RISING BAY WATER TEMPERATURES TIDAL MANAGEMENT RECOMMENDATIONS FROM STAC WORKSHOP

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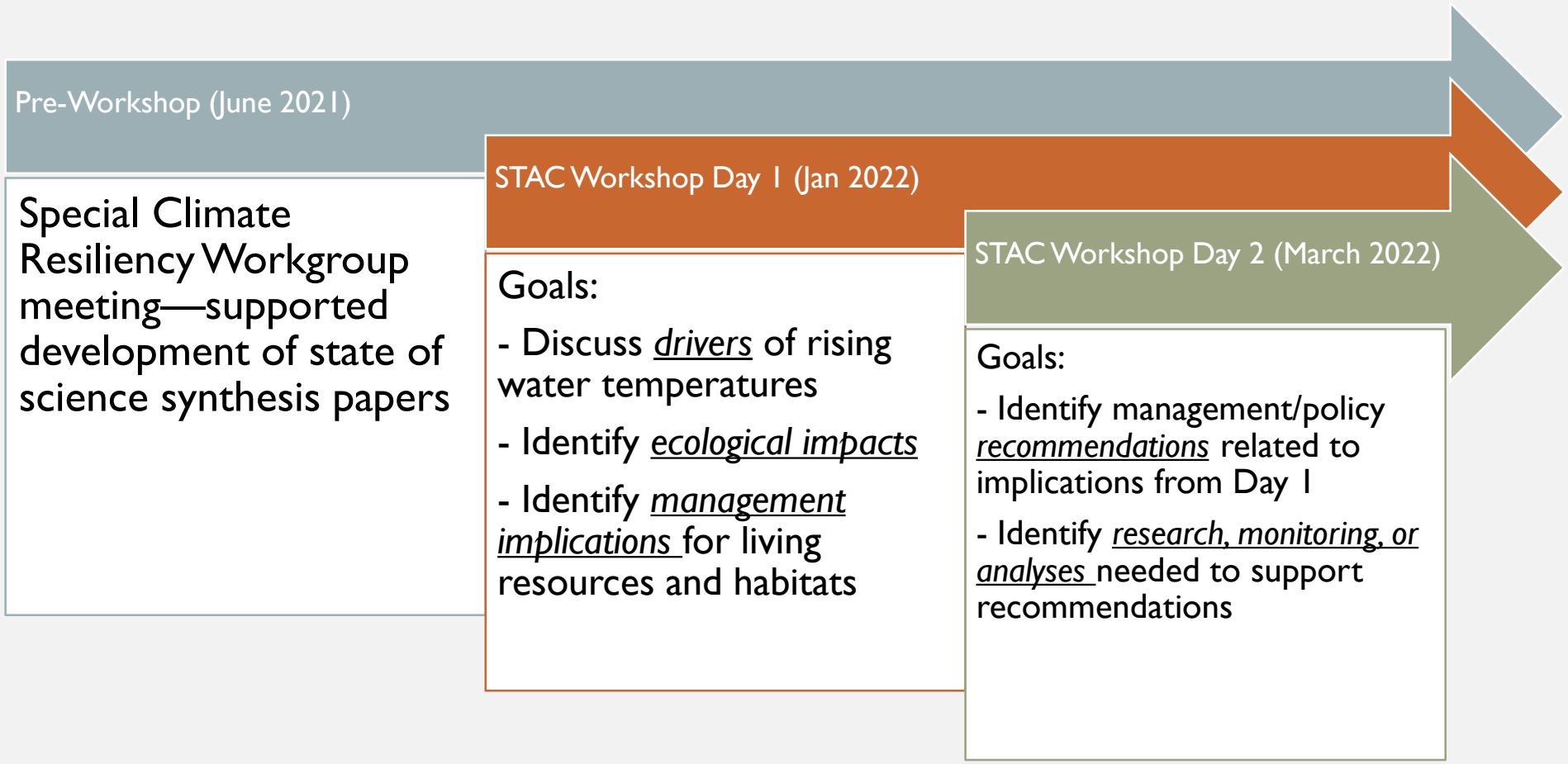
June CRWG Monthly Meeting

June 29th, 2022

1:30PM-3:30PM

WORKSHOP OBJECTIVES



See Synthesis Papers & Briefing Papers for More Information

BMPs- Forest Buffers

Fisheries- Brook Trout

Watershed

Mitigation
Lowering of Water Temps

Tidal

Adaptation
Minimize Impacts & Adjust

Submerged Aquatic Vegetation (SAV)

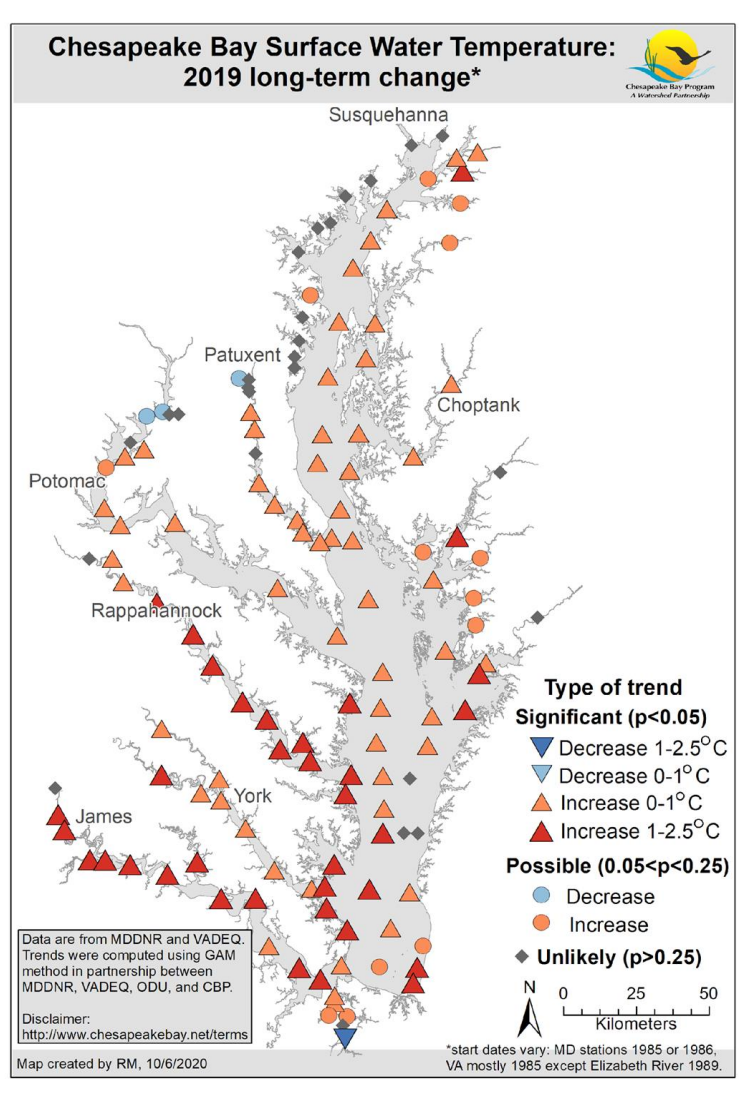
Oysters

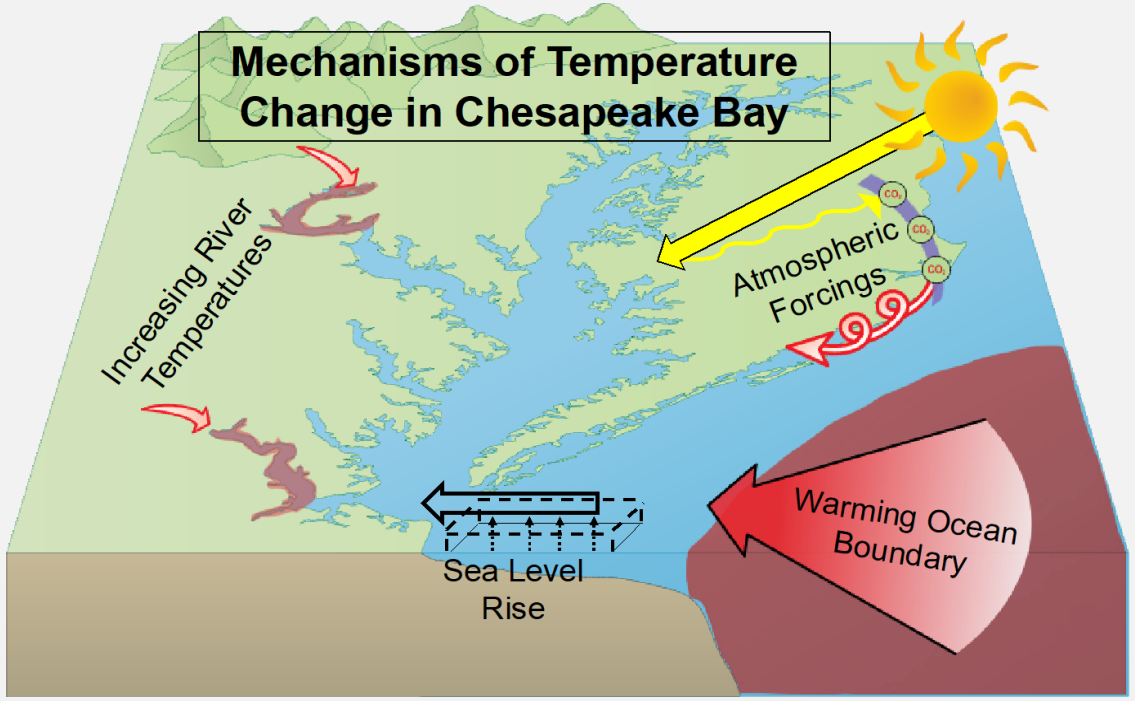
Blue Crabs

Forage
(Menhaden, Bay anchovy, benthic invertebrates)

Striped Bass

CHESAPEAKE BAY TIDAL WATER TEMPERATURES HAVE BEEN INCREASING OVER THE PAST THREE DECADES





Over the Past 30 Year Period

Annual average: +~0.7°C increase

Summertime: +1.0 °C increase

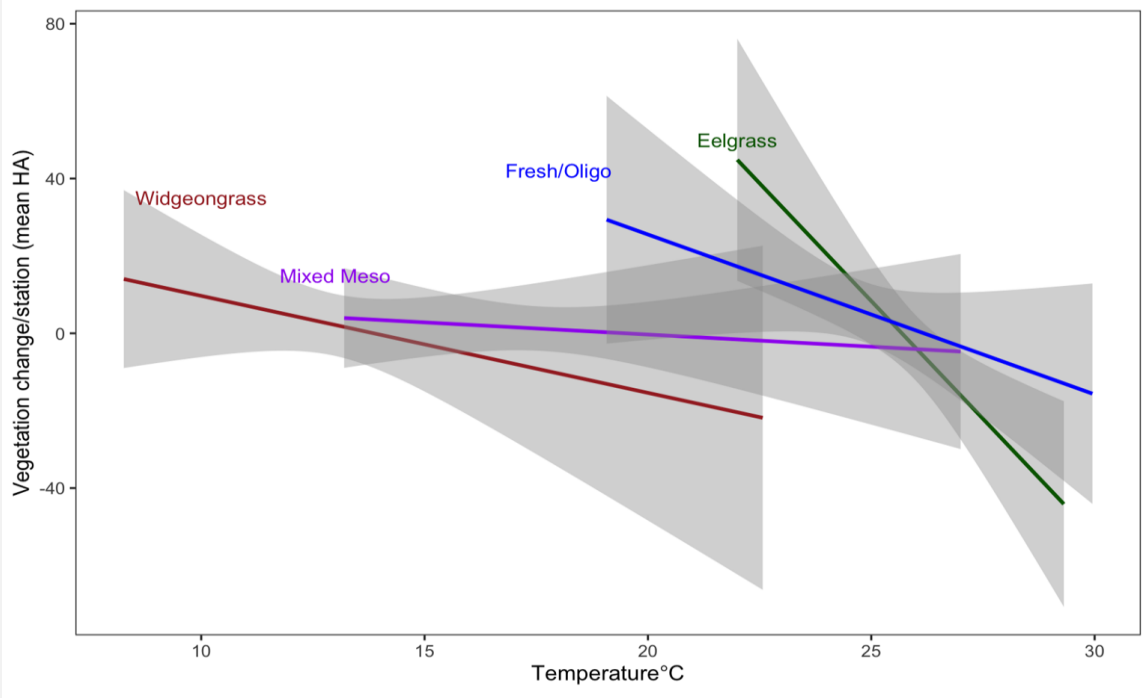
Wintertime: +0.3°C increase

ECOLOGICAL IMPACTS

- Fisheries:
  - Positive impacts are likely for blue crab and some forage species
  - Negative impacts are predicted for oysters
  - Striped bass may experience both negative and positive

POSITIVE
DIRECT
Increased growth rates & earlier maturation
Reduced winter mortality (blue crabs & oysters)
INDIRECT
Longer spawning and/or growing season
More algae/food (oysters)

NEGATIVE
DIRECT
Reduced survival due to detrimental temperature ranges (more so during earlier life stages)
INDIRECT
Increased hypoxic conditions
Ocean Acidification (OA)
Increases in pathogens/disease occurrence (old & new)
Alteration in food resources (abundance & quality)
New non-native predators



- Submerged Aquatic Vegetation:
  - Viable populations of eelgrass likely to be extirpated
  - Impacts to other SAV not as well studied
  - CO_2 fertilization effect may provided some counterbalance to impacts of warming

FOUR MAIN THEMES

Ecosystem-Based Management

- Considerations related to seasonal shifts, prey availability, & habitat change and suitability

Multiple Stressors

- Considerations related to co-occurring stressors and extreme events (e.g., marine heat waves, increased precipitation)

Nearshore Habitats

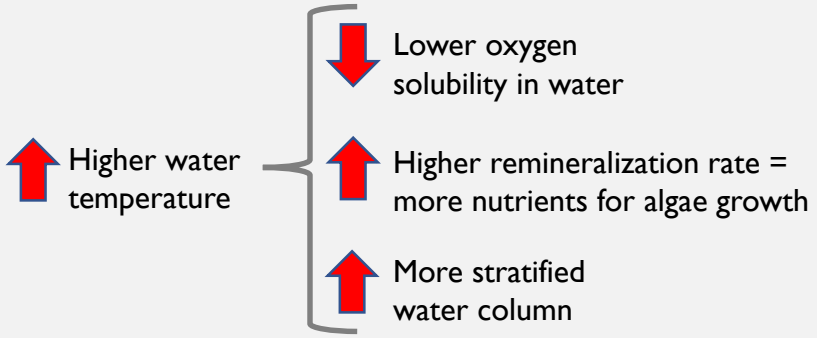
- Considerations related to strategically co-locating certain restoration efforts or watershed best management practices (BMPs) to maximize resilience of nearshore habitats

New Temperature Regime

- Considerations of the pros and cons of an ecosystem shift to a new temperature regime in Chesapeake Bay (e.g., changes in species distributions; new species moving in; new pathogens; BMP effectiveness)

Implications of Ecosystem-Level Effects, Multiple Stressors & Extreme Events on Survival & Habitat

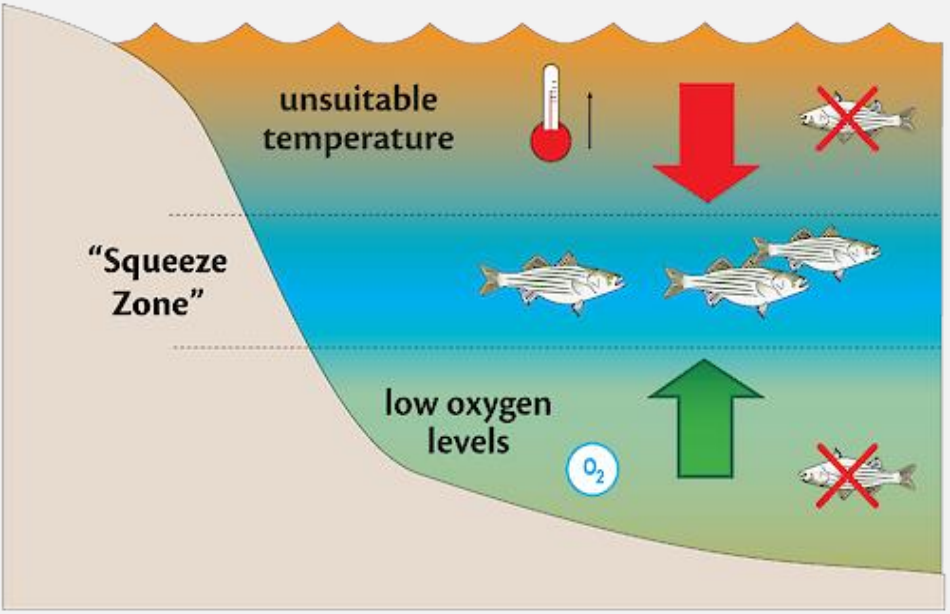
- Shifts in species ranges and habitats
- Some Bay species' populations are shifting north while other species from the south are becoming more prevalent in the Bay



All combined = even lower dissolved oxygen

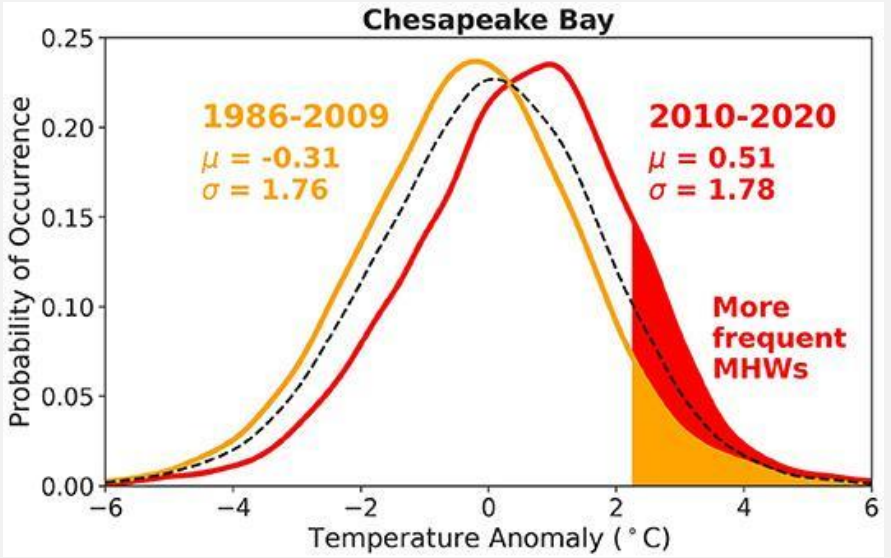
- Reduced SAV habitat from sea level rise and hardening of shorelines
- Changes in the intensity, duration, & frequency of marine heat wave events & effects on survival

Squeeze Zone for Striped Bass



Conceptual diagram illustrating the compressed habitat of the striped bass from the low oxygen levels from the bottom, and the unsuitable unsuitiable tempatures on the top waters.
Diagram courtesy of the Integration and Application Network (ian.umces.edu), University of Maryland Center for Enviromental Science. Source: Boesch, D.F. (editor). 2008. Global Warming and the Free State: Comprehensive Assessment of Climate Change Impacts in Maryland. Report of the Scientific and Technical Working Group of the Maryland Commission on Climate Change. University of Maryland Center for Environmental Science, Cambridge, Maryland. This report is a component of the Plan of Action of the Maryland Commission on Climate Change, submitted to the Governor and General Assembly pursuant to Executive Order 01.10.2007.07.

- Reduced water clarity & salinity from increased precipitation effects on SAV & oysters
- SAV community changes & effect on habitat-use by fish and crabs



Source: Mazzini and Pianca 2022

DECISION MAKING PROCESS

- Objectives for Day 2 of the Workshop:
  - identify management and policy recommendations;
  - identify the research, monitoring, or analysis needs to support these recommendations.
- Four breakout room sessions identified recommendations for each of the four main themes
  - Post breakout sessions participants weighted in on feasibility and impact of recommendations
- Five recommendations were selected by the Tidal Subgroup leads based on workshop discussions, development of the recommendation (e.g. rationale, science needs, and implementation steps), feasibility, and impact

ECOSYSTEM-BASED MANAGEMENT RECOMMENDATION

- Establish Chesapeake Bay wide Striped bass fishing guidance based on temperature and dissolved oxygen thresholds to reduce catch and release mortality.

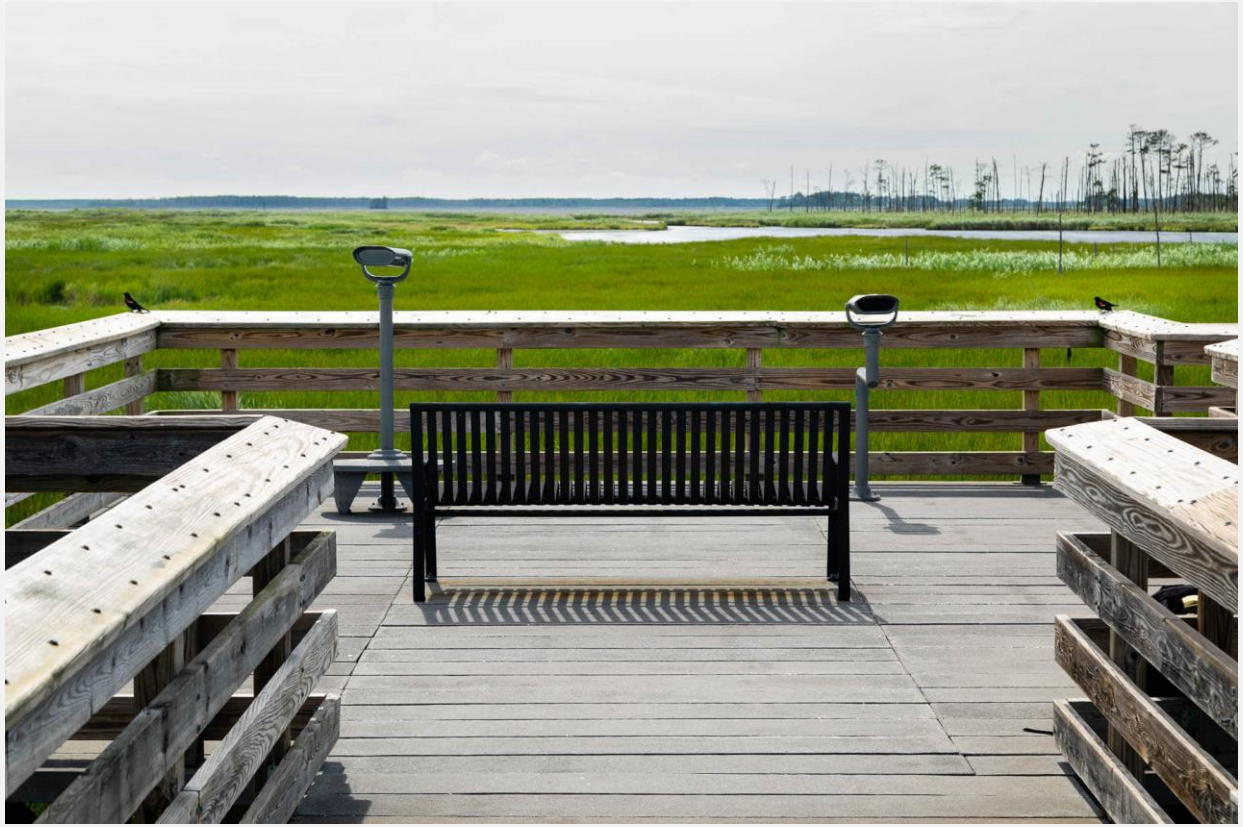
- Consider developing habitat condition thresholds and fishing guidance for other recreationally targeted species at risk during periods of poor habitat conditions.

ASSOCIATED SCIENCE NEEDS

- Determine temperature and oxygen thresholds for striped bass and other key species.
- Conduct investigations to better understand behavior of anglers on the water
- Develop habitat suitability models and indicators for key fishery resources

NEARSHORE HABITAT RECOMMENDATION

- Chesapeake Bay Program partners should develop common criteria and metrics to help target, site, design and implement tidal natural infrastructure projects in the nearshore where ecological and climate resilience benefits are highest.

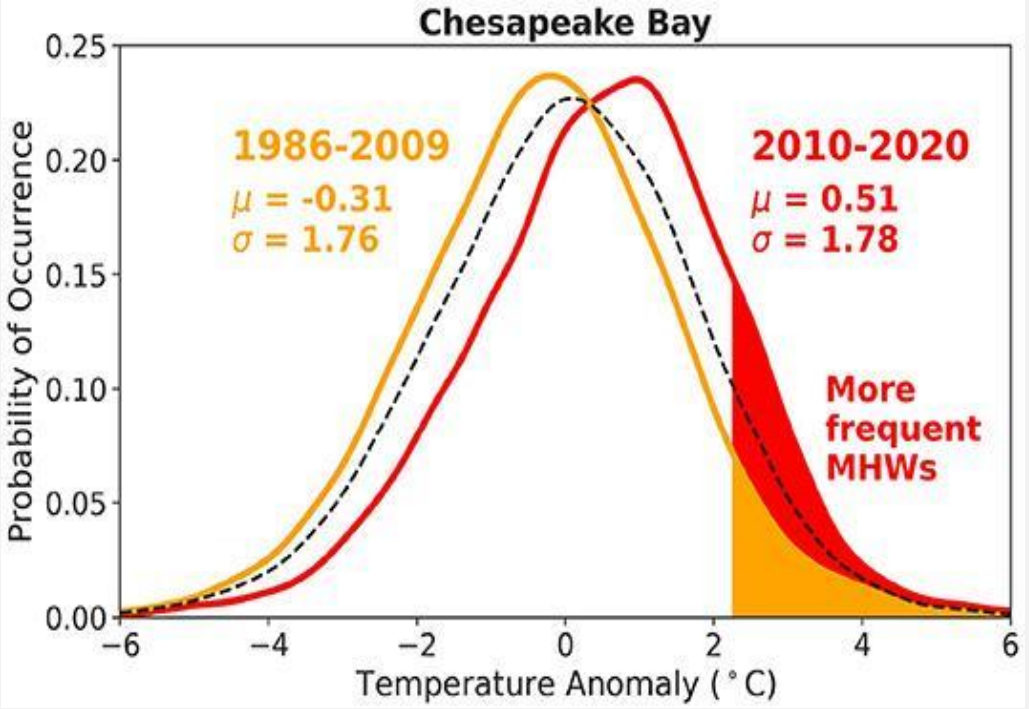


ASSOCIATED SCIENCE NEEDS

- Detailed analysis of costs of natural infrastructure versus hardened infrastructure
- Threshold analysis of ecological impacts and benefits
- Research into behavioral drivers behind shoreline hardening decisions.
- Development of criteria for targeting where multiple benefits and ecosystem services can be optimized.
- Use of models to increase understanding of habitat change from sea level rise

MULTIPLE STRESSORS RECOMMENDATION

- An interdisciplinary team of scientists, resource managers, meteorologists, and communicators should collaborate to design and create a publicly available heat wave alert system.



Source: Mazzini and Pianca 2022

ASSOCIATED SCIENCE NEEDS

- Review current definitions of heat waves and conduct research to determine an appropriate definition for Chesapeake Bay (or tributaries as appropriate).
- Explore real time monitoring of marine heat waves and need for forecast products.
- Link heat waves to living resources by analyzing heat waves and fishery survey data such as ChesMMAP.
- Incorporate dissolved oxygen and link to habitat preferences of key species such as striped bass, blue crabs, oyster, and SAV.
- Development of the warning system
- Outreach to public, and to partners in development

NEW TEMPERATURE REGIME RECOMMENDATION 1

- Develop and implement a strategy to improve communications between living resource managers, scientists and stakeholders on the new temperature regime, the impacts and management response/adaptation strategies.

ASSOCIATED SCIENCE NEEDS

- Understand where the gaps are in our current communication strategies
- Social science research to help understand decision making (e.g., understanding behavior of anglers on the water when throwing back or keeping catches, understanding property owners' choice in shoreline protection)
- Development of communication strategies to specific audiences (e.g., policy-makers, managers, residents, local partners)

NEW TEMPERATURE REGIME RECOMMENDATION 2

- Explore strategic, long term ways to advance ecosystem approaches to fishery management in the Bay. This would include developing climate predictions and assessing the risks of environmental drivers on fishery species and their habitats to inform fishery management planning and decisions.

ASSOCIATED SCIENCE NEEDS

- Improve environmental monitoring of surface and bottom temperature, dissolved oxygen and fish habitat condition
- Explore a State of ecosystem report level synthesis for the Chesapeake Bay to track how climate change is progressing and for use by managers to adapt actions addressing the changes appropriately.
- Better understanding of physiological response of certain species
- Explore assessments for emerging fisheries to facilitate management as climate change creates conditions for these fisheries to be economically viable.
- Consider establishing monitoring stations where there are significant fisheries habitat and spawning grounds (long-term monitoring currently is more set up to characterize large bay segments).
- Evaluate need for zooplankton monitoring at spawning and nursery areas.
- Improve information on drivers of natural mortality and recruitment success for key fishery species and build into ecosystem models- inclusion of how climate change will affect fisheries.

QUESTIONS?