

Multi-LCC Mississippi River Basin / Gulf Hypoxia Initiative
High Impact Conservation Practices – Fact Sheets

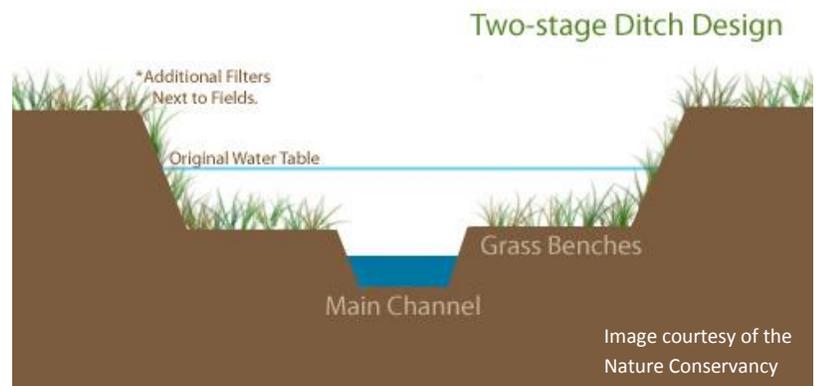
Practice #3 – Hydrological Restoration (Two-Stage Ditch)

Updated 19 January 2016 (draft for review)

WHAT IS A TWO-STAGE DITCH?

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 does

not provide a 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 antithetical to these natural processes.



Multiple options exist for re-establishing floodplains to agricultural ditches that range in cost and engineering input required. Designed by observing natural streams and rivers, the two-stage concept addresses the erosion and flooding that are symptomatic of the traditional drainage ditch design. 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 provide beneficial impacts for agriculture, water quality, and wildlife by restoring some of the natural characteristics to an otherwise heavily modified landscape.

WHY A TWO-STAGE DITCH

Traditional drainage ditches are often beset by erosion and instability problems due to the high volumes of water that they must handle during peak flows. This erosion can result in bank failure, widening the ditch and eating away valuable arable land until the stream eventually becomes impassable and requires extensive (and expensive) maintenance. Furthermore, traditional ditches do nothing to slow or filter the flow of nutrients and other contaminants

from farm fields into the watershed proper. Two-stage ditches are more stable than traditional drainage ditches and also provide filtering benefits that can help to reduce the amount of nutrients and sediment entering larger streams and rivers.

WILDLIFE BENEFITS

By restoring some of the natural characteristics to the stream, the two-stage ditch concept also provides increased habitat for multiple forms of wildlife. By reducing the amount of nutrients and sediment flowing through the stream and by restoring some of the natural hydrology, the two-stage ditch benefits several species of fish, including blackside darter, creek chub, johnny darter, sculpin, and Topeka shiner, black redhorse, pugnose minnow, river redhorse, and smallmouth bass. Furthermore, the widening of the stream and the creation of the floodplain inherent to the two-stage ditch design results in increased habitat for migratory shore birds and perhaps even waterfowl, specifically the American golden plover and the blue-winged teal.

INSTALLATION & COSTS

The primary costs of two-stage ditches are associated with the earthwork necessary to increase the ditch width. Costs for construction increase with both watershed size and ditch depth and generally range from \$5.00- \$20.00/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.

MONITORING

- in stream water quality monitoring
- population surveys?
- migratory bird surveys?

LIMITATIONS/CONSIDERATIONS

The resulting wider ditch top width associated with two-stage ditches may require surrendering of agricultural land; this surrender subsequently results in a cost to the landowner. To offset these 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).

RESEARCH AND MORE INFORMATION

In Indiana and Ohio the Nature Conservancy has been extremely active in promoting two-stage ditches and in putting the practice on the ground. More information on TNC's efforts to incorporate two-stages ditches into the agricultural landscape can be found at <http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/indiana/howwework/two-stage-ditches.xml>.

More information on two-stage ditches can also be found in the NRCS' Stream Restoration Design Handbook under "Two-Stage Channel Design." The two-stage ditch concept may also fall under NRCS's Conservation Practice Standard (584): Channel Bed Stabilization.

- Great Lakes Regional Water Program "Building Better Ditches"
<http://greatlakeswater.uwex.edu/sites/default/files/library/general/betterditches-fv.pdf>
- Jessica L. D'Ambrosio, Jonathan D. Witter, Andy Ward
- University of Notre Dame's Water Quality Fact Sheet
(<http://environmentalchange.nd.edu/programs/landuse/>)

OPPORTUNITY AREAS

