A Proposed Framework for Analyzing Water Quality and Habitat Effects on Aquatic Living Resources of Chesapeake Bay

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Why?

- Valued by stakeholders and society
- Ecological/economic efficiency (“reckoning”)
- Realistic/feasible targets and goals
- Restoration is costly
- Expectations
- Adaptive management
- Winner and losers

Chesapeake Bay

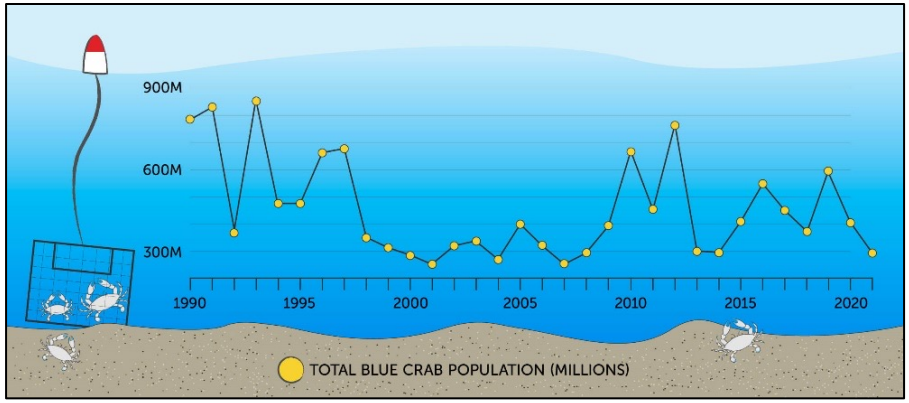
Good news	Bad News
• CB is not alone • We know how to do this • Chesapeake is well studied • Long history of monitoring, modeling, and process studies	• Challenging (Everglades) • Answers may not satisfying; false negatives • Major effort • Other management occurring to promote stability

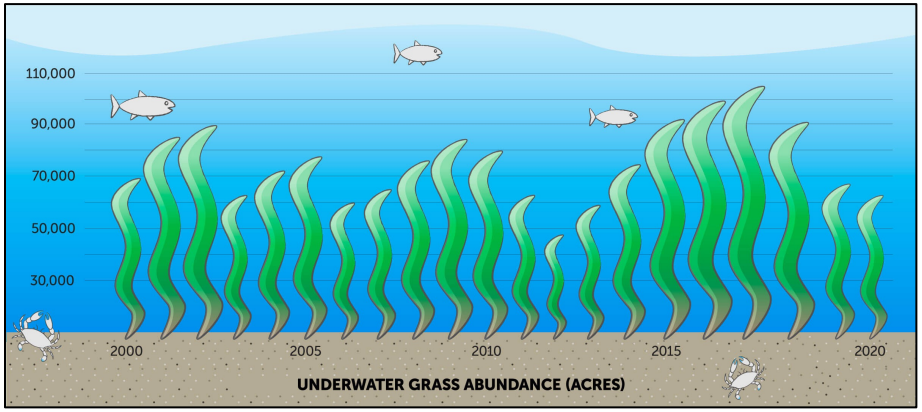
Very Different Situation to “WQ”

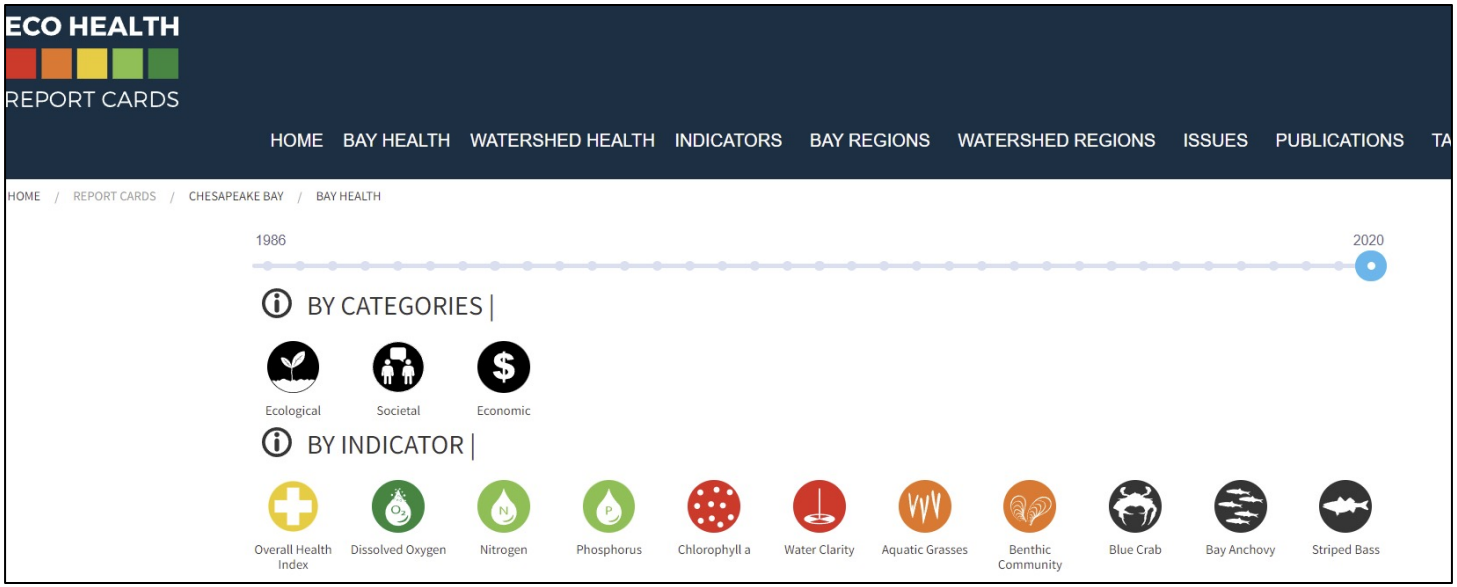
- Questions change
- Not specific targets for many living resources
- Not an established set of data or models
- Greater uncertainties

Very Different Situation to “WQ”

- Many critters move
- Affected by many factors in a complex life cycle
- Responses are on longer time scales
- Ability to isolate responses to actions decreases

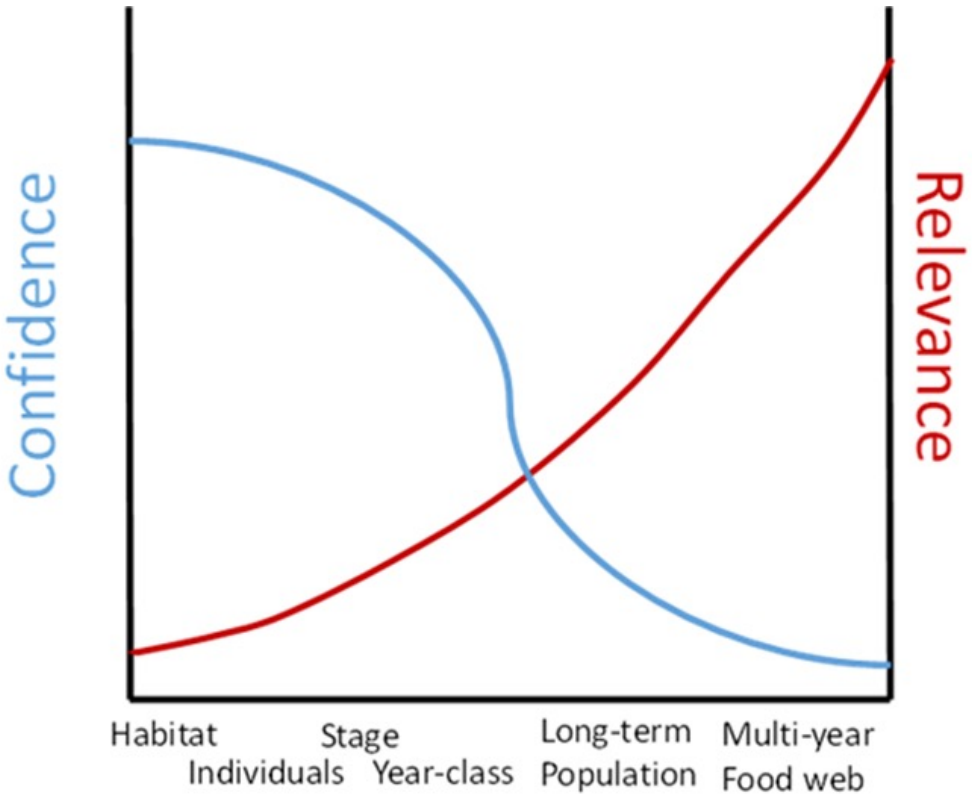

900M
600M
300M
1990
1995
2000
2005
2010
2015
2020
TOTAL BLUE CRAB POPULATION (MILLIONS)


110,000
90,000
70,000
50,000
30,000
2000
2005
2010
2015
2020
UNDERWATER GRASS ABUNDANCE (ACRES)

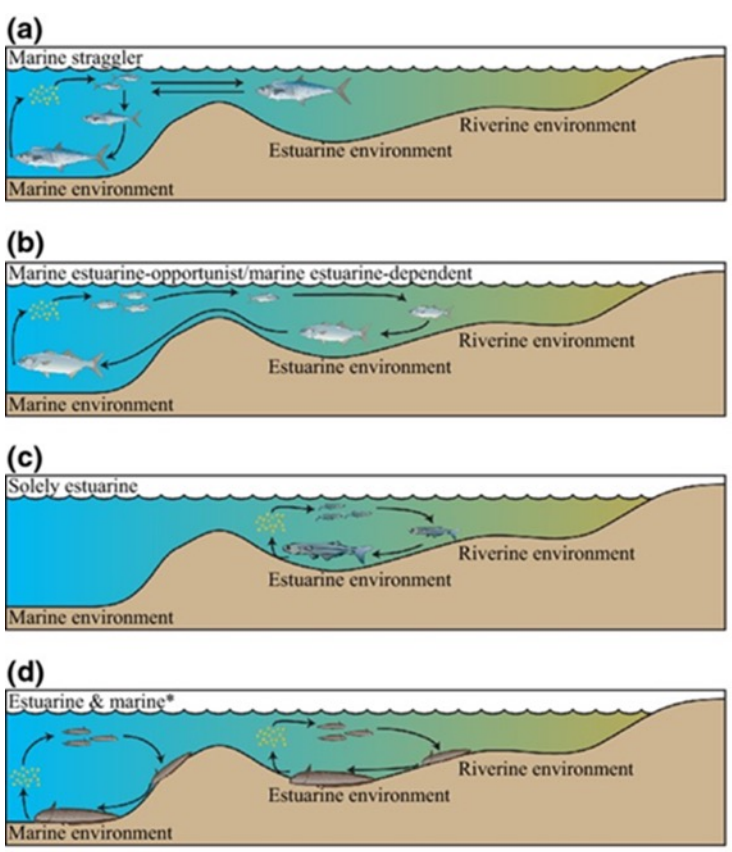

ECO HEALTH
REPORT CARDS
HOME
BAY HEALTH
WATERSHED HEALTH
INDICATORS
BAY REGIONS
WATERSHED REGIONS
ISSUES
PUBLICATIONS
HOME / REPORT CARDS / CHESAPEAKE BAY / BAY HEALTH
1986
2020
BY CATEGORIES |
Ecological
Societal
Economic
BY INDICATOR |
Overall Health Index
Dissolved Oxygen
Nitrogen
Phosphorus
Chlorophyll a
Water Clarity
Aquatic Grasses
Benthic Community
Blue Crab
Bay Anchovy
Striped Bass

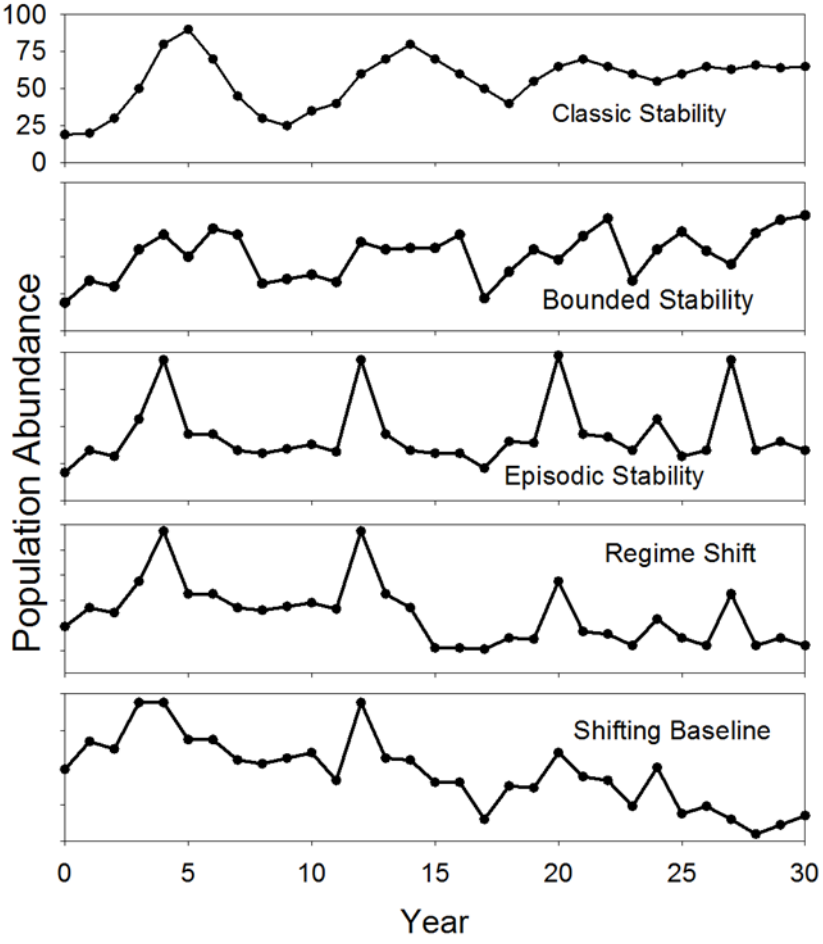
Framework

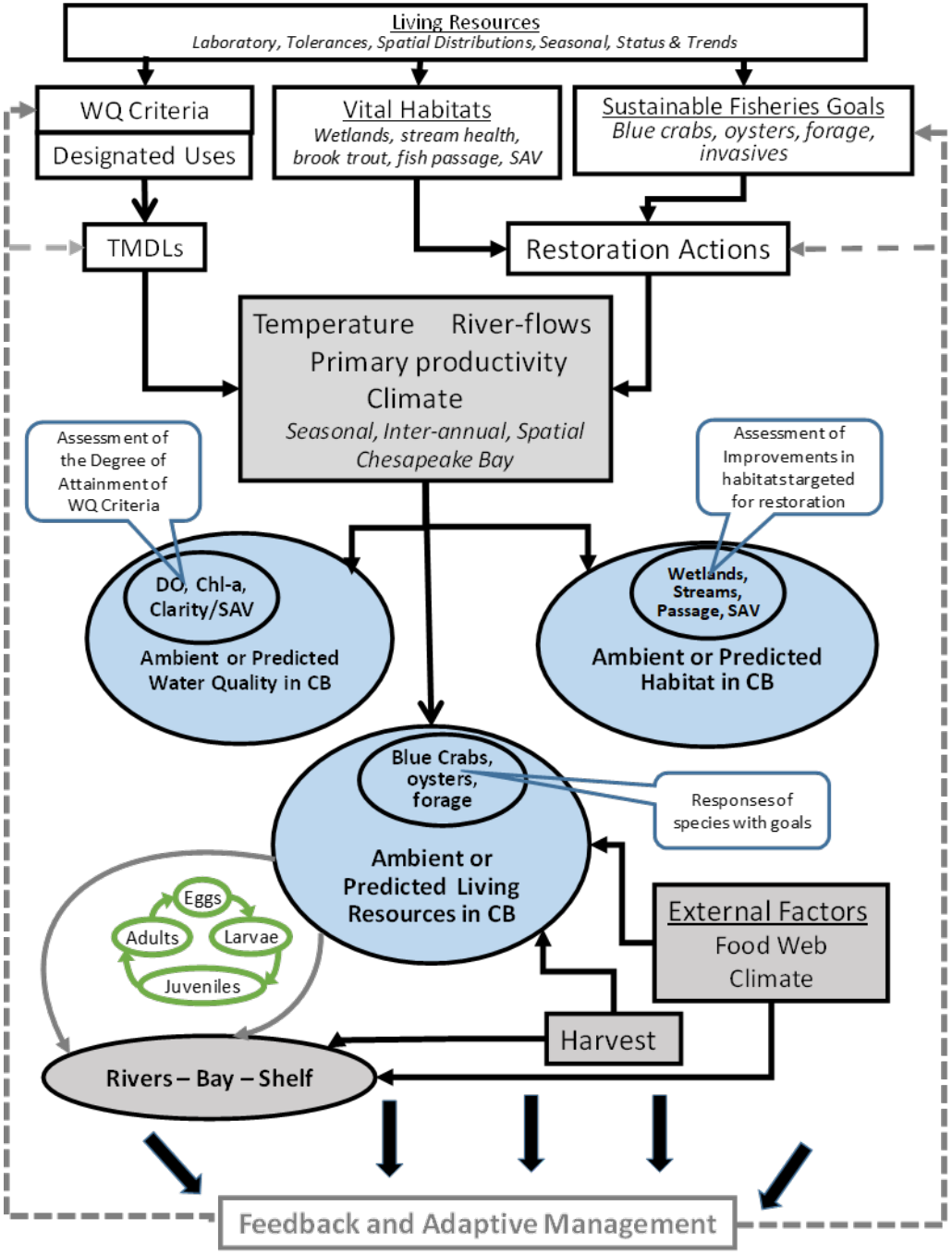
- Uses the results of the Watershed and Estuary
  - Types, timing, locations, magnitude
  - WQ and habitat
- Describes translation of these changes into responses of living resources



Foundational Concepts - Examples






Living Resources
Laboratory, Tolerances, Spatial Distributions, Seasonal, Status & Trends
WQ Criteria
Designated Uses
Vital Habitats
Wetlands, stream health, brook trout, fish passage, SAV
Sustainable Fisheries Goals
Blue crabs, oysters, forage, invasives
TMDLs
Restoration Actions
Temperature River-flows
Primary productivity
Climate
Seasonal, Inter-annual, Spatial
Chesapeake Bay
Assessment of the Degree of Attainment of WQ Criteria
Assessment of Improvements in habitat targeted for restoration
DO, Chl-a, Clarity/SAV
Ambient or Predicted Water Quality in CB
Wetlands, Streams, Passage, SAV
Ambient or Predicted Habitat in CB
Blue Crabs, oysters, forage
Responses of species with goals
Ambient or Predicted Living Resources in CB
Eggs
Adults
Larvae
Juveniles
External Factors
Food Web
Climate
Harvest
Rivers – Bay – Shelf
Feedback and Adaptive Management

Going Forward

- We know the question(s) pretty well
- Incentive (demand?) and ingredients are available
- Leverage existing analyses; identify new analyses
  - CA Delta, Everglades, Coastal LA, NCEAS, NAS, Columbia River
- Follow the framework, we can add analyses:
  - “meta-methods”
  - “meta-results”
- Rigorous and robust assessment
- We present this in early stage and welcome comments, criticisms, and suggestions (krose@umces.edu)

Key Messages

- Doable and messy
- Strategic
- Explained