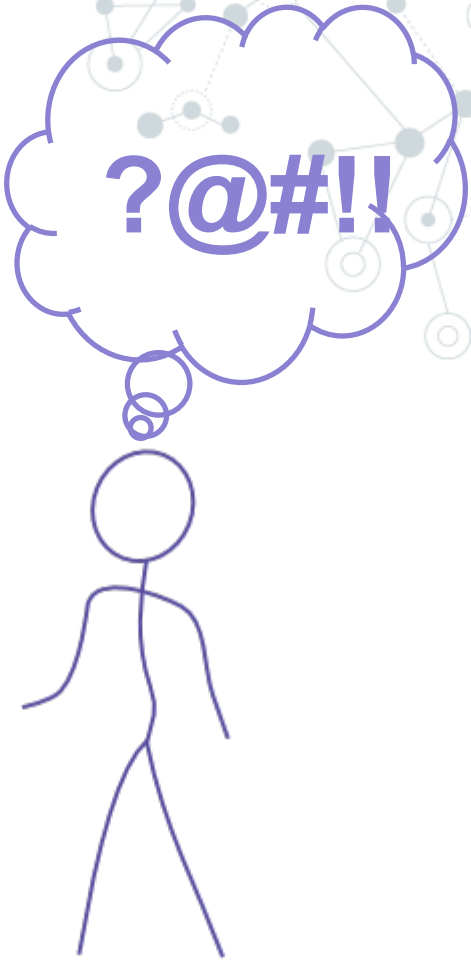
Communicating Models

Explaining complex systems to diverse audience

This model is a Black Box

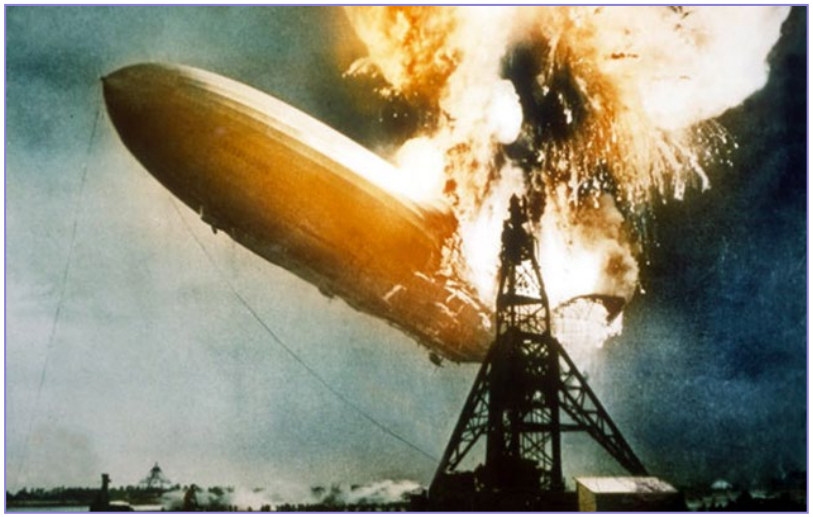
All models are wrong, but some are useful



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

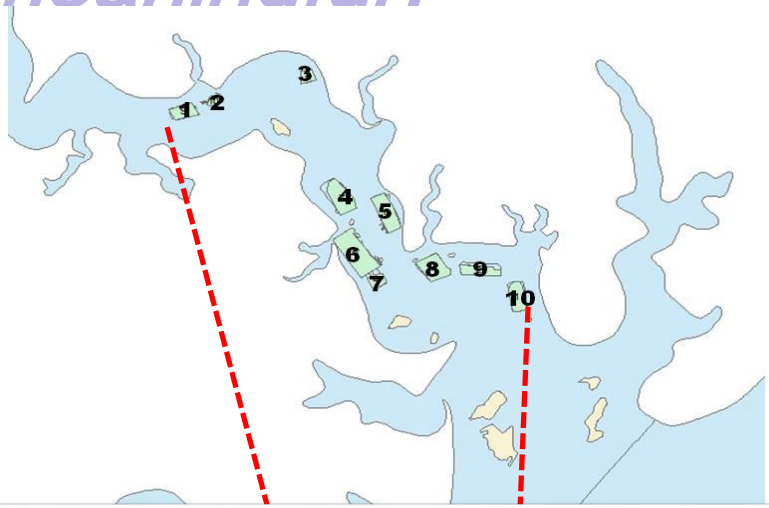
Model Communication 2.0

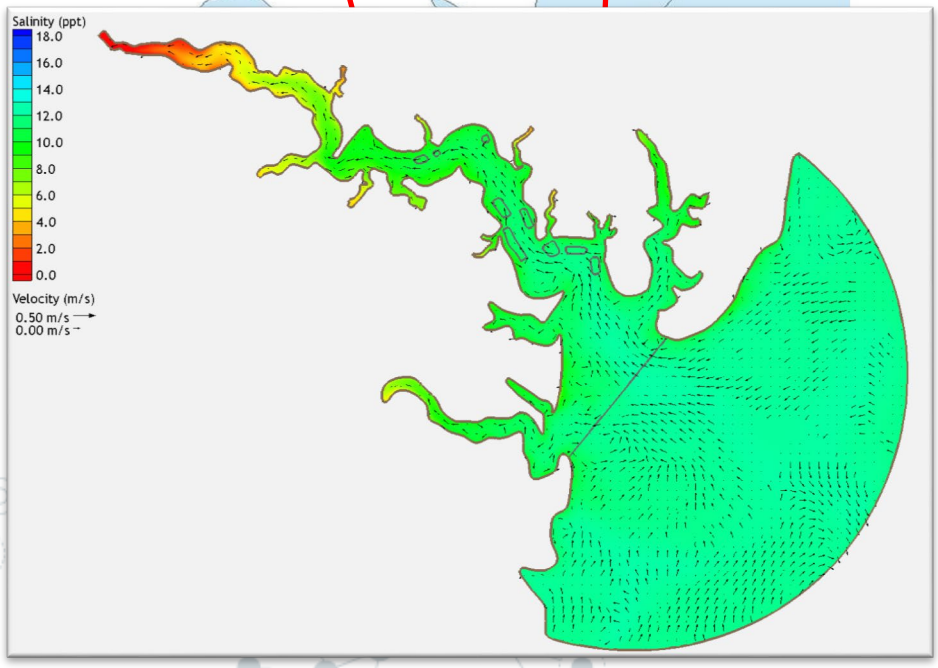
Case study: Oyster modeling in Chesapeake Bay

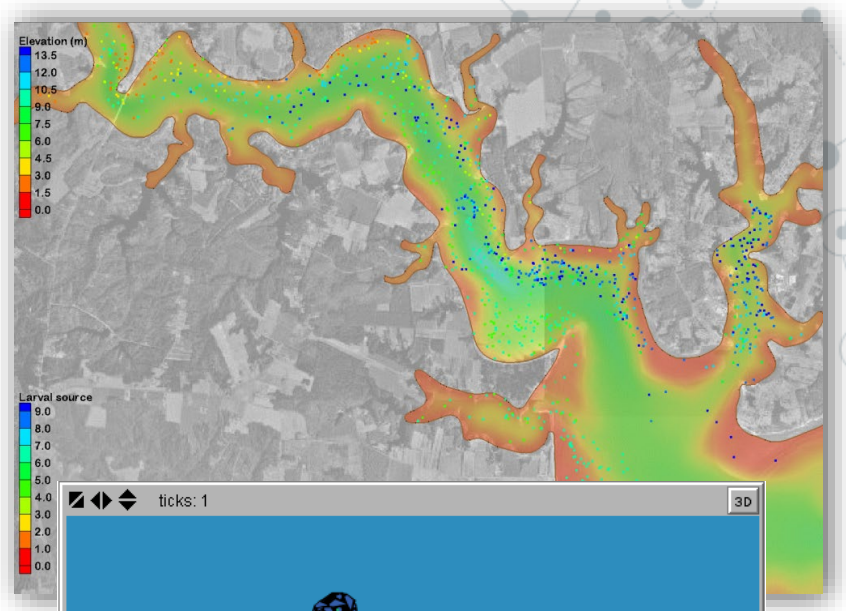
- Oyster abundance at all time low
- Federal and state agencies disagree on how to bes manage species (fishery vs. environmental benefits
- Developed an integrated hydrodynamic-ecological model to address management questions
  - Multi-disciplinary team developed hydrodynamic, particle tracking, and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

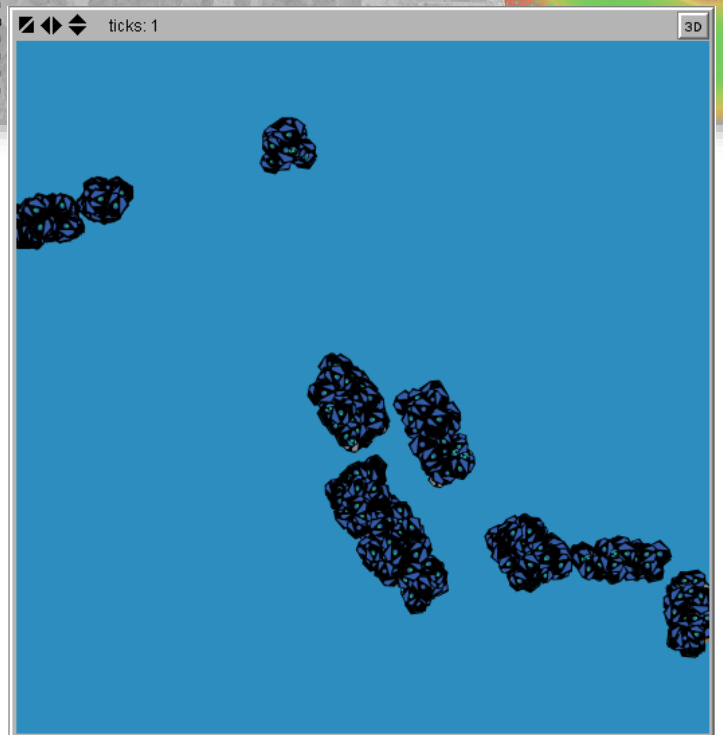
Communication challenge

How to make this understandable & meaningful?







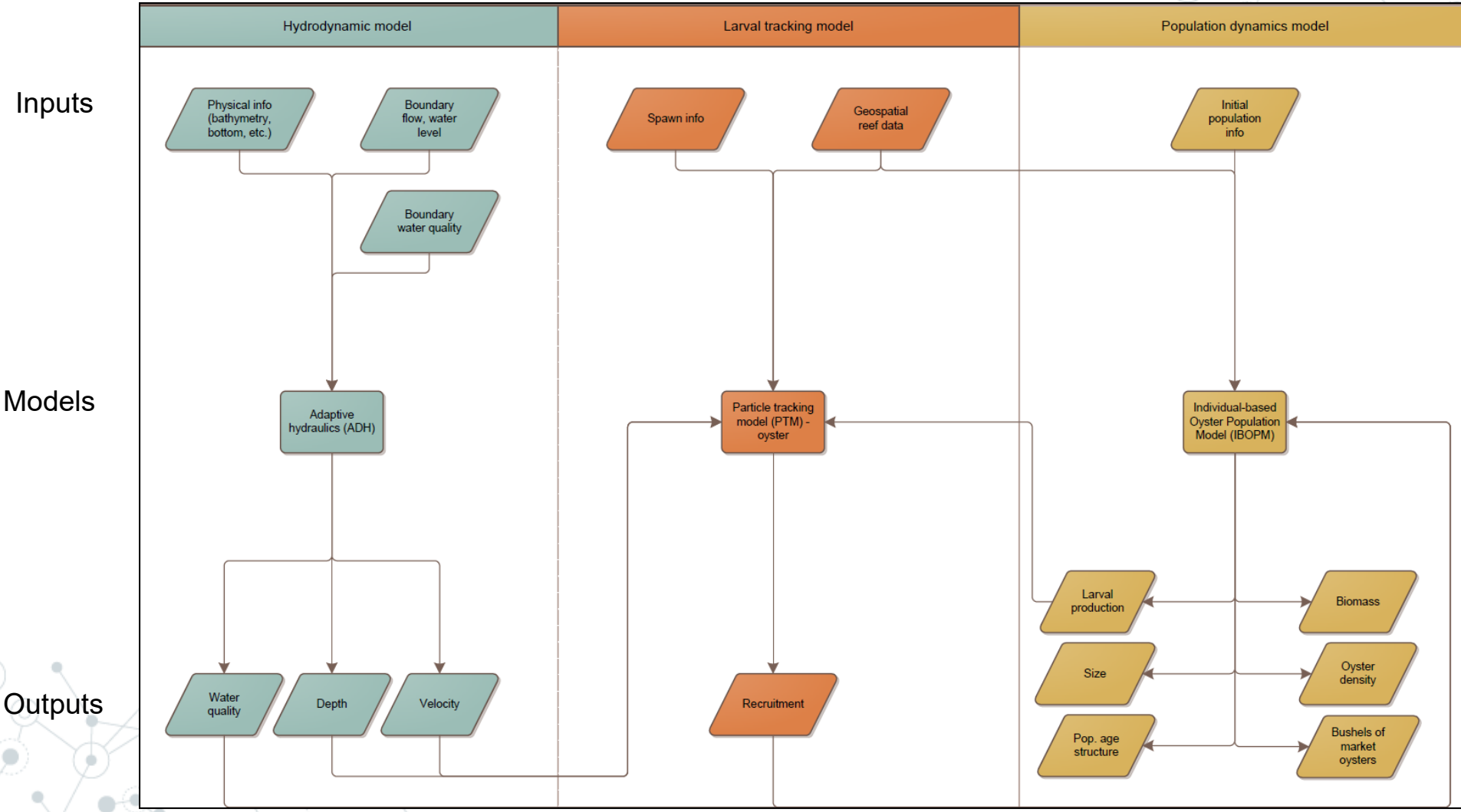


- Federal & State stakeholders
  - Planners, project managers, fisheries managers, oyster biologists
  - No engineers or modelers in stakeholder group, but they had general understanding of models

- We decided on a mediated-modeling approach

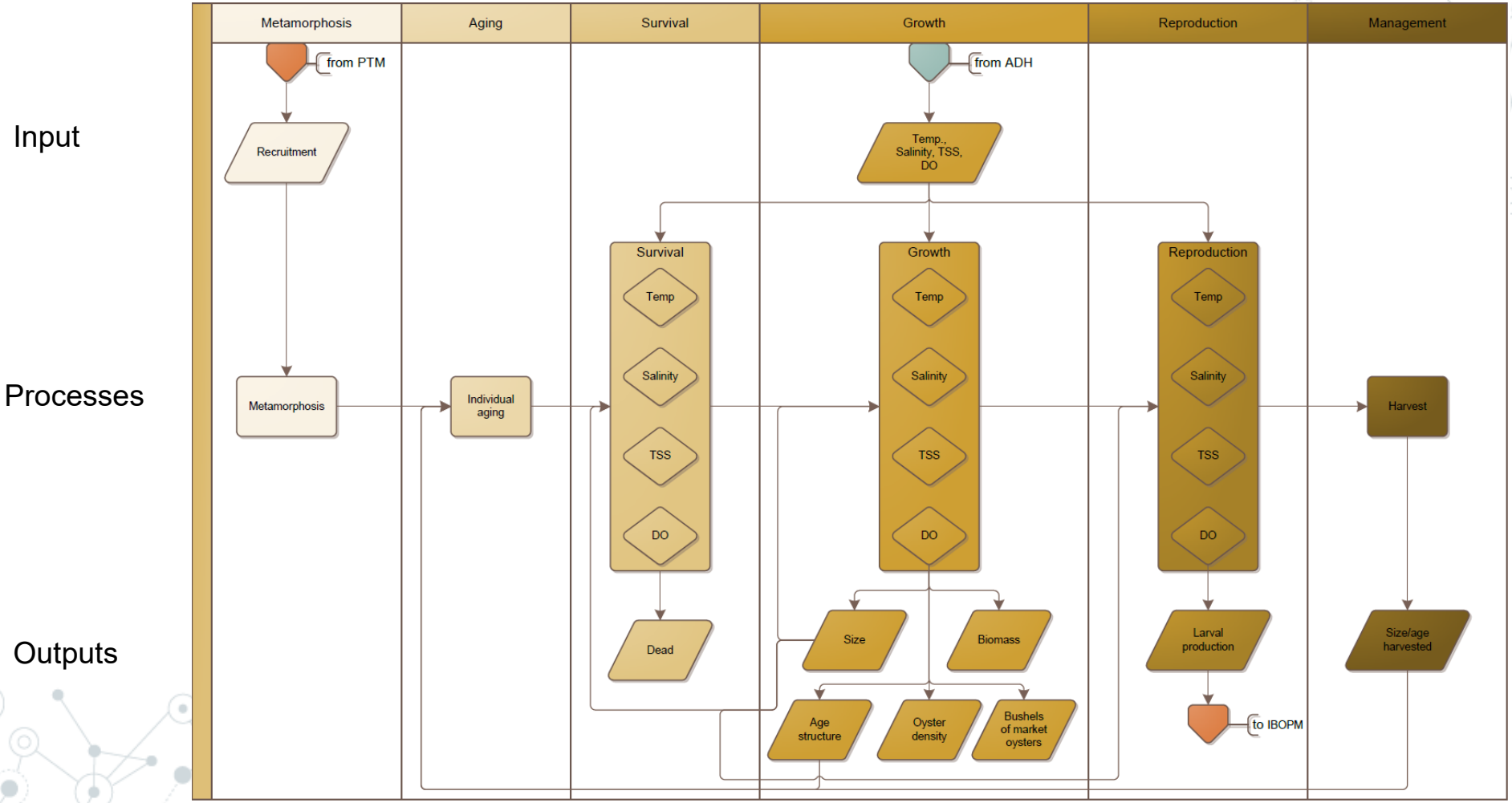
- <u>Audience Analysis</u>: Series of meetings prior to, during, and after model development
  - Preliminary meeting: discussion of modeling approach
    - identified background knowledge and experience of stakeholders
  - Second meeting: we convened with stakeholders to evaluate model and develop scenarios

Obstacle 2: Understanding big picture



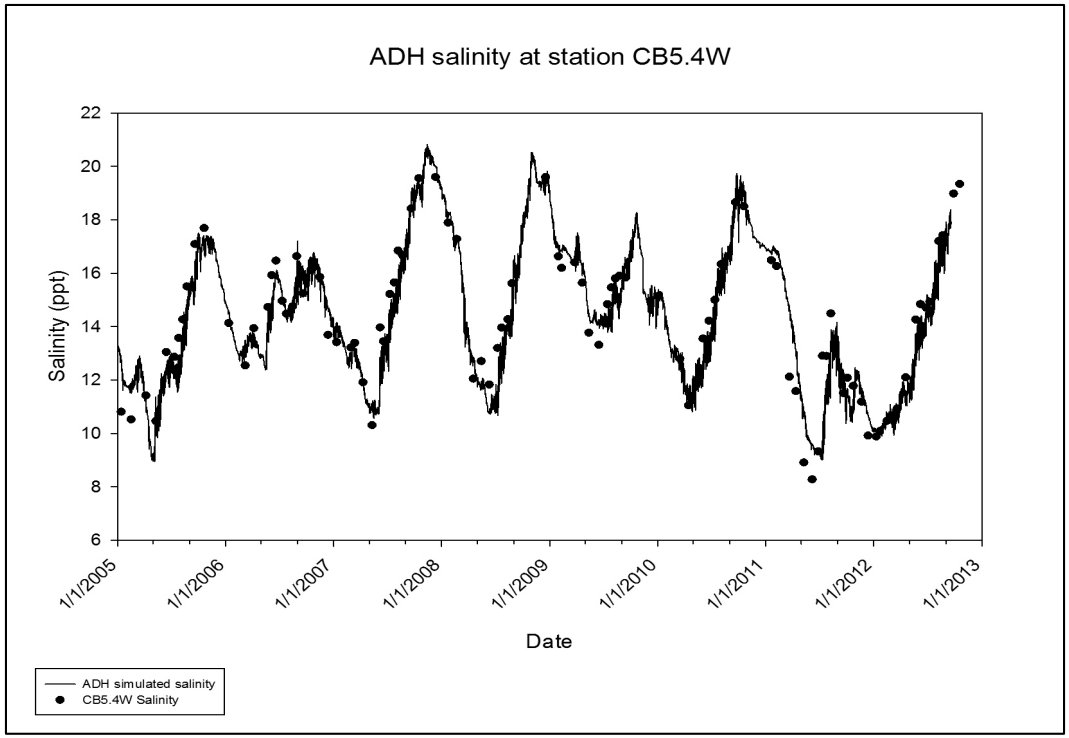
Drilling down to points of interest

Population Dynamics Submodel



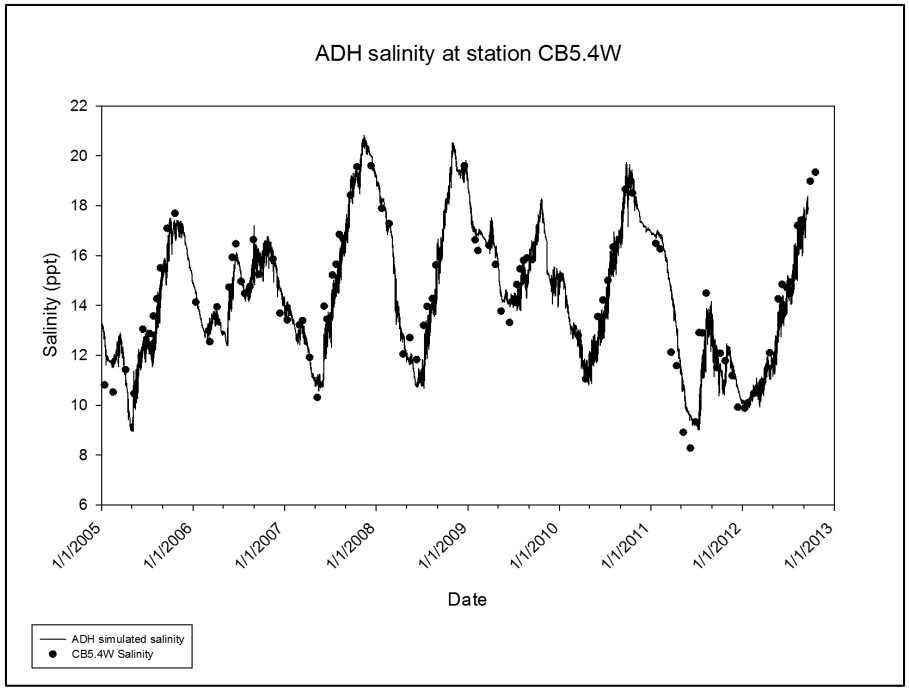
Obstacle 2 confirmed

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



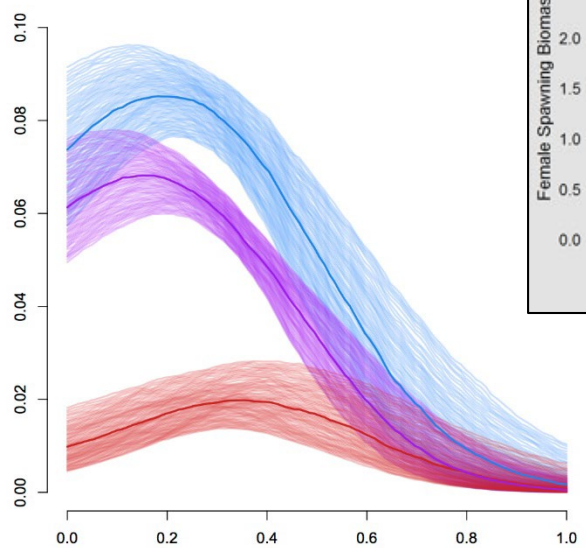
Additional Model Communication Pitfalls Observed

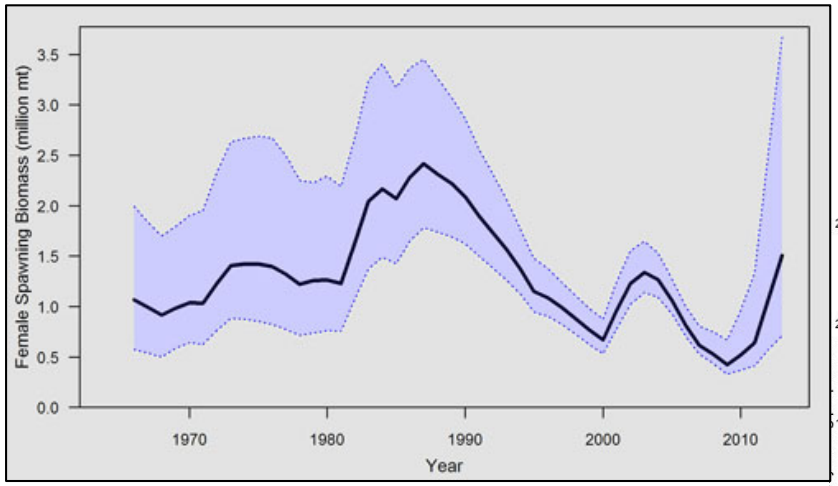
- Each team member wants to talk about how cool their stuff is
  - Audience analysis defines interests (i.e., what to talk about, what to omit)

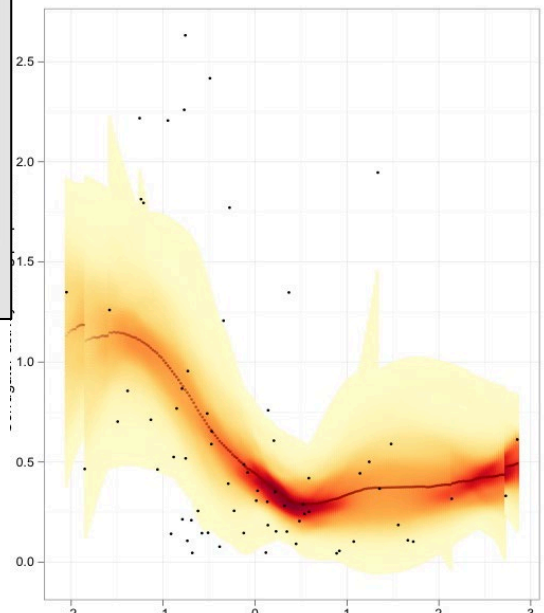


Potential Pitfalls

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

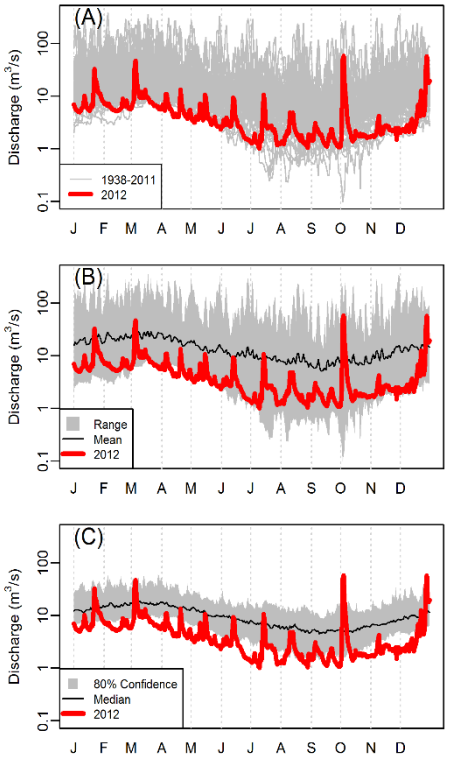


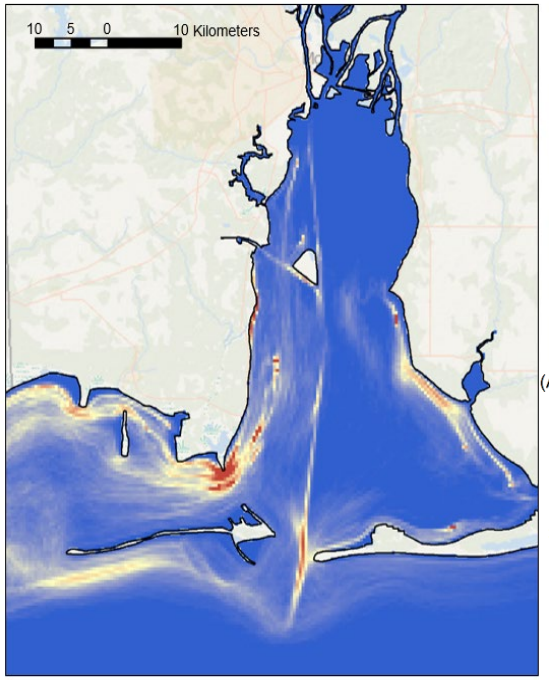


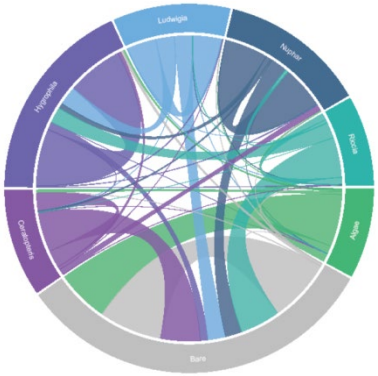


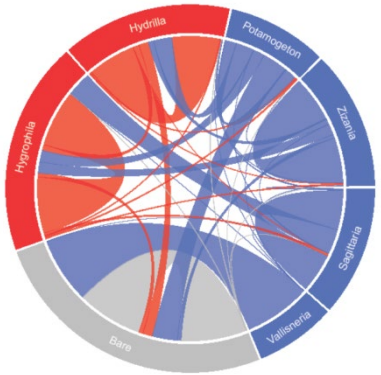
Novel Visualizations

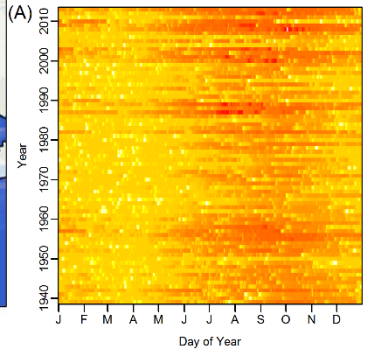
- Visualexploration takes advantage of the capacity of the human eye to rapidly detect anpatterns

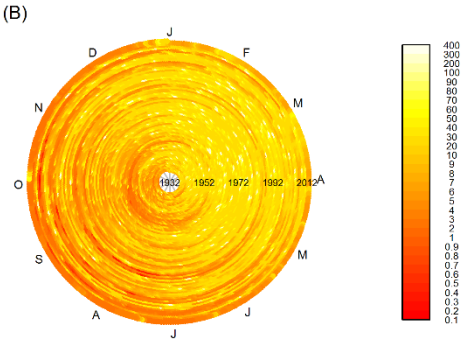






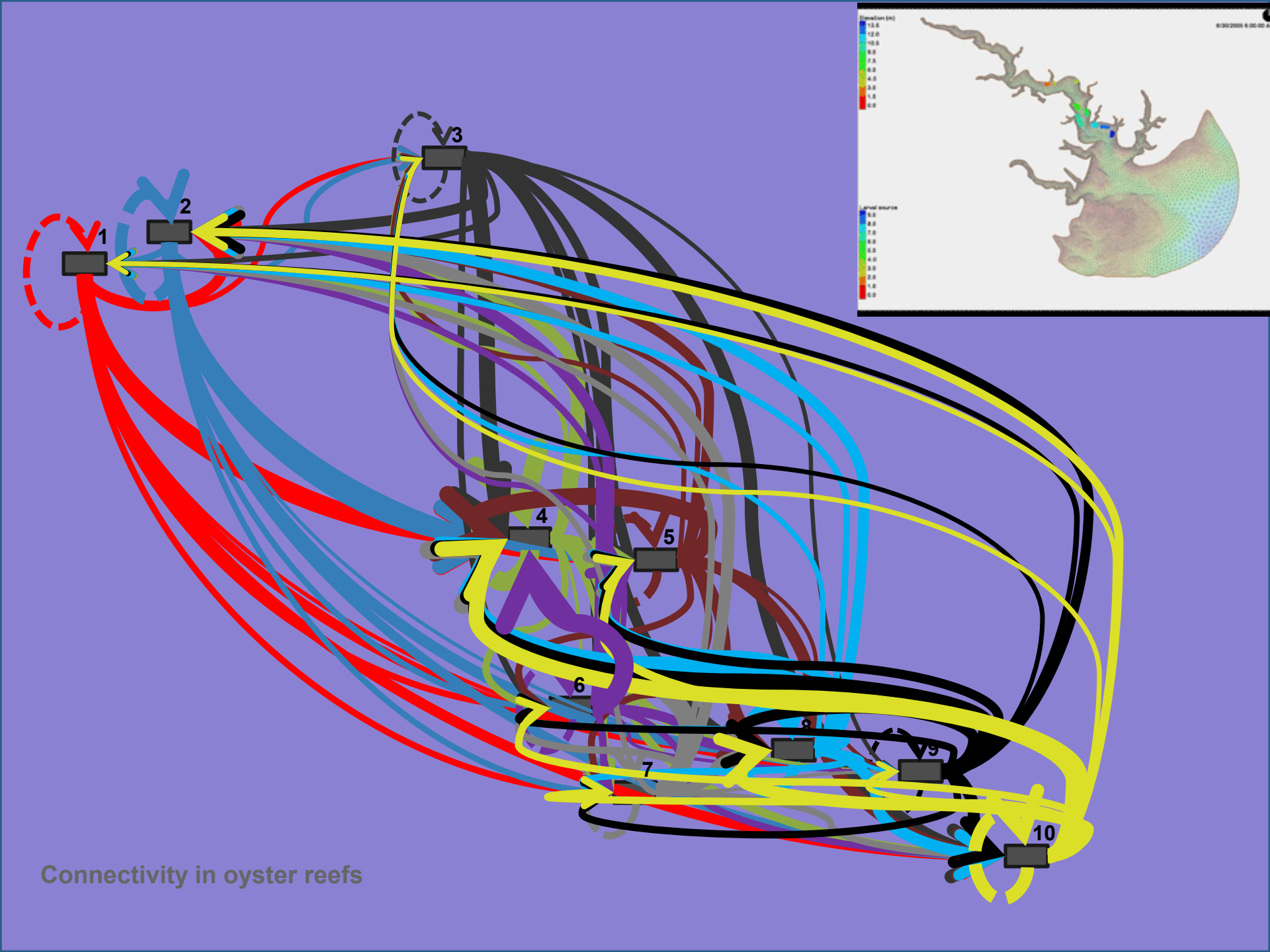






Colors draw eye and audience tends to pay attention

Interesting to certain audiences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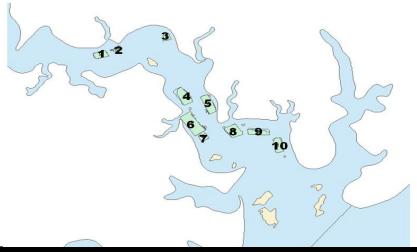
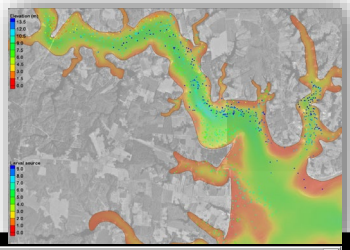
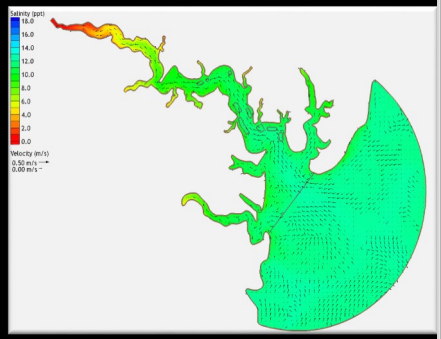
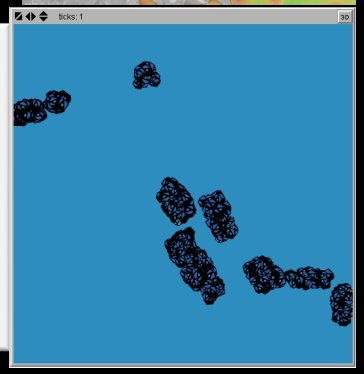
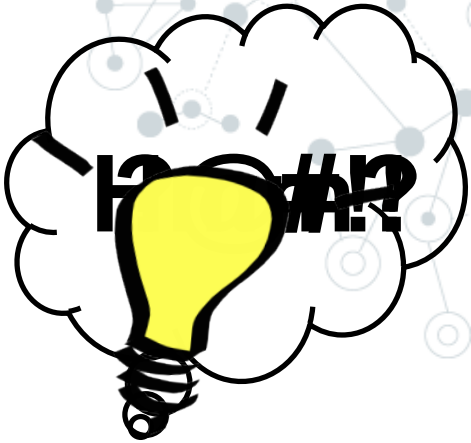
Connectivity in oyster reefs





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