

# Updated Phase 6 Modeling Results for Climate Change Impacts

Presentation to Virginia's Chesapeake Bay Stakeholder Advisory Group  
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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.

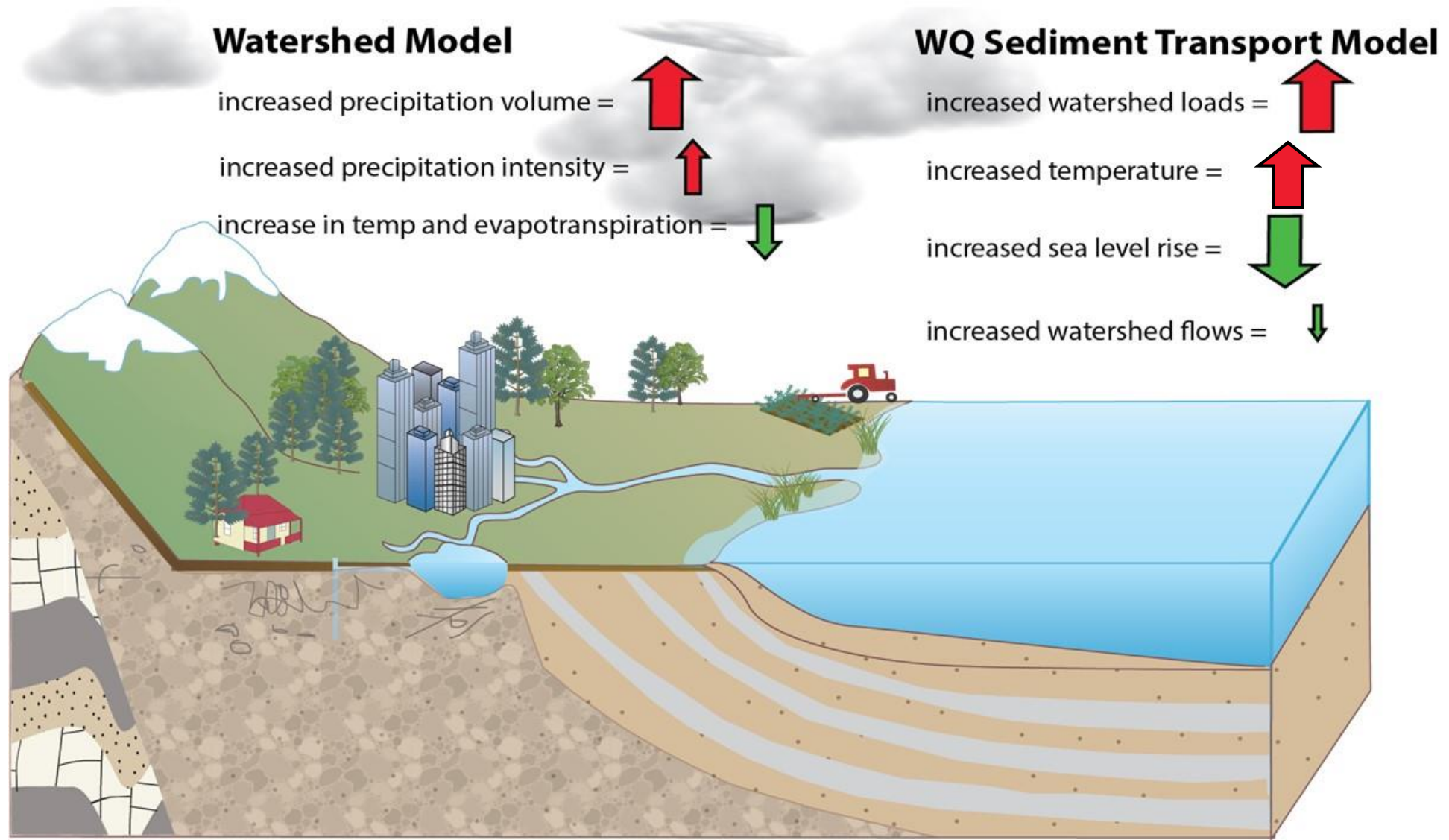


# 2017/2018 Climate Change Loads and Planning Targets

Jurisdiction	Nitrogen Climate Change	Nitrogen Planning Target	Phosphorus Climate Change	Phosphorus Planning Target
NY	0.400 (3.8%)	11.59	0.014 (2.9%)	0.606
PA	4.135 (5.7%)	73.18	0.141 (4.7%)	3.073
MD	2.194 (4.8%)	45.30	0.114 (3.2%)	3.604
WV	0.236 (3.7%)	8.35	0.019 (3.9%)	0.456
DC	0.006 (0.3%)	2.43	0.001 (0.8%)	0.130
DE	0.397 (8.5%)	4.59	0.006 (5.1%)	0.120
VA	1.722 (3.1%)	55.82	0.193 (3.0%)	6.186
Basinwide	9.09 (4.6%)	201.25	0.489 (3.4%)	14.173

\*Units: millions of pounds

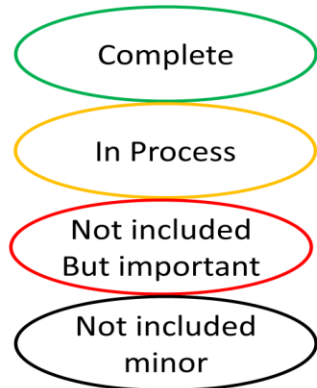
# Components of Climate Change – Effect on Tidal Dissolved Oxygen





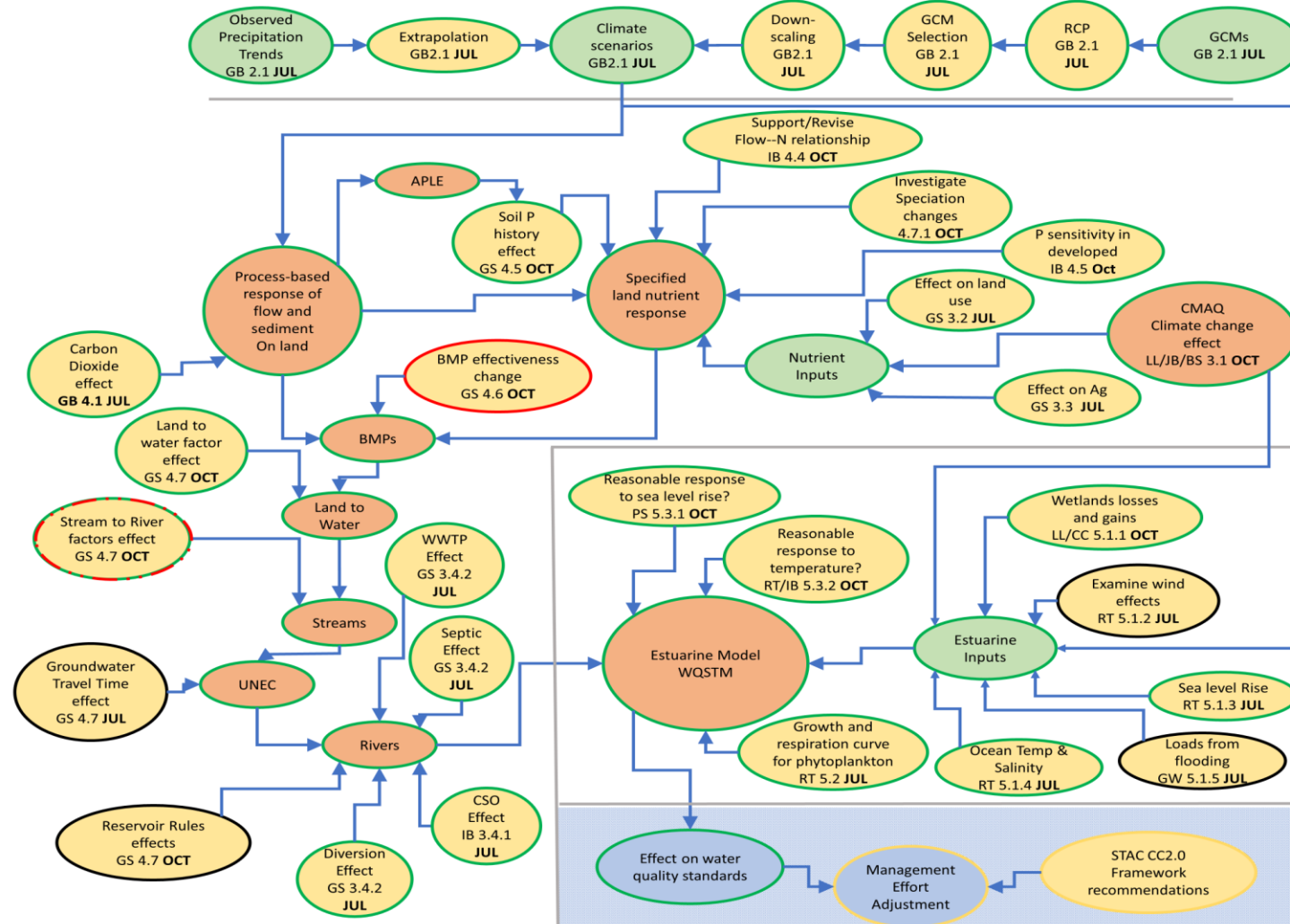
# Elements of Chesapeake Water Quality Climate Risk Assessment

**Model**  
**Data Set**  
**Endpoint**  
**Project/Decision**



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

## Climate Change Processes and Dependencies



Climate

Watershed

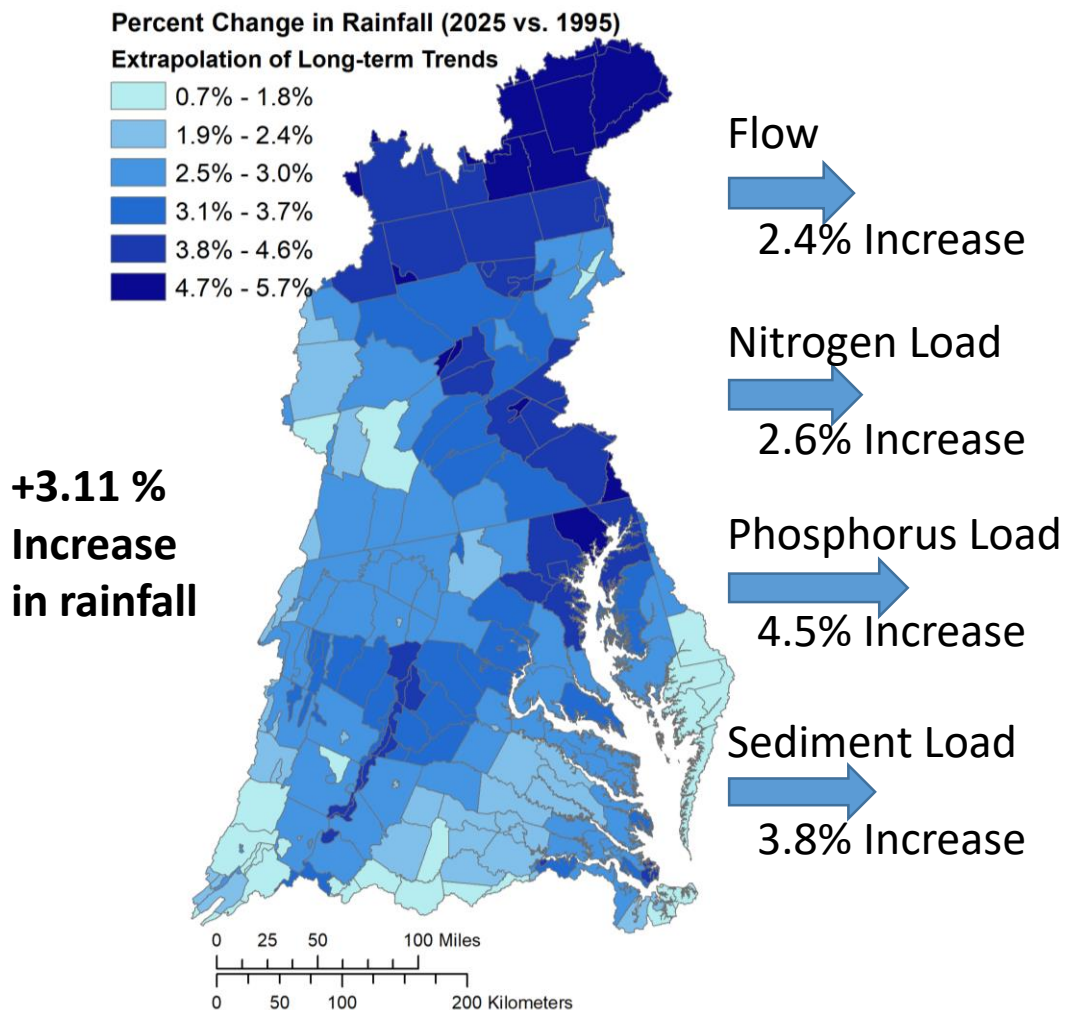
Estuary

Management



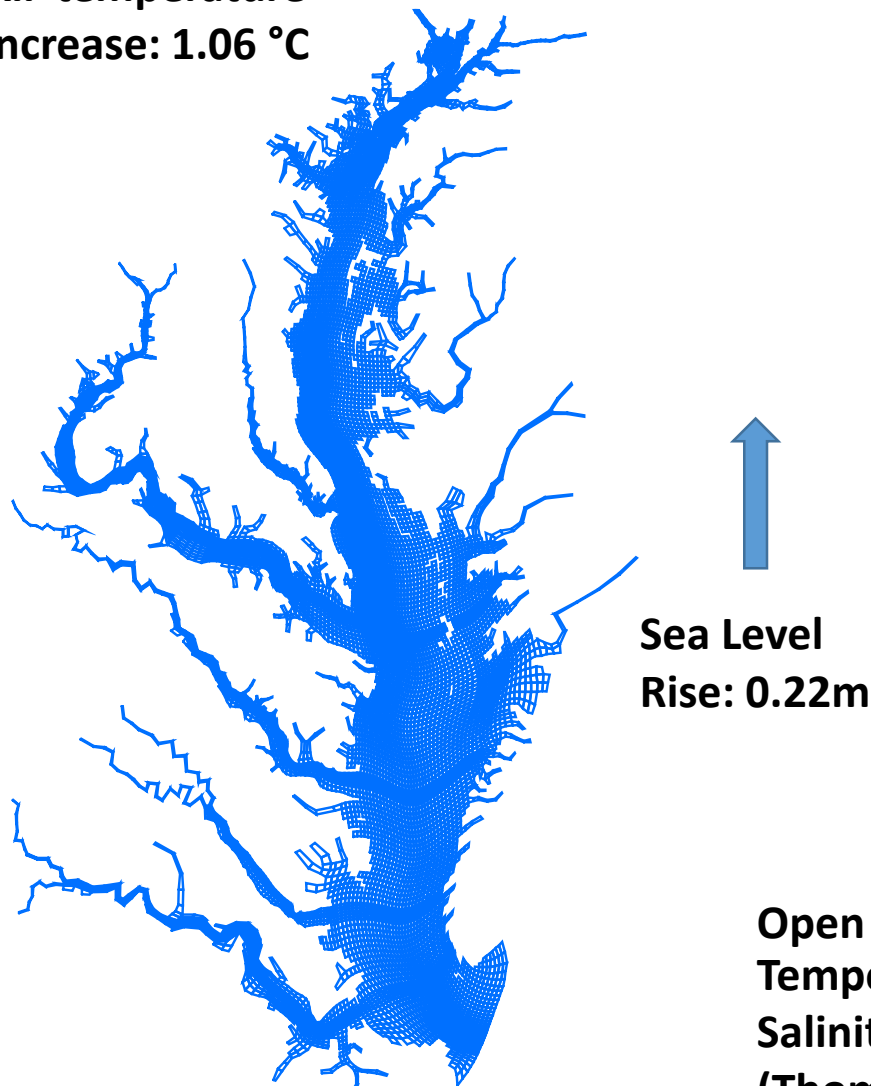


# Elements of 2025 Climate Change (1995-2025)



Phase 6 Watershed Model

**Air-temperature increase: 1.06 °C**



Model: CH3D-ICM 400m-1km Resolution

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

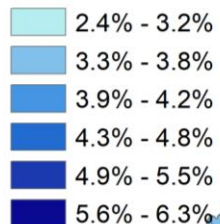


# Elements of 2035 Climate Change (1995-2035)

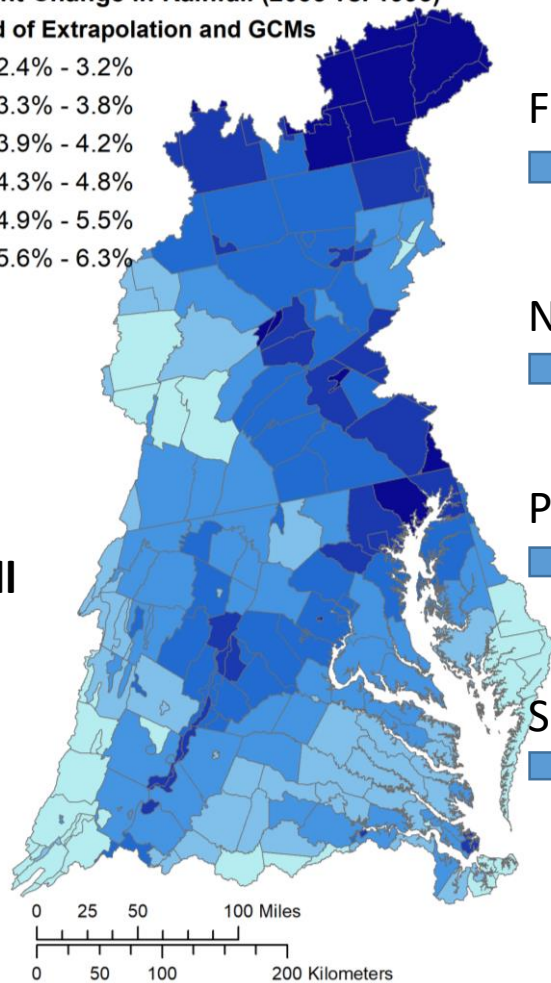
Air-temperature  
increase: 1.39 °C

Percent Change in Rainfall (2035 vs. 1995)

Hybrid of Extrapolation and GCMs



**+4.21 %**  
Increase  
in rainfall



Phase 6 Watershed Model

Flow



3.7% Increase

Nitrogen Load



4.7% Increase

Phosphorus Load

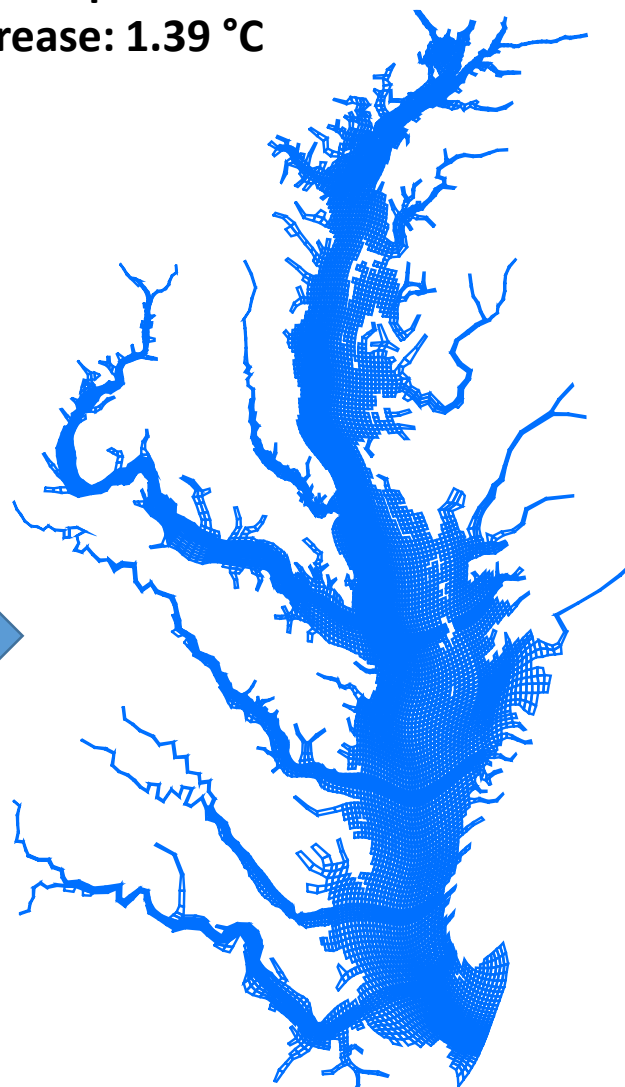


9.9% Increase

Sediment Load



8.5% Increase



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)

# 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 Baywide 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 and Management Board have approved specific climate change recommendations for PSC consideration in December.