

EVALUATION OF THE IMPACT OF EPHEMERAL GULLIES ON SEDIMENT LOADING WITHIN WATERSHEDS USING AGNPS

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Abstract: The Maumee River Basin is a major watershed that drains into Lake Erie at Toledo Harbor in Ohio producing a significant amount of sediment into the harbor requiring periodic dredging. An evaluation of this watershed would help to determine recommended conservation practices that could control sediment entering into the harbor and reduce the associated dredging costs. The Upper Auglaize Watershed agricultural non-point source modeling project was an interagency effort to use a Geographic Information System (GIS) based modeling approach for assessing and reducing pollution from agricultural runoff and other non-point sources that eventually discharges into the Toledo Harbor. A significant source of sediment was identified from ephemeral gully processes and an approach was needed to assess this and determine its contribution to the total sediment load entering the harbor. This project applied the U.S. Department of Agriculture (USDA), Agricultural Research Service's AGricultural Non-Point Source (AGNPS) suite of models to the Upper Auglaize River Watershed and was conducted by an interagency team consisting of a partnership between the: (1) USDA, Agricultural Research Service (ARS); (2) USDA, Natural Resources Conservation Service (NRCS); (3) U.S. Army Corps of Engineers (USACE); (4) U.S. Geological Survey (USGS); (5) Ohio State University; (6) University of Toledo (UT); (7) Heidelberg College; (8) Ohio Department of Natural Resources (ODNR), Division of Soil and Water Conservation; (9) Ohio Environmental Protection Agency (OEPA); and (10) Allen, Auglaize, Van Wert, and Putnam Soil and Water Conservation Districts.

Ephemeral gullies were found to be the primary source of erosion (72 percent), sediment yield (73 percent), and sediment loading (73 percent) through the application of AGNPS. Controlling sediment load means controlling gully erosion and possibly trapping sediment yield before it reaches the stream system. Most BMPs (e.g., no-till, conversion of cropland, etc.) that reduce sheet and rill erosion and its sediment yield will also reduce gully erosion and its sediment yield. However, grassed waterways, which have no effect on sheet and rill erosion, are frequently an effective BMP to prevent ephemeral gullies. Riparian vegetation and sediment traps would also reduce the delivery ratios of all types of landscape erosion.

New techniques were developed by the team to quantify the ephemeral gully erosion within the model. When calibrated to available stream gage data the model demonstrated more (73% in the existing condition simulation) of the sediment load originated from ephemeral gully erosion rather than traditional sheet and rill erosion.