

## **BUILDING THE LINKAGES BETWEEN NUTRIENT ENRICHMENT AND STREAM ECOSYSTEM IMPAIRMENT IN THE MIDWEST: DEVELOPMENT OF MULTIMETRIC BIOTIC INDICES**

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### **ABSTRACT**

An evaluation of algal, invertebrate, and fish metrics/indices that best reflect the effects of excess nutrients along a gradient of unimpacted reference sites to impacted sites in Midwest will be presented. This regional analysis focuses primarily on two Nutrient Ecoregions: Region VI, Cornbelt and Northern Great Plains and Region VII, Mostly Glaciated Dairy Region. Data from the USGS National Water-Quality Assessment (NAWQA) program collected during 1993-2005 were used, including water-chemistry, habitat, basin-characteristics, and algal-, invertebrate-, and fish-community data. Initially, 56 sites with greater than 6 nutrient samples per year were analyzed to select the metrics that best represented the nutrient gradients (nitrogen, phosphorous, and ratios) in these nutrient ecoregions. For each biotic assemblage (algae, invertebrate, and fish), a large number of candidate metrics were identified for testing, and these metrics were evaluated for their range of values, for their variability (within and between sites), and for their ability to represent a change in biological condition associated with nutrients. Emphasis was placed on determining periphyton metric indicators of both healthy and degraded streams that provide the needed links between nutrients and the condition of the invertebrate and fish communities already being monitored by states in the Midwest. Differences in the metrics selected between the nutrient ecoregions will be discussed. The selected biotic metrics were then used to predict the nutrient condition at 135 independent test sites throughout these nutrient ecoregions.

The results will be presented in the context of the proposed USEPA Nutrient Criteria that list streams as impaired if streams had nutrient values that exceeded the 25<sup>th</sup> percentile of existing data for total nitrogen, total phosphorus, turbidity, or chlorophyll *a* in seston or periphyton. However, not one state has yet accepted the proposed criteria. The nutrient levels that are associated with degradation of the biological communities in this study will provide additional information that Midwestern States can use in their Nutrient Criteria development.

### **KEYWORDS**

Nutrient criteria, Multi-metric biotic Index, River water-quality indicators, Midwest regional assessment