

ABSTRACT

THESIS: Modeling the Impact of Buffer Strips on Phosphorus Concentration in Buck Creek Watershed, Indiana: A GIS Approach

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DATE: December, 2010

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This study has attempted to model and quantify the impacts of Beneficial Management Practices (BMP) like buffer strips on the phosphorus concentration and loading in the Buck Creek Watershed of Central Indiana. The GIS based modeling was done using the Soil and Water Assessment Tool (SWAT) developed by the U.S. Department of Agriculture-Agricultural Research Services (USDA-ARS). The results from the EPA funded two year (2002-2004) Upper White River Watershed Project (UWRWP) for the Buck Creek Watershed were used as the measured base data for the modeling evaluation. These measured data were compared against the data generated out of the model simulation based on two different scenarios which took into consideration the combinations of land use, agricultural management practices, point source pollutions and BMPs. Scenario-1 simulated all the aspects of land use intensity, moderate agricultural management practices and moderate point source pollutions taking place in the Buck Creek watershed. While running the model in scenario-1, there was a noticeable increase in the phosphorus loading to the sub-watersheds ranging from 10% in the lowland sub-watershed of BC-4 to 39% in the highland sub-watershed of BC-7. In scenario-2, BMPs were implemented in the model which added 100 acres of vegetated buffer strips uniformly in all sub-watersheds and 3 acres of grassed buffers along the streams except BC-3. On re-running the model in scenario-2, there was a drastic decline in the phosphorus loading to the stream. It has been noted that there was at least 15% reduction in the loading of phosphorus to the stream where buffer strips were implemented. The present GIS modeling study helped to quantify the changes in the loading of sediments and nutrients which are induced by any parametric changes in the watershed including soil, slope, land use, agricultural management practices and BMPs.