

A METHOD OF DETERMINING WETLAND POND FLOW PATHS USING WATER QUALITY MEASUREMENTS AND GIS

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ABSTRACT

Wetland pond systems have been proposed as a possible best management practice (BMP) for improving the quality of agricultural drainage water before discharge into receiving waters. Monitoring the effectiveness of wetlands for the removal of sediments, nutrients, and other water quality constituents presents a considerable challenge due to the number drainage outfalls, seasonal variability of input water quality and quantity, and heavy sediment loads.

The goal of this study was to develop a rapid method for determining the preferential flow path through a permanent wetland receiving agricultural drainage by tracking changes in multiple water quality parameters. This method of wetland characterization is useful for the rapid assessment of mixing efficiency without the use of dye tracers.

Data was gathered from multiple points across the wetland pond using a YSI Sonde 6600 to measure water quality. Depth and location were acquired from a Garmin 188C GPS equipped with sonar. Water velocity and direction were collected from a Sontek Argonaut SL Doppler meter. The equipment was carried aboard a 12' boat and rowed to various points, taking measurements along the way. Software was written to bring the data from these instruments together so that it could be viewed in real-time and recorded.

The gathered data was plotted on a geo-referenced aerial image of the pond using ArcGIS desktop software. The results of this experiment showed that there was significant short-circuiting of the agricultural drainage through the wetland. When visualized as interpolated surfaces, several water quality parameters confirmed the water in the northeast corner of the wetland, the entrance, and the exit were all similar to each other and distinct from the rest of the pond. More traditional methods for discerning flow paths, using velocity and direction data, were unable to map this preferential flow path due to the relatively small pond currents and surface winds altering the motion of the boat.

KEYWORDS

Best Management Practice, Wetland Treatment, Agricultural Discharge, Water Quality, Monitoring, Flow.