Research Profile

Title: Agricultural BMP Database (National Corn Growers & United Soybean Board)
WE&RF Project Numbers: SIWM15T16 & SIWM14T16
Principal Investigators: Jane Clary, Wright Water Engineers, Inc.
Eric Strecker, Geosyntec Consultants
WE&RF Program Director: Harry Zhang, Water Environment and Reuse Foundation

Accomplishments Under 2016-2017 Scope of Work

- Reviewed literature sources for agricultural best management practice (BMP) performance studies suitable for upload into the Agricultural Best Management Practice Database (AgBMPDB).
- Uploaded 29 studies with over 150 fields (study areas) into the AgBMPDB Version 2.0.
- Updated 2015 Agricultural Best Management Practice Database (AgBMPDB) Data Summary report to include new data sets.
- Conducted outreach including national webinar addressing both stream restoration and the AgBMPDB in conjunction with the Natural Resources Conservation Service (NRCS) in May 2017 and delivered a presentation at WEFTEC 2016.

Background

The purpose of the AgBMPDB is to develop a centralized repository of agricultural BMP performance studies to provide scientifically-based information on practices that reduce pollutant loading from agricultural sites. The AgBMPDB includes performance data and metadata that document the many field-based and practice-based variables that affect BMP performance. The long-term goal of the AgBMPDB is to provide agricultural advisors, planners, consultants and producers with information that enables them to better select systems of BMPs for their operations and to support improvements in agricultural BMP design and implementation. The AgBMPDB will also be useful for watershed assessments and planning efforts. The initial release (Version 1.0) of the AgBMPDB in 2015 focused on row crops, particularly corn and soybeans. Version 1.0 of the database was posted for publically available download and was updated with Version 2.0 in 2017 (http://www.bmpdatabase.org/agBMP.html). The primary focus of the 2016-2017 effort was strengthening the initially populated AgBMPDB completed during 2015 through additional population of the database and updating Version 1.0 of the Data Summary. The 2016-2017 project phase, which included support from both the United Soybean Board and the National Corn Growers Association, provides:

- A further populated agricultural BMP performance database that can support field and watershed scale management decisions and programs related to implementing BMPs by identifying BMPs that enhance sustainability and support self-regulation of nutrient runoff.
- A narrative literature review table that summarizes study metadata, water quality data and yield data under various conservation practice conditions.
- BMP performance summary report for soybean crops for different BMP types and pollutants of concern based on an analysis of the data included in the database. (This report is combined with findings for corn crops, which are often grown in rotation with soybeans.)
- An updated project website which enables access from interested parties ranging from producers, researchers, and water quality regulators.

Present Status (October 2017)

The AgBMPDB has been further populated with 29 additional performance studies. The database now contains information for 73 professional publications characterizing pollutant loading and/or concentrations in 345 fields and/or study plots. A performance summary report has been prepared to summarize agricultural BMP performance data available in the second public release of the AgBMPDB. An inventory of key metadata and water quality data for individual studies is provided and overviews of studies by geographic area and practice type are also described in the report. Based on the available data, characterization of surface and subsurface pollutant loads and concentrations under various practice conditions is also provided. These characterizations should be considered preliminary, but are useful to illustrate how the AgBMPDB can be used to support evaluations of the expected benefits of conservation practices as the AgBMPDB grows. A few representative findings in the draft summary report include:

- Water quality data for individual studies and BMP categories clearly show that agricultural BMPs can provide significant reductions in pollutant loading from agricultural lands used for row crops. For example:
  - Nutrient management practices showed reductions in surface runoff phosphorus and subsurface nitrate loads.
  - No-till and conservation tillage practices showed reductions in surface runoff sediment loads and subsurface nitrate concentrations compared to conventional tillage.
  - Cover crops showed reductions in subsurface nitrate loads.
- Because the AgBMPDB associates site metadata with individual performance study water quality data, the AgBMPDB provides a tool for researchers to further explore the potential underlying causes of strong or weak performance of agricultural BMPs, which can be used to improve BMP selection and implementation in the future. Even limited initial data analysis provided in this report demonstrate that a "one size fits all" solution to agricultural water quality challenges is not realistic; therefore, more systematic and standardized reporting and access to study metadata can support decision-making regarding which solutions have demonstrated performance, given various site and production characteristics.
- Based on data analysis provided in this summary report, the challenges of effectively analyzing agricultural research data are evident due to the number of variables that combine to determine pollutant loading and BMP performance at a given site. Examples of these variables include study-specific conditions such as soil, slope, climate and weather conditions (e.g., wet year, drought), cultivation and drainage practices, edge-of-field practices implemented, in-field erosion control practices (e.g., grassed waterways, terraces), crop yield goals, and others.

Future Direction

The value of the AgBMPDB will grow as it is further populated. There is a significant amount of published, peer-reviewed literature suitable for entry into the AgBMPDB that has not yet been entered. Continued support of the AgBMPDB effort by multiple producers beyond corn and soybean producers is needed to enable continued growth of the AgBMPDB and more refined data analysis. It may be beneficial to target certain practices of interest to producers and/or certain geographic areas and prioritize entries of those studies. This effort will also help to identify areas where additional research is needed so that research dollars are maximized. Future findings from the project will continue to be accessible at www.bmpdatabase.org along with the urban stormwater BMP database, stream restoration database and national stormwater quality runoff database.