

# Influences of Basin Size in Determining Nutrient Criteria for streams in the Eastern Corn Belt Plains Ecoregion

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## Biographical Sketches of Authors

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Jeff Frey is a hydrologist with the USGS Indiana Water Science Center and has worked on water-quality projects, including fish-community assessments, transport of nutrients and pesticides, and effects of nutrients on biological communities. Since 2001, he has been the Project Chief for the National Water-Quality Assessment (NAWQA) White River-Great and Little Miami study.

## Abstract

States have been mandated to accept nutrient criteria developed by the U.S. Environmental Protection Agency or develop criteria appropriate for their state. In 2001, the U.S. Geological Survey National Water-Quality Assessment Program implemented studies to address nutrient enrichment in river basins. The objective of this analysis was to illustrate how fish communities respond along a prior-determined gradient of nutrient concentrations (TN and TP) in streams, because preliminary analysis have shown that relations between chlorophyll *a* and nutrient concentrations are not statistically significant in streams within the Eastern Corn Belt Plains Ecoregion. Preliminary analyses have shown that Detrended Correspondence Analysis (DCA) site scores, a measure of community structure and composition, have shown statistically significant relations to nutrient concentrations. The nutrient study in the Eastern Corn Belt Plains Ecoregion showed the fish-community response can differ, depending on the basin size (scale). Two data sets were compared, the first fish-community data set (n=30) contained headwater to medium-sized streams. The fish-community composition within this data set contained fish species that are common in small streams (i.e., dace, darters, and sculpins) as well and larger streams (i.e., carp, redhorse, and buffalo). Because of the natural differences in fish communities found in headwater and larger streams, the relations of the DCA fish-community site scores to nutrient concentration were weak. After the influences associated to basin size were removed, the fish communities in the second data set (n=23) contained fish communities that were similar to one another; the relations of DCA fish-community site scores to nutrient concentration were strengthened. These findings suggest that if biological communities are used to develop nutrient criteria, future analyses need to address the natural variation associated with basin size before biological communities can be used to develop nutrient criteria and the proposed criteria can be adopted.