The Issue

Drainage has long been important to agriculture and property management in the Great Lakes. Stream channels have been highly modified to a trapezoidal shape designed to transport the flow from large storm events to drain extensive portions of our productive agricultural land. The constructed ditch channel is often oversized for small flows and provides no floodplain for large flows. Despite the tradition of ditch maintenance and current majority mind set, ditch dimensions are a result of fluvial (flowing water) processes and current practices are antitheses to natural processes.

A Solution

Multiple options exist for re-establishing floodplains to agricultural ditches that range in cost and engineering input required. The two-stage design was developed by observing the natural processes of stable streams and rivers that could relieve the erosion, scouring and flooding that a conventional ditch may cause. The design strategy consists of:

- a channel that is sized to convey the effective discharge,
- a bench to serve as a floodplain for the smaller channel,
- a stage of adequate width to prevent flow overtopping the ditch banks and flooding surrounding land.

This design results in a drainage channel system that can benefit both agriculture and the environment.
The Costs

Primary costs of two-stage ditches are associated with earthwork necessary to increase the ditch width. Costs for construction increase with both watershed size and ditch depth and generally range from $5-20/linear foot. Costs may be higher than this range given certain site conditions such as removal of trees and stumps or if excavated material cannot be spoiled on-site. The resulting wider ditch top width may require surrendering of agricultural land. To offset landowner costs the potential for including the bench width in buffer programs is being explored throughout the upper Midwest. Cost-sharing for two-stage construction already has been approved for Indiana’s Environmental Quality Incentive Program (EQIP).

The Benefits

Benefits of a two-stage ditch over the typical agricultural ditch include both improved drainage function and ecological function. The two-stage design improves ditch stability by reducing water flow and the need for maintenance, saving both labor and money. It also has the potential to create and maintain better habitat and water quality conditions for the waters into which our drains flow into such as the Gulf of Mexico or Lake Erie. This is done by minimizing the amount of sediment and nutrients (such as phosphorus and nitrogen) that are transported from ditch to stream to river to sea.