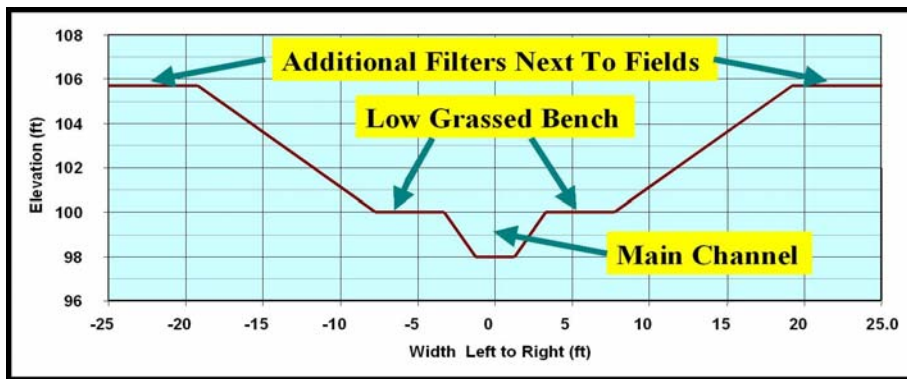


## Improving the Design of Agricultural Drainage Ditches (Can ditches be self-maintaining?)

Two-stage ditches, which have a low flow channel and a "bench" constructed into the channel, have potential to produce a more stable cross section that reduces the cost of periodic maintenance. Research is being conducted in drainage ditches in Ohio and Michigan. Drainage ditches in Indiana could benefit from this technology as it continues to develop.



**Benefits of a two-stage ditch** over a conventional ditch potentially include both improved drainage function and ecological function. Drainage benefits may include increased ditch stability and reduced maintenance. The narrow deep main channel provides better water depth during periods of low flow. Grass on the benches can provide quality cover and shade. The substrate in the main channel is improved as the two-stage form increases sediment conveyance and sorting, with fines deposited on the benches and courser material forming the bed. Two-stage ditches might also be useful in improving water quality.



**Research** is being conducted in Ohio, Michigan, Illinois, and elsewhere to better determine the science and potential benefits of the two-stage ditch. Computer models are being developed to model sediment transport in these low energy systems. **Design** tools have been developed to facilitate two-stage ditch design, and are available from Ohio Department of Natural Resources.

### To learn more:

#### Michigan contact:

- Bill Word, Hillsdale County Drain Commissioner  
(drains@co.hillsdale.mi.us)

**Experts:** (*This handout was drawn from material developed by these Ohio experts.*)

#### Indiana contacts:

- Joe Draper, The Nature Conservancy, 260-665-9141,  
(jdraper@tnc.org)
- Jane Frankenberger, Associate Professor and Extension Agricultural Engineer, Purdue University  
frankenb@purdue.edu;  
www.ecn.purdue.edu/~Frankenb)

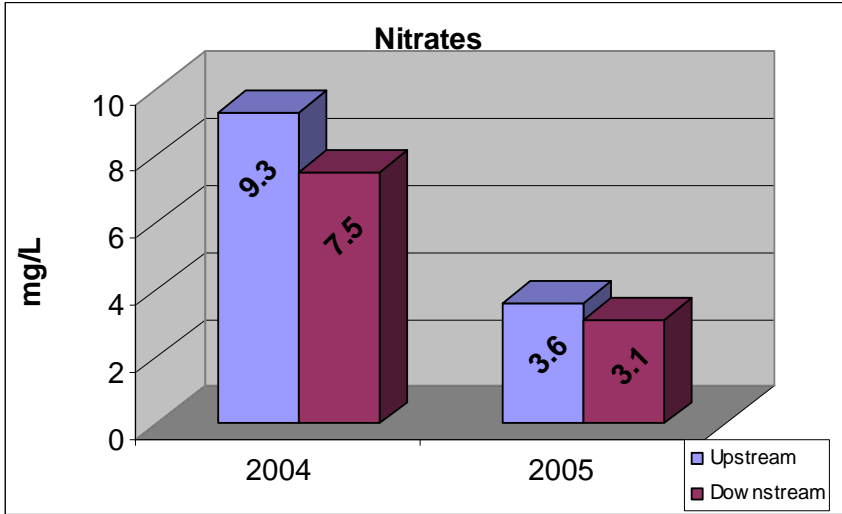
- Andy Ward, Ohio State University Department of Food, Agricultural and Biological Engineering  
(ward.2@osu.edu)
- Dan Mecklenburg, Ecological Engineer, Ohio Department of Natural Resources  
(dan.mecklenburg@dnr.state.oh.us)

#### Web sites: Ohio Natural Channel Design Project

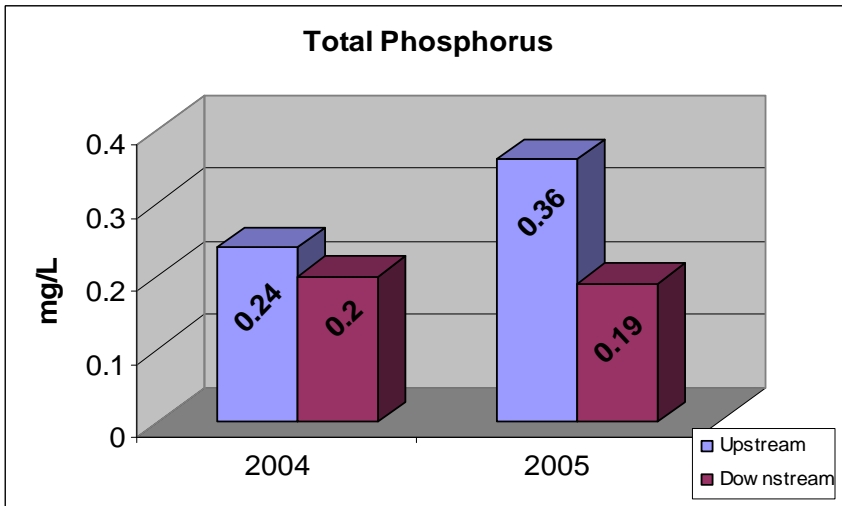
(<http://www.ag.ohio-state.edu/~ncd/>)  
The "Research" tab links to useful papers describing two-stage ditches and other concepts.



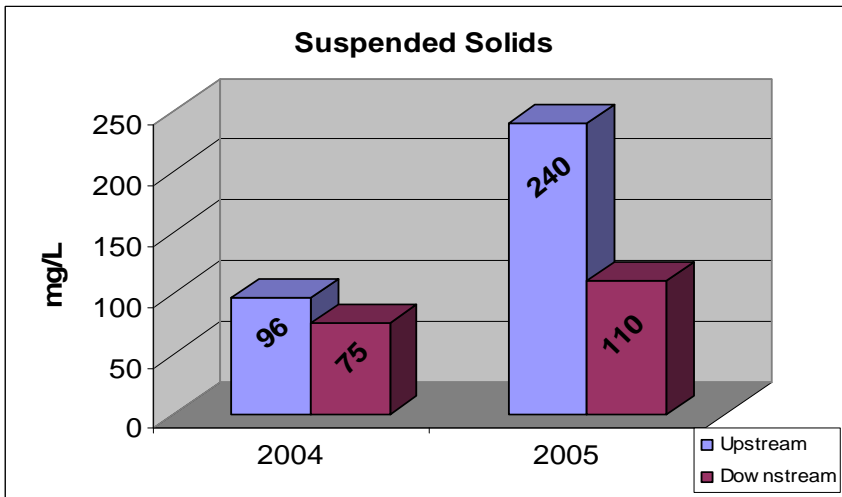
### Crommer Ditch Hillsdale County Michigan Sampling Results



Generally saw reductions of 17% from upstream to downstream



Generally saw reductions of 33% from upstream to downstream



Generally saw reductions of 38% from upstream to downstream