

# Management Motivation and Model Overview

Lee McDonnell

EPA

STAC Climate Modeling 3.0 Workshop

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# Total Maximum Daily Load (TMDL)

What management practices...

.... will reduce nitrogen, phosphorus, and sediment to levels ...

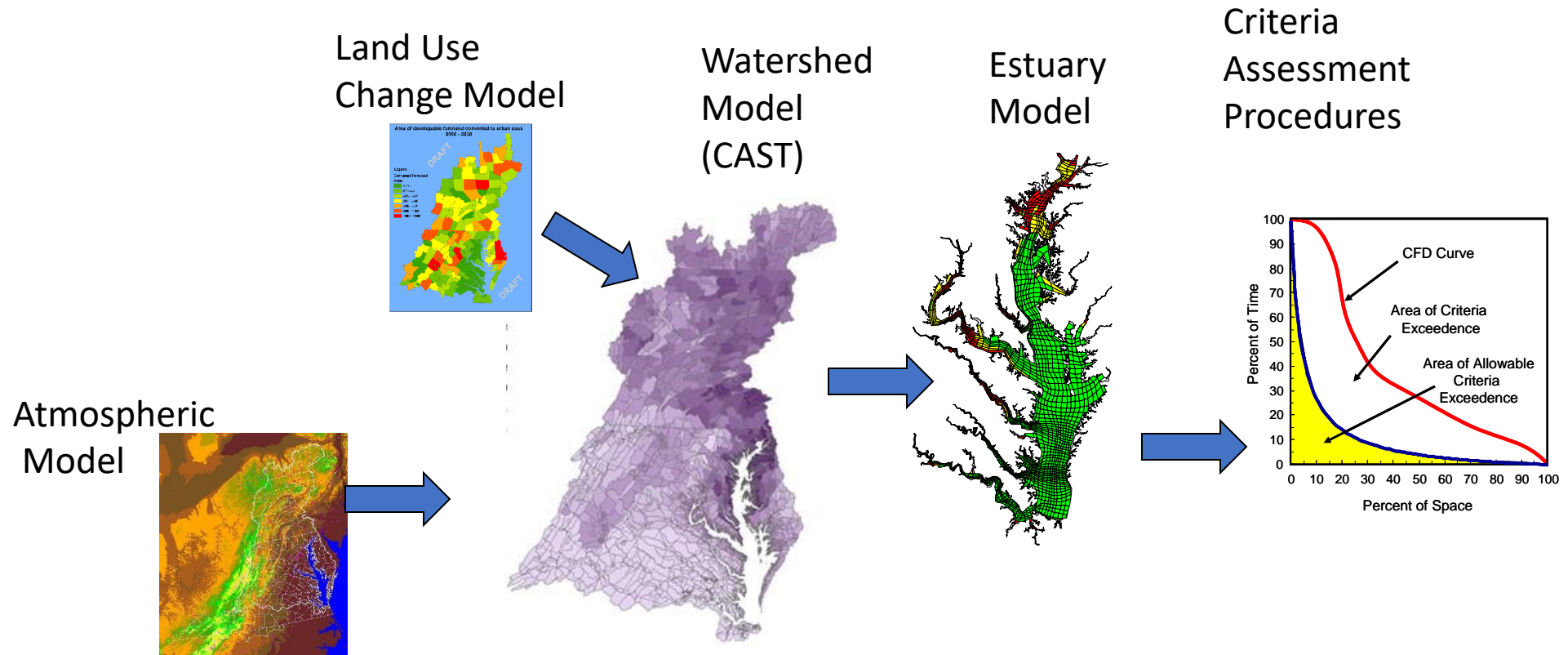
.... that will achieve levels of dissolved oxygen, clarity, and chlorophyll in the Bay...

... that are supportive of living resources?

COST = \$1~2B/year



# CBP Decision Support System



What management practices...

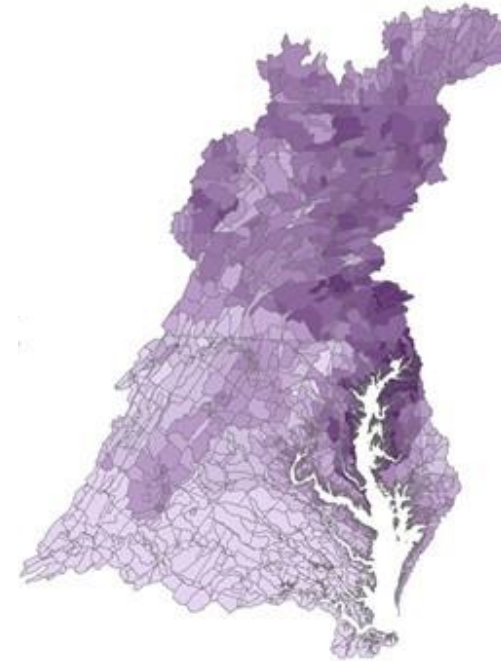
.... will reduce nitrogen and phosphorus to levels ...

.... that will achieve appropriate dissolved oxygen, clarity, and chlorophyll in the Bay?

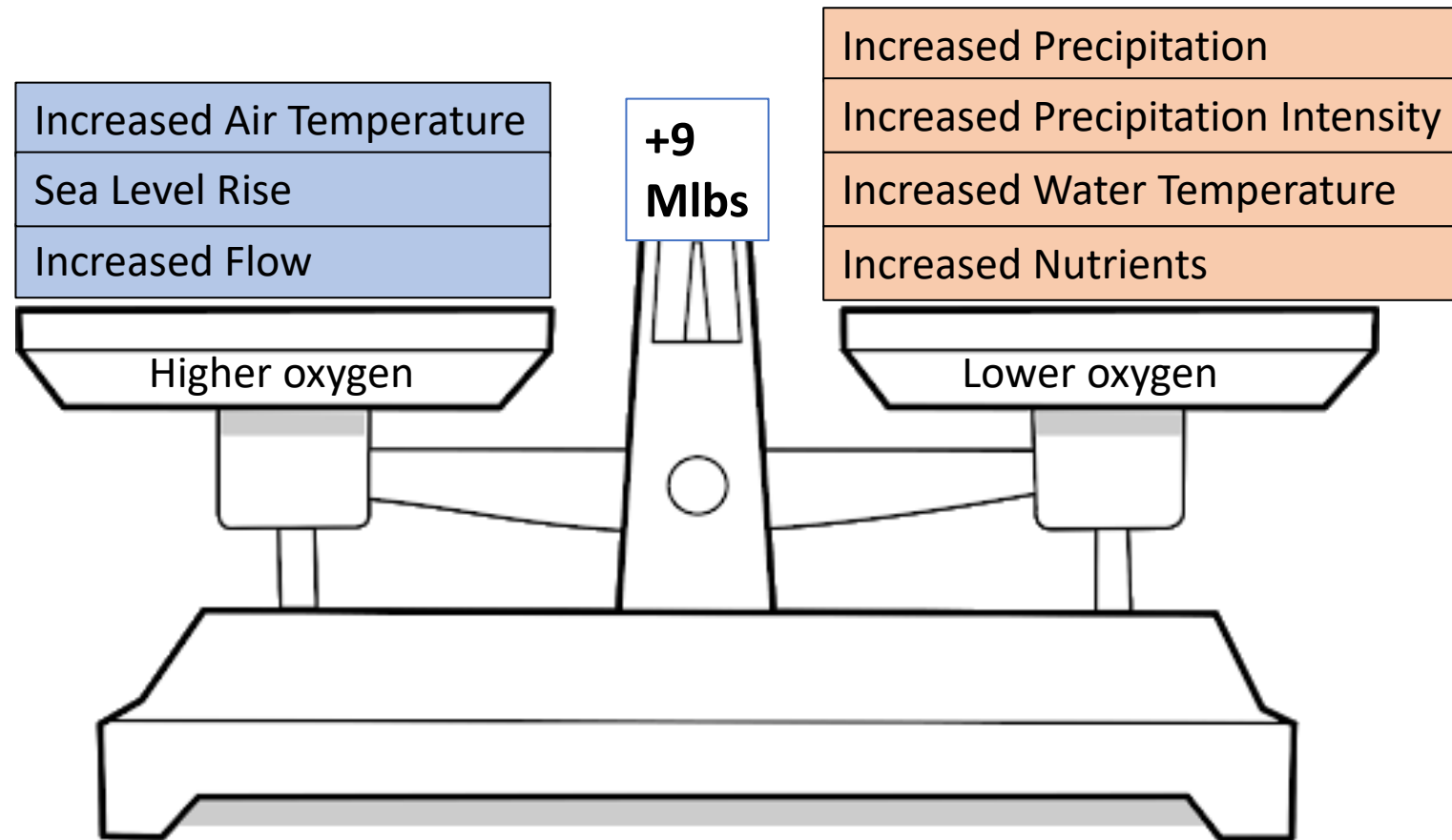
# Nutrient Targets

Major	State	StateBasin	2018 Planning Targets approved by PSC	
Major	State	StateBasin	Nitrogen	Phosphorus
Potomac	DC	DC Potomac	2.42	0.130
Eastern Shore	DE	DE Eastern Shore	4.55	0.108
Eastern Shore	MD	MD Eastern Shore	15.21	1.286
Patuxent	MD	MD Patuxent	3.21	0.301
Potomac	MD	MD Potomac	15.30	1.092
Susquehanna	MD	MD Susquehanna	1.18	0.053
Western Shore	MD	MD Western Shore	10.89	0.948
Susquehanna	NY	NY Susquehanna	11.53	0.587
Eastern Shore	PA	PA Eastern Shore	0.45	0.025
Potomac	PA	PA Potomac	6.11	0.357
Susquehanna	PA	PA Susquehanna	66.59	2.661
Western Shore	PA	PA Western Shore	0.02	0.001
Eastern Shore	VA	VA Eastern Shore	1.43	0.164
James	VA	VA James	25.92	2.731
Potomac	VA	VA Potomac	16.00	1.892
Rappahannock	VA	VA Rappahannock	6.85	0.849
York	VA	VA York	5.52	0.556
James	WV	WV James	0.04	0.005
Potomac	WV	WV Potomac	8.18	0.427

- Nutrient loads in million lbs/year
  - Watershed model (CAST) used to assess progress toward these goals



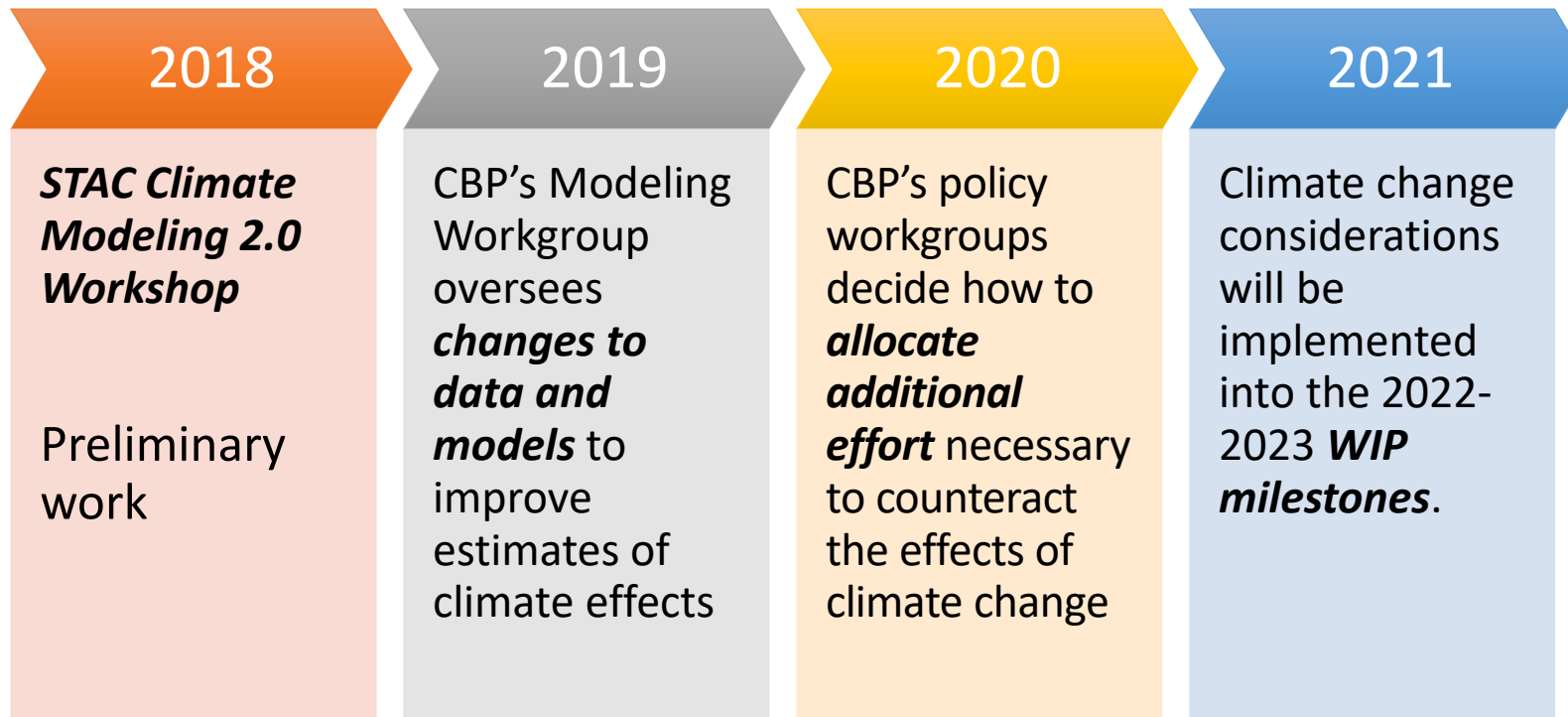
# Climate Effects on Bay Oxygen (2017 version)



# 2018 Climate Decision

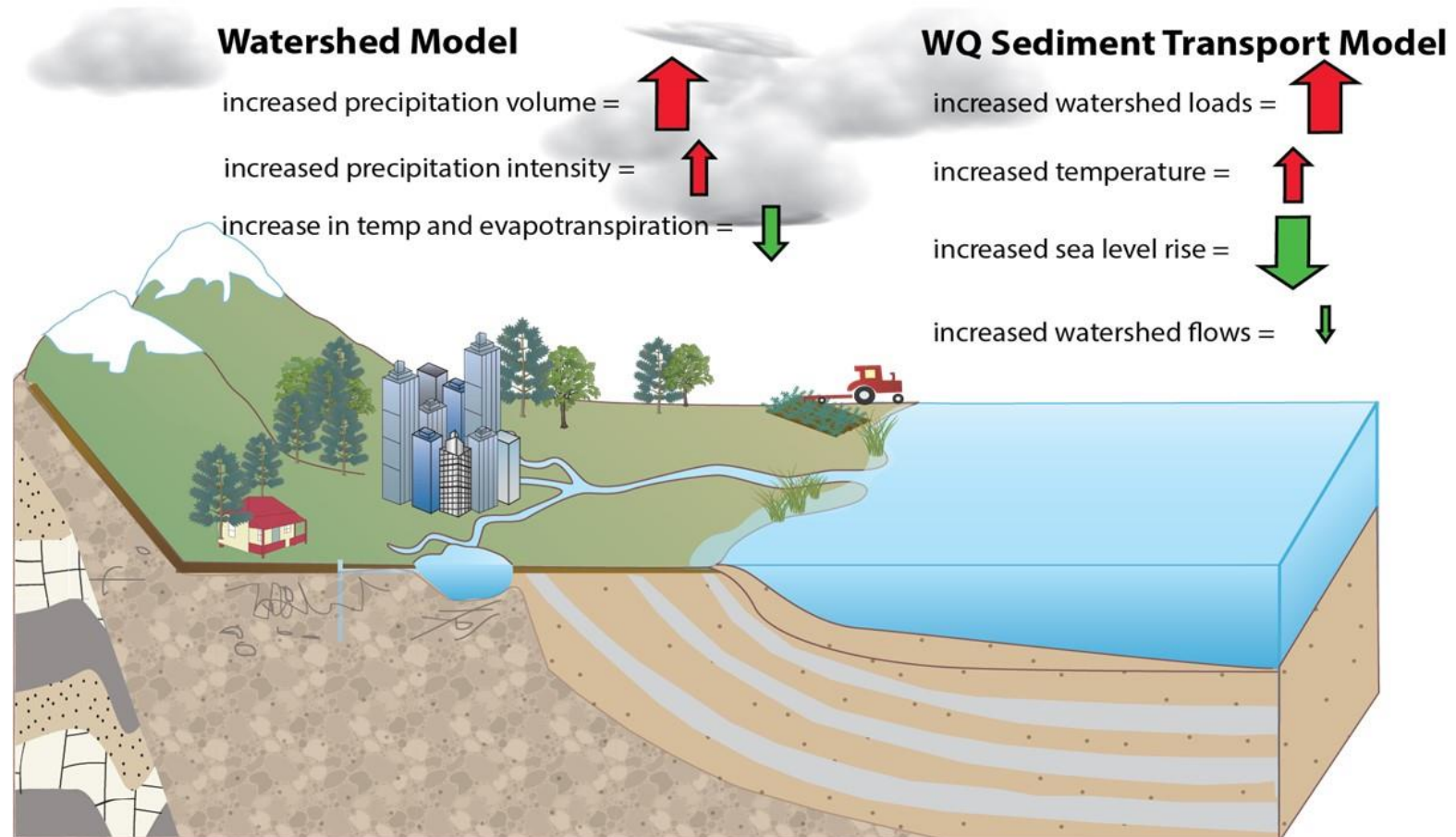
- Confidence in the 9 million pounds was low
- Principals' Staff Committee Decision
  - Develop narrative strategy now
  - Understand the Science in 2019
    - Update models
    - New estimate of load changes
  - Decide in 2021

# CBP Climate Work Plan



# Modeling updates 2019

- Modeling workgroup oversaw updates to CBP suite of models (~25 modifications)
  - Climate inputs
  - Response of watershed
  - Estuarine processes





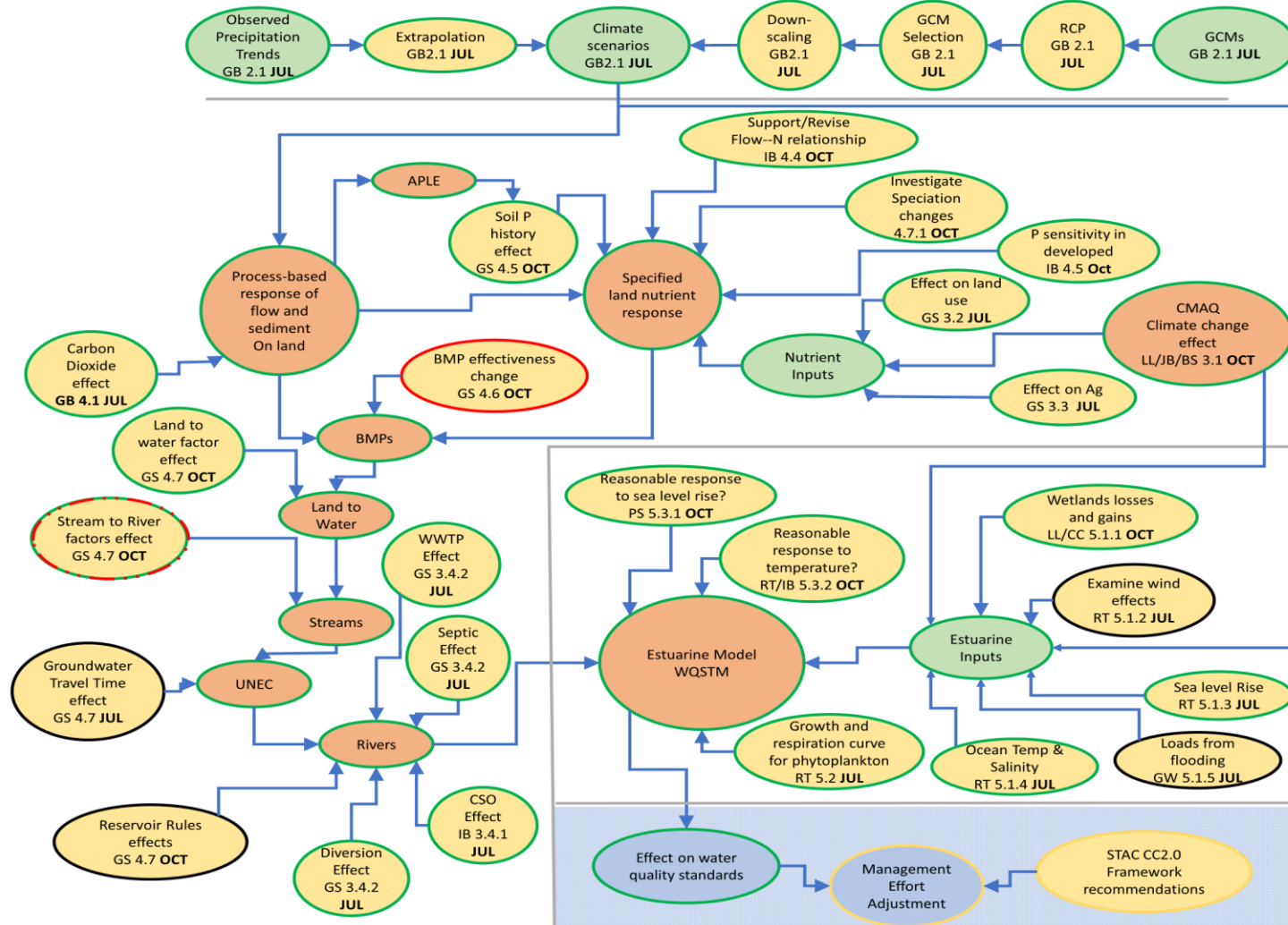
# Elements of Chesapeake Water Quality Climate Risk Assessment

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



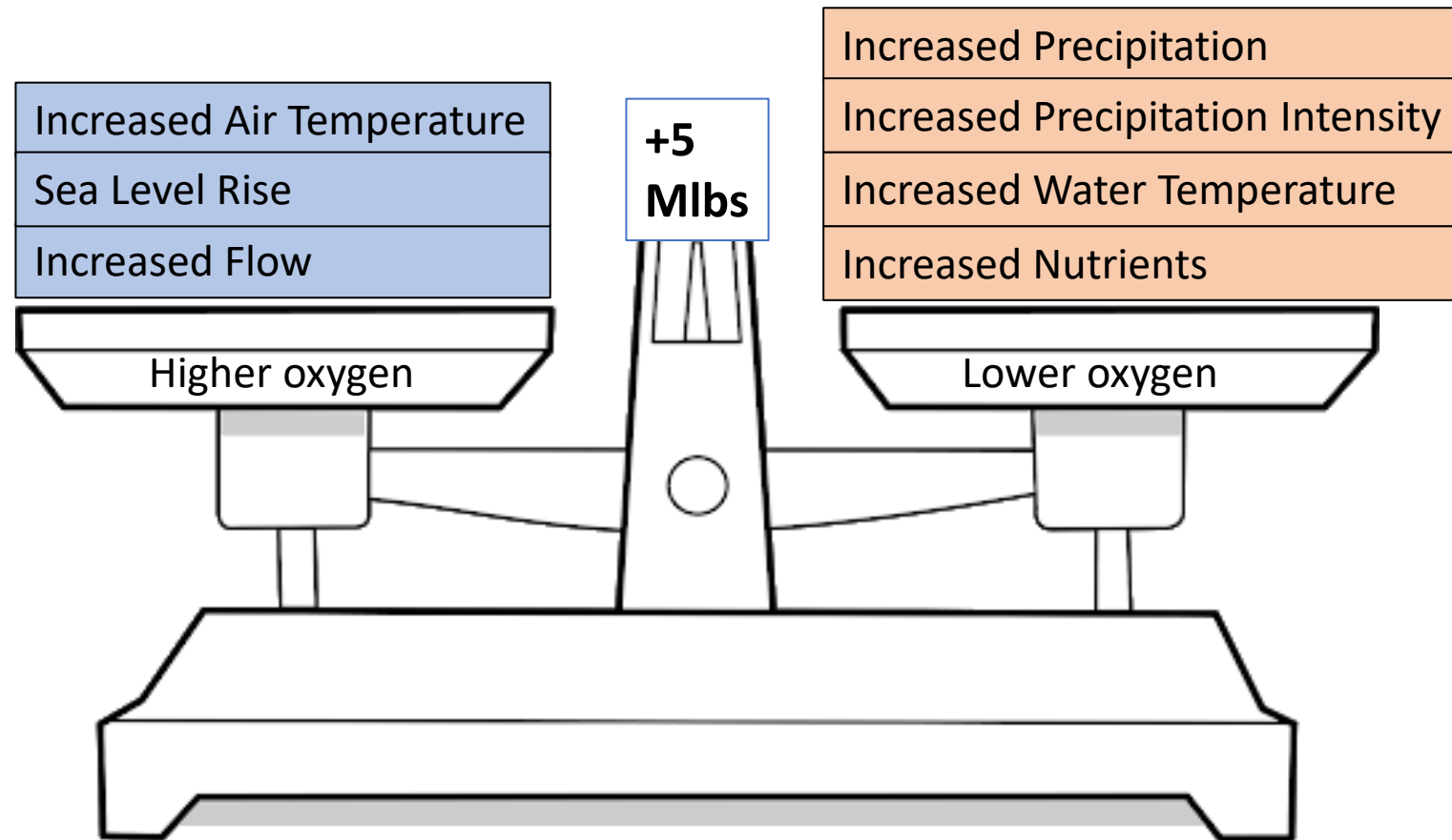
Climate

Watershed

Estuary

Management

# Climate Effects on Bay Oxygen (2020 version)



*CBP studied 21 different effects producing an overall lower level of oxygen*

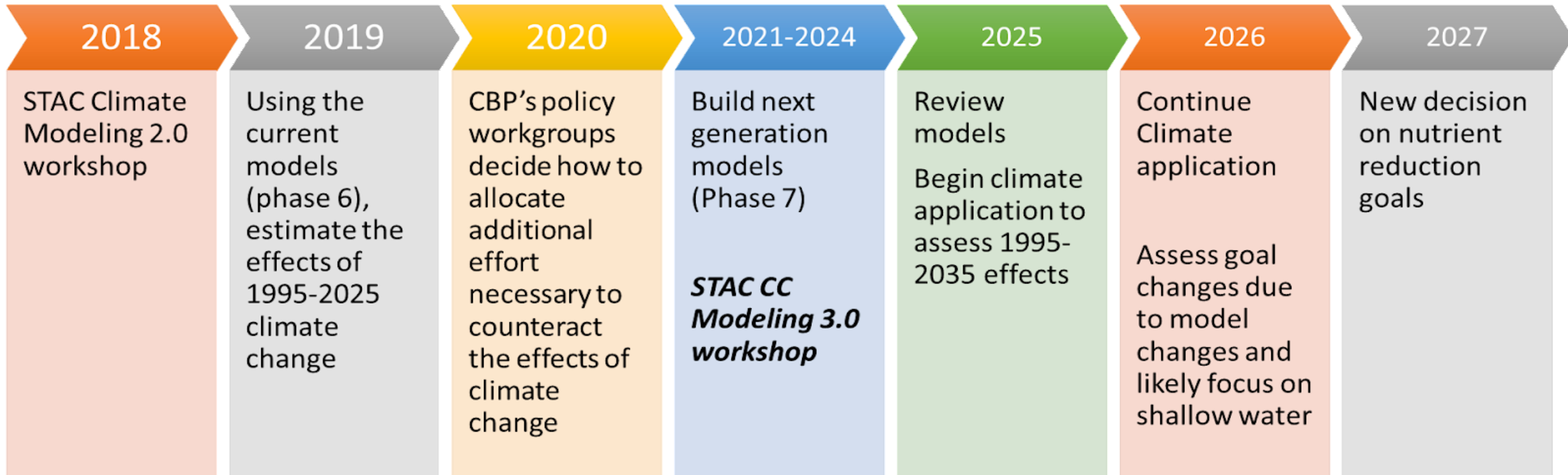
# 2021 Climate Decision – Principals' Staff Committee

- Accept updated models
- Accept recommended adjustments to TMDL planning targets, increasing the level of effort toward nutrient reduction
- Develop new models and methods for shallow water
- Reassess in 2025 for 2035 climate

# Additional Management Board 2021 Decisions

- Criteria Assessment Protocol (CAP) Workgroup will evaluate climate change risks to current water quality standard criteria and designated uses.
- Continue efforts to improve understanding of the science and refine estimates of pollutant load changes due to 2035 climate change conditions.
  - Develop a better understanding of the BMP responses, including new or other emerging BMPs, to climate change conditions.
  - Compare the current 2025 climate change assumptions with measured climate conditions through 2024.
  - Consider the efficacy of using projections from measured trends versus downscaled global climate model data for revised 2035 estimates.

# Updated Schedule



# STAC-

## Comprehensive Evaluation of System Response

- Living Resource focus

- Water quality criteria were developed according to living resource needs

- However –  Expected living resource response is unknown

- Better incorporate shallow water

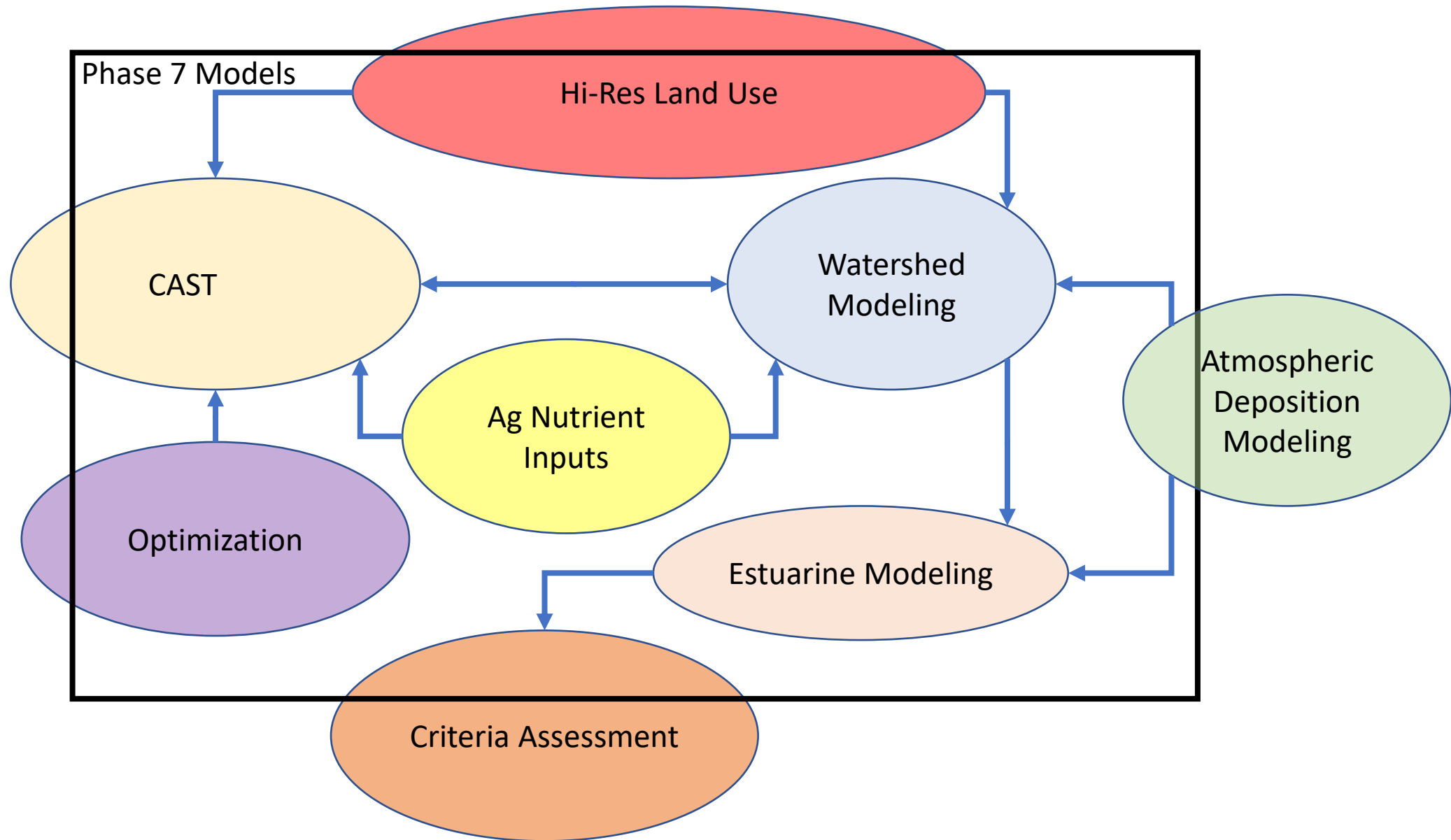
- Important for living resources

- Where people interact with the Bay

### Biological, Chemical, and Social System Response



# Phase 7 Development



# Governance

<https://cast-content.chesapeakebay.net/documents/P6ModelDocumentation%2F1%20Overview%202018%2005%2022.pdf>  
[https://www.chesapeakebay.net/who/group/modeling\\_team](https://www.chesapeakebay.net/who/group/modeling_team)  
<https://www.chesapeakebay.net/what/programs/modeling>

