Report on the Maryland Department of Agriculture (MDA), Non Cost-Shared Best Management Practice Verification Procedures Manual

This report should be reviewed in conjunction with the MDA Non-Cost Shared Best Management Practice Verification Procedures Manual (Version 2, November 2013). The Verification Manual details: the procedures required for practice reporting; definitions of each FE practice; conditions where they apply; criteria for the practice; required operations and maintenance; reduced lifespans for FE, and supporting data and documentation for reporting. It also contains a Design Criteria worksheet for each practice that is used to determine if it meets a non cost-shared practice meeting Natural Resource Conservation Service (NRCS) design criteria or MDA Functional Equivalent (FE) design criteria.

Table 1 lists the names and practice codes of the MDA non cost-shared practices and the FE counterparts that are presented in the Verification Manual and discussed in this Report.

Table 1: Proposed Maryland Non Cost-Shared BMPs and Functional Equivalents:

NRCS Code	MDNRCS Non-Cost Shared BMP Name	MDA FE Code	MDA Non-Cost Shared FE BMP Name	Additional Reporting Options
313	Waste Storage Facility	313FE	Waste Storage Structure	None
316	Animal Mortality Facility	316FE	Animal Compost Structure	
327	Conservation Cover	327FE	Alternative Crop/Switchgrass	
382A	Fence	382FE1	Watercourse Exclusion	10'-34' Width Buffer, Planted to Grass or Trees
382B	Fence	382FE2	Watercourse Exclusion	35'+ Width Buffer, Planted to Grass
382C	Fence	382FE3	Watercourse Exclusion	35'+ Width Buffer, Planted to Trees
None	None*	390FE1	Grass Buffer for Stream	10'-34' Width Buffer
390	Riparian Herbaceous Cover	390FE2	Grass Buffer for Stream	35'+ Width Buffer
None	None*	391FE1	Forest Buffer for Stream	10'-34' Width Buffer
391	Riparian Forest Buffer	391FE2	Forest Buffer for Stream	35'+ Width Buffer
422A	Hedgerow Planting	422FE1	Vegetative Environmental Buffer for Poultry	Warm Season Grass
422B	Hedgerow Planting	422FE2	Vegetative Environmental Buffer for Poultry	Trees
512	Forage and Biomass Planting	512FE	Pasture and Hayland Planting	None
528	Prescribed Grazing	528FE	Rotational Grazing	
558	Roof Runoff Structure	558FE	Barnyard Runoff Control	
561	Heavy Use Area Protection	561FE	Concentrated Area Protection	
587	Structure for Water Control	587FE	Water Control Structure	
614	Watering Facility	614FE	Watering Trough	
657	Wetland Restoration	657FE	Wetland Development	

* A smaller width may not be reported for the practice if BMP meets the NRCS Standard Design Criteria.

Agricultural Functional Equivalent (FE) BMPs

Recommendations for Approval by the Water Quality Goal Implementation Team, and it's associated Watershed Technical and Agriculture Workgroups.

Introduction

This document summarizes the recommendations by the Maryland Department of Agriculture for the acceptance of 14 non-cost shared practices meeting NRCS standards, 14 Functional Equivalent BMP's and their associated Verification Procedures. The Watershed Technical Workgroup (WTWG) recommended these practices for inclusion in the NEIEN Appendix at their meeting on November 7, 2013. On (date) the Agriculture Workgroup (AgWG) recommended the use of these practices for reporting in Phase 5.3.2 of the Chesapeake Bay Program Watershed Model. The Panel Membership was:

Panelist	Position	Affiliation
John Rhoderick	Resource Conservation Operations Manager	Maryland Department of Agriculture
Elizabeth Horsey	Agricultural Watershed Implementation Plan Coordinator	Maryland Department of Agriculture
Michael Stanton	Watershed Implementation Plan Coordinator	Maryland Department of Agriculture
Jason Keppler	Senior GIS Analyst	Maryland Emergency Mgmt.
Dana York	President, Agricultural Systems Specialist, Nutrient Management Specialist, FACAP Certifier	Green Earth Connection LLC
Robert Ensor	District Manager, Certified Agricultural Agronomist/ Certified Crop Advisor/Nutrient Management Specialist	Howard Soil Conservation District
Geoffrey Schoming	Professional Engineer	Howard Soil Conservation District
John Sheppard	District Manager	Caroline Soil Conservation District
Trista North	Director of Erosion and Sediment Control	Caroline Soil Conservation District
Stephanie Knutsen	Agriculture Resource Conservation Specialist (MDA), Certified Planner/Nutrient Management Specialist	Caroline Soil Conservation District
Alison Taylor	Agriculture Resource Conservation Specialist (MDA) Certified Planner/Nutrient Management Specialist	Caroline Soil Conservation District
Caroline Middleton	Agriculture Resource Conservation Specialist (MDA) Certified Planner/Nutrient Management Specialist	Caroline Soil Conservation District
Elmer Weibley	District Manager	Washington County Soil Conservation District

Background on Non Cost-Shared BMP Data Collection: Chesapeake Bay Executive Order 12508

In January of 2009, President Obama issued Executive Order (EO) 12508 on the Chesapeake Bay. May 12, 2010, the Federal Leadership Committee for the Chesapeake Bay Program released the EO Strategy. One of the issues in the Strategy was for USDA to assist states to get a full accounting of conservation practices both cost and non-cost shared practices (sometimes called voluntary practices) that have been implemented in the Bay Region.

USDA was to take the lead and in December 2010, a contract was awarded to the National Association of Conservation Districts (NACD) to: "Establish a reliable system to collect, verify and report data on the implementation of non-cost shared agricultural conservation practices in the Chesapeake Bay area to the Bay Program Model." States actions for the NACD effort included:

- Bay states reviewed options and decided to each develop their own system for verification;
- To date some states collect and report non-cost shared BMPs meeting NRCS standards:
- MD is the first state to move forward in establishing a process to verify non-cost shared practices meeting NRCS standards and functional equivalents (FE) data.

Importance of Maryland Reporting Non-Cost Shared Practices:

As Maryland implements local Watershed Implementation Plans to meet the new Total Maximum Daily Load requirements for the Chesapeake Bay Watershed, a more accurate accounting of all conservation measures on Maryland's agricultural land is critical to ensure that appropriate nutrient load reductions are being credited in the Bay Watershed Model. Accurate accounting is also needed to help the state plan where additional practices can be implemented. Traditionally, MDA has relied upon both State and Federal Cost-Share Programs as the source of conservation implementation data. This data is currently reported through MDA's Conservation Tracker System. Recognizing that many conservation measures have been, and are being, implemented without Federal or State financial assistance, the Chesapeake Bay Program has agreed to credit certain Best Management Practices that have been implemented without public cost-share provided they either meet USDA-NRCS standards or they are "functionally equivalent" to the USDA-NRCS standards.

Maryland Non Cost-Shared Practices Meeting NRCS Standards and Functional Equivalents

When evaluating non cost-shared practices, Maryland District technical staff identified 14 practices that were installed by farmers that do not fully meet NRCS standards, but are installed in such a way that the practice could be determined to be a **Functional Equivalent**. Since these practices are completely funded by a farmer, they may not have used the same designs, materials or certified seed as required by NRCS, but when evaluated, can be determined to function similarly to a NRCS designed practice. Therefore, MDA recommends a Functional Equivalent (FE) practice **be defined in the following manner:**

Agricultural Functional Equivalent (FE) Best Management Practice (BMP)

"A non-cost shared agricultural conservation practice that provides an environmental benefit on an annual basis that is equivalent to an existing approved Chesapeake Bay Program (CBP) BMP of similar function that is defined to meet an NRCS Standard and Specification. The recognized physical life-span of an agricultural functional equivalent

BMP shall in nearly all cases represent a significantly reduced timeframe compared to an existing approved CBP BMP of similar function. It is assumed that the design criteria and/or construction materials may not be as comprehensive as currently defined by an NRCS Standard and Specification".

Why Is It Important to Document Functional Equivalents in Maryland?

1) Farmers and Agricultural Landowners install many BMP's outside of state or federal cost share programs or cannot accept a government subsidy. Examples are:

- Plain Sect Farmers, Mennonite Farmers
- Farms owned by corporations that cannot accept federal funding due to the payment limitations.

2) Maryland Nutrient Regulations require farmers to install practices that provide water quality protection and need to be verified for compliance with state laws. These practices are not required to meet NRCS Standards and Specifications. For example:

- Stream Exclusion (fencing)
- 10' and 35' buffers for fertilizer and manure application

3) Watershed Organizations, Environmental Organizations, Conservation Organizations, and NGOs are all helping Farmers and Agricultural Landowners to meet WIP goals to protect water quality by installing BMPs. Examples are:

- Chesapeake Bay Foundation - Stream exclusion fencing with narrow width tree plantings
- Nanticoke Watershed Association – 10' Buffers on Drainage Ditches
- Chester River Association - Switch grass plantings for field buffers
- Middle Choptank River Association - Water Control Structures on Field Ditches

Finally, a priority of MDA is to capture as much data as possible on all BMP implementation in the state to give credit to and to document the good actions Maryland farmers are doing to protect the environment and the Chesapeake Bay.

Maryland Non-Cost Share Practice Identification and Verification History:

In 2010, MDA developed a verification manual for 14 FE BMP's based on work in the USDA Upper Chester River Showcase Watershed. The MDA verification manual was tested in Howard County and then released to all Districts in September 2011 (Version 1). The manual was updated in March of 2013 (Version 2).

To date, about 100 FE practices had been collected using these early manual definitions and worksheets. Upon review of the past worksheets, MDA leadership and District staff including: District Managers; a Professional Engineer; Certified Agricultural Agronomist-Certified Crop Advisor; Nutrient Management Specialists, Certified Conservation Planners; Farm Stewardship Certification Assessment Program Specialist and MD Nutrient Trading; and retired NRCS soil conservationist developed Version 3 of the MDA Verification Manual.

Functional Equivalent Practice Definition Development and Design Criteria:

Over the past two years, through the review of practices that farmers have installed without cost sharing, MDA determined there were fourteen NRCS practices that would be considered to be MDA Functional Equivalents. It was determined that Districts needed to understand the FE practice definitions and what design criteria would be required to report a FE.

To determine the critical design criteria for a MDA Functional Equivalent practice, the following actions were taken:

1) All critical NRCS Standard design components for the 14 BMPs were listed and initially considered for a FE practice. NRCS practice criteria standards are found under the USDA-NRCS: National Handbook of Conservation Practices (NHCP) at:

(http://directives.sc.egov.usda.gov/viewerFS.aspx?hid=22299)

and the Field Office Technical Guides for each state at:

(http://www.nrcs.usda.gov/technical/efotg/)

2) Critical Design Components of FE Practices were determined by the following filters:

a) Is it required by Federal or State Law? (State Law criteria may be in addition to, or more stringent than NRCS design criteria).
b) Is it required for safe functioning of the practice for humans or animals?
c) Is it required for the practice to provide water quality or resource protection?
d) Some FE standards will have more than one reportable code to record the appropriate buffer widths or type of animal.
e) FE practices will have different (but similar) names to distinguish them from Non-cost shared practices that meet a NRCS standard.
f) All FE practice standards will have a reduced lifespan and will be recertified at the end of FE lifespan to ensure they are being properly maintained and functioning.
d) Owner Certification is required for satisfaction of FE design criteria for components that are not obvious, and for adequate operations and maintenance of the practice.

CBP Practice Definitions/MDA Functional Equivalent Definitions: Refer to the MDA Non-Cost Sharing Manual in the Appendix for complete FE definitions and design criteria. FE definitions are very similar to NRCS definitions, but are sometime more narrow that the NRCS definition. For example for the NRCS Fence standard (327), the MDA FE version, Watercourse Exclusion (327FE) will only be counted for fencing systems along watercourses and the technician will have to indicate if the buffer next to the stream is in grass or trees.

No new CBP definitions were created in this project. However some practices are currently interim practices and will need to go through the AgWG expert review panel process prior to receiving credit in the Watershed Model. Additionally, some FE practices proposed may need to be reviewed by existing BMP expert review panels to see determine if it is appropriate to amend and include them in final panel BMP panel reports, and approve them to receive credit in the Watershed Model.

Table 2: The following are the MDA FE BMP Definitions and the associated CBP BMP Definitions:

NRCS BMP Name	MDA FE BMP Name	MDA FE Definition	CBP BMP Name	Interim	CBP Definition
313 Waste Storage Facility	313FE Waste Storage Structure	A waste storage impoundment made by constructing an embankment and/or excavating a pit or dugout, or by fabricating a structure.	Animal Waste Management Systems (AWMS)	N	Practices designed for proper handling, storage, and utilization of wastes generated from confined animal operations. Reduced storage and handling loss is conserved in the manure and available for land application
316 Animal Mortality Facility	316FE Animal Compost Structure	An on-farm facility for the treatment or disposal of livestock and poultry carcasses.	Mortality Composters (MortalityComp)	N	A physical structure and process for disposing of any type of dead animals. Composted material land applied using nutrient management plan recommendations.
327 Conservation Cover	327FE Alternative Crop/Switchgrass	Conversion of cropland to an herbaceous alternative crop of switchgrass.	AlternativeCrop (CarSeqAltCrops)	N	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.
382A Fence, 10'-34'	382FE1 Watercourse Exclusion, 10'-34'	A constructed barrier to livestock. A field border will be present of either herbaceous materials or trees between the stream and the fence. **(Narrow 10'-34')**	Stream Access Control with Fencing (PastFence)	N	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.
382B Fence, 35'+ Grass	382FE2 Watercourse Exclusion, 35'+ Grass	A constructed barrier to livestock. A field border will be present of either herbaceous materials or trees between the stream and the fence. **(Grass Buffer)**	Streamside Grass Buffers (GrassBuffersTrp)	N	This represents the 35-foot or greater fenced, managed grass buffer area behind stream access control with fencing. See definition for Stream Access Control with Fencing for additional details.
382C Fence, 35'+ Trees	382FE3 Watercourse Exclusion, 35'+ Trees	A constructed barrier to livestock. A field border will be present of either herbaceous materials or trees between the stream and the fence. **(Tree Buffer)**	Streamside Forest Buffers (ForestBuffersTrp)	N	This represents the 35 foot or greater fenced, managed riparian forest buffer are behind stream access control with fencing. See definition for Stream Access Control with Fencing for additional details.
390 Riparian Herbaceous Cover	390FE1 Grass Buffer for Stream, 10'-34'	Grasses, grass-like plants, and forbs that are established on cropland or managed to provide a herbaceous buffer located adjacent to and up-gradient from water bodies or a strip or area of herbaceous vegetation that removes contaminants from overland flow located adjacent to cropland. This includes areas that function as riparian herbaceous buffers and/or filter strips. **(Narrow 10'-34')**	Grass Buffers; Vegetated Open Channels for Agriculture (GrassBuffers)	N	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.
390 Riparian Herbaceous Cover	390FE2 Grass Buffer for Stream, 35'+	Grasses, grass-like plants, and forbs that are established on cropland or managed to provide a herbaceous buffer located adjacent to and up-gradient from water bodies or a strip or area of herbaceous vegetation that removes contaminants from overland flow located adjacent to cropland. This includes areas that function as riparian herbaceous buffers and/or filter strips. **(Wide 35'+)**	Grass Buffers; Vegetated Open Channels for Agriculture (GrassBuffers)	N	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.
391 Riparian Forest Buffer	391FE1 Forest Buffer for Stream, 10'-34'	An area of predominately trees and/or shrubs located adjacent to and up-gradient from water bodies. **(Narrow 10'-34')**	Forest Buffers (ForestBuffers)	N	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.
391 Riparian Forest Buffer	391FE2 Forest Buffer for Stream, 35'+	An area of predominately trees and/or shrubs located adjacent to and up-gradient from water bodies**. (Wide 35'+)**	Forest Buffers (ForestBuffers)	N	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.
422A Hedgerow Planting, Grass	422FE1 Vegetative Environmental Buffer for Poultry, Grass	Windbreaks or shelterbelts are single or multiple rows of trees; shrubs or warm season grasses in linear configurations adjacent to poultry house or poultry house fans. (**Warm Season Grass)**	None	NOT BMP FOR THIS GRASS	None (not approved at this time)
422B Hedgerow Planting, Trees	422FE2 Vegetative Environmental Buffer for Poultry, Trees	Windbreaks or shelterbelts are single or multiple rows of trees; shrubs or warm season grasses in linear configurations adjacent to poultry house or poultry house fans. **(Trees)**	Tree Planting: Vegetative Environmental Buffers Poultry (TreePlant)	Y	No CBP definition exists for Vegetated Environmental Buffers for Poultry, however the interim practice is credited as "Tree Planting." (not approved at this time)
512 Forage and Biomass Planting	512FE Pasture and Hayland Planting	Conversion of cropland to pasture or hayland through the establishment of native or introduced forage species.	Land Retirement to Pasture (LandRetirePast)	N	Converts land area to pasture. 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 farmers in land retirement procedures.
528 Prescribed Grazing	528FE Rotational Grazing	Managing the controlled harvest of vegetation with grazing animals.	Prescribed Grazing (PrecRotGrazing)	N	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. Prescribed Grazing 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 prescribed grazing systems are defined as having a vegetative cover of 60% or greater.
558 Roof Runoff Structure	558FE Barnyard Runoff Control	This practice includes the installation of practices to control runoff from barnyard areas, such as roof runoff control, diversion of clean water from entering the barnyard and control of runoff from barnyard or poultry barn areas.	Barnyard Runoff Control (BarnRunoffCont)	N	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.
561 Heavy Use Area Protection	561FE Concentrated Area Protection	The stabilization of areas frequently and intensively used by animals or vehicles by establishing vegetative cover, surfacing with suitable materials, and/or installing needed structures. **(Livestock)**	Loafing Lot Management (LoafLot)	N	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
561 Heavy Use Area Protection	561FE Concentrated Area Protection	The stabilization of areas frequently and intensively used by animals or vehicles by establishing vegetative cover, surfacing with suitable materials, and/or installing needed structures. **(Poultry)**	None	N	None (Not approved at this time)
587 Structure for Water Control	587FE Water Control Structure	A structure in a water management system that conveys water, controls the direction or rate of flow, maintains a desired water surface elevation in drainage ditches.	Water Control Structures (WaterContStruc)	N	Installing and managing boarded gate systems in agricultural land that contains surface drainage ditches.
614 Watering Facility	614FE Watering Trough	A permanent or portable device to provide an adequate amount and quality of drinking water for livestock.	Off Stream Watering Without Fencing (OSWnoFence)	N	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 stream banks. 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.
657 Wetland Restoration	657FE Wetland Development	The creation, rehabilitation or reestablishment of a wetland so that soils, hydrology, vegetative community, and habitat are a close approximation of the original natural condition that existed prior to modification, to the extent practicable.	Wetland Restoration (WetlandRestore)	N	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.

Effectiveness Estimates:

The effectiveness estimates for Non-Cost Shared practices and MDA Functional Equivalent Practices will be the same as CBP BMP's per guidance received from AgWG July 2013.

Table 3: Effective Estimates from MDA FEs/CBP BMPs

MDA FE BMP Name	CBP BMP Name	Land Use Change	Nitrogen % Effectiveness Min/Max	Phosphorus % Effectiveness Min/Max	Sediment Effectiveness Min/Max
313FE Waste Storage Structure	AWMS	N/A	75	75	N/A
316FE Animal Compost Structure	MortalityComp	N/A	40	10	N/A
327FE Alternative Crop/Switchgrass	CarSeqAltCrop	Landuse change	N/A	N/A	N/A
382FE1 Watercourse Exclusion, 10'-34'	PastFence	Landuse change	13/46	30/45	40/60
382FE2 Watercourse Exclusion, 35'+ Grass	GrassBuffersTrp	Landuse change	13/46	30/45	40/60
382FE3 Watercourse Exclusion, 35'+ Trees	ForestBuffersTrp	Landuse change	19/65	30/45	40/60
390FE1 Grass Buffer for Stream, 10'-34'	GrassBuffers	Not BMP	Not Approved BMP	Not Approved BMP	Not Approved BMP
390FE2 Grass Buffer for Stream, 35'+	Grass Buffers	Landuse change	13/46	30/45	40/60
391FE1 Forest Buffer for Stream, 10'-34'	ForestBuffers	Not BMP	Not Approved BMP	Not Approved BMP	Not Approved BMP
391FE2 Forest Buffer for Stream, 35'+	ForestBuffers	Landuse change	19/65	30/45	40/60
422FE1 Vegetative Environmental Buffer for Poultry, Grass	None	Not Approved BMP	Not Approved BMP	Not Approved BMP	Not Approved BMP
422FE2 Vegetative Environmental Buffer for Poultry, Trees	TreePlant	Landuse change	N/A	N/A	N/A
512FE Pasture and Hayland Planting	LandRetirePas	Landuse change	N/A	N/A	N/A
528FE Rotational Grazing	PrecRotGrazing	N/A	9/11	24/24	30/30

MDA FE BMP Name	CBP BMP Name	Land Use Change	Nitrogen % Effectiveness Min/Max	Phosphorus % Effectiveness Min/Max	Sediment Effectiveness Min/Max
558FE Barnyard Runoff Control	BarnRunoffCont	N/A	20/20	20/20	40/40
561FE Concentrated Area Protection (Livestock)	LoafLot	N/A	20/20	20/20	40/40
561FE Concentrated Area Protection (Poultry)	Not Approved BMP	Not Approved BMP	Not Approved BMP	Not Approved BMP	Not Approved BMP
587FE Water Control Structure	WaterContStruc	N/A	33/33	0/0	0/0
614FE Watering Trough	OSWnoFence	N/A	5/5	8/8	10
657FE Wetland Development	WetlandRestore	Landuse Change	7/25	12/50	4/15

- Estimates will vary based on hydrogeomorphic regions of Maryland.

- **Other Benefits of reporting MD Functional Equivalents:**
    - **Land Coverage:** By reporting Non-cost shared BMP's and FE's, MDA is more accurately defining land covered with BMP's for the Chesapeake Bay Model, therefore helping to better explain monitoring calibration data.
    - **Future WIP Practice Implementation:** By reporting FE's MDA will be able to more accurately determine where new practices may or may not be established to meet WIP goals.
    - **Future Funding for WIP Practice Implementation:** By reporting FE's MDA will be able to use this information to more accurately estimate the total cost-sharing data that is needed to meet WIP goals.
    - **Societal Benefits:** By reporting non-cost shared and FE's MDA will provide "credit" for all the conservation actions Maryland farmers are doing to protect the environment and the Chesapeake.

Justification for Recommended Effectiveness Estimates:
At the recommendation of the AgWG (July 2013), the effectiveness estimates for Non-Cost Shared practices meeting NRCS standards and Specifications and MDA Functional Equivalent practices will be the same. However, the FE lifespans have been reduced from NRCS lifespans (with the exception of rotational grazing). It is assumed that since the design criteria for the FE are not as extensive as required by NRCS specifications, that a technical person must visit the BMP on a more frequent basis to review the efficacy and farmer's operations and maintenance of the FE BMP. Per the required reporting "Procedures" in the MDA Verification manual: "In July of each year, the District will be provided a list of FE Practices that will need to be re-certified at the end of their FE lifespan. During the next calendar year the District will review the FE non cost-shared practice worksheets and the FE practice in the field and re-certify the FE practice. If the practice is no longer present or it cannot meet the FE design specification it will be removed from Conservation Tracker."

References Utilized for Manual Development and this Report:

- List of references:
    - MDA Non Cost-Shared Verification Procedures Manual, November 2013, Versions 1 and 2
    - Estimates of County-Level Nitrogen and Phosphorus Data for use in the Modeling Pollutant Reduction-Documentation for Scenario Builder Version 2.4.
    - "Developing Best Management Practice Definitions and Effectiveness Estimates for Nitrogen, Phosphorus and Sediment in the Chesapeake Bay Watershed" Final Report December 2009, University of Maryland Mid-Atlantic Water Program
    - USDA-NRCS National Conservation Practice Handbook
    - Maryland Natural Resource Conservation Service Technical Guide, Section IV, Practice Standards
    - NACD Protocol Project: The report can be found at www.howardscd.org
- Appropriateness of Recommendations:
        - Applicability: The FE definitions developed by MDA would be applicable for other states in the Chesapeake Bay Watershed.
        - Study location: This report is presented for the use in Maryland only.
        - Variability: If used in other states, there would be some variability depending on state NRCS specification and state laws that may require additional specifications or design criteria. There would be some variability between the eastern and western counties in Maryland on planting dates.
        - Number of studies: The Maryland NRCS Technical Guide, Section IV Standards were used for development of all design criteria. Maryland NRCS Standards and Specifications are based the USDA-NRCS National Practices Standards and Specifications and the research and practice standard development and approval processes that is used to develop them. Maryland planting dates and rate come from the University Maryland and/or Cooperative Extension Recommendations.
        - Scientific support: The scientific support for USDA-NRCS National Standards and Specifications are based on federal and/or state scientific research.
    - Other considerations to include:
        - BMP FE worksheets from Versions 1 and 2 were reviewed for the development of Version 3 worksheets of the verification manual. Individuals who had used the previous worksheets were used to help further clarify what a FE practice should be.
        - The FE BMP definitions were designed utilizing the Maryland NRCS BMP design standards, which are implemented similarly throughout the Chesapeake Bay watershed.
        - Lifespans for FE practices were reduced to assure the viability of the practice. A Professional Engineer and Certified Agronomist and Certified Conservation Planners who have designed and implemented NRCS practices determined the FE effective lifespan based on FE design criteria through their personal knowledge in the design and implementation of NRCS practices.
        - The reduction values are applied annually.

- How much influence do the results have on the final estimate?
  - Existing BMP's in Chesapeake Bay Partnership BMP Documentation and Maryland NRCS Standards and Specifications were used for the BMP Design Criteria and effectiveness estimates.

Application of Practice Effectiveness Estimates

Table 4: Reporting Units in Scenario Builder and NEIEN Appendix

BMP Name	Unit Name	Measurement Name
Waste Storage Structure FE	COUNT	BEEF_AU
Waste Storage Structure FE	COUNT	DAIRY_AU
Waste Storage Structure FE	COUNT	GOATS_AU
Waste Storage Structure FE	COUNT	HORSE_AU
Waste Storage Structure FE	COUNT	OTHER_AU
Waste Storage Structure FE	COUNT	POULTRY_AU
Waste Storage Structure FE	COUNT	SHEEP_AU
Waste Storage Structure FE	COUNT	SWINE_AU
Animal Compost Structure FE	COUNT	Systems
Animal Compost Structure FE	COUNT	Systems
Alternative Crop/Switchgrass FE	ACRE	Acres
Watercourse Exclusion Fencing FE	FEET	Length
Watercourse Exclusion Fencing FE	FEET	Width
Watercourse Exclusion Grass FE	FEET	Length
Watercourse Exclusion Grass FE	FEET	Width
Watercourse Exclusion Forest FE	FEET	Length
Watercourse Exclusion Forest FE	FEET	Width
Grass Buffer for Stream Narrow FE	ACRE	Acres
Grass Buffer for Stream Wide FE	ACRE	Acres
Forest Buffer for Stream Narrow FE	ACRE	Acres
Forest Buffer for Stream Wide FE	ACRE	Acres
Vegetative Environmental Buffer Grass FE	FEET	Length
Vegetative Environmental Buffer Trees FE	FEET	Length
Pasture and Hayland Planting FE	ACRE	Acres
Rotational Grazing FE	ACRE	Acres
Barnyard Runoff Control FE	COUNT	Number
Concentrated Area Protection Livestock FE	ACRE	Acres
Water Control Structure FE	COUNT	Number
Watering Trough FE	COUNT	Number
Wetland Development FE	ACRE	Acres

All Existing CBP Partnership BMP Characteristics and Outcomes were used for MDA Non-Cost Shared and FE BMPs

- Conditions under which the BMP works: BMP's will address the same load sources as the CBP BMP's.
- On-the-ground, operational, average conditions have been taken into account with the use existing CBP BMP effectiveness estimates.
- Considerations for benefits in load reductions among various hydrologic flow regimes have been taken into account with the use of existing CBP BMP effectiveness estimates.
- Benefits in load reductions among species of nitrogen and species of phosphorus and how these considerations yielded a total nitrogen and total phosphorus reduction benefit and sediment load reduction benefits have been taken into account with the use existing CBP BMP effectiveness estimates.

Geographic Considerations

- Location within the Chesapeake Bay watershed where these practices are applicable- Maryland.

Land Types:

Table 5: Land Types to which MDA FE BMPs are applied

BMP Name	Default Land Use	Default SBLandUse
Waste Storage Structure FE	Agricultural	Livestock
Waste Storage Structure FE	Agricultural	dairy
Waste Storage Structure FE	Agricultural	Goats
Waste Storage Structure FE	Agricultural	horses
Waste Storage Structure FE	Agricultural	Livestock
Waste Storage Structure FE	Agricultural	Poultry
Waste Storage Structure FE	Agricultural	sheep and lambs
Waste Storage Structure FE	Agricultural	Swine
Animal Compost Structure FE	Agricultural	Poultry
Animal Compost Structure FE	Agricultural	Dairy
Alternative Crop/Switchgrass FE	Agricultural	ROW
Watercourse Exclusion Fencing FE	Pasture/Hay	trp
Watercourse Exclusion Fencing FE	Pasture/Hay	trp
Watercourse Exclusion Grass FE	Pasture/Hay	trp
Watercourse Exclusion Grass FE	Pasture/Hay	trp
Watercourse Exclusion Forest FE	Pasture/Hay	trp
Watercourse Exclusion Forest FE	Pasture/Hay	trp
Grass Buffer for Stream Narrow FE	Agricultural	CROPFERT

Grass Buffer for Stream Wide FE	Agricultural	CROPFERT
Forest Buffer for Stream Narrow FE	Agricultural	CROPFERT
Forest Buffer for Stream Wide FE	Agricultural	CROPFERT
Vegetative Environmental Buffer Grass FE	Agricultural	Afocafo
Vegetative Environmental Buffer Trees FE	Agricultural	Afocafo
Pasture and Hayland Planting FE	Agricultural	ROW
Rotational Grazing FE	Pasture/Hay	PASTURE
Barnyard Runoff Control FE	Agricultural	Afocafo
Concentrated Area Protection Livestock FE	Agricultural	afocafo
Water Control Structure FE	Agricultural	ROW
Watering Trough FE	Agricultural	PASTURE
Wetland Development FE	Agricultural	AG

- The Scale at which the BMP and BMP load reduction benefits are applied have been taken into account with the use of existing CBP BMP effectiveness estimates.
- The pre-BMP and post-BMP circumstances, including the baseline conditions for individual practices have been taken into account with the use of existing CBP BMP's.
- Variations in BMP effectiveness across the watershed due to climate, hydrogeomorphic region, soil types and vegetation – or other measureable factors have been taken into account with the use of existing CBP BMP's.

Temporal Considerations:

- All these practices are considered cumulative.
- Temporal performance of the BMP including lag times between establishment and full functioning (if applicable) have been taken into account with the use of existing CBP BMP's.
- The need for annualized benefits was accounted for with practices that only perform during specific time periods within a year have been taken into account with the use of existing CBP BMP's.
- Useful life: Lifespans have been reduced from NRCS Standards. It is assumed that since the FE design criteria may not be as extensive as required by NRCS specifications, that a technical person must visit the BMP on a more frequent basis to review the efficacy of the FE BMP and the farmer's operation and maintenance of the BMP.

Table 6: NRCS BMP Standard Design Lifespan and the MDA FE lifespan:

MDA FE BMP Name	NRCS Lifespan Years	MDA FE Lifespan Years
Waste Storage Structure	15	5
Animal Compost Structure	15	5
Alternative Crop/Switchgrass	15	5
Watercourse Exclusion	20	5
Grass Buffer for Stream	10	5
Forest Buffer for Stream	15	10
Vegetative Environmental Buffer for Poultry, Grass	10	3
Vegetative Environmental Buffer for Poultry, Trees	15	5
Pasture and Hayland Planting	5	3
Rotational Grazing	1	3
Barnyard Runoff Control	10	5
Concentrated Area Protection	10	5
Water Control Structure	20	5
Watering Trough	20	5
Wetland Development	15	5

- More frequent reviews of the FE BMPs will assist in accounting for imperfect operation and maintenance of the practice. If will also help determine the accuracy of owner certification for practice components that may not be obvious after the practice was installed and were certified to the technician by the landowner.

Practice Limitations

- Potential interactions with other practices-None
- Ancillary benefits beyond nitrogen, phosphorus and sediment loads for some practices could include but is not limited to reduced atmospheric N losses and air emissions.

Practice Monitoring and Reporting

Description of how states will track and report the Non Cost Shared and FE BMPs:

- The Soil Conservation District will assign a technically proficient trained, certified person(s) from their staff to perform the verification.
    - District staff will conduct an on-site evaluation of the BMP.

- The appropriate verification worksheet will be filled out for the identified practice. Each worksheet has the design criteria for both the practice that will meet a NRCS standard and a FE.
- The District staff person will look at each BMP design criteria worksheet and determine: if it is present (mark Y); not present (mark N); not applicable for this practice (mark N/A).
- **If the BMP meets NRCS standard**,
    - All the appropriate highlighted criteria in the NRCS column must be present to meet a NRCS BMP Standard. (Refer to Section IV of NRCS Technical Guides if more information is needed);
    - After noting the appropriate design criteria are present (Y, N or N/A) the District staff person will circle the appropriate finding "Meets NRCS Spec";
    - They will fill in the date the practice was installed by the farmer. (Installation date);
    - They will record or check the appropriate reportable code information for the practice;
    - A picture will be taken of the BMP;
    - The District staff person will document any additional information that is important for verification, such as: the % of coverage of vegetation; width of buffer (must be at least 35'), etc.;
    - They will document the BMP in Conservation Plan: If owner agrees to complete and sign an NRCS Operation and Maintenance Plan, the BMP may be recorded and reported in a NRCS Toolkit Plan; If they do not sign and O&M Plan, the District staff person will document the BMP in the Plan folder and report in Conservation Tracker.
    - The District will keep the worksheet and picture in Conservation Plan folder in the District Office;
    - The appropriate District staff will report the BMP in Conservation Tracker.
- **If the BMP does not meet NRCS standard,** District staff will review the Functional Equivalent Practice design Criteria worksheet for a FE BMP.
    - All the appropriate highlighted criteria in the FE column must be present to meet a MDA FE BMP;
    - They will fill in the date the practice was installed by the farmer. (Installation date);
    - They will fill in or check the appropriate reportable code information for the practice.
    - District staff will take a picture of the FE BMP;
    - They will document any additional information they feel is important for verification, such as: the % of coverage of vegetation, actual width of buffer (less than 35'), etc.
    - District staff will document any design criteria (materials, etc.) that the owner certifies were used in the installation of the FE BMP;

- They will inform the farmer when the District will be back to re-certify the practice; and any operation and maintenance actions District staff feel are appropriate or needed;
- They will document FE BMP in Conservation Plan. The District will keep the worksheet and picture in the Conservation Plan folder in the District Office;
- The appropriate District staff will report the BMP in Conservation Tracker.

Non-Cost Shared and FE Practice Reporting

- All verified practices must be reported in MDA Conservation Tracker.
  - Those that meet a NRCS practice standard will be reported with appropriate NRCS BMP code (i.e. 316 – Animal Mortality Facility)
  - Those that do not meet NRCS standard but meet the Functional Equivalent standard will be reported under the Functional Equivalent code (i.e. 316FE – Animal Compost Structure)
  - In some cases there will be additional information to report in Conservation Tracker, such as: Type of Animal, Animal Units (AU), Buffer Width Category, etc.;
  - In Tracker the date the practice was implemented or installed by owner/operator will be reported.
  - The record will indicate "Farmer Installed" as technician to indicate the BMP was not implemented through cost-sharing with federal or state funding;
- At any point at which the FE BMP is brought up to NRCS standard, the District staff will change the status by documenting it on a new worksheet and change the status of the BMP reported in Conservation Tracker.
- In July of each year, the District will be provided a list of FE Practices that will be re-certified at the end of their FE lifespan. During the next calendar year the District will review the non cost-shared FE practice worksheets and the FE practice in the field and re-certify the practice. If the FE practice is no longer present or it cannot meet the FE design specification it will be removed from Conservation Tracker.

Quality Assurance Checking of Non-Cost Shared BMP's

- All non-cost shared BMPs identified and reported will be subject to the same level of additional review during MACS Spot Checks or Quality Assurance Reviews.
- Suggestion for a BMP Design Criteria review timeline: NRCS Standards and Specifications are reviewed approximately every 5 years or more often if deemed necessary by the NRCS National Standard Reviews. At such time as Maryland NRCS standards are revised, MDA will review the appropriative Non Cost-shared worksheets and update them as needed.

Data Gaps and Research Needs

- The following BMP's will need to be completed through the Partnership Expert Panel Process with effectiveness rating for them to be final in the model:
    - Efficiencies for buffer widths for narrow Grass Buffers has not been considered by an Expert Panel
    - Efficiencies for Buffer Widths for narrow Forest Buffers have not been considered by the current Expert Panel (10'-34').
    - Poultry Heavy Use Protection Areas are required and used in the poultry industry. Some initial research has been collected on their effectiveness by the Maryland Department of Environment. The University of Delaware is currently conducting research on this BMP
    - Vegetative Environmental Buffers on poultry houses have been recognized as providing air quality benefits and some nutrient processing. This is currently a Interim BMP in MD. Collection of research to support efficiencies is needed for tree and warm season grass buffers.
- Potential Efficiencies for Switchgrass: Currently Ken Staver if Wye Research has been working on the nutrient uptake of Swithgrass on the Eastern Shore. Results of his work may help inform effectiveness rating for Alternative Crop/Switchgrass BMP in the future (currently a land use change BMP).

Attachments

- MDA Non Cost-shared Verification Procedures Manual, November 2013 Version No.3
- NEIEN Appendix
- Interview Summary Report

Interview Summary Report:

Date	Attendees	Actions
7/15/13	Mark Dubin, CBP Dana York, GEC	Meeting to for Recommendation on Next Steps for Maryland to submit FE BMP's
7/23/13	John Rhoderick, MDA	Meeting with John Rhoderick to develop next steps on FE Submittal to CBP
8/7/13	Greg Sandi, MDA Michael Stanton, MDA Dana York, GEC	Meeting with MDE on NEIEN node and to update next steps MDA will take to submit FE's to CBP program
8/9/13	AWG Members	AWG Meeting- MDA present next steps and ask for guidance on submitting FE's to AgWG and CBP. AWG tells MDA to use two assumptions: 1) The FE BMP's will have the same efficiencies as the those meeting a NRCS standard, but they should have a shorter lifespan.
8/26/13	John Rhoderick, MDA Beth Horsey, MDA Michael Stanton, MDA Jason Keppler, MD Dana York, GEC Bob Ensor, HSCD	Meeting with MDA to present MDA worksheet concept. MDA approved concept and told GEC complete and return with final worksheets with suggested FE Design Criteria.
9/17/13	John Rhoderick, MDA Beth Horsey, MDA Michael Stanton, MDA Dana York, GEC Bob Ensor, HSCD	Meeting with MDA to review and adjust FE Design Criteria.
8/18/13	Bob Ensor, HSCD Goef Schoming, HSCD	Meeting with Howard County staff to review and finalize MDA FE design Criteria and to look at suggestions and guidance for middle Maryland counties.
9/24/13	John Sheppard, CSCD Trista North, CSCD Stephanie Knutsen, CSCD Alison Taylor, CSCD Carol Middleton, CSCD Dana York, GEC Bob Ensor, HSCD	Meet with Caroline County Soil Conservation Staff on FE design criteria for worksheets and collect suggestions and guidance for eastern shore counties.
9/25/13	Elmer Weibley, WCSCD Bob Ensor, HSCD	Meet with Washington County Soil Conservation staff on FE design criteria for worksheets and to collect suggestions and guidance for western Maryland counties.

9/26/13	AgWG Members	Ag Work Group Meeting- WQGIT members were also present. Presented latest worksheet concepts as developed from field District Staff Review. AgWG approved technical concept. AgWG told MDA to request a review from WQGIT of FE design criteria and verification protocol for acceptance into the bay program. MDA told they may submit the BMP names for inclusion to the NEIEN Appendix with the names turned off until approved to meet the Appendix deadline.
9/30/13	MDA	MDA proposed a review from WQGIT of FE design criteria and verification protocol for acceptance into the bay program. WQGIT Acting Chair referred the recommendation back to the AWG for action.
9/30/13	John Rhoderick, MDA Beth Horsey, MDA Michael Stanton, MDA	Reviewed and acted on District Staff FE Design Criteria recommendations.
10/7/13	WTWG Members	Presentation to the WTWG meeting on MDA FE BMP process and design criteria.
10/9/13	Mark Dubin, CBP Dana York, GEC	Teleconference on CBP BMP Efficiency Reporting.
10/10/13	Mark Dubin, CBP Dana York, CBP	NEIEN Appendix proposal.
10/15/13	John Rhoderick, MDA Beth Horsey, MDA Michael Stanton, MDA Dana York, GEC Mark Dubin, CBP Matt Johnston, CBP	Meeting with MDA on NEIEN Appendix, and selection of appropriate CBP BMPs for MDA FE's.
10/21/13	John Rhoderick, MDA Beth Horsey, MDA Michael Stanton, MDA Dana York, GEC Bob Ensor, HSCD	Meeting to determine FE worksheet and Contrack Reporting Requirements.
11/5/13	John Rhoderick, MDA Beth Horsey, MDA Michael Stanton, MDA Dana York, GEC	Meeting to review CBP edits and CBP program document submission.
11/7/13	AgWG Members	AWG Meeting