



Agricultural Best Management Practice (BMP) Database

User's Guide for Data Entry

Version 1.1

Prepared by

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Disclaimer

The Agricultural BMP Database (“Database”) was developed as an account of work sponsored by the Water Environment Research Foundation (WERF) and the National Corn Growers Association (NCGA) (collectively, the “Sponsors”). The Database is intended to provide a consistent and scientifically defensible set of data on Best Management Practice (“BMP”) designs and related performance. Although the individuals who completed the work on behalf of the Sponsors (“Project Team”) made an extensive effort to assess the quality of the data entered for consistency and accuracy, the Database information and/or any analysis results are provided on an “AS-IS” basis and use of the Database, the data information, or any apparatus, method, or process disclosed in the Database is at the user’s sole risk. The Sponsors and the Project Team disclaim all warranties and/or conditions of any kind, express or implied, including, but not limited to any warranties or conditions of title, non-infringement of a third party’s intellectual property, merchantability, satisfactory quality, or fitness for a particular purpose. The Project Team does not warrant that the functions contained in the Database is meet the user’s requirements or that the operation of the Database is be uninterrupted or error free, or that any defects in the Database is be corrected.

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The Project Team’s tasks have not included, and will not include in the future, recommendations of one BMP type over another. However, the Project Team’s tasks have included reporting on the performance characteristics of BMPs based upon the entered data and information in the Database, including peer reviewed performance assessment techniques. Use of this information by the public or private sector is beyond the Project Team’s influence or control. The intended purpose of the Database is to provide a data exchange tool that permits characterization of BMPs solely upon their measured performance using consistent protocols for measurements and reporting information.

The Project Team does not endorse any BMP over another and any assessments of performance by others should not be interpreted or reported as the recommendations of the Project Team or the Sponsors.

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**Key U.S. Department of Agriculture Natural Resources Conservation Service (NRCS)
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Agricultural Best Management Practices (BMP) Database Data Entry Guide Version 1.0

1 PURPOSE

The purpose of the Agricultural Best Management Practice Database (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 meta data 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.

Terminology

The terms best management practice (BMP) and conservation practice are used interchangeably in this User's Guide. The AgBMPDB builds upon a framework originally developed for urban stormwater BMPs, the International Stormwater BMP Database, which has been a long-term effort dating back to 1997. The AgBMPDB is accessible on the same publically-accessible project website, www.bmpdatabase.org.

The purpose of this guide is to provide supporting information to agricultural researchers submitting data to the AgBMPDB through the AgBMPDB data entry spreadsheet package. This guide provides an overview of the AgBMPDB, the data entry spreadsheet package, and each data element included in the AgBMPDB. Version 1.0 is limited to common conservation practices implemented for row crops, but may be expanded in the future to address practices for other agricultural sectors.

2 SOFTWARE AND DATA SUBMISSION PROCESS

The AgBMPDB Data Entry Spreadsheets are provided in Microsoft Excel 2010. Users must have a licensed copy of Microsoft Excel 2007 or later to enter data into the spreadsheets. Once data entry is complete, the spreadsheet can be emailed to the AgBMPDB Clearinghouse for review. After review, follow-up to clarify and/or correct submitted information may be necessary. Once the study submission is finalized, then the Clearinghouse is responsible for appending the study to the publically-available master AgBMPDB, which is accessible at <http://www.bmpdatabase.org/agBMP.html>.

Although Microsoft Excel is the only required software for data entry, other software used for the broader project includes Microsoft Access for data storage and subsequent download for use by researchers and back-end use of Microsoft SQL Server for data retrieval from the project website. Once the AgBMPDB is populated with a reasonable number of data sets, performance summaries including tabular and graphical statistical summaries will be completed. (See

performance analysis examples for the urban stormwater BMP Database, accessible at www.bmpdatabase.org for more information.) Figure 1 shows a diagram of how these components are related, and Figure 2 provides a simple overview and vision of how the AgBMPDB supports the long-term goals of the project.

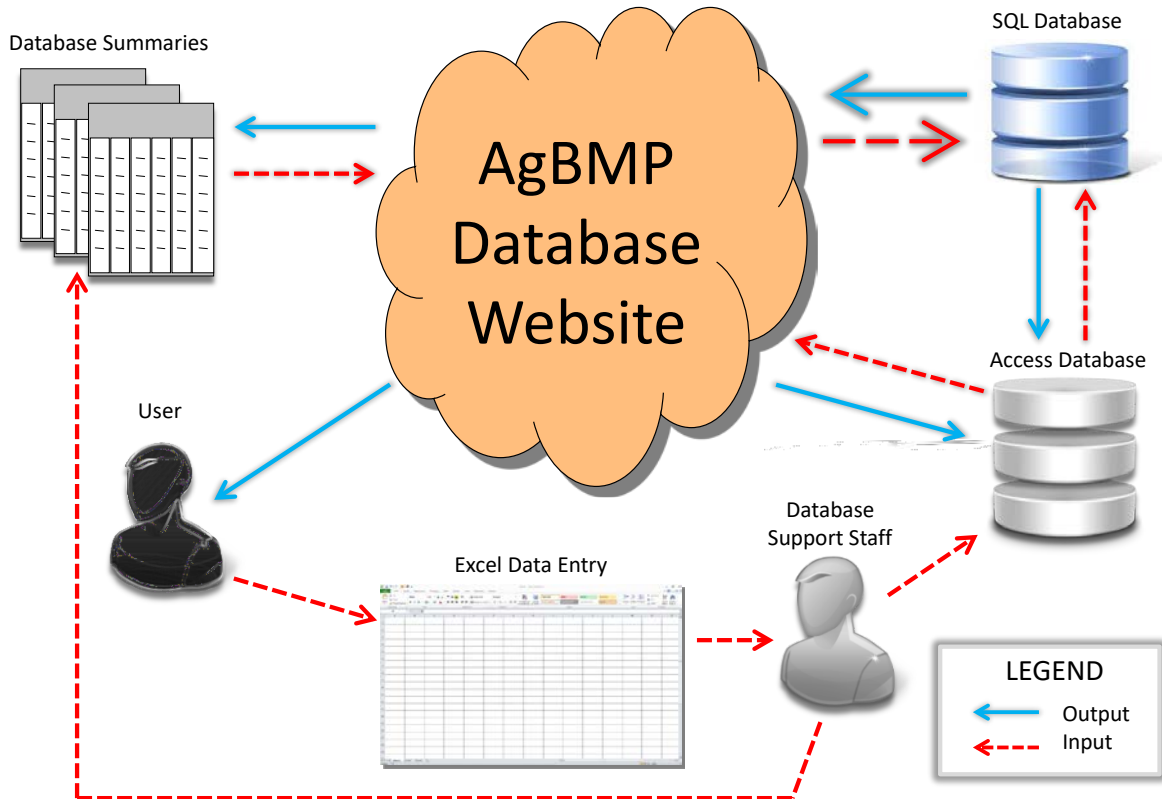


Figure 1. Diagram of the AgBMPDB Basic Technical Structure

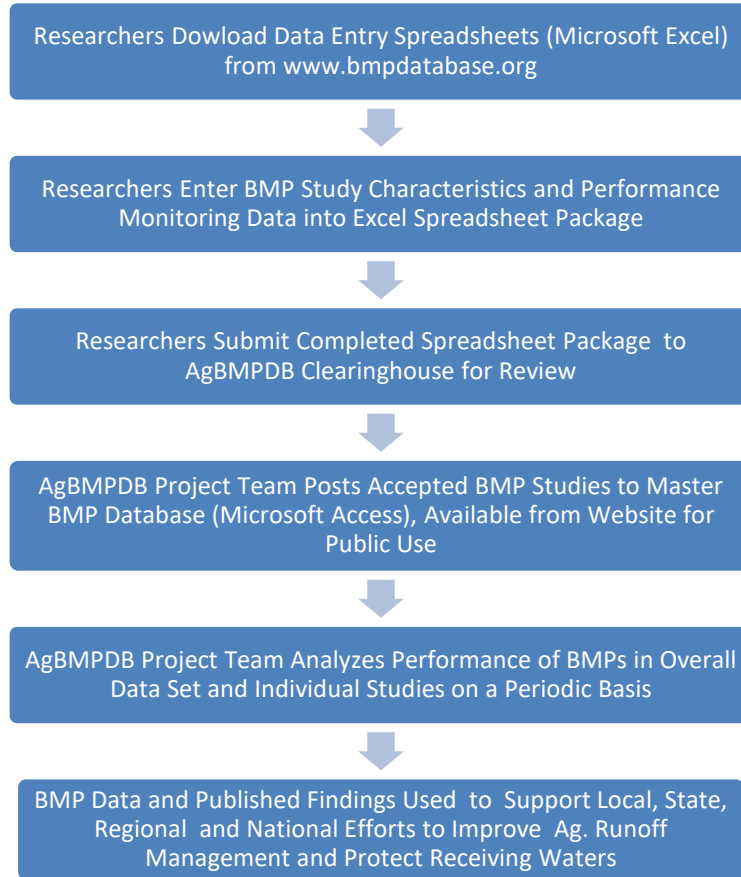


Figure 2. General Overview of AgBMPDB Project

3 DATABASE STRUCTURE OVERVIEW

The AgBMPDB is a relational database including multiple tables linked together by unique numeric key fields. Figure 3 provides a simplified overview of the basic database structure. Additional supporting tables are also included in the AgBMPDB, but are not identified in Figure 3. The relational structure of the AgBMPDB allows data providers to define a Test Site (study location) that can then be linked to various information/data sets including Study Areas, Monitoring Stations, Monitoring Events, and Monitoring Costs. Each Study Area is linked to one or more Practices (conservation practice/BMP), as well as Land Cover/Crop information. Monitoring Stations can also be associated with the Practices being evaluated by the study. The Practices table links to 14 practice-specific design data tables (e.g., grassed waterway, conservation tillage) and Practice Costs (capital and operations/maintenance). Monitoring Events are linked to Monitoring Data, including Precipitation, Flow, and Water Quality. Data in these tables are also associated with the Monitoring Stations where the data were collected. The AgBMPDB structure is designed to enable users to retrieve meta data for conservation practice studies and their associated performance monitoring results.

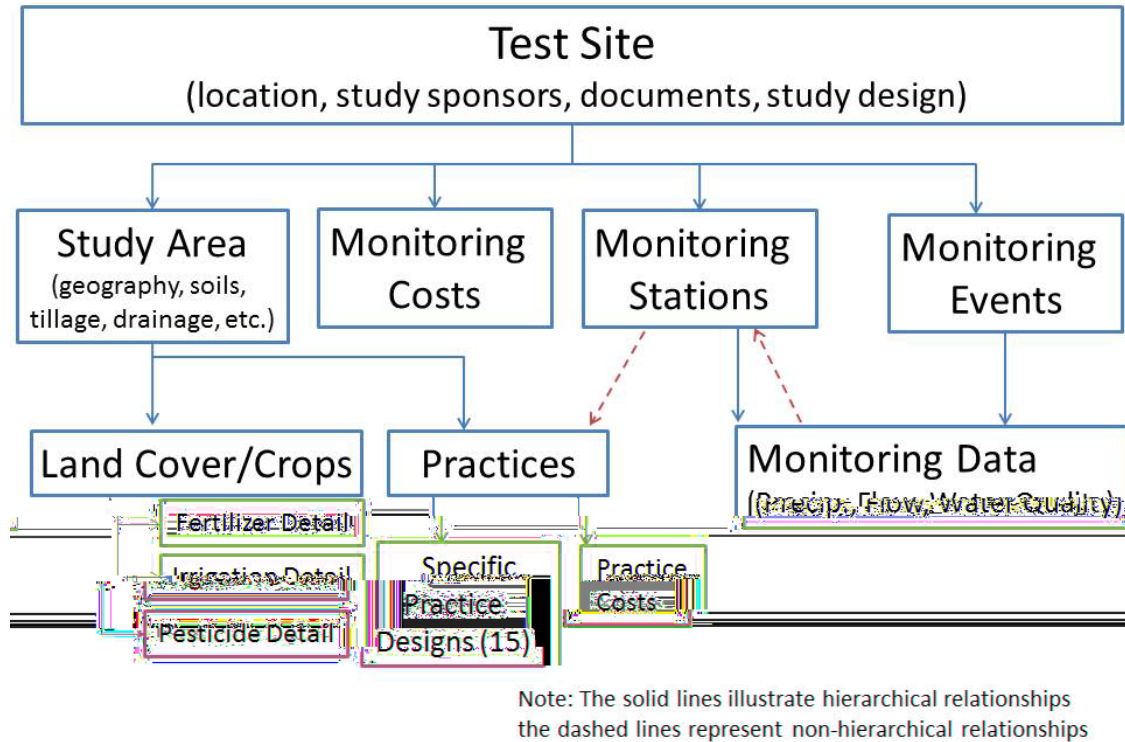


Figure 3. General Structure of AgBMPDB

4 LANDOWNER PRIVACY

Landowner privacy is a significant concern for many landowners where BMP studies have been conducted. As a result, a privacy-level data element is provided in Section 6.2.3, enabling the specific geographic location of the study to remain private at the request of the landowner. Additional landowner privacy provisions may be developed in future phases of the project.

5 SPREADSHEET BASICS

The Data Entry process requires completion of a series of Excel spreadsheets. Basic familiarity with Excel is necessary to complete the data entry process. The Excel Help feature offers a tutorial for “Getting Started with Excel” for users unfamiliar with the software. Basic information needed to facilitate the data entry process follows in terms of order of data entry for the spreadsheet, understanding data priority levels and using pick-lists (i.e., dropdown menus).

5.1 Order of Entry

In order for the spreadsheet package to properly populate certain pick-lists that link user-defined data elements together, the data provider must enter data into the spreadsheets in the proper sequence. This sequence is generally categorized by color-coded spreadsheet tab labels as follows:

1. Red: These spreadsheets define the test site, study area, practice types and monitoring station set-up for the site. These spreadsheets must be completed first to enable proper population of pick-lists in other spreadsheets.

2. Yellow: These spreadsheets represent supplemental information for the site such as detailed records for fertilizer, pesticides/herbicides, irrigation management, and cost data. Most data entered into these spreadsheets are not required, but are “nice-to-have” as described in Section 5.2 below.
3. Pink: These spreadsheets represent monitoring data such as precipitation, flow and water quality. The data entered on these spreadsheets are used to assess performance of BMPs.
4. Green: These spreadsheets represent design information for practices being monitored at the site. A user will select one or more of these spreadsheets, depending on the practices present at the site.
5. Grey: These spreadsheets are “pick-lists” located at the end of the data entry package, as described in Section 5.3. These are for general reference and are not required for data entry.

5.2 Description of Data Priority Codes

In order to enable meaningful analysis of BMP data, a fairly extensive amount of information is requested in the spreadsheet package. These data requests are prioritized as “required”, “important” (but not required), and “nice to have.” The priority level for each data element is color coded in the spreadsheet cells according to these three priority levels:

- **Required [R]**: “Required” data are necessary for proper evaluation and comparison of BMP performance. If these data are not provided, then the study may either be rejected from inclusion in the AgBMPDB or excluded from certain types of analysis. Required fields are color-coded in blue in the spreadsheets.
- **Important [I]**: “Important” data are also necessary for proper evaluation and comparison of BMP data; however, these data may not always be available in a performance studies. Studies with missing “important” information will still be accepted in the AgBMPDB, but researchers are encouraged to include this information in submittals for future studies. Important fields are color-coded in purple in the spreadsheets.
- **Nice to have [N]**: “Nice to have” fields provide data that are useful in BMP evaluation, but not essential for BMP evaluation. For example, “comments” and cost data are considered nice to have. Nice-to-have fields are color-coded in yellow in the spreadsheets.

In the remainder of this User’s Guide, the priority level of each data element is identified by [R], [I], or [N], corresponding to the descriptions above.

5.3 Pick-Lists

Some fields in the Excel workbook require that entries conform to pre-established “pick-lists”. The pick-lists are provided in dropdown boxes on the individual spreadsheets (Figure 4). When a pick-list is provided, the data provider is not required to manually use the dropdown box, provided that the information entered is a value listed in the pick-list. If the entry is not consistent with the options in the pick-list, then the user will receive an error message. As an example, for the monitoring data spreadsheets, the user must enter previously defined monitoring event numbers and monitoring station names; however, the user has the option to paste or type in these values, provided that they exist in the pick-list.

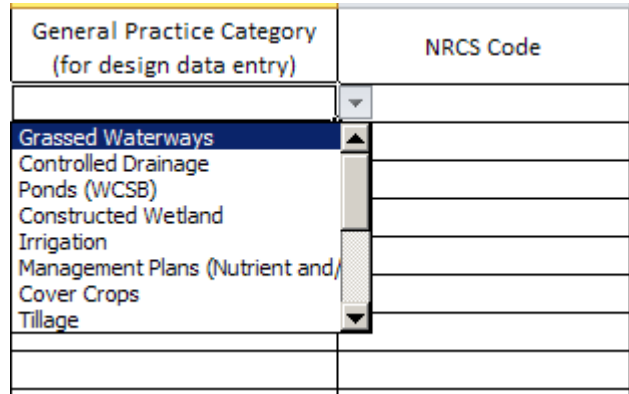


Figure 4. Example Pick-list for Selecting a General Practice Category

6 DATA ENTRY SPREADSHEETS

6.1 Begin Here

The “Begin Here” spreadsheet enables the user to define the Test Site name (project identifier) and Study Area (study site) names so that this information populates throughout the data entry spreadsheet package. The AgBMPDB Clearinghouse will assign unique Site IDs and Study Area IDs once the study is accepted for submission. Test Site IDs are 10-digit numeric codes composed of the 4-digit year, 3-digit data source ID (will be developed based on submitting organizations), and 3-digit study number. The Study Area IDs are 12-digit numeric codes composed of the Test Site ID plus a 2-digit Study Area code.

The “Begin Here” spreadsheet also enables the user to list the user-defined monitoring station names for the overall Test Site and assigns a Monitoring Station ID to the station, as illustrated in Table 1.

Table 1. “Begin Here” Data Entry Fields Example

Enter Test Site Name	Internal Use Only Test Site ID
Pepper Farms 1	2013001001
Enter Study Area Name(s)	Internal Use Only Test Site ID
Pepper Farm	201300100101
Enter Monitoring Station Name(s)	Internal Use Only Monitoring Station ID
R-1	1
FS-3	2
In-FS	3
Out-FS	4

6.2 Test Site

The purpose of the Test Site table is to identify the study, the geographic characteristics, involved parties, and the general study design. The Test Site table is also used to identify supporting information accompanying the study submission such as published reports, quality assurance plans, photos, site layouts, and other information. The Test Site table is the primary table identifying the performance study, from which all other relational tables in the AgBMPDB follow.

6.2.1 Basic Test Site Information

Test Site ID Code [R]: The Test Site ID code is a 10-digit code for the Test Site assigned on the “Begin Here” data entry spreadsheet that auto-populates throughout the data entry spreadsheet package to enable meta data and data entered in multiple tables to be associated with the Test Site. The 10-digit code is based on the 4-digit year of data submission, a 3-digit data provider code assigned by the data Clearinghouse, and a 3-digit study number.

Test Site Name [R]: User-defined name assigned to the Test Site that is entered on the previously described “Begin Here” data entry page that auto-populates throughout the data entry spreadsheet package. The Test Site name selected should be named in a manner that protects landowner privacy.

County (or non-U.S. state/province) [R]: County in the U.S. where the Test Site is located. If the study is located outside of the U.S., enter the state or province in this field.

State (in U.S.) [R]: U.S. state where the Test Site is located. Selected from a pick-list of abbreviations. If located outside of the U.S., enter XX for the state.

Country [R]: Country where the Test Site is located. Enter a two-character country code (e.g., use US for the United States).

Narrative Study Design [R]: This field is used to provide a brief narrative of the study design.

Experimental Design Type [R]: Select the experimental design type from a pick-list. Agricultural conservation practice studies may evaluate a single conservation practice, dispersed conservation practices, or treatment trains. Additionally, multiple variations of practices may be evaluated at single Test Site through plot studies. Consequently, a designated “Experimental Design Type” field is included in the Test Site table to better characterize the relationship between the Study Areas and monitoring locations at the site. Figures 5 through 9 illustrate several of these experimental designs. A pick-list is provided allowing entry of these experimental design types:

1. **Inflow-Outflow:** This study design is selected if the study examined one conservation practice type (or treatment train) with a discrete point(s) of inflow and outflow. An Inflow/Outflow design measures the conservation practice’s effectiveness by measuring the pollutant concentrations and/or volumes at the points of inflow and at the points of outflow (e.g., treatment outlet, overflow outlet, etc.).
2. **Before-After (Control-Test, Temporal):** This experimental design examines the point discharge of a basin (i.e., Study Area), before and after conservation practices are implemented. Paired data analyses are not possible with this configuration since the samples are collected at different times (i.e., different monitoring events). Instead, analyses must focus on analyzing differences in the statistical distributions, which inherently can require a larger number of data points to detect differences, depending on the sample variability and the magnitude of the differences.
3. **Paired Sites (Multiple Tests, With Control):** This experimental design represents studies where one or more practice configurations are tested on different plots, and there is a control plot without practices. This configuration allows for paired data analyses, based on both a relative comparison among other Study Areas and against a Control Site.
4. **Paired Sites (Multiple Tests, No Control):** This experimental design represents studies where one or more practice configurations are tested on different plots, but there is no control plot without practices. This configuration allows for paired data analyses based on a relative comparison among other Study Areas, rather than a Control Site. Results from this type of study may be compared against water quality benchmarks or perhaps Control Site from other studies with similar site conditions.
5. **Upstream-Downstream:** The Upstream/Downstream study design describes studies that evaluate large areas which utilize multiple conservation practices and may not have discrete points of inflow or outflow from which to measure pollutant concentrations directly. Instead, sampling sites are located in a stream upstream and downstream of the Study Area. This design allows for an evaluation of the incremental change in concentrations and/or loads caused by runoff and shallow subsurface flow/seepage contributions from the Study Area.
6. **Other:** this field is provided to allow for other types of experimental designs. If “Other” is selected, then provide an explanation in the “Comments” field associated with this table.

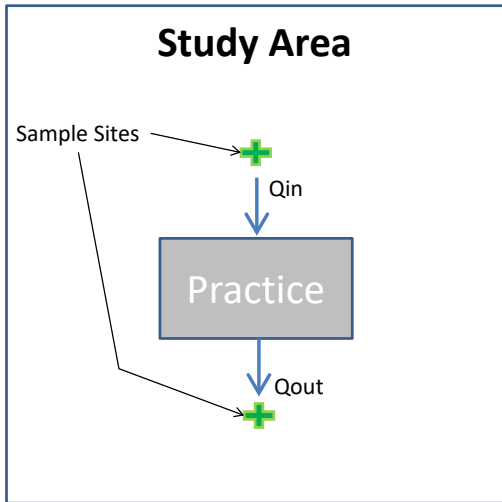


Figure 5. Inflow-Outflow Study Design

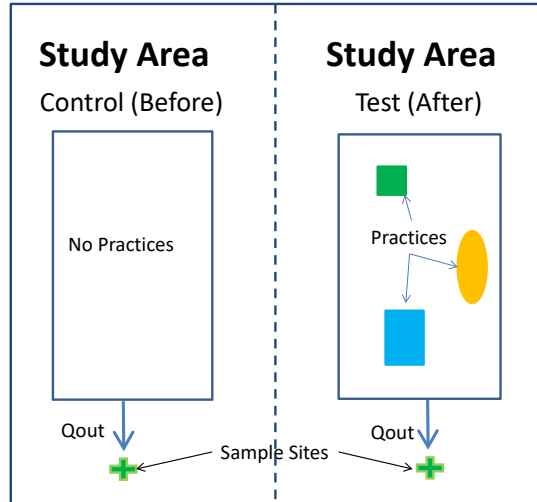


Figure 6. Before-After (Control-Test, Temporal)

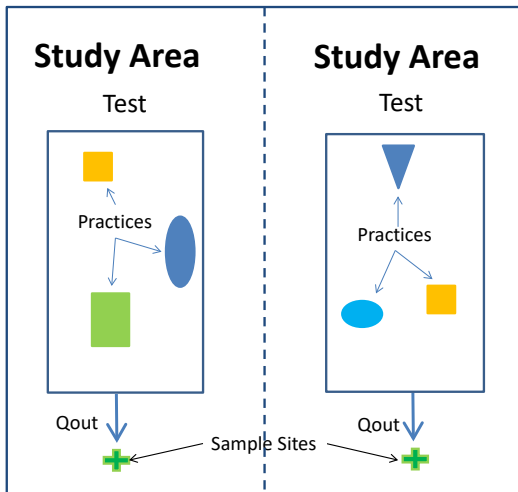


Figure 7. Paired Sites (Multiple Tests, No Control)

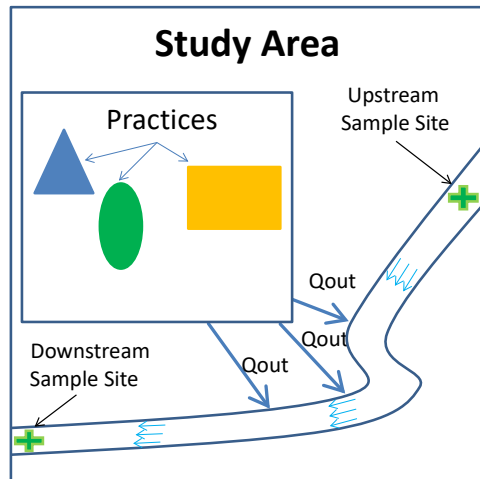


Figure 8. Upstream-Downstream

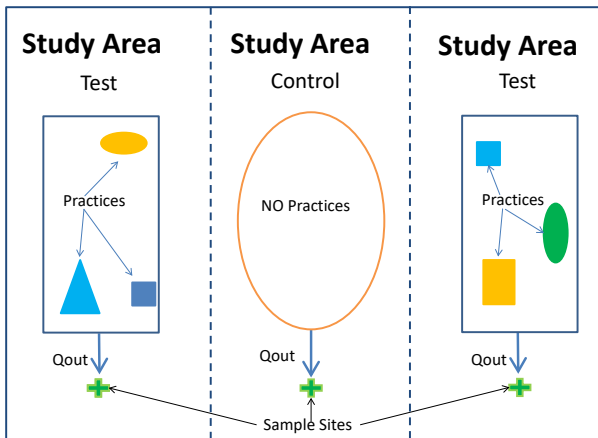


Figure 9. Paired Sites (Multiple Tests, With Control)

NRCS Standard 201 Monitoring Designs (Source: NRCS 2012a)

Under Standard 201, the NRCS requires either a paired field approach or an above and below treatment approach for monitoring. The NRCS defines these approaches as:

- A paired approach provides for a determination of conservation practice effectiveness by comparing a control field and a treatment field that are similar in terms of soil, slope, vegetation, hydrology, initially receive identical management, and receive the same weather (e.g., precipitation events) (Clausen and Spooner 1993). Monitor both fields (watersheds) under identical crop and management conditions without any new practice implementation during the baseline period. Follow this with monitoring of both fields after conservation practice implementation in the treatment field. The monitoring regime (i.e., sample location, method, and frequency) must remain the same through both baseline and post-implementation periods. Selecting a single field with split drainage areas simplifies the paired approach.
- In-field above and below approach. In this system, the first station monitors water quality above treatment and a second station monitors water quality below treatment. As with the paired approach, follow the baseline period with a post-treatment monitoring period (NRCS, 2003).

Test Site Scale [R]: Agricultural studies can be conducted at a variety of scales. Test Site scale is an important data element that is used in future queries of the AgBMPDB to group studies of similar scale. One of the following study scales should be selected from a pick-list:

- Plot: monitoring focuses on a smaller Study Area within a field. Multiple plots may be monitored to test the effectiveness of variations in conservation practice application.
- Field: monitoring is focused on individual field(s).
- Farm: monitoring evaluates multiple practices on multiple fields, monitored as a whole.
- Subwatershed: Sub-watersheds are those that have drainage areas of approximately 500 - 1,000 acres. (Definition adopted from NRCS Standard 201, NRCS 2012a)
- Watershed: Hydrologic Unit Code (HUC)-12 scale monitoring or larger. See Section 6.2.3 for more information on HUCs.

Most performance studies suitable for the AgBMPDB are expected to range from plot to farm scales.

General Performance Assessment Method [R]: Closely related to experimental design type, the general performance assessment method must be selected from a pick-list. The purpose of this field is to ensure that future users of the study's performance data compare data for similar study types. The pick-list includes:

- | | |
|---------------------------------|---------------------|
| ▪ Edge-of-Field (surface flows) | ▪ Structure Outflow |
| ▪ Instream | ▪ Other |
| ▪ Subsurface | |

Crop(s)/Crop Rotations [R]: Provide a brief narrative of the crop(s) grown in the Study Area, including typical crop rotation (e.g., corn-soybeans, continuous corn).

Study Duration [R]: Provide the approximate study duration in narrative form, with units provided (e.g., 5 years).

Number of Study Areas [R]: Number of discrete areas monitored in the overall study, including control sites.

6.2.2 Reference/Citation Information

This portion of the Test Site table provides information that a future user of the study may need to access the original published source of the performance data.

Short Reference (Author[s], year) [R]: Provide a short reference in the form of “author last name, year” (e.g., Jones et al., 2013). If the work is unpublished, use the researcher’s last name and year that the study was completed. This short reference format may be used as the basis of future queries or summaries associated with the AgBMPDB.

Authors/Researchers [R]: Provide a complete author list in reference format (e.g., Sharpley, A., Barnes, B.), consistent with the published research.

Year of Publication [R]: 4-year date of research publication (e.g., 2013) or date research was completed.

Report Title [R]: Report title, as published (e.g., Effect of No-Till and Extended Rotation on Nutrient Losses in Surface Runoff).

Report Source Citation [R]: Journal name or publication type (e.g., Journal of Irrigation and Drainage, USGS Water Resources Investigation Report). If the data source is unpublished, then state “unpublished data.”

Sponsoring Program(s) [R]: Name of organization sponsoring the research (e.g., USDA Agricultural Research Service).

Monitoring Entity(s) [R]: Name of organization or entities conducting the monitoring (e.g., University of North Carolina).

Weblink [N]: Link to publically available report, if applicable.

Summary/Abstract [R]: Brief abstract-style summary of the study context and findings. Limit to one to two paragraphs.

Comments [N]: Other pertinent comments that a user of this research would need to be aware of to avoid inappropriate use of the data. An example might be: “The findings of this study may be influenced by drought conditions.”

6.2.3 Geographical Information

Geographical characteristics are an important factor that influences the comparability of studies and potentially performance of conservation practices; therefore, several types of geographical

category information are requested. This information is useful for facilitating queries of studies with similar characteristics, as well as for generally identifying study locations where landowner privacy is a concern.

NRCS Land Resource Region (LRR) (from pick-list) [R]: Land resource regions are geographic areas in North America that are characterized by a particular pattern of soils, climate, water resources and land uses. The pick-list is provided in Table 2. To locate the LRR, see Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin (Handbook 296, NRCS 2006), accessible at: ftp://ftp-fc.sc.egov.usda.gov/NSSC/Ag_Handbook_296/Handbook_296_high.pdf.

Table 2. NRCS Land Resource Region (LRR) Pick-List

NRCS Land Resource Region (LRR) Pick-List
Aleutian Alaska
Atlantic and Gulf Coast Lowland Forest and Crop Region
California Subtropical Fruit, Truck, and Specialty Crop Region
Caribbean Region
Central Feed Grains and Livestock Region
Central Great Plains Winter Wheat and Range Region
East and Central Farming and Forest Region
Florida Subtropical Fruit, Truck Crop, and Range Region
Hawaii
Hawaii Region
Interior Alaska
Lake State Fruit, Truck Crop, and Dairy Region
Mississippi Delta Cotton and Feed Grains Region
Northeastern Forage and Forest Region
Northern Alaska
Northern Atlantic Slope Diversified Farming Region
Northern Great Plains Spring Wheat Region
Northern Lake States Forest and Forage Region
Northwestern Forest, Forage, and Specialty Crop Region
Northwestern Wheat and Range Region
Pacific Basin Region
Rocky Mountain Range and Forest Region
South Atlantic and Gulf Slope Cash Crops, Forest, and Livestock Region
Southern Alaska
Southwest Plateaus and Plains Range and Cotton Region
Southwestern Prairies Cotton and Forage Region
Western Alaska
Western Great Plains Range and Irrigated Region
Western Range and Irrigated Region
<i>NA—Outside North America</i>

NRCS Major Land Resource Area ID (MLRA) (from pick-list) [I]: Major land resource areas (MLRAs) are subregions of the land resource regions (LRRs) and comprise smaller homogeneous areas. Once the LRR is selected, the corresponding MLRA can be selected from a pick-list. To identify the MLRA, see *Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin* (Handbook 296, NRCS 2006), accessible at: ftp://ftp-fc.sc.egov.usda.gov/NSSC/Ag_Handbook_296/Handbook_296_high.pdf. (The pick-list is not shown here due to length). Once uploaded to the AgBMPDB, the MLRA numeric ID will be automatically associated with this entry.

Hydrologic Unit Code (12-digit) [I]: The U.S. Geological Survey (USGS) has categorized streams in the U.S. by hydrologic unit codes (HUCs). Each hydrologic unit is identified by a unique HUC consisting of two to twelve digits based on six levels of stream classification. The 12-digit HUC corresponds to sixth-level watersheds at the subwatershed scale. (For broader context, 10-digit HUCs are at the watershed scale, 2-digit HUCs are at the regional scale.) Enter -999999 if the study is located outside of the U.S. To find the appropriate HUC, go to <http://datagateway.nrcs.usda.gov/Catalog/ProductDescription/WBD.html> or <http://cfpub.epa.gov/dmr/selecthuc12.html>.

Map Coordinates Privacy Level [R]: Landowner privacy is a significant concern to some landowners and data providers. Privacy level may be identified as Public, meaning that the exact coordinates could be plotted on a Google Earth map, or Private, meaning that the exact coordinates will not be plotted on a Google Earth map.

Decimal Latitude [N]: Where privacy concerns allow, enter the latitude in decimal degrees (e.g., 39.785983). For large areas, the approximate centroid of the Study Area can be used. Google Earth can be used to obtain the approximate latitude and longitude by zooming into the site location and right-clicking the mouse and selecting "What's Here?"

Decimal Longitude [N]: Where privacy concerns allow, enter the longitude in decimal degrees (e.g., -105.100563). For large areas, the approximate centroid of the Study Area can be used. Google Earth can be used to obtain the approximate latitude and longitude by zooming into the site location and right-clicking the mouse and selecting "What's Here?"

Site Elevation (m) [N]: Enter the site elevation in meters.

Horizontal Datum [N]: Identify the datum used for latitude and longitude (e.g., UTM NAD83).

Vertical Datum [N]: Identify the datum used for elevation (e.g., NAVD88).

EPA Ecoregion [R]: Enter the U.S. Environmental Protection Agency (EPA) Level 1 Ecoregion where the study is located. The EPA Level I Ecoregions for North America are divided into 15 broad ecological regions. See http://www.epa.gov/wed/pages/ecoregions/na_eco.htm for more information. As shown in Figure 10 and Table 3, the Level 1 Ecoregion pick-list includes:

Table 3. EPA EcoRegion IDs and Descriptions

1	Arctic Cordillera	9	Great Plains
2	Tundra	10	North American Deserts
3	Taiga	11	Mediterranean California
4	Hudson Plains	12	Southern Semi-Arid Highlands
5	Northern Forests	13	Temperate Sierras
6	Northwestern Forested Mountains	14	Tropical Dry Forests
7	Marine West Coast Forests	15	Tropical Humid Forests
8	Eastern Temperate Forests	-	<i>NA-Outside of North America</i>
		99	

6.2.4 Attachment Checklist

The last portion of the Test Site table is a series of yes/no entries used to identify additional attachments included with the data entry spreadsheet package submittal. These additional attachments are not required [N], but are highly encouraged. Data providers are required to enter yes or no to indicate whether these attachments are provided. The data provider should enter yes or no for each field to indicate whether the following additional attachments to the submittal are provided:

- Publication/report
- Site photos
- Site diagrams (planview)
- Sampling and analysis plan (quality assurance project plans [QAPP])

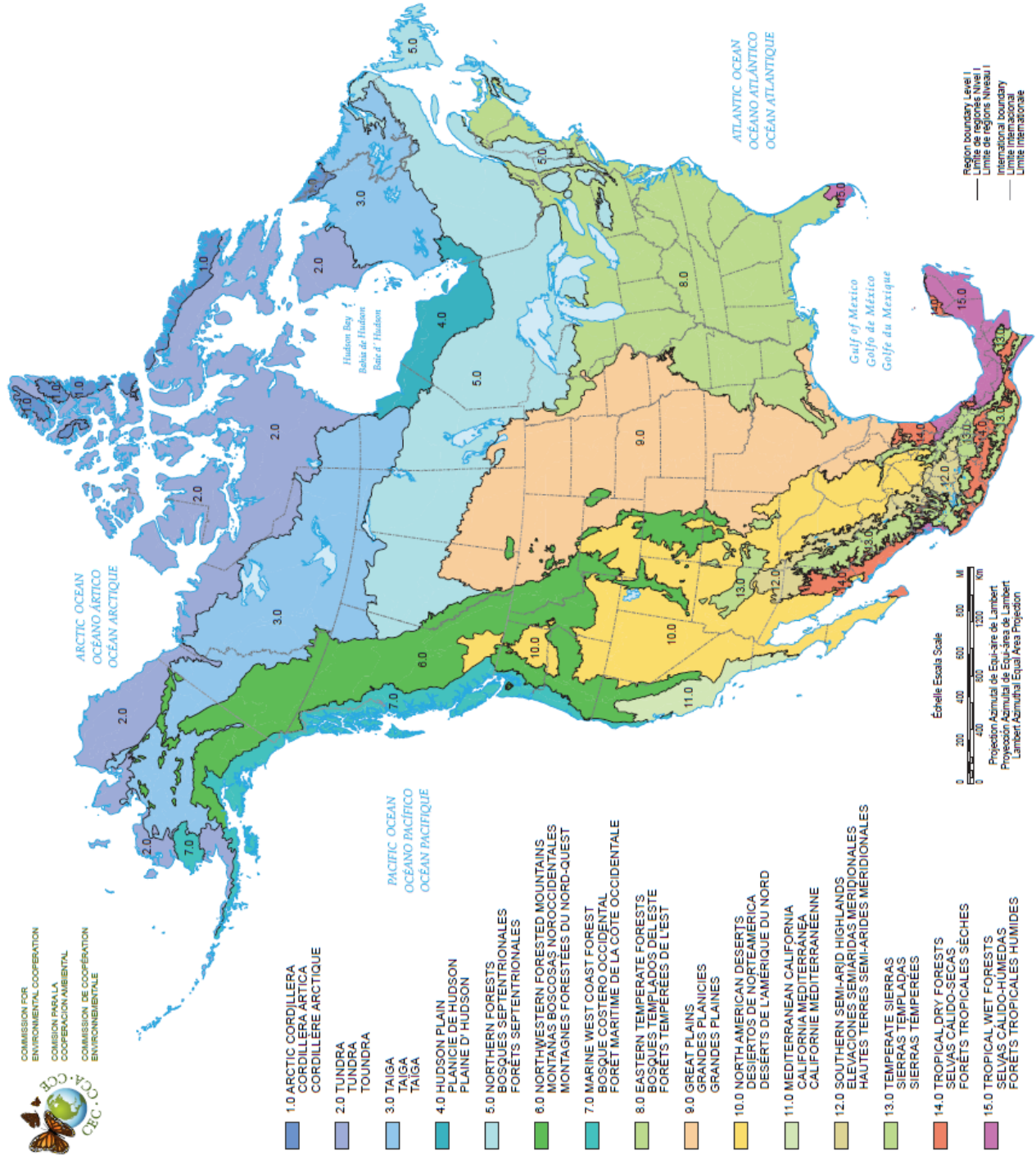


Figure 10. EPA Level 1 Ecoregions
 (Source: ftp://ftp.epa.gov/wed/ecoregions/cec_na/NA_LEVEL_1.pdf)

6.3 Study Area

The purpose of the Study Area table is to identify the area containing or tributary to the conservation practice(s) studied. More than one Study Area may be present at a Test Site, depending on the study design configuration (as described in Section 6.2.1). For study designs relying on test-control configurations, it is critical to thoroughly document the Study Area conditions for both Study Areas. For example, test and control Study Areas could have the same tributary area and land use (e.g., “look the same”), but the underlying soil types could be different, which could affect performance comparisons for the Study Areas. Study areas associated with an agricultural monitoring study may include multiple “nested” locations. These could include one or more edge-of-field locations and/or an overall subwatershed (see Figure 11, example from NRCS 201; NRCS 2012a). Each Study Area monitored, even if nested, should be described separately in this spreadsheet.

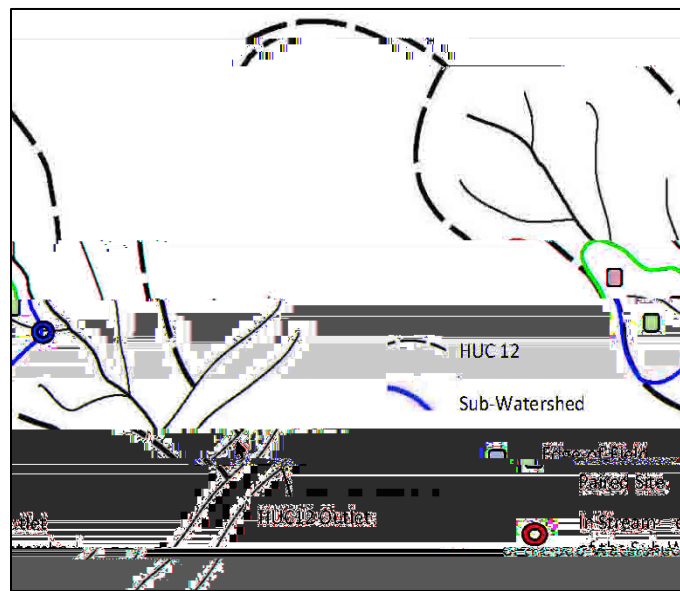


Figure 11. Potential Sub-Watershed Approach to Edge-of-Field Monitoring as Shown in NRCS Conservation Monitoring Activity Standard 201 (Source: NRCS 2012a)

Test Site ID Code [R]: [Auto-populates from Begin Here spreadsheet]

Site Name [R]: [Auto-populates from Begin Here spreadsheet]

Study ID [R]: [Auto-populates from Begin Here spreadsheet]

Study Area Name [R]: [Auto-populates from Begin Here spreadsheet]

Study Area Type [R]: Study areas can be categorized as a “test” location where conservation practices are implemented, or as a “control” site, where conservation practices have not been implemented. Control sites can be subcategorized as Control-Natural or as Control-Production. A natural control site is used to compare an uncultivated area to a cultivated area with conservation practices implemented. A control-production site is a location where the land is used for agricultural production, but without the conservation practice being tested. Select the Study Area type from this pick-list:

- Test
- Control-Production
- Control-Natural

Monitoring Period [R]: The selected monitoring period is an important aspect of experimental design. Enter the duration of the monitoring period (e.g., 6 years) in this field. The NRCS recommends that the monitoring period cover the full crop-rotation sequence for the Study Area. Select the monitoring period for the Study Area from this pick-list:

- Multi-year
- Annual
- Growing Season
- Other

Tributary Area [R]: Enter the local contributing drainage area associated with the study site. For example, if the study is monitoring edge-of-field runoff, enter the area of the field. Enter -999999 if the tributary area is unknown.

Tributary Area (units) [R]: Enter the units associated with the tributary area.

Crop Rotation (or Crop) for Study Area [R]: Enter the crop rotation sequence for the Study Area, or the crop (e.g., continuous corn) if rotation is not used. (Note: more detailed crop-related information is requested in the Crops spreadsheet.)

Crop History Prior to Study (narrative) [I]: Enter the crop history for the Study Area prior to the study time period. At a minimum, enter the prior season's crops and tillage practices. Where available, the last five years of crop history should be described.

Surface Drainage and Soil Characteristics

Precision Graded (Y/N)? [N]: Enter yes, no or unknown to identify whether precision grading techniques were used in the study area.

Slope (%) [I]: Enter the average Study Area slope (0-100) as a percentage.

Dominant Hydrologic Soil Group [R]: Enter the dominant native hydrologic soils group(s) for the Study Area. The four primary hydrologic soil group types are described as:

- Group A soils have a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission.
- Group B soils have a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.
- Group C soils have a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine texture to fine texture. These soils have a slow rate of water transmission.

- Group D soils have a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a clay pan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Select the dominant hydrologic soils group(s) from the pick-list:

- | | | |
|-----|-------|------------------|
| ▪ A | ▪ A/B | ▪ B/D |
| ▪ B | ▪ A/C | ▪ C/D |
| ▪ C | ▪ A/D | ▪ NA (Not Known) |
| ▪ D | ▪ B/C | |

Soil Map Unit ID [I]: The soil map unit ID(s) for the Study Areas can be obtained on-line from the NRCS Web Soil Survey.

Describe Soils [I]: Provide narrative descriptions of the Study Area soil types/texture classes. This information can also be obtained on-line from the NRCS Web Soil Survey.

Constructed Drainage Conveyance Type [I]: Select the constructed surface drainage conveyance type present at the Study Area from this pick-list:

- | | |
|--------------------|------------------|
| ▪ Berm | ▪ Levee |
| ▪ Ditch | ▪ Other |
| ▪ Diversion | ▪ Not Applicable |
| ▪ Grassed Waterway | |

NRCS Web Soil Survey

The Web Soil Survey (WSS) provides soil data and information produced by the National Cooperative Soil Survey. It is operated by the NRCS and provides access to soil maps and data available online for most of the nation's counties. It can be accessed at:
<http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>

Number of Water and Sediment Control Basins [I]: Enter the number of water and sediment control basins present for the Study Area. Enter 0, if none are present. Enter -9 if this information is unknown.

Is the Study Area Irrigated? (Y/N) [R]: Enter yes or no to identify whether the Study Area is irrigated.

Tile Drain Characteristics

Enter characteristics of the tile drain system. Information requested for the below is based on NRCS Standard 202 (NRCS 2012b). If Drainage Water Management is implemented as a conservation practice being studied at the site, then the priority-level for nice-to-have [N] data fields is increased to important [I].

- **Tile Drainage (Y/N) [R]:** Enter yes/no, depending on whether tile drainage is present at the Study Area.
- **Drainage Controlled? (Y/N) [R]:** Enter yes or no to indicate whether Drainage Water Management (Controlled Drainage) is implemented at the Study Area. If yes, enter additional information in the Drainage Water Management (DWM) practice spreadsheet.
- **Sub-irrigation with Tile? (Y/N) [R]:** Enter yes or no to indicate whether sub-irrigation occurs in conjunction with controlled drainage for the tile drain system.
- **Tile Drainage Area (acres) [R]:** Enter the area (in acres) drained by the tile system. Enter -999999 if the drainage area is unknown. Enter 0 if no tile drainage system is present.
- **Tile Age (yrs) [N]:** Enter the approximate age of the tile in years.
- **Tile Size (diameter in inches) [N]:** Enter the tile drain size, reported as diameter in inches, for lateral drains.
- **Drain Size (diameter in inches) [N]:** Enter the drain size, reported as diameter in inches, for the main trunk line drain.
- **Tile Type [N]:** Enter the type of tile drain materials (e.g., clay, plastic, concrete, metal, other, unknown).
- **Tile Layout [N]:** Enter the general tile drain layout pattern, as selected from a pick-list of common subsurface drainage arrangements: Parallel, Herringbone, Double Main, Targeted, Other or Unknown (See Figure 12).
- **Tile Depth (ft) [N]:** Enter the average tile drain depth below the ground surface in feet.
- **Tile Length above Outlet (ft) [N]:** Enter the tile drainage length above the outlet.
- **Subsurface Drainage System Average Grade (%) [N]:** The average grade of the subsurface drainage system, measured in percent slope.
- **Lateral Tile Spacing (ft) [N]:** Enter the average tile drain spacing in feet.
- **Number of Risers [N]:** Enter the number of risers associated with the tile drain system.
- **Number of Surface Inlets [N]:** Enter the number of surface inlets associated with the tile drain system.

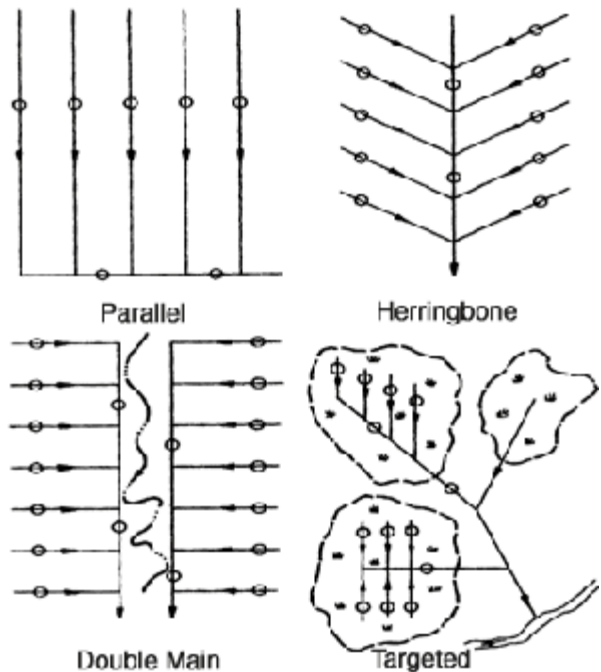


Figure 12. Common Tile Layout Patterns
 (Source: Wright and Sands, 2001, University of Minnesota Extension Service)

- **Describe Tile Drainage System [I]:** Provide additional description of the tile drain system or a narrative description where quantitative information is not available.

Comments [N]: Provide other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data.

6.3.1 Crop/Land Cover Detail

Land cover and crop types in a Study Area are two major factors influencing the quality and quantity of runoff that should be carefully documented within agricultural conservation practice studies. Because land cover and crop types vary over time at agricultural sites, it is important to document the land cover and crop type in place for a Study Area for a given period of time. The Crop/Land Cover spreadsheet is used for this purpose.

Tip: Use of Comments Fields

Most spreadsheets in the AgBMPDB Data Entry package have Comment fields, where the user can provide a descriptive narrative. Users are encouraged to use the comments fields, even though these fields are “nice to have” (optional). Providing simple comments can help to ensure that future users of the data correctly understand the study design, watershed conditions, conservation practices, and monitoring data.

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Study Area ID [R]: [Auto-populates once the Study Area is entered]

Crop ID [R]: [Populated by an auto-numbered field]

Study Area [R]: [Select the applicable Study Area from the pick-list of previously defined Study Areas at the Test Site]

Crop Produced [R]: Enter the crop type for each record, adding discrete records for each additional crop produced in the associated study area. For crop rotations that are not documented as individual records, the crop rotation sequence should be entered. If the land use record is not associated with crop production, enter Not Applicable.

Land Cover [R]: Select the land cover type for each portion of the Study Area from the pick-list based on USGS land cover categories (<http://landcover.usgs.gov/classes.php>), as shown in Table 4. If a portion of the Study Area is non-agricultural land, enter this area as a land cover record and enter “Not Applicable” in the Crop Produced data entry field.

Table 4. USGS Land Cover Institute Land Cover Types and Codes

Water	Shrubland
11 Open Water	51 Shrubland
12 Perennial Ice/Snow	Non-Natural Woody
Developed	61 Orchards/Vineyards/Other Herbaceous
21 Low Intensity Residential	Upland Natural/Semi-natural Vegetation
22 High Intensity Residential	71 Grasslands/Herbaceous
23 Commercial/Industrial/Transportation	Herbaceous Planted/Cultivated
Barren	81 Pasture/Hay
31 Bare Rock/Sand/Clay	82 Row Crops
32 Quarries/Strip Mines/Gravel Pits	83 Small Grains
33 Transitional	84 Fallow
Forested Upland	85 Urban/Recreational Grasses
41 Deciduous Forest	Wetlands
42 Evergreen Forest	91 Woody Wetlands
43 Mixed Forest	92 Emergent Herbaceous Wetlands

Acres Planted (or Acres Land Cover) [R]: Enter the areas of the Study Area planted for each crop or associated with the land cover record.

Percent of Tributary Area (%) [R]: Enter the percent of the Study Area covered by the subject land use/crop.

Plant Date [I]: Enter the plant date for the crop. Enter the exact date [DD/MM/YYYY] or approximate date (e.g., Spring 2010).

Harvest Date [I]: Enter the harvest date for the crop. Enter the exact date [DD/MM/YYYY] or approximate date (e.g., Spring 2010).

Seeding Rate [I]: Enter the numeric value for the seeding rate for the crop (e.g., 32,000). (Units of measure are entered in a separate field.)

Seeding Rate Unit (/acre) [I]: Specify the units associated with the seeding rate (e.g., seeds/acre, lbs PLS/acre).

Variety [N]: Enter the seed variety associated with the crop.

Yield (/acre) [R]: Enter the numeric value for the per-acre yield for the crop (e.g., 160) at the completed harvest date. (Units of measure are entered in a separate field.) If the yield is unknown, enter -999999.

Yield Units (/acre) [R]: Specify the units associated with the crop yield (e.g., bushels/acre).

Tillage Type [R]: Specify the tillage type associated with the crop, as selected from this pick-list:

Conservation Tillage Practices

- No-Till
- Strip Tillage
- Mulch Tillage
- Ridge Tillage
- Conservation Tillage (general)

Other Tillage Practices Used on Control Sites

- Conventional (Intensive) Tillage
- Reduced Tillage (15-30% Residue)
- Other
- Unknown

Tillage Date [N]: Enter the tillage date for the crop. Enter the exact date [DD/MM/YYYY] or approximate date (e.g., Spring 2010).

Tillage Depth (inches) [I]: Enter the depth of tillage in inches.

Residue Management [I]: Narratively describe the residue management practices associated with the crop.

Cover Crop Species [R]: Enter the cover crop species, if any, or enter “None” if no cover crop is planted.

Fertilizer Narrative [I]: Provide a general description of the fertilizer application practices at the Study Area. Where detailed records are available, use the Fertilizer Detail supporting table to enter specific quantitative information.

Detailed Fertilizer Records (Y/N)? [R]: This yes/no question is used as a flag to indicate whether additional information is provided in the Fertilizer Detail supporting table.

Irrigation Narrative [I]: Provide a general description of the irrigation practices at the Study Area. Where detailed records are available, use the Irrigation Detail supporting table to enter specific quantitative information. For dryland farming, enter “not applicable.”

Detailed Irrigation Records (Y/N)? [R]: This yes/no question is used as a flag to indicate whether additional information is provided in the Irrigation Detail supporting table.

Herbicide/Pesticide Narrative [I]: Provide a general description of the herbicide/pesticide application practices at the Study Area. Where detailed records are available, use the Herbicide/Pesticide Detail supporting table to enter specific quantitative information.

Detailed Herbicide/Pesticide Records (Y/N)? [R]: This yes/no question is used as a flag to indicate whether additional information is provided in the Herbicide/Pesticide Detail supporting table.

Comment [N]: Provide other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data.

6.3.2 Fertilizer Detail

Information requested for the Fertilizer Detail below is based on NRCS Standard 202 (NRCS 2012b). If a Nutrient Management Plan is being monitored as a conservation practice at the Study Area, then important [I] fields are considered required [R] information to evaluate performance of the management plan in proper context.

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Study Area [R]: [Auto-populates previously identified Study Area after Crop ID is selected]

Crop Produced (previously identified) [R]: [Auto-populates previously identified crop after Crop ID is selected]

Crop ID (previously identified) [R]: [Select Crop ID from pick-list of previously-defined crops from the Crops spreadsheet]

Fertilizer Application Dates, Types, Methods, and Rates

For up to three fertilizer application events (e.g., Fert1, Fert2, Fert3), enter the following information:

General Application Date [I]: Enter the fertilizer application start date. Enter the exact date [DD/MM/YYYY] or approximate date (e.g., Spring 2010).

Fertilizer Formulation [R]: Select the fertilizer formulation/type applied to the Study Area.

Examples include, but are not limited to:

- Commercial
- Biosolids--Municipal
- Other (Describe)
- Not Provided
- Not Applicable
- Manure--Unspecified
- Manure--Poultry
- Manure--Sheep
- Manure--Dairy
- Manure--Beef
- Manure--Swine

Application Method [R]: Select the fertilizer application method for the Study Area. Examples include, but are not limited to:

- Knife
- Band
- Broadcast
- Other
- Unknown

Fertilizer Application Rate [R]: Provide the fertilizer application rate per unit area and units of measurement. Enter -999999 if fertilizer is applied, but the application rate is unknown.

Fertilizer Application Rate Units [R]: Provide the units of measurement associated with the fertilizer application rate.

Nutrient Content of Fertilizer for Each Fertilizer Application Event

Nutrient Content [I]: For up to three fertilizer application events (e.g., Fert1, Fert2, Fert3), enter the average, minimum and maximum nutrient content in kg/ha, where:

- **N:** Nitrogen content.
- **P₂O₅:** Phosphorus content, reported as phosphorus oxide.
- **K₂O:** Potassium content, reported as potassium oxide.

If only one set of measurements is available, enter the results in the average columns. Minimum and maximum content are not requested for K.

Micro-nutrient Content [N]: Describe other micro-nutrient content of the fertilizer pertinent to the study.

Carbon to Nitrogen Ratio (for manure) [N]: Enter the carbon to nitrogen ratio for manure applied to the site. Typically, when organic materials with a C:N ratio of greater than 30 are added to soils, there is immobilization of soil nitrogen during the initial decomposition process. Organic materials with a C:N ratio below 20 that are added to soils generally show an early release of nitrogen in the decomposition process. For ratios between 20 and 30, there may be neither immobilization nor release of mineral nitrogen.

Salt Fraction (for manure) and Units [N]: Enter salt fraction quantified as electrical conductivity (EC), which is an indication of soluble salts. The units of measure are either millimhos per centimeter (mmho/cm) or deciSiemens per meter (dS/m). Soluble salts include all ions that are contained in manure liquids.

Manure Moisture Content (as is) (%) [N]: Enter the moisture content of applied manure. All manure analyses should include either the moisture or dry matter content, and are usually expressed as a percentage. Dry weight analyses are useful for comparing nutrient levels without the dilution effect of water (Iowa State Extension 2012).

Phosphorus Content of Soil

Soil testing is critical for determining the need for phosphorus (P) fertilization. Test results guide the rate of application recommended to optimize production (Sawyer and Mallerino 1999). Several different test methods are available for testing soil phosphorus, as described below. For more information on how to interpret these test methods, see: http://www.agronext.iastate.edu/soilfertility/info/mnconf11_22_99.pdf.

Soil Phosphorus Test Method [I]: Several different phosphorus test methods may be used; Examples include, but are not limited to:

- Bray I
- Mehlich III
- Olsen
- Unknown

- Other

Soil Test Phosphorus Result [I]: Enter the soil test phosphorus numeric result and reporting units.

Soil Test Phosphorus Units [I]: Enter the units of measurement for the soil test phosphorus numeric result.

Comment [N]: Provide other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data. Additional soil test results or fertilizer application information can be added in this field.

6.3.3 Irrigation Detail

Information requested for the Irrigation Detail below is based on NRCS Standard 202 (NRCS 2012b). If an Irrigation Management Plan is being monitored as a conservation practice at the Study Area, then important [I] fields are considered required [R] information to evaluate performance of the management plan in proper context.

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Study Area [R]: [Auto-populates previously identified Study Area after Crop ID is selected]

Crop Produced (previously identified) [R]: [Auto-populates previously identified crop after Crop ID is selected]

Crop ID (previously identified) [R]: [Select Crop ID from pick-list of previously-defined crops from the Crops spreadsheet]

Irrigation Source [I]: Select the irrigation water source from the pick-list provided:

- Groundwater-Spring
- Groundwater-Well
- Lagoon
- Surface (unknown type)
- Surface-Ditch
- Surface-Reservoir
- Surface-Stream
- Reclaimed Water
- Other
- Not applicable

Irrigation Method [I]: Select the irrigation method from the pick-list provided:

- Drip
- Flood, Bay Border/Strip
- Flood, Furrow
- Flood, Level Basin
- Subsurface
- Surge
- Spray, Lateral Move (Wheel Line)
- Spray, Low Elevation
- Spray, Low Energy
- Spray, Mid Elevation
- Spray, Center Pivot
- Spray, Traveling Gun
- Other
- Unknown
- Not applicable (Dryland)

Nutrient Concentration in Irrigation Water [I]: Enter the nutrient concentration of the irrigation water. Provide nitrogen, phosphorus and potassium concentrations, when available. Use the Comment field to provide supplemental information on the basis of the nutrient measurements. This data element is important because the nutrient content of irrigation water is often not considered when developing a fertilization program. This overlooked source of plant nutrients is important and can save producers money and prevent adding of nonessential quantities of nutrients to the agri-ecosystem (Tracy and Heffner 1993).

Irrigation Date [I]: Enter the start dates of each irrigation cycle. Enter exact date [DD/MM/YYYY] or approximate date (e.g., May 2010).

Operation Time (Duration) (hrs) [I]: Enter the duration of each irrigation cycle in hours. If individual irrigation records are entered, then enter the operation time for each event. If approximate dates or irrigation periods are entered, then enter an average operation time for that period.

Flow Rate (gpm) [I]: Enter the irrigation application rate (flow rate) in gallons per minute (gpm) for the irrigation cycle. If individual irrigation records are entered, then enter the flow rate for each event. If approximate dates or irrigation periods are entered, then enter an average flow rate for that period.

Comment [N]: Provide other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data.

6.3.4 Pesticide/Herbicide Detail

Information requested for the Pesticide/Herbicide detail below is based on NRCS Standard 202 (NRCS 2012b). If a Pesticide Management Plan is being monitored as a conservation practice at the Study Area, then important [I] fields are considered required [R] information to evaluate performance of the management plan in proper context.

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Study Area [R]: [Auto-populates previously identified Study Area after Crop ID is selected]

Crop Produced (previously identified) [R]: [Auto-populates previously identified crop after Crop ID is selected]

Crop ID (previously identified) [R]: [Select Crop ID from pick-list of previously-defined crops from the Crops spreadsheet]

Application Date [I]: Enter the application start date for each pesticide application record. Enter exact date [DD/MM/YYYY] or approximate date (e.g., May 2010).

Pesticide Class [R]: Select the pesticide class, as populated by this pick-list:

Chemical Pesticides:

- Organophosphate
- Carbamate
- Organochlorine
- Pyrethroid

Biopesticides:

- Microbial
- Plant Incorporated Protectants
- Biochemical

Other:

- Other

See <http://www.epa.gov/pesticides/about/types.htm> for additional information.

Herbicide/Pesticide Name [I]: Enter the name of the herbicide/pesticide.

Application Method [I]: Enter the application method.

Application Rate [I]: Enter the numeric application rate for each event.

Units [I]: Enter the units associated with the application rate.

Area Treated (acres) [I]: Enter the land area treated by pesticides/herbicides.

Comment: Provide other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data.

6.4 Conservation Practices (General)

The NRCS defines a conservation practice as “a specific treatment, such as a structural or vegetative measure or management technique commonly used to meet specific needs in planning and conservation, for which standards and specifications have been developed. Conservation practices are in the NRCS Field Office Technical Guide, Section IV, which is based on the National Handbook of Conservation Practices.”

The Practices table is used to identify each conservation practice present at a Test Site. Both structural (constructed) and management (operational) practices can be entered into the AgBMPDB. Multiple practices may be entered as part of a single Test Site submission, provided that the practices are given a unique name and are related to their respective Study Areas within the Test Site. When more than one practice exists within a Study Area, as is common with agricultural conservation practice studies, it is important to describe how the

practices are related to each other. For sites where the integrated effects of multiple practices are monitored at the edge-of-field or instream, then an “Overall Site” conservation practice type should be entered as a conservation practice in this spreadsheet, in addition to information on individual practices.

BMP ID [R]: [Auto-populates a unique BMP ID for each record entered into the spreadsheet]

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Study Area [R]: [Select the applicable Study Area from the pick-list of previously defined Study Areas at the Test Site]

Practice Name (user assigned) [R]: Enter a brief (e.g., < 20 characters) user-defined name for the practice being monitored (e.g., Filter Strip 1A).

General Practice Category [R]: Select the general practice category from the pick-list that best describes the practice being studied. Select Other Practice if the general practice category is not listed. The purpose of this field is to associate the general Practice spreadsheet with the appropriate supporting practice-specific design spreadsheet. For the initial release of the AgBMPDB, the design data requested focuses on a subset of the most commonly used conservation practices for row crops and may be expanded or revised in future releases of the Database. If the Study Area includes multiple practices that are monitored to evaluate their effectiveness as an overall, integrated program, then enter design information for the individual practices AND complete the “Overall Site (Multiple Practices)” conservation practice type.

The AgBMPDB Version 1.0 pick-list for row crops includes:

- Filter Strip
- Grassed Waterway
- Riparian Buffer
- Terrace
- Cover Crop
- Water and Sediment Control Basin/Pond
- Constructed Wetland
- Conservation Tillage
- Drainage Water Management
- Pesticide Management
- Nutrient Management
- Irrigation Management
- Other Practice
- Overall Site (Multiple Practices)
- Control (for control sites used for comparisons)

NRCS Practice Name [R]: Select the NRCS practice name that best describes the practice being monitored from the pick-list. (See Attachment B.) For an alphabetical index and additional descriptive information for each practice, also see:
http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/null/?cid=nrcs143_026849.

NRCS Practice Code [R]: [auto-populated to correspond with the selected NRCS practice name description].

Designed to NRCS Standards? (Y/N) [R]: Enter yes, no or unknown to identify whether the practice was designed and implemented in accordance with NRCS design standards. If No, then describe known differences in the Comments field.

Date Implemented [R]: Enter the date that the practice was implemented. This date may be entered as a text field (e.g., March 2013) or as an exact date (e.g., 3/15/2013).

Acres Benefitted [R]: Enter the number of acres benefitted by the practice. In some cases the practice area and the acres benefitted are the same; however, the acres benefitted may exceed the practice implementation area (e.g., a grassed waterway benefits the entire upstream drainage area).

Purpose of Practice (treatment objectives) [I]: Identify the purpose(s) of the practice. Using example purpose statements from NRCS practice sheets, representative practice purposes may include (but are not limited to) one or more of the following:

- Reduce erosion from wind and water.
- Increase soil organic matter content.
- Reduce watercourse and gully erosion.
- Trap sediment.
- Reduce and manage onsite and downstream runoff.
- Minimize agricultural nonpoint source pollution of surface and groundwater resources.
- Maintain or improve the physical, chemical, and biological condition of soil.
- Reduce nutrient, pathogen, and/or pesticide loading from drainage systems into downstream receiving waters.

Operation and Maintenance Description [I]: Describe operation and maintenance activities conducted for each practice. This field is intended primarily for physical practices (e.g., grass strips, water and sediment control basins) rather than management plans.

General Narrative Description/Comments [I]: Provide a brief narrative description of the practice, along with other pertinent comments that a user of this research would need to know in order to properly understand the study. Use this field to identify known deviations from NRCS design standards, if applicable.

6.5 Monitoring Stations

The Monitoring Stations table enables the user to relate the Monitoring Stations identified on the “Begin Here” spreadsheet to specific Practices at a Test Site. Careful population of this spreadsheet is critically important for proper future uses of monitoring data submitted to the AgBMPDB. The Monitoring Station table essentially serves as a “look-up” table for the overall study.

For Test Sites that contain more than one conservation practice in series, two conservation practices may share the same Monitoring Station. For example, a Monitoring Station may monitor the effluent from one conservation practice as well as the influent to a downstream conservation practice. In such cases, the relationship of the Monitoring Station must be identified relative to **each** conservation practice. A clear understanding of the relationship of multiple Monitoring Stations to the site design is critical for the evaluation of conservation practice performance data. In the Monitoring Station table, data providers are also requested to

provide a narrative description of the monitoring equipment/instrumentation in place at each monitoring station.

Table 5 provides an example of selected fields in the Monitoring Station table where multiple conservation practices are monitored, but share several common monitoring stations. In this example a grassed waterway flows into a water and sediment control basin (WASCOB). Each practice is monitored separately and the overall treatment train is also entered into the table. The three conservation practices evaluated (grassed waterway, WASCOB, and overall site) are related to (“share”) the same rain gauge and some common monitoring locations.

Table 5. Example Monitoring Station Table for a Study Area with a Grassed Swale-Water and Sediment Control Basin Sequence (selected fields shown)

Study Area	Practice Name	Monitoring Station ID (auto-populated)	Monitoring Station Name	Monitoring Station Type
Pepper Farm	Grassed Waterway 1	1	R-1	Rainfall
Pepper Farm	WASCOB 1	1	R-1	Rainfall
Pepper Farm	Overall PF Site	1	R-1	Rainfall
Pepper Farm	Grassed Waterway 1	2	In-FS	Inflow
Pepper Farm	Grassed Waterway 1	3	Out-FS	Outflow
Pepper Farm	WASCOB 1	3	Out-FS	Inflow
Pepper Farm	WASCOB 1	4	Out	Outflow
Pepper Farm	Overall PF Site	2	In-FS	Inflow
Pepper Farm	Overall PF Site	4	Out	Outflow

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Study Area ID [R]: [Auto-populates after the Practice Name is selected]

Study Area [R]: [Auto-populates after the Practice Name is selected]

Practice ID [R]: [Auto-populates after the Practice Name is selected]

Practice Name (from pick-list) [R]: [Select the relevant previously defined practice name from the pick-list]

Monitoring Station Name (user assigned) [R]: [Select the relevant previously defined monitoring station name from the Begin Here spreadsheet, as included in the pick-list]

Monitoring Station ID [R]: [Auto-populates after the Monitoring Station Name is selected]

Monitoring Station Type [R]: Identify the relationship of the Monitoring Station to the conservation practice, as selected from this pick-list:

Structural BMP Monitoring Location Types

- Inflow
- Outflow
- Intermediate Outflow (e.g., intermediate location along a grass filter)
- Bypass
- Overflow

Field-scale Monitoring Location Types

- Edge of Field, Surface (test)
- Edge of Field, Drain (test)
- Edge of Field (control)

Stream Monitoring Location Types

- Instream (above)
- Instream (below)

Other Supplemental Monitoring

- Groundwater
- Soil Pore Water (Vadose)
- Irrigation water
- Soil
- Sediment/Solids (accumulated in ponds/basins)
- In-pond (water column)
- Rainfall
- Other

Describe Equipment/Instrumentation [I]: Provide a general description of the equipment and associated instrumentation in place at the site. An example might include: “Each drainage area was equipped with an H flume, a data logger to record the hydrograph, and a nearby recording rain gage. Flow-proportional samples were collected using Coshocton Wheels with the outflow directed to containers housed within air-conditioned shelters.”

Describe Monitoring Wells [I]: For monitoring stations that measure subsurface data, describe the monitoring well depth, screen elevations and other descriptive information related to soils/geology pertinent to the data collected.

Continuous Monitoring Available? (y/n) [I]: Enter yes or no to identify whether continuous monitoring data are available for this study. If so, these data may be submitted as a supplemental data package, but should not be entered into the spreadsheet package itself.

Comment [N]: Other pertinent comments that a user of this research would need to understand the study design.

6.6 Monitoring Data

Monitoring results include Precipitation, Flow, or Water Quality data associated with a monitoring event or period. Monitoring results must be reported in association with previously defined Monitoring Events and Monitoring Stations. (Key fields in each relevant table enable subsequent linkage of these data through use of queries in Microsoft Access.) For sites also monitoring groundwater levels, the Water Quality spreadsheet can be used to enter depth to groundwater. A general overview of information requested for each type of monitoring data follows.

6.6.1 Monitoring Events

The purpose of the Monitoring Event table is to develop a user-defined list of events monitored at the Test Site so that Precipitation, Flow, and Water Quality data can easily be paired together. Events are defined at the Test Site level since most monitoring designs monitor the same events at both the control and test Study Areas, and multiple practices may be monitored for the same events. In the Monitoring Event table, a user is able to select the type of event monitored such as precipitation runoff, baseflow, irrigation runoff, etc. Antecedent field conditions (e.g., active cultivation period, winter fallow period, etc.) can also be narratively described in this table for event-based data.

Monitoring Event ID [R]: [Auto-populates a sequential list of unique event numbers as each new record is entered]

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Event Data Type [R]: Monitoring event data may be reported as a series of individual monitoring events or as summary statistics for a cumulative monitoring period. From the pick-list, select whether the event type is characterized as a single event or as a summary statistic for a multi-event monitoring period:

- Summary Statistic
- Single Event

Event Monitoring Period [R]: From the provided pick-list, select the type of monitoring period associated with the reported event:

- Single Event
- Month
- Multi-year
- Annual
- Growing Season
- Other

Runoff Event Type [R]: Monitoring events may focus on a variety of runoff types. Select the runoff type from the pick-list:

- Surface Runoff (general)
- Surface Runoff (rain)
- Surface Runoff (snowmelt)
- Surface Runoff (rain-on-snow)
- Surface Runoff (simulated rain)
- Baseflow
- Irrigation Return Flow
- Underdrain Flow (tile drain)
- Groundwater (routine)

Date Information

If individual monitoring events are reported, then use the Event Start Date and Time fields. If summary statistics are reported, use the General Start and End Date identifiers.

Enter Date Information for Summary Statistics OR Individual Events	
Summary Statistics	Individual Events
<ul style="list-style-type: none"> ▪ General Start Date Identifier (only for Summary Statistics) [R]: Text format allowed. ▪ General End Date Identifier (only for Summary Statistics) [R]: Text format allowed. 	<ul style="list-style-type: none"> ▪ Event Start Date [R]: Date monitoring event began [DD/MM/YYYY]. ▪ Event Start Time [N]: Time monitoring event began [hh:mm]. ▪ Event Antecedent Dry Period (hrs) [I]: Total length of time of the prolonged dry period that preceded the monitoring event in hours. Dry period can be defined as the sum of all consecutive 6-hour periods with less than 0.1 inches of precipitation. Not applicable for summary statistics. ▪ Describe Relevant Antecedent Study Area Conditions (soil moisture, crop/tillage status, 24-hr & 72-hr precipitation, etc.) [I]: Not applicable for events reported as summary statistics.

Comments [N]: Provide other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data.

6.6.2 Precipitation

Precipitation data such as date and time that the event began and ended and total depth (and peak intensity) are useful parameters for evaluating practice performance. For example, a conservation practice may perform well for a low-intensity, short-duration storm, but perform poorly for storms of high intensities or long durations. This type of information can help to explain variations in conservation practice performance. Because some agricultural conservation practice studies use irrigation or some type of synthetic rainfall event to generate surface runoff, the Precipitation table also allows entry of irrigation and synthetic rainfall information when characterizing precipitation events. The irrigation information presented in this table is related to the specific monitoring event and is similar to the information provided for a natural rainfall event (e.g., depth, duration, average intensity, peak intensity, etc.), but the units of measure may differ (e.g., gpm/acre instead of in/hr).

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Monitoring Station Name [R]: [Select from pick-list of previously defined Monitoring Stations]

Monitoring Station ID [R]: [Auto-populates the Monitoring Station ID associated with the Monitoring Station Name]

Event # (from pick-list) [R]: [Select the Event number from a pick-list of previously defined Event numbers from the Monitoring Events table]

Date/Time Information for Events or Summary Statistics:

Individual Events	Summary Statistics
<ul style="list-style-type: none"> ▪ Start Date [R]: Date precipitation event began. [DD/MM/YYYY] 	<ul style="list-style-type: none"> ▪ General Start Date Identifier (only for Summary Statistics) [R]: Text format allowed.
<ul style="list-style-type: none"> ▪ Start Time [I]: Time precipitation event began. [hh:mm] 	<ul style="list-style-type: none"> ▪ General End Date Identifier (only for Summary Statistics) [R]: Text format allowed.
<ul style="list-style-type: none"> ▪ End Date [I]: Date precipitation event began. [DD/MM/YYYY] 	
<ul style="list-style-type: none"> ▪ End Time [I]: Time precipitation event ended. [hh:mm] 	

Value Period [R]: Identify the time period associated with the result or summary statistic:

- Event
- Annual
- Season
- Month
- Multi-year

Result Type/Summary Statistic Type (from pick-list) [R]: Select the summary statistic type from the provided pick-list. For individual events, select options beginning with “Event.”

- Total
- Mean
- Median
- Minimum
- Maximum
- 25th Percentile
- 75th Percentile
- Other (describe in Comments field)
- Peak 1-hour

Number of Events [I]: Enter the number of sampling events included in the summary statistics.

Value [I]: Depth of precipitation or irrigation event.

Units [I]: Depth units for precipitation event or summary statistic. Select from the pick-list of units (e.g., in, ft, mm, gal/acre, in/hr, gpm/acre etc.).

Comments [N]: Provide other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data.

6.6.3 Flow

Stormwater runoff, irrigation runoff, and baseflow data are important for calculating pollutant loading from a Study Area. For each monitored event, the types of flow data requested include event volumes and peak flow rates into, from, or bypassing a structural conservation practice or from an overall Study Area. Types of flow data requested in the Flow table include event-based flow volume and peak flow rates for each location where flow is monitored. Continuous flow records can be submitted separately for archiving with the AgBMPDB, but should not be entered into this spreadsheet, which is intended for event-based data or summary statistics for longer-term records.

For some conservation practice study designs, estimates of infiltration and/or groundwater measurements are valuable for evaluating performance of the site. These measurements can be entered into the Water Quality table (see Section 6.6.4).

For some

Monitoring Station ID [R]: [Auto-populates the Monitoring Station ID associated with the Monitoring Station Name]

Event # (from pick-list) [R]: [Select the Event number from a pick-list of previously defined Event numbers from the Monitoring Events table]

Date/Time Information for Individual Events or Summary Statistics:

Individual Events	Summary Statistics
<ul style="list-style-type: none"> ▪ Flow Start Date [R]: Date flow measurements began. [DD/MM/YYYY] ▪ Flow Start Time [I]: Time flow measurements began. [hh:mm] ▪ Flow End Date [I]: Date flow measurements ended. [DD/MM/YYYY] ▪ Flow End Time [I]: Time flow measurements ended. [hh:mm] 	<ul style="list-style-type: none"> ▪ General Start Date Identifier (only for Summary Statistics) [R]: Text format allowed. ▪ General End Date Identifier (only for Summary Statistics) [R]: Text format allowed.

Measurement Type [R]: Identify the type of flow event reported:

- Runoff
- Peak Flow
- Baseflow
- Subsurface Flow
- Combined Flow (surface and subsurface)
- Stream Flow
- Other

Result Type/Summary Statistic Type (from pick-list) [R]: Select the summary statistic type from the provided pick-list. For individual events, select options beginning with “Event”.

- Event
- Total
- Mean
- Median
- Minimum
- Maximum
- 25th Percentile
- 75th Percentile
- Other (describe in Comments field)

Value Period [R]: Identify the time period associated with the result or summary statistic:

- Event
- Annual
- Season
- Month
- Multi-year

Number of Events [I]: Enter the number of sampling events included in the summary statistics.

Water Years [I]: Enter the number of water years included in the summary statistics.

Value [R]: Value for flow result.

Units [R]: Units associated with the flow value.

Flow Quality Flag [R]: This field is used to flag the general quality of the flow data reported with the study. Flow monitoring can be challenging and difficulties are often encountered, even for well-designed and managed studies. Choose from the following pick-list of qualitative flow quality flags:

- H: Highly reliable flow data, as reported by the data provider.
- M: Moderately reliable flow data, as reported by the data provider.
- L: Limited reliability, should be used with caution, as reported by the data provider.
- A: Acceptable flow data, as reported in published report or paper. (*This is the default for studies entered by third-parties from published literature.*)

Comments [N]: Provide other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data.

6.6.4 Water Quality

Water quality data in combination with flow data for a monitoring event can be used to calculate loads of each constituent, which are fundamental for comparing the performance of conservation practices at different sites, locations, and regions. The AgBMPDB is designed to be compatible with many Electronic Data Deliverable (EDD) formats now offered by laboratories and are generally based on EPA's Water Quality Exchange (WQX) format, using "modern" STORET terminology. The spreadsheet data entry approach proposed for the AgBMPDB enables pasting of EDDs into the spreadsheet for direct import to the Water Quality table, thereby reducing the likelihood of data entry errors.

In cases where researchers have collected both event-based data (e.g., flow-weighted composite event mean concentration [EMC] sample concentrations) and calculated loads associated with these events, the researcher has the option to upload both the individual event data, as well as calculated loads. Data fields are provided so that the user can identify the type of data uploaded to the Water Quality table (e.g., concentration [including EMC and individual grab samples], load/event, load/month, load/year). If loads are provided, the researcher should also provide the underlying event-based data used as the basis of these load calculations, when event-based data are available.

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

What is WQX?

Water Quality Exchange (WQX) is a modern data framework used to submit and share water quality monitoring data over the Internet that is used by the publically-accessible STORET Data Warehouse. WQX is the primary means of submitting water quality monitoring data to EPA. For more information, see: <http://www.epa.gov/storet/wqx/>.

Monitoring Station Name [R]: [Select from pick-list of previously defined Monitoring Stations]

Monitoring Station ID [R]: [Auto-populates the Monitoring Station ID associated with the Monitoring Station Name]

Load or Concentration [R]: Identify whether the results entered are loads or concentrations.

Reporting Period [R]: Enter the time period associated with the result from this pick-list:

- Event
- Month
- Annual
- Season
- Multi-year
- Other (describe in Comments field)

Result/Summary Statistic Type (from pick-list) [R]: Select the summary statistic type from the provided pick-list. For individual events, select "N/A-Event Result."

- Mean
- Median
- Geometric Mean
- Minimum
- Maximum
- Standard Deviation
- Total (sum)
- Coefficient of Variation
- 25th Percentile
- 75th Percentile
- N/A-Event Result
- Other (Define in Comments field)

Sample Medium (from pick-list) [R]: Select the sample medium from the provided pick-list:

- Groundwater
- Surface Runoff/Flow
- Soil
- Dry Atmospheric Fallout
- Wet Precip (Rain/Snow)
- Pond/Lake Water
- Bottom Sediment
- Biological
- Other/Describe in Comments

Sample Type (from pick-list) [R]: Select the sample type from the provided pick-list:

- EMC, Flow Wgt: Flow Weighted Composite EMCs
- Time Weighted Composite
- Unweighted (Mixed) Composite
- Grab: Grab Sample (Single, No Compositing)

- Other: (Define in Comments field)

Number of Measurements (aliquots for composite or samples for statistic) [I]: Enter the number of measurements associated with the result.

- For summary statistics, this number represents the number of sampling events.
- For individual events, this number represents the number of aliquots used to create the composite sample. A composite sample consists of multiple samples of water during a runoff-event that can be collected using a variety of methods such as flow-weighted, time-weighted, grab samples or other approaches. If only a single grab sample is associated with the entire event, enter 1.

Event # (from pick-list) [R]: [Select the Event number from a pick-list of previously defined Event numbers from the Monitoring Events table]

Date/Time Information for Events or Summary Statistics:

Individual Events	Summary Statistics
<ul style="list-style-type: none"> ▪ Sampling Start Date [R]: Date monitoring began for a specific constituent (or physical property, such as groundwater elevation) during the event. [DD/MM/YYYY] ▪ Sampling Start Time [N]: The time of day when monitoring began for a specific constituent (or physical property, such as groundwater elevation) during the event; for grab samples this is the time of sample collection. [hh:mm] 	<ul style="list-style-type: none"> ▪ General Start Date Identifier (only for Summary Statistics) [R]: Text format allowed. ▪ General End Date Identifier (only for Summary Statistics) [R]: Text format allowed.

Water Quality Parameter (WQX) [R]: The water quality parameter in WQX format is the name of the constituent analyzed. The relevant constituent should be selected from the WQX pick-list. WQX codes must be used to enter water quality data to facilitate standardization of constituent names for later data retrieval. Commonly reported constituent names are provided on the spreadsheet named “Common WQX Names,” with a complete list of over 3,000 constituent names on the spreadsheet named “Full WQX List.” Both of these “look-up” spreadsheets are located at the end of the data entry spreadsheet package (scroll to the far right on the spreadsheet tabs). Water level depths for monitoring wells and other water level height data (e.g., stream gauge) can also be entered in this field.

Sample Fraction [R]: Sample fraction represents the form of the water quality constituent that was analyzed. Select the sample fraction from the provided pick-list of possible sample fractions (e.g., dissolved, total, particulate).

Value [R]: Value (concentration or load) of water quality constituent listed in the “WQX Characteristic” field.

WQ Units [R]: Units used to measure the water quality constituent listed in the “WQX Characteristic” field. Select the appropriate units from the pick-list (e.g., mg/L, lbs/year, etc.).

Qualifier [R]: Populated with a pick-list of data flags to identify non-detects (“U” values), laboratory estimates (“J” values), non-detect/estimated (“UJ” values), and rejected data (“R” values).

Detection Limit [I]: The quantitative value for the method detection limit or laboratory reporting limit for the analyzed constituent. Report the detection limit in the same units as the water quality result.

Detection Limit Type [I]: Populated by a pick-list of possible detection limit types (e.g. upper quantitation limit, method detection limit, etc.).

No. of Non-Detects (if summary statistic) [I]: Enter the number of values reported as non-detects for the data set used to generate summary statistics.

Non-Detect Substitution Method (if summary statistic) [R]: When water quality values are not present above detection limits, then the convention used to handle non-detects for purposes of calculating summary statistics must be specified. These methods can include simple substitution (e.g., ½ detection limit, zero, detection limit), distributional methods, and more robust approaches. Commonly used methods are provided in the following pick-list:

- DL: Detection Limit
- Half DL: Half of Detection Limit
- Zero: Zero
- MLE: Maximum Likelihood Estimate
- K-M: Kaplan-Meier
- ROS: Regression on Statistics
- Other: Other method. If selected, describe in Comments field.

For a description of the strengths and weaknesses of each method, see Helsel and Hirsch (2002): <http://pubs.usgs.gov/twri/twri4a3/pdf/twri4a3-new.pdf>.

Data Entry Tips

- Double-check units of measure. (e.g., are units of volume used for volume fields? Are milligrams vs. micrograms properly entered?)
- Only use standard water quality parameter names from the provided pick-lists and be sure to specify the sample fraction (e.g., dissolved, total) where necessary.
- Provide detection limits and laboratory qualifiers. Non-detected values should not be reported as “0” values; instead, provide the detection limit and a U qualifier.
- Use comment fields to explain unusual data results that have been verified, but may appear to be errors or outliers to subsequent data users.
- Event, Precipitation, Flow and Water Quality tables all have “flagging” fields that enable the user to specify whether the results are appropriate for analysis. Use these fields where needed and explain anomalies in the comment fields.
- Be sure to select the “WQX” characteristic that corresponds to the form in which the analysis result was reported from the laboratory. For example, is orthophosphate reported “as P” or “as PO4”? Are results total or dissolved?

Analysis Method [I]: Analytical method used to measure the water quality sample. This can be obtained from the laboratory analysis report.

Appropriate for Performance Analysis? (Yes or No) [R]: Enter yes or no to indicate whether the water quality data are appropriate for performance analysis.

Comments [N]: Provide other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data.

6.7 Cost Data

Two types of cost data are requested with data submissions. The first type of cost data focuses on the cost of conservation practices implemented at a Test Site. The second type of cost data focuses on the cost of monitoring for the performance study. Cost data submittals are considered nice to have, but are not required for a study to be accepted to the AgBMPDB.

6.7.1 Practice Cost Data

Practice Cost data enable a user to develop a general understanding of the comparative costs of various conservation practices. Enter the cost of each practice implemented for a Study Area separately, unless an “overall site” practice name has been defined in the Practices table. In that case, the user can enter the overall costs of multiple practices for the site.

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Practice Name [R]: [Select from pick-list of previously-defined practice names] Note: the cost for overall site practices should be associated with an “overall practice” BMP type.

Year of Cost Estimate [N]: Enter the year providing the cost basis of the practice cost [YYYY].

Initial Practice Implementation/Construction Costs [N]: Enter the approximate total cost of the initial investment in the practice. This may include purchase of equipment, installation of the practice and other upfront investment. If possible, enter to the nearest \$100.

Description of Items Included in Initial Practice Cost [N]: Describe materials, equipment, labor and other costs used to develop the initial practice cost estimate.

Government Cost Share (%) [N]: Enter the percent government cost share for the practice, if applicable. Enter 0, if not applicable. Include the cost-share program name in the comments field.

Average Annual Routine Operation/Maintenance Costs [N]: Enter the average annual routine operation and maintenance costs.

Average Rehabilitation Costs (infrequent major maintenance) [N]: Enter the average periodic rehabilitation costs. Examples could include dredging a water and sediment control basin.

Annual Amount of Production Lost (commodity/acre) [N]: If the conservation practice removes land from active production, provide the approximate lost commodity production lost in units of lost commodity/acre (e.g., bushels/acre).

Annual Value of Production Lost (\$/acre) [N]: If the conservation practice removes land from active production, provide the approximate annual value of production lost in units of \$/acre. (This field provides the dollar value for the previously entered in “Annual Value of Production Lost (commodity/acre).”

Differential Cost of the Conservation Practice Relative to Control Practice [N]: Enter the differential cost (net difference) between the cost of the conservation practice and a control (standard/traditional) practice. Use the comments field to describe the basis of the calculated value. The result may be positive (if the conservation practice was more expensive) or negative (if the conservation practice was less expensive than the control practice).

Comments [N]: Provide additional information pertinent to the costs associated with the conservation practice that a user would need to be aware of to avoid inappropriate use of the data.

6.7.2 Monitoring Cost Data

The Monitoring Costs table allows the user to list the approximate annual monitoring costs for the Test Site.

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Monitoring Period (Year(s)) [N]: The period in year(s) during which monitoring was conducted.

Year of Cost Basis [N]: The year that the monitoring activities were conducted or equipment purchased. For example, if the instrument was purchased in 1995 for \$500, then 1995 is the year of cost basis.

Total Cost [N]: Enter the total cost of the monitoring program for the study period.

Equipment Costs [N]: The total cost of sampling and flow gauging equipment (rental or purchase) and installation.

Annual Maintenance Costs [N]: The average annual maintenance costs for the monitoring equipment.

Annual Sampling Costs [N]: The average annual costs of sampling in terms of personnel time and materials.

Annual Laboratory Costs [N]: The average annual costs of sample analysis by a laboratory.

Comment [N]: Provide other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data.

6.8 Practice-Specific Design Data

After selecting a “Practice Category” and “Practice Type” from the Practices table, data providers can then select more detailed practice-specific design and implementation data in the supporting practice-specific tables. Within each of the practice-specific tables, the user is able to provide key design and implementation characteristics associated with a specific practice. Twelve tables associated with practices pertinent to row crops are provided, along with one general table that can be used for any practice type in the event the user’s practice does not adequately fit within the defined categories and one table that should be used to reflect “overall site” studies with integrated practices. For example, a site that implements the “CORE 4” practices would include practice characteristics for each of the four practice areas, but also enter a practice type for the overall system of practices at the Study Area.

For more information on practice design information, see NRCS practice descriptions and job sheets accessible at:

http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/null/?cid=nrcs143_026849

6.8.1 Filter Strips

Filter strips are areas of herbaceous vegetation situated between cropland, grazing land, forest land, or disturbed land and environmentally sensitive areas. Sensitive areas include streams, lakes, wetlands, and other water bodies and areas susceptible to damage by waterborne pollutants, including sediment, particulate organics, sediment-adsorbed contaminants, and dissolved contaminants (NRCS 2003).

For Filter Strips integrated into Grassed Waterway designs, use the Grassed Waterway design spreadsheet.

For Filter Strips incorporating shrubs and forest canopy along a stream or waterbody, use the Riparian Forest Buffer design spreadsheet.



Figure 13. Filter Strip

(Photo Source: NRCS 2003; Conservation Practice 393 Job Sheet)

Practice information requested for Filter Strips includes:

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Practice Name [R]: [Select from pick-list of user-defined Practice names]

Practice ID [R]: [Auto-populates once the Practice Name is entered]

Filter Strip Width (ft) [R]: The width of the filter strip in feet. Width is measured in the direction of flow. Since filter strips are typically placed along the contour, their dimension at the narrow point is considered to represent the width (NRCS 1999).

Filter Strip Length (ft) [R]: The length of a filter strip is the longitudinal distance across the landscape that the strip occupies perpendicular to the direction of flow (i.e., length along the contour).

Filter Strip Area (acres) [I]: Enter the total area of the filter strip in acres.

Filter Strip (%) [R]: The percent slope (0-100) of the filter strip.

Filter Strip Vegetation Type [R]: Enter the species/cultivars planted or present in the filter strip.

Describe Site Preparation and Planting Methods [I]: Provide a narrative description of site preparation and planting methods. Representative site preparation activities include firming the seedbed and applying lime and fertilizer. Descriptions of planting methods may include descriptions of the seeding method and depth, seeding rate (PLS lbs/acre), mulch (tons/acre), and planting companion crops of small grains (NRCS 2003).

Avg. Filter Strip Vegetation Height (in) [I]: Average height at which the filter strip vegetation is maintained in inches.

Is the Filter Strip Used By Livestock? (Yes or No) [I]: Enter yes or no to indicate whether livestock use the filter strip area.

Is the Filter Strip Irrigated? (Yes or No) [I]: Enter yes or no to indicate whether the filter strip is irrigated.

Filter Strip Maintenance Description [I]: A narrative use to describe filter strip maintenance operations and the frequency of filter strip maintenance. Maintenance includes activities to maintain the original width and length of the filter strip. Representative activities include harvesting, mowing, reseeding, and fertilizing as necessary to maintain plant density and vigorous plant growth. Following major storms, maintenance may include removing trapped sediment and repairing eroding areas (NRCS 2003).

Comments [N]: Provide other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data.

6.8.2 Grassed Waterways

A grassed waterway (typically with a vegetated filter strip) consists of a natural or constructed vegetated channel that is shaped or graded and vegetated to carry surface water at a non-erosive velocity to a stable outlet (NRCS definition for Conservation Practice 412, NRCS 2003). Grassed waterways are commonly used to convey runoff from terraces and diversions but are an important conservation practice wherever concentrated flows occur (Miller et al. 2012).

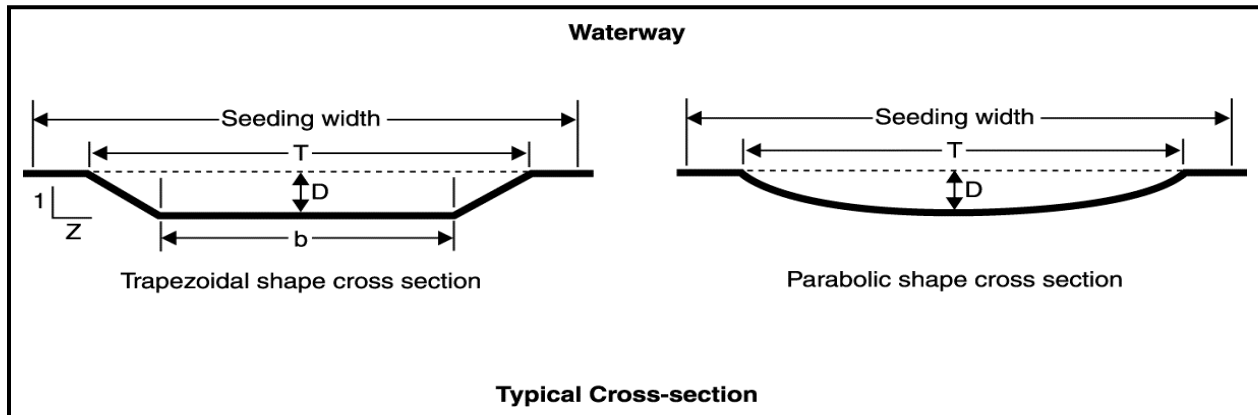


Figure 14. Trapezoidal and Parabolic Grassed Waterways
(Source: NRCS 2003, Conservation Practice Standard 412)

Design data requested for Grassed Waterways includes:

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Practice Name [R]: [Select from pick-list of user-defined practice names]

Practice ID [R]: [Auto-populates once the Practice Name is entered]

Cross-Section Shape [R]: Select the general cross-section shape from the pick-list:

- Trapezoidal
- Parabolic
- Irregular
- Other
- Unknown

Top Width of the Grassed Waterway (ft) [R]: The top width of the grassed waterway, measured in feet, as shown by “T” in Figure 14.

Bottom Width of the Grassed Waterway (ft) [I]: The bottom width of the grassed waterway, measured in feet, as shown by “b” in Figure 14. This information is not required for parabolic channels.

Depth of Grassed Waterway (ft) [R]: The full depth of the grassed waterway, measured in feet.

Length of Grassed Waterway (ft) [R]: The length of the grassed waterway at the point of monitoring, measured in feet.

Side Slope of Grassed Waterway (Z:1) [I]: The average side slope of the grassed waterway, expressed as Z:1 (see Figure 14). This information is not required for parabolic channels.

Grade (Bed Slope) of Grassed Waterway (%) [R]: The average bed slope (longitudinal) of the grassed waterway.

Design Storm Basis and Characteristics [I]: Describe the design capacity of grassed waterway in terms of storm return frequency (e.g., 10-year, 24-hour duration storm). If design flow depth and velocity are available, also provide this information.

Plant Species in Grassed Waterway [R]: Enter the species/cultivars planted or present in the grassed waterway.

Describe Site Preparation and Planting Methods [I]: Provide a narrative description of site preparation and planting methods. Representative site preparation activities include firming the seedbed and applying lime and fertilizer. Descriptions of planting methods may include descriptions of the seeding method and depth, seeding rate (PLS lbs/acre), mulch (tons/acre), and planting companion crops of small grains (NRCS 2003). If a filter strip is part of the grassed waterway design, also provide a description of site preparation and planting methods for the filter strip.

Are terraces used with grassed waterway? (y/n) [R]: Enter yes/no to indicate whether terraces are used in conjunction with the grassed waterway.

Are filter strips integrated into the grassed waterway design? (y/n) [R] Enter yes/no. If yes, then complete the descriptive information for the filter strip below.

If filter strips are integrated into the grassed waterway design, then provide filter strip design characteristics:

- **Grass Filter Width [I]:** The width of the filter strip in feet. Width is measured in the direction of flow (NRCS 1999) from the adjacent Study Area into the grassed waterway.
- **Grass Filter Slope (%) [I]:** The percent slope (0-100) of the filter strip. The slope of the filter and soil of the filter area impact the overall filter performance.
- **Grass Filter Plant Species [I]:** Enter the species/cultivars planted or present on the filter strip.
- **Are filter strips on both sides of the grassed waterway (y/n) [R]** Enter yes/no.

Comments [N]: Provide other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data. If the grassed waterway is lined or reinforced with other materials, include this in the Comments field.

6.8.3 Riparian Buffers

Riparian forest buffers are areas of trees, shrubs and herbaceous vegetation planted or maintained along waterways. For riparian buffers without tree canopy or shrubs, use the grassed waterway spreadsheet instead of the riparian buffer spreadsheet.

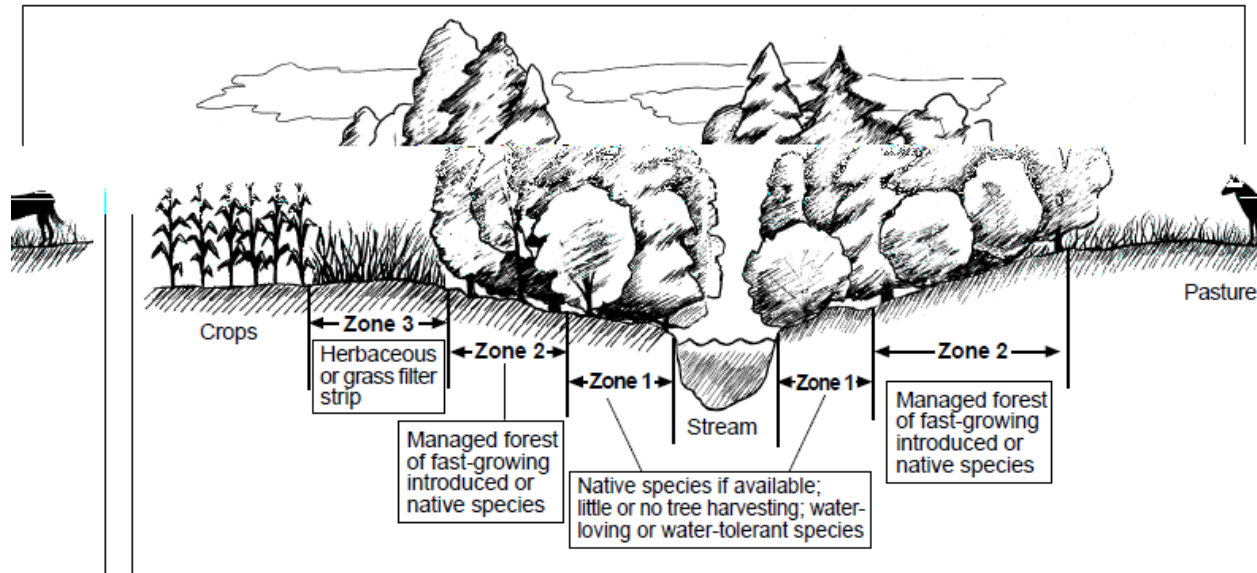


Figure 15. Riparian Forest Buffer

(Source: NRCS 1999, CORE 4 Conservation Practice Training Guide)

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Practice Name [R]: [Select from pick-list of user-defined practice names]

Practice ID [R]: [Auto-populates once the Practice Name is entered]

Is the riparian buffer present on both sides of the stream? (Yes/No) [R] Enter yes or no to indicate whether a riparian buffer is provided on both sides of the stream. If a riparian buffer is provided on both banks of a stream in a Study Area, then enter the design information for each side of the buffer as a separate conservation practice (e.g., Riparian Buffer-Left, Riparian Buffer-Right). This is required because buffer widths and characteristics may vary, depending on ownership and other factors.

Buffer Average Width [R]: The average width of the buffer zone in feet.

Buffer Average Slope, % [R]: The average percent slope (0-100) of the buffer zone.

Describe Vegetation in Each Zone of the Buffer [R]: Describe the vegetation present in each zone of the riparian buffer. See Figure 15 for typical riparian buffer zones.

Is the Buffer Area Used By Livestock? (y/n) [R]: Enter yes or no, depending on whether livestock uses the riparian area.

Riparian Buffer Management Activities [R]: Describe management activities used in the riparian buffer (e.g., mowing frequency, weed control, selective timber harvesting, pruning, etc.).

Comment [N]: Provide other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data.

6.8.4 Terraces

Terraces are earthen structures that intercept runoff on moderate to steep slopes. They transform long slopes into a series of shorter slopes. Terraces reduce the rate of runoff and allow soil particles to settle out. The resulting cleaner water is then carried off the field in a non-erosive manner (NRCS-Iowa 2001).



Figure 16. Terrace Types
(Photo Source: NRCS-Iowa 2001, Terrace Job Sheet)

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Practice Name [R]: [Select from pick-list of user-defined practice names]

Practice ID [R]: [Auto-populates once the Practice Name is entered]

Terrace Type [R]: Select the general type of terrace implemented from the pick-list (NRCS-Iowa 2001):

- **Storage:** Storage terraces collect water and store it until it can infiltrate into the ground or be released through a stable outlet. Underground outlets with pipe intakes are the most common type of outlet. Deep soils with high infiltration rates can sometimes be used as outlets.
- **Gradient:** Gradient terraces are designed as channels to slow runoff water and carry it to a stable outlet like a grassed waterway.
- **Other:** If the terrace type cannot be described as storage or gradient, then select Other and describe further in the Comments field.

Terrace Cross-Section [R]: Select the general terrace cross-section shape (NRCS-Iowa 2001, also shown in Figure 16):

- **Grassed Back Slope Terrace:** Grassed back slope terraces typically have a farmable front

slope with a 2:1 back slope (2 feet horizontal to every 1 foot of vertical drop). Downhill slope is typically seeded with perennial grass.

- **Narrow Base Terrace:** Narrow base terraces typically have 2:1 slopes on both the front slope and back slope. Both front and back slope are typically seeded with perennial grasses.
- **Broad Base Terrace:** Broad base terraces are flatter terraces that are farmed on both slopes. They should not be built on land slopes greater than 8 percent. Farmable slopes should not be steeper than 5:1.
- **Other:** If another cross-section type is used, provide additional information in the Comments field.

Terrace Front Slope [I]: Enter the approximate front slope of the terrace as horizontal to vertical (e.g., 2:1).

Terrace Back Slope [I]: Enter the approximate back slope of the terrace as horizontal to vertical (e.g., 2:1).

Fertilizer and Lime Application Rate [I]: Describe the fertilizer (N, P, K) and lime application rate (lbs/acre) for the terrace.

Seeding Rates and Species [I]: Describe the seeding rates and plant species for the terrace, including nurse crops, if applicable.

Number of Terraces [I]: Enter the number of terraces implemented at the site.

Terrace Spacing (ft) [R]: Enter the approximate average spacing between terraces (ft).

Terrace Length (ft) [I]: Enter the approximate average terrace length (parallel to the contour) in feet.

Terrace Width (ft) [I]: Enter the approximate average terrace width in feet.

Design Runoff [I]: Enter the design runoff event for the terrace (e.g., 10-year, 24-hour storm).

Describe Orientation of Terraces [R]: Describe the orientation of the terraces to the field and to each other. For example, most terraces should be parallel to the field contour and parallel to each other.

Describe Terrace Outlet [I]: Describe outlet associated with terrace (e.g., grassed waterway, underground outlet) and measures implemented to control erosion, if applicable.

List Other Practices Used with Terraces [R]: Representative examples include conservation tillage and grassed waterways.

Describe Maintenance Activities for Terraces [I]: Representative activities include sediment removal, erosion repair, revegetation, rodent control, weed control/mowing, intake/outlet repairs, and other practices.

Comment [N]: Provide other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data.

6.8.5 Water and Sediment Control Basin (WASCOB)/Water Quality Pond

Water and sediment control basins (WASCOBs) consist of an embankment across the slope of a field or minor waterway to temporarily detain and release water through a piped outlet or through infiltration. They are constructed perpendicular to the flow direction and parallel to each other. WASCOBs are usually installed in areas where the land is relatively steep and undulating. WASCOBs are used to improve the ability to farm sloped land and to reduce erosion on farmland and waterways. WASCOBs are used to manage hydrology by controlling downstream flow rates, thereby reducing erosion. A buffer of permanent vegetation surrounding risers can help to filter sediment and pollutants (Miller et al. 2012).

Although the NRCS WASCOB design standard involves complete draining of the basin following the runoff event, this practice table also allows data entry for wet ponds constructed to provide water quality and sediment control benefits.

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Practice Name [R]: [Select from pick-list of user-defined practice names]

Practice ID [R]: [Auto-populates once the Practice Name is entered]

Design Storm [I]: Describe the design storm return frequency used to design the basin, if known (e.g., 10-year, 24-hour duration storm).

General Pond Design Type [R]: Select “wet” or “dry” to indicate whether the basin is designed to maintain a permanent pool (wet) or empty completely between runoff events (dry).

Total Storage Volume (cf) [R]: Total storage volume below the freeboard, measured in cubic feet.

Total Surface Area (sf) [R]: Total area of the storage basin below the freeboard, measured in cubic feet.

Forebay Exists [I]: Enter yes or no to indicate whether the basin includes a separate forebay or sedimentation basin.

Sediment Storage Capacity (cf) [R]: The design storage capacity for sediment storage, measured in cubic feet.

Permanent Pool Volume (cf) [R]: The approximate volume of perennial pool of water in the pond if one exists, measured in cubic feet. Enter 0 if no permanent pool is present.

Bottom or Permanent Pool Surface Area (sf) [R]: The surface area of the bottom of the pond or of the perennial pool, if one exists, measured in square feet.

Retention Time or Volume Emptying Time (hrs) [R]: Estimated time for the pond to completely drain or for a parcel of water to travel from the inlet to the outlet during a full condition (not including freeboard), measured in hours.

Freeboard Depth (ft) [R]: The depth to the top edge of the freeboard if it exists, measured in feet.

Planting Area (sf) [R]: The portion of the total surface area planted with vegetation, measured in square feet.

Describe Outlet Works [R]: Used to describe the outlet structure and orifice diameters, etc., for the practice.

Comments [N]: Provide other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data.

6.8.6 Constructed Wetland

Constructed wetlands, sometimes called treatment wetlands, are human-made systems engineered to mimic the functions of natural wetlands. In agriculture, constructed wetlands are used to filter runoff from cropland, feedlots, aquaculture operations and agricultural processing facilities. Constructed wetlands can also provide habitat for some waterfowl, other birds, amphibians and invertebrate (Miller et al. 2012).

Test Site ID Code [R]: [Auto-populates from Test Site table]






Site Name [R]: [Auto-populates from Test Site table]

Practice Name [R]: [Select from pick-list of user-defined practice names]

Practice ID [R]: [Auto-populates once the Practice Name is entered]

Wetland Shape [R]: Select the general wetland shape from the pick-list illustrated in Table 4.

Table 4. General Constructed Wetland Shapes
 (Source: NRCS Wetland Science Institute [NRCS-WSI] 2003)

Shape (select from pick-list)	Description	Graphic
Oval	Generally circular	
Oxbow	Kidney-shaped with two lobes	
Amoeba	Multiple lobes with random shape, high perimeter to surface area ratio	
Meander	Mimics an abandoned stream channel meander	
Linear	Generally linear	
Other	Other type	

Surface Area of Wetland (acres) [R]: Enter the surface area of the wetland in acres.

Length of Wetland (ft) [I]: Enter the length of the wetland in feet along the direction of flow from inlet to outlet.

Longitudinal Slope of Wetland (%) [I]: Enter the longitudinal slope of the wetland in percent (0-100).

Depth Descriptions [I]: Describe the depth-related features of the wetland in terms of % area and average depth per area. For example, 20% 3-ft depth, 10% 2-ft depth and 70% 1-ft depth.

Plant Species in Wetland [R]: List the species planted in the wetland, including approximate percentage of wetland vegetation established.

Water Source [R]: Describe the water source for the wetland. Representative sources of water may include direct precipitation, runoff from contributing drainage area, groundwater discharge, or riverine or lake flooding. Pumping, from groundwater or surface water, may also be a water source for the site (e.g., during dry years) (NRCS WSI 2003).

Structures Providing Wetland Hydrology [I]: Describe structures and/or methods used to establish wetland hydrology. Wetland hydrology restoration or creation often involves the use of various types of structures to restore, enhance, or regulate hydrology on the site. Structures may include dikes, low berms, diversions, grade stabilization structures, water control

structures, excavated and embankment ponds, and de-leveling features, such as depressions, wildlife islands, swales, and sloughs (NRCS WSI 2003)

Water Control Structures Managing Hydrology [R]: Water Control Structures are often needed to help establish and manage hydroperiod by managing water surface elevation upstream of the structure. These structures may be designed with or without drawdown capability (inlet invert above wetland bottom). Common water control structures, which can be selected from a pick-list, include:

- Stoplog
- Flashboard riser
- Chute
- Open drop/weir
- Other

Design Storm Basis and Characteristics [I]: Provide the design capacity of the constructed wetland in terms of storm return frequency (e.g., 10-year, 24-hour duration storm).

Comments [N]: Provide other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data.

6.8.7 Conservation Tillage (Crop Residue Management)

Conservation tillage is a crop residue management approach that leaves at least 30 percent of crop residue undisturbed from harvest through planting. Crop residues are materials left on an agricultural field after the crop has been harvested. These residues include stalks and stubble (stems), leaves and seed pods. Conservation tillage types include no-till/strip-till, ridge-till and mulch-till (NRCS 2003).

Because conservation tillage studies may compare results to control sites where conventional tillage is used, each type of tillage involved with the conservation tillage study must be entered in this spreadsheet. Test practices are associated with some type of conservation tillage and Control practices are associated with traditional tillage practices that are not considered to be “conservation” tillage.

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Practice Name [R]: [Select from pick-list of user-defined practice names]

Practice ID [R]: [Auto-populates once the Practice Name is entered]

Site Type [R]: Test or Control. Test practices are associated with some type of conservation tillage and control practices are associated with traditional tillage practices that are not considered to be “conservation” tillage.

Type of Tillage [R]: Populated by a pick-list of common tillage practices. See <http://www.ctic.purdue.edu/media/pdf/TillageDefinitions.pdf> for additional explanation on tillage types. The pick-list includes:

Conservation Tillage Practices

- No-Till
- Strip Tillage
- Mulch Tillage
- Ridge Tillage
- Conservation Tillage (general)

Other Tillage Practices Used on Control Sites

- Conventional (Intensive) Tillage
- Reduced Tillage (15-30% Residue)
- Other
- Unknown

Tillage Type Descriptions (Source: NRCS-Iowa 2011)

- **No-Till:** Soil and residue is left undisturbed from harvest to planting except for nutrient injection. Planting, drilling or nutrient application is done in a narrow seedbed or slot created by coulters, row cleaners, or disk openers. No full-width tillage operations are done. Weeds are controlled with herbicide. Row cultivation should only be used for emergency weed control. This practice is also referred to as zero-till, slot till, direct seeding or slot plant.
- **Strip-till:** Soil and residue is left undisturbed from harvest to planting except for strips up to a third of the row width. No full width tillage operations are done. These strips are cleared of residue and tilled for warming and drying purposes either before or during the planting operation. This practice is also referred to as row-till, zone-till or fall strip-till.
- **Mulch Till:** Full width tillage which disturbs the entire soil surface prior to planting (spring or fall). Tillage tools such as chisels, field cultivators, rotary harrows, disks, sweeps or blades are used. Weeds are controlled with herbicides and/or cultivation.
- **Ridge Till:** Soil and residue is left undisturbed from harvest to planting except for nutrient injection. Plant in seedbed prepared on ridges with sweeps, disk openers, coulters or row cleaners. Residue is left on the surface between ridges. Ridges are rebuilt during cultivation. Weeds are controlled with herbicide and/or cultivation.

Depth of Tillage (in) [R]: Depth into the soil column that tillage practices penetrate, measured in inches.

Beginning of Tillage Operation [R]: The date when tillage operations began. Enter the exact date [DD/MM/YYYY] or approximate date (e.g., Spring 2010).

End of Tillage Operations [I]: The date when tillage operations ended. Enter the exact date [DD/MM/YYYY] or approximate date (e.g., late March 2010).

Tillage Frequency [R]: A narrative field used to describe the frequency that tillage operations take place.

Tillage Equipment [R]: Narrative field that allows the user to describe the tillage equipment type(s) used during practice implementation. This field is intended to describe general equipment types, as opposed to manufacturer brand names.

Residue Orientation [I]: Enter whether the residue will be standing or flat during the critical times of the year. Standing residue has proven to be more effective for wind erosion control, and flat residue is more effective for water erosion control (NRCS 1999).

Residue Height (in) [I]: Enter the height of the stubble in inches if the residue will be left standing during the critical times of the year. Otherwise enter N/A (NRCS 1999).

Row Width (ft) [I]: Enter the row width of the crop. This information may be useful for erosion prediction (NRCS 1999).

Percent Row Width Disturbed [I]: Enter the percentage of row width disturbed by soil engaging implements. The no-till practice standard specifies no more than a third of the row width can be disturbed by soil engaging implements (NRCS 1999).

Soil Tillage Intensity Rating (STIR) [I]: A numerical value that reflects the kind and severity of disturbance that tillage practices have on soil. The value is calculated with the NRCS RUSLE2 erosion model and may range from 0-200. As examples, STIR values for no-till are typically less than or equal to 10 and are less than or equal to 60 for mulch till (NRCS Iowa Job Sheet, 2011).

Percent Residue Cover [I]: Enter the percent ground cover actually on the soil surface (as opposed to planned) as determined by field estimation (NRCS 1999).

Crop Residue Management [R]: Populated by a pick-list that allows the user to indicate if crop residue was bailed, grazed, burned, or not treated.

Was Aeration Used? (Yes or No) [R]: Populated by a Yes/No pick-list that allows the user to indicate whether special aeration equipment was used in addition to tillage practices.

Comments [N]: A narrative that allows the user to describe the general tillage operation and add specific information not covered with the fields presented.

6.8.8 Cover Crops

Cover crops include grasses, legumes, and forbs planted for seasonal cover and other conservation purposes. The NRCS (2011) identifies the following benefits of cover crops:

- Reduce erosion from wind and water.
- Increase soil organic matter content.
- Capture and recycle or redistribute nutrients in the soil profile.
- Promote biological nitrogen fixation and reduce energy use.
- Increase biodiversity.
- Suppress weeds.
- Manage soil moisture.
- Minimize and reduce soil compaction.

Design data for cover crops includes:

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Practice Name [R]: [Select from pick-list of user-defined practice names]

Practice ID [R]: [Auto-populates once the Practice Name is entered]

Acres Planted in Cover Crop [R]: Enter the number of acres planted in the cover crop. Note: this area may be equal to or smaller than the “acres benefitted” field for the General Practice description.

Cover Crop [R]: Enter the cover crop species.

Seeding Rate [I]: Enter the seeding rate for the cover crop.

Seeding Rate Units [I]: Enter the units associated with the seeding rate for the cover crop.

Seeding Date [I]: Enter the seeding date for the cover crop. Enter an exact date [DD/MM/YYYY] or an approximate date by month (e.g., April 2010).

Establishment Method [I]: Describe the methods used to establish the cover crop.

Nutrient Application Description [I]: Describe nutrient rate and timing for the cover crop, or cross-reference to data provided in “Fertilizer Detail” spreadsheet.

Weed/Pest Management Description [I]: Describe methods used to control pests/weeds. These methods may include mechanical methods such as mowing or pesticide/herbicide application. If pesticides/herbicides are applied, then cross-reference to data provided in “Pesticide Detail” spreadsheet.

Termination Method for Cover Crop [I]: Describe the timing and method used to terminate the cover crop.

Comments [N]: Provide other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data. The field may also be used to provide other information pertinent to establishing and managing the cover crop.

6.8.9 Drainage Water Management (Controlled Drainage)

Drainage water management (DWM) is the process of managing the timing and the amount of water discharged from agricultural drainage systems. Controlled drainage is similar to traditional tile drainage except that tile outflow is intercepted by a water control structure that effectively controls the elevation of the water table in a field by having an adjustable outlet elevation within the structure (Figure 17). Controlled drainage may be implemented as part of a new system or as part of a system retrofit (Miller et al. 2012).

The design spreadsheet is used to provide description of the drainage water management methods and operations for the tile drainage system. The basic description of the tile drainage system must be provided as part of the Study Area spreadsheet, as described in Section 6.3.

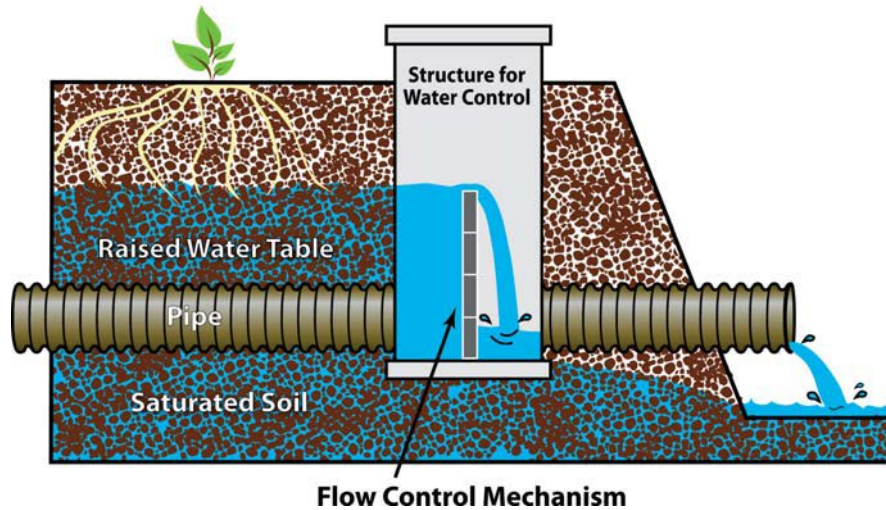


Figure 17. Drainage Water Management Diagram
(Source: NRCS-Iowa 2012)

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Practice Name [R]: [Select from pick-list of user-defined practice names]

Practice ID [R]: [Auto-populates once the Practice Name is entered]

Tile Drain Characteristics Provided in Study Area? (y/n) [R]: Enter yes or no to indicate whether tile drain characteristics were entered in the Study Area spreadsheet.

Describe Structures Used to Control Tile Drainage [R]: Describe the structures used to control tile drainage.

Describe Timing of Controlled Drainage Operations [R]: Describe the timing of drainage water management operations.

Additional Tile Drainage Characteristics [I]: Use this field to provide additional description of the tile drainage system, if needed, in addition to the tile drainage characteristics fields in the Study Area table (See Section 6.3).

Describe Subsurface Drainage Management and Use [R]: A narrative used to describe the management, use and additional details of the subsurface drainage system, the outfall characteristics, etc. For example, describe how target water level settings are managed relative to fallow, planting and harvest periods, as illustrated in Figure 18.

Comments [N]: Provide other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data.

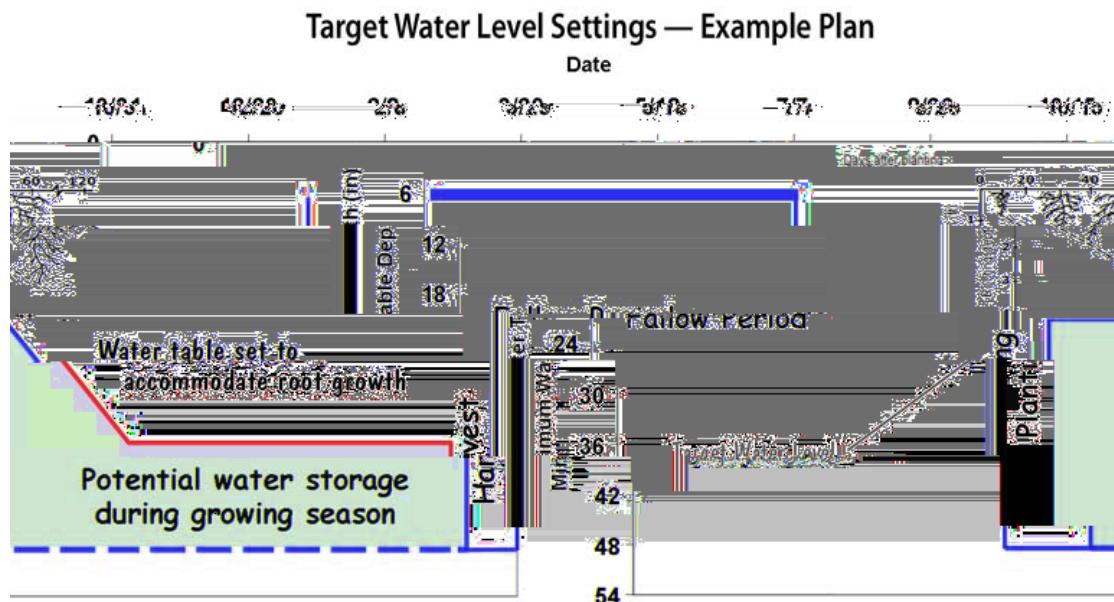


Figure 18. Example Plan of Target Water Level Settings for a Drainage Water Management Plan (Source: NRCS-Iowa 2012)

6.8.10 Irrigation Management

Irrigation management means controlling the rate, volume and timing of irrigation such that water is applied efficiently and without negative environmental impacts. Irrigation management can be applied to any irrigation operation (Miller et al. 2012).

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Practice Name [R]: [Select from pick-list of user-defined practice names]

Practice ID [R]: [Auto-populates once the Practice Name is entered]

Irrigation detail completed? (y/n) [R]: Enter yes or no to indicate whether the Irrigation Detail spreadsheet was completed. If Irrigation Management is studied at the site, then the spreadsheet described in Section 6.3.3 must be completed.

Annual Irrigation Volume Used (ac-ft) [R]: The approximate annual total volume of irrigation water used, measured in acre-ft.

Is tailwater recovery used? (Yes or No) [R]: Enter yes or no to indicate whether irrigation tailwater is reused.

Describe irrigation equipment[R]: Describe irrigation equipment installed to support irrigation management.

Describe irrigation management operational practices [R]: A narrative used to describe the overall irrigation management practices and any specific details not covered in the spreadsheet.

Describe maintenance type and frequency for the irrigation system [R]: Examples include system flush frequency, nozzle inspection, and other practices.

Comments [N]: Other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data.

6.8.11 Nutrient Management Plan

Nutrient management is "managing the amount, source, placement, form, and timing of the application of nutrients and soil amendments to ensure adequate soil fertility for plant production and to minimize the potential for environmental degradation, particularly water quality impairment." (NRCS 2007, General Manual, Part 402 Nutrient Management). The nutrients that have the greatest impact on water quality are nitrogen (N) and phosphorus (P). Nutrient management practices are some of the most effective ways to improve water quality and nutrient management is recognized as a "Core 4" practice that can be implemented on almost every farm (Miller et al. 2012; NRCS 1999).

Nutrient application practices are requested as part of the Fertilizer Detail described in Section 6.3.2. When Nutrient Management Plans are implemented, then the Fertilizer Detail is required [R] information. The purpose of this design spreadsheet is to provide additional information on how the Nutrient Management Plan was implemented to reduce nutrient loading from the agricultural operation. Information requested in the Fertilizer Detail is not repeated in this spreadsheet.

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Practice Name [R]: [Select from pick-list of user-defined practice names]

Practice ID [R]: [Auto-populates once the Practice Name is entered]

Fertilizer Detail Completed? (y/n) [R]: Enter yes or no to indicate whether the Fertilizer Detail spreadsheet was completed. If Nutrient Management is studied at the site, then the spreadsheet described in Section 6.3.2 must be completed.

Describe the Nutrient Management Plan [R]. Provide a narrative description of the Nutrient Management Plan implemented for the Study Area.

Comments [N]: Other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data.

6.8.12 Pesticide Management Plan

Pesticide/herbicide application practices are requested as part of the Pesticide/Herbicide Detail described in Section 6.3.3. When Pesticide Management Plans (or Integrated Pest Management) are implemented, then the Pesticide/Herbicide Detail is required [R] information.

The purpose of this design spreadsheet is to provide additional information on how the Pesticide Management Plan was implemented to reduce nutrient loading from the agricultural operation. Information requested in the Pesticide Detail is not repeated in this spreadsheet.

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Practice Name [R]: [Select from pick-list of user-defined practice names]

Practice ID [R]: [Auto-populates once the Practice Name is entered]

Pesticide Detail Completed? (y/n) [R]: Enter yes or no to indicate whether the Pesticide Detail spreadsheet was completed. If Pesticide Management is studied at the site, then the spreadsheet described in Section 6.3.4 must be completed.

Describe the Pesticide Management Plan [R]. Provide a narrative description of the Pesticide Management Plan implemented for the Study Area.

Comments [N]: Other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data.

6.8.13 General Practice (Other Practice)

The General Practice table is a generic table that allows a user to input information on any conservation practice that does not fit into the above categories.

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Practice Name [R]: [Select from pick-list of user-defined practice names]

Practice ID [R]: [Auto-populates once the Practice Name is entered]

Describe Key Features of the Practice [I]: Provide an overview of the key structural or design features of the practice. Where appropriate, use the NRCS “job sheet” for the practice as a general guide for the types of design information for the practice. (Required [R] for Structural practices.)

Describe Operational Requirements of the Practice [I]: A narrative used to describe the operational aspects of the practice, including the intensity and frequency of management activities. Where appropriate, use the NRCS “job sheet” for the practice as a general guide for the types of design information for the practice. (Required [R] for operational practices.)

Practice Water Quality Volume (cf) [I]: For structural practices, enter the total volume of the structural practice used for water quality control in cubic feet.

Practice Water Quality Flow Rate (cfs) [I]: For structural practices, enter the design treatment rate or maximum design discharge rate of the structural practice in cubic feet per second.

Design Storm [I]: For structural practices, enter the design storm used in the practice design.

Comment [N]: Provide other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data.

6.8.14 Overall Site (Multiple Practices)

The purpose of this spreadsheet is for the user to provide an overall description of Study Areas where multiple practices are implemented and the performance of the overall Study Area is monitored at the edge of field or upstream/downstream of the Study Area. Where design information is available for individual practices at the Study Area, the design information should be entered for **each** individual practice and then narratively described for the overall site.

Test Site ID Code [R]: [Auto-populates from Test Site table]

Site Name [R]: [Auto-populates from Test Site table]

Practice Name [R]: [Select from pick-list of user-defined practice names]

Practice ID [R]: [Auto-populates once the Practice Name is entered]

Describe Overall System of Practices at the Site [R]: A narrative used to describe the overall combination of practices at the site.

Practice 1[I]: Identify the first practice implemented at the site.

Practice 2[I]: Identify the second practice implemented at the site.

Practice 3[I]: Identify the third practice implemented at the site.

Practice 4[I]: Identify the fourth practice implemented at the site.

Practice Other [I]: Identify other practices implemented at the site.

Duration of Practice Implementation [R]: Narratively describe the overall time period during which the combination of practices was implemented (e.g., 5 years).

Comment [N]: Provide other pertinent comments that a user of this research would need to be aware of to better understand the study or avoid inappropriate use of the data.

6.9 Submitting Completed Spreadsheet Package to the AgBMPDB

Once the data entry package is complete, email the spreadsheet package to clary@wrightwater.com. The Clearinghouse staff will review the data submittal and follow-up with any questions or needed corrections.

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ATTACHMENT A: NRCS CONSERVATION PRACTICES

The table below provides a list of NRCS Conservation practice codes and names. The practices of primary focus for the AgBMPDB Release Version 1.0 are identified in the left column; however, any of these practices can be entered into the AgBMPDB using the General Practice and Overall Site spreadsheets.

AgBMPDB Focus	NRCS Code	Conservation Practice Name
	472	Access Control
	560	Access Road
	309	Agrichemical Handling Facility
	371	Air Filtration and Scrubbing
	311	Alley Cropping
	591	Amendments for Treatment of Agricultural Waste
	366	Anaerobic Digester
	316	Animal Mortality Facility
	575	Animal Trails and Walkways
	450	Anionic Polyacrylamide (PAM) Application
	397	Aquaculture Ponds
	396	Aquatic Organism Passage
	310	Bedding
	400	Bivalve Aquaculture Gear and Biofouling Control
	672	Building Envelope Improvement
	314	Brush Management
	584	Channel Bed Stabilization
	326	Clearing and Snagging
	372	Combustion System Improvement
	317	Composting Facility
	327	Conservation Cover
	328	Conservation Crop Rotation
Y	656	Constructed Wetland
	332	Contour Buffer Strips
	330	Contour Farming
	331	Contour Orchard and Other Perennial Crops
Y	340	Cover Crop
	342	Critical Area Planting
	588	Cross Wind Ridges
	589C	Cross Wind Trap Strips
	402	Dam
	348	Dam, Diversion
	324	Deep Tillage
	356	Dike
	362	Diversion
Y	554	Drainage Water Management
	432	Dry Hydrant
	375	Dust Control from Animal Activity on Open Lot Surfaces
	373	Dust Control on Unpaved Roads and Surfaces
	647	Early Successional Habitat Development/Management
AgBMPDB Focus	NRCS Code	Conservation Practice Name
	374	Farmstead Energy Improvement
	592	Feed Management
	382	Fence
	386	Field Border
Y	393	Filter Strip

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	394	Firebreak
	398	Fish Raceway or Tank
	399	Fishpond Management
	512	Forage and Biomass Planting
	511	Forage Harvest Management
	666	Forest Stand Improvement
	655	Forest Trails and Landings
	383	Fuel Break
	410	Grade Stabilization Structure
Y	412	Grassed Waterway
	548	Grazing Land Mechanical Treatment
	561	Heavy Use Area Protection
	422	Hedgerow Planting
	315	Herbaceous Weed Control
	603	Herbaceous Wind Barriers
	423	Hillside Ditch
Y	595	Integrated Pest Management
	320	Irrigation Canal or Lateral
	428	Irrigation Ditch Lining
	388	Irrigation Field Ditch
	464	Irrigation Land Leveling
	430	Irrigation Pipeline
	436	Irrigation Reservoir
	441	Irrigation System, Microirrigation
	442	Irrigation System, Sprinkler
	443	Irrigation System, Surface and Subsurface
	447	Irrigation System, Tailwater Recovery
Y	449	Irrigation Water Management
	527	Karst Sinkhole Treatment
	460	Land Clearing
	544	Land Reclamation, Abandoned Mined Land
	544	Land Reclamation, Currently Mined Land
	453	Land Reclamation, Landslide Treatment
	455	Land Reclamation, Toxic Discharge Control
	466	Land Smoothing
	670	Lighting System Improvement
	468	Lined Waterway or Outlet
	516	Livestock Pipeline
	457	Mine Shaft and Adit Closing
	482	Mole Drain
	353	Monitoring Well
AgBMPDB Focus	NRCS Code	Conservation Practice Name
	484	Mulching
	379	Multi-Story Cropping
Y	590	Nutrient Management
	500	Obstruction Removal
	582	Open Channel
Y	378	Pond

	521C	Pond Sealing or Lining, Bentonite Treatment
	521D	Pond Sealing or Lining, Compacted Clay Treatment
	521A	Pond Sealing or Lining, Flexible Membrane
	521B	Pond Sealing or Lining, Soil Dispersant Treatment
	462	Precision Land Forming
	338	Prescribed Burning
	528	Prescribed Grazing
	533	Pumping Plant
	550	Range Planting
	562	Recreation Area Improvement
	566	Recreation Land Grading and Shaping
Y	345	Residue and Tillage Management, Mulch Till
Y	329	Residue and Tillage Management, No-Till/Strip Till/Direct Seed
Y	346	Residue and Tillage Management, Ridge Till
	344	Residue Management, Seasonal
	643	Restoration and Management of Rare and Declining Habitats
Y	391	Riparian Forest Buffer
Y	390	Riparian Herbaceous Cover
	654	Road/Trail/Landing Closure and Treatment
	555	Rock Barrier
	558	Roof Runoff Structure
	367	Roofs and Covers
	557	Row Arrangement
	610	Salinity and Sodic Soil Management
Y	350	Sediment Basin
	646	Shallow Water Development and Management
	381	Silvopasture Establishment
	632	Solid/Liquid Waste Separation Facility
	572	Spoil Spreading
	574	Spring Development
	570	Stormwater Runoff Control
	580	Streambank and Shoreline Protection
	578	Stream Crossing
	395	Stream Habitat Improvement and Management
	585	Stripcropping
	587	Structure for Water Control
	606	Subsurface Drain
	607	Surface Drain, Field Ditch
	608	Surface Drain, Main or Lateral
	609	Surface Roughening
AgBMPDB Focus	NRCS Code	Conservation Practice Name
	568	Trails and Walkways
Y	600	Terrace
	612	Tree/Shrub Establishment
	660	Tree/Shrub Pruning
	490	Tree/Shrub Site Preparation
	620	Underground Outlet
	645	Upland Wildlife Habitat Management

	635	Vegetated Treatment Area
	601	Vegetative Barrier
	630	Vertical Drain
	360	Waste Facility Closure
	633	Waste Recycling
	313	Waste Storage Facility
	634	Waste Transfer
	629	Waste Treatment
	359	Waste Treatment Lagoon
Y	638	Water and Sediment Control Basin
	636	Water Harvesting Catchment
	642	Water Well
	351	Water Well Decommissioning
	614	Watering Facility
	640	Waterspreading
	355	Well Water Testing
Y	658	Wetland Creation
Y	659	Wetland Enhancement
Y	657	Wetland Restoration
Y	644	Wetland Wildlife Habitat Management
	380	Windbreak/Shelterbelt Establishment
	650	Windbreak/Shelterbelt Renovation
	384	Woody Residue Treatment