

Background Information on Including Climate Change Impacts under the Chesapeake Bay TMDL

COG staff document - May 5, 2020

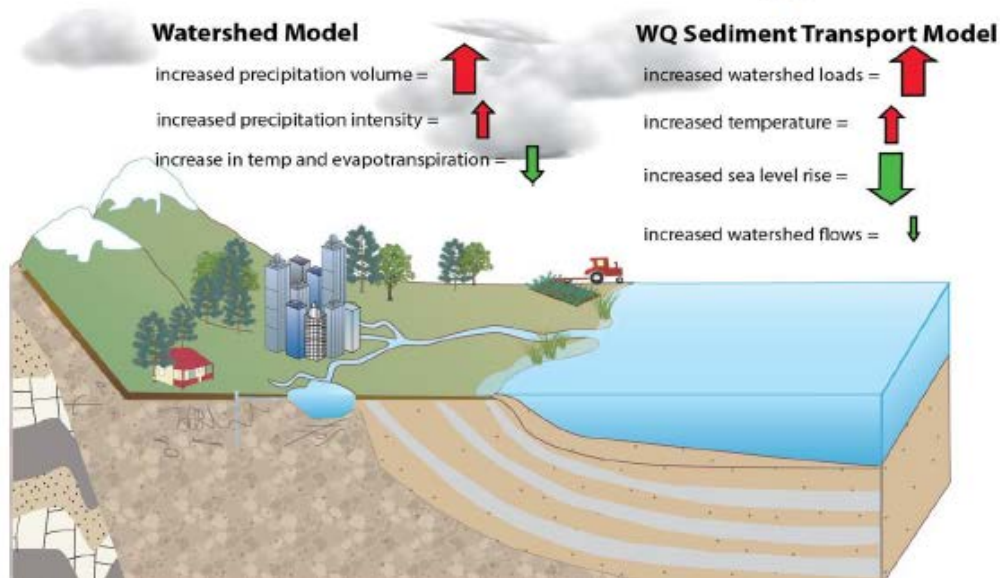
In adopting their Phase III Watershed Implementation plans (WIPs) in 2018, the Bay Program partner jurisdictions mostly chose to follow a narrative strategy that described their plans to address the effect of climate change on their actions to improve water quality. They also committed to using a quantitative approach by 2021: factoring climate change impacts into their numeric reduction targets under the WIPs and, in doing so, employing updates the Bay Program has since made to its suite of models to more accurately account for climate change impacts. *(Note: both the District of Columbia and Virginia included additional reductions based on the Bay Program's preliminary estimate of climate change impacts in their 2018 WIPs.)*

The current schedule calls for the Bay Program's Principals' Staff Committee to make a final decision among various policy options for quantitatively incorporating climate change impacts in the WIPs by late 2020 or early 2021, in time for the new reduction targets to be incorporated into the 2022-2023 milestones.

Background

Because the Bay Program models show that the net effect of climate change is to decrease the level of dissolved oxygen in the Bay (*comparing the relative size of the red negative-impact arrows in the chart below to the green positive-impact arrows*), incorporating it into the WIPs increases the level of effort that is required for those plans to achieve the Bay's water quality standards.

Components of Climate Change – Effect on Tidal Dissolved Oxygen



Source: Chesapeake Bay Program

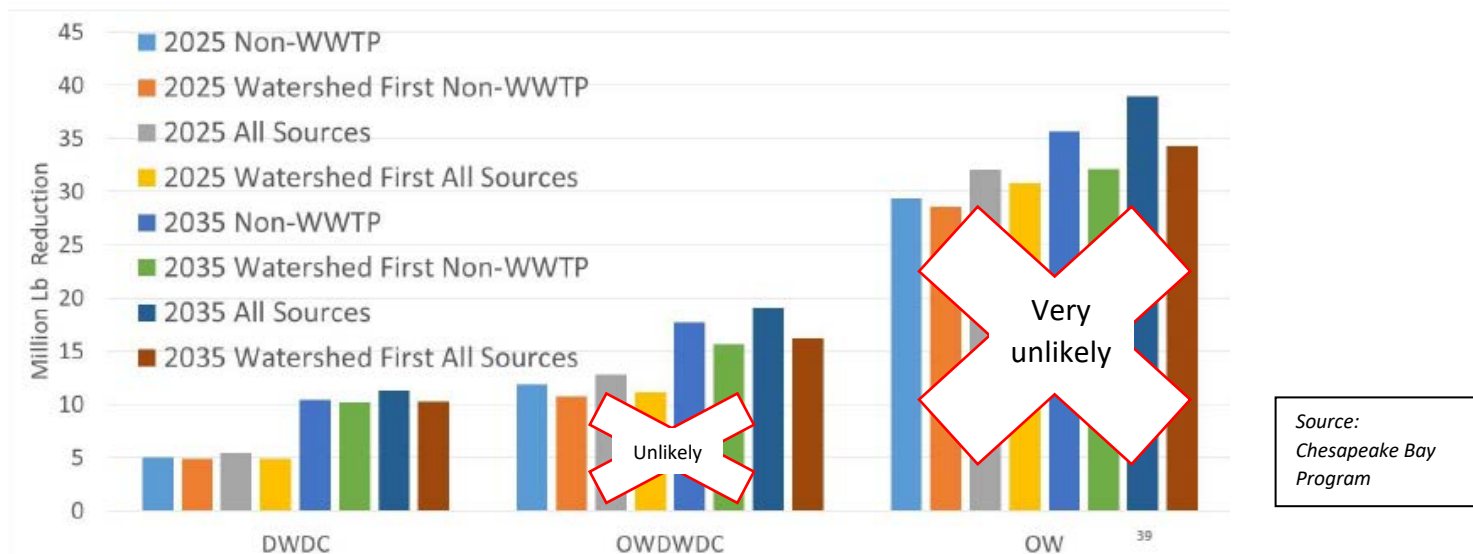
Preliminary modeling estimates in 2018 put the level of additional nutrient reduction necessary to offset the impact of climate change in 2025 at about 9 million pounds of nitrogen and 0.5 million pounds of phosphorus for the Bay watershed as a whole. Allocated among the Bay partners, this represented an additional reduction (or level of effort -- LoE) of about 25 - 30 percent for most of the partners.

Options

The new reduction numbers from the updated models vary depending on how the partners choose to interpret the climate mandate and how the additional reductions are allocated among the jurisdictions. These largely policy-based choices include:

- How to treat potential water quality violations in the “Open Water” classification of the Bay. To date, the level of nutrient reduction to achieve the Bay’s Total Maximum Daily Load has been based on modeled estimates of dissolved oxygen in the deeper waters of the Bay, where it is typically the most limited. The recent modeling efforts show that climate change also could significantly impact dissolved oxygen levels in surface waters. In general, the more Open Water impacts that are included in the TMDL calculations, the greater the amount of nutrient reductions needed to offset them, but the most dramatic Open Water impacts appears unlikely to be included at this time.
- The year on which to base climate targets – at this point either 2025 or 2035. Since climate change’s negative impact on Bay water quality increases over time, picking a later year increases the amount of reductions to be incorporated into the WIPs.
- The year by which to achieve climate change-driven reductions. The end point for the Bay TMDL issued in 2010 is still 2025. However, the offsets for climate change would not have to be achieved by that date. The Bay Program partners could choose a later date.
- The partners also are considering several different ways of allocating among themselves the additional reductions to offset climate change. The consequences for additional reductions of nitrogen – which is more difficult to achieve -- are shown in the chart below and noted in the summary.

Nitrogen Total Reductions

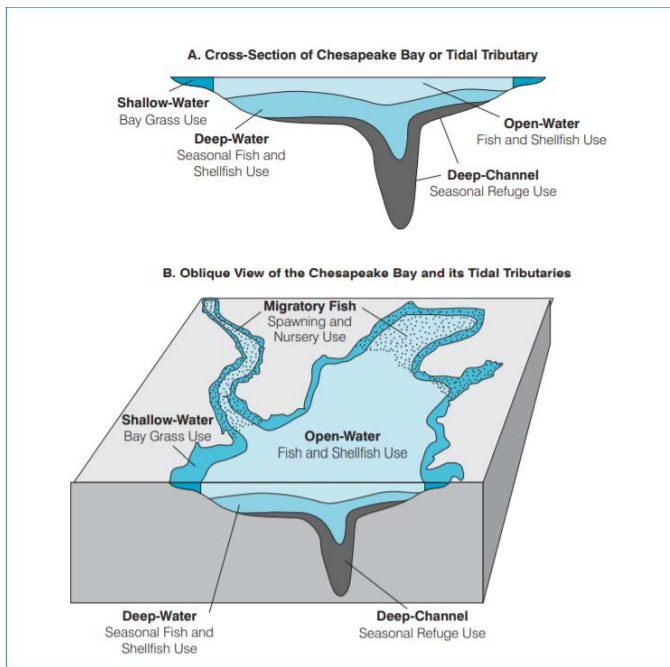


In summary

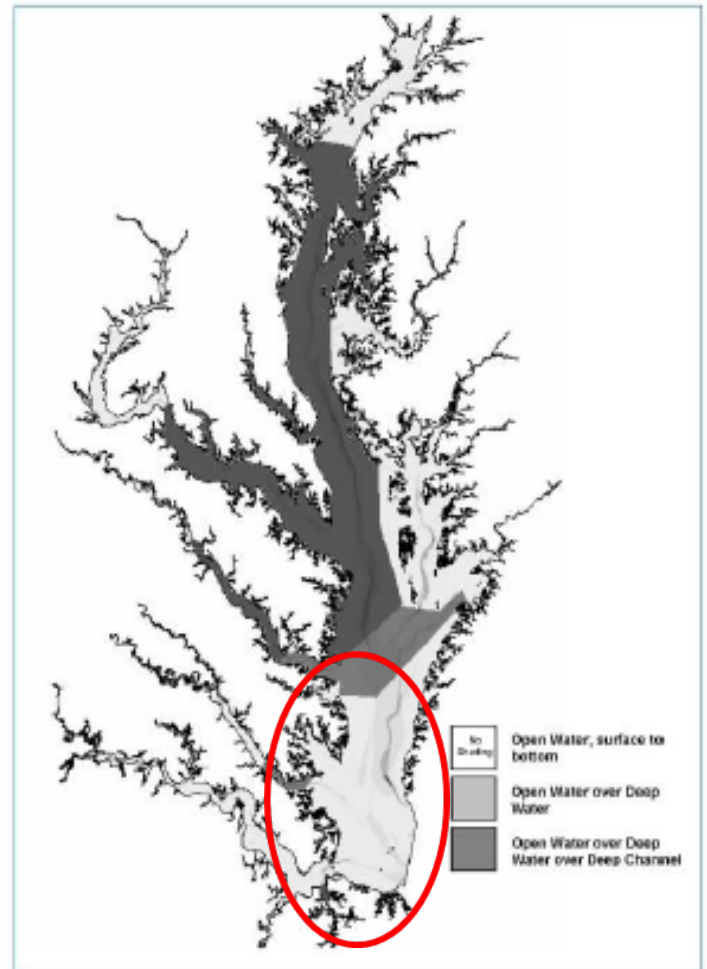
Incorporating climate change into the Bay TMDL will increase the level of nutrient reduction efforts required of the Bay partner jurisdictions by varying amounts, depending on the policy choices made. In Maryland, these additional reductions represent ranges from a 11 – 61 percent increase in the nitrogen LoE under the unlikely set of options in the chart above to a 11 - 36 percent increase under the more likely options (the DWDC set). In Virginia, the comparable numbers are: a 15 - 77 percent increase under the Unlikely options or a 15 - 42 percent increase under the more likely set. (Note: the Virginia WIP already included an increased level of effort for the preliminary estimate of climate change impact: about 25 percent for nitrogen.)

Further Background

Open water in the Bay officially refers to all surface waters down to the depth at which the pycnocline occurs, typically about 10 - 15 meters deep— with the exception of shallow waters no more than 2 meters in depth. In most of the middle portion of the Bay, this open water is underlain by deeper water and in the middle of the mid-Bay, by the deepest waters of the main channel, as shown in the left diagram below. Open water comprises the main habitat for striped bass and other important fish species.



Source: Chesapeake Bay Program



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A diagram of the Chesapeake Bay in which the shading indicates the depth of the water column. The area highlighted in red at the bottom of the Bay is where open waters may be most impacted by climate change, although the Bay Program’s water quality model is somewhat uncertain about this impact.