MB and WQGIT Decisions on Climate Allocations

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USWG

PSC Decision – 3/2018

1. Narrative strategy in the Phase III WIPs
2. Understand the Science
    1. Update models
    2. New estimate of load changes
3. Incorporate into 2022-2023 milestones

WQGIT Decision on Climate Allocations

Background

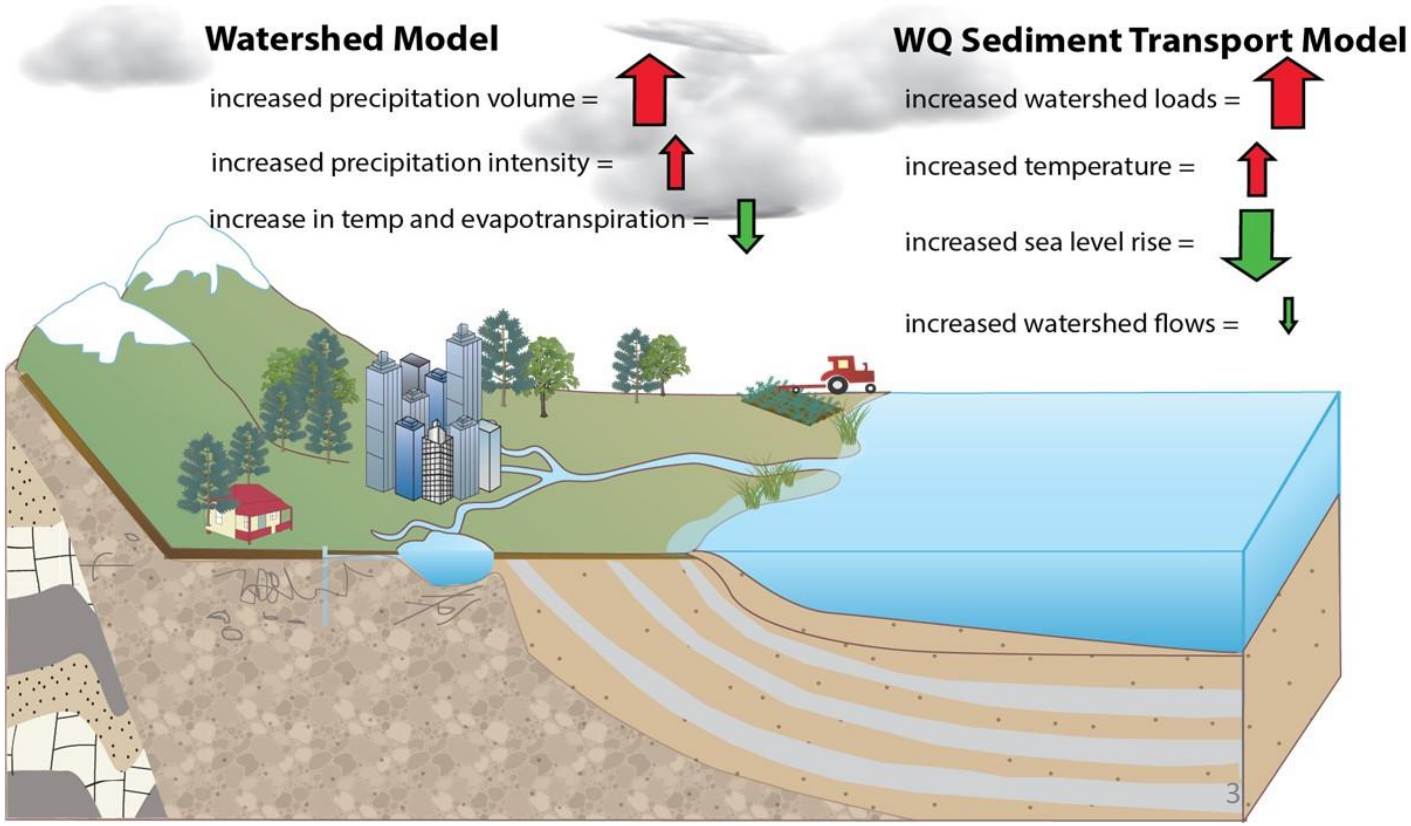
The PSC met in March 2018 and agreed that the jurisdictions' Phase III WIPs would address climate change narratively and include numeric pollutant reduction loads due to 2025 climate change conditions. Specifically, the WIPs would include a narrative strategy describing the jurisdictions' current action plans and strategies to address an increase in nitrogen and phosphorus across the watershed as a result of climate change as well as changes in the tidal Chesapeake. The narrative included the initial estimates of climate change effects on dissolved oxygen standards equivalent to an increase of 9 million pounds of nitrogen and 0.5 million pounds of phosphorus across the watershed. As part of the same decision the PSC agreed to refine the climate modeling and assessment framework based on improved understanding of the science of the impacts of climate change. The partnership further committed to adopting revised numerical climate change targets by 2021 using updated versions of the CBP's modeling tools and incorporating those revised climate change estimates into 2022-2023 Milestones.

Modeling updates 2019

During 2019, the Modeling workgroup oversaw improvements in the CBP's ability to simulate the effects of climate change. Based on input from STAC and the partnership, upgrades were made to model inputs and processes. Changes were made to model inputs of rainfall, air temperature, wetland area change, sea level rise, and ocean temperature and salinity. Watershed delivery of nitrogen, phosphorus, and sediment were modeled using improved processes to capture the effects of climate changes on watershed loads. The estuarine algal simulation was improved, and the model results were validated using multiple model comparisons and analysis of observed data.

Modeling workgroup oversaw updates to CBP suite of models (~25 modifications)

- Climate inputs
- Response of watershed
- Estuarine processes



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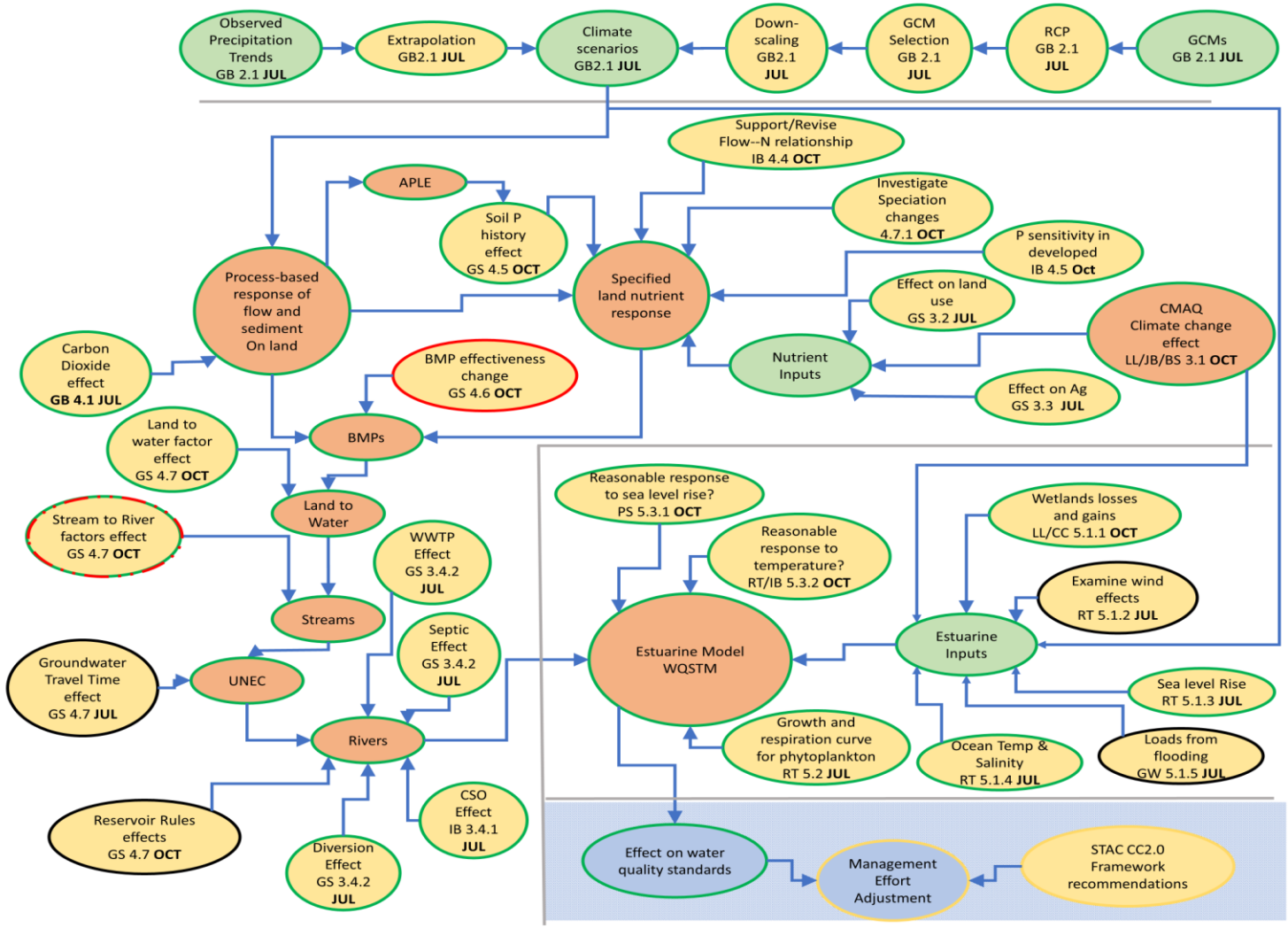
Elements of Chesapeake Water Quality Climate Risk Assessment

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

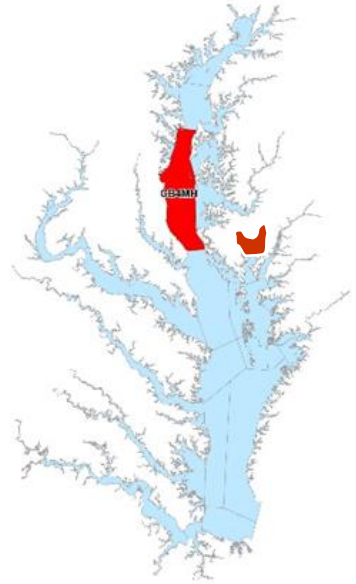
Estuary

Management

△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	2035	2045	2055
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%



Deep Water More Affected

Load reductions return to same average state

Open Water

Open water is an important use for living resources and modeling showed future non-attainment in CB6MH and CB7MH

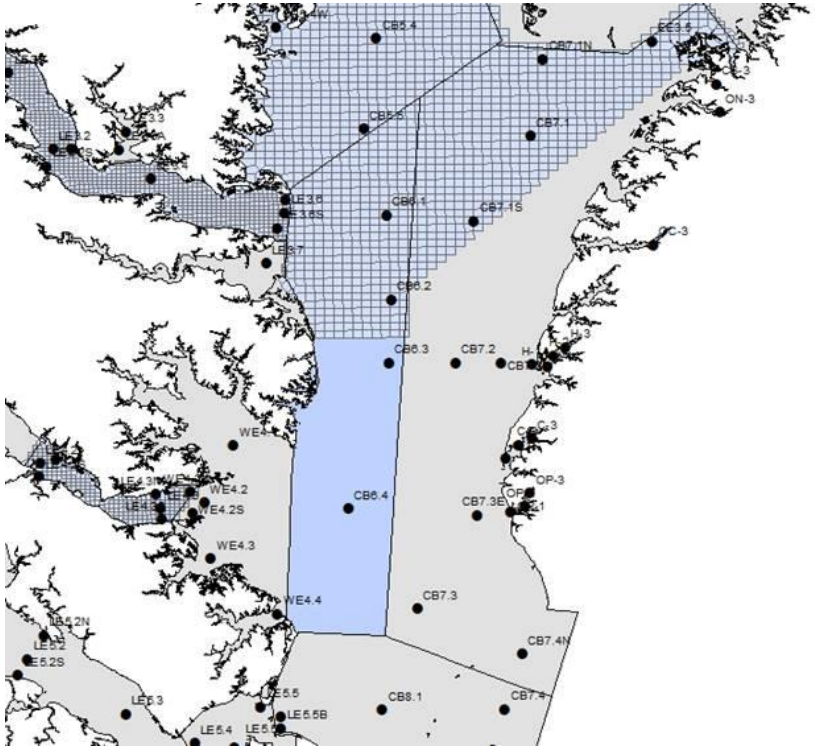
… However

The partnership decided not to drive allocations with CB6MH and CB7MH open water

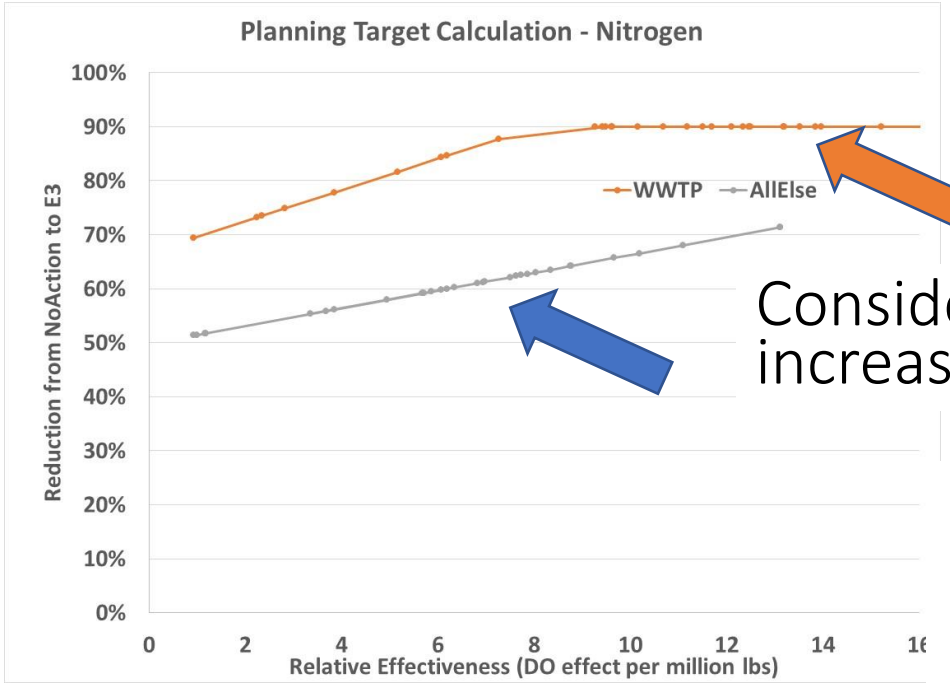
- Relatively insensitive to load reductions
- No other Mainstem Open Water violations through 2055
- Uncertainty over boundary of open water

The Criteria Assessment Protocol Workgroup began to address these issues at their 8/19/20 meeting.

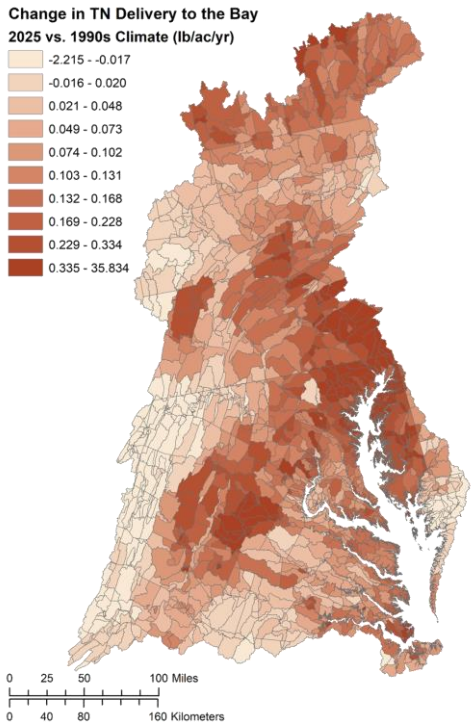
Climate change was found to have a more detrimental effect on water close to the surface of the Bay compared to deeper water and the effect also varied spatially. However, an analysis showed that the current CBP models were not appropriately designed to assess designated uses in shallow waters and that Open Water designated uses, while negatively affected, were still likely meeting water quality standards. There were also areas in the CB6MH and CB7MH segments of the Bay where the current open water designated use is applied throughout the water column (surface to bottom). In these areas, the models indicated that the non-attainment in the open water standard was isolated to areas below the pycnocline, an area typically held to the deep water or deep channel standard in mesohaline Bay segments. Modeling indicated that the deep water standard would be met in these areas of CB6 and CB7 under climate change conditions. The Modeling Workgroup recommended, and the WQGIT agreed, that Open Water designated uses not be considered for the current climate change allocation decisions. However, the Partnership's Criteria Assessment Protocol Workgroup (CAPW) will evaluate climate change risks to current water quality standard criteria and designated uses, including the open-water designated use for CB6MH and CB7MH, beginning this summer. Preliminary evaluations suggest that the addition of a deep water designated use in these areas would be appropriate.



WQGIT decided to continue with 1995-2025 and reassess in 2035



Considered options for increasing both lines



Considered option for reducing each state-basin's climate-induced watershed loads

Year

The WQGIT reviewed modeling scenarios that showed increasing level of nutrient reduction effort necessary as climate change intensifies from 2025 through 2055. The WQGIT considered the options of 2025 and 2035 for the target years for climate change effects and for implementation. In keeping with the PSC direction, the WQGIT decided to continue with accounting for climate effects between 1995 and 2025 and incorporating additional reductions by 2025. The WQGIT also decided that the current estimates of 2035 climate change effects should be documented in a narrative in the 2022-2023 milestones and that the partnership should continue to refine the climate modeling and assessment framework to update the 2035 estimates in 2025. This approach mirrors the March 2018 PSC approved approach for the initial 2025 climate change estimates.

Wastewater Treatment

The WQGIT considered additional allocation options that used the TMDL allocation chart but included various changes to the wastewater treatment line. The wastewater treatment line in the original TMDL allocation chart had the wastewater plants in the most effective basins set a 4.5mg/l for nitrogen and those in the least effective basins set at 8 mg/l Several scenarios were proposed and analyzed including:

- Moving the WWTP and non-WWTP lines by the same amount
- Moving the upper part of the WWTP line from 4.5 mg/l TN to 4 mg/l TN and from 0.22 mg/l TP to 0.18 mg/l TP and raising the non-WWTP line for any remaining load
- Moving the intercept of the WWTP line from 8 mg/l TN to 6 mg/l TN and from 0.54 mg/l TP to 0.364 mg/l TP and raising the non-WWTP line for any remaining load

These alternatives to the allocation approach resulted in options referred to as 'NPS+PS', '6 and 4.5', '6 and 4', and '8 and 4', each with a 'Watershed Loads First' and 'Allocate All' option. At the July 2020 WQGIT meeting, consensus was reached to exclude the '6 and 4.5' and '6 and 4' scenarios.

Jurisdictional Watershed Loads

Climate change between 1995 and 2025 has generally increased total rainfall, the intensity of rainfall, and temperature-driven evapotranspiration in the watershed. Some of the improvements made since late 2017 in the CBP's ability to simulate the effects of climate change has allowed for improved geographic resolution in the resulting watershed loads. In most areas of the watershed, the total rainfall increase is larger than the evapotranspiration increase which leads to an increase in flow and resulting increase in nitrogen. The increase in water balance and the increase in rainfall intensity lead to an increase in phosphorus for all parts of the watershed. It was determined through modeling scenarios that if the individual jurisdictions were to reduce nitrogen and phosphorus loads by the amount of the climate-related increase in watershed loads estimated through 2025, water quality standards would be met at a level consistent with the 2017 planning target decision. As a result, no additional allocation, beyond the watershed based load increases estimated for each jurisdiction, would be needed. However, the estimate for 2035 (and beyond) climate change would need allocation beyond the jurisdictional watershed loads. This alternative is referred to as 'Watershed Loads First' or 'L1st' and would also require the selection of an alternative allocation approach for 2035 and beyond.

The WQGIT also considered an alternative referred to as 'Allocate All, NPS Only' that would allocate load reductions using a similar method to that used by the partnership in the 2010 TMDL, 2017 Phase III WIP Planning Targets and the initial climate change allocation in December, 2017. This method relates state-basin effectiveness to influence main stem dissolved oxygen to reduction effort (known as the TMDL allocation chart or the "hockey-stick plot" – see slide 3 of the July 2020 WQGIT presentation for an example). The alternative raises the non-wastewater ('NPS Only') line on the TMDL allocation chart to a higher level of effort until the additional climate change load is accounted for.

Proposed Decision

State	TN			TP		
	Dec 2017 PSC	L1st Climate increase	Adjusted L1st Proposed	Dec 2017 PSC	L1st Climate increase	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

- **Each jurisdiction makes additional reductions equal to the increase due to climate change.**
- **NY's nitrogen efforts are decreased by .3 million lbs, WV's negative nitrogen loads are eliminated**
- **All other jurisdiction loads are increased by 8% to account for the balance**

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Management Board **Approved** 10/15 – Overview

- Accept updated models
- Exclude shallow and open water pending development of new models and methods
- Accept goal of returning to 2017 planning target level of non-attainment

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Management Board **Approved** 10/15

1. Accept updated models for use in re-evaluating climate change for 2025 and 2035.
2. Exclude model estimated non-attainment in shallow open water from the climate change allocation.
3. Exclude model estimated non-attainment in open water in CB6 and CB7 from the climate change allocation.
4. Criteria Assessment Protocol (CAP) Workgroup will evaluate climate change risks to current water quality standard criteria and designated uses, including the open water designated use for CB6MH and CB7MH.
5. 2025 climate change estimate will consider main Bay DW/DC and ensure additional non-attainment returns to 2017 Planning Target levels and within existing variances.

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Management Board **Endorsed to PSC**

- Use the suggested ‘watershed loads first’ option with NY special case
- Include extra reductions to be completed by 2025 starting with 2022-2023 milestones
  - Include a narrative that preliminary analysis suggests a doubling of effort related to climate change by 2035 (still being worked out)

- Re-evaluate 2035 climate in 2025 with updated models and climate data

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Management Board **Endorsed** 10/15

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.

~~7. Include a narrative in the Milestones that describe the current estimated jurisdiction-specific nutrient loads due to 2035 climate change conditions.~~

11. Include a narrative in the 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. (NOT YET ENDORSED, email vote pending)

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.

10. For 2025 climate change estimate, allocate using the jurisdiction's watershed loads first option with a 2025 special case for NY.
    a) The NY special case is a policy adjustment to the science-based watershed loads and applies only to the 2025 nitrogen climate allocation.
    b) Reduce NY nitrogen allocation to 0.399 (returning to a value similar to the initial estimate in 2017)
    c) Increase WV nitrogen allocation from -0.054 to 0.000
    d) Increase remaining jurisdictions to 108% of their science-based watershed nitrogen allocation