



Title: Are benches in agricultural ditches a benefit?

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State: OH **Region:** Great Lakes

Year of Funding:

Theme: Environmental Restoration

Situation: The use of nitrogen fertilizers on agricultural fields in the Upper Midwest, greatly contribute to nitrogen in the stream system, which in turn is said to be the cause of hypoxic zones in the Gulf of Mexico. Much of this region is characterized by the extensive use of tile drainage and maintained ditches to optimize soil moisture levels. The uptake of nutrients by these headwater streams is critical in the development of strategies to counter the adverse effects of poor water quality.

Objectives: The goal of the study is to evaluate the potential for the rehabilitation of drainage systems in agricultural settings by using fluvial geomorphic concepts to improve the water quality, aquatic habitats as well as maintain drainage. The efficiency of two-stage ditch geometry with vegetated bench features in improving water quality in these headwater streams is one such concept.

Methods: The two-stage ditch is hypothesized to be an effective tool to improve water quality as well as produce a more stable cross section, thereby reducing the cost of periodic maintenance. Workshops have been conducted in Ohio, Illinois and Michigan with local farmers and county engineers in attendance, to explain the science and the potential benefits of the two-stage ditch. Computer models are also being evaluated to model sediment transport in these low energy systems.

Partnerships: Local state and federal agencies involved with the project are ODNR, Ohio EPA, NRCS, USGS local county engineers, local soil and water conservation districts, local extension agents, soil and watershed coordinators and some special interest groups.

Research: A research team with diverse backgrounds in water quality, nutrient cycling, drainage processes, river geomorphology and economic analyses is studying the effect of benches in agricultural ditches as a means to improve water quality. Concurrently held meetings and workshops ensure that agricultural producers and researchers are sensitive to the others needs. A ditch scheduled for maintenance was given a two-stage geometry and is a primary test site for much of the research being conducted.

Resources: Time contributed by faculty and staff at Ohio State University in the departments of Food Agriculture and Biological Engineering and Natural Resources. Advanced Drainage Systems provided housing material samplers as in-kind donations.

Results: Water quality and discharge data as well as topographic survey data are being collected. The construction of two prototype two-stage ditches has been completed in Wood and Mercer Counties, Ohio. Water quality and discharge rates at these sites are being monitored using ISCO 6712 samplers. Uptake rate of nutrients in two-stage ditches and conventional single stage ditches are being studied for comparison. Computer models to predict the manner in which these benches form are also being evaluated.



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