Chesapeake Bay Program's
Scientific and Technical Advisory Committee Workshop

Rising Watershed and Bay Water Temperatures—
Ecological Implications and Management Responses

Session 4: Monitoring and Modeling Recommendations

Presented by Scott Phillips and Gary Shenk
USGS

Monitoring & Modeling Session Overview

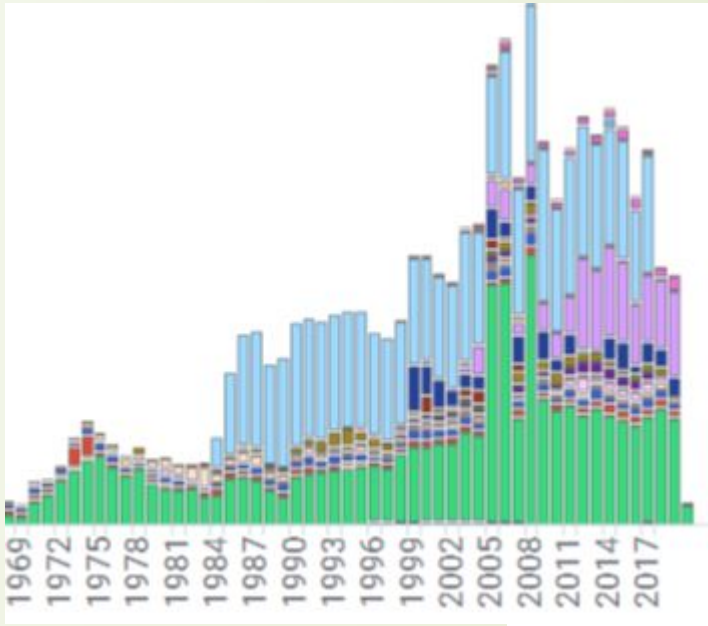
Objective: Get input on proposed recommendations for STAC report

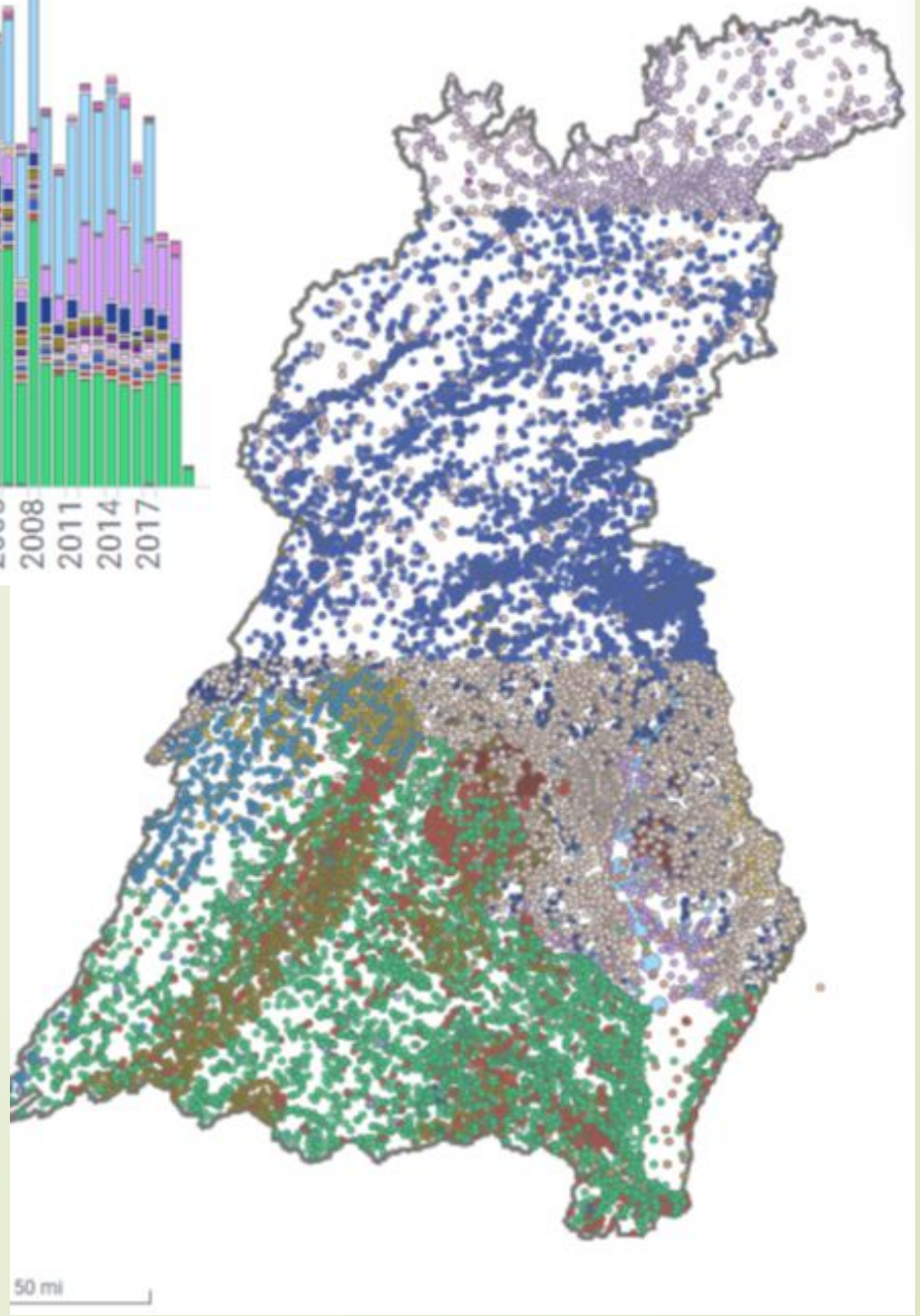
- **Participants use Jamboard to provide input on proposed recommendations**
  - Are there additions or revisions you would like to see for the modeling recommendations?
  - Are there additions or revisions you would like to see for the monitoring recommendations?

- **Brief presentations on proposed recommendations**
  - **Monitoring**
  - **Modeling**
  - **4 each**
- **Discussion of Jamboard results**

Mon 1: Use existing monitoring data to assess temperatures in rivers and streams.

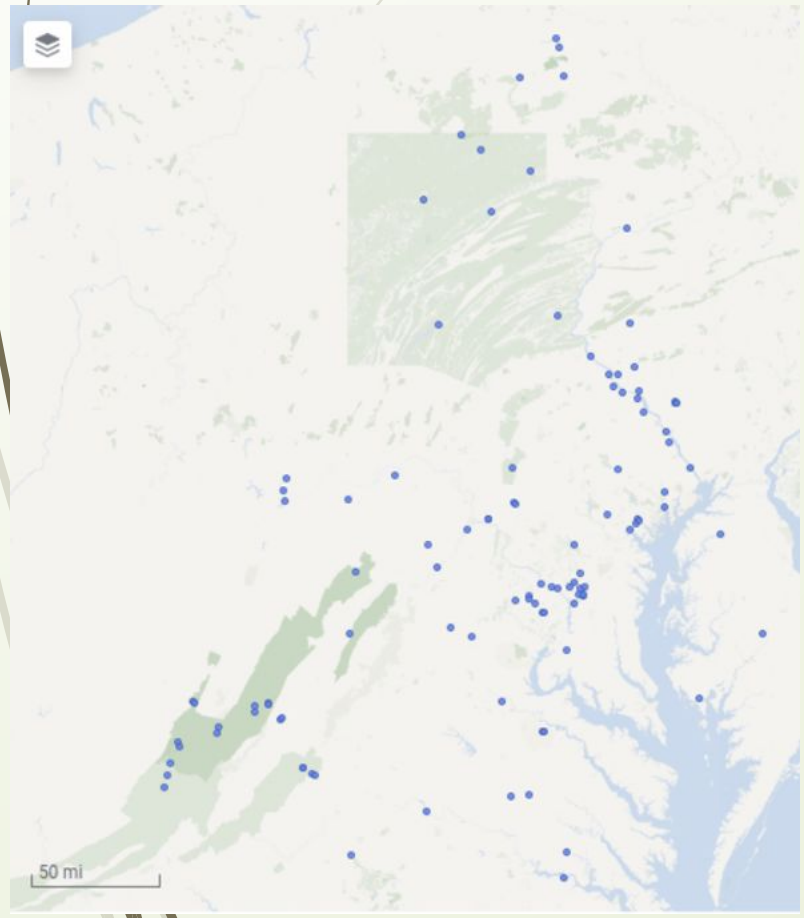
- An inventory of data collected by multiple agencies is available from the USGS.
- Status, trends, and correlations with land use types and other factors should be investigated.
- Help identify gaps for smaller streams





JOHN CLUNE, TAMMY ZIMMERMAN, JAMES COLGIN, CHARLIE SANDUSKY, USGS

MON-2. Monitoring data is insufficient and needs to be improved for assessing temperatures in streams draining all landscape areas.



Continuous monitoring sites

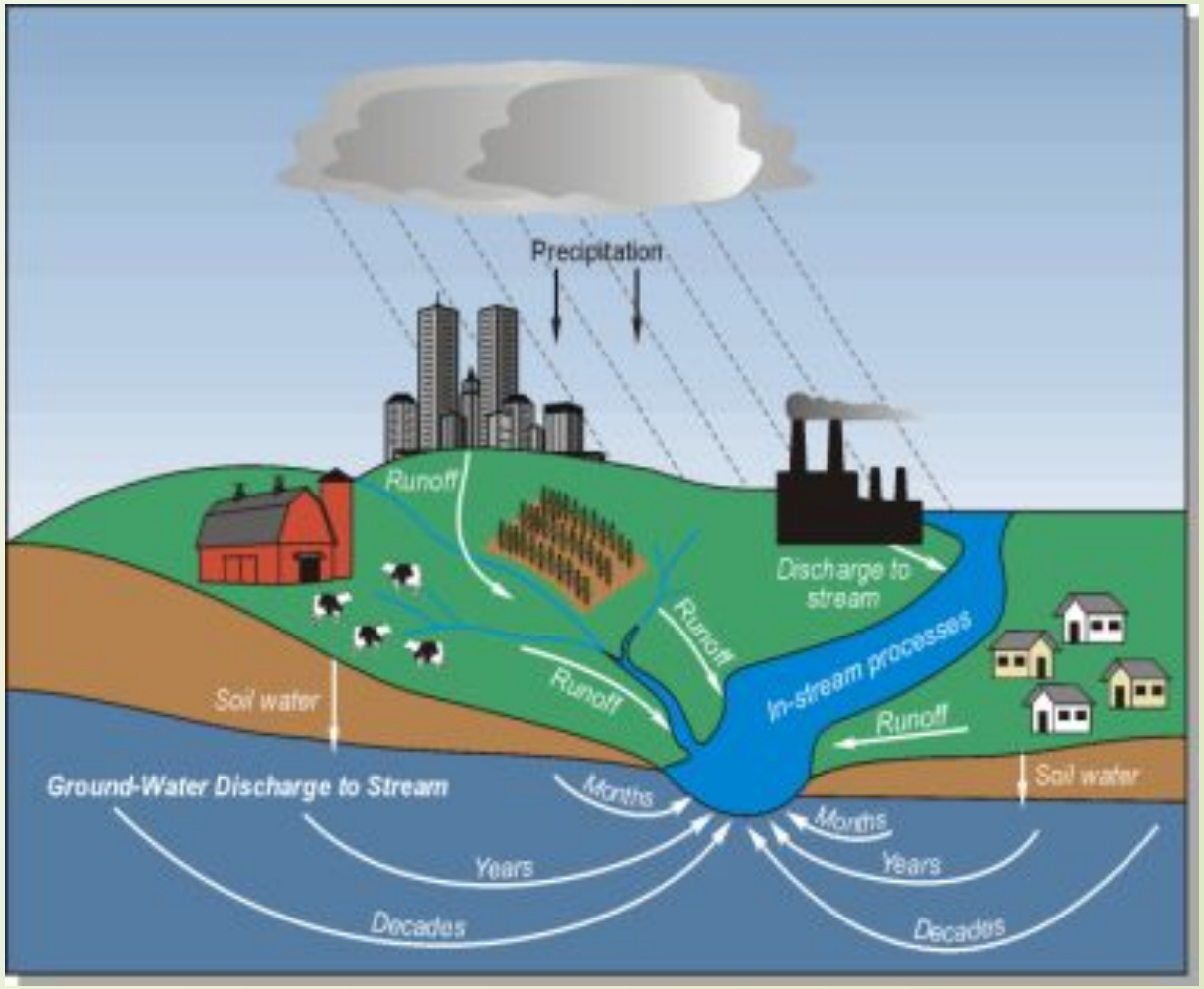
More to come …

- SRBC
- PADEP
- NPS
- etc

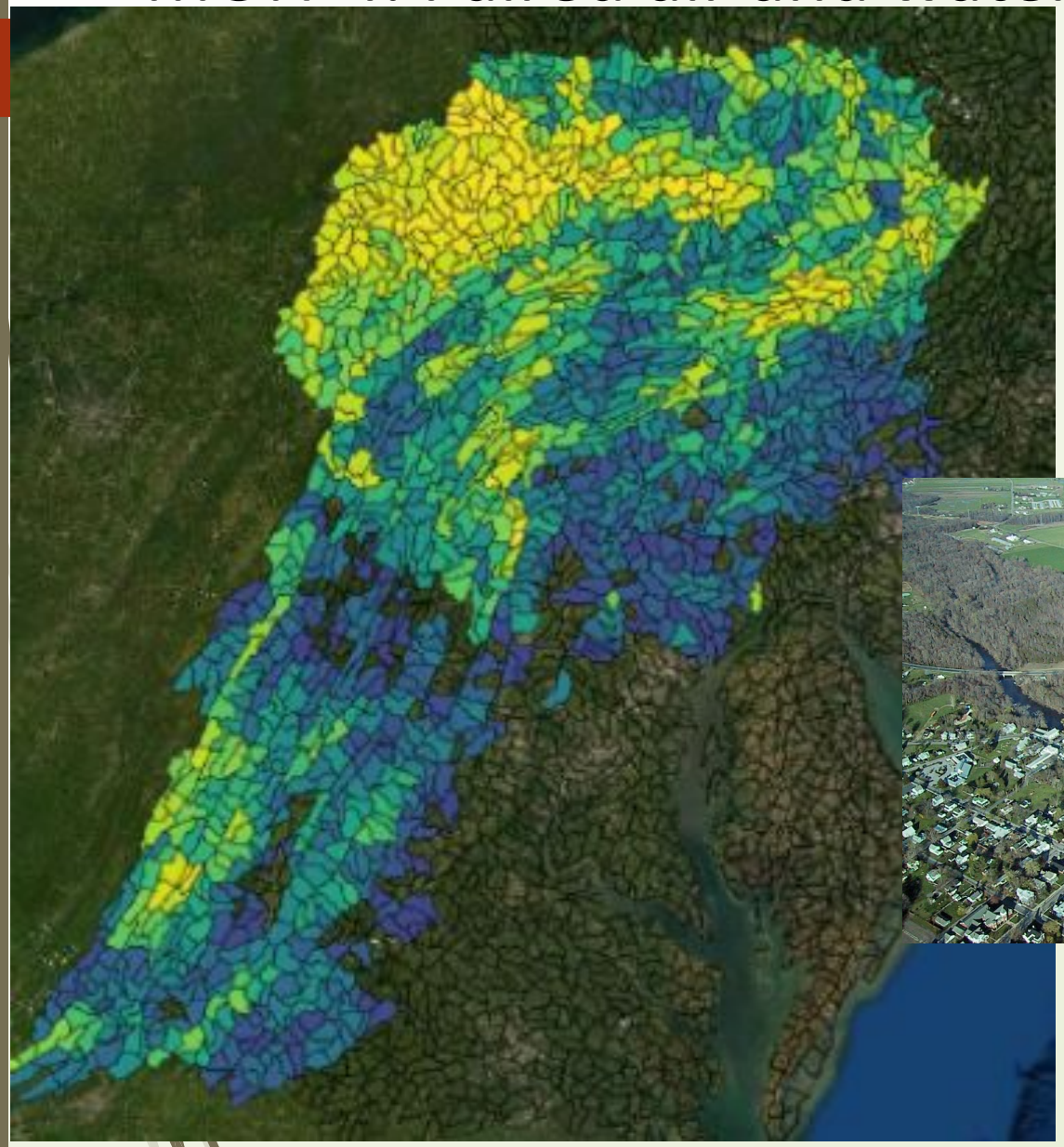
- Smaller streams generally lack consistent monitoring for temperature
- New temperature monitoring is needed in smaller streams important for cold-water fisheries.
- Continuous monitoring needed

MON-3. Integrated monitoring programs should be established

- Differentiate the influences of air and groundwater on stream temperatures
- Places important for coldwater fisheries and detect responses to management actions.



MON-4. Paired air and water relationships should be evaluated

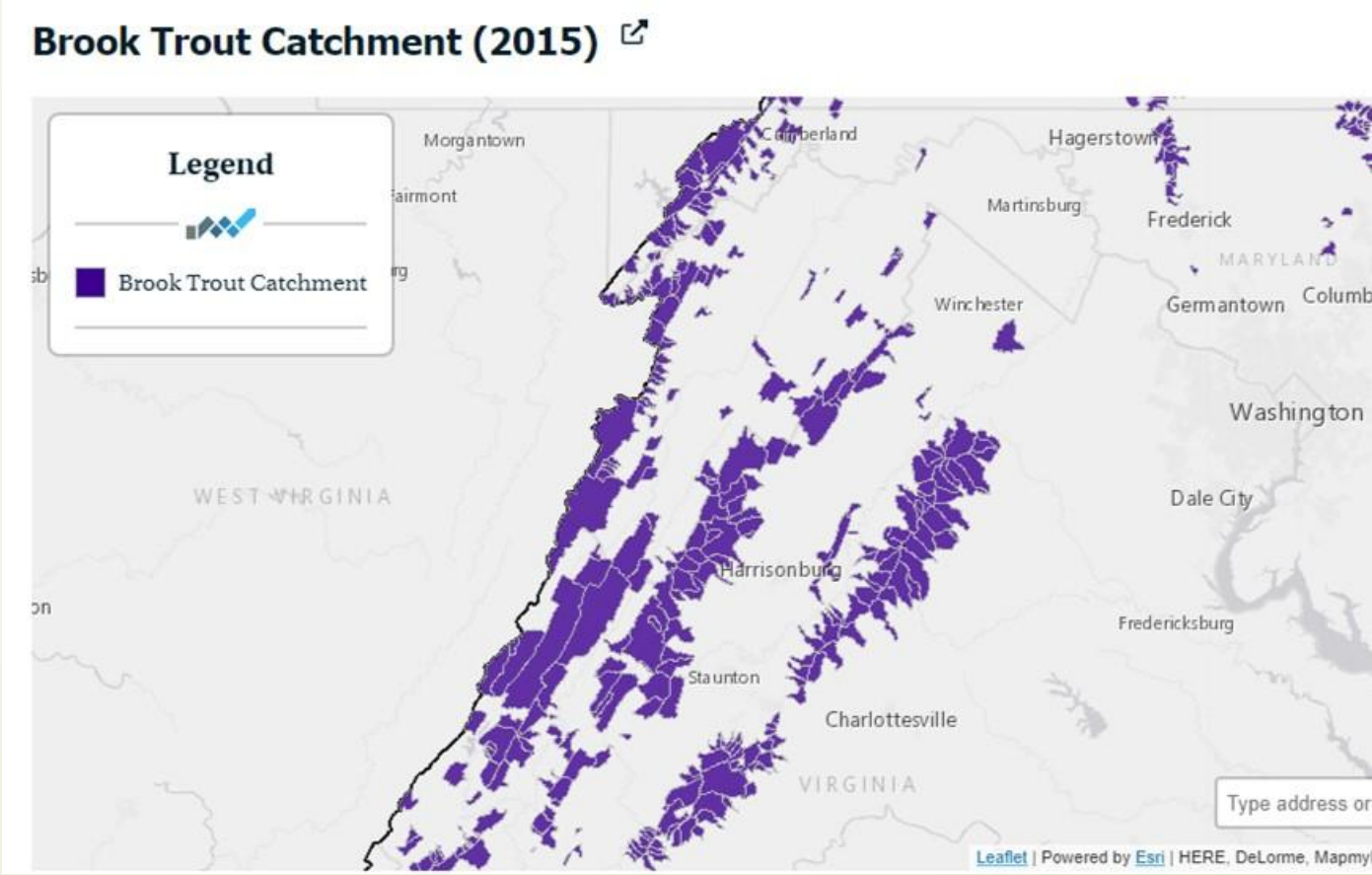


- Help identify thermally resistant watersheds
- Those where land uses are exacerbating water temperature rises above air temperature rises.

Walker, J.D., B.H. Letcher, K.D. Rodgers, C.C. Muhlfeld, and V.S. D'Angelo. 2020. An interactive data visualization framework for exploring geospatial environmental datasets and model predictions. Water 12:2928-2948

Mod-1: Develop locally focused models

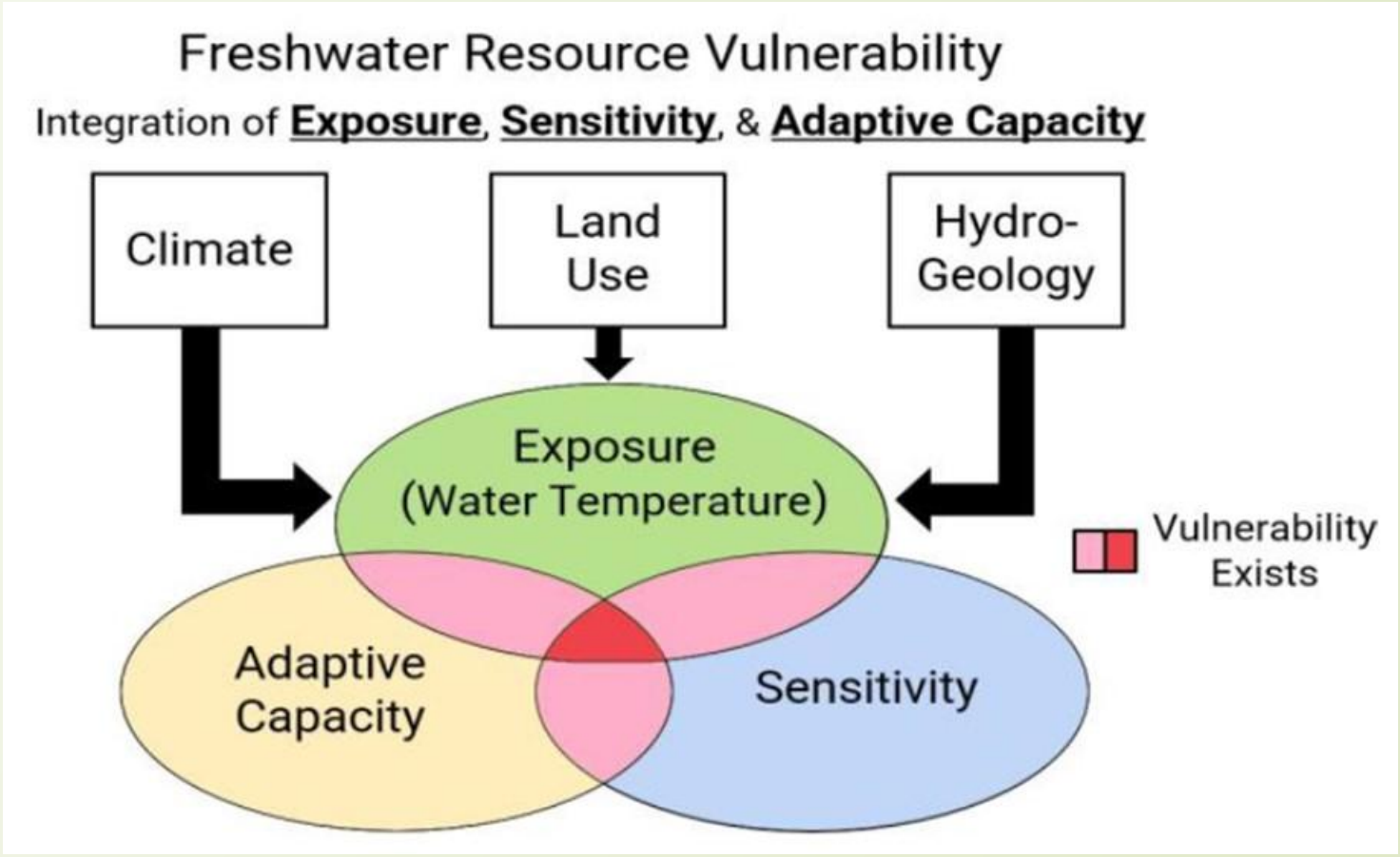
- Scale at 10s of meters
- Process-based
  - Land use
  - groundwater



- Useful to fisheries managers
  - Identify areas in danger of exceeding temperature thresholds
  - Identify areas for protection and stocking

Mod-2: Conduct vulnerability assessment

- Identify areas where species are vulnerable due to co-occurrence of high temperature exposure, high sensitivity, and low adaptive capacity



- Useful to CBP decision-makers
  - Implications of plans
  - Target resources

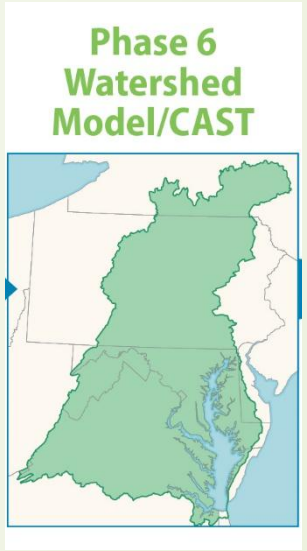
Mod-3: Use the Chesapeake Healthy Watersheds Assessment in local and regional models

Vulnerability Indicators	*Health Indicators*
➢ Future development	➢ Landscape condition
➢ Forest Loss	➢ Habitat
➢ Extent of land protection	➢ Hydrology
➢ Water use	➢ Geomorphology
➢ Wildfire risk	➢ Water quality
➢ Climate change	➢ Biological condition

- CHWA data, particularly vulnerability indicators, can be used in local models
- Findings from local and regional models can be used to improve the CHWA

HTTPS://WWW.CHESAPEAKE.ORG/STAC/WP-CONTENT/UPLOADS/2019/12/8.-HEALTHY-WATERSHEDS-ASSESSMENT.PDF

Organization that can make change



Nitrogen, Phosphorus, Sediment
Temperature, fisheries, biota effects

Compare to goals

Proposed
Land use and BMP Strategy

- **Temperature** impacts on watershed biota and fisheries should be better **represented** in the CBP's existing management tools to influence land use and BMP implementation decisions. Information on management practice effects on water temperatures should be considered for the Chesapeake Assessment Scenario Tool (**CAST**). Adapt and improve stream and fish habitat models to model the connection between temperature changes estimated in CAST and estimated effects on stream biota and fisheries in the watershed

Breakout Discussion Questions

- Are there additions or revisions you would like to see for the monitoring recommendations?
- Are there additions or revisions you would like to see for the modeling recommendations?