Requesting Final Partnership Decisions on 2025 Climate Change Impacts

Principals Staff Committee
December 17, 2020
James Martin and Ed Dunne, WQGIT Co-Chairs

WQGIT; Gary Shenk, USGS; Lewis Linker, EPA; Richard Tian, UMCES; Gopal Bhatt, Penn State; Isabella Bertani, UMCES; Carl Cerco, Attain; and CBP Modeling Workgroup

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Reminder of Previous Discussion

Climate Change Processes and Dependencies

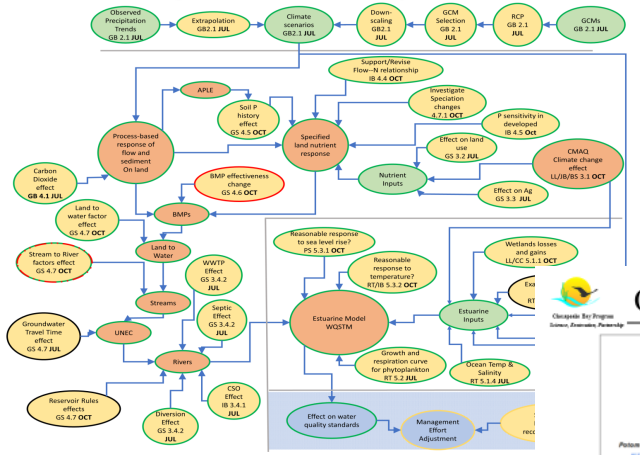
Model
Data Set
Endpoint
Project/Decision

Complete
In Process
Not included But important
Not included minor

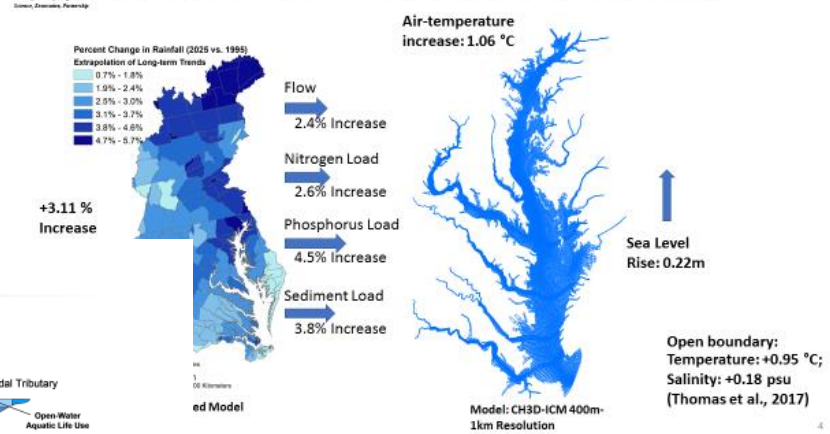
Initials indicate the responsible person
Numbers indicate the section of the documentation

Climate

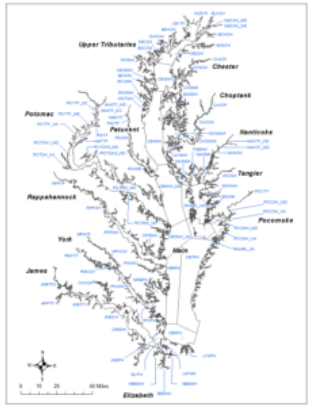
Watershed

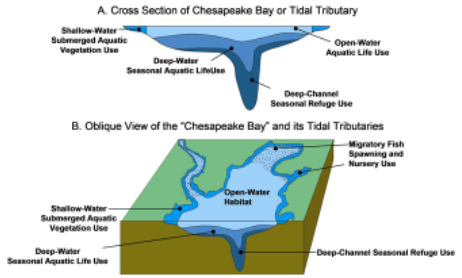


Elements of 2025 Climate Change (1995-2025)



Overview of Bay Designated Uses

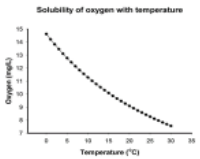




Tidal Fresh Open Water DO Water Quality Standard Violation Rates

Nonattainment of **Tidal Fresh Open Water DO** water quality standard (5.5mg/l 30-day mean)

Estimating substantial increases in Open Water DO non-attainment under increased (1°C) 2025 temperature in shallow waters.



		1995 Climate	2025 Climate	2035 Climate		
PAXTF	MD	2.81%	11.93%	11.95%		
WBRTF	MD	0.00%	32.27%	32.27%		
PISTF	MD	4.63%	4.65%	4.65%	4.65%	4.65%
MATTF	MD	0.00%	0.00%	0.00%	0.00%	0.00%
RPPTF	VA	0.00%	0.00%	0.00%	0.00%	1.65%
MPNTF	VA	1.31%	27.03%	36.88%	41.21%	35.67%
PMKTF	VA	6.90%	71.26%	81.54%	74.44%	69.83%
JMSTFL	VA	0.00%	0.00%	0.38%	0.96%	1.02%
JMSTFU	VA	0.00%	0.00%	0.00%	0.00%	0.00%
APPTF	VA	4.59%	0.00%	0.00%	0.00%	4.59%
NORTF	MD	0.00%	0.00%	0.00%	0.00%	0.00%
CHSTF	MD	0.00%	0.00%	0.00%	0.00%	0.00%
CHOTF	MD	0.00%	0.00%	0.00%	0.00%	0.00%
NANTF_MD	MD	0.00%	0.73%	4.70%	0.73%	0.00%
POCTF	MD	0.00%	69.83%	77.48%	77.48%	77.48%

y and Tributary Open Water Violation Rates

Open Water DO water quality standard (5 - 5.5 mg/l 30-day mean)

not reach violation, even by 2055

e much more effected

Cbseg	Planning Target	2025	2035	2045	2055
CB1TF	0.00%	0.00%	0.00%	0.00%	0.00%
CB2OH	0.00%	0.00%	0.00%	0.00%	0.00%
CB3MH	0.00%	0.00%	0.00%	0.00%	0.00%
CB4MH	0.00%	0.00%	0.00%	0.00%	0.00%
CB5MH_MD	0.00%	0.00%	0.00%	0.00%	0.00%
CB5MH_VA	0.00%	0.00%	0.00%	0.00%	0.00%
CB6PH	0.03%	0.39%	0.71%	0.99%	1.29%
CB7PH	0.32%	1.41%	2.11%	3.02%	4.19%
CB8PH	0.00%	0.00%	0.00%	0.00%	0.00%

Cbseg	Planning Target	2025	2035	2045	2055
PAXMH	0.00%	0.00%	0.00%	0.00%	0.03%
POTMH_MD	0.00%	0.00%	0.00%	0.00%	0.00%
RPPMH	0.00%	0.00%	0.00%	0.00%	0.00%
YRKPH	0.00%	0.00%	0.00%	0.00%	0.00%
MOBPH	0.00%	0.00%	0.01%	0.11%	0.16%
JMSPH	0.00%	0.00%	0.00%	0.00%	0.00%
CHSMH	0.00%	0.00%	0.00%	0.00%	0.00%
EASMH	0.00%	0.00%	0.00%	0.00%	0.00%
CHOMH2	0.00%	0.00%	0.00%	0.00%	0.00%
TANMH_MD	0.00%	0.00%	0.00%	0.00%	0.00%
TANMH_VA	0.00%	0.00%	0.00%	0.00%	0.03%

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Key Points in Assessment of 2025 Climate Change

- The efforts since December 2017 to understand the science have produced an improved model with a better understanding of the underlying processes
  - Revised load estimates will be focused on the deep water and deep channel designated uses
  - Improved model provides ability to consider alternative allocation methods
  - Adjustments to the designated uses in CB6 and CB7 are being considered
  - More work is needed on the shallow water simulation and understanding climate effects on BMPs

- Resulting Climate Change load estimates for 2025 have **decreased by about half** from the December 2017/March 2018 estimates (about 5M lbs TN)

- However, the estimated load reduction to address climate risk for 2035 is about twice that of the estimated 2025 nitrogen load reduction (about 10M lbs TN).

- The WQGIT is finalizing its specific recommendations on how to address future climate impacts (e.g. 2035) to the Management Board for their consideration. Anticipate those moving forward to PSC at your next meeting (or two).

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2025 Climate Change Load Allocation

State	Original Estimate		2020 Update	
	TN	TP	TN	TP
DC	0.006	0.001	0.007	0.001
DE	0.397	0.006	0.039	0.003
MD	2.194	0.117	1.142	0.111
NY	0.400	0.015	0.399	0.044
PA	4.135	0.143	1.811	0.095
VA	1.722	0.187	1.589	0.337
WV	0.236	0.017	0.000	0.009
Total	**9.089**	**0.485**	**4.986**	**0.599**

Decision Requested: Approve 2020 update to the 2025 climate change load allocations

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Expectations for Additional Climate Change Reductions

Jurisdictions will be expected to account for additional nutrient and sediment pollutant loads due to 2025 climate change conditions in a Phase III WIP addendum and/or 2-year milestones beginning in 2022.

Decision Requested: Re-confirm expectations for additional 2025 climate change reductions (these expectations were initially approved by the PSC in 2018)

- 2022-2023 Milestones are due on January 15, 2022
  - Programmatic Milestones
  - Numeric Milestones for Key BMPs

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Document Current Understanding of 2035 Climate Effect

Include a narrative in the 2022-2023 Milestones that describe the current understanding of 2035 climate change conditions, to the effect that:

> "Preliminary estimates for the climate impact through 2035 indicate a doubling of the 2025 load effect. The effect of climate change on our ability to meet the Bay's water quality standards is a significant and increasing concern."

Specific language for the narrative and a more detailed one-pager are under development by the Climate Resiliency Workgroup and Communications Workgroup for WQGIT and Management Board approval.

Decision Requested: Approve expectations for documenting the current understanding of 2035 climate effect and development of Milestones narrative and one-pager

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Continue to Improve Understanding of the Science

Continue efforts to improve understanding of the science and refine estimates of pollutant load changes due t o 2035 climate change conditions.

a) Develop a better understanding of the BMP responses, including new or other emerging BMPs, to climate change conditions.

b) Compare the current 2025 climate change assumptions with measured climate conditions through 2024.

   i. To include: rainfall volume, intensity and distribution; air temperature, hydrology, water temperature, sea level rise, and changes in bay stratification and circulation.

c) Consider the efficacy of using projections from measured trends versus downscaled global climate model data for revised 2035 estimates.

d) Improve understanding and simulation of climate change impacts to open water designated use in shallow waters.

In 2025, the Partnership will consider results of updated methods, techniques, and studies and revisit existing estimated loads due to climate change to determine if any updates to those 2035 load estimates are needed.

Decision Requested: Approve commitment to continue to improve understanding of climate effects and reassess in 2025

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Back-up Slides

The slides that follow were previously presented to the WQGIT, Management Board or PSC. They are included here for reference or review if needed.

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Previous PSC 2025 Climate Change Decisions

1. Incorporate Climate Change in the Phase III WIPs

Include a narrative strategy in the Phase III WIPs that describe the jurisdictions current action plans and strategies to address climate change, as well as the jurisdiction-specific nutrient and sediment pollution loadings due to 2025 climate change conditions, while incorporating local priorities and actions to address climate change impacts.

2. Understand the Science

Address the uncertainty by documenting the current understanding of the science and identifying research gaps and needs:

a) Develop an estimate of pollutant load changes (N, P and Sediment) due to climate change conditions.
b) Develop a better understanding of the BMP responses, including new or other emerging BMPs, to climate change conditions.
c) In 2021, the Partnership will consider results of updated methods, techniques, and studies and revisit existing estimated loads due to climate change to determine if any updates to those load estimates are needed.
d) Jurisdictions will be expected to account for additional nutrient and sediment pollutant loads due to 2025 climate change conditions in a Phase III WIP addendum and/or 2-year milestones beginning in 2022.

3. Incorporate into Milestones

Starting with the 2022-2023 milestones, determine how climate change will impact the BMPs included in the WIPs and address these vulnerabilities in the two-year milestones.

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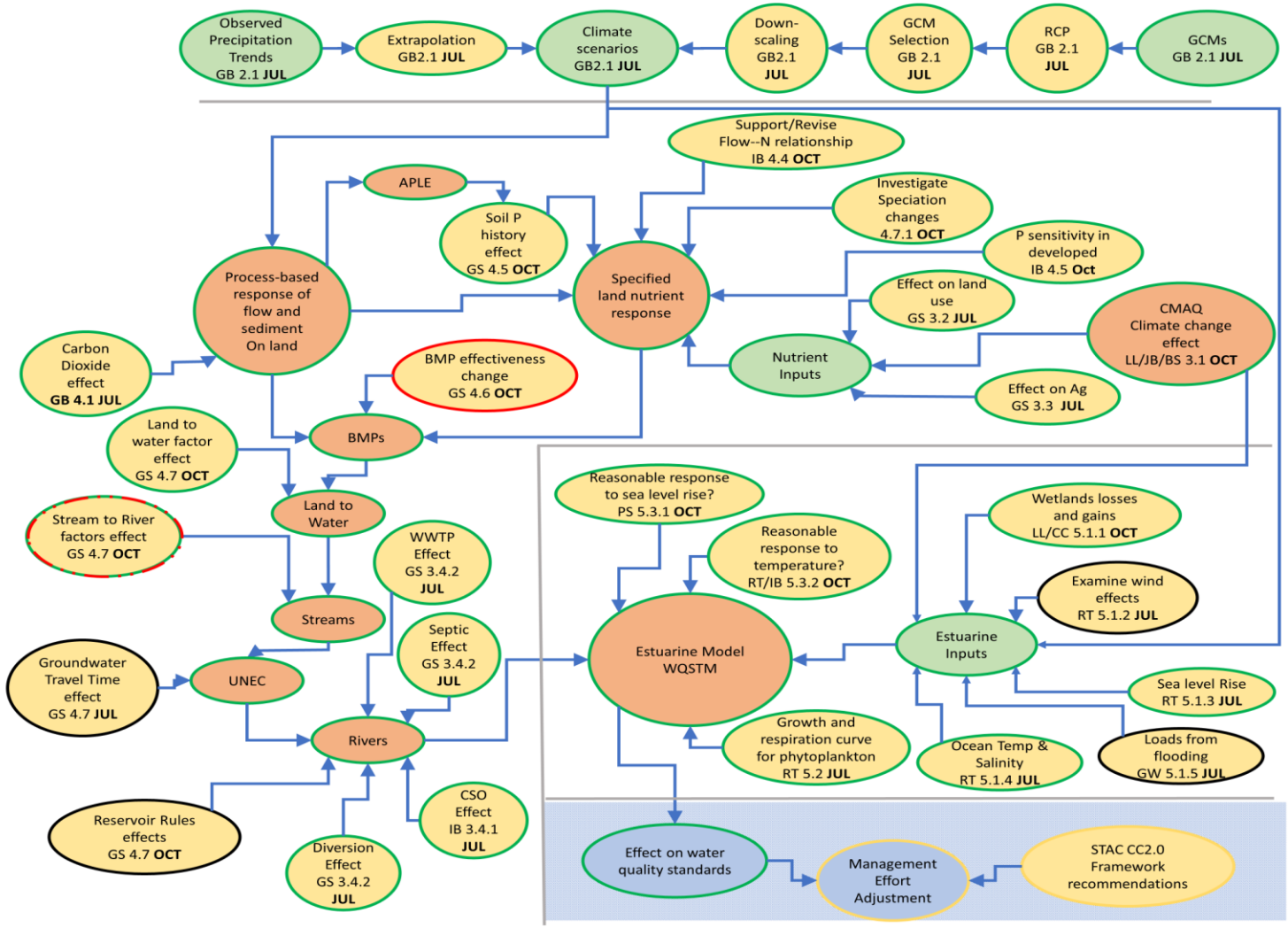
Elements of Chesapeake Water Quality Climate Risk Assessment

Model
Data Set
Endpoint
Project/Decision

Complete
In Process
Not included But important
Not included minor

Initials indicate the responsible person
Numbers indicate the section of the documentation

Climate Change Processes and Dependencies



Climate

Watershed

Estuary

Management

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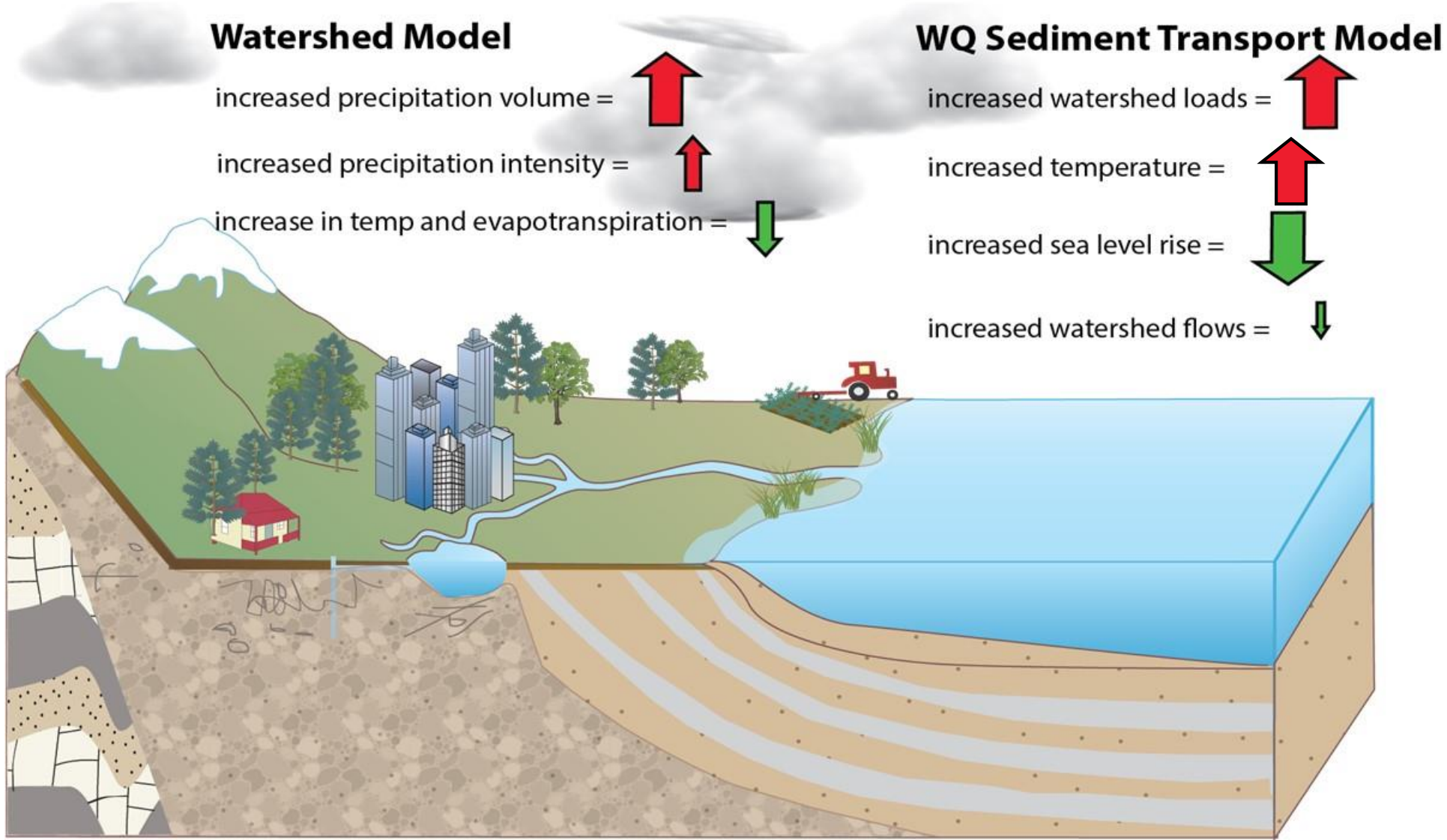
Components of Climate Change – Effect on Tidal Dissolved Oxygen



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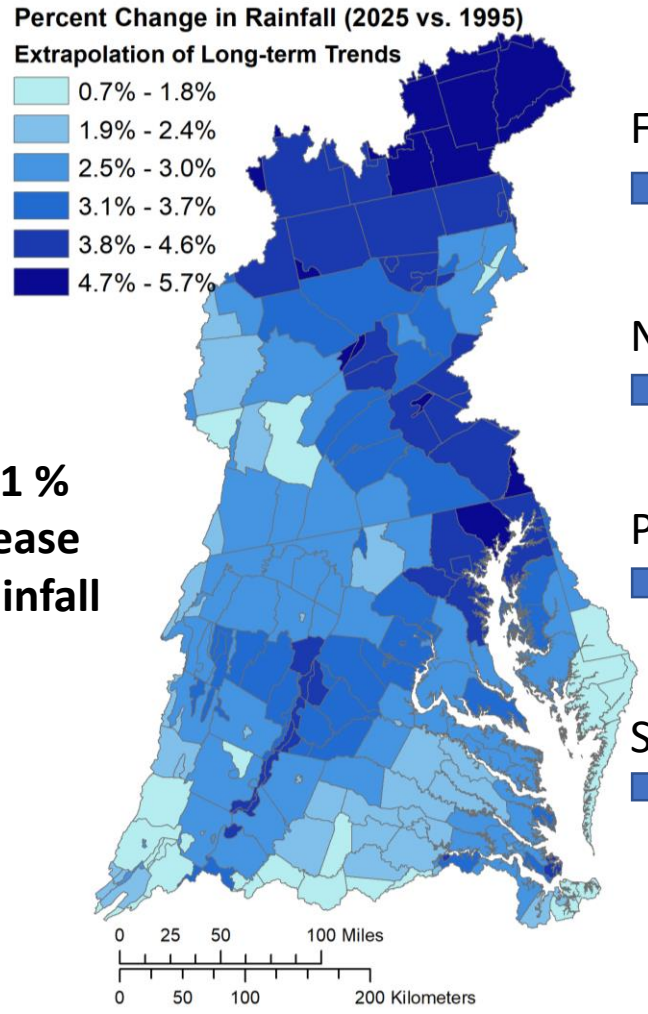
Elements of 2025 Climate Change (1995-2025)



+3.11 % Increase in rainfall

Phase 6 Watershed Model

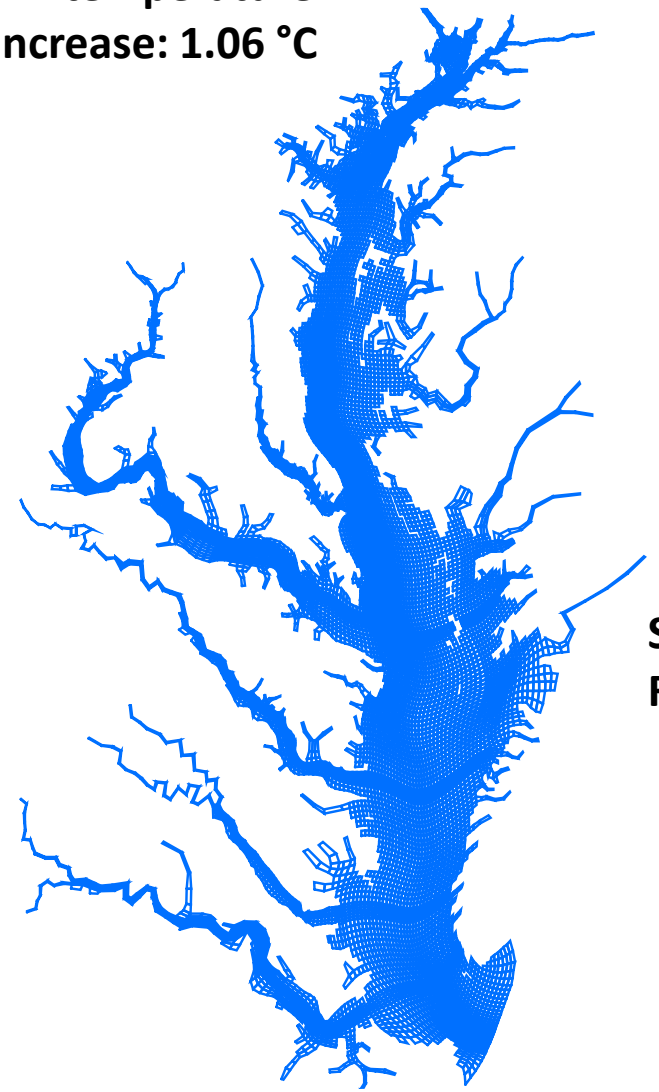
Flow → 2.4% Increase

Nitrogen Load → 2.6% Increase

Phosphorus Load → 4.5% Increase

Sediment Load → 3.8% Increase

Air-temperature increase: 1.06 °C



Sea Level Rise: 0.22m

Model: CH3D-ICM 400m-1km Resolution

Open boundary:
Temperature: +0.95 °C;
Salinity: +0.18 psu
(Thomas et al., 2017)

Elements of 2035 Climate Change (1995-2035)

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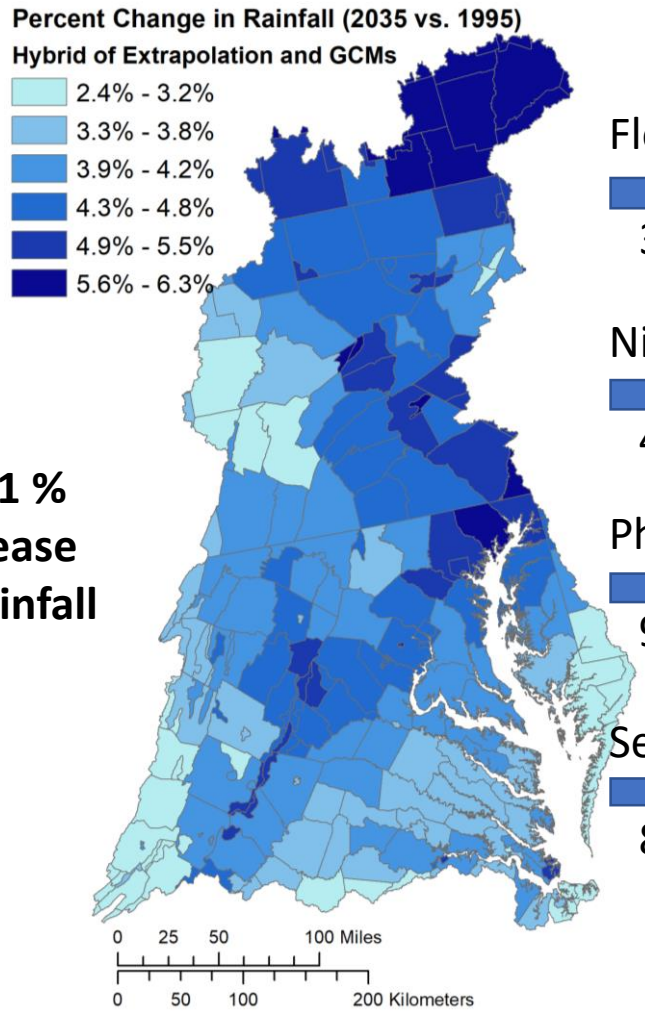


+4.21 % Increase in rainfall

Phase 6 Watershed Model

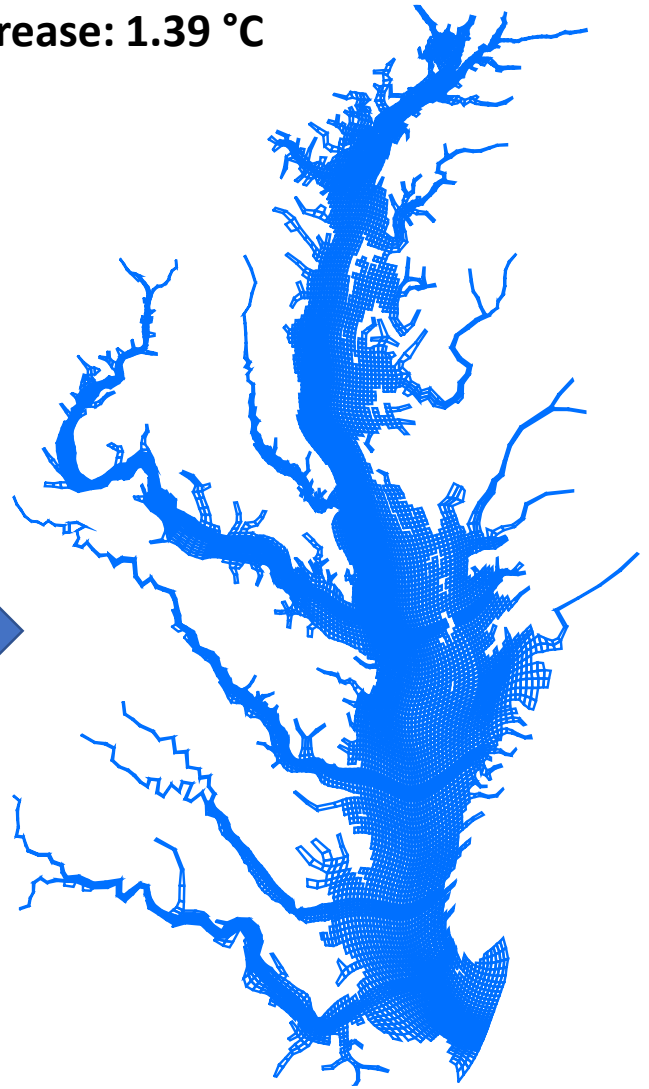
Flow → 3.7% Increase

Nitrogen Load → 4.7% Increase

Phosphorus Load → 9.9% Increase

Sediment Load → 8.5% Increase

Air-temperature increase: 1.39 °C



Model: CH3D-ICM 400m-1km Resolution

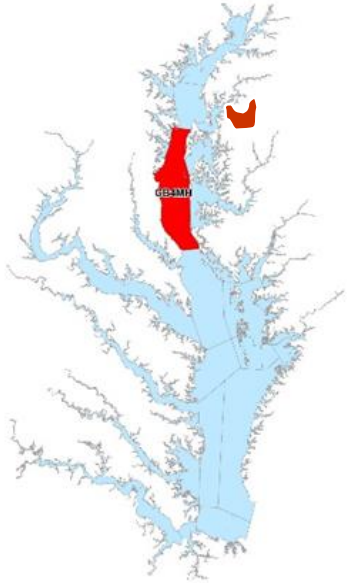
Sea Level Rise: 0.31m

Open boundary:
Temperature: +1.32 °C;
Salinity: +0.25 psu
(Thomas et al., 2017)

△Achievement of Deep Channel DO Water Quality Standard

Achievement of **Deep Channel DO** water quality standard (1mg/l instantaneous minimum) expressed as ***an incremental increase*** over the PSC agreed to 2025 planning targets

CB Segment	State	2025 Climate 2025 Land Use 204TN 14.0TP 1993-1995 DO Deep Channel	2035 Climate 2025 Land Use 208TN 14.6TP 1993-1995 DO Deep Channel	2045 Climate 2025 Land Use 212TN 15.4TP 1993-1995 DO Deep Channel	2055 Climate 2025 Land Use 220TN 16.7TP 1993-1995 DO Deep Channel
CB3MH	MD	0.00%	0.00%	0.00%	0.00%
CB4MH	MD	1.47%	3.15%	4.62%	7.31%
CB5MH	MD	0.00%	0.00%	0.00%	0.00%
CB5MH	VA	0.00%	0.00%	0.00%	0.00%
POTMH	MD	0.00%	0.00%	0.00%	0.00%
RPPMH	VA	0.00%	0.00%	0.00%	0.00%
ELIPH	VA	0.00%	0.00%	0.00%	0.00%
CHSMH	MD	0.01%	0.92%	1.08%	2.34%



△Achievement of Deep Water DO Water Quality Standard

Achievement of **Deep Water DO** water quality standard (3 mg/l 30-day mean) expressed as ***an incremental increase*** over the PSC agreed to 2025 planning targets.

CB Segment	State	2025 Climate 2025 Land Use 204TN, 14.0TP 1993-1995 DO Deep Water	2035 Climate 2025 Land Use 208TN, 14.6TP 1993-1995 DO Deep Water	2045 Climate 2025 Land Use 212TN, 15.4TP 1993-1995 DO Deep Water	2055 Climate 2025 Land Use 220TN, 16.7TP 1993-1995 DO Deep Water
CB3MH	MD	0.01%	0.15%	0.16%	0.21%
CB4MH	MD	0.94%	1.61%	2.00%	2.66%
CB5MH	MD	0.52%	1.01%	1.32%	1.66%
CB5MH	VA	0.00%	0.00%	0.00%	0.00%
CB6PH	VA	0.00%	0.00%	0.00%	0.00%
CB7PH	VA	0.00%	0.00%	0.00%	0.00%
PATMH	MD	0.01%	0.02%	0.42%	2.66%
MAGMH	MD	1.66%	1.66%	1.91%	1.91%
SOUMH	MD	0.00%	0.00%	0.00%	0.00%
SEVMH	MD	0.00%	0.00%	0.00%	0.00%
PAXMH	MD	0.00%	0.00%	0.00%	0.00%
POTMH	MD	0.03%	0.15%	0.56%	0.81%
RPPMH	VA	0.00%	0.24%	1.48%	1.85%
YRKPH	VA	0.00%	0.00%	0.00%	0.00%
ELIPH	VA	0.00%	0.00%	0.00%	0.00%
SBEMH	VA	0.00%	0.00%	0.44%	3.12%
CHSMH	MD	0.00%	0.00%	0.00%	0.00%

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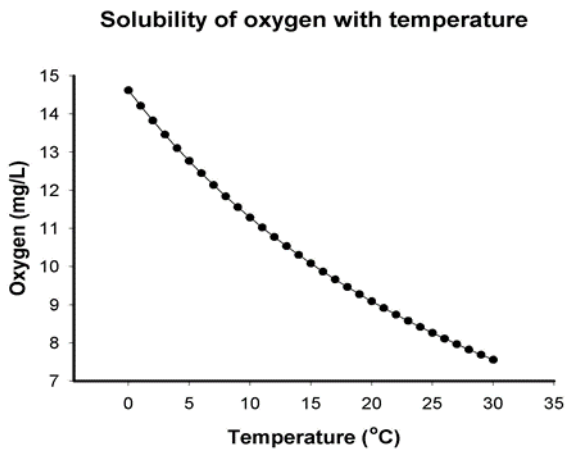
Tidal Fresh Open Water DO Water Quality Standard Violation Rates

Nonattainment of **Tidal Fresh Open Water DO** water quality standard (5.5mg/l 30-day mean)

Estimating substantial increases in Open Water DO non-attainment under increased (1°C) 2025 temperature in shallow waters.



		1995 Climate	2025 Climate	2035 Climate	2045 Climate	2055 Climate
PAXTF	MD	2.81%	11.93%	11.95%	12.37%	13.35%
WBRTF	MD	0.00%	32.27%	32.27%	39.65%	54.64%
PISTF	MD	4.63%	4.65%	4.65%	4.65%	4.65%
MATTF	MD	0.00%	0.00%	0.00%	0.00%	0.00%
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JMSTFU	VA	0.00%	0.00%	0.00%	0.00%	0.00%
APPTF	VA	4.59%	0.00%	0.00%	0.00%	4.59%
NORTF	MD	0.00%	0.00%	0.00%	0.00%	0.00%
CHSTF	MD	0.00%	0.00%	0.00%	0.00%	0.00%
CHOTF	MD	0.00%	0.00%	0.00%	0.00%	0.00%
NANTF_MD	MD	0.00%	0.73%	4.70%	0.73%	0.00%
POCTF	MD	0.00%	69.83%	77.48%	77.48%	77.48%

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Open Water is Important!

- The Open Water criteria are based on living resource needs for striped bass and other important species.
- There is a huge amount of Open Water (2/3 of the Bay) with DO water quality standards in place to protect living resources.
- It is the portion of the Bay that we interact with the most.
- Shallow Open Water (less than 2 meters deep) may have increased impacts from future estimated temperature increases.

- Open Water DO nonattainment in shallow water requires additional investigation. Ultimately, an improved Bay Model simulation of shallow water is needed to better understand the climate effects on Open Water DO water quality standards in Chesapeake's shallow waters.

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Main Bay and Tributary Open Water Violation Rates

Non-attainment of **Open Water DO** water quality standard (5 - 5.5 mg/l 30-day mean)

- Most areas do not reach violation, even by 2055
- CB6 and CB7 are much more effected

Cbseg	Planning Target	2025	2035	2045	2055
CB1TF	0.00%	0.00%	0.00%	0.00%	0.00%
CB2OH	0.00%	0.00%	0.00%	0.00%	0.00%
CB3MH	0.00%	0.00%	0.00%	0.00%	0.00%
CB4MH	0.00%	0.00%	0.00%	0.00%	0.00%
CB5MH_MD	0.00%	0.00%	0.00%	0.00%	0.00%
CB5MH_VA	0.00%	0.00%	0.00%	0.00%	0.00%
CB6PH	0.03%	0.39%	0.71%	0.99%	1.29%
CB7PH	0.32%	1.41%	2.11%	3.02%	4.19%
CB8PH	0.00%	0.00%	0.00%	0.00%	0.00%

Cbseg	Planning Target	2025	2035	2045	2055
PAXMH	0.00%	0.00%	0.00%	0.00%	0.03%
POTMH_MD	0.00%	0.00%	0.00%	0.00%	0.00%
RPPMH	0.00%	0.00%	0.00%	0.00%	0.00%
YRKPH	0.00%	0.00%	0.00%	0.00%	0.00%
MOBPH	0.00%	0.00%	0.01%	0.11%	0.16%
JMSPH	0.00%	0.00%	0.00%	0.00%	0.00%
CHSMH	0.00%	0.00%	0.00%	0.00%	0.00%
EASMH	0.00%	0.00%	0.00%	0.00%	0.00%
CHOMH2	0.00%	0.00%	0.00%	0.00%	0.00%
TANMH_MD	0.00%	0.00%	0.00%	0.00%	0.00%
TANMH_VA	0.00%	0.00%	0.00%	0.00%	0.03%

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Why are CB6 and CB7 acting so differently?

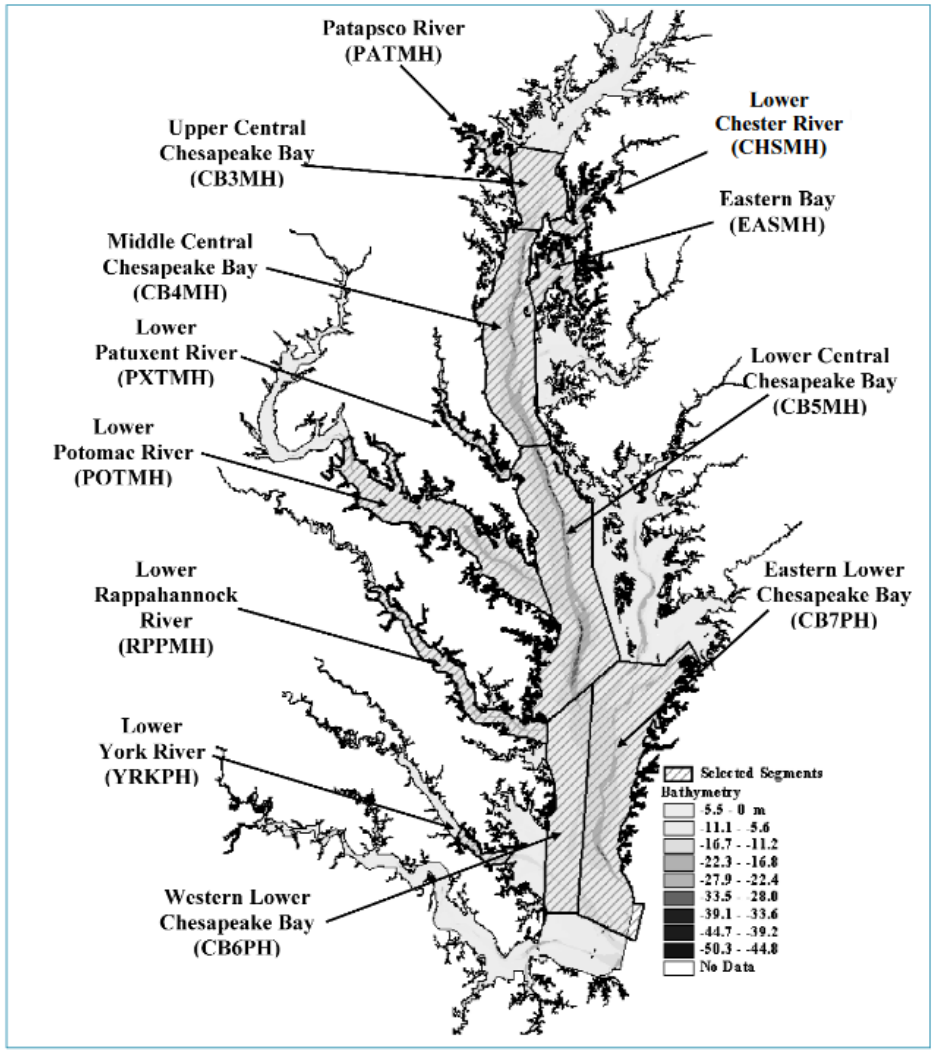


Figure IV-19. Chesapeake Bay Program segments identified as having chronic low dissolved oxygen

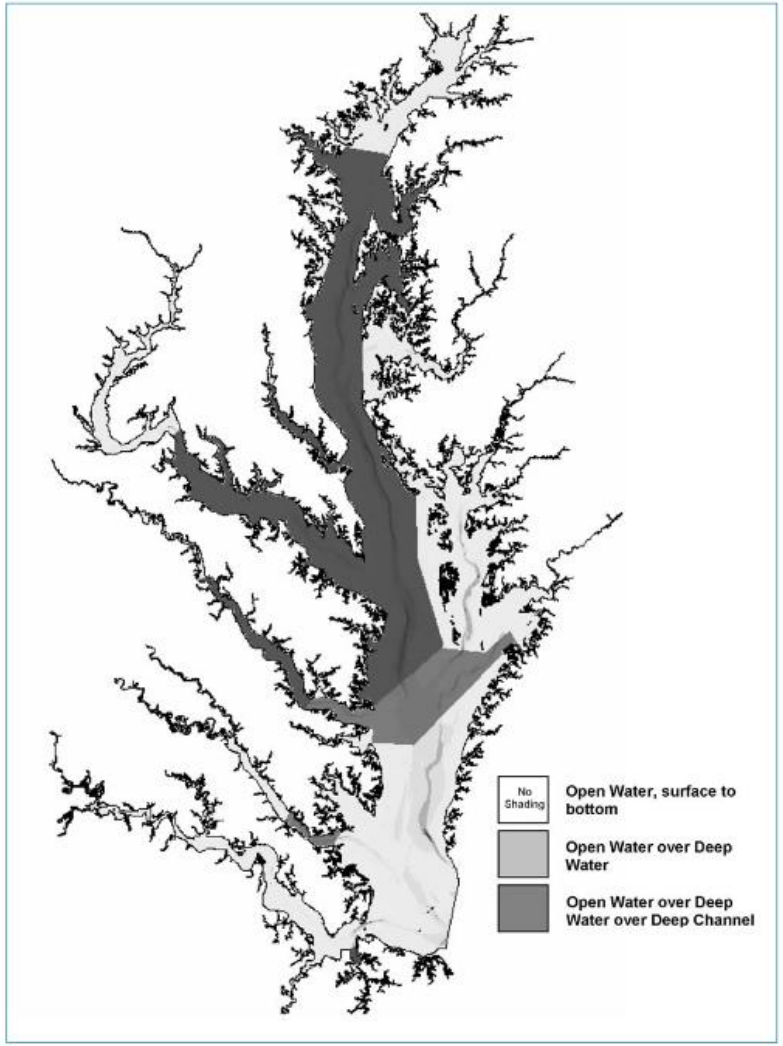


Figure IV-23. Map showing the dissolved oxygen designated uses of the Chesapeake Bay and its tidal tributaries.

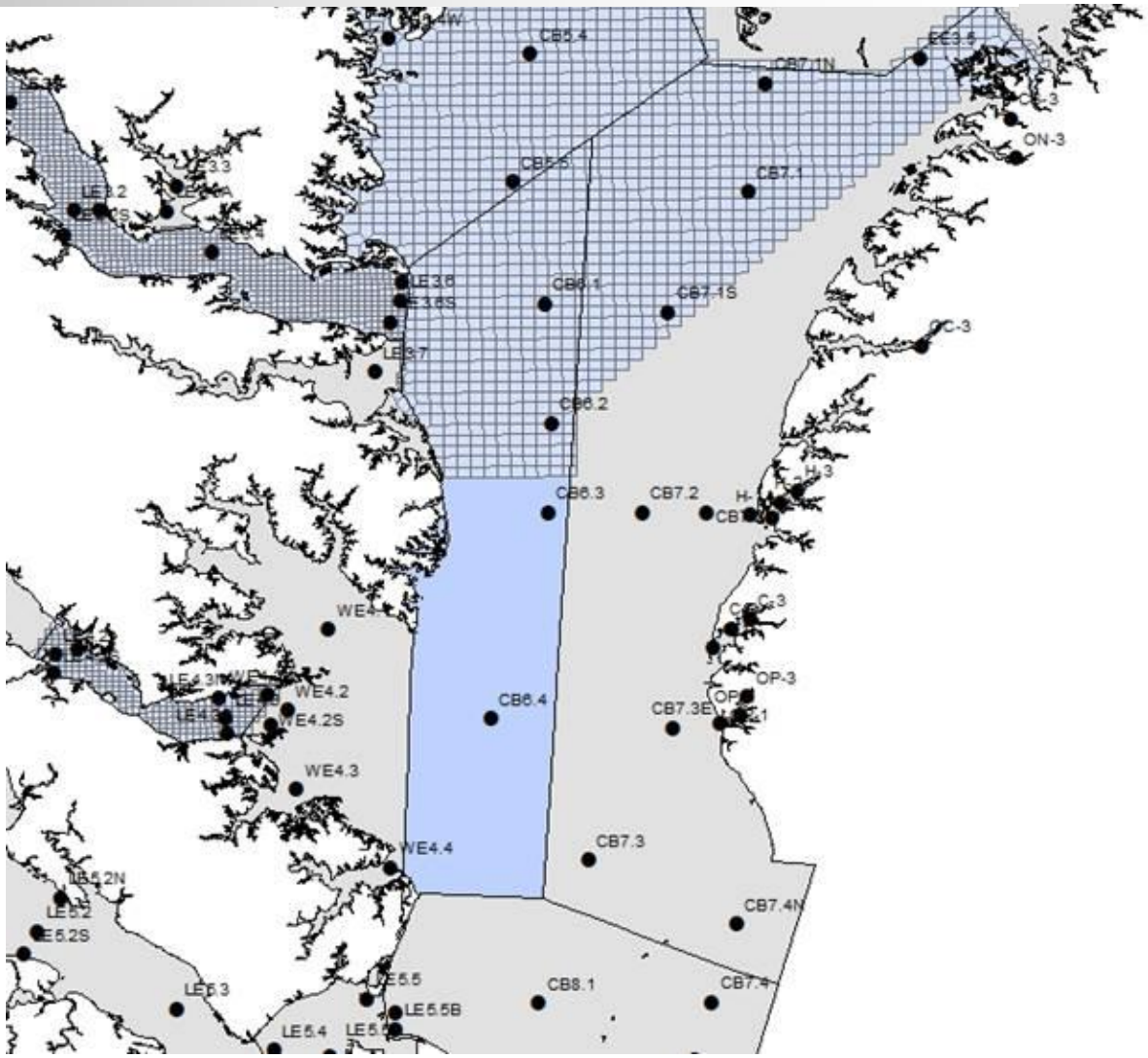
- 2003 Technical Support Document

"The delineation of the boundary was determined by examining maps of contemporary dissolved oxygen concentration distributions and the anecdotal historical dissolved oxygen concentration data record."

https://www.chesapeakebay.net/content/publications/cbp_13218.pdf

Deep Water Boundary

- CB6 boundary adjusted in 2004 as:
  - Near the end of the natural channel
  - The point where non-attainment goes under 1% in the 2003 Cap Load allocations
- Modeling Team took a closer look at the Open Water DO nonattainment forecasted in CB6 and CB7
  - Nonattainment was happening below the pycnocline.
  - But DO concentrations below the pycnocline would not violate the Deep Water DO standard (> 3 mg/l).
- The Modeling Workgroup recommended to the WQGIT that it avoid driving allocations with CB6 and CB7 Open Water DO because:
  - Attainment is relatively insensitive to load reductions.
  - No other mainstem segment had Open Water DO violations estimated through 2055.
  - A more appropriate delineation of the designated uses of Open Water DO and Deep Water DO is needed.



https://www.chesapeakebay.net/content/publications/cbp_13270.pdf

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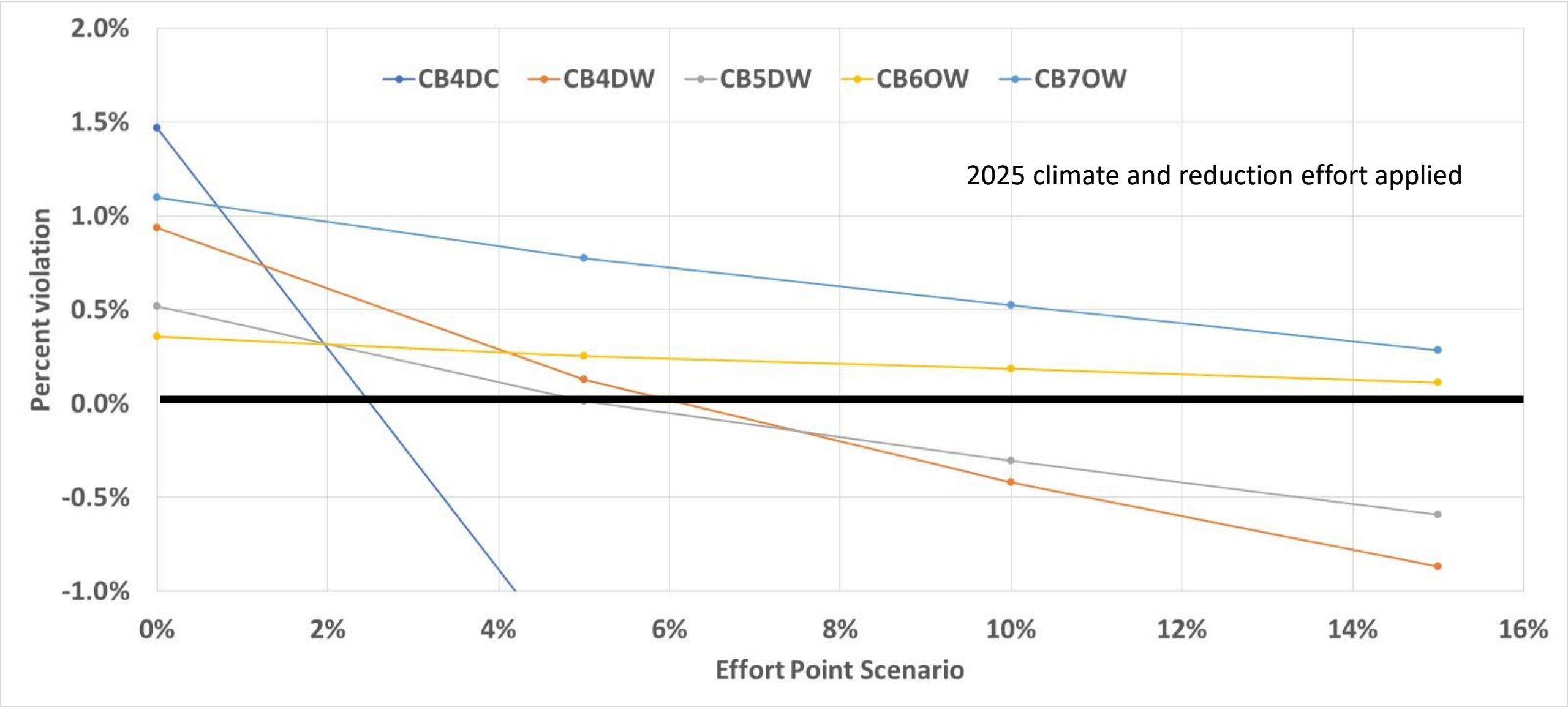
CB6 and CB7 are Less Sensitive to Reductions



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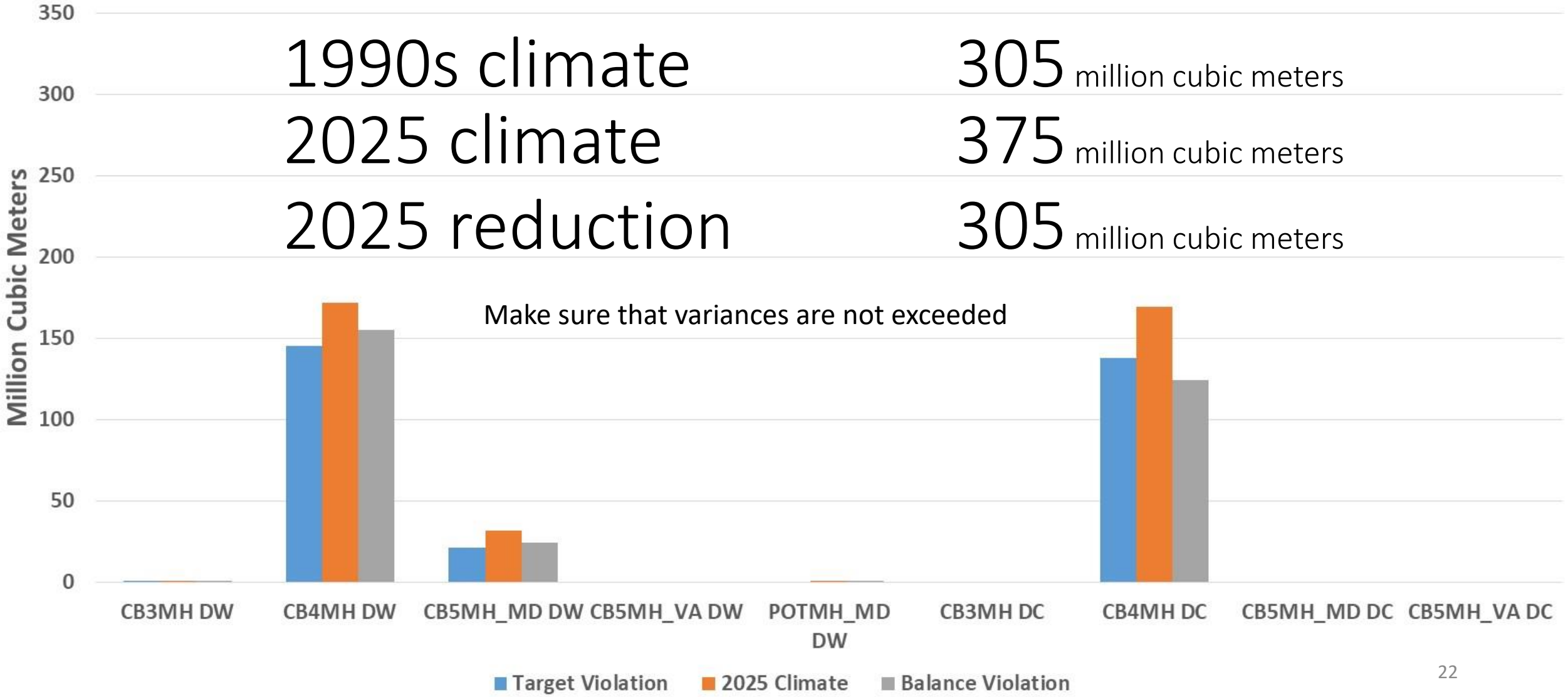
Climate Change Effect on Main Bay DWDC

1990s climate 305 million cubic meters

2025 climate 375 million cubic meters

2025 reduction 305 million cubic meters

Make sure that variances are not exceeded



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Climate Allocation Options

- Watershed loads first?
  - Take out jurisdiction's watershed load increases due to climate change first, then allocate any remaining reductions using the planning targets method
  - Allocate all climate change reductions using planning targets method

- Adjustments to planning target allocation method?
  - Only move the non-WWTP sources line (no change)
  - Move the WWTP and non-WWTP sources lines by the same amount
  - Set the WWTP source line at 8mg/l and 4mg/l then move the non-WWTP sources line to achieve the remaining reductions
  - Several other adjustments to the WWTP line were considered and ruled out by the WQGIT

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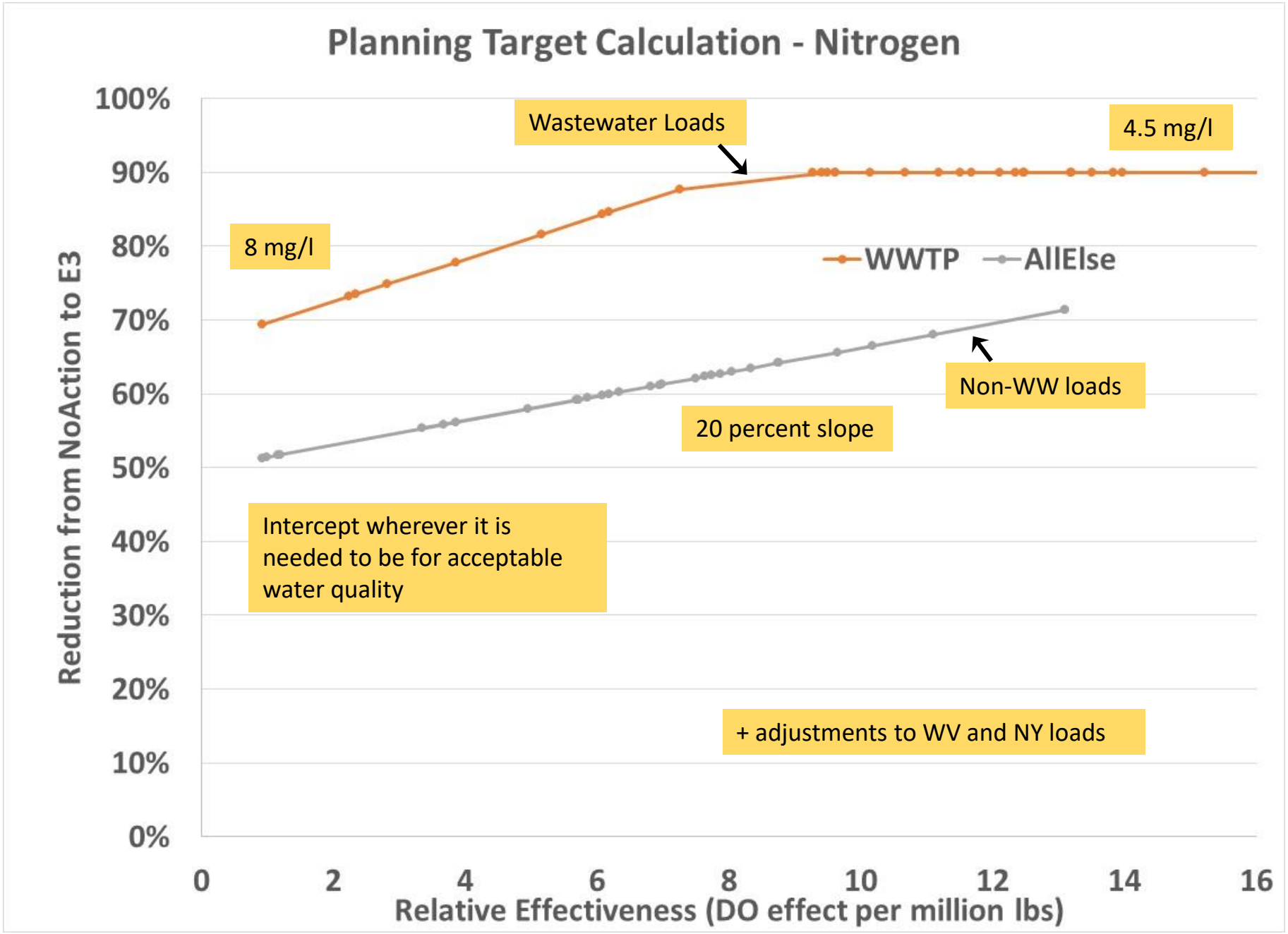

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2025 Climate Allocation Options

Effects from climate changes between 1995 and 2025

WWTP Scenario	NPS only	NPS only	NPS+PS	NPS+PS	8 and 4	8 and 4
Year	2025	2025	2025	2025	2025	2025
Watershed First	No	L1st	No	L1st	No	L1st
State	TN	TN	TN	TN	TN	TN
DC	0.003	0.006	0.152	0.006	0.257	0.259
DE	0.212	0.036	0.116	0.036	0.054	-0.122
MD	1.164	1.061	1.590	1.061	1.922	1.819
NY	0.242	0.699	0.201	0.699	0.179	0.636
PA	2.298	1.683	1.740	1.683	1.407	0.793
VA	0.957	1.476	1.497	1.476	1.190	1.709
WV	0.138	-0.054	0.103	-0.054	0.082	-0.111
Total	5.015	4.908	5.400	4.908	5.091	4.984

WWTP Scenario	NPS only	NPS only	NPS+PS	NPS+PS	8 and 4	8 and 4
Year	2025	2025	2025	2025	2025	2025
Watershed First	No	L1st	No	L1st	No	L1st
State	TP	TP	TP	TP	TP	TP
DC	0.001	0.001	0.018	0.001	0.021	0.021
DE	0.005	0.003	0.002	0.003	0.002	0.000
MD	0.079	0.111	0.107	0.111	0.116	0.149
NY	0.013	0.044	0.011	0.044	0.011	0.043
PA	0.103	0.095	0.069	0.095	0.070	0.062
VA	0.137	0.337	0.179	0.337	0.121	0.321
WV	0.012	0.009	0.008	0.009	0.007	0.003
Total	0.348	0.599	0.393	0.599	0.348	0.599

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Watershed Loads First with 2025 NY Special Case

State	TN Dec 2017 PSC	TN L1st Climate increase	TN Adjusted L1st Proposed	TP Dec 2017 PSC	TP L1st Climate increase	TP Adjusted L1st Proposed
DC	0.006	0.006	0.007	0.001	0.001	0.001
DE	0.397	0.036	0.039	0.006	0.003	0.003
MD	2.194	1.061	1.142	0.117	0.111	0.111
NY	0.400	**0.699**	0.399	0.015	0.044	0.044
PA	4.135	1.683	1.811	0.143	0.095	0.095
VA	1.722	1.476	1.589	0.187	0.337	0.337
WV	0.236	**-0.054**	0.000	0.017	0.009	0.009
Total	9.089	4.908	4.986	0.485	0.599	0.599

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Management Board Discussion and Endorsement

Endorsement = Recommendation supported by MB to advance to PSC for approval

6. Incorporate the additional nitrogen (N) and phosphorus (P) loads due to 2025 climate change conditions into Programmatic Milestones no later than the 2022-2023 Milestones, with all actions to achieve those reductions in place by 2025.

10.

State	2025 Climate N	2025 Climate P
DC	0.007	0.001
DE	0.039	0.003
MD	1.142	0.111
NY	0.399	0.044
PA	1.811	0.095
VA	1.589	0.337
WV	0.000	0.009
Total	**4.986**	**0.599**

11. Include a narrative in the 2022-2023 Milestones that describe the current understanding of 2035 climate change conditions, to the effect that "Preliminary estimates for the climate impact through 2035 suggest a doubling of the 2025 load effect, suggesting that the effect of climate change on our ability to meet the Bay's water quality standards is an ongoing concern." Specific language for the narrative to be developed by the WQGIT.

8. Continue efforts to improve understanding of the science and refine estimates of pollutant load changes due to 2035 climate change conditions.
   a) Develop a better understanding of the BMP responses, including new or other emerging BMPs, to climate change conditions.
   b) Compare the current 2025 climate change assumptions with measured climate conditions through 2024.
      i. To include: rainfall volume, intensity and distribution; air temperature, hydrology, water temperature, sea level rise, and changes in bay stratification and circulation.
   c) Consider the efficacy of using projections from measured trends versus downscaled global climate model data for revised 2035 estimates.

9. In 2025, the Partnership will consider results of updated methods, techniques, and studies and revisit existing estimated loads due to climate change to determine if any updates to those 2035 load estimates are needed.

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2035 Climate Allocation Options

Effects from climate changes between 1995 and 2035

WWTP Scenario	NPS only	NPS only	NPS+PS	NPS+PS	8 and 4	8 and 4
Year	2035	2035	2035	2035	2035	2035
Watershed First	No	L1st	No	L1st	No	L1st
State	TN	TN	TN	TN	TN	TN
DC	0.007	0.007	0.316	0.046	0.260	0.260
DE	0.442	0.138	0.242	0.112	0.284	-0.020
MD	2.426	1.905	3.315	2.017	3.184	2.663
NY	0.504	1.202	0.420	1.191	0.441	1.139
PA	4.789	3.618	3.627	3.472	3.899	2.728
VA	1.995	3.009	3.121	3.151	2.228	3.242
WV	0.288	0.308	0.214	0.299	0.231	0.252
Total	10.451	10.187	11.255	10.288	10.528	10.263

WWTP Scenario	NPS only	NPS only	NPS+PS	NPS+PS	8 and 4	8 and 4
Year	2035	2035	2035	2035	2035	2035
Watershed First	No	L1st	No	L1st	No	L1st
State	TP	TP	TP	TP	TP	TP
DC	0.002	0.001	0.037	0.006	0.022	0.021
DE	0.010	0.007	0.004	0.007	0.007	0.004
MD	0.164	0.235	0.222	0.242	0.201	0.272
NY	0.026	0.087	0.023	0.087	0.025	0.086
PA	0.214	0.287	0.143	0.278	0.181	0.255
VA	0.285	0.733	0.374	0.745	0.269	0.718
WV	0.025	0.053	0.016	0.052	0.020	0.048
Total	0.726	1.404	0.818	1.416	0.726	1.404