

# Quantifying Occupancy of Non-native Aquatic Species in South Carolina's Coastal Plain Using eDNA and Electrofishing

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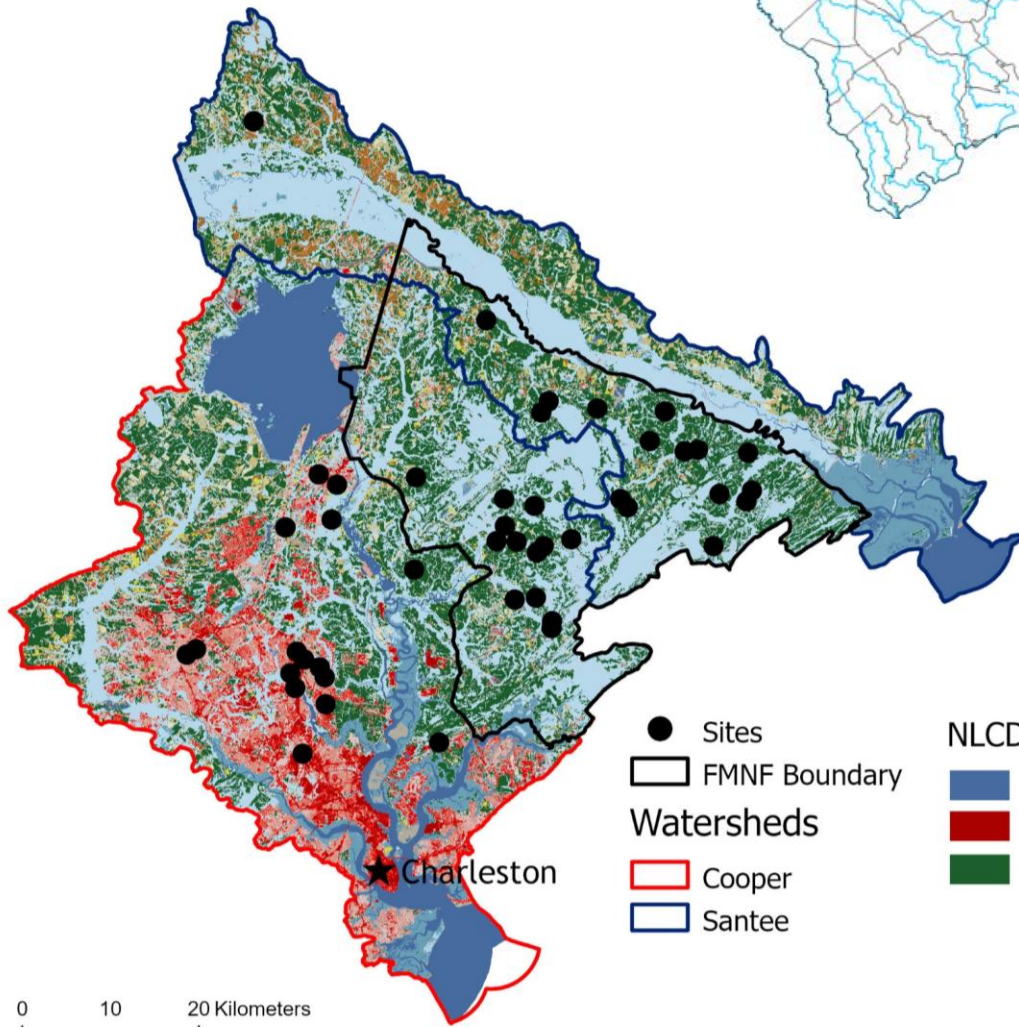
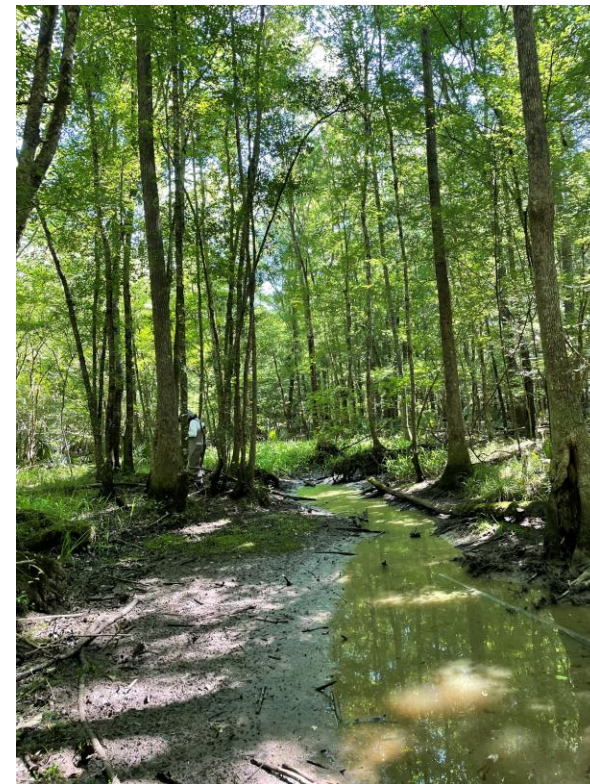


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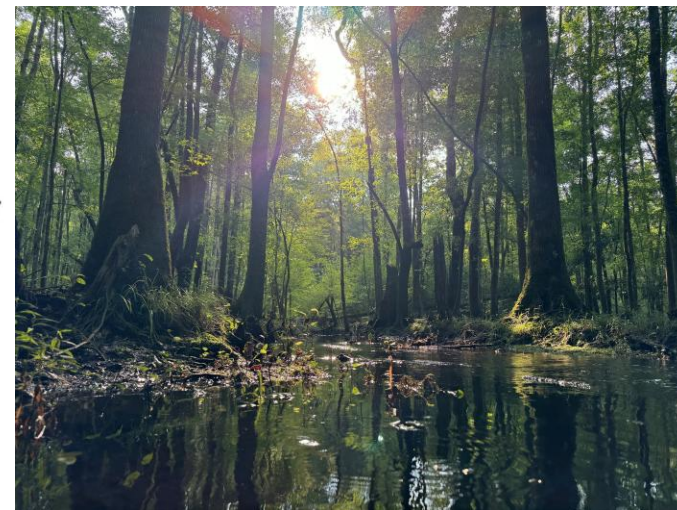
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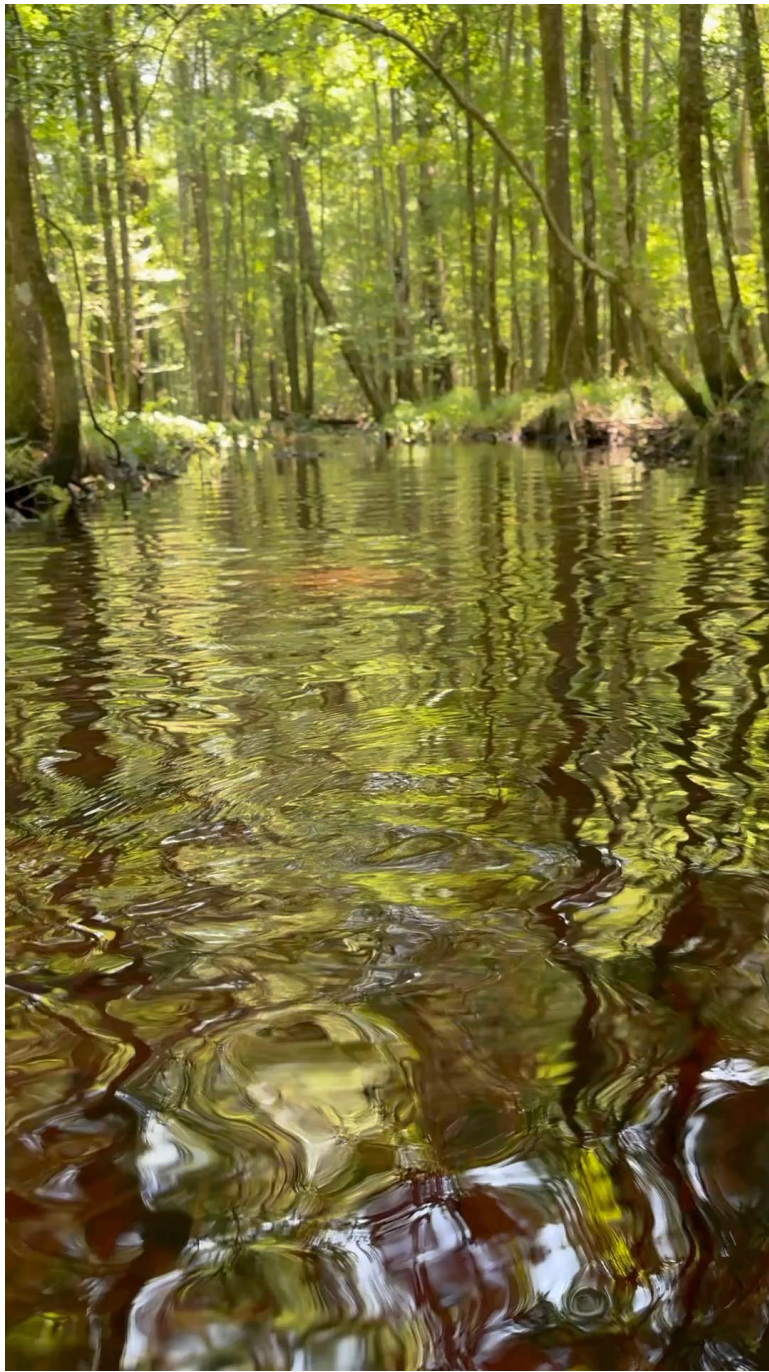
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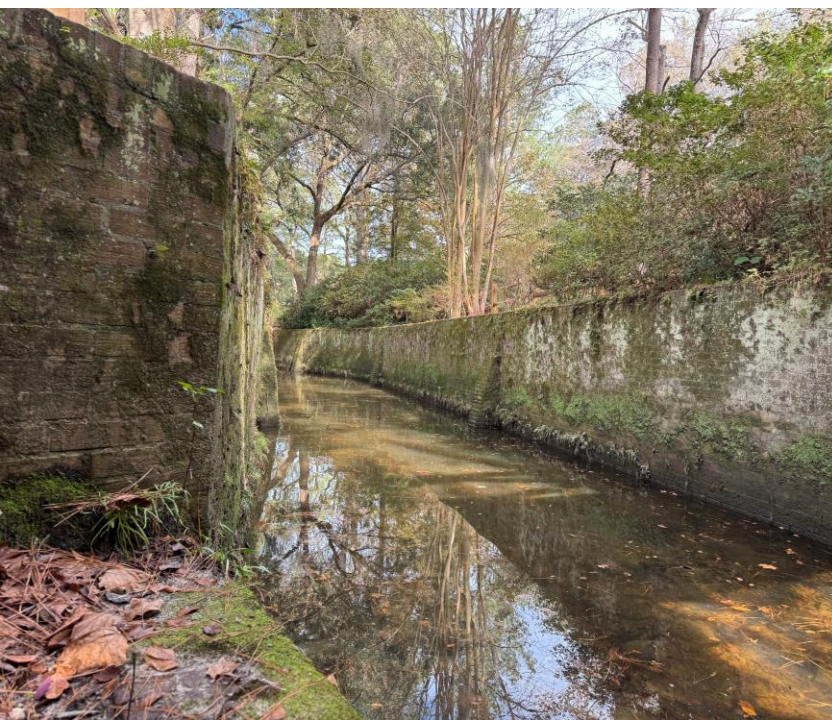


- Sites
- FMNF Boundary
- Watersheds
- Cooper
- Santee
- NLCD 2024
- Open Water
- Developed
- Forest

0 10 20 Kilometers



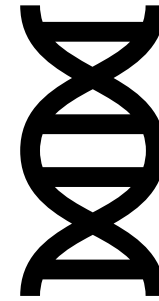




# Nonnative species threaten freshwater diversity



# Environmental DNA (eDNA) as a novel detection tool



# Traditional Sampling – Backpack Electrofishing



# Compare electrofishing and eDNA for detecting nonnative fishes in a dynamic freshwater system.

1. Assess detection probabilities and key covariates for each method.
2. Compare seasonal occupancy and covariate effects in a low-gradient, developing stream network.



# Hypotheses

- **Nonnative species occupancy is strongly associated with human activity**
- **Results from the eDNA analysis and electrofishing surveys will be congruent**

# Capturing multi-scale landscape variation

- 45 sites in SC Coastal Plain Streams
- Sites revisited 3-4 times
- Collected eDNA, electrofishing data, habitat, and water quality



# Nonnative species presence results from electrofishing



Green Sunfish – 5 Urban sites

# Green Sunfish Positive Detections



# Occupancy Modeling

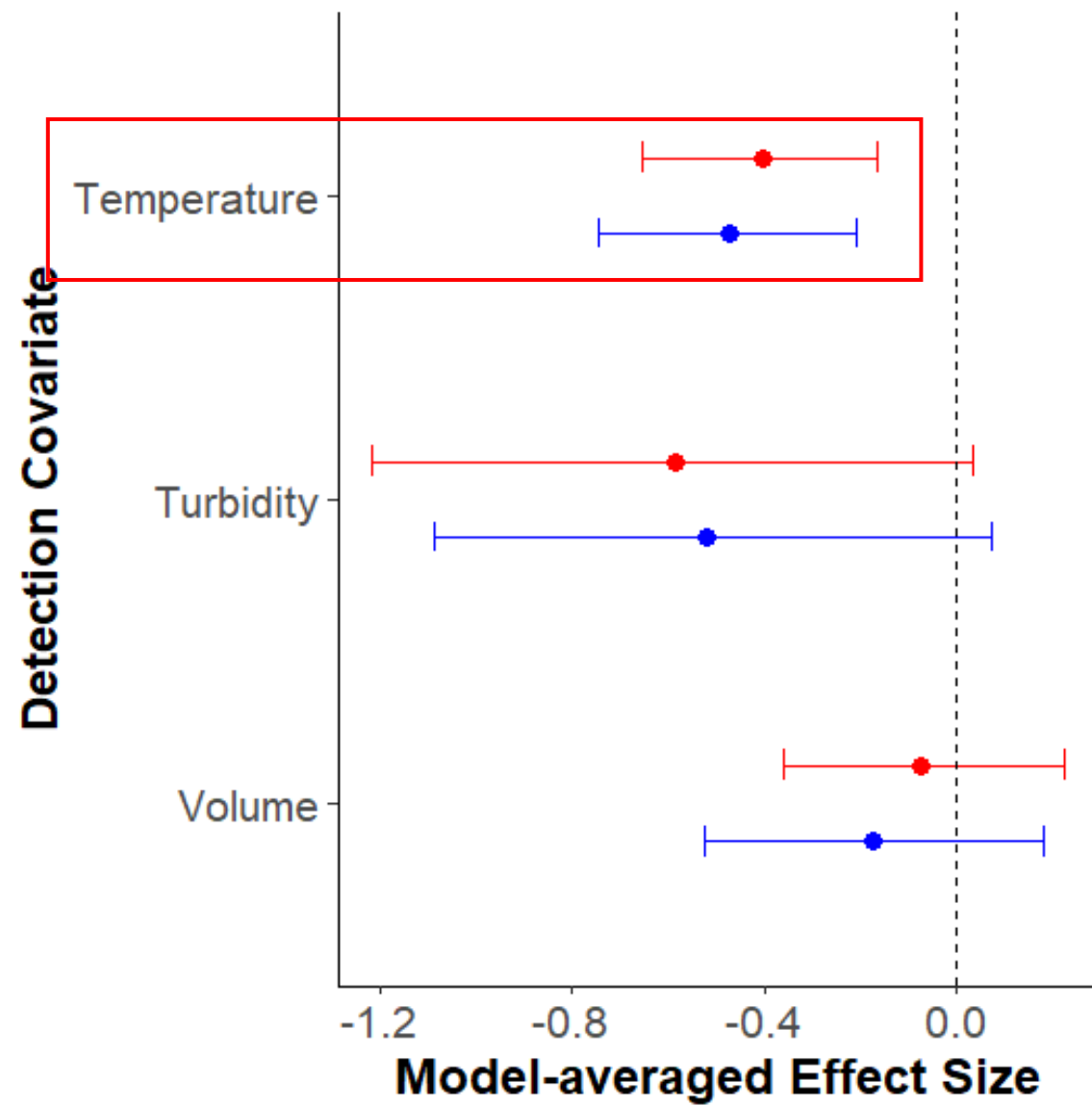
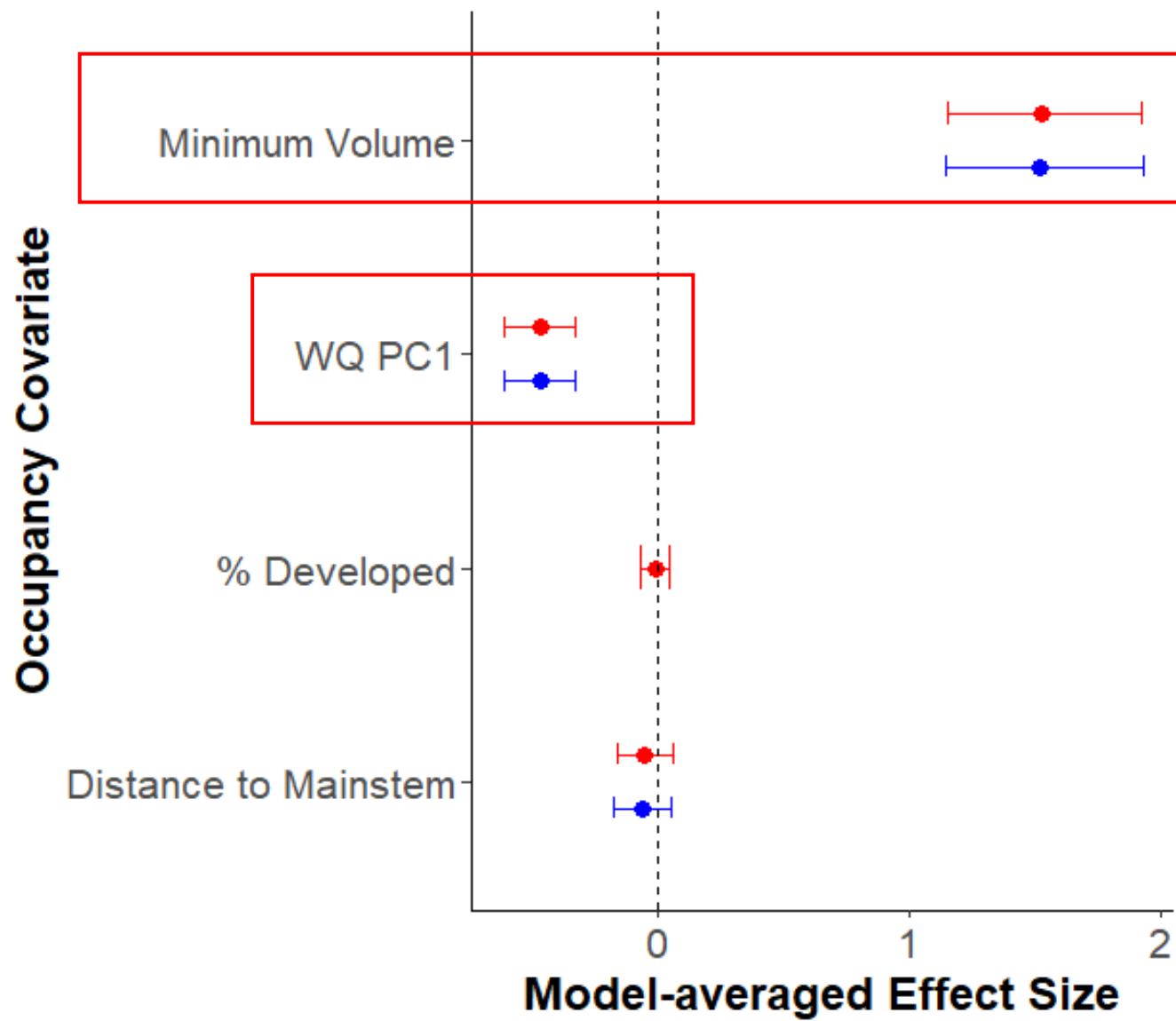


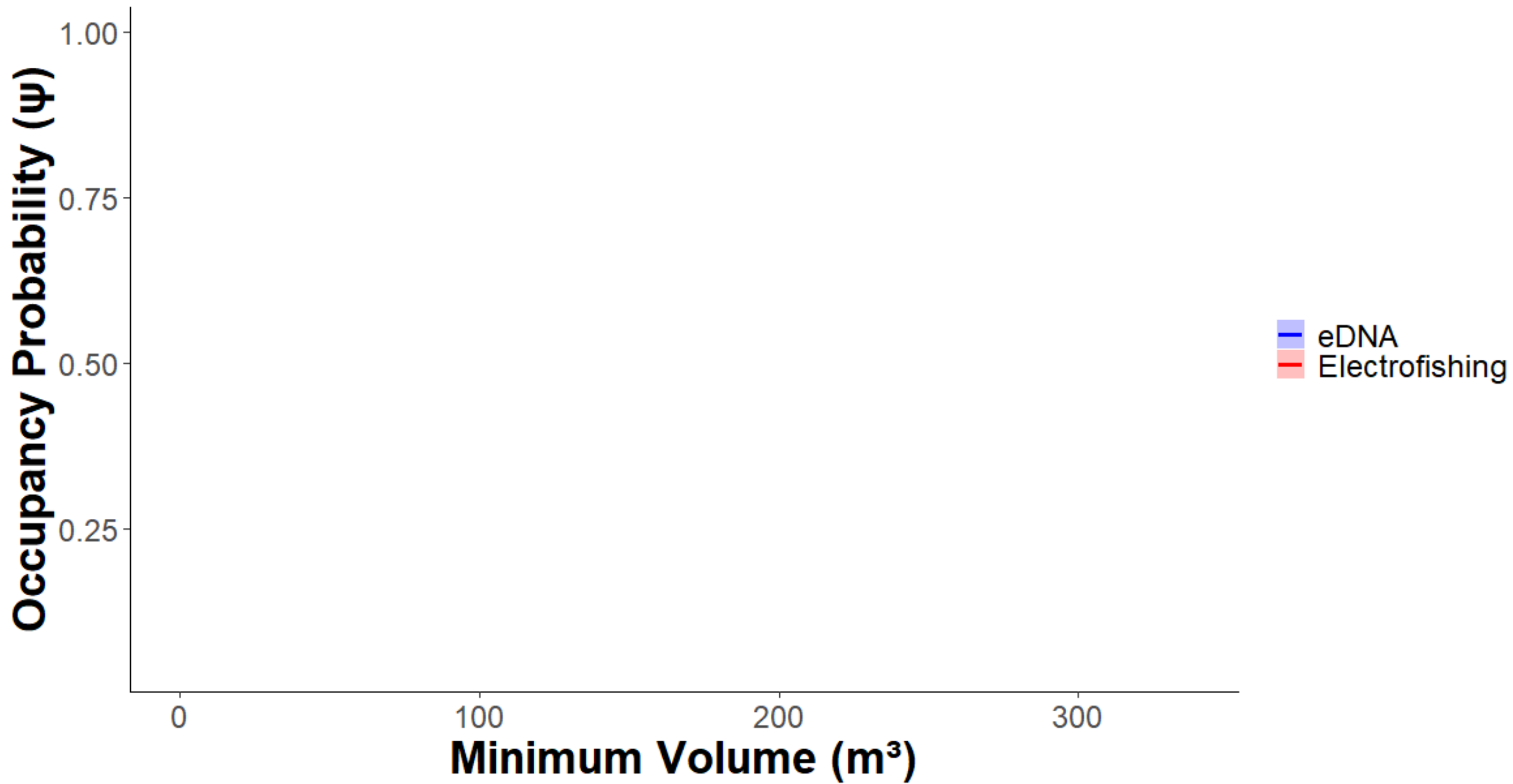
$\Psi$  = Occupancy Probability

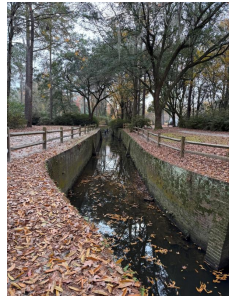
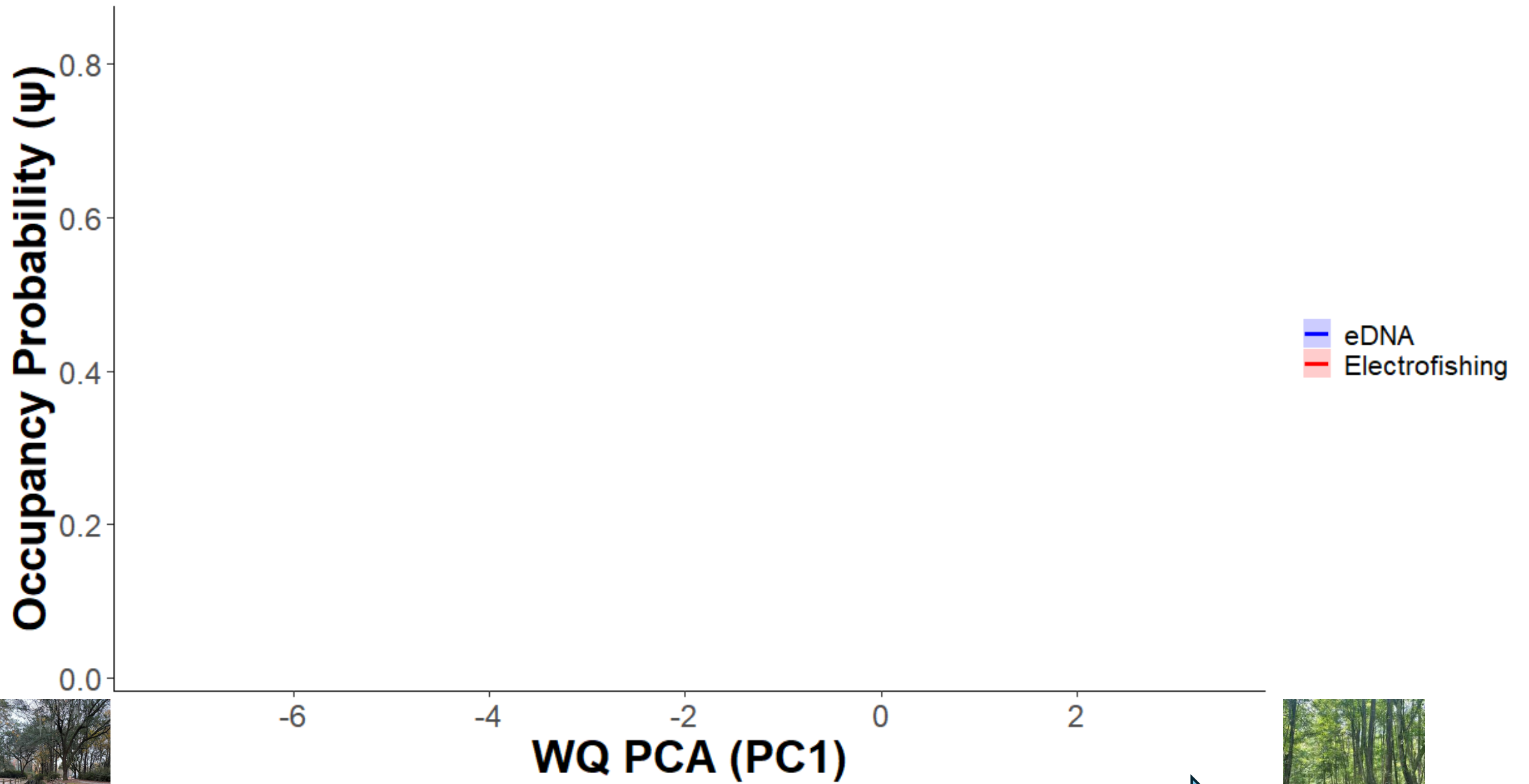
$p$  = Detection Probability

| Site     | Visit 1 | Visit 2 | Visit 3 | Visit 4 |
|----------|---------|---------|---------|---------|
| A (eDNA) | 0       | 1       | 0       | 0       |
| A (BPEF) | 0       | 0       | 0       | 0       |
| B (eDNA) | 0       | 1       | 1       | 1       |
| B (BPEF) | 1       | 1       | 1       | 1       |

**Occupancy Covariates: Distance to Mainstem, Minimum Volume, Developed Land Cover Percentage, Water Quality PCA**  
**Detection Covariates: Turbidity, Volume, Temperature**



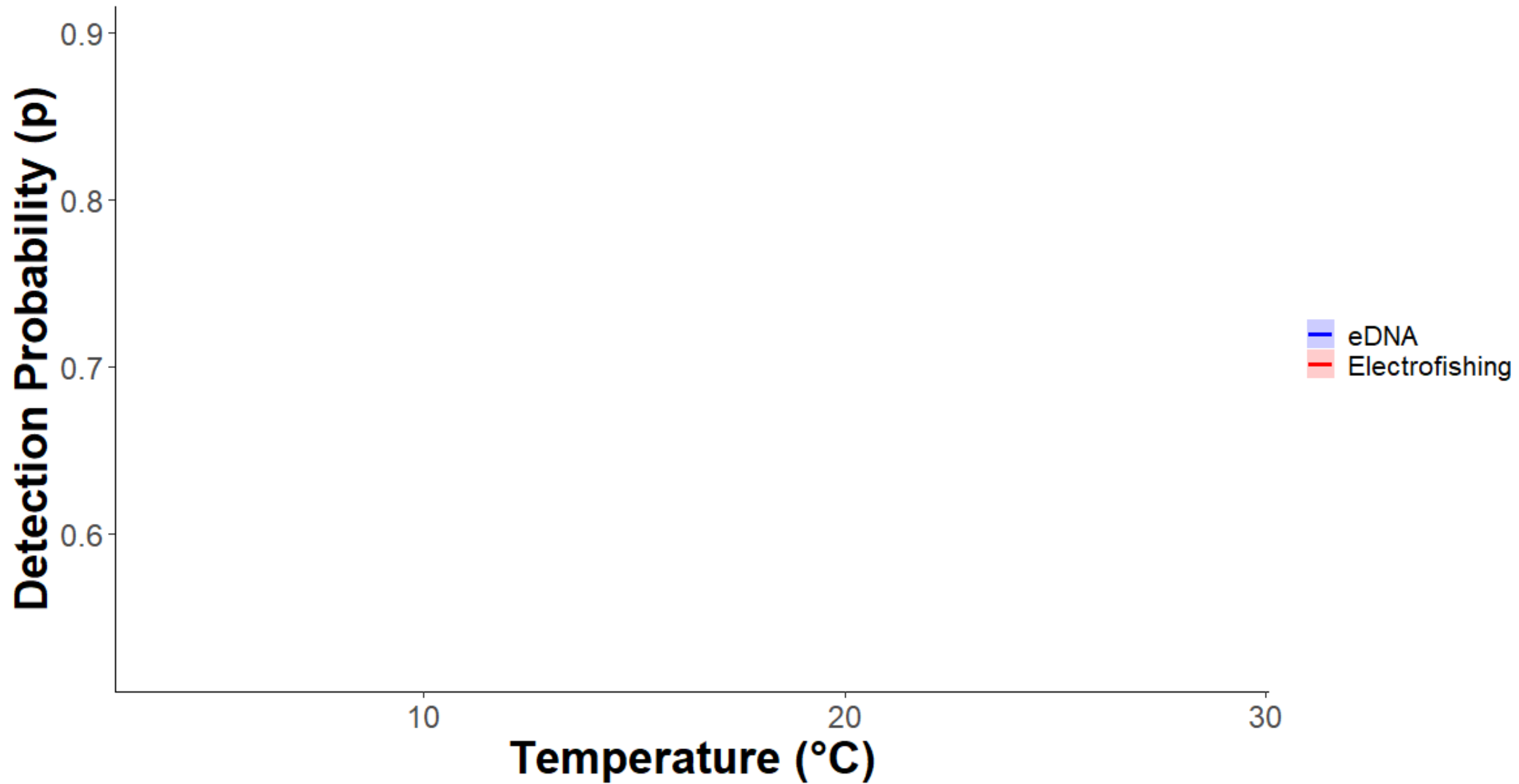




Warmer, Higher pH, DO

Cooler, Acidic, Low DO





# Backpack Electrofishing = eDNA



$\Psi = 0.09$  (Influenced by Minimum Volume and Water Quality)  
 $p = 0.79$  (Negatively influenced by Temperature)



# Implications

- **eDNA is a promising tool, but system-specific**
- **Know your system, know your fish!**

