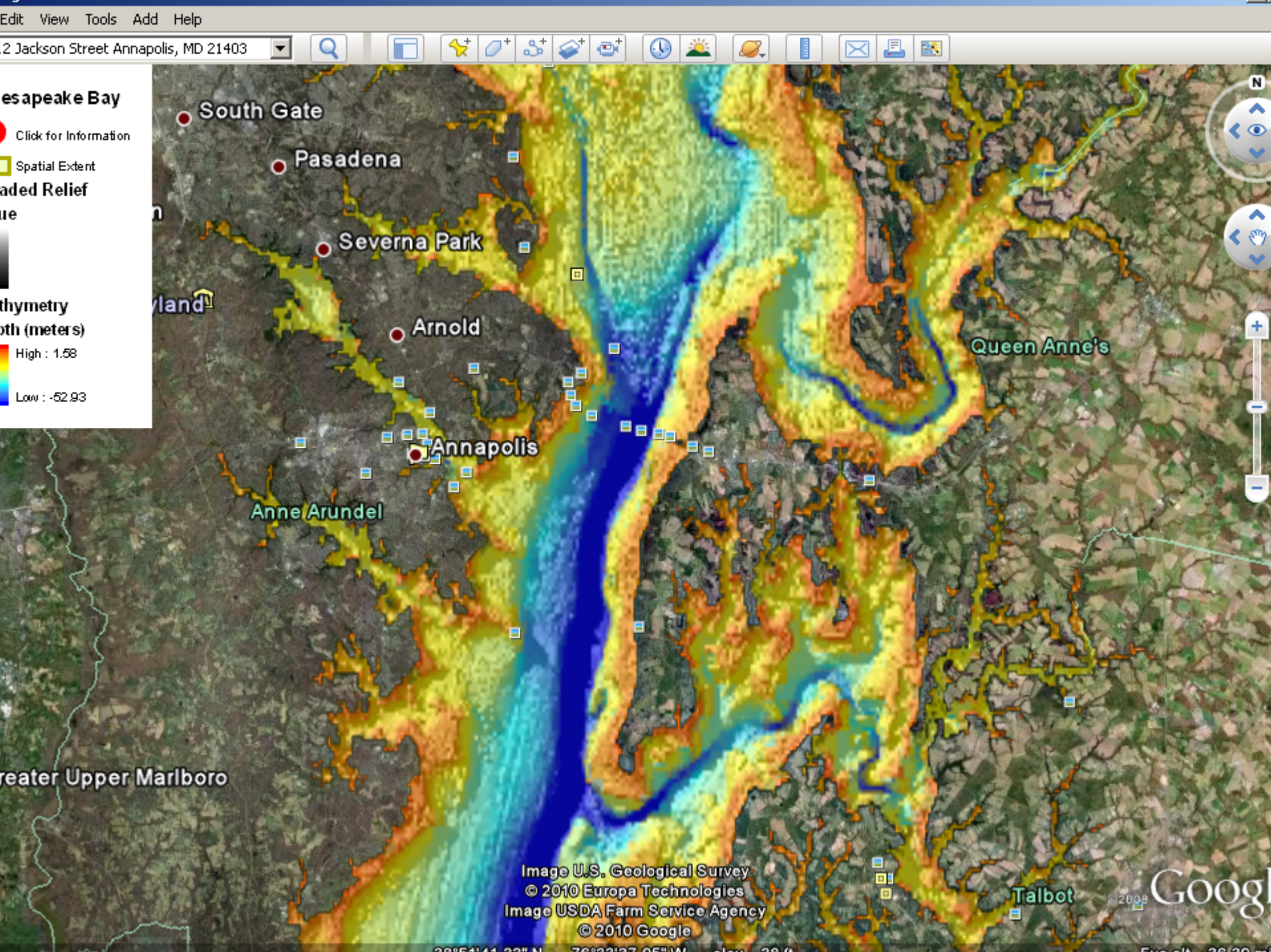
| Cbseg | State | 1985 Scenario 342TN, 24.1TP, 9790TSS '93-'95 DO Deep Channel | "91 -'00 Base Scenario 309TN, 19.5TP, 8950TSS '93-'95 DO Deep Channel | 2007 Scenario 254TN, 17.1TP, 6498TSS '93-'95 DO Deep Channel | Target Load Option A 200TN, 15TP, 6390TSS '93-'95 DO Deep Channel | Tributary Stategy 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| APPTF | VA | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BACOH | MD | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BIGMH | MD | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BOHOH | MD | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BSHOH | MD | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CB1TF | MD | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CB2OH | MD | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CB3MH | MD | 17.9% | 14.5% | 6.1% | 0.2% | 0.1% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% |
| CB4MH | MD | 51.5% | 46.2% | 20.9% | 4.4% | 2.6% | 1.8% | 0.2% | 0.0% | 0.0% | 0.0% |
| CB5MH | both | 27.9% | 22.3% | 2.6% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CB6PH | VA | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CB7PH | VA | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CB8PH | VA | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CHKOH | VA | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CHOMH1 | MD | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CHOMH2 | MD | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CHOOH | MD | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CHOTF | MD | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CHSMH | MD | 38.0% | 38.0% | 29.4% | 14.0% | 14.0% | 13.7% | 13.7% | 9.4% | 3.6% | 0.0% |
| CHSOH | MD | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CHSTF | MD | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CNDOH | MD | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CRRMH | VA | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| DCATF | DC | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| DCPTF | DC | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| DENTF | DE | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| EASMH | MD | 31.5% | 26.1% | 12.9% | 4.2% | 2.3% | 1.3% | 0.3% | 0.0% | 0.0% | 0.0% |
| EBEMH | VA | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| ELIPH | VA | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |




# 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>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# 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% |

# An Estimate of the Deep Water DO Response

- At the ~180 TN, 12.0TP level all segments come into attainment, except for two, the Chester and Magothy Mesohalines.
- At the 170TN 11.3TP level all Deep Water segments are estimated to have come into attainment.

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|
| APPTF | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BACOH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BIGMH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BOHOH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BSHOH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CB1TF | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CB2OH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CB3MH | 2.6% | 2.0% | 0.6% | 0.1% | 0.1% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% |
| CB4MH | 23.8% | 19.7% | 9.9% | 6.0% | 5.2% | 4.8% | 4.1% | 3.2% | 2.0% | 0.0% |
| CB5MH | 9.8% | 6.9% | 1.5% | 0.5% | 0.3% | 0.3% | 0.1% | 0.0% | 0.0% | 0.0% |
| CB6PH | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CB7PH | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CB8PH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CHKOH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CHOMH1 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CHOMH2 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CHOOH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CHOTF | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CHSMH | 35.5% | 24.7% | 15.6% | 2.7% | 1.8% | 1.8% | 1.6% | 0.5% | 0.4% | 0.0% |
| CHSOH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CHSTF | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CNDOH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CRRMH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| DCATF | N/A | N/A | 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 | N/A | N/A |
| DENTF | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| EASMH | 25.4% | 5.7% | 1.4% | 0.8% | 0.7% | 0.7% | 0.2% | 0.2% | 0.0% | 0.0% |
| EBEMH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| ELIPH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

# 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% |

# An Estimate of the Open Water DO Response

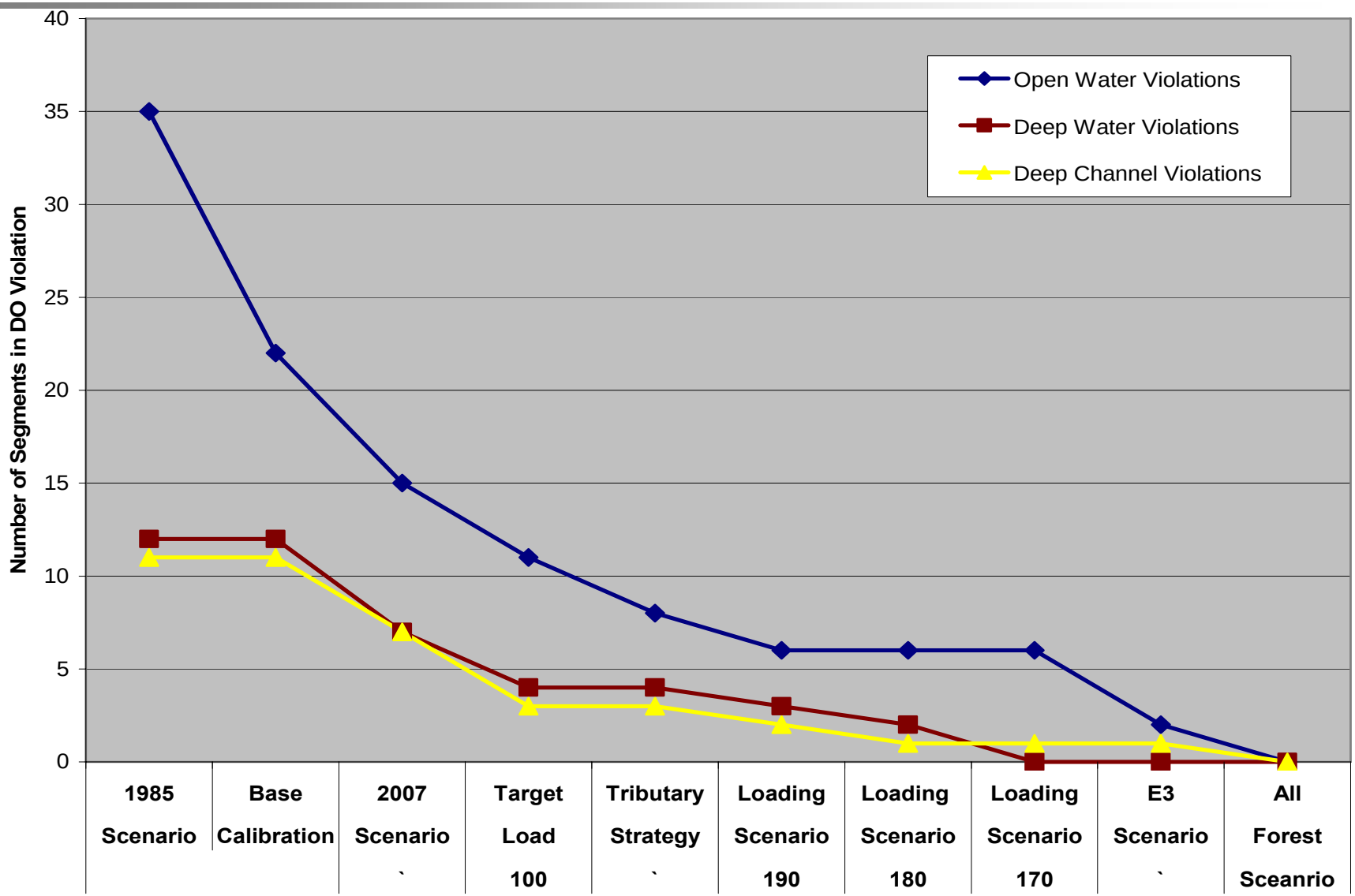
- After taking out segments with known simulation issues, there are 11 segments of Open Water DO nonattainment (>1%) in the Target Load Option A Scenario.
- This decreases to 8 non-attaining Open Water segments in the Tributary Strategy and 6 at ~180TN.
- At E3 there are 3 segments of Open Water DO that are in nonattainment.

| Cbseg | 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 | 0.0% | 0.0% | 4.7% | 4.6% | 4.6% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| BACOH | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| BIGMH | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| BOHOH | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| BSHOH | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CB1TF | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CB2OH | 0.5% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CB3MH | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CB4MH | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CB5MH | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CB6PH | 4.5% | 2.9% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CB7PH | 8.8% | 7.0% | 2.2% | 0.5% | 0.3% | 0.2% | 0.1% | 0.1% | 0.0% | 0.0% |
| CB8PH | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CHKOH | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CHOMH1 | 3.1% | 1.8% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CHOMH2 | 15.6% | 4.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CHOOH | 16.7% | 1.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CHOTF | 18.8% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CHSMH | 0.8% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CHSOH | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CHSTF | 0.0% | 0.0% | 0.0% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CNDOH | 7.7% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CRRMH | 39.9% | 24.5% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| DCATF | 37.6% | 27.5% | 22.2% | 13.7% | 1.2% | 1.5% | 0.1% | 0.0% | 0.0% | 0.0% |
| DCPTF | 10.1% | 0.6% | 0.2% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| DENTF | 0.2% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| EASMH | 2.7% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| EBEMH | 22.7% | 22.7% | 21.5% | 4.7% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| ELIPH | 3.6% | 4.3% | 0.1% | 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



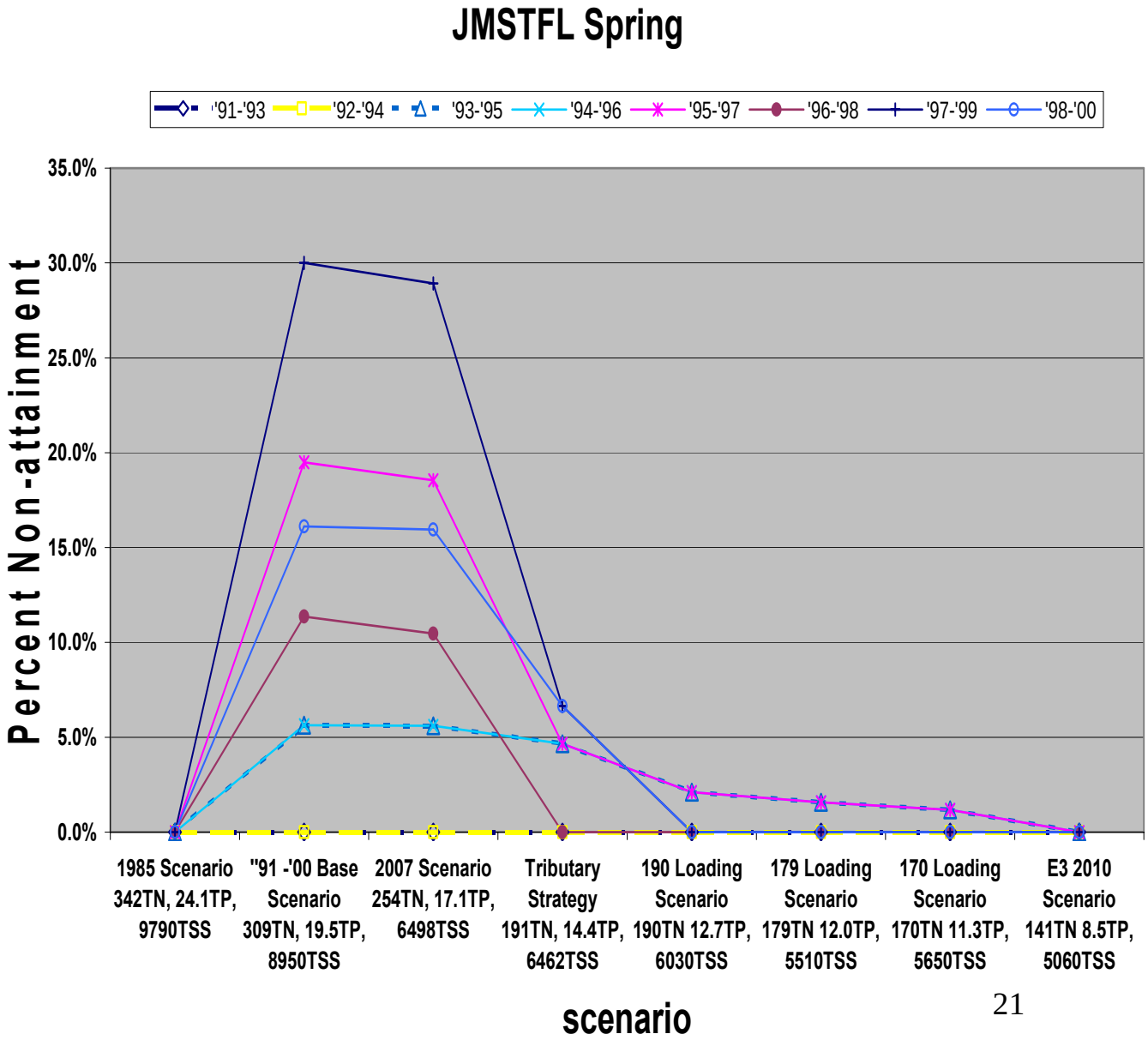
# Chlorophyll Assessment

| Cbseg | Scenario→ Year → State | 1985 Scenario 342TN, 24.1TP, 9790TSS '93-'95 CL Spring Seasonal | "91 -'00 Base Scenario 309TN, 19.5TP, 8950TSS '93-'95 CL Spring Seasonal | 2007 Scenario 254TN, 17.1TP, 6498TSS '93-'95 CL Spring Seasonal | Tributary Strategy 191TN, 14.4TP, 6462TSS '93-'95 CL Spring Seasonal | 190 Loading Scenario 190TN 12.7TP, 6030TSS '93-'95 CL Spring Seasonal | 179 Loading Scenario 179TN 12.0TP, 5510TSS '93-'95 CL Spring Seasonal | 170 Loading Scenario 170TN 11.3TP, 5650TSS '93-'95 CL Spring Seasonal | E3 2010 Scenario 141TN 8.5TP, 5060TSS '93-'95 CL Spring Seasonal | All Forest Scenario 58TN 4.4TP, 3240TSS '93-'95 CL Spring Seasonal |
|---|---|---|---|---|---|---|---|---|---|---|
| DCATF | DC | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| DCPTF | DC | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| JMSTFL | VA | 0.0% | 5.6% | 5.6% | 4.7% | 2.1% | 1.6% | 1.2% | 0.0% | 0.0% |
| JMSTFU | VA | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| JMSOH | VA | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| JMSMH | VA | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| JMSPH | VA | 4.6% | 5.4% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |

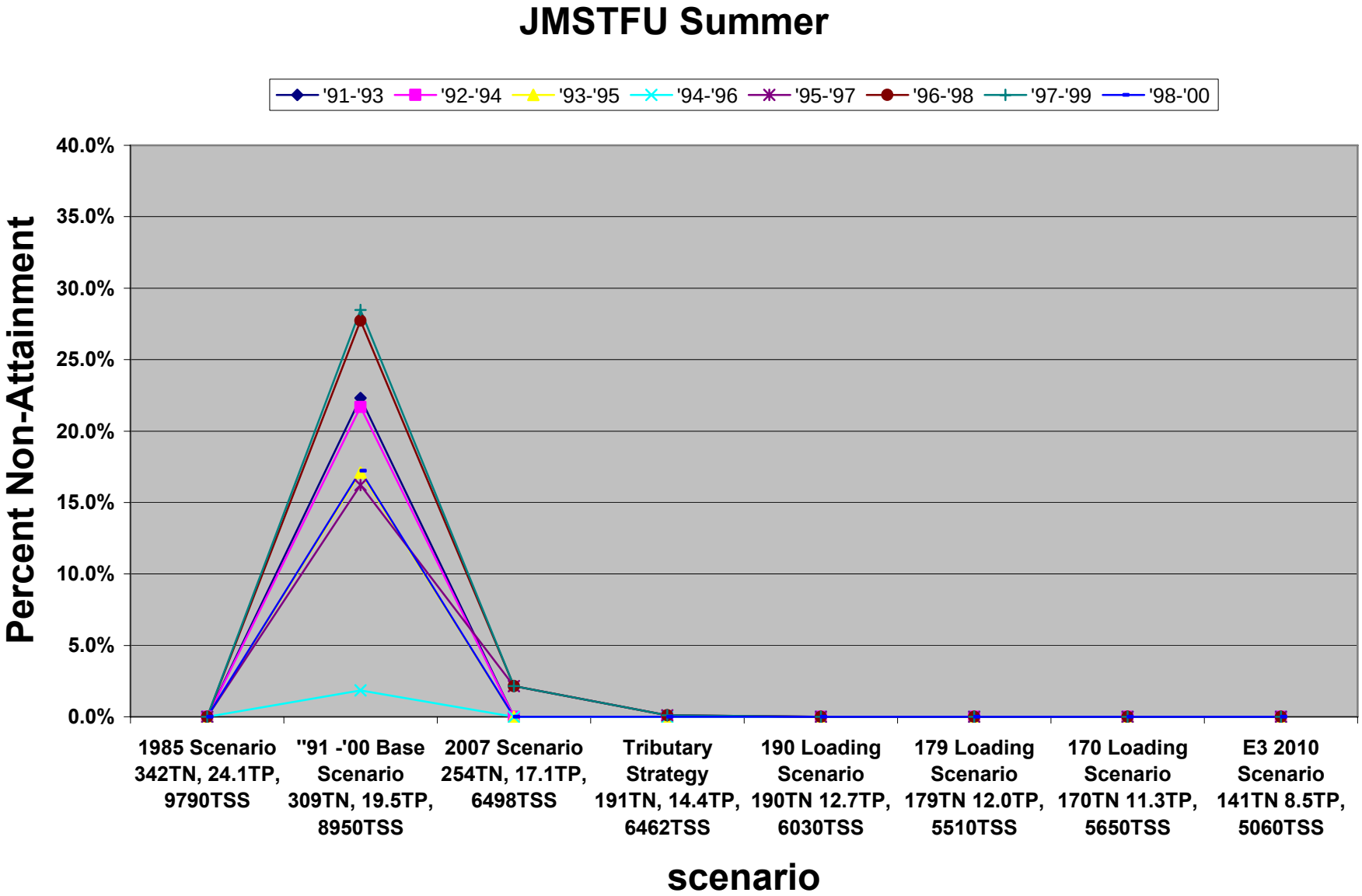
| Cbseg | Scenario→ Year → State | 1985 Scenario 342TN, 24.1TP, 9790TSS '93-'95 CL Summer Seasonal | "91 -'00 Base Scenario 309TN, 19.5TP, 8950TSS '93-'95 CL Summer Seasonal | 2007 Scenario 254TN, 17.1TP, 6498TSS '93-'95 CL Summer Seasonal | Tributary Strategy 191TN, 14.4TP, 6462TSS '93-'95 CL Summer Seasonal | 190 Loading Scenario 190TN 12.7TP, 6030TSS '93-'95 CL Summer Seasonal | 179 Loading Scenario 179TN 12.0TP, 5510TSS '93-'95 CL Summer Seasonal | 170 Loading Scenario 170TN 11.3TP, 5650TSS '93-'95 CL Summer Seasonal | E3 2010 Scenario 141TN 8.5TP, 5060TSS '93-'95 CL Summer Seasonal | All Forest Scenario 58TN 4.4TP, 3240TSS '93-'95 CL Summer Seasonal |
|---|---|---|---|---|---|---|---|---|---|---|
| DCATF | DC | NoData | NoData | NoData | NoData | NoData | NoData | NoData | NoData | NoData |
| DCPTF | DC | 0.0% | 33.6% | 26.5% | 46.1% | 21.8% | 44.5% | 37.4% | 2.3% | 0.0% |
| JMSTFL | VA | 0.0% | 20.2% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| JMSTFU | VA | 0.0% | 17.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| JMSOH | VA | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| JMSMH | VA | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| JMSPH | VA | 0.0% | 3.7% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |

# Chlorophyll Assessment

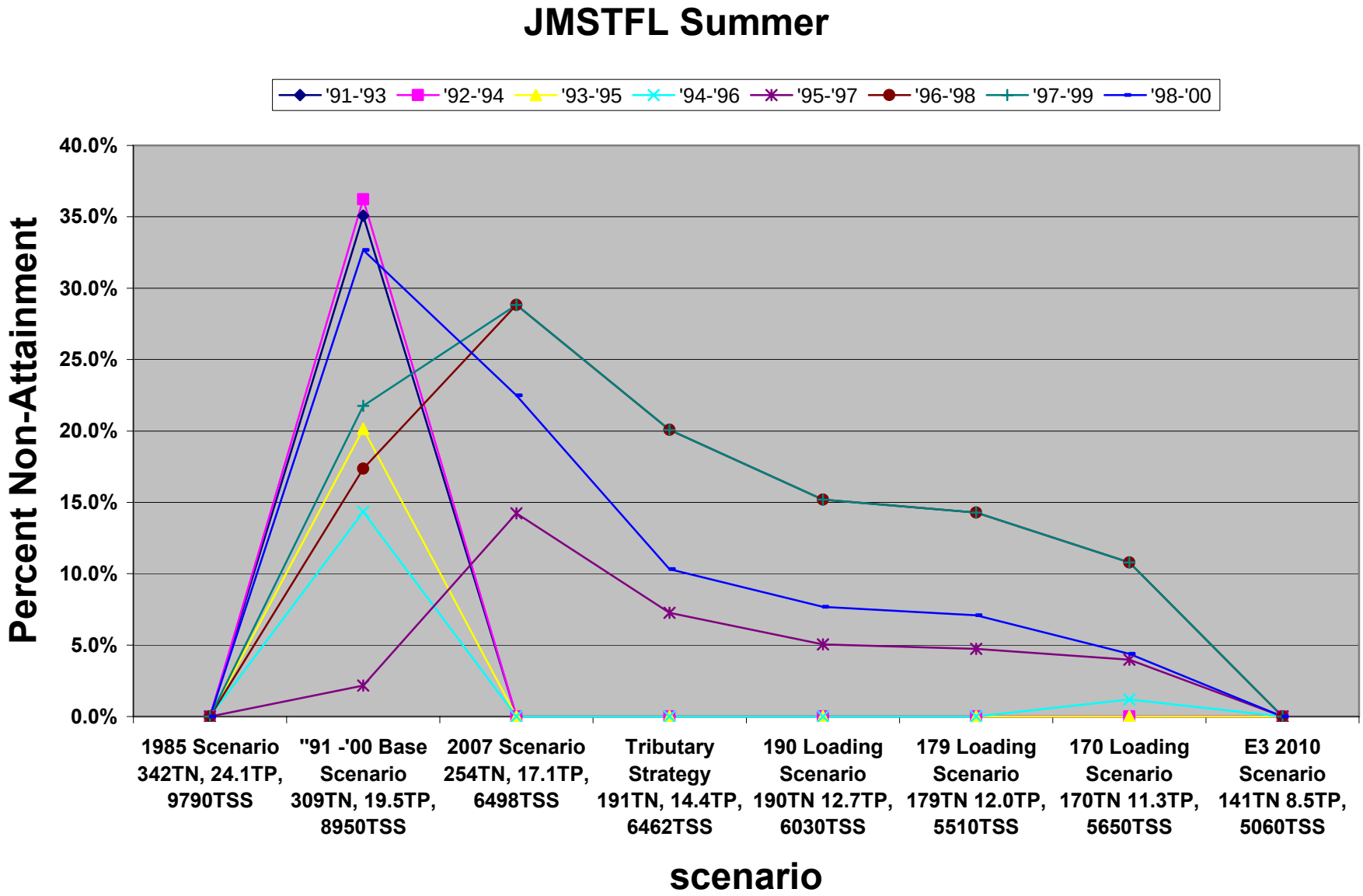
In all 3-year assessment periods E3 nutrient loads in the tidal fresh region of the James are estimated to achieve the chlorophyll standard throughout the tidal fresh region in spring and summer seasons.



# Chlorophyll Assessment



# Chlorophyll Assessment



# Key Points *Redux*:

- We need to achieve all water quality standards.
- An estimated global load level of around 180 to 170 million pounds TN and an associated TP level of 12.0 to 11.3 million pounds respectively achieves Deep Channel DO standards with only one exception (CHSMH).
- An estimated global load level of around 180 to 170 million pounds TN and an associated TP level of 12.0 to 11.3 million pounds respectively achieves Deep Water DO standards with only two exceptions (CHSMH and MAGMH) at the 180TN nutrient load level and no Deep Water violations at the 170TN nutrient level).
- We need to decide the level of the global nutrient load targets to move to local reductions toward and beyond E3 for the Open Water problem segments.