Matrix Introduction

Stressors → Habitats and Populations → Ecosystem Services

Pressure → State → Impact

Complex Social-Ecological Systems

Environmental planning and management problems are often directed at protecting human health, well-being, or ecosystem services and involve complex, coupled social and ecological systems

Decision-making in complex systems requires an adequate understanding (model) of the system

Time and space scales	Shared understanding	Anticipate outcomes prior to decisions

Complex Social-Ecological Systems

For model development, there is a scientific method

- Data and literature synthesis
- Field and Lab Studies
- Aggregation and synthesis for a model

However, model development based on the scientific method often lags decision time-frames

- Too many potential social-ecological interactions
- Funding is too slow or insufficient to address the system

We need another way …

nature sustainability

ARTICLES

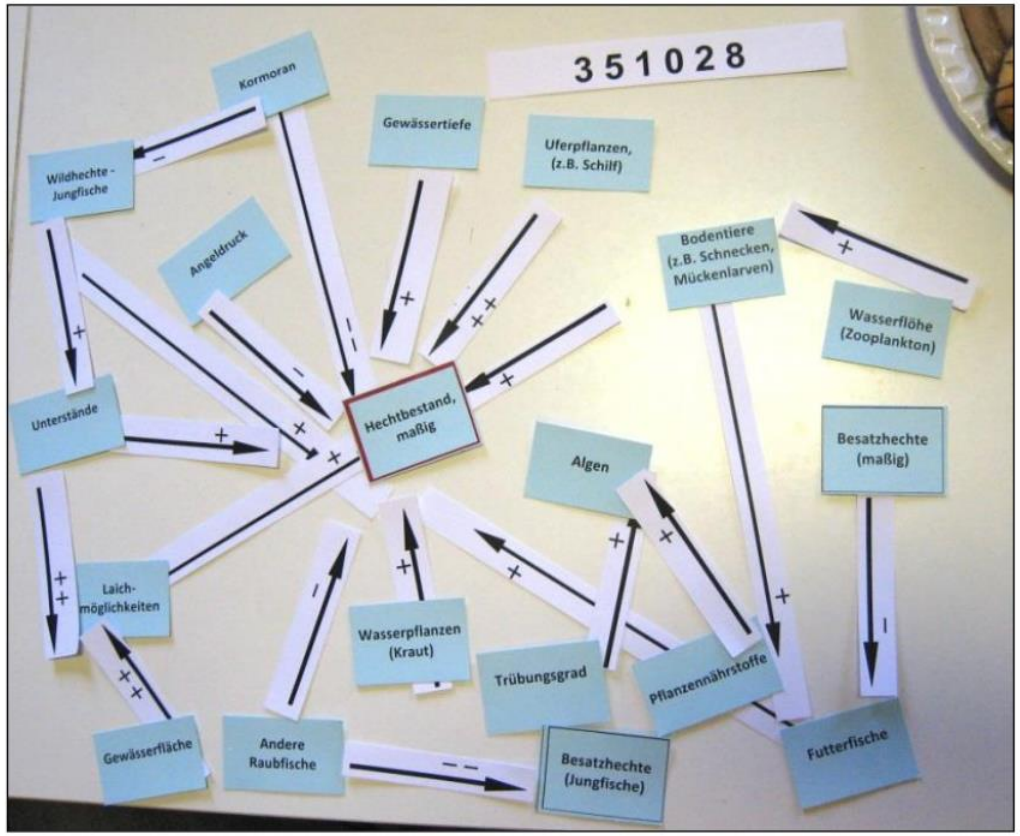
https://doi.org/10.1038/s41893-019-0467-z

Wisdom of stakeholder crowds in complex social–ecological systems

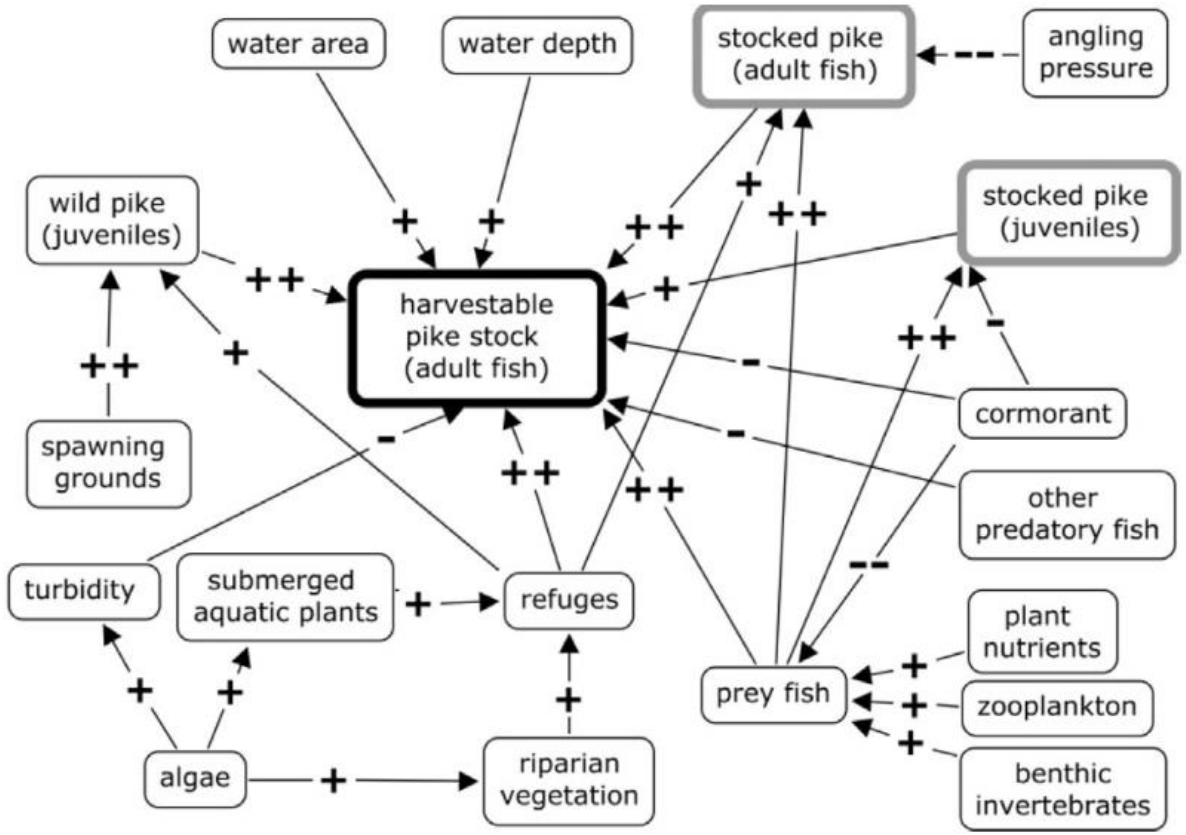
Aminpour et al. (2020)

“Wisdom of the Crowds”

- First demonstrated over a century ago when crowds estimate the weight of a dead ox. The average estimate was remarkably close to the actual weight
- Over the last several decades, has been used for increasingly complex problems
- Aminpour et al. (2020) use Wisdom of the Crowds for a complex social-ecological system involving the pike fishery in Germany
  - Asked stakeholders to produce a quantitative (quasi) causal model describing pike ecology and fishery management
  - Causal models produced by a diverse set of stakeholders were nearly identical to the models produced by an expert panel



Aminpour et al. (2020)



Gray et al. (2015)

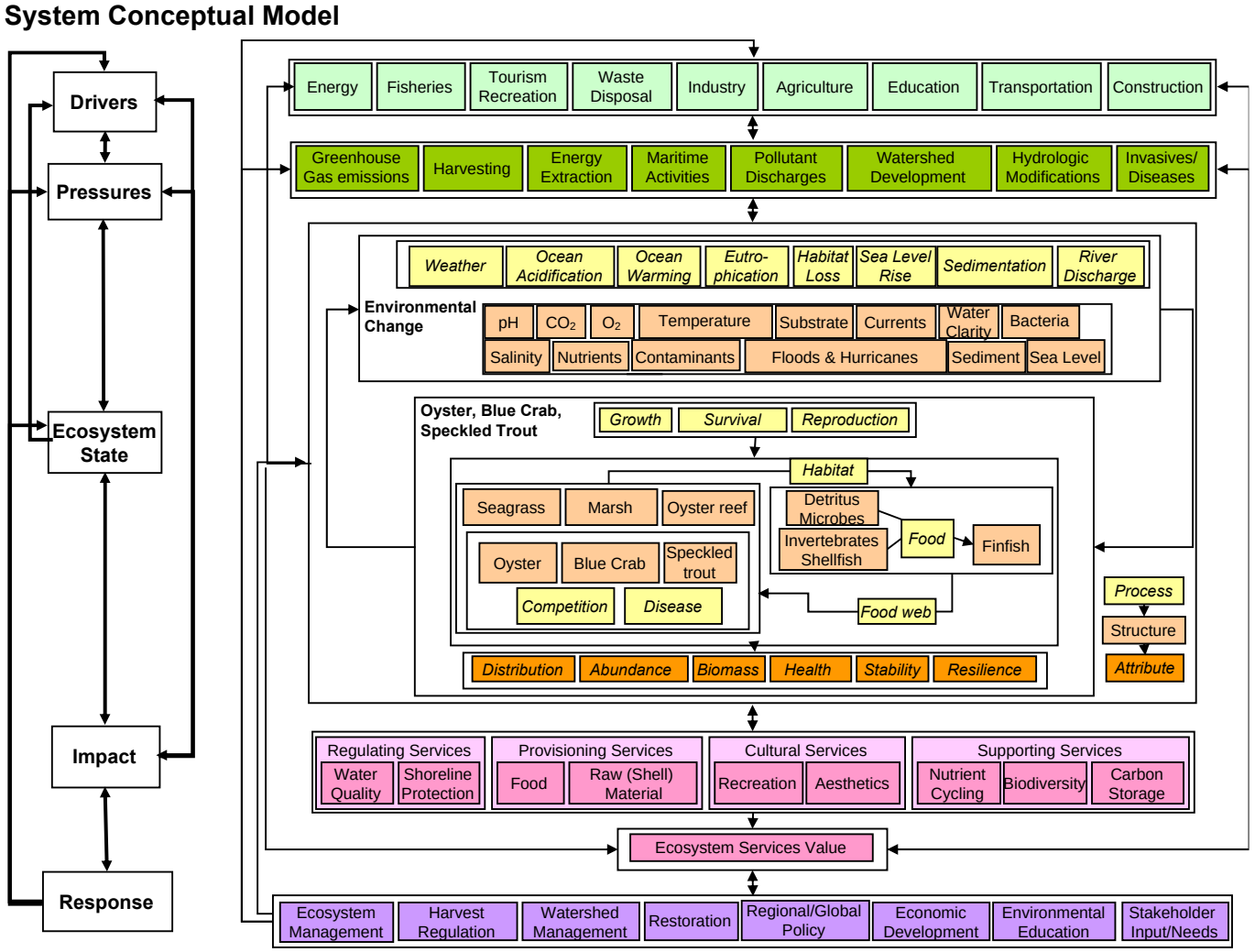
If you remember back to 2012, we did something like this for the 2013-2018 CCMP

- We used stakeholder groups to develop conceptual models that linked stressors, status, and management related to the six priority areas that bay stakeholders valued the most
  - Access
  - Beaches and Shoreline
  - Fish
  - Heritage and Culture
  - Environmental Health and Resilience
  - Water Quality

Going forward, what will this look like?

One possibility: DPSIR approach

Example DPSIR for Oysters, Blue Crab, and Speckled Trout (Lehrter et al. NOAA RESTORE proposal)



Today, we begin discussing an approach for linking environmental pressures (stressors) to habitats and populations to ecosystem services based on the issue of coal ash

- We are not experts on coal ash, but we are scientists and managers and have collective wisdom
- Development of causal model is rooted in a Driver → Pressure → State → Impact → Response framework (DPSIR) (Bradley and Yee 2015)
- We would like to hear from the SAC about this approach
- If the SAC agrees, we plan to use this approach to develop system level models for several pertinent issues in Mobile Bay