

Examination of Algal Community Data for Establishment of Nitrogen and Phosphorus Criteria in Southern Missouri Streams

Missouri Nutrient Criteria Technical Team

Background

- **2001** – US EPA asked States to develop nutrient criteria plan
- **2009** – Justus and others; found that algal communities of the Ozarks correlated well with nutrient levels
- **2010** – Algae selected to evaluate as indicator species for Ozark streams for Missouri nutrient criteria

Sites

- **59 algae and nutrient samples from 44 sites**
- **Collected July-early November 1993-1995 and 2006-2007**
- **Total Nitrogen concentrations ranged from .04 to 4.85 mg/L**
- **Total Phosphorus concentrations ranged from <0.004 to 1.14 mg/L**

Study Area

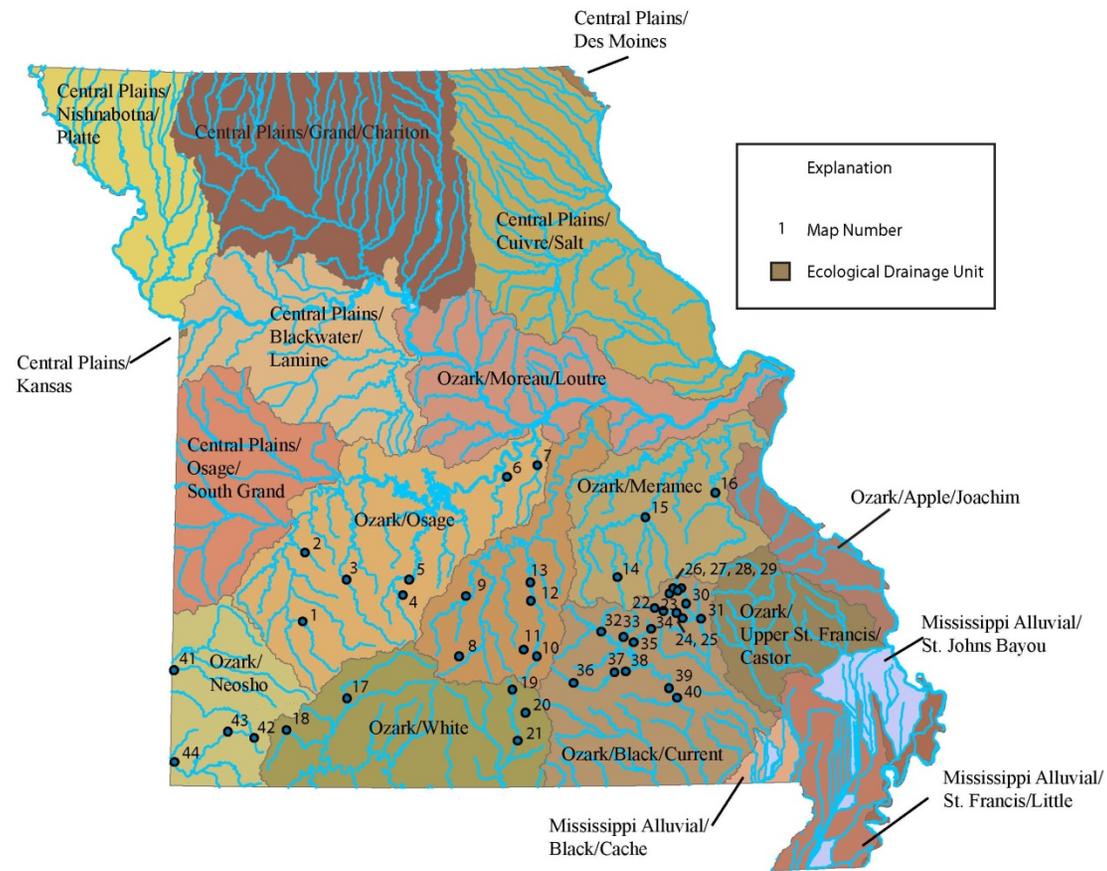


Figure 1. Location of algae sampling sites and ecological drainage units, Missouri

Sites, continued

- All sites were **riffle/pool** geomorphology
- Dominant substrate was **cobble/gravel**
- **Drainage area** ranged from 18 to 4,318 square kilometers
- **Basin land use** included forest, agriculture, mining, and urban

Data Analyses

- **By community structure and by algal metrics**
- **Metrics most correlated with nutrients in this study were:**
 - **Organic nitrogen tolerant**
 - **Oxygen tolerant**
 - **Bahl's pollution tolerance**
 - **Saprobien index**

Data Analyses, continued

- **Data analyses by community structure and by metrics indicate a significant shift in the algae community near the 75th-80th percentile of nutrient concentration (TN and TP) for this dataset**

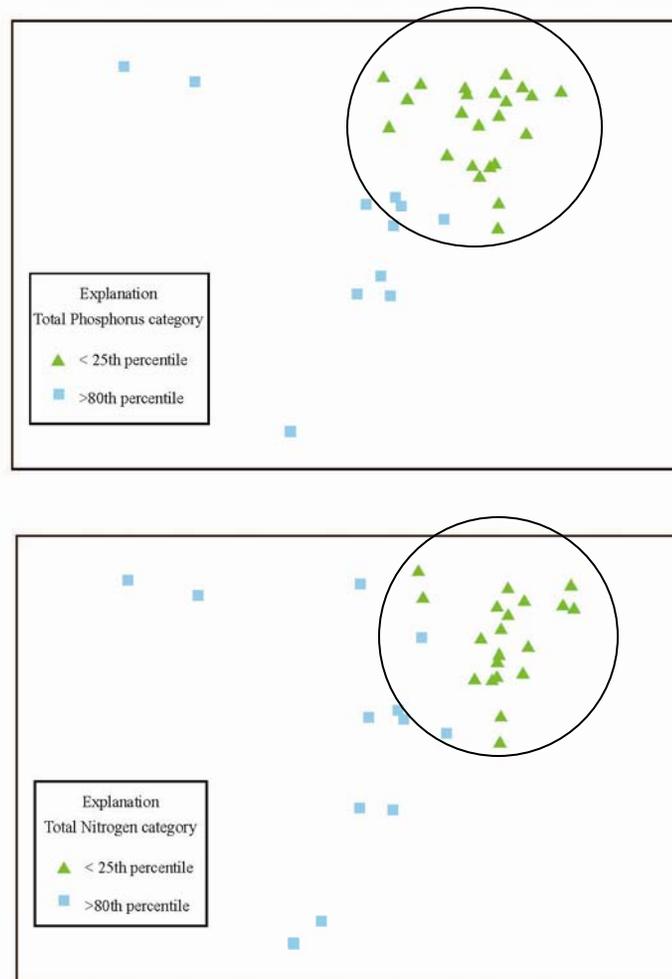


Figure 7. MDS plot of Organic Nitrogen metric and the upper and lower percentile categories of total nitrogen and total phosphorus, Ozark dataset.

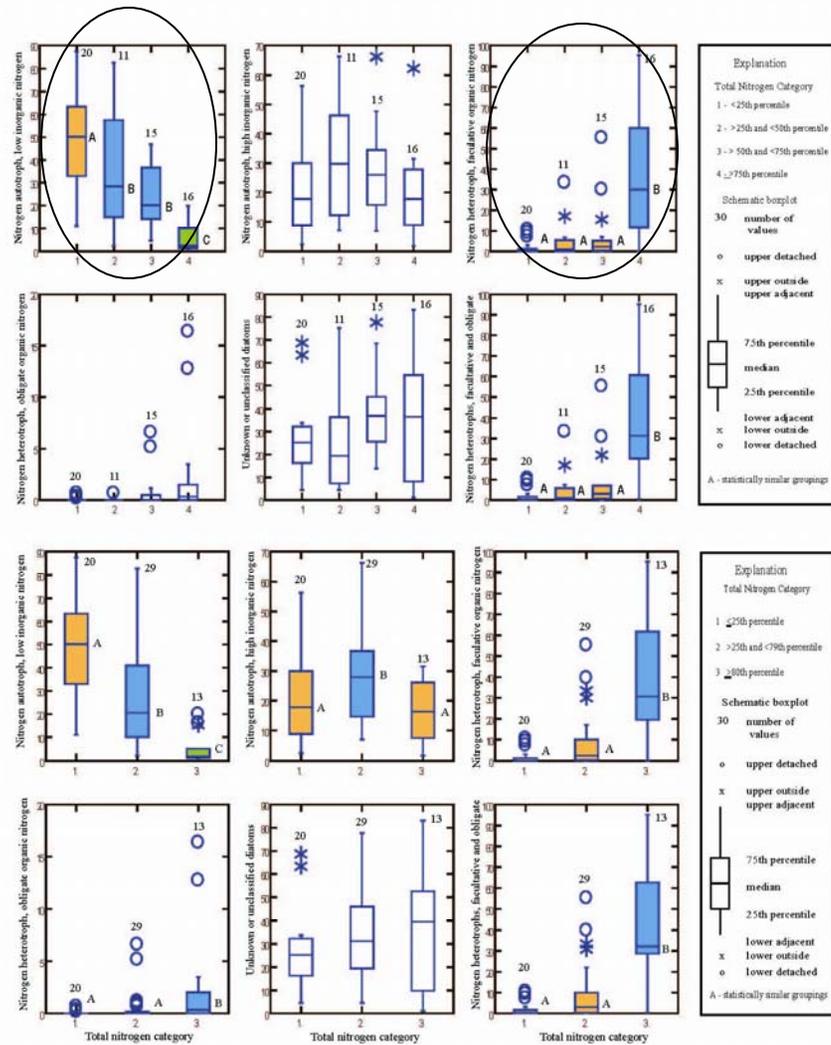


Figure 8. Organic Nitrogen metric (percent of population) versus several total nitrogen categories, Ozark dataset.

Community shift

- **<25th percentile of TN and TP concentrations:**
 - **Nitrogen fixing or nutrient sensitive species were found at larger relative abundances**
 - *Calothrix sp.* , *Cymbella sp.*,
Achnanthydium sp.
 - **Fewer eutrophic related species found or found at smaller relative abundance**

Community shift, continued

- **>75th percentile of TN and TP concentrations:**
 - **Algae species that are more tolerant to higher organics and nutrient were present at larger relative abundances**
 - ***Navicula minima*, *Pleurocapsa minor*, and *Homoethrix janthina* in greater numbers**

Results

- **The four metrics, nutrient data, and species composition data indicate that there is a significant change in algae community structure in the Ozark region when total nitrogen and phosphorus concentrations reach the 75th to 80th percentile of the related dataset**

Results, continued

- **Nutrient concentrations:**
 - **Total Nitrogen: 0.47 to 0.68 mg/L**
 - **Total Phosphorus: 0.031 to 0.035 mg/l**

