

## ABSTRACT

### TEMPORAL ASSESSMENT OF MANAGEMENT PRACTICES AND WATER QUALITY IN THE DUCK CREEK WATERSHED, WISCONSIN.

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The Duck Creek watershed has degraded water quality due to non-point source pollution from agricultural lands within the basin. Through federal, state, and local non-point source control programs, Brown County, Outagamie County, and the Oneida Tribe of Indians have implemented various land management changes aimed at improving the water quality within the Duck Creek watershed. In addition, changes in land ownership and related management have occurred. In this study, a 20-year record of flow and phosphorus concentration data, fish and macroinvertebrate surveys and changes in land management were assembled from numerous entities. Using this fairly robust data set, changes in land management, water quality and biotic conditions were characterized in the Duck Creek watershed and the relationship between these changes were explored. Linear regression and other statistical techniques were applied to detect possible trends and relationships between watershed metrics. During the 20-year record, dairy farms, barnyards, and permitted point source discharges decreased while the prevalence of conservation tillage and cropland nutrient management increased. There was a statistically significant decrease in total and dissolved phosphorus concentrations from water year 1989 through 1995 (Period 1). There was also a significant decrease in total phosphorus and dissolved phosphorus concentrations from Period 1 to Period 3 (water years 2004-2008). Fish assemblages displayed a change in community health in multiple areas of the watershed through increasing abundance, increasing diversity, and increasing members of sensitive species. The macroinvertebrate dataset had several limitations therefore no trends were determined. Observed trends in phosphorus concentrations and fish biotic integrity are likely linked to improved management practices and changes in land use.

Trout Creek, a major tributary to Duck Creek, has received focused watershed management efforts in recent years. In 2008, a water quality monitoring study was conducted to characterize physical and chemical water quality conditions in Trout Creek. Phosphorus concentrations exceeded 0.1 mg/l in about half of the samples and were greater in an upstream location. Automated multi-probe monitoring indicated that the stream has characteristics similar to that of a cool-water stream and conditions suitable for species such as Brook Trout.