Indicators of the Occurrence of *Vibrio* in the Winyah Bay, SC Estuary

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Acknowledgements

Concept

Field sampling for *Vibrio*

This project

PRISM2 model

Prior project

**Forecast future *Vibrio* in the study area**

This project
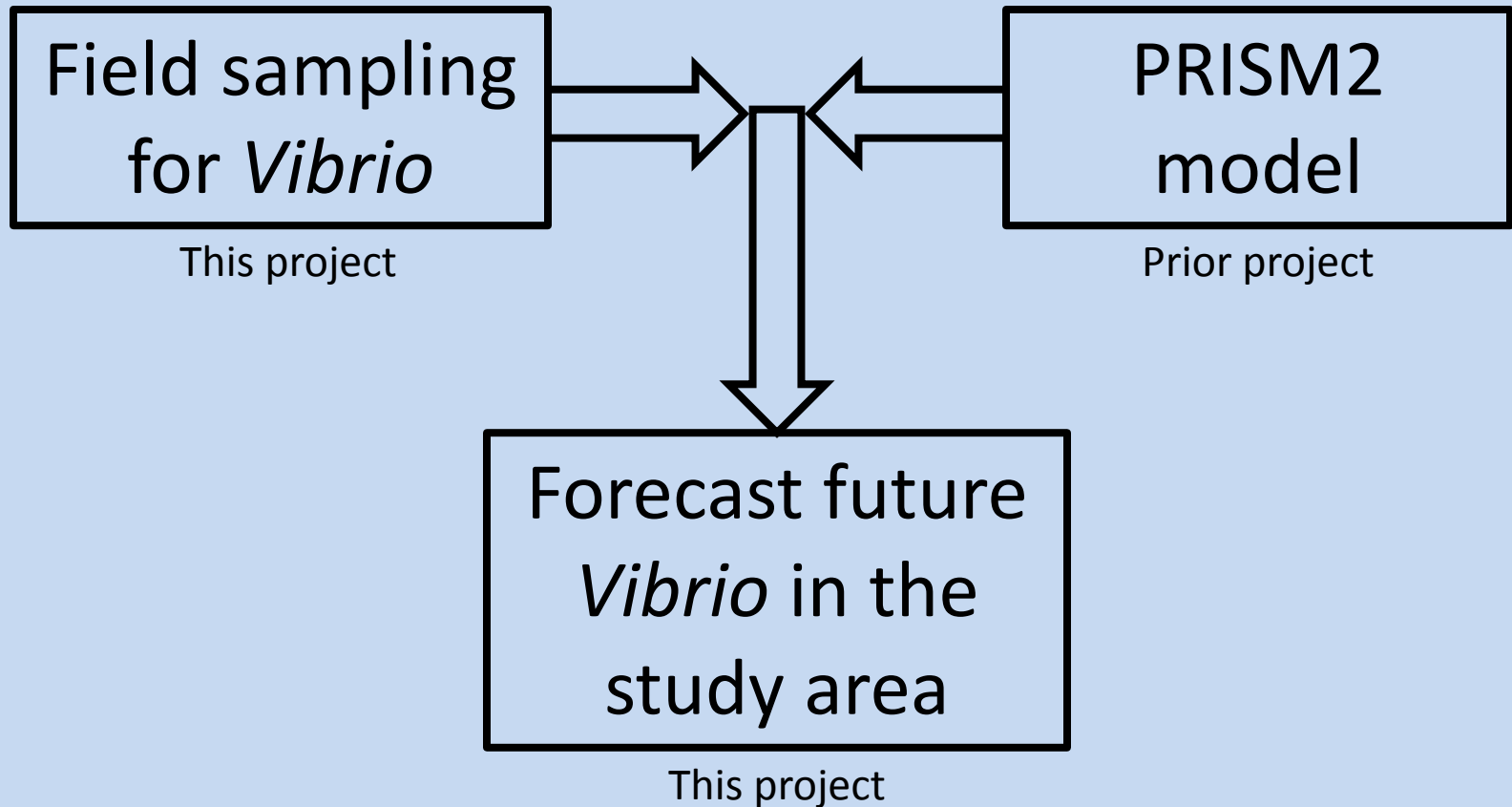
Research Objectives

- Quantifying the distribution of *Vibrio vulnificus* and *Vibrio parahaemolyticus* in the Waccamaw River/Winyah Bay estuary

- Correlate *Vibrio* occurrence with environmental parameters
  - Especially salinity / conductivity

- Potential trends of *Vibrio* for the years 2055-2068 under future sea level and streamflow

Methods

- Monthly sampling in the Waccamaw River/Winyah Bay
  - Surface/bottom water
  - Field parameters measured
  - April – October 2012
  - Special Sandy sample
- Filter and incubate
  - CHROMagar
  - Focus on *V. vulnificus* and *V. parahaemolyticus*
- Statistics
  - Correlations of Vibrio spp with temperature, conductivity, and turbidity
  - Regression models
- Couple with PRISM2

Sampling Sites
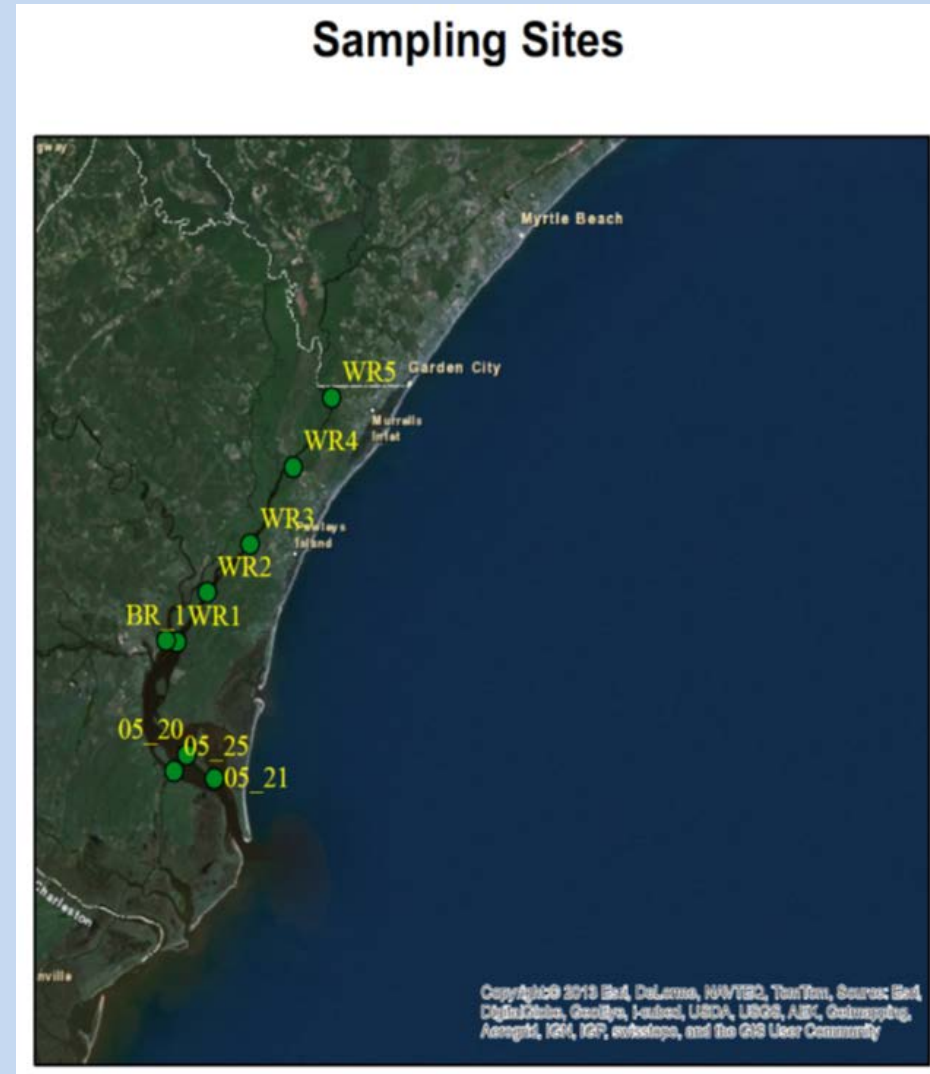
Methods

- PRISM2 overview
  - Developed by USGS and ADMi
  - Neural network model
  - Uses streamflow, sea level, and tide stage
  - Predict conductivity in the Waccamaw River and Intracoastal Waterway

- PRISM2
  - Trained using historic data
  - HSPF model predictions of future streamflow
  - Used 1, 2, 3 ft. sea level rise
  - Predict future conductivity

- This project
 - Predict impact on *Vibrio* distribution
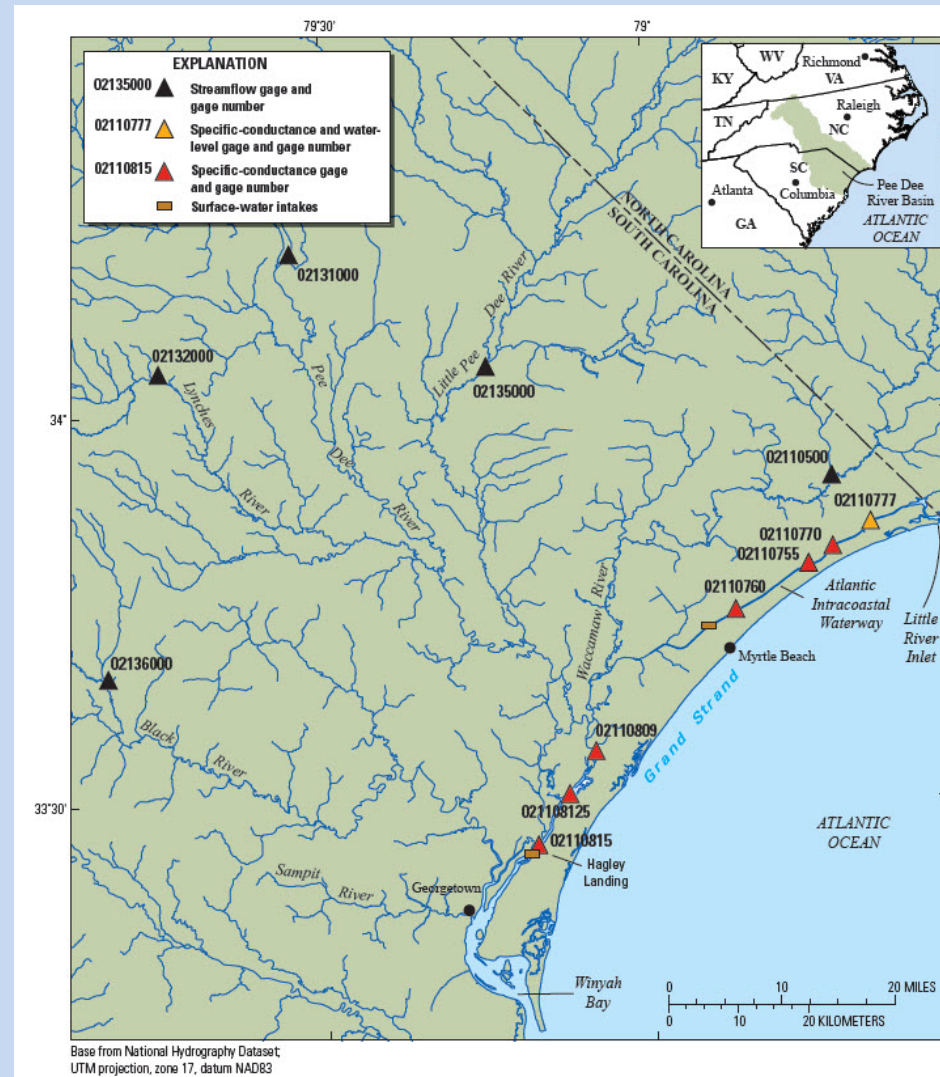
Results

- *Vibrio* found at all sites
  - Highest concentrations within known optimal salinity range
- PRISM2 predicts conductivity increases
  - Sea level is stronger driver of salinity trends than river flow
  - 90th percentile conductivities 2X – 15X depending on location and SLR
  - Peaks more frequent and longer duration
- *V. vulnificus*
  - More common in upriver sites
  - High concentrations more frequent and longer duration
  - Depends on SLR

Sampling Sites
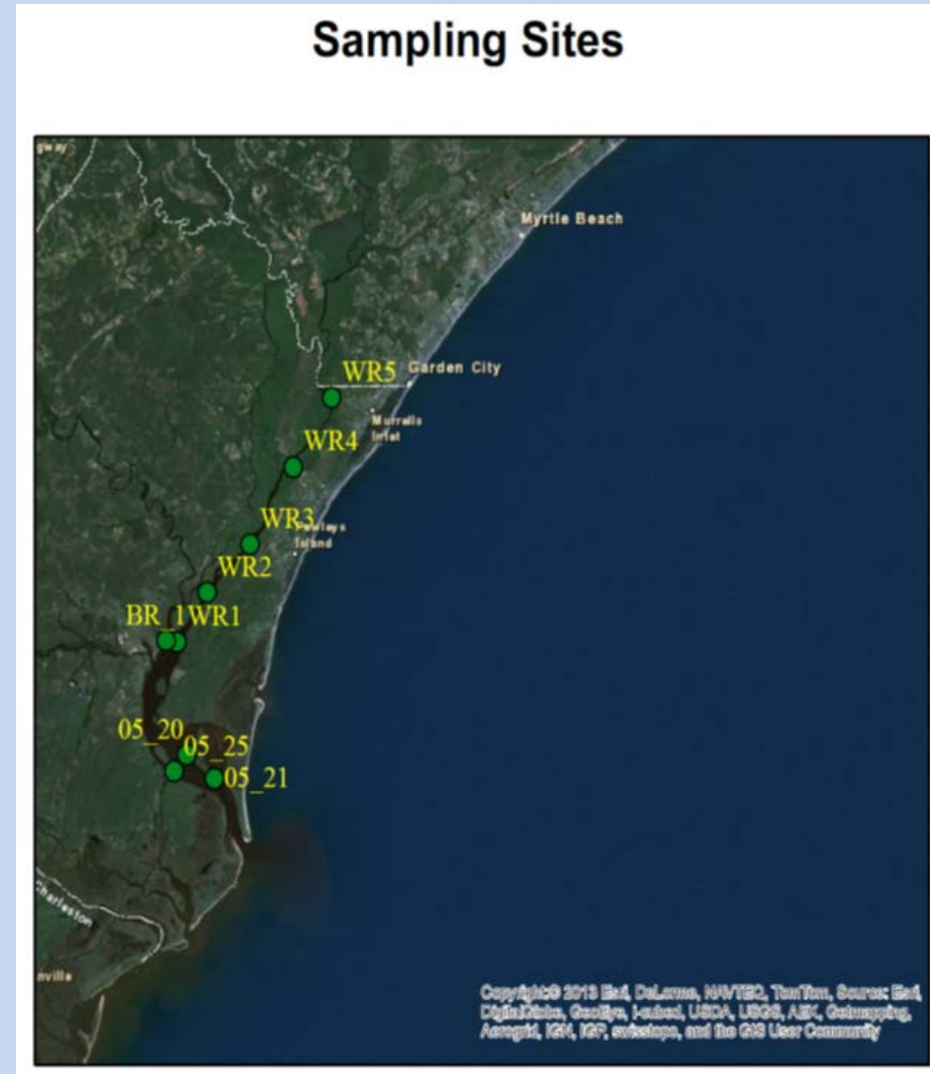
Implications

- Greater opportunity for exposure
  - Geographic range increase
  - Temporal expansion
- Exposure risk based on occurrence of optimal conductivity range
  - Increase as much as 36X
  - Wound infections only
- Other factors
  - Temperature not included in this study
  - Optimal range is 15-30° C –> *V. vulnificus*
  - Estuarine water is warming
  - Expect more days per year in range
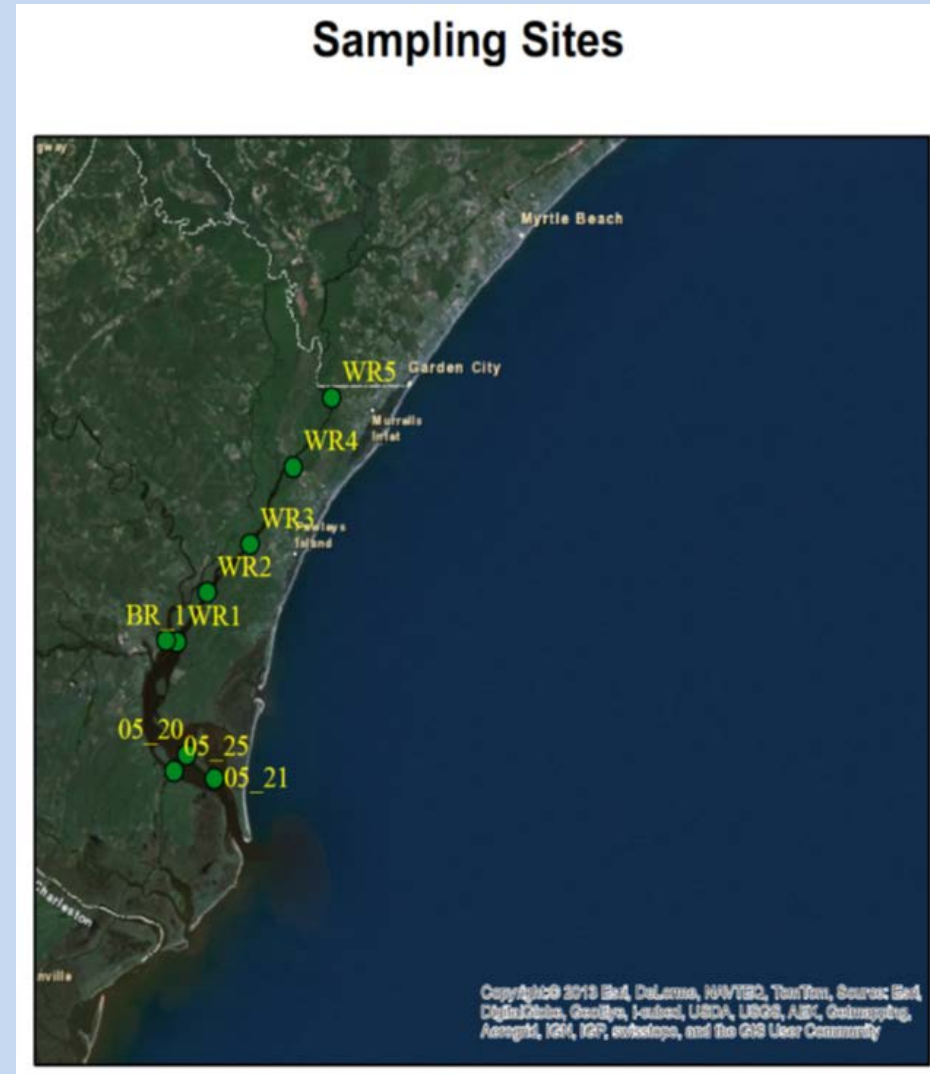
Summary and conclusions

1) *Vibrio* spp. occur throughout the Waccamaw River/Winyah Bay estuary
    1) Even fresh water reaches
2) Salinity predicted to rise in the future
    1) Higher salinities, greater frequency, and longer duration of conditions that favor *Vibrio* growth
3) Potentially significant public health implications
4) Future work:
    1) Look at virulence
    2) Integrate temperature into the model

Questions?

PRISM2 report

Conrads, P.A., Roehl, E.A., Jr., Daamen, R.C., and Cook, J.B., 2013. Simulation of salinity intrusion along the Georgia and South Carolina coasts using climate-change scenarios: U.S. Geological Survey Scientific Investigations Report 2013–5036, 92 p. + 5 apps.

(http://pubs.usgs.gov/sir/2013/5036/)

Deeb thesis

Deeb, Reem, 2013. Climate Change Effects on Vibrio Bacteria in the Winyah Bay Estuary and the Projected Spread of Vibrio Under Future Climate Scenarios. Masters thesis, University of South Carolina, Columbia. 106 p.