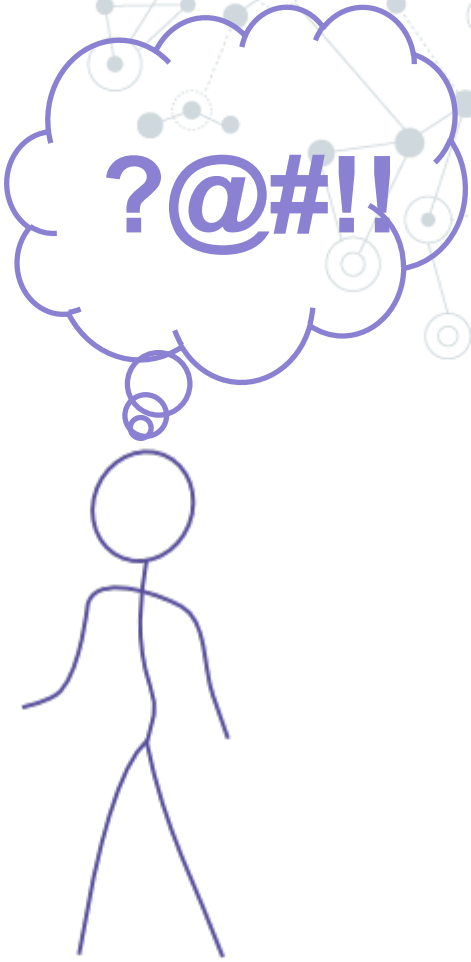
Communicating Models

Explaining complex systems to diverse audience

This model is a Black Box

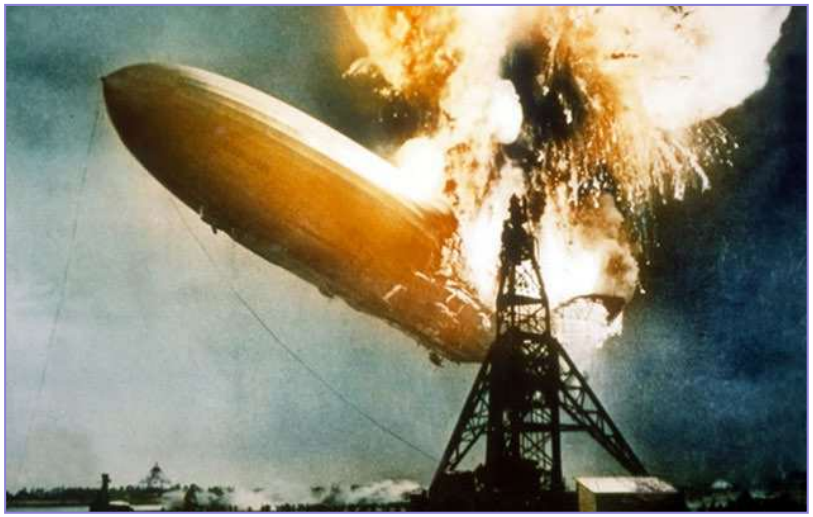
All models are wrong,
but some are useful



Communicating Models

- Two levels required
  - Technical documentation
    - Each stage of model development should be thoroughly documented, including equations and assumptions
  - Communicating to non-technical audiences
    - How do we communicate to non-modelers, stakeholders, general public, etc…

Model Communication … a Disaster!



- Most ignored aspect of modeling
- Confusion over the meaning of "model"
- Preexisting notions prevent audience from understanding objective

- Very rarely do we
  - Analyze audience
  - Anticipate potential obstacles

Three Common Obstacles in Communicating Models

1. Audience fails to understand meaning & use of a key concept or term
2. Audience struggles to represent mentally some phenomenon, structure, or process
3. Audience may have a preexisting understanding preventing them from believing (therefore understanding) the model

1. Audience fails to understand meaning of a key concept

Elucidating Explanation:

- Lists a concept's critical features
- Provide an array of varied examples & nonexamples
- Provides opportunities to practice distinguishing examples from nonexamples by looking for critical features

2. Audience struggles to represent mentally some phenomenon, structure, or process

A General Impression of the System

- Develop a summary image identifying critical components
- Structure-suggesting titles & organizing analogies
- Strong main points & connections
- Easily discernible points with clear connections between them that create a narrative form
- Clear conceptual models can really help with this

3. Audience's preexisting notions prevent understanding

Transformative Explanation

- States existing "lay" or "implicit" description of the system
- Acknowledge the apparent plausibility
- Using examples familiar to the audience, point out where existing description falls short
- Present an alternative explanation
- Demonstrate how alternative more effectively represents the system

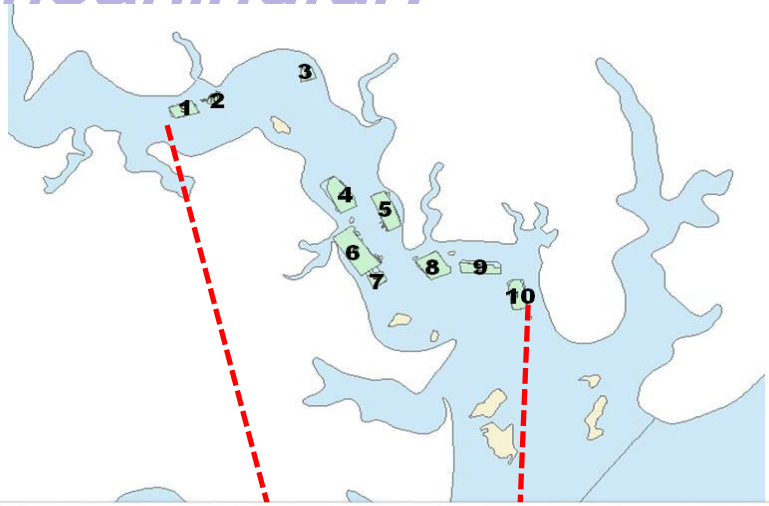
Model Communication 2.0

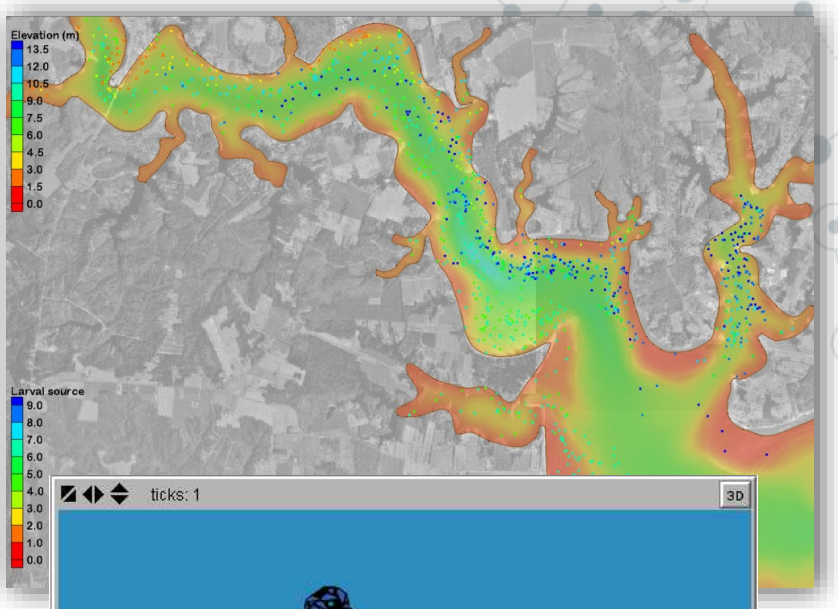
Case study: Oyster modeling in Chesapeake Bay

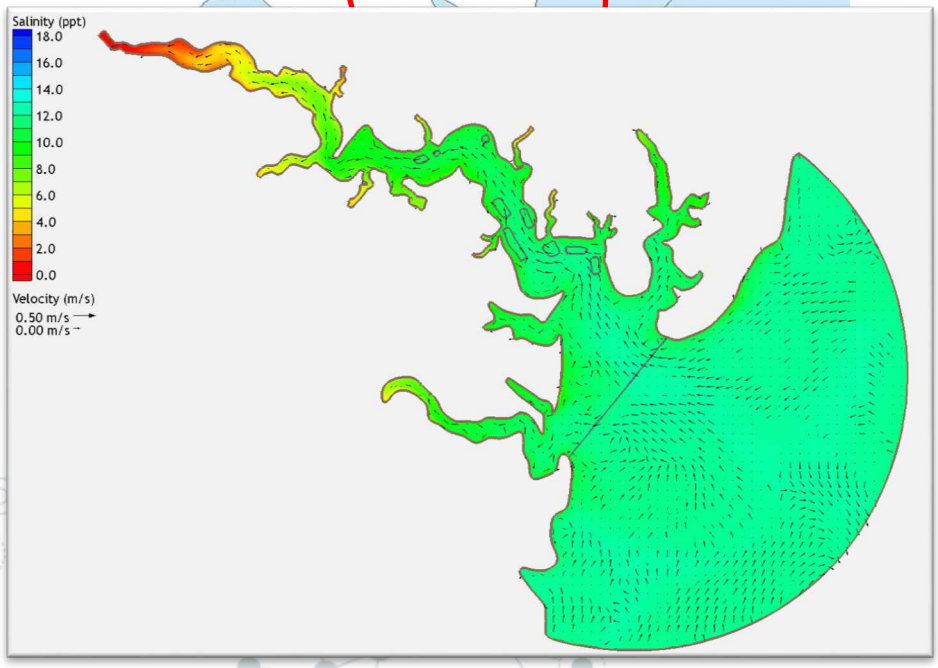
- Oyster abundance at all time low
- Federal and state agencies disagree on how to best manage species (fishery vs. environmental benefits)
- Developed an integrated hydrodynamic-ecological model to address management questions
  - Multi-disciplinary team developed hydrodynamic, particle tracking, and agent-based models

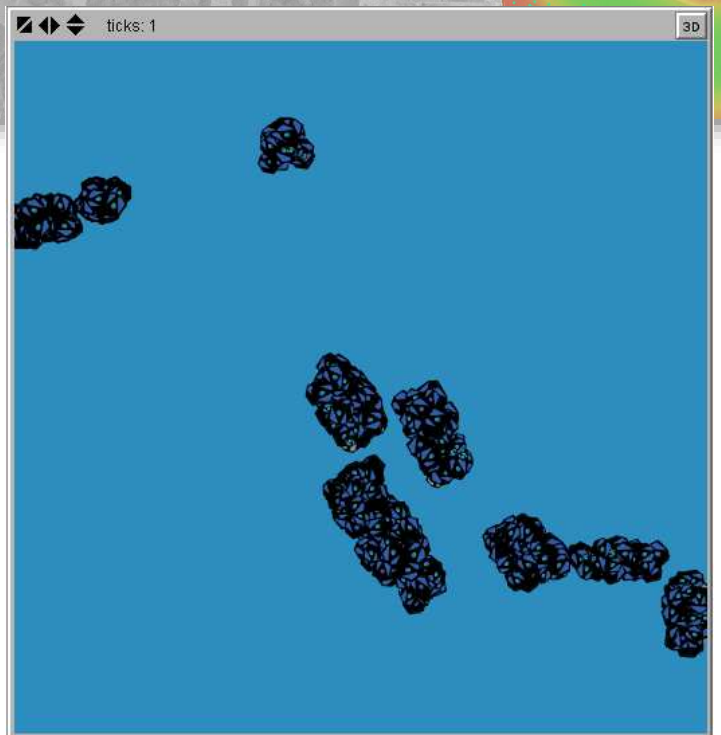
Communication challenge

How to make this understandable & meaningful?







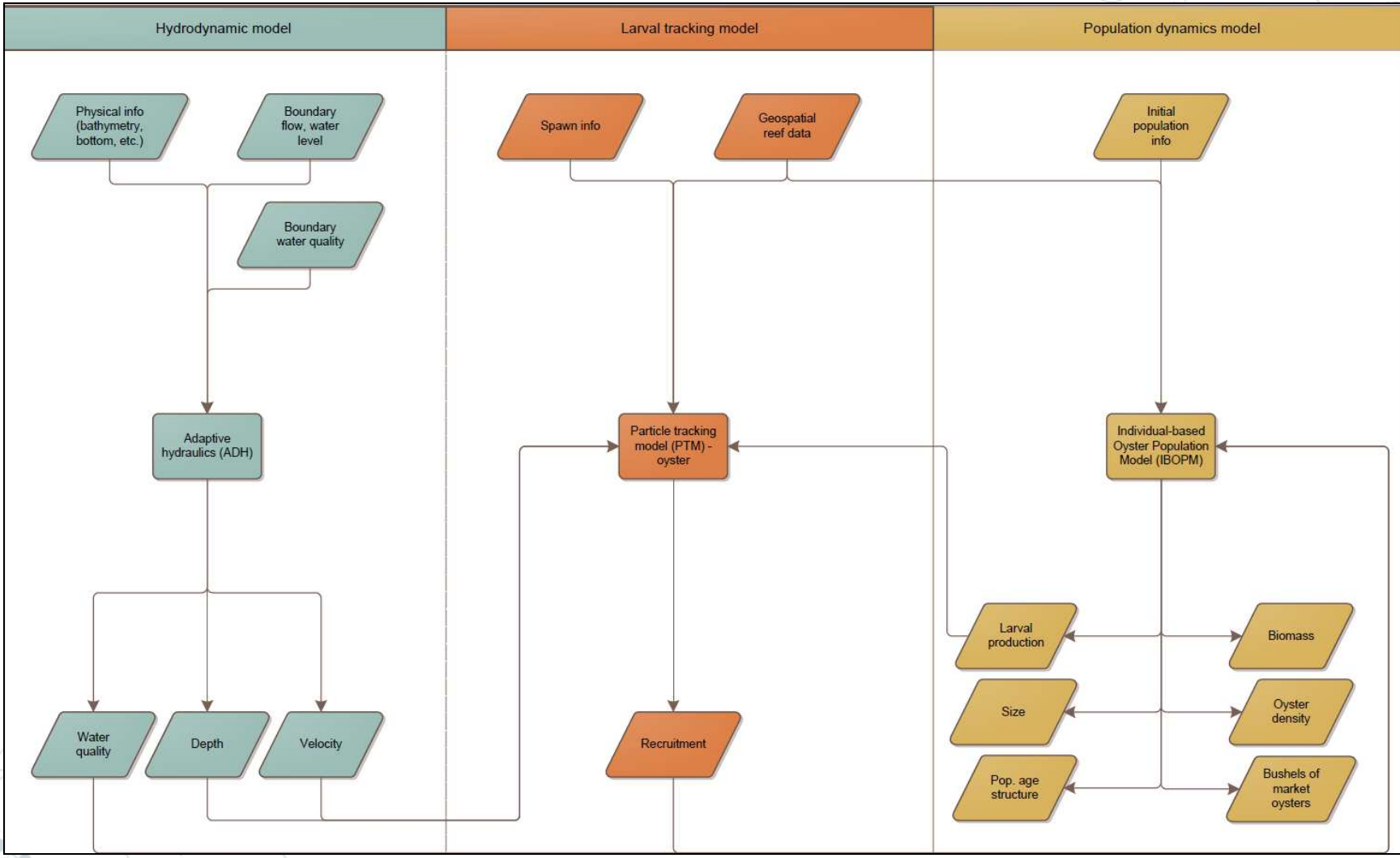


- Federal & State stakeholders
  - Planners, project managers, fisheries managers, oyster biologists
  - No engineers or modelers in stakeholder group, but they had general understanding of models

- We decided on a mediated-modeling approach

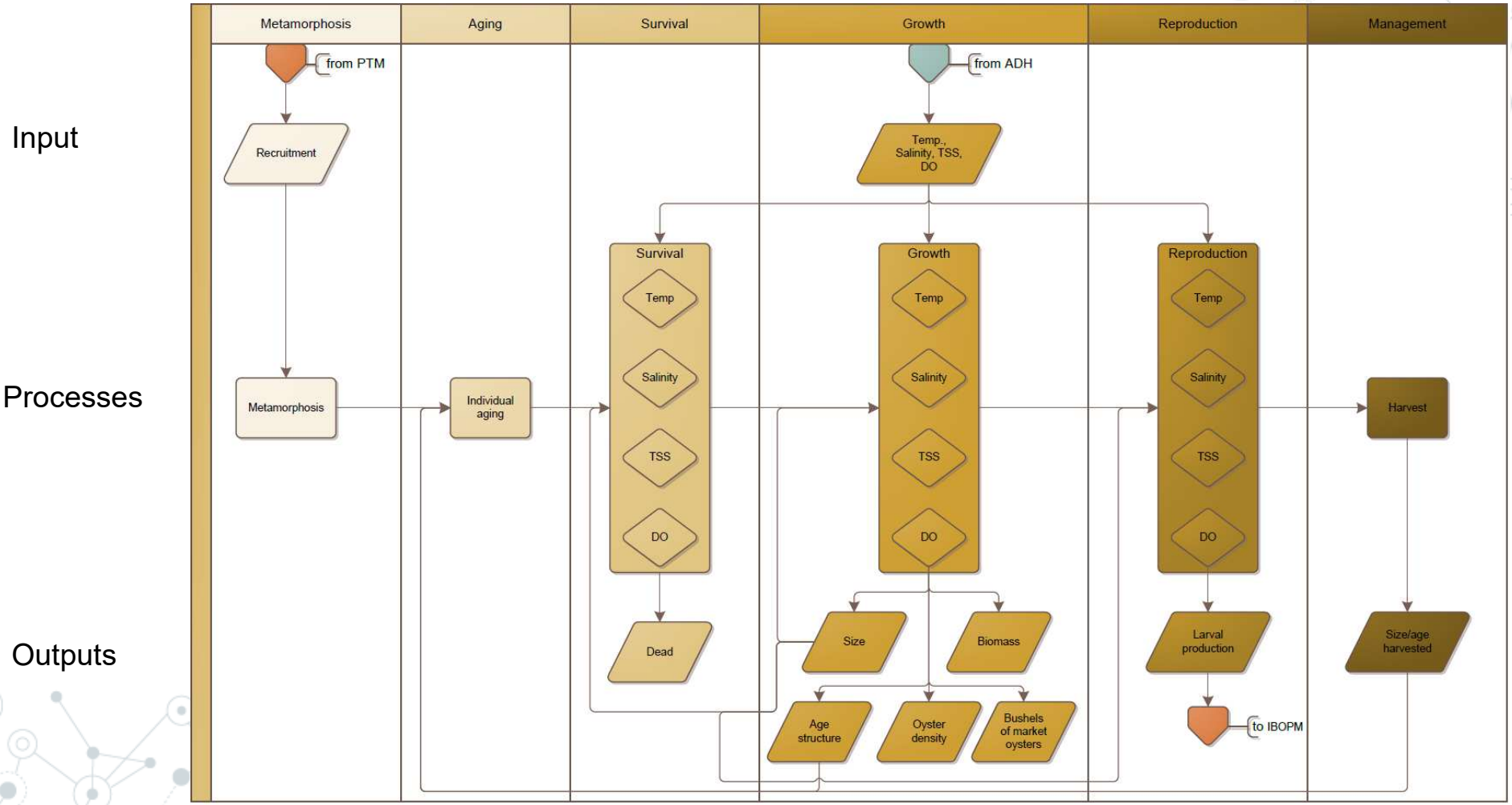
- Audience Analysis: Series of meetings prior to, during, and after model development
  - Preliminary meeting: discussion of modeling approach
    - identified background knowledge and experience of stakeholders
  - Second meeting: we convened with stakeholders to evaluate model and develop scenarios

Obstacle 2: Understanding big picture



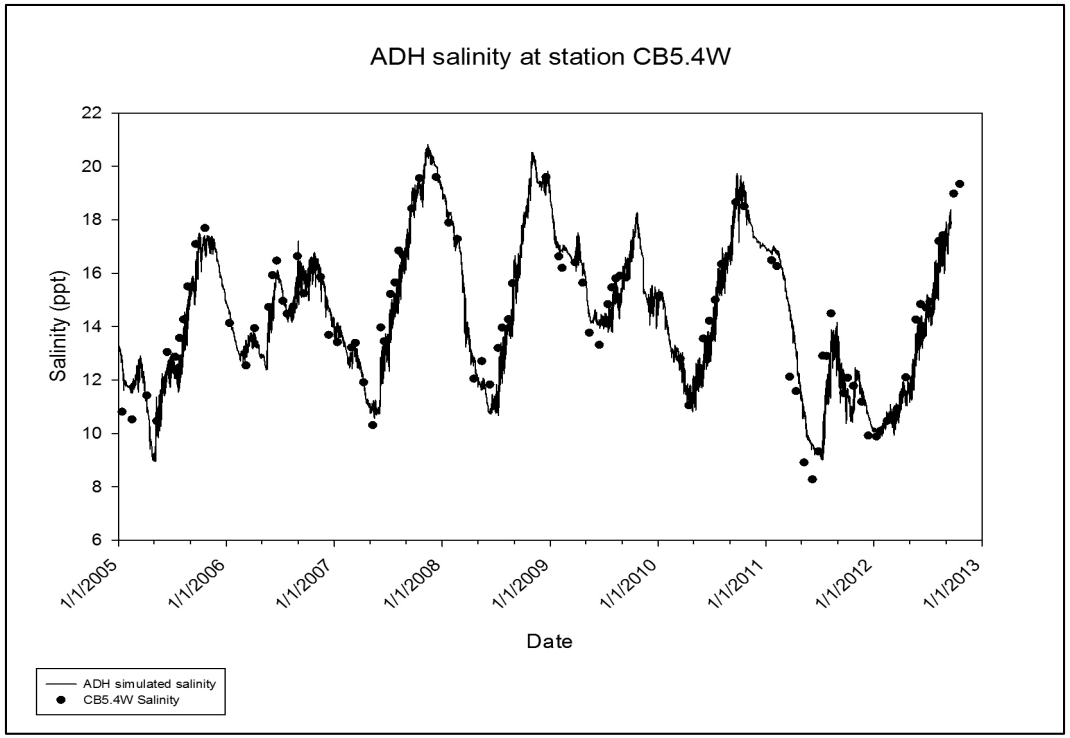
Drilling down to points of interest

Population Dynamics Submodel



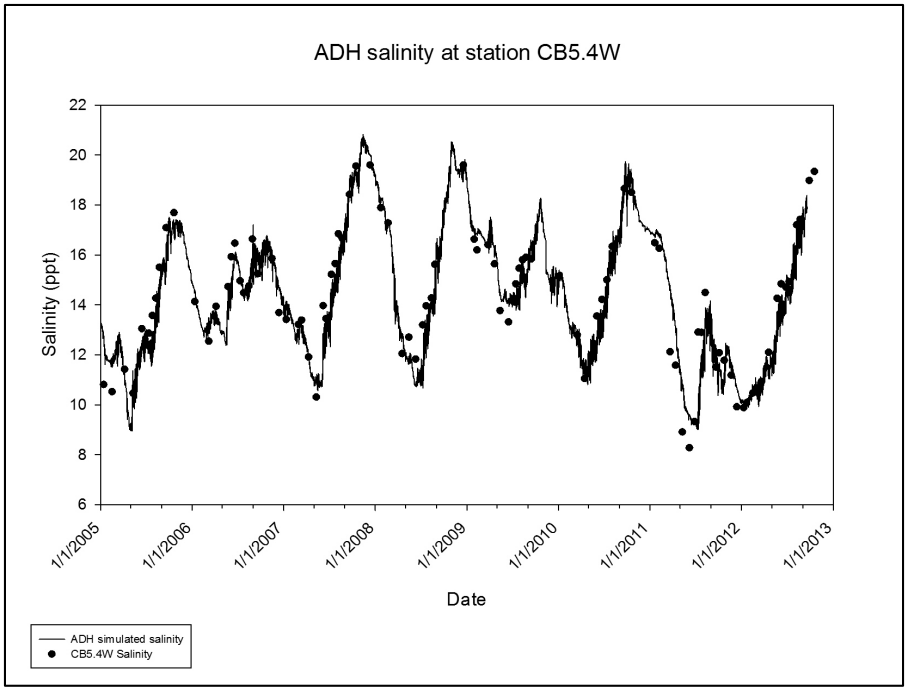
Obstacle 2 confirmed

- Audience was interested in big picture of oyster dynamics and not underlying hydrodynamic & particle tracking models
  - For example:



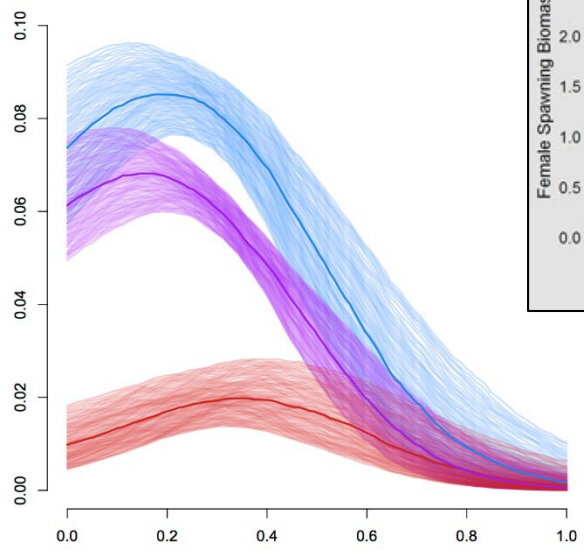
Additional Model Communication Pitfalls Observed

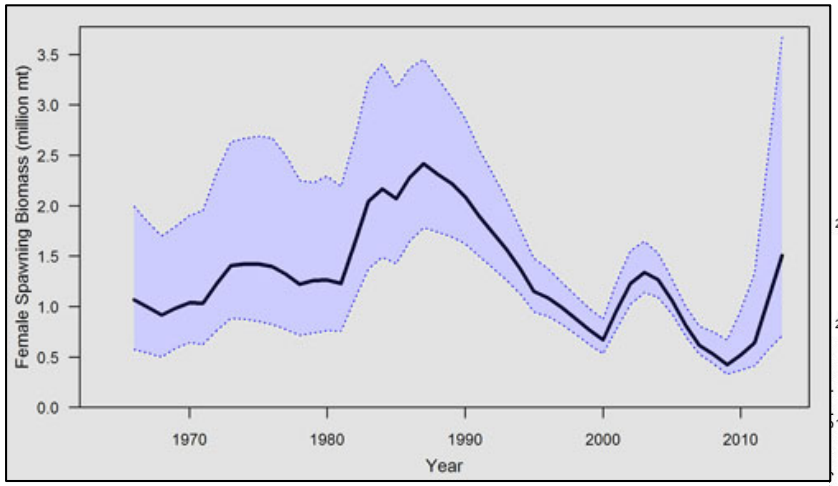
- Eachteam memberwants to talk about how cool their stuff is
  - Audienceanalysis defines interests (i.e., what to talk about, what to omit)

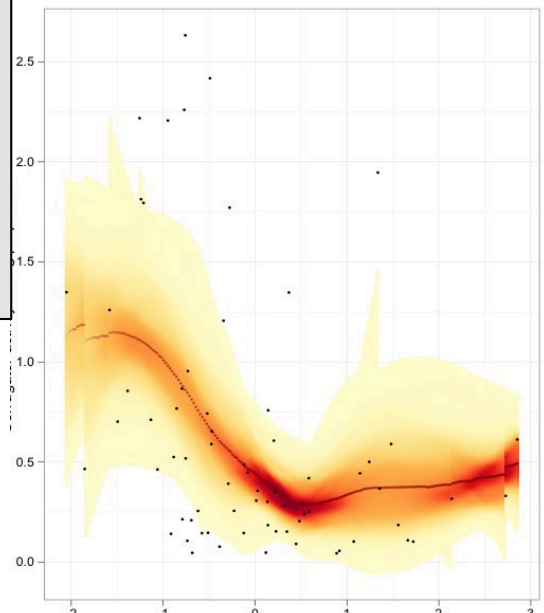


Potential Pitfalls

- Discussing, rather than just documenting, uncertainty is crucial
  - Without describing limitations, it hurts modeler's credibility

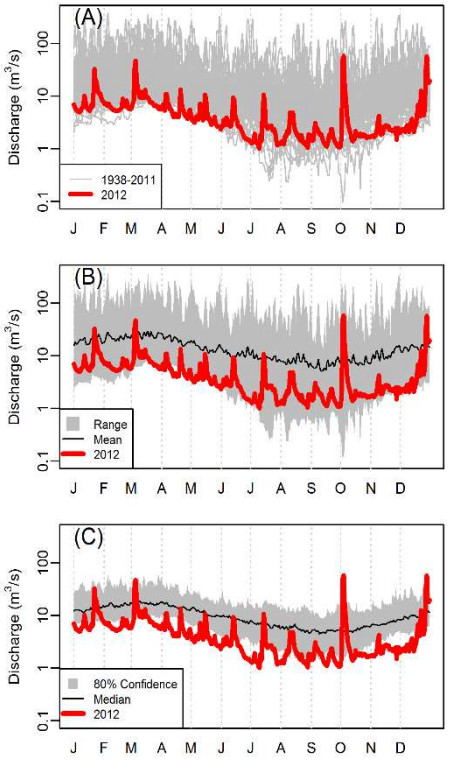


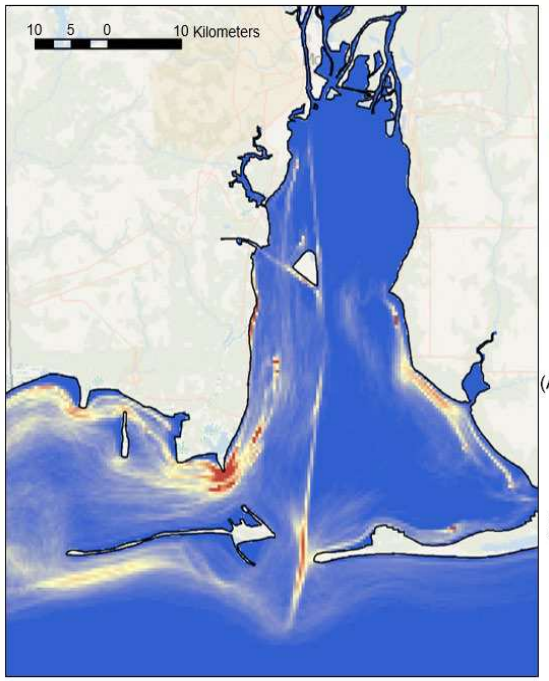


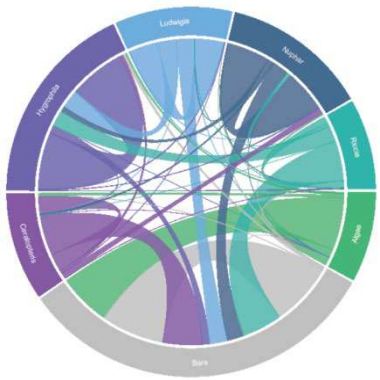


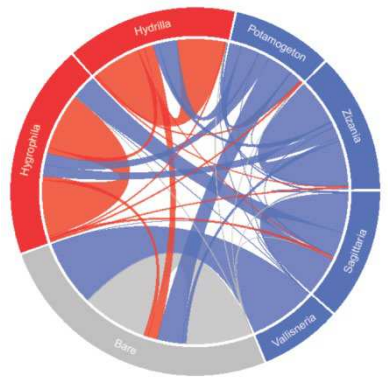
Novel Visualizations

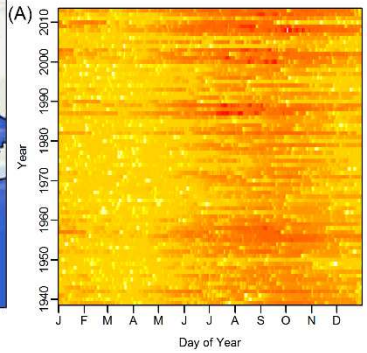
- Visualexploration takes advantage of the capacity of the human eye to rapidly detect anpatterns

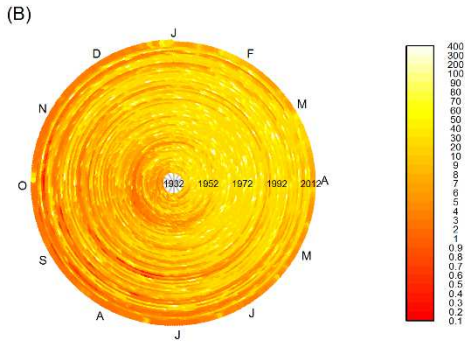






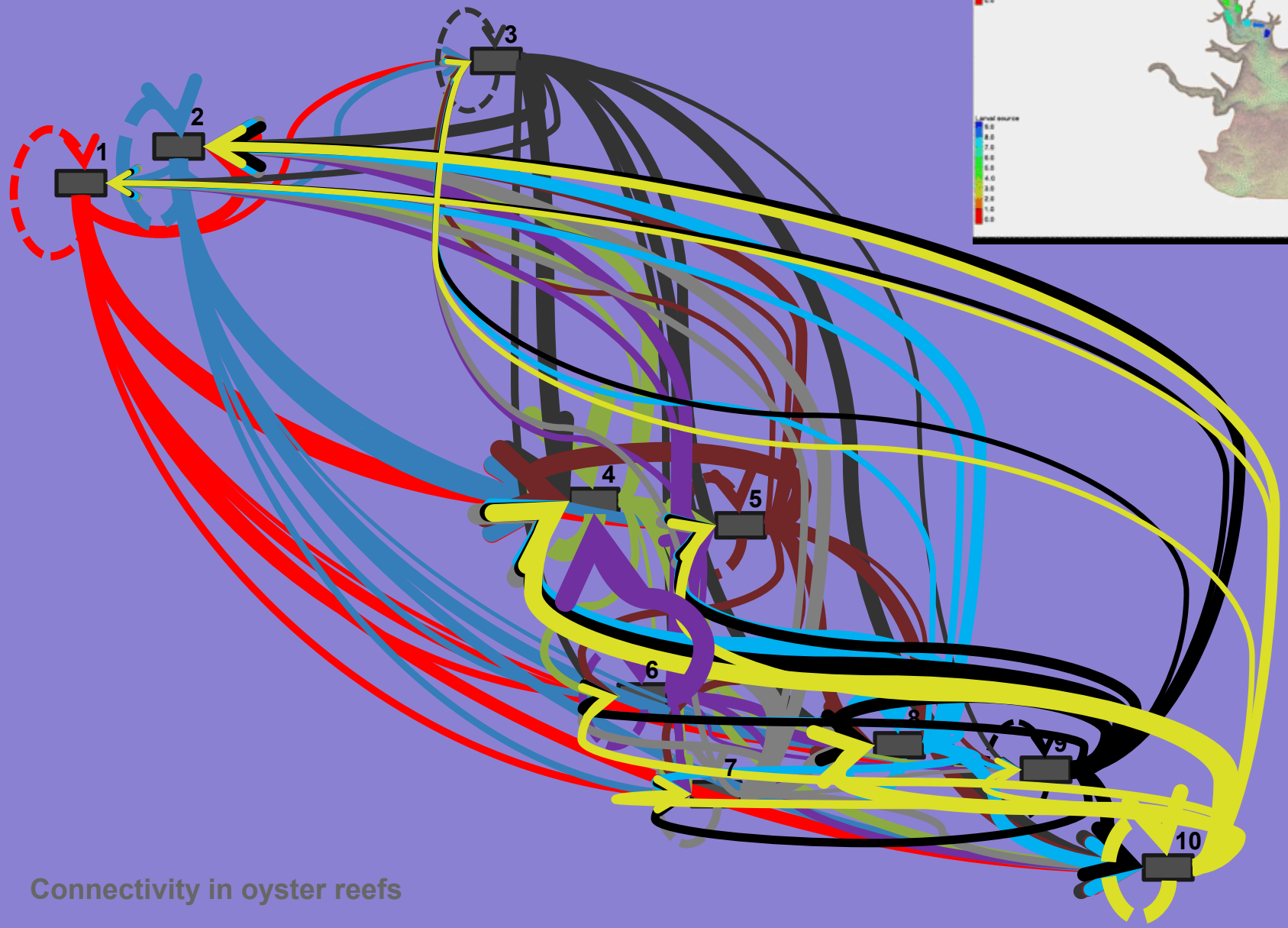


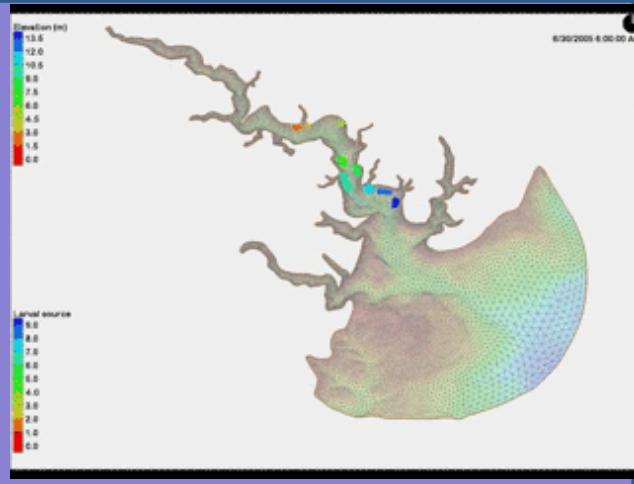




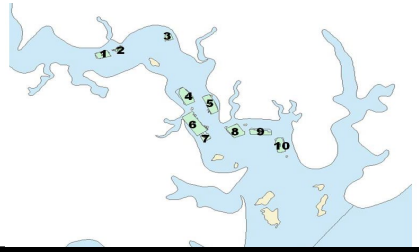
Interesting to certain audiences

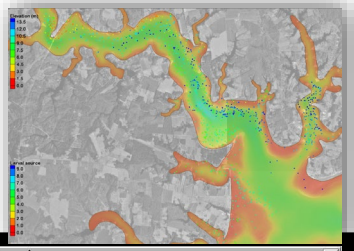
Colors draw eye and audience tends to pay attention

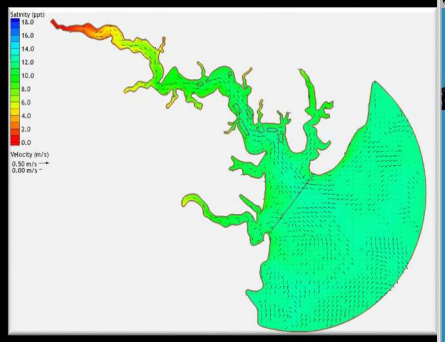


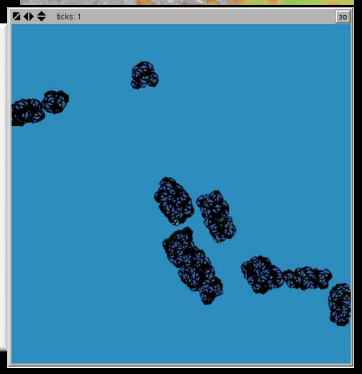


Connectivity in oyster reefs









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