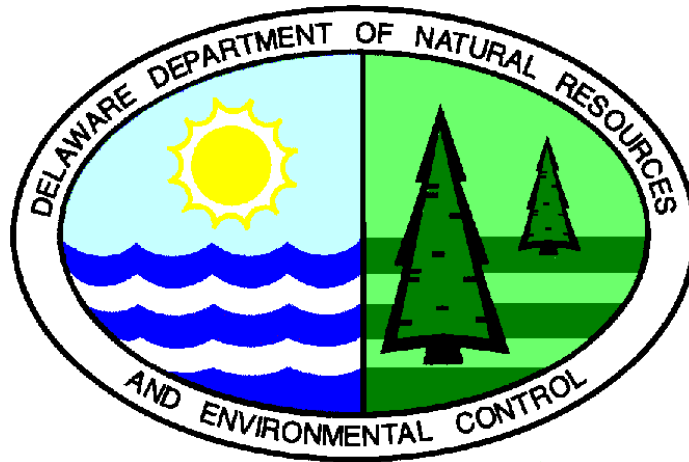


STATE OF DELAWARE

**NONPOINT SOURCE
BEST MANAGEMENT PRACTICE
IMPLEMENTATION DATA**

QUALITY ASSURANCE PROJECT PLAN



November 2013

**Delaware Department of Natural Resources and Environmental Control
Division of Watershed Stewardship
Watershed Assessment Section
820 Silver Lake Boulevard, Suite 220
Dover, DE 19904-2464
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**State of Delaware
Nonpoint Source Best Management Practice Implementation Data
Quality Assurance Project Plan**

Group A – Project Management

A1 – Title and Approval Sheet

Plan Coverage: This *Nonpoint Source BMP Implementation Data Quality Assurance Project Plan* reflects the overall Quality Assurance Program framework and management systems necessary to assure that data reported by the Delaware Department of Natural Resources and Environmental Control-Division of Watershed Stewardship-Watershed Assessment Section (DNREC-DWS-WAS) are of acceptable quality to meet the needs of the United States Environmental Protection Agency’s Chesapeake Bay Program Office (EPA-CBPO).

Name: Marcia Fox
Title: DNREC-DWS-WAS, Grant Manager, Quality Assurance Manager

Signature: _____ **Date:** _____

Name: John Schneider
Title: DNREC-DWS-WAS, Program Administrator

Signature: _____ **Date:** _____

Name: Doreen Vetter
Title: U.S. EPA Project Officer

Signature: _____ **Date:** _____

Name: Rich Batiuk
Title: U.S. EPA Quality Assurance Officer

Signature: _____ **Date:** _____

*Questions or comments regarding this QAPP should be referred to Marcia Fox, 302-739-9939
or Marcia.Fox@state.de.us.*

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A3 – Distribution List

This document is being provided to the following:

Last	First	Title	Organization
Absher	Debbie	Agriculture BMP Data Provider	Sussex Conservation District
Atkins	Jared	Stormwater BMP Data Provider	Kent Conservation District
Batiuk	Rich	US EPA	CBPO Quality Assurance Officer
Biddle	Mark	Restoration	DNREC-DWS-WAS
Cole	Randy	Stormwater BMPs	Delaware Department of Transportation
Coleman	Robert	Manure Relocation and Nutrient Management Plan Data Provider	DDA-NMP
Comegys	Heather	Manure Relocation/Alternative Use Data Provider	Perdue Agrirecycle
Deputy	Morris	Stormwater BMPs	Town of Middletown
Fox	Marcia	CBP Implementation Grant Manager, Quality Assurance Manager	DNREC-DWS-WAS
Goodrow	Sandra	Industrial Stormwater BMPs	DNREC-DW
Graeber	Ron	Wastewater	DNREC-DW-Groundwater Discharges Section
Hardesty	Marianne	Agriculture BMP Data Provider	New Castle Conservation District/NRCS
Harris	Mike	Stormwater BMPs	New Castle County
Hart	Eugenia	Contractor	Tetra Tech
Hoyd	Kyle	Urban Forestry Data Provider	Delaware Department of Agriculture (DDA)-Forest Service
Hudson	Wayne	Manure Relocation/Alternative Use Data Provider	Perdue Agrirecycle
Ley	MaryEllen	Quality Assurance Coordinator	USGS / EPA-CBPO
Mortazavi	Ellie	Stormwater BMPs	New Castle County
Murphy	Dennis	IT Support Lead	DNREC-Office of Information Technology
Nichols	Don	Stormwater BMPs	New Castle Conservation District
Petrichenko	Paul	Agriculture BMP Data Provider	USDA, Delaware Natural Resources Conservation Service
Pioro	Frank	Director	DNREC - DWS
Riley	Timothy	Agriculture BMP Data Provider	Kent Conservation District
Royzman	Madislav	Contractor	Tetra Tech
Rutherford	Jamie	Stormwater BMPs	DNREC-DW-SSWP
Schepens	Dave	Wastewater	DNREC-DW-Groundwater Discharges Section
Schneider	John	Administrator	DNREC - DWS - WAS
Seybold	Bill	Forestry Data Provider	Delaware Department of Agriculture (DDA)-Forest Service
Sweeney	Jeffrey	University of Maryland / EPA-CBPO	NPS Data Manager
Towle	Larry	Manure Relocation and Nutrient Management Plan Data Provider	DDA-NMP
Vetter	Doreen	Project Officer	EPA-Chesapeake Bay Program Office (CBPO)
Volk	Jennifer	Environmental Quality and Management Specialist	University of Delaware
Walch	Marianne	Stormwater BMPs	Delaware Department of Transportation
Walls	Jennifer	CBP Regulatory and Accountability Grant Manager	DNREC-DWS-WAS
Watson	Jessica	Stormwater BMPs	Sussex Conservation District

A4 – Project / Task Organization

Best management practices (BMPs) to reduce nonpoint source (NPS) pollution are funded and installed by numerous federal, state, local, and private agencies within Delaware including the Department of Natural Resources and Environmental Control (DNREC), the Department of Agriculture (DDA), the Natural Resource Conservation Service (NRCS), three county Conservation Districts, counties and towns, and the Perdue AgriRecycle facility. The BMP data that is generated is maintained and undergoes quality assurance procedures by the implementing organization, which includes spot checks of installed BMPs.

Data is aggregated from these multiple groups and reported to funding agencies for tracking purposes. Historically, Delaware provided the Environmental Protection Agency – Chesapeake Bay Program Office (EPA-CBPO) with BMP implementation data in a spreadsheet or tabular format. In an attempt to standardize, streamline, and document data manipulations, CBPO and the jurisdictions in the bay watershed signed an agreement specifying that data associated with BMPs will be transferred exclusively through the National Environmental Information Exchange Network (NEIEN) as of December 31, 2010. Grant guidance specifies that the exchange should contain data for projects that were implemented between July 1 and June 30 each year.

The Chesapeake Bay Program (CBP) Implementation Grant Manager serves as an independent quality assurance manager, and develops and maintains the official, approved Quality Assurance Project Plan (QAPP) covering all programs receiving funds from the CBP Implementation Grant and the CBP Regulatory and Accountability Grant. In addition, both Grant Managers prepare and submit annual reports to the EPA-Chesapeake Bay Program Office (CBPO) providing a qualitative description of ongoing activities being done to achieve

restoration goals. An organization chart showing reporting and quality assurance responsibilities is provided in Figure 1.

A5 – Problem Definition and Background

The tracking, reporting, and quality assurance of NPS BMPs are requirements of the Delaware CBP Implementation Grant from the EPA-CBPO. Data is provided to EPA-CBPO for inclusion in watershed model progress evaluations on or before December 31st of each year or as otherwise stipulated in the grant documents; however, in 2013 data are due to EPA-CBPO on December 1st. Since this work involves the acquisition of environmental data generated from direct measurement activities, data collected from other sources, and data compiled from computerized information databases and systems, an approved QAPP must be in place. This technical document of quality assurance and control procedures and specifications serves as the QAPP in accordance with 40 CFR 30.54 and 31.45. This QAPP will support the quality of the data behind the CBP's annual *Restoration Assessment for Reducing Pollution*, will allow the EPA-CBPO to understand the various sources of NPS BMP data and any analyses done by jurisdictions prior to submission to the EPA-CBPO, and will assist the EPA-CBPO in preparing for possible future scrutiny of all watershed model inputs under the Chesapeake Bay Total Maximum Daily Load (TMDL).

A6 – Project / Task Description

Data regarding the implementation of NPS BMPs are compiled in order to assess progress toward reaching water quality goals, which includes both State of Delaware prescribed TMDL reductions for nutrients and bacteria as well as EPA TMDL reductions for nutrients and sediment. Implementation is ongoing and data is reported to the EPA-CBPO annually (on or before December 1st each year) to reflect recent implementation activities. A full description of

the quality assurance activities performed on these data sets is included in Section B10 Data Management (page 12). The following sections of this QAPP will be updated annually (on or before October 15th) to reflect any changes to field, sample handling and storage, laboratory, quality control, or data management activities.

A7 – Quality Objectives and Criteria

Details regarding the quality of the NPS BMP data reported by the DNREC-DWS-WAS to the EPA-CBPO for use in watershed modeling to estimate restoration progress are contained in the following sections. All efforts have been made to produce data that is comparable to data collected previously and currently by other Chesapeake Bay Program grant recipients and partners. Details on the quality of data provided by DNREC are included in the following sections. All BMPs completed must be certified as complete and meeting appropriate standards as deemed by the authorized cost share program.

A8 – Special Training / Certification

Any special training or certification required to implement or inspect NPS BMPs is determined and overseen by the implementing organization. Additionally, individuals involved with NPS BMP data management and data quality assurance and control procedures are not required to have any special training or certification, however in order to perform these functions effectively, training in spreadsheets, databases, and geographic information systems (GIS), as well as computer programming and code writing may be necessary. Delaware's Quality Assurance Manager received training from the EPA on Quality Assurance Strategies for the use of Existing Data in February 2013. Due to privacy concerns, BMP implementing organizations

determine who may have clearance to complete data sets and in some situations restrict the transfer of personal and locational information.

A9 – Documents and Records

Implementing organizations will maintain NPS BMP data sets. These data sets are needed for the NEIEN schemas and are transmitted via established NEIEN protocols for inclusion in the annual progress run input deck. Data included in EPA-CBPO annual reports will be retained electronically in Extensible Markup Language (XML) format by the DNREC-DWS-WAS in perpetuity. The DNREC-DWS-WAS will send the QAPP electronically to all individuals on the distribution list (A3) on or before October 1st each year for annual review and comment. Any edits to reflect changes in status or procedure will be incorporated into the final document submitted to the EPA-CBPO on or before December 1st each year. The final, EPA-CBPO approved QAPP will be electronically distributed to the same individuals and will be retained in both electronic and paper format in perpetuity by the DNREC-DWS-WAS.

Group B – Data Generation and Acquisition

Sections B1 through B8 of this QAPP are not directly applicable to NPS BMP data tracking and reporting. Situations where implementing organizations generate data through sampling to answer research questions do occur. For example, soil samples are taken during the development of a nutrient management plan to determine appropriate fertilizer and manure application rates. Likewise, manure is sampled to determine nutrient content. In addition, samples may be taken to determine the performance level of a BMP, such as taking effluent samples from alternative and innovative onsite wastewater treatment and disposal systems. Details regarding any sampling protocols related to NPS BMPs will be incorporated in future versions of this QAPP. Details regarding surface water quality monitoring protocols can be found in both the DNREC (DNREC, 2007) and Nanticoke Creekwatcher QAPP documents (NWA, 2013). Additionally, the Delaware Natural Resources and Conservation Service (NRCS) completed a QAPP and Corrective Action Plan in FY2012 (NRCS, 2012).

B1 – Sampling Process Design (Experimental Design)

B2 – Sampling Methods

B3 – Sample Handling and Custody

B4 – Analytical Methods

B5 – Quality Control

B6 – Instrument / Equipment Testing, Inspection, and Maintenance

B7 – Instrument / Equipment Calibration and Frequency

B8 – Inspection / Acceptance of Supplies and Consumables

B9 – Non-direct Measurements

DNREC's Division of Watershed Stewardship, Watershed Assessment Section (DNREC-DWS-WAS) in collaboration with the Office of Information Technology (OIT) obtains NPS BMP tracking data from both internal and external sources (See Figure 1), which are then reported to the EPA-CBPO for inclusion in model scenario runs via NEIEN. BMP data associated with stormwater fall under the responsibility of the nine delegated agencies under DNREC's Division of Watershed Stewardship - Sediment and Stormwater Program (DNREC-DWS-SSW). BMPs associated with wastewater treatment are implemented, tracked, and reported by DNREC's Division of Water - Groundwater Discharges Section (DNREC-DW-GWDS). BMP data associated with agriculture are implemented, tracked, and/or maintained by multiple agencies including the NRCS, DNREC's Non-Point Source 319 Program, Delaware Department of Agriculture, the three county Conservation Districts, and the Perdue AgriRecycle company.

In the spring of 2007, DNREC's Divisions of Water Resources and Soil and Water Conservation (now known as the Divisions of Water and Watershed Stewardship) contracted with URS Corporation to conduct an assessment of BMP data collection activities across the state. The resulting report, which summarizes the points of contact, type of BMP data maintained by each agency, data storage structures, data sharing limitations, and supporting software, can be found in Appendix A. The implementing agencies described in Appendix A are responsible for ensuring delivery of quality data and the independent Quality Assurance Manager reviews all data to ensure BMP reported levels reasonably reflect on-the-ground conditions. DNREC-DWS-WAS is not in a position to address the uncertainty or the quality assurance process related to other agencies' data collected, managed, and reported or accessible from the

internet. All of the referenced NPS data is planned to be included in the annual data call and reported as per established NEIEN protocols.

B10 – Data Management

BMP data is requested on an annual or more frequent basis from numerous agencies that implement, track, and/or maintain this type of data in the stormwater, wastewater, and agriculture-related sectors. Figure 1 depicts BMP data reporting and quality assurance responsibilities.

Previously, the majority of data submitted to DNREC-DWS-WAS was done electronically in Excel spreadsheets, however, paper copies were occasionally submitted from some reporting agencies as well. This varied data had to be compiled into a single document with a consistent format and as such, was inconvenient and time consuming for all involved. In an attempt to standardize, streamline, and document data manipulations, CBPO and the jurisdictions in the bay watershed signed an agreement specifying that data associated with BMPs will be transferred exclusively through the National Environmental Information Exchange Network (NEIEN) as of December 31, 2010. Grant guidance specifies that the exchange should contain data for projects that were implemented between July 1 and June 30 each year.

The Exchange Network is a partnership between the Bay jurisdictions and the CBPO for the secure, real time exchange of environmental information. The Network uses extensible markup language (XML), web services, and common data standards to transmit data from the jurisdictions to the CBPO. Existing data management systems are able to remain in place and, through the Network, data is delivered based on pre-described methods, or a schema. The CBP NPS BMP schema was developed by PA, VA, and MD with a \$390,000 grant, which included the building of a node at the CBPO. Delaware began mapping data from state sources into the

schema. The schema in use contains fields such as jurisdiction, data source, contact information, name of practice, practice components, location, unit of measure, quantity, status, and funding source.

In Delaware, data from each implementing organization is supplied to DNREC's OIT for conversion into an XML document. Once all data sources have been received, data is transmitted through DNREC's network node. Since the 2010 data submission was the first through NEIEN, Delaware required the assistance of Tetra Tech to complete several of these XML documents. DNREC's OIT prepared the XML data for stormwater and onsite wastewater practices. Data from the DDA Forest Service and Nutrient Management Program (manure relocation and nutrient management planning) were provided to Tetra Tech in GIS, database, or Excel format for this work. Additionally, in 2010, an agreement (Basinwide 1619 Agreement) was reached to have federal agencies, such as the USDA's NRCS and FSA, report practices directly to the USGS for CBP modeling rather than have jurisdictions report on their behalf. Delaware has worked with contractors to map NRCS data to the schema for the 2010 - 2013 data submission.

Staff from both the DNREC-DWS-WAS and OIT participated in conference calls with Tetra Tech to review the XML schema and code documentation, review and adjust NEIEN BMP codes, and help document the translation from NEIEN codes to Scenario Builder codes. Once data is submitted as XML documents through NEIEN, it is entered into the Nutrient and Sediment Scenario Builder which creates input scenarios for the Watershed Model.

In 2014, DNREC will establish a 1619 Conservation Cooperator Agreement to report USDA conservation practices. Signing this 1619 agreement, with NRCS and FSA, will allow Delaware access to the USDA's datasets for CBPO reporting while maintaining data

confidentiality as required by Section 1619 of the Food, Conservation, and Energy Act of 2008 (2008 Farm Bill). Additionally, DNREC has contracted with Tetra Tech to develop a data tracking and reporting tool for the State of Delaware to streamline the processes, improve tracking, and reduce the need for contractor support. This new system will be used in December 2014 to submit excel templates, process BMP data, and generate the NEIEN XML documents needed for CBWSM reporting.

B10.1 – Data Management: BMPs for Agricultural Land Uses

NRCS/FSA Data - Data are provided by Devereux Environmental Consulting (third party contractor of USGS) in excel format at the state and county level. Detailed cover crop information submitted by the Conservation Districts is subtracted from NRCS/FSA cover crop data. The remaining acreage is reported as is to avoid double counting.

DDA Manure Transport – Manure Transport is provided by DDA as tons of poultry manure. The data includes the sending watershed, receiving watershed, receiving town, receiving state, claim tons, claim date, application number, and whether the relocation was “farm to farm in DE”, “farm to farm outside DE”, “farm to alternative use”, and “farm to alternative use (off peninsula)”. Delaware does not transport any manure besides poultry. The poultry in Delaware are all broilers except for one layer facility; therefore, the Animal Group is labeled as “Poultry”. Majority of the Nanticoke watershed is in Sussex County (86%) and a small portion is in Kent County (14%); therefore, the assumption was made that all manure (within the Nanticoke watershed) comes from Sussex County. The Marshyhope Watershed is within two counties, so the claim tons are split evenly between the 2 counties. Only manure exported from the

Chesapeake Bay watershed is included and all other watersheds (Indian River, Indian River Bay and Murderkill watershed entries) are deleted. COUNTY_TO in the Excel sheet is left blank if the manure leaves the Chesapeake Bay watershed or is identified as “farm to alternative use” and “farm to alternative use off peninsula”.

DDA Nutrient Management Planning – DDA provides total acres with each claim and the percentage of those acres in each watershed. Only nutrient management for the Chesapeake Bay is included and all other watersheds are deleted. These watersheds are identified by HUC using Geographic Information Systems (GIS). All Nutrient Management Plans (NMP) are done as a 3-year plan, but those acres are only put in the database for the first year. For example, in 2012, NMP acres for 2010 and 2011 were added to the 2012 acres to get the actual acres with NMP. Each individual claim has a claim date and an approval date, but not an actual implementation date, so “2012” was included as the implementation date so as not to be confused by the 2009, 2010, and 2011 dates that were included to represent those acres actually with NMP in 2012. In 2013, the nutrient management expert panel report was approved and enacted for Phase 5.3.2 for 2013 progress. All active NMPs in Delaware are considered Tier 1 and are provided as total acres of nutrient management by adding NMPs for 2011, 12, and 13.

DDA Forestry Tree Planting – The Department of Agriculture’s Delaware Forest Service (DFS) provides acreage of tree plantings (afforestation and reforestation). DDA provides GIS coverage of tree planting in the Chesapeake Bay watershed. HUC12s are identified by using GIS for each planting area. The GIS coverage includes an attribute table that includes the “type” of project (either afforestation or reforestation). Only “afforestation” records are included in the progress

run. Most of Forestry's reforestation projects are cost-shared through NRCS funds; and therefore, are already counted by NRCS data. When the project is paid by DDA Forestry or the private landowner that information will not be reported by NRCS and only DFS acreage will be used in the progress run.

Irrigation Management – The acreage of irrigated land was calculated in July 2010 based on Google Earth Imagery by NRCS. The 2013 Irrigated Land Project is an update to this dataset based on 2012 imagery in ArcGIS. A complete methodology is listed in Appendix B. Data are reported as acreage by HUC using 2013 as the implementation year.

Conservation District Cover Crop Data – Detailed cover crop information is received from each County Soil & Water Conservation District – New Castle, Kent, and Sussex. Data is received in excel format. Cover crop data is reviewed and determined to be commodity (harvested) or traditional (destroyed). Only those crops identified in the Chesapeake Bay Watersheds are included. All cover crop data provided by the Districts is subtracted from the NRCS cover crop acres for that respective county.

Sussex County – In 2012, some cover crops were provided as multiple crops (e.g., barley/wheat) which means part of the field was planted in one and one planted in the other. Sometimes crops are planted as a seed mix. Records with seed mixes are split 50/50 for acreage in each crop. In 2013, the Cover Crop Expert Panel Report was approved and many of these seed mixes are acceptable in Phase 5.3.2 for 2013 progress. Planting dates are provided and were used to determine whether the crops are

early/late/standard. Sussex Conservation District cover crop acreage is subtracted from Sussex County NRCS cover crop data to avoid double counting.

Kent County – Data are compiled using the criteria set above for Sussex County.

Additionally, a few records had two planting dates listed. For these entries, the latter date was assumed as implementation date. Kent Conservation District cover crop acreage is subtracted from Kent County NRCS cover crop data to avoid double counting.

New Castle County – The same methodology was followed as Sussex and Kent counties. New Castle Conservation District cover crop acreage is subtracted from New Castle County NRCS cover crop data to avoid double counting.

DNREC Restoration Database – DNREC –DWS-WAS maintains a restoration database that captures restoration practices like wetland restoration, tree plantings, forest buffers, and grass buffers. These practices are compiled from various projects throughout DNREC. The restoration database links DNREC BMPs to NRCS practice codes. The database is not set to match the BMPs reporting to EPA-CBPO. Therefore, DNREC-DWS-WAS must make judgment calls when assigning acres (or other units) to specific EPA-CBPO BMPs.

Water Control Structures – DNREC-DWS-WAS and Sussex Conservation District worked collaboratively in the summer of 2013 to update water control structure data by ground truthing and verifying structures with GPS. A complete methodology is listed in Appendix B. Data are reported as acreage by HUC using 2013 as the implementation year. Water control structures implemented by DNREC are also captured in the DNREC Restoration Database.

B10.1.1 – List of Agricultural BMPs

BMP	BMP Short Name	BMP Description	Unit	Data Source
5, 10, or 35-ft Riparian Buffer Setback	Delaware definition only	Trees planted next to waterways filter and take up nutrients from run-off, stabilize the soil, and provide wildlife habitat. The recommended buffer width for streamside forest buffers is 100 feet. This practice is for buffers that do not meet the 100 foot recommendation but have widths of either 35 ft., 10 ft., or 5 ft.	acres	DDA, DNREC, USFWS
Agronomic Improvements	Delaware definition only	New seed varieties are being developed for additional nutrient efficiency. Current seed varieties are 40% to 50% efficient at utilization and up-take of nutrients.		DDA, Conservation Districts
Alternative Crops	CarSeqAltCrop	Alternative crops is a BMP that accounts for those crops that are planted and managed as permanent, such as warm season grasses, to sequester carbon in the soil. Carbon sequestration refers to the conversion of the Watershed Model land uses that are cropland to the hay land use.	acres	DNREC, USFWS
Alternative Use of Manure	Delaware definition only	Livestock Manure (primarily poultry litter) generated on Delaware farms is currently applied as fertilizer to Delaware crop fields or transported to areas of need through DDA's Nutrient Relocation Program. A small percentage is pelletized and sold as an organic fertilizer for residential and commercial use through Perdue AgriRecycle. Developing alternative uses for manure produced in the Chesapeake Bay Watershed represents a large	tons	DDA

BMP	BMP Short Name	BMP Description	Unit	Data Source
		opportunity for area farmers. One potential use for the region's excess manure is energy generation. Using excess manure to feed energy generation systems		
Barnyard Runoff Control	BarnRunoffCont	Includes the installation of practices to control runoff from barnyard areas. This includes practices such as roof runoff control, diversion of clean water from entering the barnyard and control of runoff from barnyard areas. Different efficiencies exist if controls are installed on an operation with manure storage or if the controls are installed on a loafing lot without a manure storage.	acres	NRCS, FSA
Biofilters	Biofilters	Ammonia emission reduction includes housing ventilation systems that pass air through a biofilter media with a layer of organic material, typically a mixture of compost and wood chips or shreds that supports a microbial population. The ammonia emissions are reduced by oxidizing volatile organic compounds into carbon dioxide, water and inorganic salts. The ammonia conserved in the BMP is no longer considered in the model.		NRCS, FSA
Commodity Cover Crop Early Aerial Rye	ComCovCropEAR	A winter rye crop planted at least 2 weeks prior to the average frost date with an aerial seeding method. A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.	acres	Conservation Districts
Commodity Cover Crop Early Aerial Wheat	ComCovCropEAW	A winter wheat crop planted at least 2 weeks prior to the average frost date with an aerial seeding method. A commodity cover crop may receive nutrient applications after March 1	acres	Conservation Districts

BMP	BMP Short Name	BMP Description	Unit	Data Source
		of the following year after establishment.		
Commodity Cover Crop Early Drilled Barley	ComCovCropEDB	A winter barley crop planted at least 2 weeks prior to the average frost date with a drilled seeding method. A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.	acres	Conservation Districts
Commodity Cover Crop Early Drilled Rye	ComCovCropEDR	A winter rye crop planted at least 2 weeks prior to the average frost date with a drilled seeding method. A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.	acres	Conservation Districts
Commodity Cover Crop Early Drilled Wheat	ComCovCropEDW	A winter wheat crop planted at least 2 weeks prior to the average frost date with a drilled seeding method. A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.	acres	Conservation Districts
Commodity Cover Crop Early Other Rye	ComCovCropEOR	A winter rye crop planted at least 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.	acres	Conservation Districts
Commodity Cover Crop Early Other Wheat	ComCovCropEOW	A winter wheat crop planted at least 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.	acres	Conservation Districts

BMP	BMP Short Name	BMP Description	Unit	Data Source
Commodity Cover Crop Early-Planting Aerial Corn Barley	ComCovCropEAB	A winter barley crop planted at least 2 weeks prior to the average frost date with an aerial seeding method. A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.	acres	Conservation Districts
Commodity Cover Crop Early-Planting Aerial Soy Barley	ComCovCropEASB	A winter barley crop planted at least 2 weeks prior to the average frost date with an aerial seeding method. The cover crop follows soybeans. The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Commodity Cover Crop Early-Planting Aerial Soy Rye	ComCovCropEASR	A winter rye crop planted at least 2 weeks prior to the average frost date with an aerial seeding method. This cover crop follows soybeans. A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.	acres	Conservation Districts
Commodity Cover Crop Early-Planting Aerial Soy Wheat	ComCovCropEASW	A winter wheat crop planted at least 2 weeks prior to the average frost date with an aerial seeding method. This crop follows soybeans. A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.	acres	Conservation Districts
Commodity Cover Crop Early-Planting Other Barley	ComCovCropEOB	A winter barley crop planted at least 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.	acres	Conservation Districts
Commodity Cover Crop Late Other Wheat	ComCovCropLOW	A winter rye crop planted after the average first frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). A commodity cover crop may receive nutrient applications after March 1 of the following	acres	Conservation Districts

BMP	BMP Short Name	BMP Description	Unit	Data Source
		year after establishment.		
Commodity Cover Crop Late-Planting Drilled Rye	ComCovCropLDR	A winter rye crop planted after the average first frost date with a drilled seeding method. A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.	acres	Conservation Districts
Commodity Cover Crop Late-Planting Drilled Wheat	ComCovCropLDW	A winter wheat crop planted after the average first frost date with a drilled seeding method. A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.	acres	Conservation Districts
Commodity Cover Crop Late-Planting Other Rye	ComCovCropLOR	A winter rye crop planted after the average first frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.	acres	Conservation Districts
Commodity Cover Crop Standard Drilled Rye	ComCovCropSDR	A winter rye crop planted no more than 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.	acres	Conservation Districts
Commodity Cover Crop Standard Other Rye	ComCovCropSOR	A winter rye crop planted no more than 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). A commodity cover crop may receive nutrient applications	acres	Conservation Districts

BMP	BMP Short Name	BMP Description	Unit	Data Source
		after March 1 of the following year after establishment.		
Commodity Cover Crop Standard Other Wheat	ComCovCropSOW	A winter wheat crop planted no more than 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.	acres	Conservation Districts
Commodity Cover Crop Standard-Planting Drilled Barley	ComCovCropSDB	A winter barley crop planted no more than 2 weeks prior to the average frost date with a drilled seeding method. A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.	acres	Conservation Districts
Commodity Cover Crop Standard-Planting Drilled Wheat	ComCovCropSDW	A winter wheat crop planted no more than 2 weeks prior to the average frost date with a drilled seeding method. A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.	acres	Conservation Districts
Commodity Cover Crop Standard-Planting Other Barley	ComCovCropSOB	A winter barley crop planted no more than 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.	acres	Conservation Districts
Conservation Till Without Nutrients	ConserveTillom	This conservation till BMP reflects conservation tillage on land areas that receive only inorganic fertilizer. This BMP is a reduction applied to high till without nutrients and requires: (a) a minimum 30% residue coverage at the time of planting, and (b) a non-	acres	NRCS

BMP	BMP Short Name	BMP Description	Unit	Data Source
		inversion tillage method.		
Continuous No Till	ContinuousNT	The Continuous No-Till (CNT) BMP is a crop planting and management practice in which soil disturbance by plows, disk or other tillage equipment is eliminated. CNT involves no-till methods on all crops in a multi-crop, multi-year rotation. When an acre is reported under CNT, it will not be eligible for additional reductions from the implementation of other practices such as cover crops or nutrient management planning. Multi-crop, multi-year rotations on cropland are eligible. Crop residue should remain on the field. Planting of a cover crop might be needed to maintain residue levels. The system must be maintained for a minimum of five years. All crops must be planted using no-till methods.	acres	NRCS
Continuous, High Residue, Minimum Soil Disturbance Tillage Management	HRTill	Continuous, High Residue, Minimum Soil Disturbance Tillage (HRTill) Management is a crop planting and residue management practice in which soil disturbance by plows and implements intended to invert residue is eliminated. Any disturbance must leave a minimum of 60% crop residue cover on the soil surface as measured after planting. The practice involves all crops in a multi-crop, multi-year rotation and the crop residue cover requirement (including living and dead material) is to be met immediately after planting of each crop.	acres	NRCS
Cover Crop Early Aerial	CoverCropEAB	A winter barley crop planted at least 2 weeks prior to the average frost date with an aerial	acres	Conservation

BMP	BMP Short Name	BMP Description	Unit	Data Source
Barley		seeding method . The crop may be neither fertilized nor harvested.		Districts
Cover Crop Early Aerial Rye	CoverCropEAR	A winter rye crop planted at least 2 weeks prior to the average frost date with an aerial seeding method. The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Cover Crop Early Aerial Wheat	CoverCropEAW	A winter wheat crop planted at least 2 weeks prior to the average frost date with an aerial seeding method . The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Cover Crop Early Drilled Rye	CoverCropEDR	A winter rye crop planted at least 2 weeks prior to the average frost date with a drilled seeding method. The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Cover Crop Early Drilled Wheat	CoverCropEDW	A winter wheat crop planted at least 2 weeks prior to the average frost date with a drilled seeding method. The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Cover Crop Early Other Rye	CoverCropEOR	A winter rye crop planted at least 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Cover Crop Early Other Wheat	CoverCropEOW	A winter wheat crop planted at least 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Cover Crop Early-Planting Aerial Soy Barley	CoverCropEASB	A winter barley crop planted at least 2 weeks prior to the average frost date with an aerial seeding method . The cover crop follows soybeans. The crop may be neither fertilized nor harvested.	acres	Conservation Districts

BMP	BMP Short Name	BMP Description	Unit	Data Source
Cover Crop Early-Planting Aerial Soy Rye	CoverCropEASR	A winter rye crop planted at least 2 weeks prior to the average frost date with an aerial seeding method . The cover crop follows soybeans. The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Cover Crop Early-Planting Aerial Soy Wheat	CoverCropEASW	A winter wheat crop planted at least 2 weeks prior to the average frost date with an aerial seeding method . The cover crop follows soybeans. The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Cover Crop Early-Planting Drilled Barley	CoverCropEDB	A winter barley crop planted at least 2 weeks prior to the average frost date with a drilled seeding method. The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Cover Crop Early-Planting Other Barley	CoverCropEOB	A winter barley crop planted at least 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Cover Crop Late Drilled Rye	CoverCropLDR	A winter rye crop planted after the average first frost date with a drilled seeding method. The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Cover Crop Late Other Wheat	CoverCropLOW	A winter wheat crop planted after the average first frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Cover Crop Late-Planting Drilled Wheat	CoverCropLDW	A winter wheat crop planted after the average first frost date with a drilled seeding method. The crop may be neither fertilized nor harvested.	acres	Conservation Districts

BMP	BMP Short Name	BMP Description	Unit	Data Source
Cover Crop Late-Planting Other Rye	CoverCropLOR	A winter rye crop planted after the average first frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Cover Crop Standard Drilled Barley	CoverCropSDB	A winter barley crop planted no more than 2 weeks prior to the average frost date with a drilled seeding method. The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Cover Crop Standard Drilled Rye	CoverCropSDR	A winter rye crop planted no more than 2 weeks prior to the average frost date with a drilled seeding method. The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Cover Crop Standard Drilled Wheat	CoverCropSDW	A winter wheat crop planted no more than 2 weeks prior to the average frost date with a drilled seeding method. The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Cover Crop Standard Other Barley	CoverCropSOB	A winter barley crop planted no more than 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Cover Crop Standard Other Rye	CoverCropSOR	A winter rye crop planted no more than 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Cover Crop Standard Other Wheat	CoverCropSOW	A winter wheat crop planted no more than 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Cropland Irrigation	Cropirrmgmt	Cropland under irrigation management is used to decrease climatic variability and	acres	DNREC,

BMP	BMP Short Name	BMP Description	Unit	Data Source
Management		<p>maximize crop yields. The potential nutrient reduction benefit stems not from the increased average yield (20-25%) of irrigated versus non-irrigated cropland, but from the greater consistency of crop yields over time matched to nutrient applications. This increased consistency in crop yields provides a subsequent increased consistency in plant nutrient uptakes over time matched to applications, resulting in a decrease in potential environmental nutrient losses. The current placeholder effectiveness value for this practice has been proposed at 4% TN, 0% TP and 0%TSS, utilizing the range in average yields from the 2002 and 2007 NASS data for irrigated and non-irrigated grain corn as a reference. The proposed practice is applied on a per acre basis, and can be implemented and reported for cropland on both lo-till and hi-till land uses that receive or do not receive manure.</p>		NRCS
Decision Agriculture	DecisionAg	<p>A management system that is information and technology based, is site specific and uses one or more of the following sources of data: soils, crops, nutrients, pests, moisture, or yield for optimum profitability, sustainability, and protection of the environment. This BMP is modeled as a land use change to a nutrient management land use with an effectiveness value applied to create an additional reduction.</p>	acres	NRCS, FSA

BMP	BMP Short Name	BMP Description	Unit	Data Source
Enhanced Nutrient Application Management Efficiency Version	EffNutManEnhance	Based on research, the nutrient management rates of nitrogen application are set approximately 35% higher than what a crop needs to ensure nitrogen availability under optimal growing conditions. In a yield reserve program using enhanced nutrient management, the farmer would reduce the nitrogen application rate by 15%. An incentive or crop insurance is used to cover the risk of yield loss. This BMP effectiveness estimate is based on a reduction in nitrogen loss resulting from nutrient application to cropland 15% lower than the nutrient management recommendation. The effectiveness estimate is based on conservativeness and data from a program run by American Farmland Trust.	acres	NRCS, FSA, DDA
Enhanced Nutrient Management	EnhancedNM	Based on research, the nutrient management rates of nitrogen application are set approximately 35% higher than what a crop needs to ensure nitrogen availability under optimal growing conditions. In a yield reserve program using enhanced nutrient management, the farmer would reduce the nitrogen application rate by 15%. An incentive or crop insurance is used to cover the risk of yield loss. This BMP effectiveness estimate is based on a reduction in nitrogen loss resulting from nutrient application to cropland 15% lower than the nutrient management recommendation. The effectiveness estimate is based on conservativeness and data from a program run by American Farmland Trust. This BMP is modeled as a land use change to a nutrient management land use with an effectiveness value applied to create an additional reduction.	acres	DDA
Forage Radish + Grass ,	CoverCropEDFRG	A winter mix of radish and grasses planted at least 2 weeks prior to the average frost date	acres	Conservation

BMP	BMP Short Name	BMP Description	Unit	Data Source
Early, Drilled		with a drilled seeding method . The crop may be neither fertilized nor harvested.		Districts
Forage Radish + Grass, Early, Aerial	CoverCropEAFRG	A winter mix of radish and grasses planted at least 2 weeks prior to the average frost date with an aerial seeding method . The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Forage Radish + Grass, Early, Aerial, After Soy	CoverCropEASFRG	A winter mix of radish and grasses planted following a soybean crop at least 2 weeks prior to the average frost date with an aerial seeding method . The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Forage Radish + Grass, Early, Other	CoverCropEOFRG	A winter mix of radish and grasses planted at least 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor h	acres	Conservation Districts
Forage Radish + Grass, Normal, Drilled	CoverCropSDFRG	A winter mix of radishes and grasses planted no more than 2 weeks prior to the average frost date with a drilled seeding method. The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Forage Radish + Grass, Normal, Other	CoverCropSOFRG	A winter mix of radishes and grasses planted no more than 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized	acres	Conservation Districts
Forage Radish, Early, Aerial	CoverCropEAFR	A winter radish crop planted at least 2 weeks prior to the average frost date with an aerial seeding method . The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Forage Radish, Early, Aerial, After Soy	CoverCropEASFR	A winter radish crop planted following a soybean crop at least 2 weeks prior to the average frost date with an aerial seeding method . The crop may be neither fertilized nor harvested.	acres	Conservation Districts

BMP	BMP Short Name	BMP Description	Unit	Data Source
Forage Radish, Early, Drilled	CoverCropEDFR	A winter radish crop planted at least 2 weeks prior to the average frost date with a drilled seeding method . The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Forage Radish, Early, Other	CoverCropEOFR	A winter radish crop planted at least 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Forest Buffers	ForestBuffers	Agricultural riparian forest buffers are linear wooded areas along rivers, stream and shorelines. Forest buffers help filter nutrients, sediments and other pollutants from runoff as well as remove nutrients from groundwater. The recommended buffer width for riparian forest buffers (agriculture) is 100 feet, with a 35 feet minimum width required.	acres in buffers	DDA, DNREC, USFWS
Grass Buffers; Vegetated Open Channel - Agriculture	GrassBuffers	Agricultural riparian grass buffers are linear strips of grass or other non-woody vegetation maintained between the edge of fields and streams, rivers or tidal waters that help filter nutrients, sediment and other pollutants from runoff. The recommended buffer width for riparian forests buffers (agriculture) is 100 feet, with a 35 feet minimum width required. Vegetated open channels are modeled identically to grass buffers.	acres in buffers	NRCS, FSA, DDA, DNREC, USFWS
Heavy Use Poultry Area Pads	Delaware definition only	Establishing a pad structure that stabilizes areas frequently and intensively used by people, animal, or equipment to prevent nutrient movement into surface and groundwater.	structure	NRCS
Land Retirement to hay without nutrients (HEL)	LandRetireHyo	Converts land area to hay without nutrients. Agricultural land retirement takes marginal and highly erosive cropland out of production by planting permanent vegetative cover such as shrubs, grasses, and/or trees. Agricultural agencies have a program to assist	acres	NRCS, FSA, DDA, DelDOT,

BMP	BMP Short Name	BMP Description	Unit	Data Source
		farmers in land retirement procedures.		DNREC
Large Animal Mortality Program	Delaware definition only	Large animal mortality handling for operations with large animals. Program will assure off-site transport for large animal mortality.	animal units	DDA, Conservation Districts, DNREC
Livestock Waste Structures	Delaware definition only	Animal waste is stored in structures to protect it from the weather until it can be used as a crop fertilizer when conditions are appropriate for transport to another location.	structure	NRCS, FSA
Loafing Lot Management	LoafLot	The stabilization of areas frequently and intensively used by people, animals or vehicles by establishing vegetative cover, surfacing with suitable materials, and/or installing needed structures. This does not include poultry pad installation.	acres	DDA, Conservation Districts, NRCS
Manure Relocation	Delaware definition only	Excess manure is transported away from farms with high phosphorus levels to other farms or locations that can use the manure safely.	acres	DDA
Mortality Composters	MortalityComp	A physical structure and process for disposing of any type of dead animals. Composted material land applied using nutrient management plan recommendations.	structure	NRCS, FSA
Non Urban Stream Restoration	NonUrbStrmRest	Stream restoration in urban areas is used to restore the urban stream ecosystem by restoring the natural hydrology and landscape of a stream, help improve habitat and water quality conditions in degraded streams. The reduction is 0.2 lb nitrogen per foot, 0.068	feet	DDA, DNREC, NRCS,

BMP	BMP Short Name	BMP Description	Unit	Data Source
		phosphorus per foot, and 54.25 lbs sediment per foot .		USFWS
Nutrient Management	NutMan	Nutrient management plan (NMP) implementation (crop) is a comprehensive plan that describes the optimum use of nutrients to minimize nutrient loss while maintaining yield. A NMP details the type, rate, timing, and placement of nutrients for each crop. Soil, plant tissue, manure and/or sludge tests are used to assure optimal application rates. Plans should be revised every 2 to 3 years.	acres	DDA, NRCS, FSA
Poultry House Remediation	Delaware definition only	The roofing of abandoned houses is often removed as scrap metal and when it rains, the nutrient rich floors leach into groundwater. The amount of legacy nutrients under poultry houses is sizable. This practice removes and composts the wood materials and soil below the house to eliminate this pollutant source.		DDA, NRCS, FSA
Poultry Litter Treatment (alum, for example)	Alum	Surface application of alum, an acidifier, to poultry litter to acidify poultry litter and maintain ammonia in the non-volatile ionized form (ammonium).		
Poultry Litter Windrowing	Delaware definition only	The mechanical, chemical, and biological treatment of poultry litter to provide for extended reuse and timing of applying nutrients to crop needs.		NRCS, FSA
Poultry Waste Structures	Delaware definition only	These structures protect poultry waste from rain so that it can be used as a crop fertilizer when conditions are appropriate for transport to another location.	structure	NRCS, FSA

BMP	BMP Short Name	BMP Description	Unit	Data Source
Prescribed Grazing	PrecRotGrazing	This practice utilizes a range of pasture management and grazing techniques to improve the quality and quantity of the forages grown on pastures and reduce the impact of animal travel lanes, animal concentration areas or other degraded areas. PG can be applied to pastures intersected by streams or upland pastures outside of the degraded stream corridor (35 feet width from top of bank). The modeled benefits of prescribed grazing practices can be applied to pasture acres in association with or without alternative watering facilities. They can also be applied in conjunction with or without stream access control. Pastures under the PG systems are defined as having a vegetative cover of 60% or greater.	acres	NRCS, FSA
Retire Highly Erodible Land	Delaware definition only	Land that is especially vulnerable to erosion is removed from crop or hay production and planted in either grass or forest. This land is not usually disturbed for at least 10 years.	acres	DNREC, USFWS, DFS
Shoreline Erosion Control	ShoreEC	Protection of shoreline from excessive wave action by creating a marsh or an offshore structure such as a sill, breakwater or sand containment structure.	feet	DNREC, USFWS, DFS
Soil Conservation and Water Quality Plans	ConPlan	Farm conservation plans are a combination of agronomic, management and engineered practices that protect and improve soil productivity and water quality, and to prevent deterioration of natural resources on all or part of a farm. Plans may be prepared by staff working in conservation districts, natural resource conservation field offices or a certified private consultant. In all cases the plan must meet technical standards.	acres	NRCS, FSA

BMP	BMP Short Name	BMP Description	Unit	Data Source
Stream Access Control with Fencing	PastFence	<p>Stream access control with fencing involves excluding a strip of land with fencing along the stream corridor to provide protection from livestock. The fenced areas may be planted with trees or grass, or left to natural plant succession, and can be of various widths. To provide the modeled benefits of a functional riparian buffer, the width must be a minimum of 35 feet from top-of-bank to fence line. The implementation of stream fencing provides stream access control for livestock but does not necessarily exclude animals from entering the stream by incorporating limited and stabilized in-stream crossing or watering facilities. The modeled benefits of stream access control can be applied to degraded stream corridors in association with or without alternative watering facilities. They can also be applied in conjunction with or without pasture management systems such as prescribed grazing or PIRG. Alternative watering facilities typically involves the use of permanent or portable livestock water troughs placed away from the stream corridor. The source of water supplied to the facilities can be from any source including pipelines, spring developments, water wells, and ponds. In-stream watering facilities such as stream crossings or access points are not considered in this definition.</p>	acres	NRCS, FSA

BMP	BMP Short Name	BMP Description	Unit	Data Source
Stream Protection without Fencing	Delaware definition only	This BMP requires the use of alternative drinking water sources away from streams. The BMP may also include options to provide off-stream shade for livestock, and implementing a shade component is encouraged where applicable. The hypothesis on which this practice is based is that, given a choice between a clean and convenient off-stream water source and a stream, cattle will preferentially drink from off-stream water source and reduce the time they spend near and in streams and streambanks. Alternative watering facilities typically involves the use of permanent or portable livestock water troughs placed away from the stream corridor. The source of water supplied to the facilities can be from any source including pipelines, spring developments, water wells, and ponds. In-stream watering facilities such as stream crossings or access points are not considered in this definition. The modeled benefits of alternative watering facilities can be applied to pasture acres in association with or without improved pasture management systems such as prescribed grazing or PIRG.	acres	NRCS, FSA
Streamside Forest Buffers	ForestBuffersTrp	Converts streamside areas to forest. In the model, converts degraded riparian pasture to hay without nutrients. Should be used with Stream Access Control with Fencing to convert from hay without nutrients to forest.	acres in buffers	NRCS, DNREC, DFS
Streamside Grass Buffers	GrassBuffersTrp	Converts degraded riparian pasture to hay without nutrients	acres in buffers	NRCS, DNREC, DFS

BMP	BMP Short Name	BMP Description	Unit	Data Source
Streamside Wetland Restoration	WetlandRestoreTrp	Converts degraded riparian pasture to forest.	acres	NRCS, DNREC, DFS
Streamside/Tax Ditch Restoration	Delaware definition only	A suite of innovative alternative practices designed to enhance the removable of nutrients once they leave the field. These include increasing vegetative buffers that protect ditches from sediment and nutrient runoff. This may include reengineering of drainage channels to reestablish floodplains or redirect storm flows to wetland areas.	linear feet	DNREC, DFS, USFWS, Conservation Districts
Tier 1 Crop Group Nutrient Application Management Efficiency Version	EffNutMan	The Crop Group Nutrient Application Management reflects operations with documentation for manure and/or fertilizer application management activities in accordance with basic land grant university (LGU) recommendations. This documentation should support farm-specific efforts to maximize growth by application of nitrogen and phosphorus with respect to proper nutrient source, rate, timing and placement for optimum crop growth consistent with LGU recommendations. Particular attention is paid to: 1) standard, realistic farm-wide yield goals; 2) credit of N sources (soil, sod, past manure and current year applications; 3) P application rates consistent with LGU recommendations based on soil tests for fields without manure; 4) N based application rates consistent with LGU recommendations for fields receiving manure.	acres	DDA

BMP	BMP Short Name	BMP Description	Unit	Data Source
Tree Planting	TreePlant	Tree planting includes any tree planting, except those used to establish riparian forest buffers, targeting lands that are highly erodible or identified as critical resource areas.	acres	NRCS, USFWS, DFS, DelDOT, DNREC
Triticale, Early, Aerial	CoverCropEAT	A winter triticale crop planted at least 2 weeks prior to the average frost date with an aerial seeding method . The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Triticale, Early, Aerial, After Soy	CoverCropEAST	A winter triticale crop planted following a soybean crop at least 2 weeks prior to the average frost date with an aerial seeding method. The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Triticale, Early, Drilled	CoverCropEDT	A winter triticale crop planted at least 2 weeks prior to the average frost date with a drilled seeding method. The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Triticale, Early, Other	CoverCropEOT	A winter triticale crop planted at least 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Triticale, Late, Drilled	CoverCropLDT	A winter triticale crop planted after the average first frost date with a drilled seeding method. The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Triticale, Late, Other	CoverCropLOT	A winter triticale crop planted after the average first frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking).	acres	Conservation Districts

BMP	BMP Short Name	BMP Description	Unit	Data Source
		The crop may be neither fertilized nor harvested.		
Triticale, Normal, Drilled	CoverCropSDT	A winter triticale crop planted no more than 2 weeks prior to the average frost date with a drilled seeding method. The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Triticale, Normal, Other	CoverCropSOT	A winter triticale crop planted no more than 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Vegetative Environmental Buffers	Delaware definition only	Tree planting includes any tree planting, except those used to establish riparian forest buffers, targeting lands that are highly erodible or identified as critical resource areas.	acres	DDA, DNREC
Voluntary BMPs	Delaware definition only	A program to conduct farm assessments and inventory of voluntary conservation practices that have been installed but farmers and landowners, since 2005, but are not part of current data inventories.		DDA, DNREC
Water Control Structures	WaterContStruc	Installing and managing boarded gate systems in agricultural land that contains surface drainage ditches.	acres	DDA, DNREC, USFWS
Wetland Restoration	WetlandRestore	Agricultural wetland restoration activities re-establish the natural hydraulic condition in a field that existed prior to the installation of subsurface or surface drainage. Projects may include restoration, creation and enhancement acreage. Restored wetlands may be any wetland classification including forested, scrub-shrub or emergent marsh.	acres	NRCS, DDA, DNREC

BMP	BMP Short Name	BMP Description	Unit	Data Source
Winter Hardy Brassica, Early, Aerial	CoverCropEAHB	A winter brassica crop planted at least 2 weeks prior to the average frost date with an aerial seeding method . The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Winter Hardy Brassica, Early, Aerial, After Soy	CoverCropEASHB	A winter brassica crop planted following a soybean crop at least 2 weeks prior to the average frost date with an aerial seeding method . The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Winter Hardy Brassica, Early, Drilled	CoverCropEDHB	A winter brassica crop planted at least 2 weeks prior to the average frost date with a drilled seeding method. The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Winter Hardy Brassica, Early, Other	CoverCropEOHB	A winter hardy brassica crop planted at least 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvest	acres	Conservation Districts
Winter Hardy Oats, Early, Aerial	CoverCropEAHO	A winter hardy oats crop planted at least 2 weeks prior to the average frost date with an aerial seeding method . The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Winter Hardy Oats, Early, Aerial, After Soy	CoverCropEASHO	A winter hardy oats crop planted following a soybean crop at least 2 weeks prior to the average frost date with an aerial seeding method. The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Winter Hardy Oats, Early, Drilled	CoverCropEDHO	A winter hardy oats crop planted at least 2 weeks prior to the average frost date with a drilled seeding method . The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Winter Hardy Oats, Early, Other	CoverCropEOHO	A winter hardy oats crop planted at least 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk	acres	Conservation Districts

BMP	BMP Short Name	BMP Description	Unit	Data Source
		chopping or light disking). The crop may be neither fertilized nor harvested.		
Winter Hardy Oats, Normal, Drilled	CoverCropSDHO	A winter hardy oats crop planted no more than 2 weeks prior to the average frost date with a drilled seeding method. The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Winter Hardy Oats, Normal, Other	CoverCropSOHO	A winter hardy oats crop planted no more than 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvest	acres	Conservation Districts
Winter Killed Oats, Early, Aerial	CoverCropEAKO	A winter killed oats crop planted at least 2 weeks prior to the average frost date with an aerial seeding method. The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Winter Killed Oats, Early, Aerial, After Soy	CoverCropEASKO	A winter killed oats crop planted following a soybean crop at least 2 weeks prior to the average frost date with an aerial seeding method . The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Winter Killed Oats, Early, Drilled	CoverCropEDKO	A winter killed oats crop planted at least 2 weeks prior to the average frost date with a drilled seeding method . The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Winter Killed Oats, Early, Other	CoverCropEOKO	A winter killed oats crop planted at least 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvested.	acres	Conservation Districts
Agriculture Strategies on DNREC/DDA Lands	Delaware definition only	Agriculture strategies include adopting applicable actions and practices from the Chesapeake Bay Executive Order Section 502, including cover crops, on Publicly Owned	acres	DDA, DeIDOT,

BMP	BMP Short Name	BMP Description	Unit	Data Source
		Lands and maintained by DNREC, DDA, and DeIDOT.		DNREC
CAFO Setbacks	Delaware definition only	<p>Setbacks are defined as a specified distance from surface waters or potential conduits to surface waters where manure, litter, and process wastewater may not be land applied.</p> <p>CAFO owners or operators are prohibited from applying manure, litter, or process wastewater within 100 feet of any down gradient surface water or conduit surface water, or they must have a 35 foot vegetated buffer setback planted in accordance with the Vegetated Buffer Strip Technical Standard.</p>	acres	DDA

B10.2 – Data Management: BMPs for Forest Land Uses

DDA Forestry Harvesting - The DDA Delaware Forest Service (DFS) provides acreage of harvested forestland. DDA-DFS provides GIS coverage of permitted timber harvest practices in the Chesapeake Bay watershed. HUCs are identified using GIS by intersecting the Timber Harvest coverage with the USGS HUC12 coverage to determine the HUC 12 for each harvest area.

Historical Harvested Forest Data – DNREC-DWS-WAS and DDA-DFS worked collaboratively in the summer of 2013 to update forest harvest area data by digitizing harvested forest areas with ArcGIS. The digitization of these harvest areas are linked to an Access database containing all permit information, creating a spatial reference. Capturing this data will allow Delaware to report these historical harvested forest data for inclusion in the CBWSM. A complete methodology is listed in Appendix D.

B10.2.1 – List of Forest BMPs

BMP	BMP Short Name	BMP Description	Unit	Data Source
Forest Harvesting Practices	ForHarvestBMP	Forest harvesting practices are a suite of BMPs that minimize the environmental impacts of road building, log removal, site preparation and forest management. These practices help reduce suspended sediments and associated nutrients that can result from forest operations.	acres	DDA

B10.3 – Data Management: BMPs for Urban/Suburban Land Uses

DDA Urban Tree Planting – The DDA-DFS provides number of trees planted, by the Urban and Community Forestry Program, in Microsoft Word. The data is entered into Excel with unique identifier, implementation date, number of trees, and HUC.

DeIDOT Stormwater Practices – DNREC-DWS-WAS works with the approved DeIDOT contractor (KCI) to receive all DeIDOT stormwater practices. The contractor submits XML to DNREC-DWS-WAS and OIT for CBPO reporting.

DeIDOT Street Sweeping – DeIDOT compiles street sweeping data from roadways in New Castle and Kent Counties. Pollutant loads are calculated using the mass loading approach outlined in the Chesapeake Urban Stormwater Workgroup’s recommendations memo (<http://chesapeakestormwater.net/wp-content/uploads/downloads/2012/06/CBP-Expert-Panel-Memo-on-Street-Sweeping.pdf>).

DNREC Onsite Wastewater Practices – Data are pulled from the Delaware Environmental Network (DEN). WAS works with OIT to extract data inputted into DEN by the GWDS. Information is compiled for septic connections, septic pumping, and septic inspections and OIT creates XML for CBPO reporting.

DNREC Stormwater Practices - Data are pulled from the MudTracker Database. DNREC-DWS-WAS works with OIT to extract data inputted into MudTracker by the DNREC-DWS-SSW. OIT compiles all stormwater practice BMPs and creates XML for CBPO reporting.

DNREC Septic System and Abandonment - DNREC WAS and GWDS worked collaboratively in November 2013 to update septic system connection data with ArcGIS. The digitization of these septic connections is linked to the Delaware Environmental Navigator database containing all permit information, creating a spatial reference. A complete methodology is listed in Appendix E.

B10.3.1 – List of Urban/Suburban and Septic BMPs

BMP	BMP Short Name	BMP Description	Unit	Data Source
Septic Connection	SepticConnect	This is when septic systems get converted to public sewer. This reduces the number of systems because the waste is sent into the sewer and treated at a wastewater treatment plant.	systems	DNREC
Septic Denitrification	SepticDenitrify	Septic denitrification represents the replacement of traditional septic systems with more advanced systems that have additional nitrogen removal capabilities. Traditional septic systems usually consist of a large tank designed to hold the wastewater allowing grits and solids time for settling and decomposition. Wastewater then flows to the second component, the drainfield. An enhanced septic system like that shown can provide further treatment of nitrogen through processes that encourage denitrification of the wastewater.	systems	DNREC
Septic Pumping	SepticPump	Septic systems achieve nutrient reductions through several types of management practices, including frequent maintenance and pumping. On average, septic tanks need to be pumped once every three to five years to maintain effectiveness. The pumping of septic tanks is one of several measures that can be implemented to protect soil absorption systems from failure. When septic tanks are pumped and sewage removed, the septic system's capacity to remove settleable and floatable solids from wastewater is increased.	systems	DNREC

Bioretention/raingardens - A/B soils, no underdrain	BioRetNoUDAB	An excavated pit backfilled with engineered media, topsoil, mulch, and vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and biochemical reactions within the soil matrix and around the root zones of the plants. This BMP has no underdrain and is in A or B soil.	acres treated	DNREC, Conservation Districts
Bioretention/raingardens - A/B soils, underdrain	BioRetUDAB	An excavated pit backfilled with engineered media, topsoil, mulch, and vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and biochemical reactions within the soil matrix and around the root zones of the plants. This BMP has an underdrain and is in A or B soil.	acres treated	DNREC, Conservation Districts
Bioretention/raingardens - C/D soils, underdrain	BioRetUDCD	An excavated pit backfilled with engineered media, topsoil, mulch, and vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and biochemical reactions within the soil matrix and around the root zones of the plants. This BMP has an underdrain and is in C or D soil.	acres treated	DNREC, Conservation Districts
Bioswale	BioSwale	With a bioswale, the load is reduced because, unlike other open channel designs, there is now treatment through the soil. A bioswale is designed to function as a bioretention area.	acres treated	DNREC

Dry Detention Ponds and Hydrodynamic Structures	DryPonds	Dry Detention Ponds are depressions or basins created by excavation or berm construction that temporarily store runoff and release it slowly via surface flow or groundwater infiltration following storms. Hydrodynamic Structures are devices designed to improve quality of stormwater using features such as swirl concentrators, grit chambers, oil barriers, baffles, micropools, and absorbent pads that are designed to remove sediments, nutrients, metals, organic chemicals, or oil and grease from urban runoff.	acres treated	DNREC
Dry Extended Detention Ponds	ExtDryPonds	Dry extended detention (ED) basins are depressions created by excavation or berm construction that temporarily store runoff and release it slowly via surface flow or groundwater infiltration following storms. Dry ED basins are designed to dry out between storm events, in contrast with wet ponds, which contain standing water permanently. As such, they are similar in construction and function to dry detention basins, except that the duration of detention of stormwater is designed to be longer, theoretically improving treatment effectiveness.	acres treated	DNREC
Erosion and Sediment Control	EandS	Erosion and sediment control practices applied to construction land. Acres in excess of available construction land rolls to other urban land uses. Protects water resources from sediment pollution and increases in runoff associated with land development activities. By retaining soil on-site, sediment and attached nutrients are prevented from leaving disturbed areas and polluting streams.	acres treated	DNREC
Impervious Urban	ImpSurRed	Reducing impervious surfaces to promote infiltration and percolation of runoff storm	acres	DNREC

Surface Reduction		water.		
Permeable Pavement w/ Sand, Veg. - A/B soils, no underdrain	PermPavSVNoUDAB	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has no underdrain, has sand and/or vegetation and is in A or B soil.	acres treated	DNREC
Permeable Pavement w/ Sand, Veg. - A/B soils, underdrain	PermPavSVUDAB	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, has sand and/or vegetation and is in A or B soil.	acres treated	DNREC
Permeable Pavement w/ Sand, Veg. - C/D soils, underdrain	PermPavSVUDCD	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, has sand and/or vegetation and is in C or D soil.	acres treated	DNREC
Permeable Pavement w/o Sand, Veg. - A/B soils, no underdrain	PermPavNoSVNoUDAB	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has no	acres treated	DNREC

underdrain, no sand or vegetation and is in A or B soil.

Permeable Pavement w/o Sand, Veg. - A/B soils, underdrain	PermPavNoSVUDAB	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, no sand or vegetation and is in A or B soil.	acres treated	DNREC
Permeable Pavement w/o Sand, Veg. - C/D soils, underdrain	PermPavNoSVUDCD	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, no sand or vegetation and is in C or D soil.	acres treated	DNREC
Shoreline Erosion Control	ShoreEC	Protection of shoreline from excessive wave action by creating a marsh or an offshore structure such as a sill, breakwater or sand containment structure.	feet	DeIDOT, DNREC
Street Sweeping 25 times a year-acres (formerly called Street Sweeping Mechanical Monthly)	StreetSweep	Street sweeping conducted on a twice monthly basis. The regularity of the street sweeping and reduces nitrogen, phosphorus, and sediment whereas less regular street sweeping reduces only sediment. The same street must be swept 25 times a year. The acres submitted are for the area of streets that are swept.	acres	DeIDOT

Street Sweeping 25 times a year-lbs	StreetSweepLbs25x	Street sweeping conducted on a twice monthly basis. The regularity of the street sweeping and reduces nitrogen, phosphorus, and sediment whereas less regular street sweeping reduces only sediment. The same street must be swept 25 times a year. The lbs submitted are for the lbs of material picked up by the sweeper. These lbs of material are the lbs of TSS removed. The TN reduction is 0.00175 of the TSS. The TP reduction is 0.0007 of the TSS.	lbs	DeIDOT
Street Sweeping Pounds	StreetSweepLbs	Street sweeping measured by the weight of street residue collected. Street sweeping and storm drain cleanout practices rank among the oldest practices used by communities for a variety of purposes to provide a clean and healthy environment, and more recently to comply with their National Pollutant Discharge Elimination System stormwater permits. The ability for these practices to achieve pollutant reductions is uncertain given current research findings. Only a few street sweeping studies provide sufficient data to statistically determine the impact of street sweeping and storm drain cleanouts on water quality and to quantify their improvements. The ability to quantify pollutant loading reductions from street sweeping is challenging given the range and variability of factors that impact its performance, such as the street sweeping technology, frequency and conditions of operation in addition to catchment characteristics. Fewer studies are available to evaluate the pollutant reduction capabilities due to storm drain inlet or catch basin cleanouts.	lbs	DeIDOT

Urban Filtering Practices	Filter	Practices that capture and temporarily store runoff and pass it through a filter bed of either sand or an organic media. There are various sand filter designs, such as above ground, below ground, perimeter, etc. An organic media filter uses another medium besides sand to enhance pollutant removal for many compounds due to the increased cation exchange capacity achieved by increasing the organic matter. These systems require yearly inspection and maintenance to receive pollutant reduction credit.	acres treated	DNREC, DeIDOT
Urban Forest Buffers	ForestBufUrban	An area of trees at least 35 feet wide on one side of a stream, usually accompanied by trees, shrubs and other vegetation that is adjacent to a body of water. The riparian area is managed to maintain the integrity of stream channels and shorelines, to reduce the impacts of upland sources of pollution by trapping, filtering, and converting sediments, nutrients, and other chemicals.	acres in buffers	DDA, DNREC
Urban Grass Buffers	UrbGrassBuffers	This BMP changes the land use from pervious urban to pervious urban. Therefore, there is no change and no reduction from using this BMP.	acres in buffers	DDA, DNREC
Urban Infiltration Practices w/o Sand, Veg. - A/B soils, no underdrain	Infiltration	A depression to form an infiltration basin where sediment is trapped and water infiltrates the soil. No underdrains are associated with infiltration basins and trenches, because by definition these systems provide complete infiltration.	acres treated	DeIDOT, DNREC

Urban Nutrient Management Plan	UrbanNMPlan	<p>An urban nutrient management plan is written, site-specific plan which addresses how the major plant nutrients (nitrogen, phosphorus and potassium) are to be annually managed for expected turf and landscape plants and for the protection of water quality. The goal of an urban or turf and landscape nutrient management plan is to minimize adverse environmental effects, primarily upon water quality, and avoid unnecessary nutrient applications. It should be recognized that some level of nutrient loss to surface and groundwater will occur even by following the recommendations in a nutrient management plan. The impacts of urban nutrient management plans will differ from lawn-to-lawn depending on nutrient export risk factors. This BMP is the default for lawns with an unknown risk type.</p>	acres	DDA, DeIDOT
Urban Nutrient Management Plan High Risk Lawn	UrbanNMPlanHR	<p>An urban nutrient management plan is written, site-specific plan which addresses how the major plant nutrients (nitrogen, phosphorus and potassium) are to be annually managed for expected turf and landscape plants and for the protection of water quality. The goal of an urban or turf and landscape nutrient management plan is to minimize adverse environmental effects, primarily upon water quality, and avoid unnecessary nutrient applications. It should be recognized that some level of nutrient loss to surface and groundwater will occur even by following the recommendations in a nutrient management plan. The impacts of urban nutrient management plans will differ from lawn-to-lawn depending on nutrient export risk factors. This BMP is for lawns with a high risk of nutrient export.</p>	acres	DDA, DeIDOT

Urban Nutrient Management Plan Low Risk Lawn	UrbanNMPlanLR	An urban nutrient management plan is written, site-specific plan which addresses how the major plant nutrients (nitrogen, phosphorus and potassium) are to be annually managed for expected turf and landscape plants and for the protection of water quality. The goal of an urban or turf and landscape nutrient management plan is to minimize adverse environmental effects, primarily upon water quality, and avoid unnecessary nutrient applications. It should be recognized that some level of nutrient loss to surface and groundwater will occur even by following the recommendations in a nutrient management plan. The impacts of urban nutrient management plans will differ from lawn-to-lawn depending on nutrient export risk factors. This BMP is for lawns with a low risk of nutrient export.	acres	DDA, DeIDOT
Urban Stream Restoration	UrbStrmRest	Stream restoration in urban areas is used to restore the urban stream ecosystem by restoring the natural hydrology and landscape of a stream, help improve habitat and water quality conditions in degraded streams. The reduction is 0.2 lb nitrogen per foot, 0.068 phosphorus per foot, and 54.25 lbs sediment per foot .	feet	DeIDOT, DNREC
Urban Tree Planting; Urban Tree Canopy	UrbanTreePlant	Urban tree planting is planting trees on urban pervious areas at a rate that would produce a forest-like condition over time. The intent of the planting is to eventually convert the urban area to forest. If the trees are planted as part of the urban landscape, with no intention to covert the area to forest, then this would not count as urban tree planting	acres	DDA

Vegetated Open Channels - A/B soils, no underdrain	VegOpChanNoUDAB	Open channels are practices that convey stormwater runoff and provide treatment as the water is conveyed, includes bioswales. Runoff passes through either vegetation in the channel, subsoil matrix, and/or is infiltrated into the underlying soils. This BMP has no underdrain and is in A or B soil.	acres treated	DNREC
Vegetated Open Channels - C/D soils, no underdrain	VegOpChanNoUDCD	Open channels are practices that convey stormwater runoff and provide treatment as the water is conveyed, includes bioswales. Runoff passes through either vegetation in the channel, subsoil matrix, and/or is infiltrated into the underlying soils. This BMP has no underdrain and is in C or D soil.	acres treated	DNREC
Wet Ponds and Wetlands	WetPondWetland	A water impoundment structure that intercepts stormwater runoff then releases it to an open water system at a specified flow rate. These structures retain a permanent pool and usually have retention times sufficient to allow settlement of some portion of the intercepted sediments and attached nutrients/toxics. Until recently, these practices were designed specifically to meet water quantity, not water quality objectives. There is little or no vegetation living within the pooled area nor are outfalls directed through vegetated areas prior to open water release. Nitrogen reduction is minimal.	acres treated	DeIDOT, DNREC

Group C – Assessment and Oversight

C1 – Assessments and Response Actions

A variety of assessments are performed on the NPS BMP data that is reported to the EPA-CBPO for inclusion in model scenario runs. Depending on the type of BMP, field assessments may be performed and implementing organizations are responsible for ensuring that reported BMPs have indeed been installed. Procedures are in place for verifying implementation when cost share or permits are involved. Funding from the Regulatory and Accountability grant helps to ensure that adequate staff and resources are available to inspect the upkeep and maintenance of long-term BMPs, such as stormwater ponds, on a regular basis rather than only if a problem is reported. Inspection frequencies can be found in Appendix A. If a BMP is found to be unsatisfactorily installed or maintained, cost share funds may be recouped if the BMP is not brought into compliance. In addition to field inspections, BMP data is regularly assessed by the Quality Assurance Manager to determine status and trends. This analysis will review any anomalies, errors, or questionable levels of implementation.

C2 – Reports to Management

Status and trends assessments of BMP implementation levels by the Quality Assurance Manager are done annually as data is submitted, prepared, and reported to the EPA-CBPO. If anomalies, errors, or questionable levels of implementation are suspected, the Quality Assurance Manager will work directly with implementing organizations to verify and validate reported data.

Group D – Data Validation and Usability

D1 – Data Review, Verification, and Validation

It is the responsibility of the implementing organization to verify that all data reported to the DNREC-DWS-WAS is complete, correct, and complies with all rules and policies of that organization. The independent Quality Assurance Manager conducts an additional review of compiled NPS BMP data for completeness, anomalies, errors, or questionable levels of implementation through a status and trends evaluation as a validation procedure.

D2 – Verification and Validation Methods

During the Quality Assurance Manager's validation procedure, implementation levels over time and implementation rates in relation to the availability of funds will be evaluated. If implementation levels do not show an increase over time or match the level of funds invested, this may suggest that an error or change in reporting procedure has occurred and requires rectifying. The Quality Assurance Manager will work directly with the implementing organization to review raw data and their verification procedures to ensure complete and accurate data.

D3 – Reconciliation with User Requirements

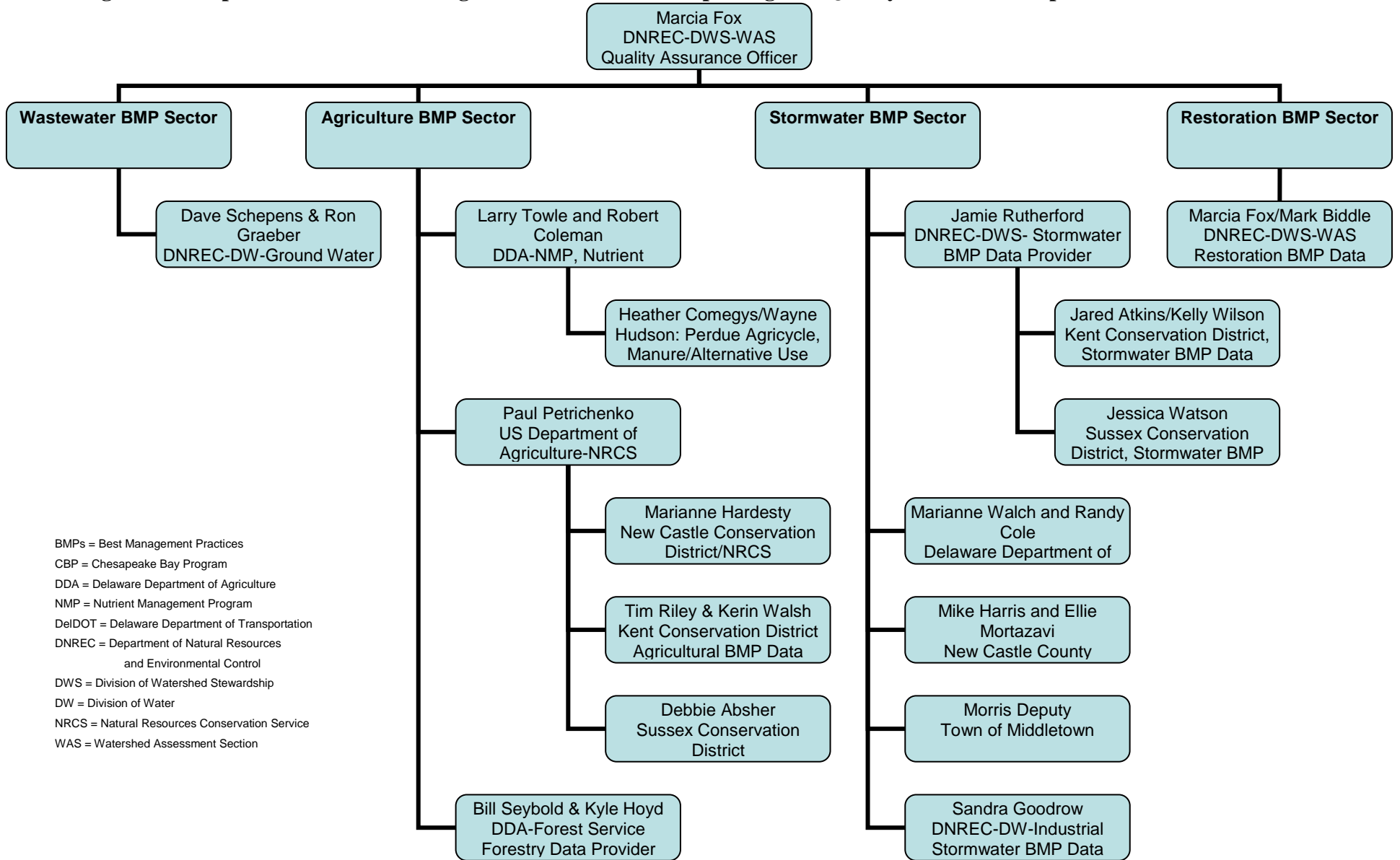
The collection, tracking, and reporting of NPS BMP data is done to assess progress toward reaching water quality goals, including both State of Delaware prescribed TMDL reductions for nutrients and bacteria as well as EPA's TMDL reductions for nutrients and sediment. The data is ultimately used in watershed and water quality models to project progress toward meeting goals to inform decision makers, so it is imperative that data is collected and reported in a usable format.

Uncertainties in the data likely do exist and may result from input errors, inconsistent data input and management procedures, and uncoordinated reporting requirements. The transition to the NEIEN reporting system will streamline the reporting process and will result in use of agreed upon data entry fields to minimize data entry errors, standardize data input and management procedures, and unify reporting from multiple agencies. Previous sections in this QAPP provide details on the multiple quality assurance measures that DNREC-DWS-WAS undergoes to develop, track, and report quality BMP implementation data.

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Figure 1. Nonpoint Source Best Management Practice Data Reporting and Quality Assurance Responsibilities



BMPs = Best Management Practices
 CBP = Chesapeake Bay Program
 DDA = Delaware Department of Agriculture
 NMP = Nutrient Management Program
 DelDOT = Delaware Department of Transportation
 DNREC = Department of Natural Resources
 and Environmental Control
 DWS = Division of Watershed Stewardship
 DW = Division of Water
 NRCS = Natural Resources Conservation Service
 WAS = Watershed Assessment Section

Appendix A
BMP Assessment for Delaware

Appendix B
Irrigated Land Methodology

Appendix C
Water Control Structure Methodology

Appendix D
Forest Harvesting Methodology

Appendix E
Septic Connection Methodology

REPORT

DELAWARE STATEWIDE BEST MANAGEMENT PRACTICES DATABASE ASSESSMENT



- Division of Soil & Water Conservation
- Division of Water Resources

URS

1200 Philadelphia Pike
Wilmington, DE 19809
302-791-0700

January 25, 2008

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APPENDICES

1. Interview Questionnaire	
2. Interview Summaries	

In the spring of 2007, URS was contracted by the Delaware Department of Natural Resources and Environmental Control (DNREC) to perform an assessment of Best Management Practice (BMP) data collection throughout the state. The objective of the assessment was to determine how best to combine statewide BMP data into a single system that could be used within DNREC, and possibly externally to assist in the tracking and maintenance of BMPs. The project initially began with the Division of Soil and Water Conservation, and was soon expanded to include the Division of Water Resources. While this effort involved two separate contracts, the results are presented in this joint report due to the similarities between the two efforts.

During the summer and early fall of 2007, URS met with Delegated Agencies of the Division of Soil and Water Conservation and organizations that report BMP information to the Division of Water Resources. A standard questionnaire was used during each interview (Appendix 1) and results were tabulated in a Microsoft Access database for review and reporting purposes. Focused on the overall objective of the assessment, the questionnaire contained four sections and was designed to achieve the following:

- 1) Determine the types of BMP information currently collected throughout the state.
- 2) Determine how BMP information is stored and maintained.
- 3) Identify restrictions, limitations, and concerns regarding the sharing of data.
- 4) Identify what hardware and software is currently in use by managers of BMP information.

Interview results from each meeting are contained Appendix 2 of this report. The Points of Contact of the Soil and Water Conservation Delegated Agencies are identified in Table 1. Table 2 identifies the Points of Contact of Reporting Agencies for the Water Resources portion of the project.

In a general sense, BMPs that fall under the oversight of one of the Delegated Agencies of the Division of Soil and Water Conservation tend to be project related and are physical features that can be visited in the field and inspected. These BMPs include, but are not limited to, wet ponds, dry ponds, infiltration trenches / basins, filter strips, bio-retention areas, bio-swales, sand filters, sediment forebays, and check dams. In most cases these BMPs are inspected on a regular basis. The method of data storage does vary significantly from Delegated Agency to Delegated Agency however.

Each Delegated Agency, with the exception of the City of Wilmington, was interviewed. Numerous attempts were made to meet with representatives from the City, however a meeting was unable to be scheduled.

BMPs that fall under the oversight of the Division of Water Resources tend to be programmatic and geographic in nature. These BMPs are less likely to be discrete features that can be located in the field and do not lend themselves to a regular inspection program. Instead, these BMPs consist of the collection and tracking of information regarding the use and condition of lands throughout the state, and lend themselves to the

creation of Geographic Information Systems (GIS) shapefiles. Example BMPs include the tracking of manure management plans, the monitoring of forest preservation plans, and the monitoring of groundwater discharges and agricultural land use.

For purposes of this report, the results of the interview process are presented in two sections, one for the Division of Soil and Water Conservation and one for the Division of Water Resources. While the findings are similar, this format will allow each Division to better assess its BMP data collection process, requirements and needs.

TABLE 1: Points of Contact (Soil and Water Conservation)

<i>Reporting Agency</i>	<i>POC: Primay POC: Secondary</i>	<i>Phone: Primary POC Phone: Secondary POC</i>	<i>Email: Primary POC Email: Secondary POC</i>
City of Newark	Mike Sistik Kelley Dinsmore	(302) 366-7040 (302) 366-7040	pwoperations@newark.de.us kdinsmore@newark.de.us
DeIDOT	Vince Davis Wendy Polasko	(302) 760-2180 (302) 760-2542	Vince.Davis@state.de.us Wendy.Polasko@state.de.us
DNREC	Jamie Rutherford	(302) 739-9921	Jamie.Rutherford@state.de.us
Kent Conservation District	Jared Adkins	(302) 741-2600	Jared.adkins@state.de.us
New Castle Conservation District	Don Nichols	(302) 832-3100	N/A
New Castle County	Mike Harris Ellie Mortazavi	(302) 395-5806 (302) 395-5802	MHarris@nccde.org EMortazavi@nccde.org
Sussex Conservation District	Jessica Watson	(302) 856-7219	Jessica.Watson@state.de.us
Town of Middletown	Morris Deputy	(302) 378-9120	mdeputy@middletownde.org

TABLE 2: Points of Contact (Water Resources)

<i>Reporting Agency</i>	<i>POC: Primary POC: Secondary</i>	<i>Phone: Primary POC Phone: Secondary POC</i>	<i>Email: Primary POC Email: Secondary POC</i>
Delaware Department of Agriculture: Forest Service	Glenn Gladders	(302) 698-4553	Glenn.gladders@state.de.us
Delaware Department of Agriculture: Nutrient Mgmt Comm	Steve Hollenbeck	(302) 698-4500	Steven.hollenbeck@state.de.us
Delaware Department of Agriculture: Nutrient Mgmt Plans	Bob Coleman	(302) 698-4556	Robert.coleman@state.de.us
DNREC: 319 Program	Mark Hogan	(302) 739-9922	Mark.hogan@state.de.us
DNREC: Coastal Program	Marcia Fox	(302) 739-9282	Marcia.fox@state.de.us
DNREC: Groundwater Discharges	Dave Schepens Ron Graeber	(302) 739-9948 (302) 739-9948	Dave.schepens@state.de.us Ronald.Graeber@state.de.us
Kent Conservation District	Tim Riley Paula Long	(302) 741-2600 (302) 741-2600	Timothy.riley@state.de.us Paula.long@state.de.us
NCCD (NRCS)	Marianne Hardesty	(302) 832-3100	Marianne.hardesty@de.usda.gov
Perdue Agricycle	Heather Comegys Wayne Hudson	(302) 943-2732 (410) 543-3919	Heather.comegys@perdue.com Wayne.hudson@perdue.com
Sussex Conservation District	Debbie Absher	(302) 856-3990	Debbie.Absher@de.nacdnet.net

Division of
Soil
&
Water
Conservation

Existing BMP Data

To gain an understanding of the types of BMP data currently collected, Delegated Agencies were asked to describe the types of BMPs that they maintain, whether the BMPs are regularly inspected, and the inspection periodicity. All but two of the Delegated Agencies, the Town of Middletown and the Sussex Conservation District, maintain an inventory of their BMPs. The Town of Middletown has a planner on staff and has set as a goal the development of a BMP inventory. The Sussex Conservation District is currently working with DNREC to develop a project tracking database that will have as a component a BMP inventory.

The type of data collected varies widely and only three of the Delegated Agencies inspect BMPs on a regular basis (typically yearly). DelDOT currently maintains two sets of inspection data. The first (structure) is data that is static, and not expected to change. This includes classification, dimensions, material, etc. The second (inspection) is expected to change over time, and a historical record is maintained.

Historical data provides a valuable history of not only the performance of a BMP but also changes in BMP condition over time. All but three of the Delegated Agencies maintain some form of historical data, however in many cases it is not maintained in an electronic format. The City of Newark for instance stores BMP data in a Microsoft Excel spreadsheet, and only maintains current data in an electronic format. Historical inspection reports are maintained by the City in a paper format. As a comparison, DelDOT stores historical data electronically, and does not overwrite any data.

An inventory, along with historical records, provides valuable data for the assessment of BMP condition and performance; however, this does not provide a complete picture of the individual BMP. Spatial data, combined with photographs, provide a convenient means to locate BMPs and review them without having to go into the field. Spatial data allows an individual to locate a BMP in relation to its surroundings and better assess the area that it treats. Digital photographs provide a visual record of conditions at the time of inspection and aid in identifying trends in BMP condition and performance over time. Only four of the Delegated Agencies maintain spatial data and photographs. As with other data, there is variation between the Delegated Agencies in how they collect spatial data and tie photos to the overall inventory. DelDOT surveys the perimeter of each BMP while New Castle County, the Kent Conservation District, and the City of Newark survey the outlet of the BMP. Finally, not all inventories have photos directly linked to inspection data.

Table 3 summarizes the data collected by the Delegated Agencies.

Storage, Display and Maintenance of Data

In order to develop a composite BMP database, DNREC must know not only what data is collected, but also how it is stored. In addition, each Delegated Agency is a stakeholder in the BMP data process and will play a role in how the composite database is maintained

and updated. For this reason, attention was paid to the concerns of each Delegated Agency regarding the maintenance of BMP data.

Depending on the Delegated Agency, BMP data is stored in paper format, spreadsheets, one of several database systems, and in one case, Hansen. Only three Delegated Agencies link BMP data to a Graphical User Interface (GUI). In each case, an ESRI software product is used. It is important to note that although different software and database systems are in use, it will be possible to combine all the electronic data into a single database. The key is to have an electronic format, either as a database, spreadsheet or shapefile to allow for the conversion of data.

The final format of a composite BMP system will impact how data is maintained by the individual Delegated Agencies. When asked their preference for data maintenance (in-house or by an outside entity) there was near unanimous agreement that data should be maintained and updated locally and then forwarded to DNREC for inclusion in the composite BMP system. The two main concerns are network security and data integrity. Each Delegated Agency maintains their own computer network and from a security perspective would not be willing allow outside entities access. In addition, each Delegated Agency feels that they have the greatest understanding of their BMPs and inspection processes and thus prefer to maintain control of their data. There was little hesitation in terms of providing DNREC with periodic data updates for a composite BMP database.

Table 4 summarizes the storage, display and maintenance of BMP data.

Data Sharing

There is little concern among the Delegated Agencies about sharing Soil and Water Conservation BMP data. While some feel that a Freedom of Information Act (FOIA) request might be needed, the only real limitation is the resources needed to pull data together. There was some concern that the size of files, especially if digital photographs are included, could pose a problem with data transfer. There are a variety of alternatives available for the transfer of large data files, thus it is not likely that this will be a problem.

When asked how they envision shared BMP data in a composite system being used, a variety of items were mentioned including:

- A planning tool to help determine maintenance needs
- Support of watershed assessments
- PCS / TMDL development
- A tool to help monitor and assess BMP performance, and what other areas are doing

Table 5 summarizes the perceived issues involved with the sharing of BMP data.

Hardware and Software

Although the Division of Soil and Water Conservation initially intends to use the composite BMP database for internal purposes only, the possibility of it being made available to the Delegated Agencies does exist. In addition, the Delegated Agencies will be tasked with provided data updates to the composite system on a regular basis. For this reason, it is important to have an understanding of the comfort level each stakeholder has with key software and the IT resources that they have in place. The final portion of the interview focused on these areas and the results are summarized in Table 6.

Recommendations

BMP data collected by Delegated Agencies of the Division of Soil and Water relates to a common set of structures that are located in the field. For this reason, it will be beneficial to standardize data collection, processing and reporting. During the interview process it became apparent that specific guidance from DNREC would be desirable. This guidance would help to ensure that common data is collected allowing BMPs data collected and maintained by different Delegated Agencies to be compared and displayed in a common format.

To achieve this, the following steps should be taken:

- 1. Develop a standard set of inspection forms to be used by each Delegated Agency.*
- 2. Standardize the method by which photographs and spatial data is collected.*
- 3. Develop a standard format for the storage of BMP data.*
- 4. Develop a standard export format for BMP data to allow easy assimilation into the composite database.*

Each step is discussed in greater detail below.

- 1. Develop a standard set of inspection forms to be used by each Delegated Agency.*

The nine Delegated Agencies all have the same requirements in terms of BMP maintenance and data collection. There is, however, a significant variation in the way each has chosen to implement their individual BMP monitoring program. In order to bring data from each Delegated Agency together it will have to be standardized. Not only does each need to look at a given BMP and ask the same questions, the answer needs to be standardized as well. The development of a standard set of BMP inspection forms will accomplish this.

Many of the Delegated Agencies have developed inspection forms that they are comfortable working with. While they do vary from one another, there is commonality which should be used as a starting point in the development of a common inspection form. By starting with existing forms, not only will changes be minimized, but the best aspects of each can be maintained and the individual Delegated Agencies will be more involved in the process and thus be able to add the value of their own experiences.

In addition to the different forms currently in use, there are differences in the depth of inspection. The development of a common inspection form implies the establishment of a minimum standard for inspection. While it is important to establish inspection requirements, it may not be reasonably feasible to achieve them right away. It would be reasonable to set an inspection standard, with a regular periodicity, and expect that the required level of data be collected within one inspection cycle. As an example the inclusion of the specific watershed that a BMP resides in could be accomplished over the next inspection cycle. Additional data, such as the drainage area served by a BMP should also be added as time and resources allow.

Finally, to minimize subjectivity and increase standardization, pre-defined selection lists should be established for each inspection point. This will ensure that data collected throughout the state can be compared regardless of who performed the inspection or where and when it occurred. In addition, set selection lists will add validity to condition assessments making sure that good is good and fair is fair.

2. Standardize the method by which photographs and spatial data is collected.

Currently available GPS survey equipment makes the collection of spatial data easy and reasonably cost-effective. Within a few seconds, a point can be located in the field, surveyed and added to a shapefile. The issue is what to actually survey in the field. While it is quite feasible to walk the perimeter of a pond and the line of a swale and actually survey the shape of the feature, this does not represent what many of the Delegated Agencies have done. To balance usefulness of data with cost of collection, the outfall of each BMP should be used as the survey point.

The outfall will locate the BMP in relation to its surroundings and provide a point to tie inspection data with photographs for a complete Graphical User Interface. In addition, many of the Delegated Agencies have already surveyed the outfall of their BMPs making this a reasonable common point. The survey of additional points such as drainage into the BMP, defects and the shape should not, however, be discouraged.

A series of photographs of each BMP should be collected to include landscape photos to show the overall BMP and its surroundings. Key features including the outfall and any defects should also be photographed. By numbering each photo with the unique identifier of the BMP, the photos and inspection data will be able to be linked in the final database.

3. Develop a standard format for the storage of BMP data.

BMP data is stored in different formats by the various Delegated Agencies. It is not necessary to require each to change to a common program (for example Microsoft Access). Instead, the data structure and naming of fields and columns must be standardized to allow data from different Delegated Agencies to be converted and stored in a common database. With each Delegated Agency maintaining BMP data, using the

same data structure processes to upload data into a common database can be put in place and common report formats developed.

4. *Develop a standard export format for BMP data to allow easy assimilation into the composite database.*

With standard data collection practices in place and a standardized data storage structure developed, processes can then be created to streamline the export and subsequent combination of BMP data. Data, once in an electronic format, can be converted from one format to another. In order to work with the greatest common factor, data should initially be delivered to DNREC in a Microsoft Excel format. Whether a Delegated Agency chooses to store data as a shapefile, or one of many database formats, an Excel file can be created and used to load data into the composite BMP database.

In addition to a standard export file, standard reports can be developed for submission to DNREC. Standard reporting has the potential to simplify the reporting process for the Delegated Agencies and will provide data to DNREC in a regular format allowing for comparison of different BMPs.

TABLE 3: Existing BMP Data (Soil and Water Conservation)

<i>Organization</i>	<i>BMPs Maintained</i>	<i>Inventory</i>	<i>BackGround Data</i>	<i>Regular Inspection</i>	<i>Inspection Frequency</i>	<i>Historical Data</i>	<i>Spatial Data</i>	<i>Photos</i>
City of Newark	Mostly extended detention basins, also have some ponds, bio-swales, bio-retention, sand filters, grass filter strips and structural BMPs. Some meet pre '91 regulations and some meet post '91 regulations.	Yes	No	Yes	Yearly	Yes	Yes	Yes
DelDOT	Wet ponds, dry ponds, infiltration trenches / basins, filter strips, bio-retention areas, bio-swales, sand filters, sediment forebays, check dams.	Yes	Yes	Yes	Under Development	Yes	Yes	Yes
DNREC	DNREC has statewide responsibility for all state and federal projects (Schools, Post Offices, etc) as well as remediation sites and contaminated sites.	Yes	No	No	N/A	Yes	No	No
Kent Conservation District	Stormwater BMPs (ponds, infiltration, bio-infil, sand filters, etc). County, Municipal and private BMPs fall under the KCD (all of Kent County except for federal and state facilities)	Yes	No	Yes	Yearly	Yes	Yes	Yes
New Castle Conservation District	Provide E&S review for 9 municipalities (all except Wilmington, Newark & Middletown). Existing BMPs are a grey area because a lot of the responsibility lies with HOAs or the Town / City	Yes	No	No	N/A	No	No	No
New Castle County	Sand Filters, Infiltration, Bio-retention, Bio-swales, Recharge Basins, Underground Detention, Wetlands, and Ponds.	Yes	No	Yes	Yearly	Yes	Yes	Yes
Sussex Conservation District	The SCD does not maintain SW practices, they provide inspection services and technical support. SCD maintains a listing of projects by name, when approved. Plans would then need to be pulled to see what BMPs might be on a given site.	No	No	No	N/A	No	No	No

TABLE 3: Existing BMP Data (Soil and Water Conservation)

<i>Organization</i>	<i>BMPs Maintained</i>	<i>Inventory</i>	<i>BackGround Data</i>	<i>Regular Inspection</i>	<i>Inspection Frequency</i>	<i>Historical Data</i>	<i>Spatial Data</i>	<i>Photos</i>
Town of Middletown	Dry ponds, wet ponds, infiltration ponds, some structural (underground systems) swales, bio-retention	No	No	No	N/A	No	No	No

TABLE 4: BMP Data Storage (Soil and Water Conservation)

<i>Organization</i>	<i>How Data Is Stored</i>	<i>Where Data is Stored</i>	<i>Data Maintained By</i>	<i>Linked To GUI</i>	<i>GUI Software</i>	<i>Future Data Maintenance</i>
City of Newark	Excel spreadsheets (inspection data) ARC 8.3 (mapping)	Shared City network drive	Data: Mike Sistek & Kelley Dinsmore. Network: IT	Yes	ArcView 8.3	Would like to be able to make changes locally. Local update and storage w/ periodic updates made to DNREC
DelDOT	Oracle	DelDOT server in Dover	DelDOT OIT	Yes	ESRI based	DelDOT would prefer to maintain their data
DNREC	MS Access. It is being migrated to SQL server	DNREC Server	DNREC IT	No	N/A	DNREC would prefer to maintain data themselves.
Kent Conservation District	MS Access	KCD server in Dover	KCD Program Staff	No	N/A	No preference, as long as the data is accessible.
New Castle Conservation District	Paper project files	NCCD building	Don Nichols	No	N/A	No Comments
New Castle County	Hansen: General descriptive information. Oracle based GUI for specific BMP information.	NCC Government center	NCC IT staff	Yes	ArcView 9.x	In house data management has several advantages, but for technical problems an outside player would be helpful.
Sussex Conservation District	MS Access	SCD building in Georgetown	In house staff member with DNREC IT support	No	N/A	SCD would prefer to input and maintain the data, if there are problems then they can go to IT. They would want to be able to control their data
Town of Middletown	Paper files	Town building		No	N/A	Prefer to maintain BMP information locally (both inspections and the data) then upload to a separate system (outside of the Town's) for sharing and distribution. Security is the main concern (along with data integrity).

TABLE 5: BMP Data Sharing Limitations (Soil and Water Conservation)

<i>Organization</i>	<i>Sharing Limitations</i>	<i>How to Obtain BMP Data</i>	<i>Possible Stakeholder Use</i>
City of Newark	Connecting into City computers is not likely to occur. The City connects to the web through U of D, although a new system is in discussion.	Just ask. The spreadsheets and inspection forms were readily shared for this project. The photos and mapping files are too big to easily share.	Making all BMP data available to residents could cause problems. Perhaps make basic data available to all (locations and types) but specifics on condition and maintenance should not be shared. Newark is focused on what they own and maintain thus little interest in data out of Newark, except maybe for City fringe areas.
DeIDOT	A data request can be made, and DeIDOT will determine the need. A FOIA request may be needed.	Ask. DeIDOT would be able to release the data, although a spreadsheet with basic data would likely be provided first.	A planning tool to help determine maintenance needs. Display aerial photos and the user could look to see general data (approx size, year built, flow, drainage areas).
DNREC	There are limits on who can gain access (security). There are possible FOIA requirements as well due to the presence of correspondence.	Make a formal request, identify the data desired and DNREC would try to supply it.	Mainly internal requests, used for watershed assessments.
Kent Conservation District	None really exist	Request the data from the program manager	Not quite sure at this point
New Castle Conservation District	Has never been an issue. Nobody has ever really requested data from the NCCD. Sharing with state agencies is not an issue.	NCCD has not received any requests, however NCCD does reply to complaints.	NCCD does not feel that what the NCCD does lends itself to a computer application. NCCD focus is construction regulation. Once the BMP is built, maint & resp. falls to the HOA or town / city.
New Castle County	FOIA is a driver. The County likes to be consistent with distribution. Sharing with another government agency is not a problem. Many BMPs are owned by an HOA or Maint. Corp so there could be some privacy issues.	Make a FOIA request, there is a County employee who processes them	It would be helpful to have DeIDOTs drainage collection system relative to the BMPs available. That would help with TMDLs as stakeholders. NCC could see private groups using the system to look for work opportunities, and that could pose a headache for maintenance corps.
Sussex Conservation District	Don't really have any issues sharing BMP data with other agencies. SCD would not mind working with Mosquito Control to get a better idea of which BMPs are breeding mosquitos, and which are not	FOIA request	In support of PCS / TMDLs with info provided on nutrient loading and removal rates. Simplification of the reporting process. If data is made available to all who need it, less time may need to be spent generating reports.
Town of Middletown	Do not want to let people into their network. Just ask (FOIA) and the data can be provided. Middletown is autonomous and does not share data in a digital format.	Just ask	Provide the ability to see what others are doing, and how BMPs are performing. Look at maintenance practices and a comparison of facilities, this will help determine if Middletown is keeping up.

TABLE 6: Software (Soil and Water Conservation)

<i>Organization</i>	<i>Comfortable with MS Access</i>	<i>Comfortable with GIS Software</i>	<i>Current Software in Use</i>	<i>IT Staff</i>	<i>IT Staff Size</i>
City of Newark	Yes	Yes	Excell & ArcView 8.3	Yes	2 people
DelDOT	Yes	Yes	ESRI	Yes	70 - 80 people
DNREC	Yes	Yes	Access, some GIS for individual cases	Yes	
Kent Conservation District	Yes	Yes	MS Access, some GIS	No	Rely on DNREC IT
New Castle Conservation District	No	No	Currently not tracking data electronically	No	N/A
New Castle County	Yes	Yes	Hansen, vb.net, Oracle	Yes	15-30 people
Sussex Conservation District	Yes	Yes	MS Access	No	N/A
Town of Middletown	Yes	No	Currently not tracking data electronically.	Yes	1 full-time professional

Division of Water Resources

Existing BMP Data

To gain an understanding of the types of BMP data currently collected and forwarded to the Division of Water Resources, Reporting Agencies were asked to describe the types of BMPs that they maintain, whether the BMPs are regularly inspected, and the inspection periodicity. All but two of the Agencies, the Delaware Department of Agriculture (DDA): Forest Service and the Kent Conservation District reported having some type of BMP inventory. The DDA Forest Service did state, however, that BMP data is maintained on forest specific BMPs.

BMP data reported to the Division of Water Resources tends to be both programmatic and geographic in nature. The BMPs are programmatic in that they involve rules and regulations related to the use of land. Permits are granted, land use designations are made and it is data that is collected and stored. The data is geographic in that a permit is good for a specific parcel of land, a preservation plan sets aside specific land. Examples include forest preservation plans, agricultural cover crop data, and nutrient management planning. As a result, background information in terms of areas served, waste removal, and physical location is typically available.

The inspection frequency of BMPs varies widely and is dependent on the type of BMP. Many of the practices are programmatic and do not lend themselves to physical inspection. As an example it would be somewhat impractical from a resource perspective to visit each farm in Sussex County to assess the use of cover crops. Therefore, in some cases, inspections occur at the time a permit or application is submitted, while in other cases inspections are random and might even be administrative in nature.

Historical data provides a valuable history of not only the performance of a BMP but also changes in BMP condition over time. Each Reporting Agency interviewed maintains some form of historical data, however, there is some variation in the amount of historical data maintained, with the majority having historical data back to 2001.

An inventory, along with historical records, provides valuable data for the assessment of BMP condition and performance. However, this does not provide a complete picture of the individual BMP. Spatial data, combined with photographs provide a convenient means to locate BMPs and review them without having to go into the field.

Spatial data is particularly important when looking at the relationship of various programs and how they can combine to affect overall water quality in an area. The ability to view forest preservation plans, crop rotation and cover plans along with the location of more physical BMPs (i.e. ponds) greatly enhances the ability to assess, plan and manage various BMP practices. All but three of the interviewees reported having spatial BMP data. The three that do not maintain spatial data relate to agricultural land use that brings into question privacy issues. This is discussed in a later section on data sharing.

Only DNREC's Groundwater Discharge section and the New Castle and Kent Conservation Districts report having photos of BMPs. These agencies maintain more "physical" BMPs that can specifically be visited in the field. It would not be practical to maintain photos of every farm or track of forest in a preservation plan.

The Kent and Sussex Conservation Districts use the NRCS Toolkit to track BMP data and the Performance Review System (PRS) to generate reports. These are systems developed by the NRCS to track and maintain data on a national level. While it is not known at this time if DNREC would be allowed direct access to the system, it may be possible for reports to be generated and forwarded to the Division of Water Resources in an electronic format. This will need to be explored further with the local NRCS office in Delaware

Table 7 summarizes BMP data collected that is reported to the Division of Water Resources.

Storage, Display and Maintenance of Data

In order to develop a composite BMP database, DNREC must know not only what data is collected, but also how it is stored. In addition, each Reporting Agency is a stakeholder in BMP data process and will play a role in how the composite database is maintained and updated. For this reason, attention was paid to the concerns of each Reporting Agency regarding the maintenance of BMP data.

Depending on the Agency, BMP data is stored in paper format, spreadsheets, one of several database systems and in the case of the Kent and Sussex Conservation Districts, the NRCS Toolkit and PRS. Four of the 10 Agencies interviewed link BMP data to a Graphical User Interface (GUI), with two using ESRI software and two using PRS and Toolkit. It is important to note that although different software and database systems are in use, it will be possible to combine all the electronic data into a single database. The key is to have an electronic format, either as a database or spreadsheet, to allow for the conversion of data.

The final format of a composite BMP system will impact how data is maintained by the individual Reporting Agencies. When asked their preference for data maintenance (in-house or by an outside entity) there was near unanimous agreement that data should be maintained and updated locally and then forwarded to DNREC for inclusion in the composite BMP system. The two main concerns are network security and data integrity. Each agency maintains their own computer network and from a security perspective would not be willing to allow outside entities access. In addition, each Reporting Agency feels that they have the greatest understanding of their BMPs and inspection processes and prefer to maintain control of their data. There was little hesitation about providing DNREC with periodic data updates for a composite BMP database.

Table 8 summarizes the storage, display and maintenance of BMP data.

Data Sharing

Much of the BMP data is currently being reported to DNREC, thus there is little concern over sharing data with government agencies. If the data is to be made public, certain privacy issues will arise. A large amount of the BMP data is collected on agricultural practices and can thus be linked to individual farms and farmers. While data specific to a farm should be protected, there is general agreement that if data is provided on a watershed basis, and individual farmers are masked, then the data can be shared. In any case, a Freedom of Information Act (FOIA) request will likely be required.

Perdue Agricycle has an additional concern in that their list of farms served and the amount of product processed is also a client list. From a business perspective, they would not like to see their client list made public. They did agree, however, that if data about farms served is provided on a watershed basis, the issue would be avoided.

When asked how they envision BMP data in a composite system being used, a variety of items were mentioned including:

- An aid in the development of reports to DNREC. The system could consolidate information to simplify the reporting process.
- Support watershed assessments.
- Provide a data clearing house so data could be downloaded direct, instead of having to make a request to DNREC.
- Support the TMDL / PCS process by providing relevant data.

Table 9 summarizes the perceived issues involved with the sharing of BMP data.

Hardware and Software

Although it is initially intended that the Division of Water Resources will use the composite BMP database for internal purposes only, the possibility for it being made available to the general public does exist. In addition, the Reporting Agencies will be tasked with providing data updates to the composite system on a regular basis. For this reason, it is important to have an understanding of the comfort level each stakeholder has with key software and the IT resources that they have in place. The final portion of the interview focused on these areas and the results are summarized in Table 10.

Recommendations

Combining the BMP data collected and reported to the Division of Water Resources will be more complicated than for the Division of Soil and Water Conservation. There are three reasons for this:

- There is much more variation in the types of data collected. Some of the data is geographic in nature and is collected and maintained in a shapefile format. This

is the case for many of the forestry and crop management programs. Other data is collected in a tabular format and is stored in spreadsheets and data tables. This is the case for the nutrient management programs.

- Much of the BMP data relates to agricultural practices and there are concerns in the agricultural community with associating data with individual farms and farmers.
- Data that is collected and maintained by the Conservation Districts is managed within the NRCS Toolkit and Performance Review Systems (PRS). These systems are not integrated with state systems and further work will be required to determine what types of reports and data can be provided to DNREC.

With these limitations in mind, there are some steps that can be taken by DNREC to begin the process of developing a composite BMP database.

1. *Ensure that all available shapefile data is sent to DNRECs 319 Program*
2. *Encourage the attribution of watershed information to agricultural data*
3. *Work with the NRCS to determine what data can be released and what format it can be provided in.*

Each step is discussed in greater detail below.

1. *Ensure that all available shapefile data is sent to DNRECs 319 Program.*

Currently much of the BMP data that exists in shapefile format either resides with or is forwarded to DNRECs 319 Program. In addition to shapefile data for agricultural BMPs and forest preservation areas, the 319 Program also collects nutrient management data from the Department of Agriculture. The 319 Program could thus serve as the starting point in an effort to bring various BMP datasets together. By integrating data from DNRECs Groundwater Discharges Section and the NRCS it would be possible to create a multi-layered GIS that could be used to relate the various practices together and develop a more holistic view of water resource practices throughout the state.

2. *Encourage the attribution of watershed information to agricultural data.*

Privacy issues will likely remain a concern for as long as site specific data is collected on individual farms. While there is concern about releasing specific data on farms there is much less concern with making general data available. For example, the fact that there are 1,500 acres of farm land covered by nutrient management plans in a watershed would be acceptable, identifying the farms by name and address would not be. By tracking crop rotation, manure generation and other agricultural items at the watershed level, DNREC will be able to monitor and manage issues affecting water quality while the privacy of the agricultural community is maintained.

To accomplish this, a standard watershed breakdown must first be established. Next, watershed data must be made a part of the various data sets for the various agricultural BMPs. In this way DNREC will be able to track the number of manure capture devices

in watershed X, the acres of cover crop and watershed Y and the number of farms using manure recycling in watershed Z.

3. *Work with the NRCS to determine what data can be released and what format it can be provided in.*

The Conservation Districts, in coordination with the NRCS, collect a significant amount of data within the state. This information is then stored and managed using the NRCS Toolkit and Performance Review System. As of this report, there was not a lot of interaction between the NRCS and DNREC. To make use of this data, DNREC must engage the NRCS, determine what data is available, how it is stored and how it might be made available to DNREC.

With these initial steps in place, it will be possible to begin the integration of the various data sets and create a composite system to review all Water Resources BMP data in a single location. The challenge will continue to be that, unlike the Soil and Water Conservation BMPs that are all of a similar type, the Water Resources BMPs each represent a different program, with its own unique objectives and data sets.

TABLE 7: Existing BMP Data (Water Resources)

<i>Organization</i>	<i>BMPs Maintained</i>	<i>Inventory</i>	<i>BackGround Data</i>	<i>Regular Inspection</i>	<i>Inspection Frequency</i>	<i>Historical Data</i>	<i>Spatial Data</i>	<i>Photos</i>
Delaware Department of Agriculture: Forest Service	Forest Stewardship Plans (shapefiles); Timber Harvest Permitting (shapefiles); Urban Forestry Program (small component) reported as points vs areas because the areas are small (even though several trees might have been planted). All data is reported to DNREC's 319 Program.	No	Yes	No	N/A	Yes	Yes	No
Delaware Department of Agriculture: Nutrient Mgmt Comm	Poultry manure tracking. Poultry is the main contributor in DE. Manure shipping is tracked in an Access database. Shipping permits are submitted, the data is put into the d/b and later exported to Excel. In-state shipments are tracked by watershed. Out of state the source is tracked by watershed but not the destination.	Yes	Yes	Yes	As apps are submitted	Yes	No	No
Delaware Department of Agriculture: Nutrient Mgmt Plans	Nutrient Management Plan Program. All farms greater than 10 acres, or 8 animal units (~30,000 chicken) must submit a NMP. DDA reimburses farmers for the cost of the plans. Plans run in 3 year cycles, either 1 3-year plan, or 3 1-year plans.	Yes	Yes	Yes	Random admin. Reviews	Yes	No	No
DNREC: 319 Program	Cover Crop data (Kent & Sussex counties), CREP (Conservation Reserve Enhancement Program), Livestock BMPs (manure storage, incinerators, composters, animal waste handling, etc), Conservation reserve program.	Yes	Yes	Yes	Varies by program	Yes	Yes	No
DNREC: Coastal Program	The coastal program is a federal program that operates a little outside of the state agencies. They do not maintain any BMP data, and have turned tracking over to other groups.							
DNREC: Groundwater Discharges	On site waste water systems of all sizes (incl. spray irrigation): Over 80,000 on site septic systems, Several hundred > 2,500 gpd; Underground injection control program.	Yes	Yes	Yes	>2500 gpd: yearly	Yes	Yes	Yes

TABLE 7: Existing BMP Data (Water Resources)

<i>Organization</i>	<i>BMPs Maintained</i>	<i>Inventory</i>	<i>BackGround Data</i>	<i>Regular Inspection</i>	<i>Inspection Frequency</i>	<i>Historical Data</i>	<i>Spatial Data</i>	<i>Photos</i>
Kent Conservation District	The KCD does not really maintain BMP data on programs of their own. Instead, they support farmers that are tasked with meeting requirements. The data then goes to the appropriate agency to track.	No	Yes	Yes	varies by BMP	Yes	Yes	Yes
NCCD (NRCS)	Cover Crop Data, Horse Pastures and loading, No till Data, Some cost share from SWM, Some riparian buffers in urban areas, Filter Strips, Some E&S measures at the edge of Ag lands, Fragmites Control.		No	No	On construction & randomly	Yes	Yes	Yes
Perdue Agricycle	Tracks of the amount of waste taken from sites and the ultimate destination whether in or out of state. They serve most of the Kent and Sussex farming community (~1,400 farms.) PA does not have data on nutrient management plans, or if they are current. PA is told yes or no on if a plan exists, but not the expiration date.	Yes	Yes	No	N/A	Yes	No	No
Sussex Conservation District	SCD provides technical and financial assistance, they are not regulatory.	Yes	Yes	Yes	---		Yes	No

TABLE 8: BMP Data Storage (Water Resources)

<i>Organization</i>	<i>How Data Is Stored</i>	<i>Where Data is Stored</i>	<i>Data Maintained By</i>	<i>Linked To GUI</i>	<i>GUI Software</i>	<i>Future Data Maintenance</i>
Delaware Department of Agriculture: Forest Service	ARCView 9.2 & Access. Data is joined to the shapefiles.	Dover network & desktop.	Glenn Gladders	Yes	ARCView 9.2 and Access	Glenn would prefer to maintain and store the data locally.
Delaware Department of Agriculture: Nutrient Mgmt Comm	MS Access	DDA Network	Steve Hollenbeck	No	N/A	Centralized data storage would work better, with local updating and maintenance.
Delaware Department of Agriculture: Nutrient Mgmt Plans	MS Access & Excel	DDA network	Bob Coleman and Judy Burnes	No	N/A	DDA would prefer to maintain the data and provide updates as needed.
DNREC: 319 Program	ESRI with MS Access back-up	DNREC Network. Data on local drive.	DNREC IT	Yes	ArcGIS 9.x	Maintain in house, share the data.
DNREC: Coastal Program						
DNREC: Groundwater Discharges	MS Access, Adabase, file folders. Data being migrated to SQL server.	Dover & Georgetown	Groundwater Discharges section staff.	No	N/A	Dave would prefer for his group to manage and maintain the data, then upload it to a master system.
Kent Conservation District	File folders.	District facility	KCD staff	No	N/A	---
NCCD (NRCS)	Performance Review System (NRCS computer system).	National Server	NRCS IT	Yes	PRS/Toolkit	NRCS will maintain their data, then have it pulled. NRCS will not upload.
Perdue Agricycle	Exel spreadsheet	Perdue Agricycle facility	Perdue Agricycle staff	No	N/A	Perdue Agricycle would prefer internal management of data, especially since it is sensitive to the business practice and protection of customer base.
Sussex Conservation District	PRS & Toolkit	National server	NRCS IT	Yes	PRS/Toolkit	SCD would input data and maintain it. Problems go to IT, SCD wants to maintain control on their data.

TABLE 9: BMP Data Sharing Limitations (Water Resources)

<i>Organization</i>	<i>Sharing Limitations</i>	<i>How to Obtain BMP Data</i>	<i>Possible Stakeholder Use</i>
Delaware Department of Agriculture: Forest Service	The only requests for data come from the 319 program. It is reported at the watershed level. Individual land owners are masked in the report.	Likely no real issue with sharing data, but would like to know more. Individual names associated with data do not need to be made public.	To provide a method of mapping and reporting to DNREC.
Delaware Department of Agriculture: Nutrient Mgmt Comm	None identified, the data is already sent to the 319 Program on a regular basis.	Ask Steve Hollenbeck. Data is already sent to the 319 Program on a regular basis.	Looking at data on a watershed basis.
Delaware Department of Agriculture: Nutrient Mgmt Plans	Likely would need to remove names due to privacy concerns.	For DNREC and other state agencies they can call the NMC and ask for a report. For members of the general public, it would likely involve a FOIA request.	General watershed information. Bob does not see a need for individual farm info and acreage to be available, but tracking of the number of acreage in a watershed could be helpful.
DNREC: 319 Program	Mark does not like to give up point data for structural BMPs (privacy issue) however descriptive information is not a problem. Gov't groups: data sharing is not an issue.	Just ask Mark Hogan.	DNREC perform daily updates. An outside source would connect in to retrieve data and put it into a database that others can use. Thus, instead of going to Mark, parties would just go to the database.
DNREC: Coastal Program			
DNREC: Groundwater Discharges	No real restrictions. Tend to follow the lead of DNREC Water Resources. Sharing data with state agencies is not too big an issue.	Make a FOIA request. If the request for data is too large, the applicant may be asked to narrow it down.	Access based system with information to support the project at hand.
Kent Conservation District	Privacy Issues: farmers ID. FOIA request likely needed. If personal information is stripped out, it is ok to let the data go.	Likely see Mark Hogan (DNREC 319 Program), as the paper folders do not contain summary data.	Possibly adding photographs to the overall system.
NCCD (NRCS)	Specifics to a farm, by name or location is an issue, Can't give financial data, On a watershed basis, there are no issues with sharing data.	---	Tracking the acceptance of conservation practices, Calculations on nutrient management practice impacts, Input for state reports that need to be submitted.
Perdue Agricycle	Perdue Agricycle is concerned about what type of data is potentially made public as it is essentially a customer list. Data on manure removal on a watershed basis would not be as much of a problem as the customer base is masked.	It would depend on who it is, government agency would be ok. From a business perspective it really depends.	The end users (customers) are growing in number, and PA wants to protect that data. Identify how many growers are signed up as generators and end uses. Identify how many are growers / generators and not end users.

TABLE 9: BMP Data Sharing Limitations (Water Resources)

<i>Organization</i>	<i>Sharing Limitations</i>	<i>How to Obtain BMP Data</i>	<i>Possible Stakeholder Use</i>
Sussex Conservation District	Privacy issues with farmers. Don't mind sharing data but don't want to be too specific. Maps that are not too specific (ie don't tag BMPs to a parcel, but rather say there of XX of BMP YY in a watershed) would be ok.	FOIA request	Providing information for PCS & TMDLs, Simplify the reporting process by making data available to all who would need it.

TABLE 10: Software (Water Resources)

<i>Organization</i>	<i>Comfortable with MS Access</i>	<i>Comfortable with GIS Software</i>	<i>Current Software in Use</i>	<i>IT Staff</i>	<i>IT Staff Size</i>
Delaware Department of Agriculture: Forest Service	Yes	Yes	ARCVIEW 9.2 & Access.	Yes	2 people
Delaware Department of Agriculture: Nutrient Mgmt Comm	Yes	No	MS Access & Excel	Yes	2 people
Delaware Department of Agriculture: Nutrient Mgmt Plans	Yes	No	MS Access & Excel	Yes	2 People
DNREC: 319 Program	Yes	Yes	ArcView 9.x & MS Access	Yes	Separate Department
DNREC: Coastal Program					
DNREC: Groundwater Discharges	Yes	Yes	Some Access, some Adabase	Yes	Separate Department
Kent Conservation District			---		---
NCCD (NRCS)	Yes	Yes	PRS & Toolkit	Yes	USDA IT
Perdue Agricycle	Yes	No	Excel	Yes	Corporate IT staff
Sussex Conservation District	Yes	Yes	PRS & Toolkit. Excel (state revolving funds)	Yes	USDA IT

Appendix 1

**DNREC Best Management Practice (BMP) Assessment
Questionnaire**

Organization:

Phone Number:

Point of Contact:

E-mail address:

I. Existing BMP Information

1. What types of BMPs do you maintain?
2. Do you have an inventory listing each BMP? Is there inspection / description data associated with the listing?
3. Is background information on the BMPs (areas served, nutrient reduction observed, etc) available?
4. Are the BMPs inspected on a regular schedule?
5. How is the BMP data updated?
6. Is historical data maintained?
7. Do you have spatial (location) data for each BMP?
 - a. What format is the spatial data in?
 - b. What type of locational information is available (lat / long, state plane, address, etc)?
8. Have the BMPs been photographed?
 - a. If so, how are the photos catalogued and associated with BMP data?

II. Data / Information storage

1. What format is BMP data stored in?
2. Where (physically) is the data stored?
3. Who is responsible for storing and maintaining the data?
4. If BMP data is stored in an electronic format, is the data linked into a Graphical User Interface (GUI)?
 - a. Is so, what software is used? version?
 - b. What programming language (if any) was used in building the GUI?
 - c. Who built the GUI?
5. In terms of future data maintenance, would you prefer to house and maintain BMP data yourself, or have an outside entity store and maintain it?

III. Data Sharing

1. What requirements or limitations do you have in place to control the distribution and sharing of data?
2. How would an interested party go about getting a copy of your BMP data?
3. How do you envision stakeholders / end users accessing and retrieving BMP information?

IV. Hardware / Software

1. Are you comfortable using MS Access? ESRI (or other) GIS software?
2. What software are you currently using to track BMP data?
3. Do you have an IT staff? If so, how large is it?

Appendix 2

Interview Summary

Organization City of Newark

Primary POC: Mike Sistik **Phone:** (302) 366-7040 **Email:** pwoperations@newark.de.us

Secondary POC: Kelley Dinsmore **Phone:** (302) 366-7040 **Email:** kdinsmore@newark.de.us

Existing BMP Information

BMPs Maintained:

Mostly extended detention basins, also have some ponds, bio-swales, bio-retention, sand filters, grass filter strips and structural BMPs. Some meet pre '91 regulations and some meet post '91 regulations.

Inventory: Yes **Inventory Comments:** sorted by private vs Newark & pre and post 1991

Background Data: No **Regular Inspections:** Yes **Inspection Frequency:** Yearly

How data is updated: Inspectors update the master spreadsheet each year following the inspection.

Historical Data: Yes **Historical Data Comments:** Spreadsheet has current data. Paper records maintained.

Spatial Data: Yes **Spatial data format:** Typically the outfall is GPSd. DE State Plane.

Photos: Yes **How photos are catalogued:** Linked using a common structure ID

Data and Information Storage

Storage Format: Excel spreadsheets (inspection data) ARC 8.3 (mapping)

Storage Location: Shared City network drive **Maintained By:** Data: Mike Sistik & Kelley Dinsmore.
Network: IT

Data Linked to a GUI: Yes **GUI Software:** ArcView 8.3

GUI Language: --- **GUI Built By:** Kelley Dinsmore

Thoughts on Future Data Maintenance:

Would like to be able to make changes locally. Local update and storage w/ periodic updates made to DNREC

Data Sharing

Data Sharing Limitations: Connecting into City computers is not likely to occur. The City connects to the web through U of D, although a new system is in discussion.

How to Obtain Data: Just ask. The spreadsheets and inspection forms were readily shared for this project. The photos and mapping files are too big to easily share.

Thoughts on Stakeholder Use:

Making all BMP data available to residents could cause problems. Perhaps make basic data available to all (locations and types) but specifics on condition and maintenance should not be shared. Newark is focused on what they own and maintain thus little interest in data out of Newark, except maybe for City fringe areas.

Hardware and Software

Comfortable with MS Access: Yes **IT Staff:** Yes

Comfortable with GIS Software: Yes **IT Staff Size:** 2 people

Current Software: Excell & ArcView 8.3

Interview Summary

Organization DelDOT

Primary POC: Vince Davis **Phone:** (302) 760-2180 **Email:** Vince.Davis@state.de.us

Secondary POC: Wendy Polasko **Phone:** (302) 760-2542 **Email:** Wendy.Polasko@state.de.us

Existing BMP Information

BMPs Maintained:

Wet ponds, dry ponds, infiltration trenches / basins, filter strips, bio-retention areas, bio-swales, sand filters, sediment forebays, check dams.

Inventory: Yes **Inventory Comments:** ---

Background Data: Yes **Regular Inspections:** Yes **Inspection Frequency:** Under Development

How data is updated: Consultants submit design data in the same format as the inventory. DelDOT has two sets of data. The first (structure) is data that is static, and not expected to change. This includes classification, dimensions, material, etc. The second (inspection) is expected to change over time, and a historical record is maintained.

Historical Data: Yes **Historical Data Comments:** No data will be overwritten.

Spatial Data: Yes **Spatial data format:** DE State Plane

Photos: Yes **How photos are catalogued:** By BMP # and sorted by year.

Data and Information Storage

Storage Format: Oracle

Storage Location: DelDOT server in Dover **Maintained By:** DelDOT OIT

Data Linked To a GUI: Yes **GUI Software:** ESRI based

GUI Language: JAVA, SDE **GUI Built By:** GeoDecisions

Thoughts on Future Data Maintenance:

DelDOT would prefer to maintain their data

Data Sharing

Data Sharing Limitations: A data request can be made, and DelDOT will determine the need. A FOIA request may be needed.

How to Obtain Data: Ask. DelDOT would be able to release the data, although a spreadsheet with basic data would likely be provided first.

Thoughts on Stakeholder Use:

A planning tool to help determine maintenance needs. Display aerial photos and the user could look to see general data (approx size, year built, flow, drainage areas).

Hardware and Software

Comfortable with MS Access: Yes **IT Staff:** Yes

Comfortable with GIS Software: Yes **IT Staff Size:** 70 - 80 people

Current Software: ESRI

Interview Summary

Organization DNREC

Primary POC: Jamie Rutherford **Phone:** (302) 739-9921 **Email:** Jamie.Rutherford@state.de.us

Secondary POC: **Phone:** **Email:**

Existing BMP Information

BMPs Maintained:

DNREC has statewide responsibility for all state and federal projects (Schools, Post Offices, etc) as well as remediation sites and contaminated sites.

Inventory: Yes **Inventory Comments:** Tied to project database. It lists what BMPs are on what site.

Background Data: No **Regular Inspections:** No **Inspection Frequency:** N/A

How data is updated: Regular updates do not occur.

Historical Data: Yes **Historical Data Comments:** Paper Records

Spatial Data: No **Spatial data format:** N/A

Photos: No **How photos are catalogued:** N/A

Data and Information Storage

Storage Format: MS Access. It is being migrated to SQL server

Storage Location: DNREC Server **Maintained By:** DNREC IT

Data Linked To a GUI: No **GUI Software:** N/A

GUI Language: N/A **GUI Built By:** N/A

Thoughts on Future Data Maintenance:

DNREC would prefer to maintain data themselves.

Data Sharing

Data Sharing Limitations: There are limits on who can gain access (security). There are possible FOIA requirements as well due to the presence of correspondence.

How to Obtain Data: Make a formal request, identify the data desired and DNREC would try to supply it.

Thoughts on Stakeholder Use:

Mainly internal requests, used for watershed assessments.

Hardware and Software

Comfortable with MS Access: Yes **IT Staff:** Yes

Comfortable with GIS Software: Yes **IT Staff Size:**

Current Software: Access, some GIS for individual cases

Interview Summary

Organization Kent Conservation District

Primary POC: Jared Adkins **Phone:** (302) 741-2600 **Email:** Jared.adkins@state.de.us

Secondary POC: **Phone:** **Email:**

Existing BMP Information

BMPs Maintained:

Stormwater BMPs (ponds, infiltration, bio-infil, sand filters, etc). County, Municipal and private BMPs fall under the KCD (all of Kent County except for federal and state facilities)

Inventory: Yes **Inventory Comments:** ---

Background Data: No **Regular Inspections:** Yes **Inspection Frequency:** Yearly

How data is updated: The Access database is updated / verified with each inspection.

Historical Data: Yes **Historical Data Comments:** Some data is only available on the field form

Spatial Data: Yes **Spatial data format:** UTM (BMP location) Lat/Long (projects)

Photos: Yes **How photos are catalogued:** They are stored in an electronic project file, however they are not linked to the database.

Data and Information Storage

Storage Format: MS Access

Storage Location: KCD server in Dover **Maintained By:** KCD Program Staff

Data Linked To a GUI: No **GUI Software:** N/A

GUI Language: N/A **GUI Built By:** N/A

Thoughts on Future Data Maintenance:

No preference, as long as the data is accessible.

Data Sharing

Data Sharing Limitations: None really exist

How to Obtain Data: Request the data from the program manager

Thoughts on Stakeholder Use:

Not quite sure at this point

Hardware and Software

Comfortable with MS Access: Yes **IT Staff:** No

Comfortable with GIS Software: Yes **IT Staff Size:** Rely on DNREC IT

Current Software: MS Access, some GIS

Interview Summary

Organization New Castle Conservation District

Primary POC: Don Nichols **Phone:** (302) 832-3100 **Email:** N/A

Secondary POC: **Phone:** **Email:**

Existing BMP Information

BMPs Maintained:

Provide E&S review for 9 municipalities (all except Wilmington, Newark & Middletown). Existing BMPs are a grey area because a lot of the responsibility lies with HOAs or the Town / City

Inventory: Yes **Inventory Comments:** No inventory, however an annual report is sent to DNREC.

Background Data: No **Regular Inspections:** No **Inspection Frequency:** N/A

How data is updated: No inventory to update

Historical Data: No **Historical Data Comments:** N/A

Spatial Data: No **Spatial data format:** N/A

Photos: No **How photos are catalogued:** N/A

Data and Information Storage

Storage Format: Paper project files

Storage Location: NCCD building **Maintained By:** Don Nichols

Data Linked To a GUI: No **GUI Software:** N/A

GUI Language: N/A **GUI Built By:** N/A

Thoughts on Future Data Maintenance:

No Comments

Data Sharing

Data Sharing Limitations: Has never been an issue. Nobody has ever really requested data from the NCCD. Sharing with state agencies is not an issue.

How to Obtain Data: NCCD has not received any requests, however NCCD does reply to complaints.

Thoughts on Stakeholder Use:

NCCD does not feel that what the NCCD does lends itself to a computer application. NCCD focus is construction regulation. Once the BMP is built, maint & resp. falls to the HOA or town / city.

Hardware and Software

Comfortable with MS Access: No **IT Staff:** No

Comfortable with GIS Software: No **IT Staff Size:** N/A

Current Software: Currently not tracking data electronically

Interview Summary

Organization New Castle County

Primary POC: Mike Harris **Phone:** (302) 395-5806 **Email:** MHarris@nccde.org

Secondary POC: Ellie Mortazavi **Phone:** (302) 395-5802 **Email:** EMortazavi@nccde.org

Existing BMP Information

BMPs Maintained:

Sand Filters, Infiltration, Bio-retention, Bio-swales, Recharge Basins, Underground Detention, Wetlands, and Ponds.

Inventory: Yes **Inventory Comments:** Inspection and Description data does is maintained

Background Data: No **Regular Inspections:** Yes **Inspection Frequency:** Yearly

How data is updated: There is a physical folder for each BMP that has plans, photos, historical inspections. Data is collected on laptops and uploaded wirelessly.

Historical Data: Yes **Historical Data Comments:** Back to 2004

Spatial Data: Yes **Spatial data format:** Typically the outfall of the structure

Photos: Yes **How photos are catalogued:** Not directly linked to BMP data

Data and Information Storage

Storage Format: Hansen: General descriptive information. Oracle based GUI for specific BMP information.

Storage Location: NCC Government center **Maintained By:** NCC IT staff

Data Linked to a GUI: Yes **GUI Software:** ArcView 9.x

GUI Language: vb.net & Oracle **GUI Built By:** NCC Staff

Thoughts on Future Data Maintenance:

In house data management has several advantages, but for technical problems an outside player would be helpful.

Data Sharing

Data Sharing Limitations: FOIA is a driver. The County likes to be consistent with distribution. Sharing with another government agency is not a problem. Many BMPs are owned by an HOA or Maint. Corp so there could be some privacy issues.

How to Obtain Data: Make a FOIA request, there is a County employee who processes them

Thoughts on Stakeholder Use:

It would be helpful to have DelDOTs drainage collection system relative to the BMPs available. That would help with TMDLs as stakeholders. NCC could see private groups using the system to look for work opportunities, and that could pose a headache for maintenance corps.

Hardware and Software

Comfortable with MS Access: Yes **IT Staff:** Yes

Comfortable with GIS Software: Yes **IT Staff Size:** 15-30 people

Current Software: Hansen, vb.net, Oracle

Interview Summary

Organization Sussex Conservation District

Primary POC: Jessica Watson **Phone:** (302) 856-7219 **Email:** Jessica.Watson@state.de.us

Secondary POC: **Phone:** **Email:**

Existing BMP Information

BMPs Maintained:

The SCD does not maintain SW practices, they provide inspection services and technical support. SCD maintains a listing of projects by name, when approved. Plans would then need to be pulled to see what BMPs might be on a given site.

Inventory: No **Inventory Comments:** Project tracker, not a BMP tracker, not NPDES driven.

Background Data: No **Regular Inspections:** No **Inspection Frequency:** N/A

How data is updated: The database itself is not updated. Individual reports are saved as word documents.

Historical Data: No **Historical Data Comments:** Maintenance reports and approved plans are saved.

Spatial Data: No **Spatial data format:** N/A

Photos: No **How photos are catalogued:** N/A

Data and Information Storage

Storage Format: MS Access

Storage Location: SCD building in Georgetown **Maintained By:** In house staff member with DNREC IT support

Data Linked To a GUI: No **GUI Software:** N/A

GUI Language: N/A **GUI Built By:** N/A

Thoughts on Future Data Maintenance:

SCD would prefer to input and maintain the data, if there are problems then they can go to IT. They would want to be able to control their data

Data Sharing

Data Sharing Limitations: Don't really have any issues sharing BMP data with other agencies. SCD would not mind working with Mosquito Control to get a better idea of which BMPs are breeding mosquitos, and which are not

How to Obtain Data: FOIA request

Thoughts on Stakeholder Use:

In support of PCS / TMDLs with info provided on nutrient loading and removal rates. Simplification of the reporting process. If data is made available to all who need it, less time may need to be spent generating reports.

Hardware and Software

Comfortable with MS Access: Yes **IT Staff:** No

Comfortable with GIS Software: Yes **IT Staff Size:** N/A

Current Software: MS Access

Interview Summary

Organization Town of Middletown

Primary POC: Morris Deputy **Phone:** (302) 378-9120 **Email:** mdeputy@middletownde.org

Secondary POC: **Phone:** **Email:**

Existing BMP Information

BMPs Maintained:

Dry ponds, wet ponds, infiltration ponds, some structural (underground systems) swales, bio-retention

Inventory: No **Inventory Comments:** A BMP inventory is a priority. Getting flooded by new development.

Background Data: No **Regular Inspections:** No **Inspection Frequency:** N/A

How data is updated: Currently not updated.

Historical Data: No **Historical Data Comments:** N/A

Spatial Data: No **Spatial data format:** N/A

Photos: No **How photos are catalogued:** N/A

Data and Information Storage

Storage Format: Paper files

Storage Location: Town building **Maintained By:**

Data Linked To a GUI: No **GUI Software:** N/A

GUI Language: N/A **GUI Built By:** N/A

Thoughts on Future Data Maintenance:

Prefer to maintain BMP information locally (both inspections and the data) then upload to a separate system (outside of the Town's) for sharing and distribution. Security is the main concern (along with data integrity).

Data Sharing

Data Sharing Limitations: Do not want to let people into their network. Just ask (FOIA) and the data can be provided. Middletown is autonomous and does not share data in a digital format.

How to Obtain Data: Just ask

Thoughts on Stakeholder Use:

Provide the ability to see what others are doing, and how BMPs are performing. Look at maintenance practices and a comparison of facilities, this will help determine if Middletown is keeping up.

Hardware and Software

Comfortable with MS Access: Yes **IT Staff:** Yes

Comfortable with GIS Software: No **IT Staff Size:** 1 full-time professional

Current Software: Currently not tracking data electronically.

Interview Summary

Organization Delaware Department of Agriculture: Forest Service

Primary POC: Glenn Gladders **Phone:** (302) 698-4553 **Email:** Glenn.gladders@state.de.us

Secondary POC: **Phone:** **Email:**

Existing BMP Information

BMPs Maintained:

Forest Stewardship Plans (shapefiles); Timber Harvest Permitting (shapefiles); Urban Forestry Program (small component) reported as points vs areas because the areas are small (even though several trees might have been planted). All data is reported to DNREC's 319 Program.

Inventory: No **Inventory Comments:** Forest specific BMPs related to Timber Permits are tracked.

Background Data: Yes **Regular Inspections:** No **Inspection Frequency:** N/A

How data is updated: As permits are issued data is entered into the database. Once a year the data is rolled up to look for items that were not entered and then the data is archived.

Historical Data: Yes **Historical Data Comments:** Back to 2005

Spatial Data: Yes **Spatial data format:** ARCVIEW 9.2, DE State Plane

Photos: No **How photos are catalogued:** N/A

Data and Information Storage

Storage Format: ARCVIEW 9.2 & Access. Data is joined to the shapefiles.

Storage Location: Dover network & **Maintained By:** Glenn Gladders
desktop.

Data Linked To a GUI: Yes **GUI Software:** ARCVIEW 9.2 and Access

GUI Language: N/A **GUI Built By:** Glenn Gladders

Thoughts on Future Data Maintenance:

Glenn would prefer to maintain and store the data locally.

Data Sharing

Data Sharing Limitations: The only requests for data come from the 319 program. It is reported at the watershed level. Individual land owners are masked in the report.

How to Obtain Data: Likely no real issue with sharing data, but would like to know more. Individual names associated with data do not need to be made public.

Thoughts on Stakeholder Use:

To provide a method of mapping and reporting to DNREC.

Hardware and Software

Comfortable with MS Access: Yes **IT Staff:** Yes

Comfortable with GIS Software: Yes **IT Staff Size:** 2 people

Current Software: ARCVIEW 9.2 & Access.

Interview Summary

Organization Delaware Department of Agriculture: Nutrient Mgmt Comm

Primary POC: Steve Hollenbeck **Phone:** (302) 698-4500 **Email:** Steven.hollenbeck@state.de.us

Secondary POC: **Phone:** **Email:**

Existing BMP Information

BMPs Maintained:

Poultry manure tracking. Poultry is the main contributor in DE. Manure shipping is tracked in an Access database. Shipping permits are submitted, the data is put into the d/b and later exported to Excel. In-state shipments are tracked by watershed. Out of state the source is tracked by watershed but not the destination.

Inventory: Yes **Inventory Comments:** Tracking of manure shipping

Background Data: Yes **Regular Inspections:** Yes **Inspection Frequency:** As apps are submitted

How data is updated: Data is updated as applications or claims (as the state approves funding) are submitted.

Historical Data: Yes **Historical Data Comments:** Back to 2001.

Spatial Data: No **Spatial data format:** Sources change over time.

Photos: No **How photos are catalogued:** N/A

Data and Information Storage

Storage Format: MS Access

Storage Location: DDA Network **Maintained By:** Steve Hollenbeck

Data Linked To a GUI: No **GUI Software:** N/A

GUI Language: N/A **GUI Built By:** N/A

Thoughts on Future Data Maintenance:

Centralized data storage would work better, with local updating and maintenance.

Data Sharing

Data Sharing Limitations: None identified, the data is already sent to the 319 Program on a regular basis.

How to Obtain Data: Ask Steve Hollenbeck. Data is already sent to the 319 Program on a regular basis.

Thoughts on Stakeholder Use:

Looking at data on a watershed basis.

Hardware and Software

Comfortable with MS Access: Yes **IT Staff:** Yes

Comfortable with GIS Software: No **IT Staff Size:** 2 people

Current Software: MS Access & Excel

Interview Summary

Organization Delaware Department of Agriculture: Nutrient Mgmt Plans

Primary POC: Bob Coleman **Phone:** (302) 698-4556 **Email:** Robert.coleman@state.de.us

Secondary POC: **Phone:** **Email:**

Existing BMP Information

BMPs Maintained:

Nutrient Management Plan Program. All farms greater than 10 acres, or 8 animal units (~30,000 chicken) must submit a NMP. DDA reimburses farmers for the cost of the plans. Plans run in 3 year cycles, either 1 3-year plan, or 3 1-year plans.

Inventory: Yes **Inventory Comments:** Database with farm and farmer info.

Background Data: Yes **Regular Inspections:** Yes **Inspection Frequency:** Random admin. Reviews

How data is updated: At the time of the application, data is updated.

Historical Data: Yes **Historical Data Comments:** Back to 2001

Spatial Data: No **Spatial data format:** N/A

Photos: No **How photos are catalogued:** N/A

Data and Information Storage

Storage Format: MS Access & Excel

Storage Location: DDA network **Maintained By:** Bob Coleman and Judy Burnes

Data Linked To a GUI: No **GUI Software:** N/A

GUI Language: N/A **GUI Built By:** N/A

Thoughts on Future Data Maintenance:

DDA would prefer to maintain the data and provide updates as needed.

Data Sharing

Data Sharing Limitations: Likely would need to remove names due to privacy concerns.

How to Obtain Data: For DNREC and other state agencies they can call the NMC and ask for a report. For members of the general public, it would likely involve a FOIA request.

Thoughts on Stakeholder Use:

General watershed information. Bob does not see a need for individual farm info and acreage to be available, but tracking of the number of acreage in a watershed could be helpful.

Hardware and Software

Comfortable with MS Access: Yes **IT Staff:** Yes

Comfortable with GIS Software: No **IT Staff Size:** 2 People

Current Software: MS Access & Excel

Interview Summary

Organization DNREC: 319 Program

Primary POC: Mark Hogan **Phone:** (302) 739-9922 **Email:** Mark.hogan@state.de.us

Secondary POC: **Phone:** **Email:**

Existing BMP Information

BMPs Maintained:

Cover Crop data (Kent & Sussex counties), CREP (Conservation Reserve Enhancement Program), Livestock BMPs (manure storage, incinerators, composters, animal waste handling, etc), Conservation reserve program.

Inventory: Yes **Inventory Comments:** GIS with an Access database with shapefiles for each program.

Background Data: Yes **Regular Inspections:** Yes **Inspection Frequency:** Varies by program

How data is updated: CREP: Ongoing process; Cover Crop: Data updated once a year; Livestock: updated once every six months. Data is provided to Mark, and he updates the GIS / database.

Historical Data: Yes **Historical Data Comments:** Back to about 1999

Spatial Data: Yes **Spatial data format:** Shapefiles, ArcGIS. DE State Plane

Photos: No **How photos are catalogued:** N/A

Data and Information Storage

Storage Format: ESRI with MS Access back-up

Storage Location: DNREC Network. **Maintained By:** DNREC IT
Data on local drive.

Data Linked to a GUI: Yes **GUI Software:** ArcGIS 9.x

GUI Language: N/A **GUI Built By:** Glenn Gladders

Thoughts on Future Data Maintenance:

Maintain in house, share the data.

Data Sharing

Data Sharing Limitations: Mark does not like to give up point data for structural BMPs (privacy issue) however descriptive information is not a problem. Gov't groups: data sharing is not an issue.

How to Obtain Data: Just ask Mark Hogan.

Thoughts on Stakeholder Use:

DNREC perform daily updates. An outside source would connect in to retrieve data and put it into a database that others can use. Thus, instead of going to Mark, parties would just go to the database.

Hardware and Software

Comfortable with MS Access: Yes **IT Staff:** Yes

Comfortable with GIS Software: Yes **IT Staff Size:** Separate Department

Current Software: ArcView 9.x & MS Access

Interview Summary

Organization DNREC: Coastal Program

Primary POC: Marcia Fox

Phone: (302) 739-9282 **Email:** Marcia.fox@state.de.us

Secondary POC:

Phone:

Email:

Existing BMP Information

BMPs Maintained:

The coastal program is a federal program that operates a little outside of the state agencies. They do not maintain any BMP data, and have turned tracking over to other groups.

Inventory: ***Inventory Comments:***

Background Data: ***Regular Inspections:*** ***Inspection Frequency:***

How data is updated:

Historical Data: ***Historical Data Comments:***

Spatial Data: ***Spatial data format:***

Photos: ***How photos are catalogued:***

Data and Information Storage

Storage Format:

Storage Location:

Maintained By:

Data Linked To a GUI: ***GUI Software:***

GUI Language: ***GUI Built By:***

Thoughts on Future Data Maintenance:

Data Sharing

Data Sharing Limitations:

How to Obtain Data:

Thoughts on Stakeholder Use:

Hardware and Software

Comfortable with MS Access:

IT Staff:

Comfortable with GIS Software:

IT Staff Size:

Current Software:

Interview Summary

Organization DNREC: Groundwater Discharges

Primary POC: Dave Schepens **Phone:** (302) 739-9948 **Email:** Dave.schepens@state.de.us

Secondary POC: Ron Graeber **Phone:** (302) 739-9948 **Email:** Ronald.Graeber@state.de.us

Existing BMP Information

BMPs Maintained:

On site waste water systems of all sizes (incl. spray irrigation): Over 80,000 on site septic systems, Several hundred > 2,500 gpd; Underground injection control program.

Inventory: Yes ***Inventory Comments:*** Some file folders, some MS Access, some Adabase

Background Data: Yes ***Regular Inspections:*** Yes ***Inspection Frequency:*** >2500 gpd: yearly

How data is updated: Field techs perform inspections and update the database. Some is done remotely in the field, some in the office. Report forms are entered into the "non-haz" database.

Historical Data: Yes ***Historical Data Comments:*** ---

Spatial Data: Yes ***Spatial data format:*** Only on larger systems, DE State Plane.

Photos: Yes ***How photos are catalogued:*** In general, photos are not linked to the data.

Data and Information Storage

Storage Format: MS Access, Adabase, file folders. Data being migrated to SQL server.

Storage Location: Dover & Georgetown ***Maintained By:*** Groundwater Discharges section staff.

Data Linked To a GUI: No ***GUI Software:*** N/A

GUI Language: N/A ***GUI Built By:*** N/A

Thoughts on Future Data Maintenance:

Dave would prefer for his group to manage and maintain the data, then upload it to a master system.

Data Sharing

Data Sharing Limitations: No real restrictions. Tend to follow the lead of DNREC Water Resources. Sharing data with state agencies is not too big an issue.

How to Obtain Data: Make a FOIA request. If the request for data is too large, the applicant may be asked to narrow it down.

Thoughts on Stakeholder Use:

Access based system with information to support the project at hand.

Hardware and Software

Comfortable with MS Access: Yes ***IT Staff:*** Yes

Comfortable with GIS Software: Yes ***IT Staff Size:*** Separate Department

Current Software: Some Access, some Adabase

Interview Summary

Organization Kent Conservation District

Primary POC: Tim Riley **Phone:** (302) 741-2600 **Email:** Timothy.riley@state.de.us

Secondary POC: Paula Long **Phone:** (302) 741-2600 **Email:** Paula.long@state.de.us

Existing BMP Information

BMPs Maintained:

The KCD does not really maintain BMP data on programs of their own. Instead, they support farmers that are tasked with meeting requirements. The data then goes to the appropriate agency to track.

Inventory: No ***Inventory Comments:*** ---

Background Data: Yes ***Regular Inspections:*** Yes ***Inspection Frequency:*** varies by BMP

How data is updated: No real updates, as things don't really change that much.

Historical Data: Yes ***Historical Data Comments:*** ---

Spatial Data: Yes ***Spatial data format:*** ---

Photos: Yes ***How photos are catalogued:*** Stormwater BMPs only.

Data and Information Storage

Storage Format: File folders.

Storage Location: District facility ***Maintained By:*** KCD staff

Data Linked To a GUI: No ***GUI Software:*** N/A

GUI Language: N/A ***GUI Built By:*** N/A

Thoughts on Future Data Maintenance:

Data Sharing

Data Sharing Limitations: Privacy Issues: farmers ID. FOIA request likely needed. If personal information is stripped out, it is ok to let the data go.

How to Obtain Data: Likely see Mark Hogan (DNREC 319 Program), as the paper folders do not contain summary data.

Thoughts on Stakeholder Use:

Possibly adding photographs to the overall system.

Hardware and Software

Comfortable with MS Access: ***IT Staff:***

Comfortable with GIS Software: ***IT Staff Size:*** ---

Current Software: ---

Interview Summary

Organization NCCD (NRCS)

Primary POC: Marianne Hardesty **Phone:** (302) 832-3100 **Email:** Marianne.hardesty@de.usda.gov

Secondary POC: **Phone:** **Email:**

Existing BMP Information

BMPs Maintained:

Cover Crop Data, Horse Pastures and loading, No till Data, Some cost share from SWM, Some riparian buffers in urban areas, Filter Strips, Some E&S measures at the edge of Ag lands, Fragmites Control.

Inventory: **Inventory Comments:** Can only pull data at the HUC 8 level. Reporting mechanism: PRS.

Background Data: No **Regular Inspections:** No **Inspection Frequency:** On construction & randomly

How data is updated: Data is entered into Toolkit / PRS by field office.

Historical Data: Yes **Historical Data Comments:** In Toolkit, does not migrate to PRS.

Spatial Data: Yes **Spatial data format:** Lat/Long

Photos: Yes **How photos are catalogued:** Some have been photographed.

Data and Information Storage

Storage Format: Performance Review System (NRCS computer system).

Storage Location: National Server **Maintained By:** NRCS IT

Data Linked To a GUI: Yes **GUI Software:** PRS/Toolkit

GUI Language: N/A **GUI Built By:** NRCS

Thoughts on Future Data Maintenance:

NRCS will maintain their data, then have it pulled. NRCS will not upload.

Data Sharing

Data Sharing Limitations: Specifics to a farm, by name or location is an issue, Can't give financial data, On a watershed basis, there are no issues with sharing data.

How to Obtain Data: ---

Thoughts on Stakeholder Use:

Tracking the acceptance of conservation practices, Calculations on nutrient management practice impacts, Input for state reports that need to be submitted.

Hardware and Software

Comfortable with MS Access: Yes **IT Staff:** Yes

Comfortable with GIS Software: Yes **IT Staff Size:** USDA IT

Current Software: PRS & Toolkit

Interview Summary

Organization Perdue Agricycle

Primary POC: Heather Comegys **Phone:** (302) 943-2732 **Email:** Heather.comegys@perdue.com

Secondary POC: Wayne Hudson **Phone:** (410) 543-3919 **Email:** Wayne.hudson@perdue.com

Existing BMP Information

BMPs Maintained:

Tracks of the amount of waste taken from sites and the ultimate destination whether in or out of state. They serve most of the Kent and Sussex farming community (~1,400 farms.) PA does not have data on nutrient management plans, or if they are current. PA is told yes or no on if a plan exists, but not the expiration date.

Inventory: Yes **Inventory Comments:** Information to build a service map exists, it is sensitive business infor

Background Data: Yes **Regular Inspections:** No **Inspection Frequency:** N/A

How data is updated: PA weighs trucks when they deliver to the plant, that data is used to track loading. Grower info (data about the farm) is updated at time of service.

Historical Data: Yes **Historical Data Comments:** Back to 2001

Spatial Data: No **Spatial data format:** Database has farm addresses.

Photos: No **How photos are catalogued:** N/A

Data and Information Storage

Storage Format: Excel spreadsheet

Storage Location: Perdue Agricycle facility **Maintained By:** Perdue Agricycle staff

Data Linked To a GUI: No **GUI Software:** N/A

GUI Language: N/A **GUI Built By:** N/A

Thoughts on Future Data Maintenance:

Perdue Agricycle would prefer internal management of data, especially since it is sensitive to the business practice and protection of customer base.

Data Sharing

Data Sharing Limitations: Perdue Agricycle is concerned about what type of data is potentially made public as it is essentially a customer list. Data on manure removal on a watershed basis would not be as much of a problem as the customer base is masked.

How to Obtain Data: It would depend on who it is, government agency would be ok. From a business perspective it really depends.

Thoughts on Stakeholder Use:

The end users (customers) are growing in number, and PA wants to protect that data. Identify how many growers are signed up as generators and end uses. Identify how many are growers / generators and not end users.

Hardware and Software

Comfortable with MS Access: Yes **IT Staff:** Yes

Comfortable with GIS Software: No **IT Staff Size:** Corporate IT staff

Current Software: Excel

Interview Summary

Organization Sussex Conservation District

Primary POC: Debbie Absher **Phone:** (302) 856-3990 **Email:** Debbie.Absher@de.nacdnet.net

Secondary POC: **Phone:** **Email:**

Existing BMP Information

BMPs Maintained:

SCD provides technical and financial assistance, they are not regulatory.

Inventory: Yes **Inventory Comments:** Reports are made to the EPA on a watershed basis, there is a list of in

Background Data: Yes **Regular Inspections:** Yes **Inspection Frequency:** ---

How data is updated: Data is entered into PRS and the NRCS Customer Toolkit.

Historical Data: **Historical Data Comments:**

Spatial Data: Yes **Spatial data format:** site not BMP specific. DE State Plane.

Photos: No **How photos are catalogued:** N/A

Data and Information Storage

Storage Format: PRS & Toolkit

Storage Location: National server **Maintained By:** NRCS IT

Data Linked To a GUI: Yes **GUI Software:** PRS/Toolkit

GUI Language: N/A **GUI Built By:** NRCS

Thoughts on Future Data Maintenance:

SCD would input data and maintain it. Problems go to IT, SCD wants to maintain control on their data.

Data Sharing

Data Sharing Limitations: Privacy issues with farmers. Don't mind sharing data but don't want to be too specific. Maps that are not too specific (ie don't tag BMPs to a parcel, but rather say there of XX of BMP YY in a watershed) would be ok.

How to Obtain Data: FOIA request

Thoughts on Stakeholder Use:

Providing information for PCS & TMDLs, Simplify the reporting process by making data available to all who would need it.

Hardware and Software

Comfortable with MS Access: Yes **IT Staff:** Yes

Comfortable with GIS Software: Yes **IT Staff Size:** USDA IT

Current Software: PRS & Toolkit. Excel (state revolving funds)

Irrigated Land Area Update Methodology – Summer 2013

Work Group:

DNREC: Bryan Bloch, Tyler Monteith, Regina Kukola
UD Extension Office: James Adkins (adkins@udel.edu)

Objective:

The acreage of irrigated land was calculated in July 2010 based on Google Earth Imagery by James Adkins. This project was an update to this dataset based on 2012 imagery in ArcGIS.

Methodology:

- An original dataset of irrigated land was established based on 2010 imagery by James Adkins
 - Polylines were drawn to identify irrigation systems on Delaware lands
 - These polylines were converted to polygon features in ArcGIS in order to calculate the acreage of these areas
 - These polygons were labeled as “July 3/4 2010” in the Imagery field of the database
- As an update, a new data layer was created using 2012 imagery to track more current irrigation area
 - A grid was overlaid on the 2012 state land imagery to establish easier areas of examination (figure 1)
 - The 2010 data set of polygons was pulled in for reference
 - At a 1:4000 scale, each grid area was examined to determine where current irrigation practices existed
 - Irrigation practices that were still in existence from the 2010 set were copied to the 2012 Irrigation layer (the “July 3/4 2010” in the Imagery field remained to allow for a query of 2010 data and newly created 2012 data)
 - New irrigation practices not found in the 2010 layer were created as new polygon features. These were tagged with “2012” in the Imagery field to allow for a query of new data
 - A “Source” field was created to indicate who inputted the data (figure 3)
 - Some of the original 2010 data was adjusted via clipping/cutting tools in order to eliminate overlapping polygons

- A geometry calculation was run in order to update the acreage of irrigated land based on the 2012 update.

Reporting:

- The updated geodatabase of 2012 irrigated land was sent to James Adkins at the UD Extension office at the end of August
- This data will be submitted as part of the Chesapeake Bay Submissions

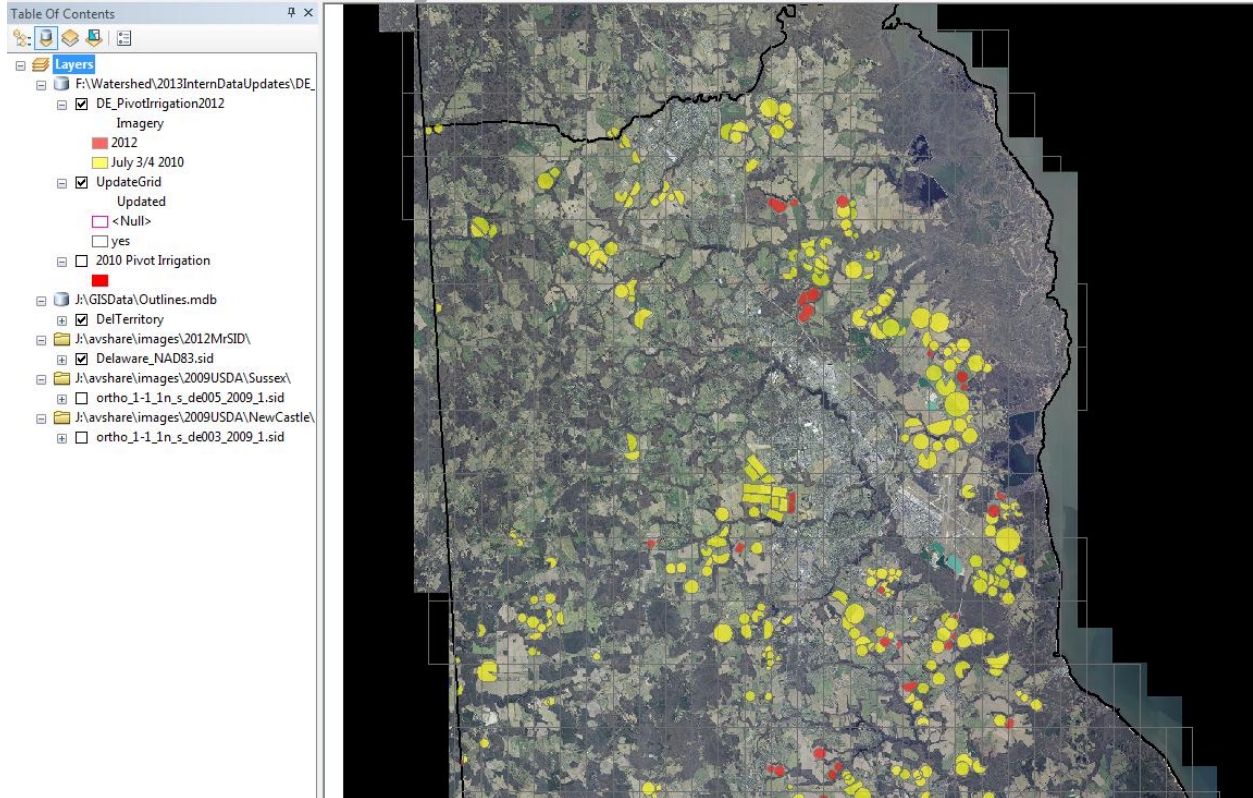


Figure 1. ArcMap layers of 2010 and 2012 irrigation areas overlaid on 2012 imagery, as seen at a county level scale.



Figure 2. ArcMap layers of 2010 and 2012 irrigation areas overlaid on 2012 imagery, as seen as a single grid for identification.

DE_PivotIrrigation2012

OBJECTID *	SHAPE *	Name	Acres	Imagery	Source
210	Polygon	4-00-05900-01-3900-00001	73.920111	2012	Tyler Monteith DNREC
211	Polygon	4-00-05900-01-3900-00001	19.935138	2012	Tyler Monteith DNREC
1075	Polygon	43000500000800	24.414754	2012	Tyler Monteith DNREC
1274	Polygon	43001000001100	34.824472	2012	Tyler Monteith DNREC
1266	Polygon	43001200000600	78.534268	2012	Tyler Monteith DNREC
1271	Polygon	43001200001700	22.257856	2012	Tyler Monteith DNREC
1446	Polygon	43001500001400	8.307385	2012	Regina Kukola DNREC
1403	Polygon	43001600005300	9.157029	2012	Regina Kukola DNREC
1395	Polygon	43001700000800	46.009661	2012	Regina Kukola DNREC
1401	Polygon	43002000000800	34.639432	2012	Regina Kukola DNREC
1549	Polygon	43002000002900	27.819366	2012	Regina Kukola DNREC
1394	Polygon	43002100000900	23.365799	2012	Regina Kukola DNREC
2324	Polygon	43200500001700	9.491977	2012	Tyler Monteith DNREC
2310	Polygon	43200500002100	26.436543	July 3/4 2010	Tyler Monteith DNREC
2309	Polygon	43200500002101	12.528447	July 3/4 2010	Tyler Monteith DNREC
2533	Polygon	43201000001102	19.223816	2012	Tyler Monteith DNREC
2501	Polygon	43201000002109	7.632534	2012	Tyler Monteith DNREC
2514	Polygon	43201000002400	14.954527	2012	Tyler Monteith DNREC
2553	Polygon	43201100001800	14.051841	July 3/4 2010	Tyler Monteith DNREC
2551	Polygon	43201100001802	10.585684	July 3/4 2010	Tyler Monteith DNREC
2554	Polygon	43201100002100	15.489202	July 3/4 2010	Tyler Monteith DNREC
2549	Polygon	43201100002500	8.716343	July 3/4 2010	Tyler Monteith DNREC
2550	Polygon	43201100002500	7.158534	July 3/4 2010	Tyler Monteith DNREC
2552	Polygon	43201100002500	9.481264	July 3/4 2010	Tyler Monteith DNREC
2548	Polygon	43201100003300	40.830238	July 3/4 2010	Tyler Monteith DNREC
2544	Polygon	43201100004500	49.211055	2012	Tyler Monteith DNREC

Figure 3. The attribute table of the 2012 irrigation layer showing the imagery year used, acreage, and source of who inputted the data.

Report for Water Control Structures Project – Summer 2013

Team Members:

Bryan Bloch (Initial Database Creation and GIS work)
Regina Kukola (Site Prioritization, Site Visit Scheduling, Field Work)
Tyler Monteith (Field Work, GIS work for updated GPS points)
Ryan Hendry (Field Work)

Contact info:

**Delaware Dept. of Natural Resources and Environmental Control
Division of Watershed Stewardship; Watershed Assessment Section
302-739-9939**

Objective:

The purpose of this project was to update a database of water control structures (WCS) from the Sussex County Conservation District (SCD). These structures were implemented and funded by the SCD and therefore, have been verified in the past. This project focused on data verification for reporting purposes. Primarily, we were interested in ground-truthing the GPS data for the structures. Our goal for the summer was to visit all 42 WCS listed in the database that were located within the Chesapeake Bay Basin.

Summary:

Water control structures provide controlled drainage to tax ditches in agricultural fields throughout the state of Delaware. Controlling water drainage from fields has important water quality implications. Discharge waters from fields with drainage control have been observed contain significantly less nitrates than discharge waters from fields with uncontrolled drainage. There are two mechanisms for this reduction in nitrate concentrations: 1. Water control structures reduce the total output of water leaving a field by 20 to 30% on average, and 2. the installation of water control structures raises the water table, and increases denitrification, which results in lower nitrate concentration in drainage waters (Osmund et al. 2002). All the structures discussed in this project report were funded by the Sussex County Conservation District.

By using a database supplied by the SCD and an ArcMap of the SCD database created by Bryan Bloch, we were able to create a list of 42 WCS in the Chesapeake Bay Basin in Sussex County that we needed to ground truth with GPS data. We met with Kip Foskey, a Planner at the SCD. He provided us with contact information for the private landowners that owned the land on which the 42 WCS were located. We called these private landowners to get their permission to visit the WCS. Of 23 landowners, we were able to successfully contact 20: 17 landowners were willing to give us permission to enter their properties this August, 2 were willing to give us

permission after their summer crop seasons were over, and 1 did not give us permission this summer.

The 17 landowners that gave us permission to visit their properties owned 21 of the 42 WCS in the Chesapeake Basin in Sussex County. We attempted to visit a total of 21 WCS over 4 field days in August and were able to successfully locate and obtain GPS information for 16 WCS. We then created a GIS document containing the GPS data we had collected.

If we contact landowners who were willing to allow us access in the fall or winter later this year, we can increase our site visits from 21 to 34. Also, Senior Conservation Planner, Kip Foskey (302-856-3990, ext. 114, kip.foskey@de.nacdnet.net) is trying to get in touch with the 3 landowners we were not able to contact this summer. If these landowners give us permission to enter their property, we could increase our site visits by 5. The only landowner who did not give us permission to enter their property wanted to talk to Kip about our visit first. There is a chance that he might decide to allow us access to his 3 WCS after speaking with Kip.

The focus of this summer was to get information for all of the WCS in the Chesapeake Bay Basin. However, by repeating our methodology, information could be obtained for WCS statewide. If this methodology were to be repeated, we would recommend getting in touch with landowners ASAP and setting up field days to visit sites at least 2-3 weeks in advance to when phone calls are first made. Successfully making contact with landowners frequently took multiple calls, sometimes over the span of several weeks.

Contents of Expanded Narrative:

- *Late June – Met with SCD to discuss project*
- *Mid July – Obtained ArcMap version of SCD Database*
- *Mid July – Developed Prioritization system for visiting WCS*
- *Mid July – Contacted Debbie Absher from SCD to obtain contact info for SCD planner to assist with contacting landowners*
- *End of July – Debbie provided contact info for SCD planner Kip Foskey*
- *Early August – Met with Kip to discuss contacting landowners*
- *Early August – Began contacting Landowners to visit WCS*
- *August – Visited WCS's & Results*

Expanded Narrative:

Late June – Met with SCD to discuss project

We met with Chip and Director of Agriculture Programs, Debbie Absher (302-856-3990, ext. 110; Debbie.Absher@de.nacdnet.net) from the Sussex County Conservation District to discuss

the project. **All of the water control structures were on private land, so we needed to contact the land owners individually to ask for permission to visit the structure.** They showed us a paper filing system of information about the water control structures and landowner contact information in the District’s office. Debbie suggested that working with a planner from the Conservation District would be the easiest way to get access to the water control structures on private land. Consulting the paper database ended up not being necessary, because **we were able to obtain contact information for landowners from Kip Foskey, the SCD Planner with whom we collaborated.**

Mid July – Obtained ArcMap version of SCD Database

We consulted with Bryan Bloch about the map he created from the Sussex County Conservation District’s water control structure database. (J:\ChesBayProj\WCS\WCSMap1). The sum for the entire county was 169. Debbie and Bryan could only locate 114 of the 169 (SCD_WCS layer). The number is low because some of the properties were located and point placed on the property but not the individual WCS’s since some properties have multiple WCS on them or location was not found at all. Bryan also went through the database to try and aerially determine the location of some structures. In the SCD_WCSMap1 attribute table field named “20” any point that reads Bryan Bloch was moved from its original location to a place that appeared more likely to have a water control structure by Bryan. Points that read original were not moved from their initial locations. For points that have read either “Bryan Bloch – check” or “original-check”, Bryan was not able to determine the placement of the structure aerially.

Mid July – Developed Prioritization system for visiting WCS

From Bryan’s work, we were able to determine the HUCs of the different WCS. We created a system to prioritize our visits of the structures, because we knew it would logistically be very difficult to visit every WCS in the database by the end of summer. Our prioritized list of WCS can be found at (F:\Watershed\2013InternDataUpdates\WCS_Verification\WCS priorities). A key to understanding the color coding in the document is below:

1 st Priority – In the Chesapeake Bay and Bryan was unable to aerially infer structure’s location
2 nd Priority – In the Chesapeake Bay and Bryan was able to aerially infer structure’s location
3 rd Priority – Outside the Chesapeake Bay and Bryan was unable to aerially infer structure’s location
4 th Priority – Outside the Chesapeake Bay and Bryan was able to aerially infer structure’s location

Our goal for the summer was to ground truth all of our 1st and 2nd priority structures (N = 42).

Mid July to End of July - Contacted Debbie Absher from SCD to obtain contact info for SCD planner to assist with contacting landowners, and Debbie provided contact info for SCD planner Kip Foskey.

In mid-July, we contacted Debbie for contact information for a SCD planner to assist us in gaining permission to WCS on private landowners' properties. Due to state fair, she was unable to supply us with contact information for a SCD planner until the end of July.

Early August – Met with Kip to discuss contacting landowners

At the SCD office, Kip was able to supply us with Sussex Count mapping system maps of the different WCS. He also provided us with phone numbers of the landowners with WCS in the Chesapeake Bay Basin. An updated spreadsheet that reflects this contact info that Kip gave us can be found at F:\Watershed\2013InternDataUpdates\WCS_Verification\WCS information. (Note: WCS outside of the Chesapeake Basin are hidden rows. Rows without color fill are WCS we were able to visit.)

Early August – Began contacting Landowners to visit WCS

Overall, landowners were very willing to allow us to come on their property and take GPS data points. However, there were a few landowners we were either unable to reach or could not give us access:

- We are still waiting on permission from WCS 6 owner.
- We attempted to contact WCS 8 owner on 8/2, 8/5, 8/14, 8/19, and 8/26 with no response
- We attempted to call WCS 13 owner on 8/2, 8/5, 8/14, 8/19, and 8/26 with no response
- We attempted to call WCS #17 owner on 8/2, 8/5, 8/13, 8/19, 8/21, 8/26
- WCS 17 is currently not accessible because of soy bean planting. In November, it will be accessible, and the owner would be willing to schedule a time for someone to come out to the WCS
- WCS 2 & 5 are currently not accessible because of corn planting. Once harvested, the owner would be willing to schedule a time for someone to come out to the WCS. This should be a higher priority because the SCD database has both properties listed as having 6 separate WCS each.

August – Visited WCS & Results (the data used to create these graphs is in WCS information.xls):

Overall, we spent 4 days in the field visiting a total of 21 WCS. Most commonly, we weren't able to visit sites because of accessibility issues due to plantings (Fig. 1).

We were able to obtain GPS data points for 16 of the 21 sites we visited (Fig. 2).

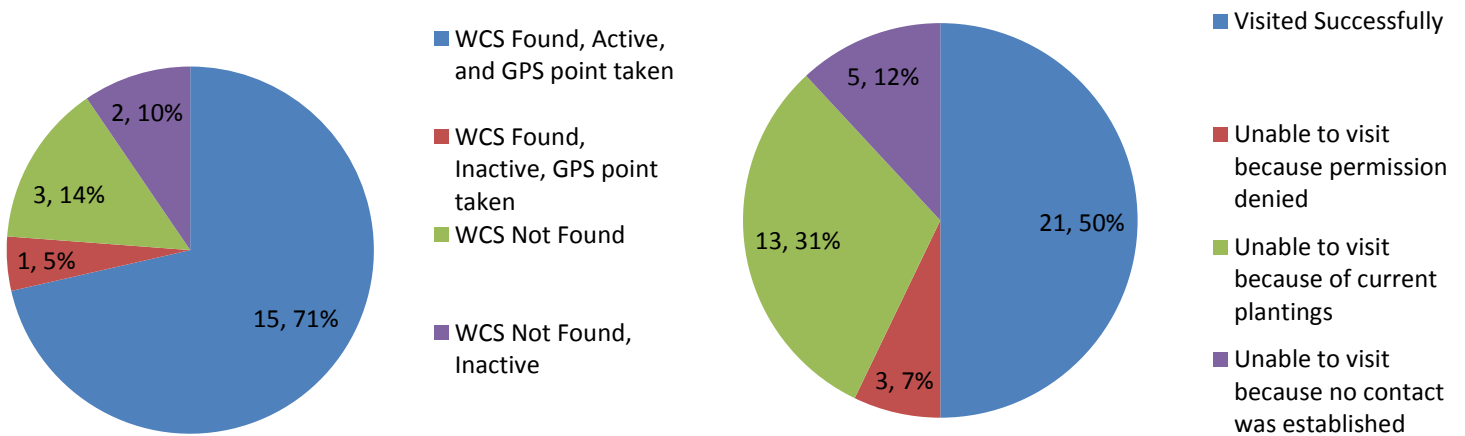


Figure 1: Pie Graph showing successful data point collection

We created an ArcMap of our data points which can be found at [Figure 2: Pie Graph showing successful site visits](#)

be found at

F:\Watershed\2013InternDataUpdates\WCS_Verification\WCS_test

References:

Osmond, D.L., J.W. Gilliam and R.O. Evans. 2002. Riparian Buffers and Controlled Drainage to Reduce Agricultural Nonpoint Source Pollution, North Carolina Agricultural Research Service Technical Bulletin 318, North Carolina State University, Raleigh, NC.

Forestry Harvested Area Update Methodology – Summer 2013

Work Group:

DNREC: Bryan Bloch, Tyler Monteith, Regina Kukola
Forest Service: Sam Topper (sam.topper@state.de.us)

Objective:

The purpose of this project was to update forest harvest area data collected by the Delaware Forest Service to include ArcGIS coverage through the digitization of harvested forest areas. The digitization of these harvest areas are then linked to an Access database containing all permit information, creating a spatial reference. These files are located on a server at the Redden State Forest Office. This will also allow for the reporting of these harvests for inclusion in the Chesapeake Bay Model.

Methodology:

- Examined the current status of harvested forest areas comparing the contents of the Access Database (containing all information on the harvest permits) to the attribute table of the DDAForest_HarvestArea layer (containing the shapefiles of harvested areas already in existence)
 - Permits were categorized as being in the Access database but without a shapefile (our main task), those in both the Access File and had a shapefile (what is up-to-date), and those that had a shapefile but did not exist in the Access database (DDA's task to update)
 - An excel file of the Access Database can be found at (F:)Watershed/2013InternDataUpdates/TimberHarvestPermits/Harvest_permits
- Shapefiles were created for harvest permits in Access Database
 - Identified all permit numbers lacking shapefiles
 - Used the hard copy of the harvest permit for reference. These documents were housed in the Forest Service office in Redden State Forest.
 - Used information from the permit and ArcMap layers in order to spatially locate the harvested area including:
 - Parcel/tax ID, Forest cover, historic aerial photography, hardcopy map of harvested area, nearest intersection, etc., as seen in figure 2.
 - Started an editing session in ArcMap using DDAForest_HarvestArea as the target and outlined the harvested area as identified in permit, using a scale of approximately 1:4,000
 - Once that shapefile was created, the attribute table for that shapefile was edited to include information on the updated shapefile, as seen in figure 3.

- LinkField was added, composed of capital letter county followed by 4 digit year, 2 digit month, and 2 digit day based from the permit (ex. S20130701)
 - This field links the shapefile to the Access Database and automatically populates the remaining fields
 - Forester Initials – initials of forester responsible for the permit, found in permit
 - Year of permit
 - County permit was issued
 - Date that the shapefile was entered (day/month/year)
 - Username of person entering the data
 - The acres field will be populated through a calculated geometry calculator function after all shapefiles have been created
 - Once all possible shapefiles were created, the calculate geometry tool was used in order to calculate the acreage of each harvested area for reporting purposes
 - HUC12 codes were determined by importing a HUC12 data layer to do an intersect for determining which HUC12 each shape file was located in
 - Once determined, these locations were joined to the DDAForest_HarvestArea layer
 - Some permits lacked sufficient information to effectively locate harvested area
 - A “nearest intersection” field was used to attempt to identify the harvested area
 - Some fields were able to be estimated based on size and historical land imagery changes between years
 - For those with too vague of descriptions, HUC12 Codes were generated
 - A list of HUC Codes for these parcels can be found at (F:)Watershed/2013InternDataUpdates/TimberHarvestPermits/Forestry_HUC_codes
 - 51 files were unable to, at minimum, determine a HUC code due to lack of sufficient information, as seen in figure 4.
 - 12 permit shapefiles (.5% of all permits) were found in the DDAForest_harvestarea GIS layer, but do not exist in the Access Database.
 - A list of these permits was created and given to the Sam Topper for them to correct
 - Since the files exist as shapefiles in GIS, it will not affect our results
 - An excel file of the progress of the project containing a list of permits divided by county, and the status of those parcels is located (F:)Watershed/2013InternDataUpdates/TimberHarvestPermits/Forestry_database_progress

Reporting:

For our purpose of reporting these practices for inclusion in the Bay Model, the template found at (F:)\\Watershed\\Chesapeake Bay\\ContractorSupport\\Tetra Tech\\FY12 Deliverables\\NEIEN methodology\\2012_NEIEN Data.zip was used as a reference for the information needed for reporting, as seen in figure 5. A final version of the reporting spreadsheet can be found at (F:)Watershed\\2013InternDataUpdates\\TimberHarvestPermits\\Timber_harvest_parcel_submission. The general template was mirrored, as mentioned above. Some parcels were located in multiple HUCs. For these, the portion of acreage in each corresponding HUC was calculated and reported in the Measure_value column. For fields that we were unable to create a shapefile, but were able to locate the associated HUC, the acreage reported came from the “Treated Area” recorded on the harvesting permit. The date located in the “BMP_EVENT_STATUS_CODE_DATE” column came from the implementation date found on the original harvest permits. If no implementation date was on the permit, the date that the permit was processed was used.



Figure 1: The ArcMap layer “DDAForest_HarvestArea” contains the shapefiles of harvested forest, indicated by the red outlines.

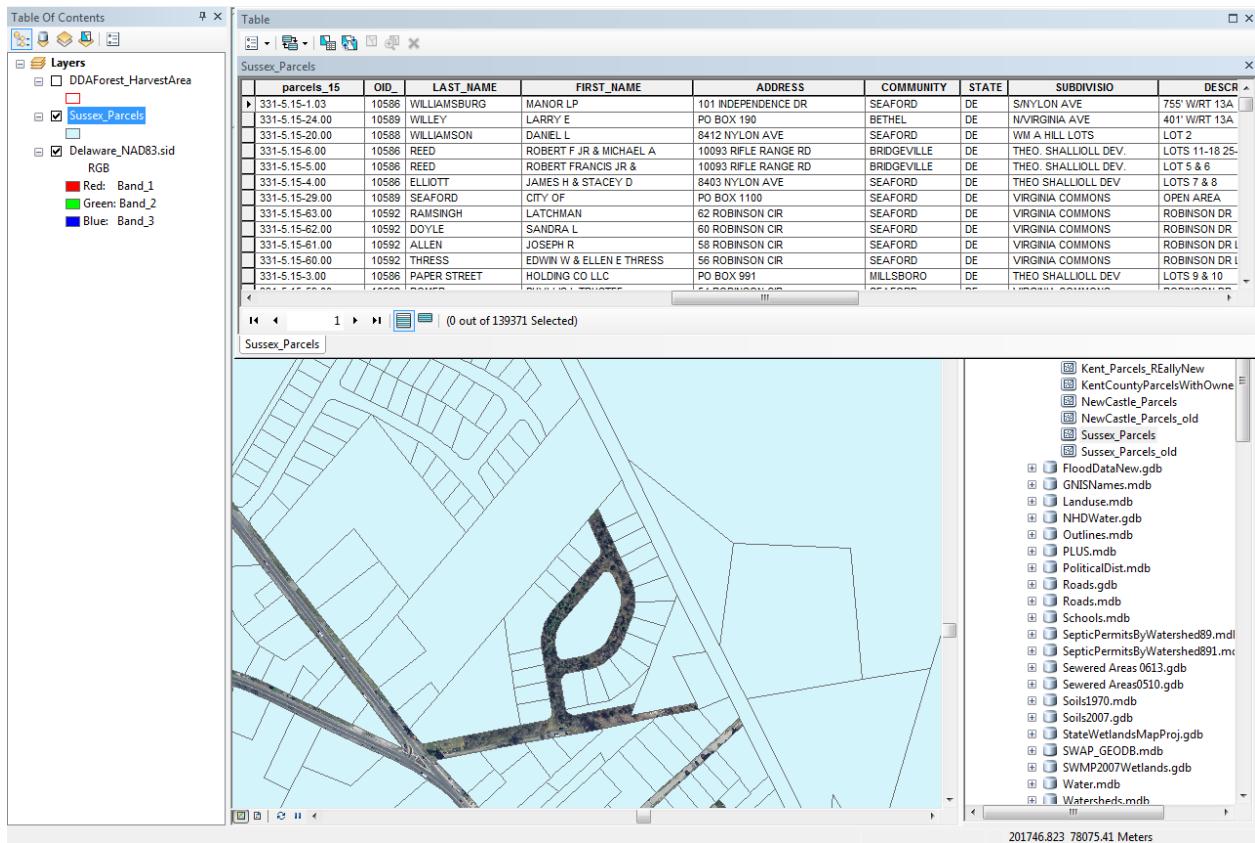


Figure 2: ArcMap layers including county parcels and historic aerial photography were used to locate the harvested area.

OBJECTID*	SHAPE*	Link_Field	Forester	Year	County	DateEntered	UserInputName	Note	SHAPE_Length	SHAPE_Area	Acres
1908	Polygon	S20100801					Bryan Bloch		1222.145017	34934.398975	8.632443
1909	Polygon	S20100701					Bryan Bloch		492.801871	9959.338555	2.460996
1910	Polygon	S20100702					Bryan Bloch		5322.130485	1424078.800266	351.896128
1911	Polygon	S20100802					Bryan Bloch		518.976091	8906.988147	2.200956
1912	Polygon	S20100804					Bryan Bloch		1239.748247	74803.843579	18.484358
1913	Polygon	S20100902					Bryan Bloch		768.998791	23260.123852	5.747679
1914	Polygon	S20100901					Bryan Bloch		971.631795	32279.002727	7.976283
1915	Polygon	S20100803					Bryan Bloch		3186.971145	394132.860174	97.391961
1916	Polygon	S20100903					Bryan Bloch		2401.518687	201075.360922	49.686605
1917	Polygon	S20100904					Bryan Bloch		1849.007163	193588.694045	47.836617
1918	Polygon	S20100905					Bryan Bloch		1963.472414	111894.485398	27.649619
1919	Polygon	S20100906					Bryan Bloch		422.338788	6305.970501	1.558233
1920	Polygon	S20101001					Bryan Bloch		1567.663392	66838.202103	16.516013
1921	Polygon	S20101002					Bryan Bloch		6133.293579	483097.818231	119.375593
1922	Polygon	S20101101					Bryan Bloch		1953.418085	123001.051238	30.3941
1923	Polygon	S20101107					Bryan Bloch		953.264476	37981.716089	9.385449
1924	Polygon	S20101106					Bryan Bloch		2028.921224	118945.346881	29.391918
1925	Polygon	S20101105					Bryan Bloch		5126.633217	402273.909336	99.40365
1926	Polygon	S20101104					Bryan Bloch		1613.156922	39817.874337	9.839172
1927	Polygon	S20101103					Bryan Bloch		2162.547435	203478.594613	50.280455
1928	Polygon	S20101102					Bryan Bloch		1569.968687	147981.972823	36.566996
1929	Polygon	S20101204					Bryan Bloch		719.670634	34081.351525	8.421652
1930	Polygon	S20101201					Bryan Bloch		964.257083	14583.214449	3.603576
1931	Polygon	S20101202					Bryan Bloch		1766.498931	80497.51608	19.89129
1932	Polygon	S20101203					Bryan Bloch		1034.00114	45371.529648	11.211504
1933	Polygon	S20110104					Bryan Bloch		1563.828552	59506.724733	14.704373
1934	Polygon	S20110201					Bryan Bloch		1505.430635	132486.568251	32.738013
1935	Polygon	S20110101					Bryan Bloch		1154.134888	71587.285353	17.689533
1936	Polygon	S20110105					Bryan Bloch		2035.441992	72046.608162	17.803033
1937	Polygon	S20110102					Bryan Bloch		921.136205	31136.246169	7.693903
1938	Polygon	S20110103					Bryan Bloch		2573.597538	123792.962506	30.589785
1939	Polygon	S20110203					Bryan Bloch		1670.149241	106918.477655	26.420026
1940	Polygon	S20110204					Bryan Bloch		877.403961	20811.205514	5.14254
1941	Polygon	S20110202					Bryan Bloch		3180.127658	511027.495871	126.277139
1942	Polygon	S20110205					Bryan Bloch		1805.008488	171862.554965	42.467992
1943	Polygon	S20110206					Bryan Bloch		1146.485265	80122.355598	19.798586
1944	Polygon	S20110302					Bryan Bloch		554.231052	8528.512681	2.107433

Figure 3: The DDAForest_HarvestArea attribute table containing the fields that need entering after a shapefile for the harvested area has been created.

O	P	Q	R	S	T	U	V	W
AcresTreated	TotalWoodlandAcres	County	Taxparcel	PropertyLocation	Clearcut	SelectionCut	Thinning	Other
15	15	Sussex		North of State road 363 and South of Road 362 near Bethany Beach	TRUE	FALSE	FALSE	FALSE
83.69999695	83.69999695	Sussex		Anderson's Corner, east of Route 5 just south of Herbeson	TRUE	FALSE	FALSE	FALSE
161	277	Sussex		South Side of C. R. 407, 1 mile south of Millsboro, DE T520 Houston	TRUE	FALSE	FALSE	FALSE
0	0	Sussex			FALSE	FALSE	FALSE	FALSE
9	9	Kent		East side of Route 15	FALSE	TRUE	FALSE	FALSE
46	204	Sussex		West of and fronting on C. R. 504, 2250 feet south of C. R. 508 Wright	TRUE	FALSE	FALSE	FALSE
20	20	Sussex		West side of US 13, just south of C. R. 454A	TRUE	FALSE	FALSE	FALSE
25	25	Sussex		West of Bethel, South side of Route 78	TRUE	FALSE	FALSE	FALSE
30	48	Sussex		North side of, but not fronting on C. R. 494, 6 miles west of Laurel	TRUE	FALSE	FALSE	FALSE
6.5	16	Sussex		North side of, but not fronting on C. R. 494, 6 miles west of Laurel	TRUE	FALSE	FALSE	FALSE
18	18	Kent		Southwest side of Burrsville Road	FALSE	TRUE	FALSE	FALSE
7.800000191	7.800000191	Kent		West side of C. R. 352 at owners residence	FALSE	TRUE	FALSE	FALSE
68	75	Sussex		C. R. 31, 2 miles west of RT 404	TRUE	FALSE	FALSE	FALSE
6	6	Sussex		Bridgeville/Federalburg Road at Atlantic Cross Roads	TRUE	FALSE	FALSE	FALSE
10	0	Sussex	1-31-8-2	Intersection of C. R. 572 and 569	TRUE	FALSE	FALSE	FALSE
4	5	New Castle		Oak Hill School Road and Black Stallion Road	TRUE	FALSE	FALSE	FALSE
4.5	4.5	Kent		Irish Hill Road	FALSE	TRUE	FALSE	FALSE
17.10000038	17.10000038	Kent		North of C. R. 44	FALSE	TRUE	FALSE	FALSE
45	45	Sussex		T-551 Donovan East side of C. R. 246, app. 1000 feet north of C. R. 245	TRUE	FALSE	FALSE	FALSE
16	16	Sussex	231-19-13	German Road, both sides, just south of Old Furnace Road	FALSE	TRUE	FALSE	FALSE
30	92	Sussex		North of C. R. 244, off C. R. 246	TRUE	FALSE	FALSE	FALSE
27	119	Sussex		South side of C. R. 297 and east of C. R. 305	TRUE	FALSE	FALSE	FALSE
48	48	Sussex		South of State Route 24 and east of Whaley's Crossroads	FALSE	FALSE	TRUE	FALSE
15	55	Sussex		Route 30 and Route 252	FALSE	FALSE	TRUE	FALSE
12	30	Sussex		Route 30, one mile south of Route 9 on the east side of the road.	FALSE	TRUE	FALSE	FALSE
110	129	Sussex		Northeast and southwest sides of Road 320, 1,200 feet west of Road 295	TRUE	FALSE	FALSE	FALSE
19	19	Sussex		West side of C. R. 501, north of C. R. 515	TRUE	FALSE	FALSE	FALSE
15	15	Sussex		West of Route 62, north side of Route 451	FALSE	FALSE	TRUE	FALSE
140	140	Kent		East side of C. R. 279, north of Whitelysburg Road, west of Harrington	TRUE	FALSE	FALSE	FALSE
20	35	Kent		At owners Residence	FALSE	TRUE	FALSE	FALSE
9	10	Sussex		South of C. R. 407 near Dagsboro	TRUE	FALSE	FALSE	FALSE
12	0	Kent		Westville & Almshouse Roads, just west of Jenkins Airport	FALSE	TRUE	FALSE	FALSE
40	40	Kent		West of, but not joining Gravesend Road, approximately 1/2 mile north of t	FALSE	FALSE	TRUE	TRUE
14	14	New Castle			FALSE	TRUE	FALSE	FALSE
15	20	New Castle			FALSE	TRUE	FALSE	FALSE

Figure 4: Some parcels had missing information that made their location too vague to effectively locate, such as missing tax ID's or property location descriptions.

NPS_BMPNAME	A	B	C	D	E	F	G
NPS_BMPNAME		NPS_BMP_MEASUREVALUE	NPS_BMP_MEASURENAME	NPS_BMP_MEASUREUNITCODE	NPS_BMP_MEASUREUNITNAME	HUC12_CODE	D_S_NAME
Tree Planting	these are old see update tree planting spreadsheet	13.4	Area Planted	ACRE	Acres	020801090404	DDA Forestry
Tree Planting	these are old see update tree planting spreadsheet	85.8	Area Planted	ACRE	Acres	020801090401	DDA Forestry
Tree Planting	these are old see update tree planting spreadsheet	69.0	Area Planted	ACRE	Acres	020801090101	DDA Forestry
Tree Planting	these are old see update tree planting spreadsheet	11.9	Area Planted	ACRE	Acres	020801090101	DDA Forestry
Tree Planting	these are old see update tree planting spreadsheet	163.6	Area Planted	ACRE	Acres	020801090301	DDA Forestry
Tree Planting	these are old see update tree planting spreadsheet	1.4	Area Planted	ACRE	Acres	020600050202	DDA Forestry
Tree Planting	these are old see update tree planting spreadsheet	10.3	Area Planted	ACRE	Acres	020801090204	DDA Forestry
Tree Planting	these are old see update tree planting spreadsheet	5.4	Area Planted	ACRE	Acres	020801090201	DDA Forestry
Tree Planting	these are old see update tree planting spreadsheet	17.2	Area Planted	ACRE	Acres	020801090201	DDA Forestry
Forest Harvesting Practices		6.0	Acres	ACRE	Acres	020801090401	DDA Forestry
Forest Harvesting Practices		30.0	Acres	ACRE	Acres	020801090202	DDA Forestry
Forest Harvesting Practices		8.0	Acres	ACRE	Acres	020801090204	DDA Forestry
Forest Harvesting Practices		14.0	Acres	ACRE	Acres	020801090205	DDA Forestry
Forest Harvesting Practices		5.0	Acres	ACRE	Acres	020801110201	DDA Forestry
Forest Harvesting Practices		43.0	Acres	ACRE	Acres	020801090201	DDA Forestry
Forest Harvesting Practices		0.7	Acres	ACRE	Acres	020801090303	DDA Forestry
Forest Harvesting Practices		39.0	Acres	ACRE	Acres	020801090402	DDA Forestry
Forest Harvesting Practices		9.0	Acres	ACRE	Acres	020801090405	DDA Forestry
Forest Harvesting Practices		10.0	Acres	ACRE	Acres	020801090405	DDA Forestry
Forest Harvesting Practices		12.0	Acres	ACRE	Acres	020801090202	DDA Forestry
Forest Harvesting Practices		14.0	Acres	ACRE	Acres	020801090406	DDA Forestry
Forest Harvesting Practices		3.0	Acres	ACRE	Acres	020801090303	DDA Forestry
Forest Harvesting Practices		26.0	Acres	ACRE	Acres	020801090205	DDA Forestry
Forest Harvesting Practices		18.0	Acres	ACRE	Acres	020801090504	DDA Forestry
Forest Harvesting Practices		33.0	Acres	ACRE	Acres	020600020401	DDA Forestry
Forest Harvesting Practices		12.0	Acres	ACRE	Acres	020600020402	DDA Forestry
Forest Harvesting Practices		23.0	Acres	ACRE	Acres	020600020401	DDA Forestry
Forest Harvesting Practices		81.0	Acres	ACRE	Acres	020600050203	DDA Forestry
Forest Harvesting Practices		159.0	Acres	ACRE	Acres	020600050205	DDA Forestry
Forest Harvesting Practices		2.0	Acres	ACRE	Acres	020600050203	DDA Forestry
Forest Harvesting Practices		9.0	Acres	ACRE	Acres	020600050202	DDA Forestry
Forest Harvesting Practices		39.0	Acres	ACRE	Acres	020600050201	DDA Forestry
Forest Harvesting Practices		11.0	Acres	ACRE	Acres	020600050201	DDA Forestry
Forest Harvesting Practices		4.0	Acres	ACRE	Acres	020600050202	DDA Forestry
Forest Harvesting Practices		4.0	Acres	ACRE	Acres	020600050202	DDA Forestry
Forest Harvesting Practices		64.0	Acres	ACRE	Acres	020600020402	DDA Forestry
Forest Harvesting Practices		4.0	Acres	ACRE	Acres	020801090301	DDA Forestry
Forest Harvesting Practices		90.0	Acres	ACRE	Acres	020600050201	DDA Forestry
Forest Harvesting Practices		35.0	Acres	ACRE	Acres	020600050201	DDA Forestry

Figure 5: This file was used as the basis for what information was needed for reporting purposes to the Bay Program.

**Septic System Abandonment and Count for the Chesapeake Bay
Geographic Information Systems Methodology – November 2013**

Delaware Department of Natural Resources and Environmental Control (DNREC)

Watershed Assessment and Management Section (WAS): Bryan Bloch

Groundwater Discharges Section (GWDS): Ron Graeber and Dave Schepens

Objective: The purpose of this project was to update the septic connection data collected by the Ground Water Discharges Section to include ArcGIS coverage. This analysis is based on the assumption that anyone paying for sewer service is using central sewer; therefore, anyone who pays for sewer should be connected to central sewer. Billing data was acquired from municipalities and cross-referenced with GWDS septic database - Delaware Environmental Network (DEN).

Methodology:

- Examined current data to compare septic counts within the Chesapeake Bay Watershed.
Data used includes:
 - GWDS DEN query (including system abandonment reason connection to central sewer)
 - 2012 Imagery
 - Google Imaging Services
 - Municipal Sewer Districts/Area (06/2013)
 - Grid 1.5 mile X 1.5 mile (489 total cells to verify)
 - County parcels-vacant/non-vacant
 - Billing Addresses or Parcel Provided by
 - Bridgeville
 - Seaford
 - Sussex County
 - Kent County-EDU'S attached
 - Still in need of data from the following municipalities:
 - Laurel
 - Delmar
 - New Castle
 - Middletown
 - Farmington
 - Greenwood
 - Harrington
- Linked municipal or county sewer billing data to tax parcels-geocoded addresses:
 - If EDU'S were attached to data that was amended to parcel attribute

- If not, assumed dwelling was one EDU, or count of dwellings on one parcel
- Using the DEN onsite point data, areas within sewer billing area, assumed connected to central sewer. EDU data was attached.
- Points were created for those parcels found to be paying for sewer services and were not found in DEN. Using 2012 imagery, points were created on the sewer service parcels.
- These data will be compiled and submitted for inclusion in the 2013 Chesapeake Bay Submission.
- Some issues were encountered when analyzing the data but were rectified:
 - Some parcels did not completely match county/municipal data
 - Geocoding addresses made it tough at time to figure which dwelling was on sewer (Bridgeville)
 - Abandoned dwellings viewing with aerial imagery, use imagery and google and parcel data if applicable to determine vacant or not
 - Data has yet to be mapped from billing data from some areas.

DEN Issues:

1. The DEN database is used to track permits
2. Duplicates must be removed
3. Other permit statuses must be updated
4. Cannot determine if prior septic systems have been abandoned or connected to sewer.
5. can't assume a specific permit status since data has not been entered in completely for all parcels, so must look one by one or digitize)

Future Recommendations:

- The State of Delaware needs a central septic tracking database. Not just for permits but for septics, sewer connections, abandonments, and pump-outs.
- Each septic record should be recorded with lat/long and number of EDU'S connected to sewer.
- GPS actual septic system location when installed or when a Class H inspection is done if applicable rather than a point being created based on the centroid of a given parcel.

Billing Contact Information:

Municipality	Contact Name	Phone	Email
Bridgeville	Jesse Savage- Town Manager April Buckler-Billing	302-337-7135	jsbridgeville@gmail.com abuckler@ddmg.net

Seaford	Sharon Drugash-Payroll Berley Mears-Director of Public Works	302-629-8307	sdrugash@seafordde.com
Sussex County	John Norris Buddy Lynch	Public Works 302-854-5396	blynch@sussexcountyde.gov
Kent County	Hans Medlar-Public Works Zach Lawson-GIS	302-744-2430	publicworks@co.kent.de.us Zach.Lawson@co.kent.de.us
Laurel	James Foskey-Public Works Jamie Smith- Operations Manager	302-875-2277	laurelpwd@comcast.net laurelop@comcast.net
Delmar			
New Castle			
Middletown			
Farmington			
Greenwood			
Harrington			