

Meeting 1 Summary

Workgroup on
Developing a Climate-Resilient Fishery Management Plan for Maryland
June 23, 2026
4:00-6:00 PM
Tawes State Office Building, Room C-1 Conference Room

Attendance

Workgroup Members

Kiley Dancy, Mid-Atlantic Fishery Management Council
Harry Hornick, Retired DNR
Henry Legett, Smithsonian Environmental Research Center
Mariah Livernois, Maryland Coastal Bays Program
Will Poston, Chesapeake Bay Foundation
Julie Reichert-Nguyen, NOAA Chesapeake Bay Office
Dave Sikorski, Coastal Conservation Association
Ward Slacum, Oyster Recovery Partnership
Troy Tuckey, Virginia Institute of Marine Science

DNR Staff

Amanda Malagari, DNR Project Lead
Tammy O'Connell
Jacob Holtz
Mike Luisi
Kate Charbonneau
Andrew Loftus, Workgroup Facilitator

Workgroup Members Not Attending

Greg Casten, ProFish Seafood Company
Sonny Gwin, Commercial Fisherman, Ocean City Maryland
Jorge Holzer, University of Maryland, College Park
Kenneth Rose, Horn Point Laboratory UMCES
Bill Sieling, Chesapeake Bay Seafood Industries Association
Taylor Woods, USGS Eastern Ecological Science Center

Pre-Meeting Background Materials

- Agenda (see Appendix A)
- Climate Change Key Facts (see Appendix B)
- [Climate-Ready Fisheries Planning Menu](#)
- Key Terms for Adaptation and Resilience (see Appendix C)

Welcome

Andrew Loftus, Group Facilitator (see Appendix B)

Andrew Loftus welcomed the group, thanking them for their participation and introducing the project lead Amanda Malagari. He noted that this workgroup is different from the advisory commissions and committees that DNR engages and that it wasn't intended to advise on policy but is primarily for gathering the thoughts and input of individuals to feed into the formal process for developing a climate resilient Fishery Management Plan covering all estuarine and marine species. Specifically, the outlined work group objectives are to:

1. Exchange existing climate and fisheries data and industry knowledge, and;
2. Collaboratively develop a climate resilient fishery management plan (FMP) for state-managed fisheries

Loftus concluded by outlining some of the logistics for this workgroup process.

Introductions and Environmental Change Observations

Workgroup members and attendees were asked to introduce themselves and provide one observation of their individual experience with climate-related impacts to fisheries.

Observations included:

- Observing changes in coastal bays from the earlier generations when family members owned waterfront property;
- Changes in fishing regulations that became necessary as species composition, spawning success, and species occurrences shifted as a result of altered environmental conditions;
- New fisheries developing as species that had rarely occurred here moved into the Bay and became common occurrence fisheries (e.g., tarpon, Spanish mackerel, cobia, etc.);
- Reduced spawning success of striped bass under current-day environmental conditions;
- The need to change (and sometimes expand) sampling programs to make sure that the species of interest are occurring in the same habitats and at the same times as in past sampling programs;
- Species that can't move (e.g., oysters) having to adapt to changing conditions (salinity, water temperatures etc.) in place or failing to thrive under new conditions;
- Required changes in governance of fisheries on the coast as species ranges and distributions change up and down the coast;
- Connecting climate and environmental change to the management and governance of fisheries;
- Substantial shifts of summer flounder occurrences and fisheries, causing changes in management.

Climate-Related Factors Projected to Impact Fisheries

Amanda Malagari (see Appendix B)

Amanda Malagari provided a comprehensive overview of observed climate and environmental changes in the Chesapeake region. Workgroup members posed the following questions and comments:

Question: Does this workgroup address habitat?

Answer: Maybe in the context of how the DNR Fishing and Boating Services can integrate with the appropriate agencies and entities that impact habitat.

Comment: Fisheries managers can take actions to control fishing mortality but not much more. The department needs to be more aligned to how appropriate divisions integrate on a common direction. For example, oysters are much more than a “fishery” but are integral to habitat for other fisheries and should be considered in that context.

Comment: Natural adaption processes are occurring in the ecosystem. We are keeping an eye on them to assess how they can be leveraged.

Comment: There are geographic patches in the Bay. We need to determine how that variability affects species?

Comment: A plan should outline specific pathways for making decisions or engaging with authorities for maximum flexibility and effectiveness.

Comment: The plan needs to be detailed enough so that we have actions but broad enough that we can reach out to different resources and funding organizations. Formalized triggers would be a prescriptive action.

Comment: The Ecosystem Approach to Fisheries Management could serve as a model for how to organize guiding principles and actions.

Comment: Incorporating aspects to address habitat will be key to resiliency!

Comment: We need to address how to cover new species that have not yet entered the fishery; new species that will move in as conditions change.

Comment: Administrative aspects need to be considered and addressed in a plan, such as potential need for additional funding to adapt data capture (e.g., monitoring programs) as monitoring programs may need to be expanded over larger periods of time and geographic regions to keep pace with changes in species distributions.

How Does a Climate Resilient FMP Fit into Department Wide Resilience Goals

Kate Charbonneau, Assistant Secretary for Aquatic Resources

Kate Charbonneau provided some context of how the climate resilient fishery management plan will interact with the overall department-wide resiliency efforts. The better input that the department can get from this group on fisheries, the more it will influence the overall department wide climate resilience plan. It's important that workgroup members bring the perspectives and experiences in dealing with changing fisheries to the forefront during this process to develop a plan that can meet the needs of constituents under future environmental conditions.

Reflecting on the Impacts of a Changing Environment

Workgroup participants were provided fifteen minutes to write down ways that the environment has changed over their lifetime and what they have done to cope with or adapt to it. These were categorized as fishing resources, fishing industry, or management.

Prompt: Reflect on your experience with a changing environment. What is one way the environment has changed over your lifetime? What have you done to cope with or adapt to it? Categorize it as fishing resources, fishing industry, or management.		
Resources	Industry	Management
Changing seasons & weather patterns affecting seasonal migration and productivity leads to data survey challenges. I've found myself adapting to these changes by fishing for things in different times of the year or shifting effort to relieve stress on struggling species.	Fluctuations in availability of fisheries products (e.g., oysters) from other states and how that influences the viability of local industry.	Changing species distributions and/or differential changes in productivity by region (e.g., black seabass). Leads to management action to reconsider allocation to reflect more recent distributions but also account for shoreside impacts/communities.
Predator-prey mismatch with seasonal change and how it affects different species recruitment.	White shrimp fishery - commercial in Virginia; no regulations for recreational.	Spring warm temperature changes -warming earlier. Spring striped bass spawning stock sampling started earlier.
Formation of cold plumes off NE Atlantic moving into the Bay during the fall. Overall geographic variability of anomalies; warm & cool areas in the Bay compared to climatological baseline. How does it affect fish movement/migration?		
I grew up fishing for wild trout in Montgomery		

<p>Prompt: Reflect on your experience with a changing environment. What is one way the environment has changed over your lifetime? What have you done to cope with or adapt to it? Categorize it as fishing resources, fishing industry, or management.</p>		
Resources	Industry	Management
County. Over time, those populations have blinked out. Now I don't fish those areas anymore – lost access.		
Warmer spring temperatures and higher variation in temperatures = shifts in Bay and coastal migration. Reduced habitat leads to shift to other species.		
Greater variability with back-to-back extremes (more heat waves/cold snaps) during transition of seasons (winter-spring; fall-winter). Unknown how it affects recruitment. Info: NOAA Chesapeake Bay Office Seasonal Summaries; NOAA Rare Events Research with UMCES.		
Increasing uncertainty and extremes in weather events (e.g., hurricanes, cold snaps) can directly affect fishing resources (fish kills, precip events, etc.) but also fishing industry and infrastructure.		
Changing productivity of striped bass leads to fishing for other species.		

What Do We Want from this Workgroup at the End of Three Meetings

Amanda Malagari and Tammy O'Connell (see Appendix B)

Amanda Malagari provided a summary of what input would be helpful from this workgroup at the conclusion of this process. In summary, the department would benefit if they could develop a toolbox for adaptation strategies that can be pulled out when needed. One example of such a toolbox is outlined in the California Marine Life Management Act (<https://wildlife.ca.gov/Conservation/Marine/MLMA>).

Focus of Future Meetings

Workgroup participants suggested topics that would help them to accomplish their task in future meetings. Suggestions included:

- Clarity on the function and structure of fishery management plans
- The fishery management planning process overall
- The current parameters around regulatory authorities and where we may need to wade into new territories
- Specific examples of how this will integrate into existing fishery management plans
- How do the Fishing and Boating Services plans integrate with MAFMC and ASMFC?
- What tools are available for understanding vulnerability
 - Projected changes in fish distribution and timing
 - Habitat suitability modelling
 - We could use striped bass as a case study

Scheduling the Remaining Three Meetings

Meeting 2 of this workgroup will take place Thursday, July 30 from 4:00-6:00 pm. The meeting will offer a Virtual option but participants are encouraged to attend in-person at the DNR Tawes Building if possible.

Meetings 3 and 4 will be scheduled using a meeting scheduling platform sent out to the workgroup in the coming weeks.

6:15PM – Workgroup was adjourned

Appendix A. Workgroup on Developing a Climate-Resilient Fishery Management Plan for Maryland

June 23, 2026

4:00-6:00 PM

Tawes State Office Building, Room C-1 Conference Room

Background Materials

- [Climate-Ready Fisheries Planning Menu](#)
- Key Facts Handout
- Terms for Adaptation and Resilience

Meeting Agenda

- | | |
|---------|--|
| 4:00 PM | Welcome – Andrew Loftus, Group Facilitator
Workgroup purpose
Self-Introductions, including one individual experience with the impacts of environmental change
Workgroup principles and ground rules |
| 4:30 PM | Climate-related factors predicted to impact fisheries – Amanda Malagari and Tammy O’Connell |
| 5:00 PM | Activity – Reflecting on the impacts of a changing environment |
| 5:30 PM | How does a climate resilient FMP fit into department wide resilience goals – Jackie Specht |
| 5:35 PM | What do we want from this workgroup at the end of 3 meetings / Topics for future meetings – Amanda Malagari and Tammy O’Connell |
| 5:45 PM | Scheduling remaining three meetings / Initial thoughts about sources of information (speakers etc.) needed in future meetings |
| 6:00 PM | Adjourn |

Appendix B. Presentation Slides

Presentation Topics

Welcome

Climate Factors Projected to Impact Fisheries

What do we want from this workgroup at the end of 3 meetings?



Welcome to the Adaptation and Resilience FMP Workgroup

June 23, 2026
Fishing and Boating Services

Workgroup Objective

1. Exchange existing climate and fisheries data and industry knowledge
2. Collaboratively develop a climate resilient fishery management plan (FMP) for state-managed fisheries

Geographic Focus: Chesapeake Bay and Atlantic coast





Timeline

Summer 2026

- June 23 - Workgroup Meeting 1 (in person)
- July - Workgroup Meeting 2 (hybrid option)
- August - Workgroup Meeting 3 (virtual)
- September - Workgroup Meeting 4 (virtual)
- October - Develop Summary Input Document
(DNR staff with review/input of Workgroup)
- November to March - Develop FMP
(DNR staff with review/input of Workgroup)

Spring 2027



Workgroup Members

First	Last	Affiliation
Greg	Casten	Profish Seafood Company
Kiley	Dancy	Mid-Atlantic Fishery Management Council
Sonny	Gwin	Commercial Fisherman, Ocean City Maryland
Jorge	Holzer	University of Maryland, College Park
Harry	Hornick	Retired DNR
Henry	Legett	Smithsonian Environmental Research Center
Mariah	Livernois	Maryland Coastal Bays Program
Will	Poston	Chesapeake Bay Foundation
Julie	Reichert-Nguyen	NOAA Chesapeake Bay Office
Kenneth	Rose	Horn Point Laboratory of the University of Maryland Center for Environmental Science
Bill	Sieling	Chesapeake Bay Seafood Industries Association
Dave	Sikorski	Coastal Conservation Association
Ward	Slacum	Oyster Recovery Partnership
Troy	Tuckey	Virginia Institute of Marine Science
Taylor	Woods	USGS Eastern Ecological Science Center
Andrew	Loftus	Facilitator (aloftus@andrewloftus.com)



Workgroup Procedures pt. 1

- There is no Workgroup chair. The facilitator will serve as the discussion leader of meetings and work in conjunction with DNR staff to plan and coordinate the meeting process.
- There will not be “votes.” The objective of this Workgroup is to gather information to be used in formulating and FMP, not provide ranked policy recommendations.
- Each member will strive to listen actively, be open-minded and be respectful of other members, the public, concepts and ideas. There will be no personal attacks or threats. Keep questions/comments to the point.
- Limit topics to those that contribute to meeting the Workgroup objectives.



Workgroup Procedures pt. 2

- If a topic requires more time than originally allocated on the agenda, the topic may be a candidate for further discussion at a future meeting.
- Workgroup members should plan to participate in every meeting. If unavoidable, a “proxy” may be offered but must be communicated to facilitator at least 1 day in advance of meeting.
- Only Workgroup members or a proxy will sit at the meeting table.
- We will develop mechanisms for members of the public to provide input.



Getting to Know the Workgroup Members

Please share with us:

- Why did you join the workgroup?
- What is one way the environment has changed over your lifetime?

What do you do when you catch a fish you have never seen before?



Key Message:

Environmental and climate conditions
in Maryland are already changing

Since the late 1990s, **annual temperature** has been
warmer than the average of 1961-2010
(Baltimore, showyourstripes.org)



MORE HOT SUMMER DAYS



Average summer days (June, July, August) above NCEI 1991–2020 climate normal.
Source: NOAA (ACIS). Accessed: 04/21/2026.



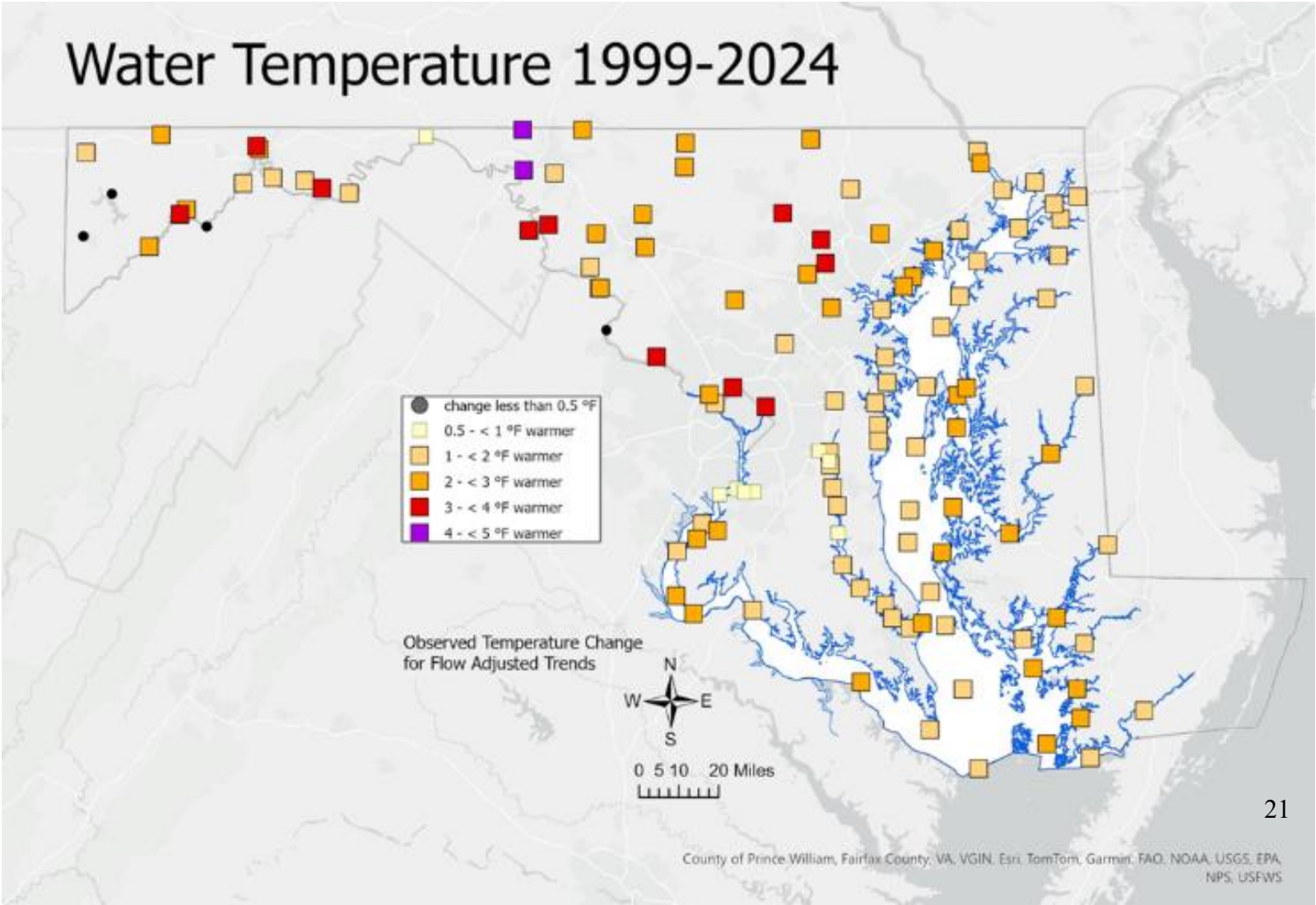
MORE WARM WINTER DAYS

DAYS ABOVE NORMAL



Annual winter (December, January, February) days above NCEI 1991-2020 climate normal.
Source: NOAA (ACIS)

Water Temperature 1999-2024



Rainfall intensity has increased by 11% from 1970-2024 (Climate Central). By 2050, annual average precipitation could be 5-10% higher, but concentrated in more frequent extreme events (>2 inches).



Precipitation influences stream flow and water quality
(e.g., temperature, salinity, oxygen, sedimentation, pollution)

Sideling Hill Creek in the
spring



Sideling Hill Creek during a
summer drought



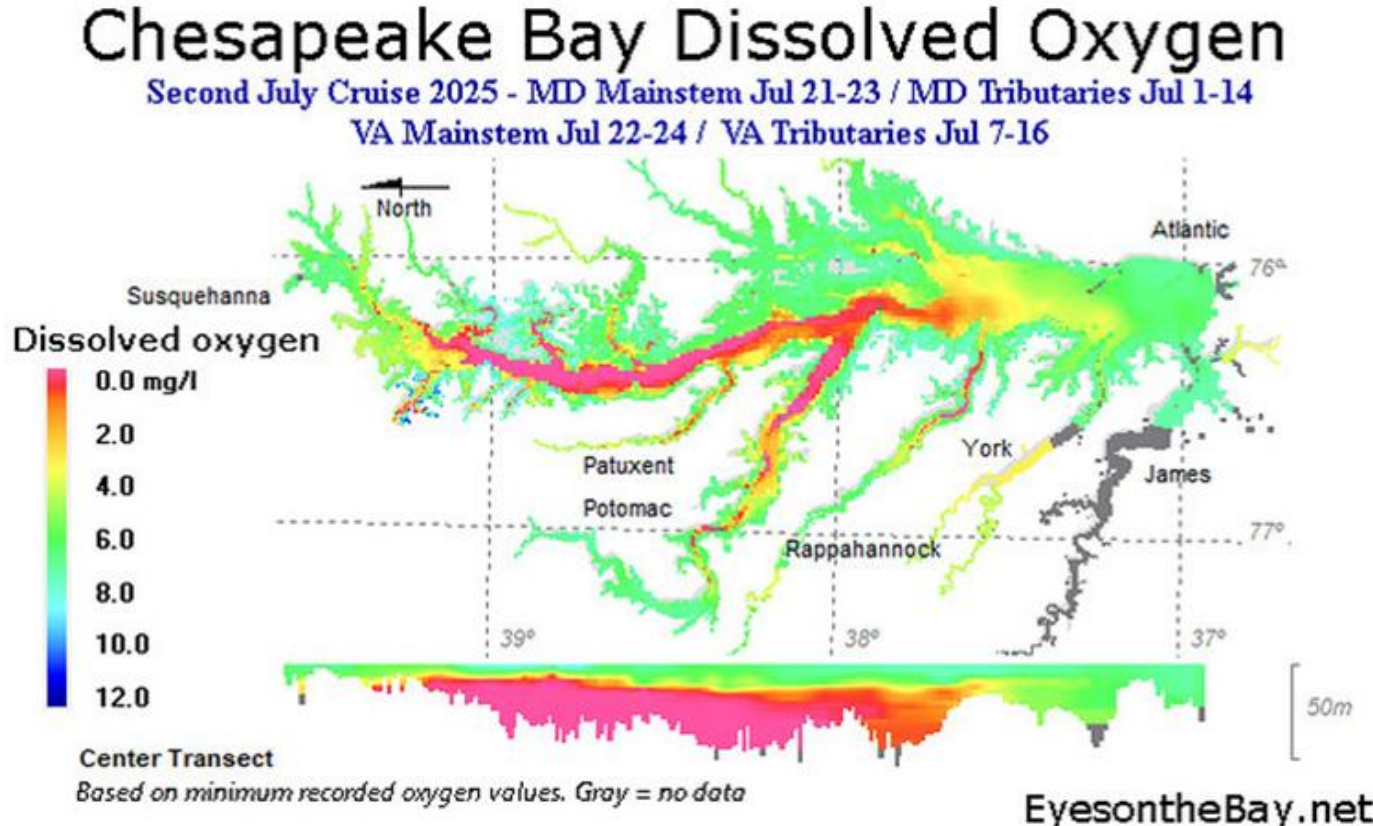
Maryland Coastal Flood Explorer



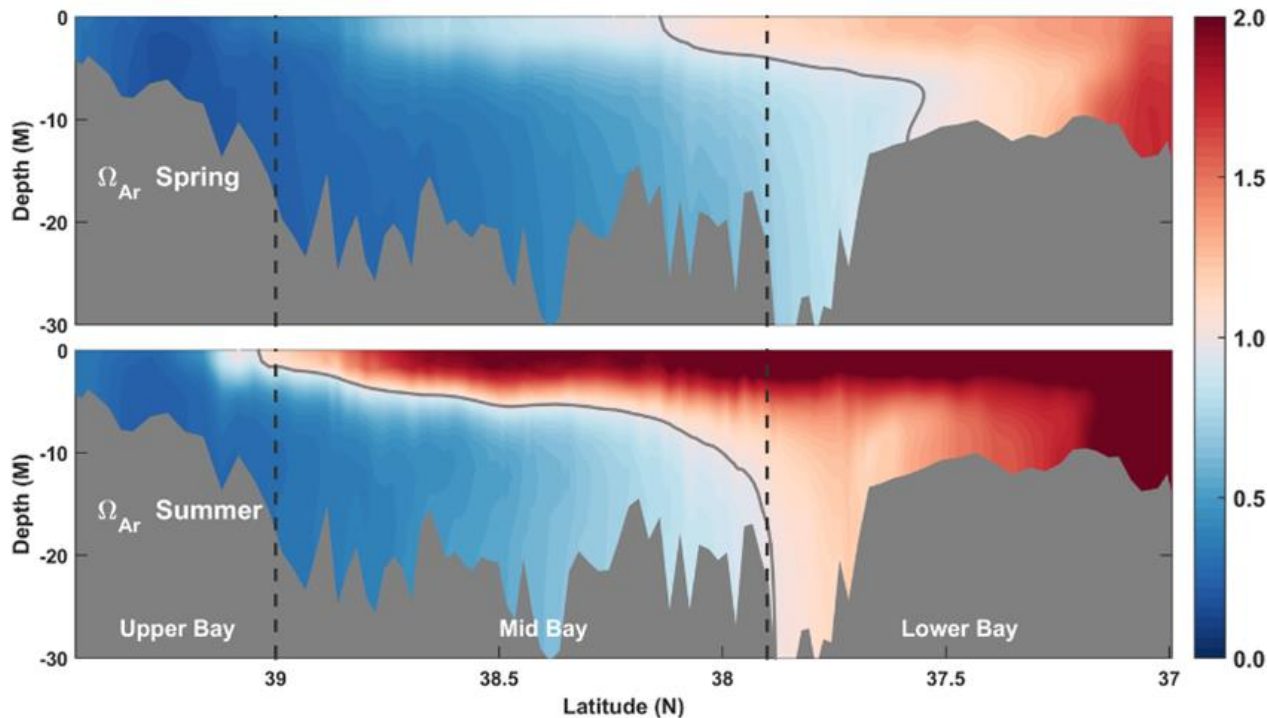
Rising sea levels have converted 25,600 acres of forests and 3,500 acres of farmland into tidal marsh between 1984 and 2020.

The best estimate for Annapolis is an increase of 1.2-1.5 ft by 2050.

Acidification of water bodies is associated with low oxygen “bad” water, especially in the summer.



When carbon dioxide dissolves in water, it triggers a chemical reaction that increases the water's acidity.



Acidity can be measured using aragonite saturation. A lower number indicates higher acidity.

26

(Shen et al. 2020)

Figure 4. Along-channel distribution of long-term averaged aragonite saturation state (Ω_{Ar}) during spring (upper panel) and summer (lower panel). The gray line represents the saturation horizon of $\Omega_{Ar} = 1.0$.

To summarize, we can already observe some environmental changes.

- Water temperature is increasing in tidal and nontidal waters
- Precipitation events and storms are becoming more intense
- The increase in coastal flooding indicates that sea level is rising
- Ocean acidification is associated with low oxygen and low calcium availability



Climate Change is changes in long-term average weather patterns on a global, continental, regional, or local scale occurring as a result of greenhouse gas emissions.

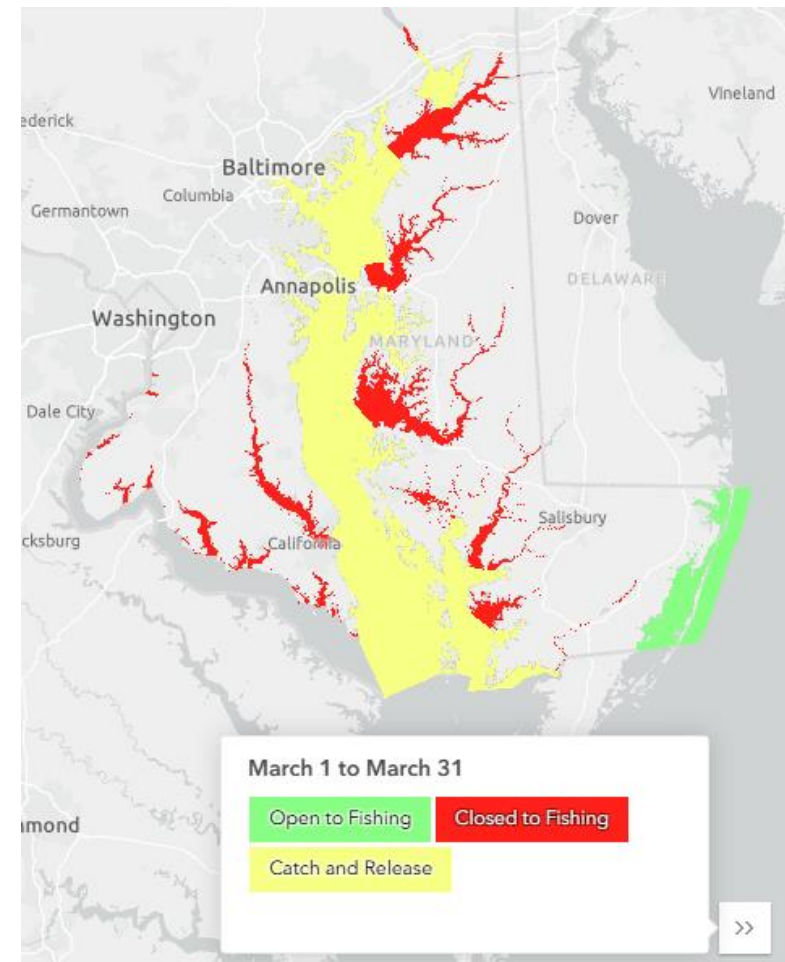
Key Message:

Changes in the environment impact
Maryland's fisheries resources,
fisheries users, and fisheries
management



Impact: Altered Stock Dynamics

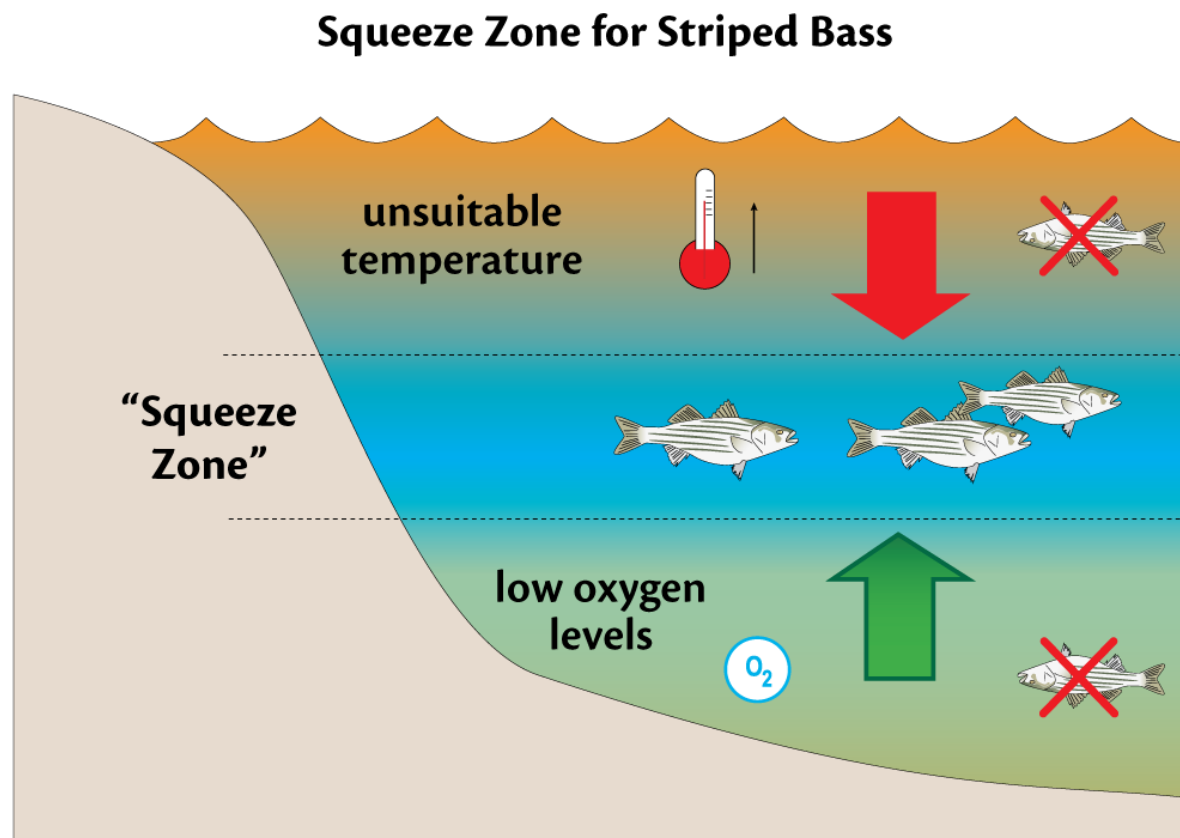
- Spawning behavior, egg production, recruitment
- Survival, growth, maturation
- Stock assessments



Striped bass spawning areas³⁰ are closed during the spawning season.

Impact: Habitat Stress

- Habitat squeeze, release mortality, food availability



Impact: Habitat Stress

- Species have varying sensitivity thresholds to acidification (State of the Ecosystem 2025)

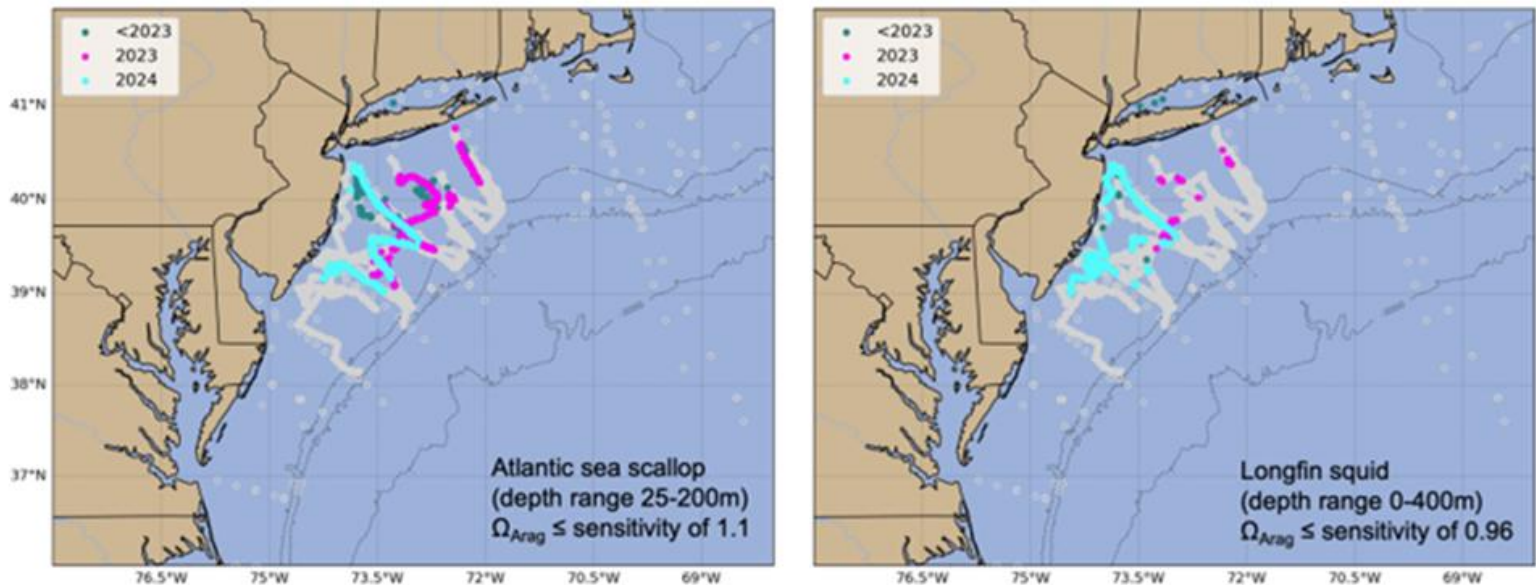
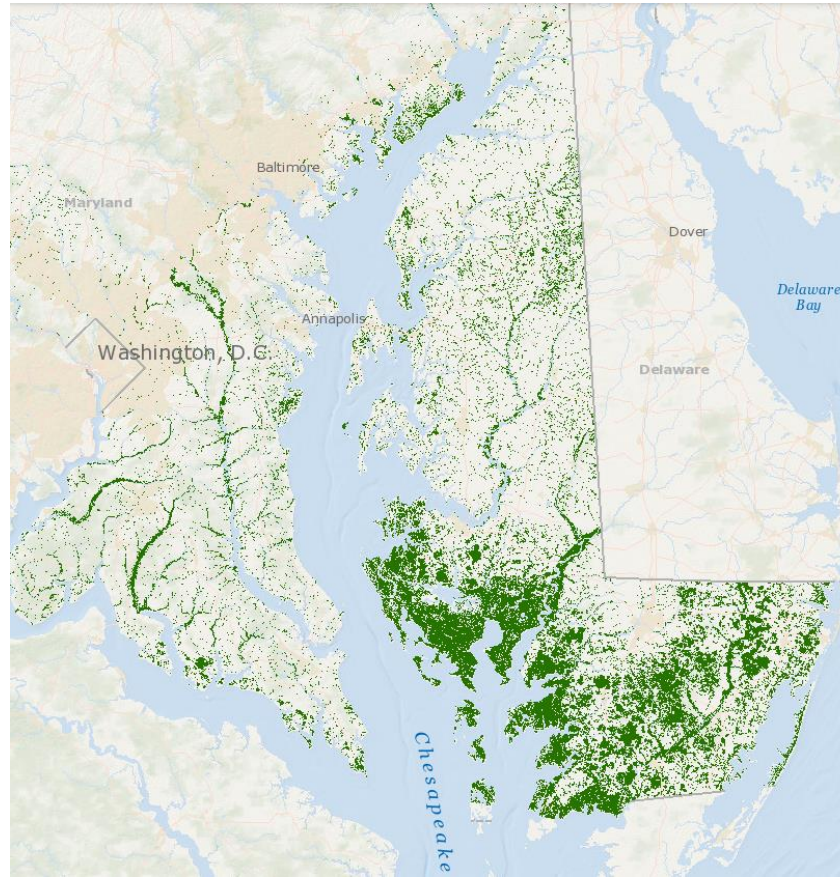


Figure 48: Locations where bottom aragonite saturation state (Ω_{Arag} ; summer only: June-August) were at or below the laboratory-derived sensitivity level for Atlantic sea scallop (left panel) and longfin squid (right panel) for the time periods 2007-2022 (dark cyan), 2023 only (magenta) and 2024 only (cyan). Gray circles indicate locations where bottom Ω_{Arag} values were above the species specific sensitivity values..

Impact: Habitat Stress

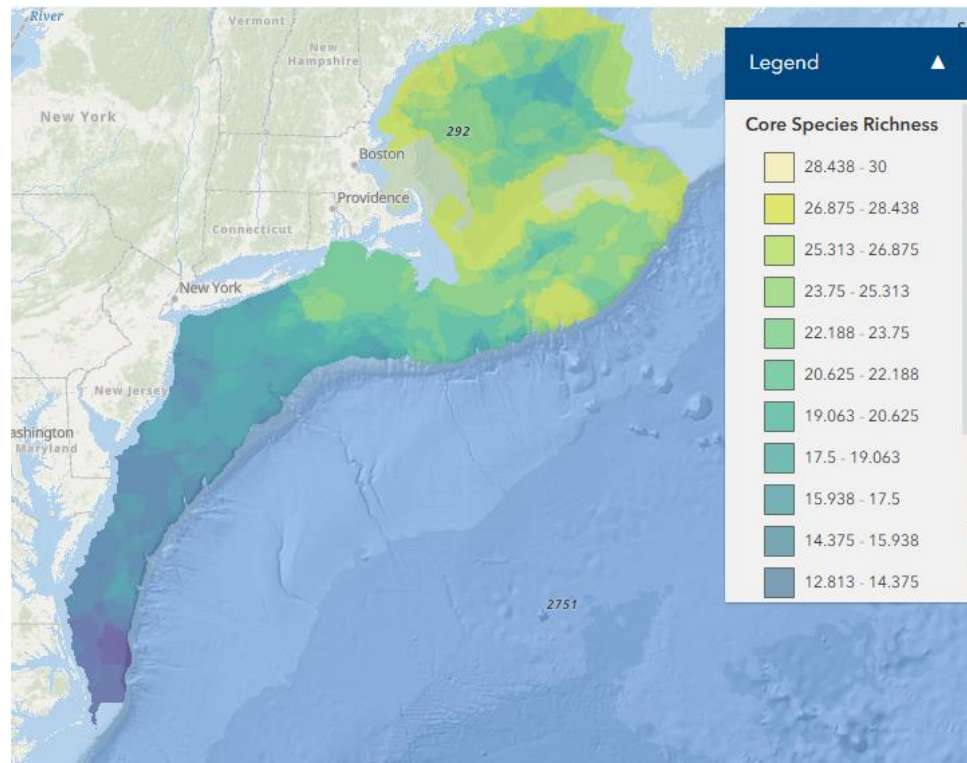
- Marsh migration, seagrass species, oyster reefs



Projected marsh
distribution in 2050,
Maryland Coastal Atlas,
SLAMM Model

Impact: Coastal Migrations and Emerging Fisheries

- Abundance has shifted 56 km north and 22.45 m deep
- The portfolio of available species could fluctuate



Impact: Weakened Coastal Infrastructure

- Flooding, storm damage



Impact: Reduced Fishing Access

- Severe weather (heat, cold, storms)
- Travel distance to fishing grounds



Article by The
Baltimore Banner
thebanner.com/community/climate-environment/chesapeake-bay-ice-breakers-3LJER3AGYFAXVG6WQBHCL7E43U/

Impact: Challenges to Monitoring & Data

- Strained capacity



Impact: Management Action

- Consider innovative options
- Limited authorities
- Regulatory timeline



To summarize, we have currently identified these potential challenges and opportunities:

- Altered stock dynamics (low recruitment)
- Habitat stress
- Coastal migrations and emerging fisheries
- Weakened coastal infrastructure
- Reduced fishing access
- Constraints in monitoring and data collection/sharing
- Management action



Vulnerability is the characteristics of exposure, sensitivity, and adaptive capacity that make a system, asset, or the natural environment more or less susceptible to harm or change.

Key Message:
Environmental and climate change
amplifies existing challenges

Natural resources are impacted by natural and human influences.

- Natural Cycles
 - North Atlantic Oscillation
 - Atlantic Multidecadal Oscillation
- Human Influence
 - Habitat Loss / Development
 - Pollution (toxins, microplastics, nutrients, etc.)
 - Invasive Species



Key Message:
Taking adaptation actions now
reduces our risk in the future



Adaptation is action to prepare for and adjust to new conditions, thereby reducing harm or taking advantage of new opportunities.

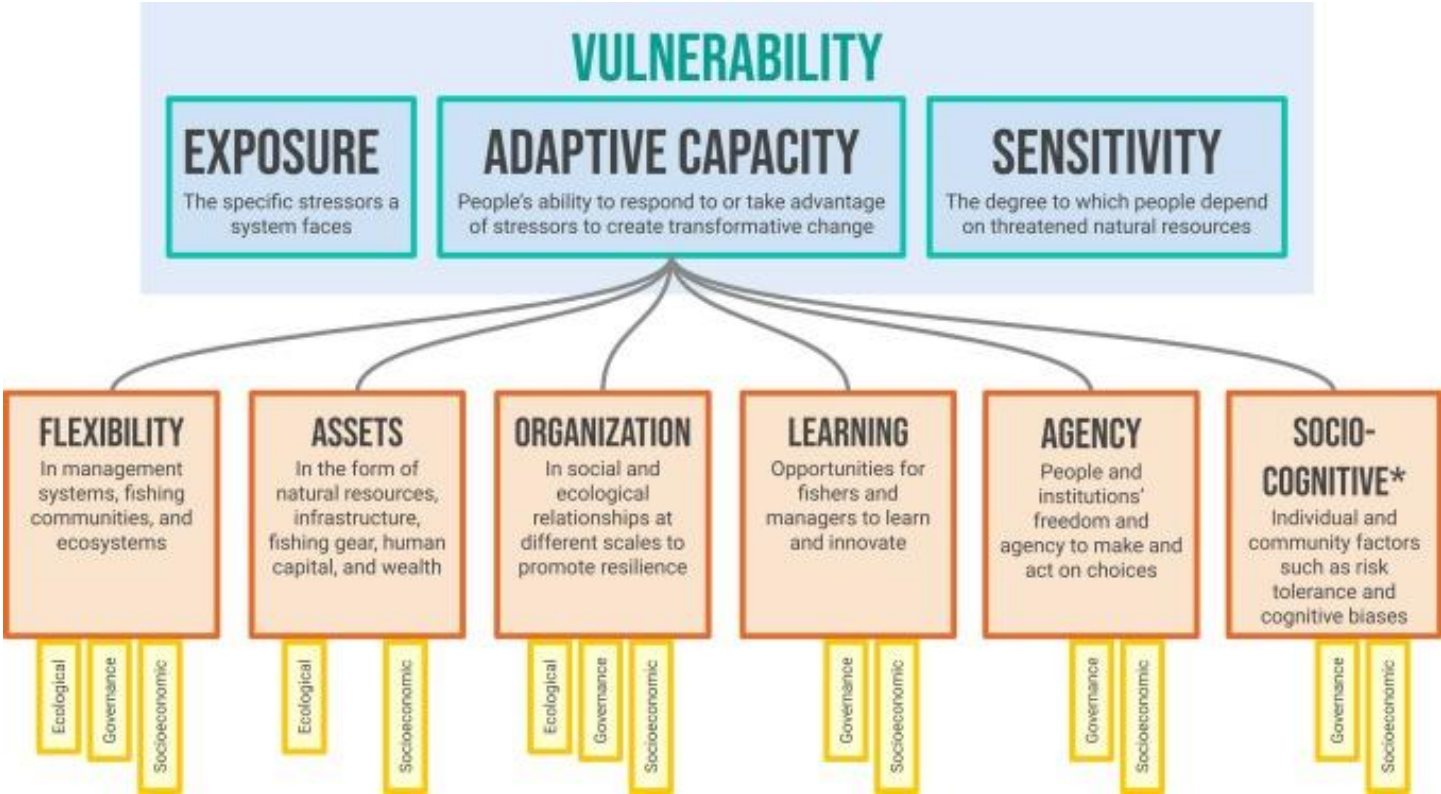


Climate adaptation refers to those actions taken to reduce vulnerability to the impacts of climate change, aimed to enhance the resilience of natural and human-based systems.



Resilience is the capacity of natural and human-based systems to anticipate disturbances, reduce vulnerability, and respond to and recover from heavy disturbances and chronic stresses.

Adapting to environmental changes reduces our vulnerability and makes us more resilient in the long term
(Golden et al. 2024)



Activity

Reflect on your experience with a changing environment.
Write your experience(s) on sticky notes.

- What is one way the environment has changed over your lifetime?
- What have you done to cope with or adapt to it?

Place your note on the board that it most closely relates to:
fishing resources, fishing industry, or management.

Maryland's Vision for a Climate-Resilient Future

Strategic Resilience Plans

Moore-Miller Administration State Plan (2024)

- Making Maryland a leader in clean energy and the greenest state in the country
- **Goal:** Increase resilience through adaptation

Next Generation Adaptation Plan (2024)

- 10-year roadmap that prioritizes the most urgent actions for advancing statewide climate change adaptation
- **Goal:** Expand climate-ready natural resources-based economies
 - Explore opportunities to develop new markets emerging for fisheries as a result of climate impacts

Resilient Maryland Strategy (2026)

- Collaborative strategy for promoting statewide resilience, including resilience for climate change and food security
- **Goal:** Increase sustainable local food production and access



The Climate Resilient Fisheries Management Plan (FMP)

Supports statewide goals for climate adaptation through:

- **Adaptive Stewardship:** Systematic flexibility to adjust seasons and limits for shifting species (e.g., shrimp, blue catfish)
- **Resilience Integration:** Connecting science and industry to maintain the heritage of fishing communities

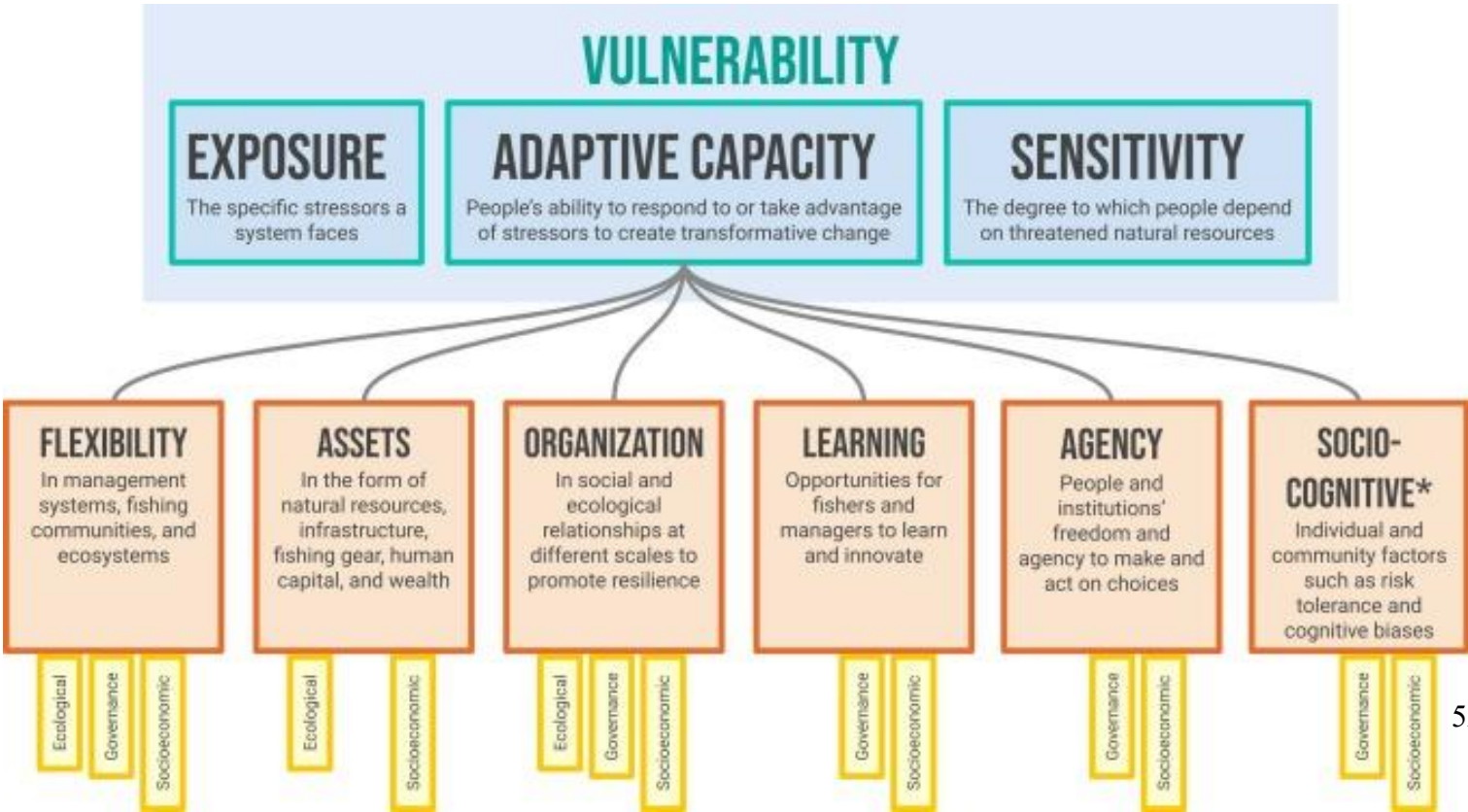
What do we want from this
workgroup?

Outcomes

Help to identify challenges and opportunities that DNR could address in a fishery management plan

- Needs assessment
- Management objectives
- Visioning and goal setting

Discuss how DNR can expand our adaptive capacity (Golden et al. 2024)



Address each fishing component (Adapted from Mason et al. 20)



Ecology
Fish resource
Habitats



Industry
Recreational
Commercial
Dealing/
Processing



Governance
Monitoring
Licensing
Gear
Regulations



Center discussions within the plan's scope

- Focus on what DNR has the authority to implement
- Follow statutory requirements

Use existing plans as a model:

- [California MLMA Master Plan, Chapter 11](#)
- [NOAA Northeast Regional Action Plan](#)
- [Scenario Planning Potential Actions Menu](#)

What topics should we discuss at
future meetings?



Thank you for participating

Appendix C. Adaptation and Resilience Terms

Term	Definition
Adaptation	Action to prepare for and adjust to new conditions, thereby reducing harm or taking advantage of new opportunities.
Climate Adaptation	Actions taken to reduce vulnerability to the impacts of climate change, aimed to enhance the resilience of natural and human-based systems.
Climate Change	Changes in long-term weather patterns on a global, continental, regional, or local scale occurring as a result of greenhouse gas emissions.
Fishery Management Plan	A systematic description of a given fishery or fisheries and the objectives and conservation and management measures for the fishery or fisheries. A fishery management plan serves as a framework for conserving and wisely using fishery resources.
Mitigation	Human intervention to reduce emissions or enhance the sinks of greenhouse gasses.
Resilience	The capacity of natural and human-based systems to anticipate threats, reduce vulnerability, and respond to and recover from heavy disturbances and chronic stresses.
Vulnerability	The characteristics of exposure, sensitivity, and adaptive capacity that make a system, asset, or the natural environment more or less susceptible to harm or change.

Principles of Adaptation

Principle	Description
Prioritization and triage	Based on vulnerability of fisheries resources and on the anticipated effectiveness of actions that attempt to reduce vulnerability
Flexible and adaptive management	Incorporates new knowledge and experience over time Aligns with the existing fishery management framework
“no regrets” decisions	Actions with variety of benefits and minimal risk; Good place to start
Precautionary actions	Reduce risk in the near term, even when future uncertainty is high
Vulnerability and uncertainty	We won't be able to account for every variable
Integrating mitigation	Investigate ways fishery management intersects with carbon sequestration strategies

5 Pillars of Climate Resilience

(Rutger de Graaf-van Dinther)

1. Threshold = Ability to withstand levels of stress before failing
2. Coping = Immediate response to manage impacts
3. Recovery = Ability to bounce back and restore normalcy
4. Adaptive = Ability to adjust practices and policies
5. Transformative = Potential for fundamental changes in systems