Correlation Matrix of cHAB Onset Predictors Varies Among Lakes

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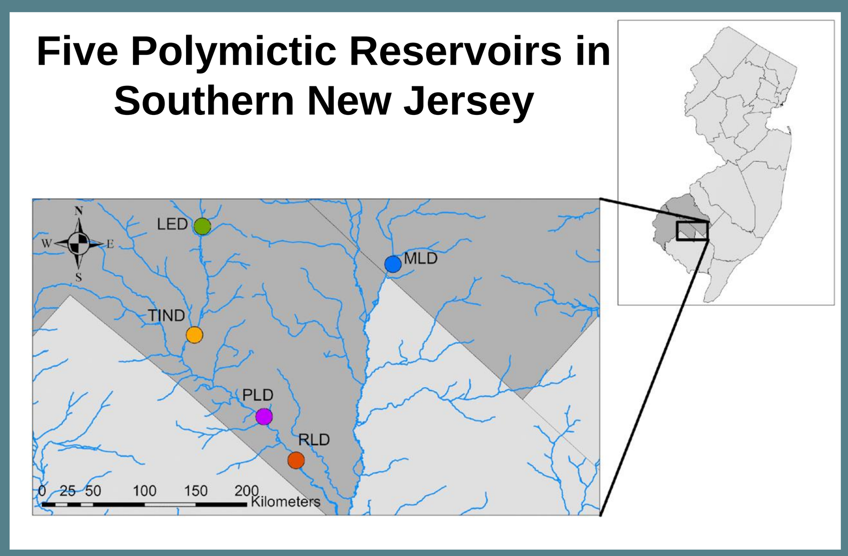


Background

- Cyanobacterial harmful algal blooms (cHABs) may introduce toxins that travel through food chains and are also physically and chemically harmful for humans and other organisms
- Need to develop tools for predicting cHABs to avoid disruption

Methods

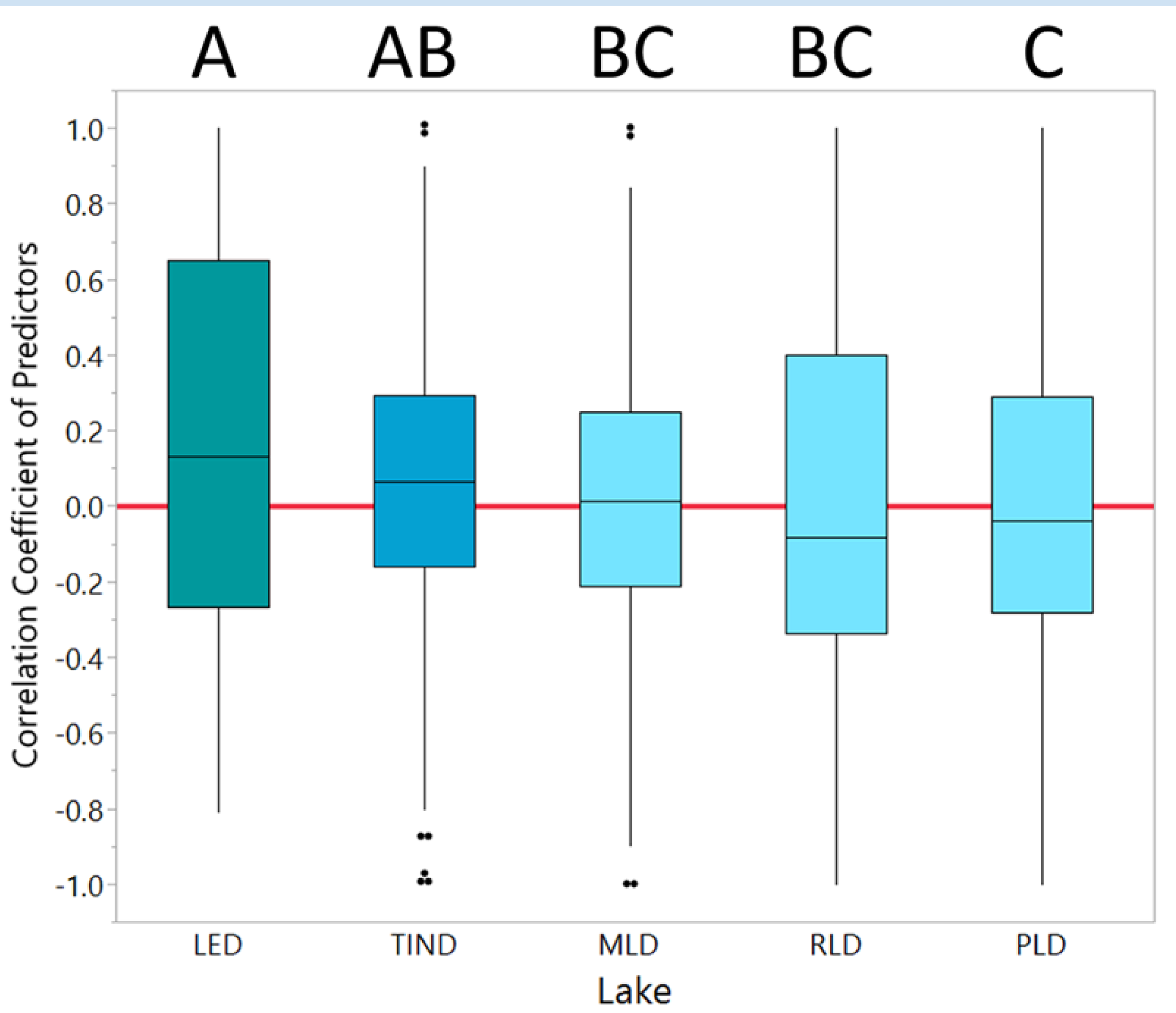
- Weekly water samples June-September 2019 adjacent to dam at five lakes
- Range of abiotic factors measured, including: nutrients, phycocyanin (PC), chlorophyll (CHL), dissolved oxygen (DO)
- Discrete samples measured in-situ in the field and in-vivo in the field and lab

Q1: Do correlation matrices differ among lakes?

Approach: Constructed correlation matrices of all water quality variables at each lake and analyzed the distribution of correlations among lakes

Analyses:

- Extracted correlation coefficients from Principal Components Analyses (PCA)
- Goodness of Fit performed on each distribution
- Kruskal-Wallis with Chi-Square and comparison with Steel-Dwass



Results:

- Correlation matrices are different among lakes (Kruskal-Wallis; p <0.0001)
- LED shifted positive due to cHAB

Implications:

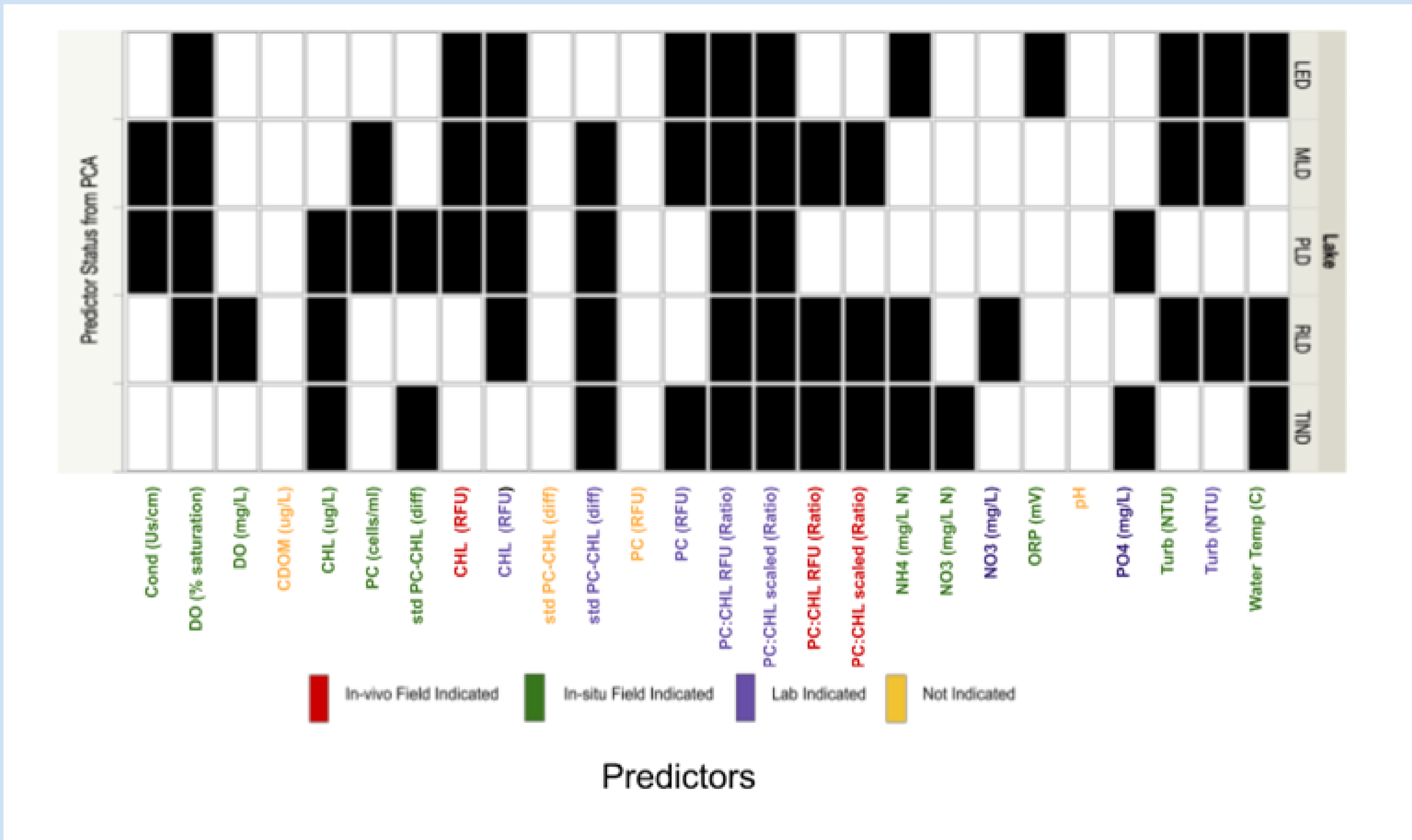
- Predictive modeling of cHABs among lakes should be possible

Q2: Which water quality variables are useful predictors of cHABS?

Approach: Obtained water quality variables and compared them among 5 lakes to determine which were the best predictors of cHABs

Analysis:

- Values extracted from PCA with Chi-Square to test utility for building a predictive model



Results:

- In-vivo PC:CHL lab (RFU) useful in all cases, four predictors never useful
- Helps determine which variables are necessary for a predictive model; some variables are always indicated while others are never indicated
- Compares validity of sample analysis in different environments; both lab and field analysis can be effective

Implications:

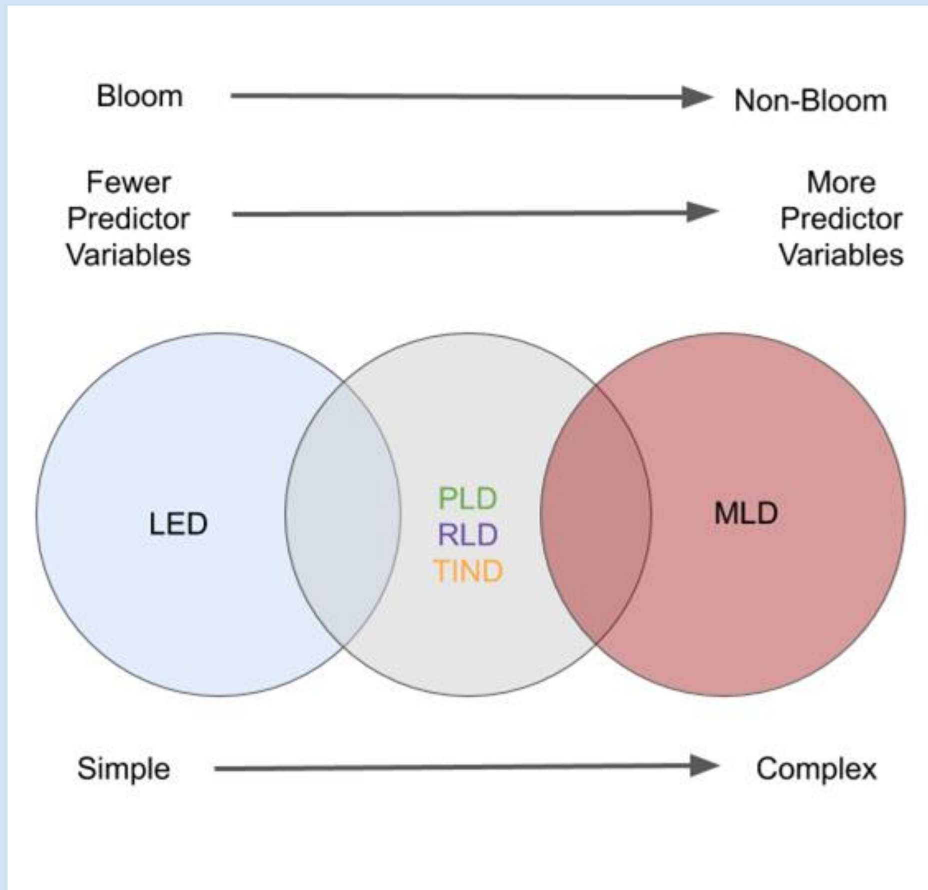
- cHABs may be detectable with low cost and low sample size methods
- Few predictors eliminated; concluding that predictive modeling of cHABs requires many inputs

Q3: How many environmental variables do you need to describe seasonal variation in water quality?

Approach: Used Principal Components Analysis (PCA) to inform a conceptual model describing the drivers of variation in water quality

Analysis:

- Variation in water quality data explained by principal components in a lake-specific PCA (n=5)



Results:

- Lakes with cHABs are simpler, require fewer principal components to describe the variation in water quality
- The opposite is true of lakes without cHABs

Implications:

- The difference between the number of predictor variables in simple vs. complex lakes is likely related to how difficult it will be to create a predictive model of cHABs.

Future Work

Discrete *in-situ* fluorometric predictors of qPCR-derived cyanobacterial density

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