A Habitat Suitability Modeling Technique

- Hightower et al. *In Press*.
- HSI model for American shad in the SE
- Multi-step process:
  1. Spawning survey—where are they spawning?
  2. Data from multiple rivers—what is available?
  3. Expert meeting—what variables do we think are important?
  4. **HSI Curve development—entirely data driven and updatable**
     - **Modeled suitability with resource selection functions (RSFs)**
       - Use and availability of various habitats (Thomas et al. 2004)
     - **Fit with Bayesian methods in OpenBUGS (free software)**
       - Flexible and updatable with future studies

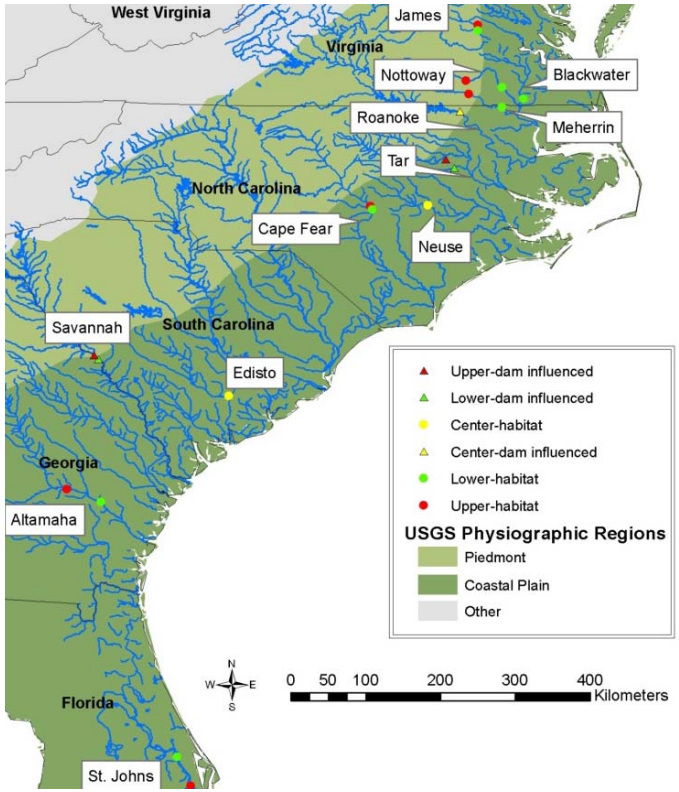
Bayesian analysis:

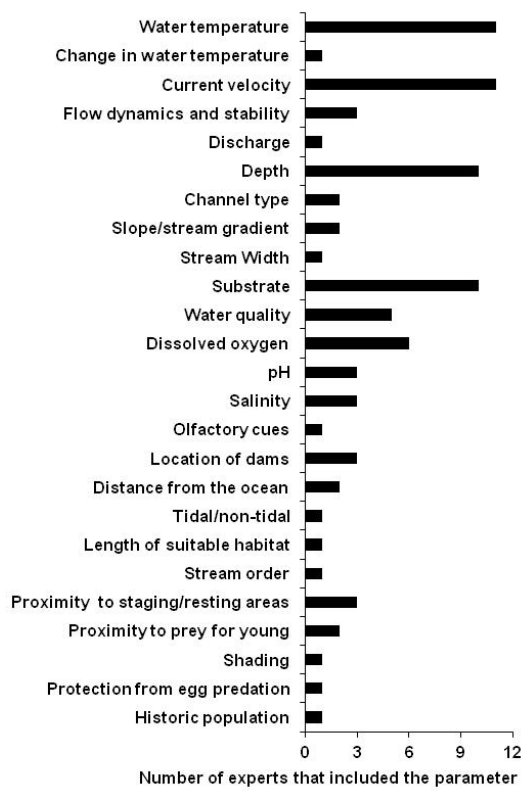
Prior + Data $\xrightarrow{\textbf{Model}}$ Posterior

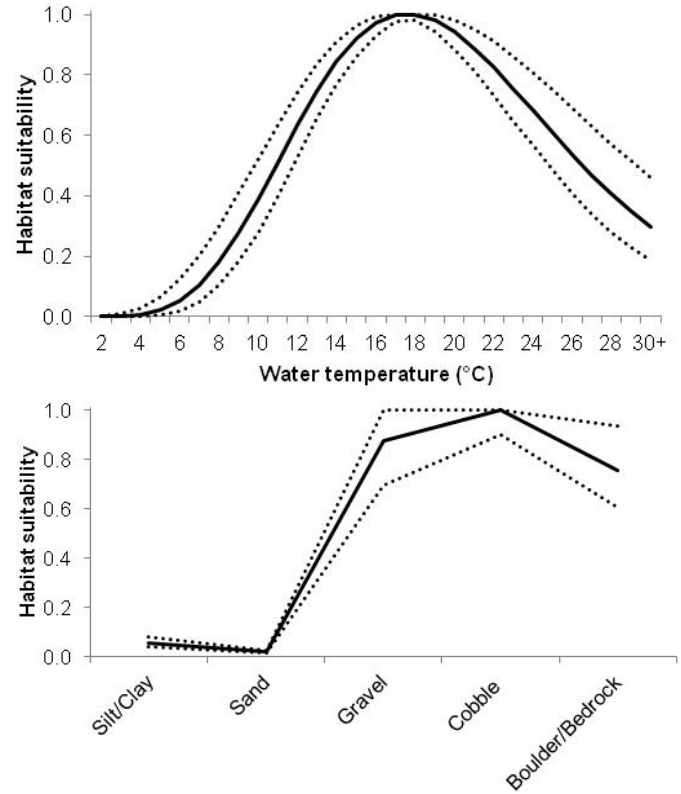
(Initial knowledge) (observed data) (results)

Model Development and Results

- Priors: all uninformative
- Data: Eight rivers from VA to FL
- Dependent variables: eggs, adults, spawning splashes
- Independent variables: temperature, velocity, depth, substrate
- Published (with supplemental code) in an open access journal

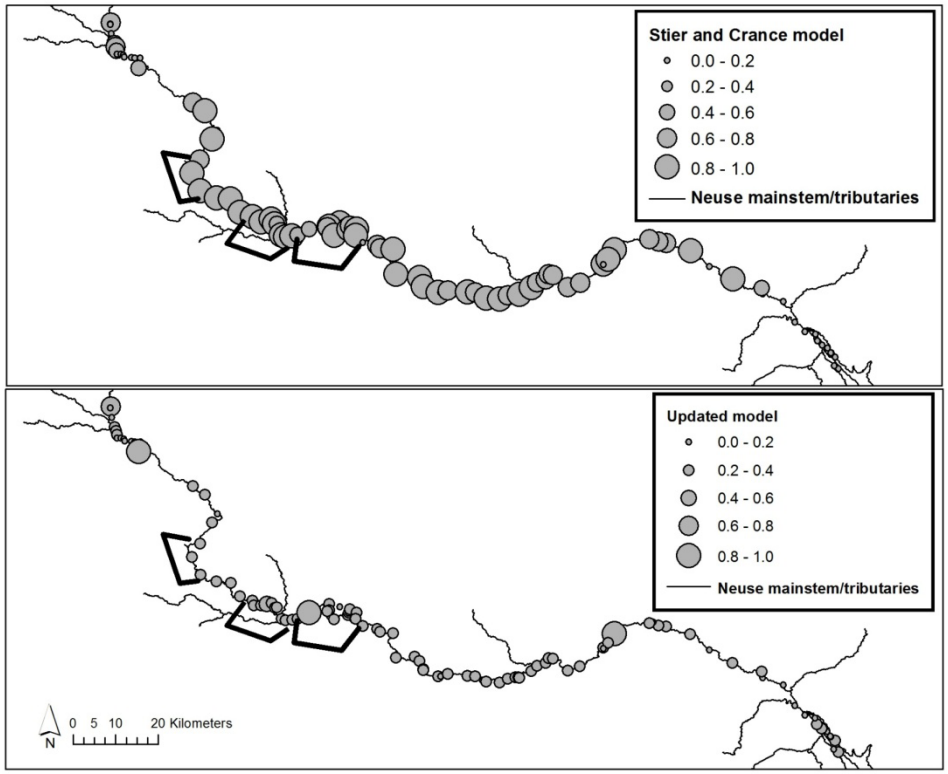






Potential Future Directions

- This technique could be used to develop HSIs for river herring
  - Combine multiple strategies for identifying suitable habitat
- Habitat availability with climate change could also be modeled
- Potential changes could be explored
  - Changes in run timing, spawning sites, amount of suitable habitat, etc.



As an Example:

Quality of habitat in the Neuse River, NC, for spawning American shad, as modeled by the original and our updated HSI

Similarly, current habitat quality could be compared to potential habitat quality under various climate scenarios