Chesapeake Bay Program partners' Agriculture Workgroup's Agricultural BMP Verification Guidance

Approved August 8, 2014

PROLOGUE: CRITICAL OVERARCHING ISSUES

In developing this verification guidance for agricultural practices, the Agricultural Work Group wrestled with a host of complicated and sometimes competing interests and perspectives. In completing the guidance, the Work Group concluded that three critical overarching issues warranted future consideration by entities other than the Work Group.

Critical Overarching Issue One: Revisiting of the Guidance's "Less than 5%" Criteria

The guidance attempts to follow the targeting recommendation of the BMP Verification Review Panel; i.e., that verification efforts should be targeted, e.g., to either those practices that accomplish the greatest pollution load reductions or those practices that are the most vulnerable. In considering this recommendation, the verification guidance proposes that jurisdictions apply less comprehensive verification efforts to those practices accounting for 5% or less of a pollutant load (see Guidance, Section XXX). In reaching this conclusion, the Work Group determined that the sum total of practices accounting for 5% or less within a jurisdiction was not likely to reach a significant level. That is, the sum total of practices receiving less verification because of the "less than 5%" criteria would not exceed, hypothetically, 25% or 50%. The actual number of practices receiving reduced levels of verification because of these criteria is not, however, actually known. The Work Group determined that **the actual impact of this guidance decision needs to be re-examined and re-evaluated** by **the Chesapeake Bay Program partners** in two years. At that time, if the actual numbers indicate that the "less than 5%" criteria led to an unreasonable level of practices receiving less comprehensive verification, the Bay Program partners may need to adopt revised criteria.

Critical Overarching Issue Two: USDA's 5% Verification Cap

USDA currently places a cap on its level of verification of contracted cost-share practices at 5%. USDA documents reflect that USDA bases this verification level primarily on dollars spent, not pollution control achieved. In addition, USDA limits access to location information of the practices for purposes of conducting verification. The Agricultural Work Group recognized that the Bay Program's state jurisdictions cannot alter the federal USDA verification standards, and that only a sister federal agency such as EPA has the ability to challenge and, as appropriate, rework this federal standard for Chesapeake Bay water quality improvement. The Work Group determined that **EPA and USDA** must take the necessary steps **to together determine the appropriate federal standard for verification of USDA contracted cost-share practices** from a water quality, natural resource stewardship perspective.

Critical Overarching Issue Three: Application of the "Independent Review" Definition to Agricultural Practices.

The BMP review panel defines "independent review" as follows:

> Independent Review: a review carried out by someone within the same organization having technical expertise in the subject matter to a degree at least equivalent to that needed for the original work, but who was not involved as a participant, supervisor, technical reviewer, or advisor in the development or operations of the program/practice under review.
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> External Independent Review: a review carried out by a separate outside organization with technical expertise in the subject matter to a degree at least equivalent to that needed for the original work. Generally, this level of review is sought when considering key decisions that are being made that could affect the overall verification program.

In considering the practicalities of development and implementation of agricultural practices within some jurisdictions, the definitional phrase "who was not involved as a participant, supervisor, technical reviewer, or advisor in the development or operations of the program/practice under review" could place significant restrictions on the ability to conduct verification of agricultural BMPs. There are areas in Bay jurisdictions where only one office of several staff is geographically able to conduct the verification. The current definition, because of the language referring to "supervisor," "reviewer," and "advisor," may eliminate any and all staff as one able to conduct an "independent review." The Work Group determined that **the BMP Review Panel** needs to **re-examine the definition** and determine if revision is necessary for the agricultural sector.

Part 1: The Need for Agricultural BMP Verification and the Bay Program Process
With the establishment of a Chesapeake Bay Total Maximum Daily Load (TMDL) and the jurisdictions' commitment to demonstrate reasonable assurance that the TMDL goals will be met, tracking, reporting, and verification of best management practice (BMP) implementation is essential. An improved approach to verification is needed to expand the tracking and reporting of implemented BMPs from agency incentive programs to private, non-cost shared and resource improvement practices in a manner that ensures public confidence that the water quality benefits from the practices are achieved. The Chesapeake Bay TMDL has brought new urgency to the matter, reinforced by calls for enhanced verification by:

- The Chesapeake Bay Independent Evaluation Report developed by the National Research Council's (NRC) panel identified five specific science-based conclusions. These conclusions focused on the finding that "accurate tracking of BMPs is of paramount importance because the CBP relies upon the resulting data to estimate current and future nutrient and sediment loads to the Bay."

- President Obama's Chesapeake Bay Executive Order Strategy committed relevant federal agencies, including the U.S. Department of Agriculture (USDA) and the U.S. Environmental Protection Agency (EPA), to develop and implement "mechanisms of for tracking and reporting of voluntary conservation practices and other best management practices installed on agricultural lands" by July 2012.

- EPA's Chesapeake Bay TMDL's Appendix S outlined the common elements for the jurisdictions to develop and implement trading and offset programs in conjunction with the requirements of the TMDL.

- Several of the Chesapeake Bay Program's independent advisory committees, including the Scientific and Technical Advisory Committee (STAC) and the Citizen's Advisory Committee (CAC), have consistently requested Bay Program partners to develop and implement an open and transparent process to verify cost-share and non-cost shared BMPs being annually tracked and reported by the jurisdictions to the Chesapeake Bay Program Office (CBPO).

In 2012 the Chesapeake Bay Program (CBP) partners' Water Quality Goal Implementation Team requested each of the source and habitat sector workgroups, including the Agriculture Workgroup, to develop guidance for jurisdictions as they seek to enhance verification of BMP implementation. As a part of this effort, the Agriculture Workgroup identified several key factors critical to building a verification protocol for agricultural BMPs.

- Were public funds used to implement the practice, or was the practice funded entirely with private dollars?

- Was the practice implemented to satisfy a federal or state regulatory requirement, or is it external to regulatory oversight?

- Is the practice structural, with a multi-year life-span, or must it be implemented annually?

- Is the practice implemented "on-the-ground" or is it a plan or other enhancement of farm management?

These factors influence the reliability of reported information and the reasonable assurance of whether the practice is implemented properly and remains functional. The following narrative considers these factors and the consequent guidance to jurisdictions for a science and best professional judgment informed verification protocol.

Part 2: Defining and Categorizing Agricultural BMPs

The Bay Program partners approved agricultural BMPs represent the largest and most diverse group of conservation practices and land use conversions across all sectors. The diversity of BMPs reflects the diversity of agricultural production and land uses across the Chesapeake Bay watershed. To address the challenge of providing verification guidance for this diverse collection of BMPs in a simple format, agricultural BMPs are organized into three categories (Table 2). The three BMP categories are based on the assessment method for their physical presence, primarily, as well as on the respective life spans or permanence on the landscape.

2a. Visual Assessment BMPs - Single Year

A practice that can be visually assessed and with a limited physical presence in the landscape over time, i.e., lasting as short as several months to a single growing season. In order to accurately account for nutrient and sediment load reduction benefits, this type of BMP must be verified and reported on an annual basis.

2b. Visual Assessment BMPs - Multi-Year

A practice that can be visually assessed and has a protracted physical presence on the landscape, i.e., of more than one year when properly maintained and operated. This type of BMP often requires increased technical and financial resources to implement compared with a single year practice.

2c. Non-Visual Assessment BMPs

A practice that cannot typically be visually assessed because it is a type of management system or enhanced approach, rather than a physical BMP. This class of BMPs is more challenging to verify since it does not have a physical presence on the landscape. However, considerable nutrient and sediment reductions are possible in well-implemented plans that can last either a single season or multiple years.

Table B-1. Examples of agricultural BMPs by category.

B-1a. Visual Assessment-Single Year	B-1b. Visual Assessment - Multi-Year	B-1c. Non-Visual Assessment
Conservation Tillage	Animal Waste Management Systems	Decision/Precision Agriculture
High-Residue Minimum Disturbance Management	Barnyard Runoff Control	Swine Phytase
Traditional Cover Crops	Stream Side Grass Buffers	Enhanced Nutrient Management Plans
Commodity Cover Crops	Prescribed Grazing	Soil Conservation and Water Quality Plans
	Pasture Alternative Watering Systems	Poultry Litter Transport

Part 3: Defining Implementation Mechanisms for Agricultural BMPs

The diversity of agricultural BMPs is mirrored in the range of approaches and funding sources supporting implementation and the resultant level of oversight across the Chesapeake Bay watershed. The sources of BMP implementation data and their maintenance oversight are grouped into four broad categories with potential for mixing between categories dependent upon the specific BMP. How a BMP is funded and implemented has direct implications for how verification of presence and function is conducted:

3.a. Non-Cost-Shared (Privately Funded) BMPs

BMPs that are implemented without public funding assistance are a source of agricultural BMPs installed without the verification benefits inherent to the other categories - public cost-share, regulatory programs, and permit-issuing programs. As a result, the establishment of verification programs providing similar certainty to those for publically funded or regulated practices will be needed.

Non-cost share BMPs are typically financed by the operator or other non-public entity or source, and may or may not meet the practice standards associated with federal and state cost-share programs. Non-cost-shared practices may lack the contractual provisions of cost-shared BMPs as well as the corresponding implementation and maintenance oversight. Non-cost share BMPs also include BMPs which are described as "resource improvement (RI) practices." Resource Improvement BMP's are practices which provide

similar annual environmental benefits for water quality but may not fully meet all the design criteria of existing governmental design standards. See Resource Improvement Practice Definitions and Verification Visual Indicators Guidance Document for applicable verification guidelines.[1]

In order to satisfy the expectation for verification of non-cost shared BMPs, it is recommended that a jurisdiction verify 100% of the initial identification of annual or multi-year structural BMPs and plan implementation by trained and certified technical field staff or engineers with supporting documentation that it meets the governmental and/or CBP practice standards. [2] Visual assessment for single year BMPs, such as tillage practices, can be statistically sub-sampled utilizing scientifically accepted procedures. [3]

Additionally, it is recommended that a jurisdiction adopt one of the two approaches detailed below regarding follow up sub-sampling verification of non-cost shared BMPs. It is recommended that jurisdictions adopt the first approach as a default. The second approach for follow up sub-sampling may be proposed by a jurisdiction with documentation as an alternative strategy for review and approval.

1. During the course of the physical lifespan period of multi-year BMPs, reoccurring annual assessments are recommended to be implemented so that BMPs are verified as being maintained and operated in accordance with the appropriate federal, state or CBP practice standard. As a default, random, follow-up assessments are recommended to be conducted on 10% of those multi-year BMPs which are known to collectively account for greater than 5% of a jurisdiction's agricultural sector nutrient and/or sediment load reductions as estimated in the most recent progress scenario. (See Appendix A Example). For example, if the Chesapeake Bay Program partners' Watershed Model estimates that 7% of all the nitrogen reductions from a jurisdiction's agricultural nitrogen load resulted from the collective implementation of prescribed grazing, then the jurisdiction should conduct random, follow-up inspections on 10% of all farms with reported prescribed grazing systems.[4]

2. A jurisdiction may propose an alternative strategy for follow up sub-sampling of non-cost shared BMPs. Any such alternative shall be accompanied by documentation of the rationale for the alternative. The BMP Verification Review Panel shall review the alternative strategy and make a recommendation to EPA on the adequacy of the

[1] http://www.chesapeakebay.net/publications/title/21973

[2] For BMPs that constitute ≤5% of the jurisdiction's agricultural sector nutrient and/or sediment load reductions as estimated in the most recent progress scenario, 5% statistical sub-sampling of tracked and reported practices is allowable for the non-cost share and regulatory program BMP categories in this section. For cost-shared category BMPs, 5% of the active contracts is permissible, and for permit-issued BMPs, 20% sampling is recommended.

[3] For BMPs that constitute ≤5% of the jurisdiction's agricultural sector nutrient and/or sediment load reductions as estimated in the most recent progress scenario, 5% statistical sub-sampling of tracked and reported practices is allowable for the non-cost share and regulatory program BMP categories in this section. For cost-shared category BMPs, 5% of the active contracts is permissible, and for permit-issued BMPs, 20% sampling is recommended.

[4] For BMPs that constitute ≤5% of the jurisdiction's agricultural sector nutrient and/or sediment load reductions as estimated in the most recent progress scenario, 5% statistical sub-sampling of tracked and reported practices is allowable for the non-cost share and regulatory program BMP categories in this section. For cost-shared category BMPs, 5% of the active contracts is permissible, and for permit-issued BMPs, 20% sampling is recommended.

alternative. An example of one such alternative is currently being developed by the Agriculture Workgroup for review and approval, at which time it will be provided to Bay Program partners as a supplemental document to the agricultural BMP verification guidance.

It is important to note that BMPs which were initially implemented and/or operated under a cost-share, regulatory, or permit program but are transitioned out of these programs and no longer are under the oversight of a cost-share agreement, regulation, or permit, will be verified by the same level of verification described for non-cost shared BMPs if they are continued to be considered for ongoing pollution reduction crediting.

3. b. Cost-Shared BMPs

BMPs that are implemented with public funds; these funds are managed by federal, state, and county agencies, and in some cases non-governmental organizations (NGOs). Cost-shared BMPs typically have contractual oversight elements such as the required involvement of certified engineers, planners and technicians who evaluate the BMPs according to governmental established design standards. These standards are intended to ensure proper installation and maintenance of the BMP over the life span of the contract and consequently so as to allow tracking and reporting on the BMPs during the life of the contract. BMPs implemented through these programs typically have existing defined verification protocols in place for the BMP during the life of the contract with the landowner dictating implementation, operation and maintenance requirements, and may provide a sufficient level of verification.

In order to satisfy the expectation for verification of cost-shared BMPs, it is recommended that a jurisdiction verify 100% of the initial identification of annual or multi-year structural BMPs and plan implementation by trained and certified technical field staff or engineers with supporting documentation that it meets the governmental and/or CBP practice standards. Visual assessment for single year BMPs, such as tillage practices, can be statistically sub-sampled utilizing scientifically accepted procedures.

Additionally, it is recommended that a jurisdiction adopt one of the two approaches detailed below regarding follow up sub-sampling verification of cost-shared BMPs. It is recommended that jurisdictions adopt the first approach as a default. The second approach for follow up sub-sampling may be proposed by a jurisdiction with documentation as an alternative strategy for review and approval.

1. During the period of contractual oversight for multi-year BMPs, reoccurring annual contractual compliance inspections are recommended to be implemented so that BMPs are verified as being maintained and operated in accordance with the funding agency's standards. As a default, random, follow-up assessments are recommended to be conducted on 10% of those multi-year BMPs which are known to collectively account for greater than 5% of a jurisdiction's agricultural sector nutrient and/or sediment load reductions as estimated in the most recent progress scenario. (See Appendix A Example). For example, if the Chesapeake Bay Program partners' Watershed Model estimates that 6% of all the nitrogen reductions from a jurisdiction's agricultural nitrogen load resulted from the collective implementation of grass buffers, then the jurisdiction

should conduct random, follow-up inspections on 10% of all farms with reported grass buffers.

2. A jurisdiction may propose an alternative strategy for follow up sub-sampling of cost-shared BMPs. Any such alternative shall be accompanied by documentation of the rationale for the alternative. The BMP Verification Review Panel shall review the alternative strategy and make a recommendation to EPA on the adequacy of the alternative. An example of one such alternative is currently being developed by the Agriculture Workgroup for review and approval, at which time it will be provided to the Bay Program partners as a supplemental document to the agricultural BMP verification guidance.

3.c. Regulatory Programs

Programs that provide oversight of a BMP through a legally imposed regulatory system. Some BMPs may be specifically identified as a legal requirement, while others may be the result of implementation of a legally-required management plan or system. Because regulations differ by state, there are differences in oversight by state and local agencies across the Bay watershed.

BMPs implemented under the requirements of governmental regulatory programs typically have existing but varied verification protocols in place for BMP implementation, operation, and maintenance over the design lifespan of the practice and may provide a sufficient level of verification.

Included within the regulatory program, understanding that offset and credit programs are continuing to evolve, are BMPs tied to offsets, mitigation, and trading. Agricultural verification protocols need to include procedures for identifying and separately managing practices which are tied to offset, mitigation, and trading programs to ensure that BMPs are not double-counted. BMPs tied to offsets, mitigation, and trading programs typically have their own specified verification protocols to achieve their intended programmatic environmental objectives.

In order to satisfy the expectation for verification of regulatory program BMPs, it is recommended that a jurisdiction verify 100% of the initial identification of annual or multi-year structural BMPs and plan implementation by trained and certified technical field staff or engineers with supporting documentation that it meets the governmental and/or CBP practice standards. Visual assessment for single year BMPs, such as tillage practices, can be statistically sub-sampled utilizing scientifically accepted procedures.

Additionally, it is recommended that a jurisdiction adopt one of the two approaches detailed below regarding follow up sub-sampling verification of regulatory program BMPs. It is recommended that jurisdictions adopt the first approach as a default. The second approach for follow up sub-sampling may be proposed by a jurisdiction with documentation as an alternative strategy for review and approval.

1. During the time period of the identified physical lifespan period of multi-year BMPs, reoccurring annual regulatory compliance inspections are recommended to be implemented so that BMPs are verified as being maintained and operated in accordance

with the appropriate federal or state regulatory practice standards. As a default, random, follow-up assessments are recommended to be conducted on 10% of those multi-year BMPs which are known to collectively account for greater than 5% of a jurisdiction's agricultural sector nutrient and/or sediment load reductions as estimated in the most recent progress scenario. (See Appendix A Example). For example, if the Chesapeake Bay Program partners' Watershed Model estimates that 9% of all the nitrogen reductions from a jurisdiction's agricultural nitrogen load resulted from the collective implementation of animal waste management systems, then the jurisdiction should conduct random, follow-up inspections on 10% of all farms with reported animal waste management systems.

2. A jurisdiction may propose an alternative strategy for follow up sub-sampling of regulatory program BMPs. Any such alternative shall be accompanied by documentation of the rationale for the alternative. The BMP Verification Review Panel shall review the alternative strategy and make a recommendation to EPA on the adequacy of the alternative. An example of one such alternative is currently being developed by the Agriculture Workgroup for review and approval, at which time it will be provided to the Bay Program partners as a supplemental document to the agricultural BMP verification guidance.

3.d. Permit-Issuing Programs

Regulatory programs that require an agricultural production operation to operate or conduct certain activities under a permit. Inspections conducted by the regulating authority are typically a condition of the permit. A permit may require periodic renewals for multi-year extensions. Implementation, operation and maintenance of BMPs are permit elements.

BMPs implemented under the oversight of permitting programs typically include defined verification protocols for all stages of BMP implementation, operation, and maintenance for the life of the permit, and may provide a sufficient level of verification.

In order to satisfy the expectation for verification of permit-issuing program BMPs, it is recommended that a jurisdiction verify 100% of the initial identification of annual or multi-year structural BMPs and plan implementation by trained and certified technical field staff or engineers with supporting documentation that it meets the governmental and/or CBP practice standards. Visual assessment for single year BMPs, such as tillage practices, can be statistically sub-sampled utilizing scientifically accepted procedures.

Additionally, it is recommended that a jurisdiction adopt one of the two approaches detailed below regarding follow up sub-sampling verification of permit program BMPs. It is recommended that jurisdictions adopt the first approach as a default. The second approach for follow up sub-sampling may be proposed by a jurisdiction with documentation as an alternative strategy for review and approval.

1. During the permit cycle, and the identified physical lifespan period of multi-year BMPs, reoccurring annual permit compliance inspections are recommended to be implemented so that BMPs are verified as being maintained and operated in accordance with the appropriate federal or state permit practice standards. As a default, random,

follow-up inspections are recommended to be conducted on 20% of those permitted multi-year BMPs, which is consistent with the EPA Concentrated Animal Feeding Operation (CAFO) program agreements with the jurisdictions for non-major permits. All CAFO permits are defined by EPA as being non-major permits. [5]

2. A jurisdiction may propose an alternative strategy for follow up sub-sampling of non-federal state permit-issuing program BMPs. Any such alternative shall be accompanied by documentation of the rationale for the alternative. The BMP Verification Review Panel shall review the alternative strategy and make a recommendation to EPA on the adequacy of the alternative. An example of one such alternative is currently being developed by the Agriculture Workgroup for review and approval, at which time it will be provided to the Bay Program partners as a supplemental document to the agricultural BMP verification guidance.

Part 4: Agricultural BMP Verification Methods

Depending on the jurisdiction, a significant number of agricultural operations may legally operate without oversight from federal and state permitting and regulatory programs or participation in voluntary cost-share programs. Verification of BMPs for all farms, regardless of presence or absence of cost-shared or regulatory programs can be accomplished through the following or combination of the following:

4a. Farm Inventory

A survey or listing of physical BMPs completed by certified, trained technical staff, or by the producer. The survey or listing is based on physical inspection. The reliability of the information and the level of verification depends upon the intensity and frequency of the survey, the training of the person completing the survey, and whether the person completing the survey must certify to its accuracy with penalties for false information. Producer completed inventories without third-party verification are not considered an adequate method for verification.

4b. Office/farm Records

An evaluation of paperwork on record at the conservation district office or the farm operation itself rather than an on-site inspection of physical BMPs. Records alone are not considered an adequate method for verification, but can be a critical compliment to other methods, especially when associated with non-visual assessment BMPs.

4c. Transect Survey

An inspection of a statistical-based sampling of BMPs. A transect survey is appropriate for a single year visual assessment of practices such as tillage management. The reliability of this method is based on the sampling and inspection methods and the training and independence of the inspectors. Transect surveys as a visual verification method are not considered an adequate method for verifying non-visual BMPs, or multi-year visual BMPs which require direct inspection, office/farm records, or certified training and engineering.

[5] Federal NPDES Program requirements for CAFO compliance evaluation programs are available in section 40 CFR123.26 (b) (1-2) of the federal regulations.

4d. Agency-sponsored Surveys

A survey of a statistical sampling of farms. Limitations on the reliability of data are similar to those for farm inventory and office/farm records. Periodic surveys and associated reports published by the National Agricultural Statistics Service (NASS), Conservation Effects Assessment Program (CEAP) and Natural Resources Inventory (NRI) are examples of this type of survey.

4e. Remote Sensing

A science-based review of images or photographic signatures verified through aerial photography, satellite imagery, or similar methods to identify physical practices on the landscape. This method may involve site-by-site imaging or statistical sampling. Implementing a sufficient land-based sampling validation protocol is necessary for ensuring the analysis of the remote images or photographic signatures are calibrated to actual conditions.

Part 5: Agricultural BMP Verification Priorities

The CBP's BMP Verification Committee and the BMP Verification Review Panel have acknowledged the potential financial and technical limitations that exist when seeking to fully implement the elements of this verification guidance. For this reason, public and private entities engaged with agricultural BMP verification are encouraged to direct their verification efforts in direct proportion to the environmental benefits that a BMP contributes towards the TMDL pollutant reduction for a jurisdiction's agricultural source sector. Agricultural BMPs that result in the highest pollutant reductions for each jurisdiction's agricultural source sector should correspondingly be the highest priority for implementing statistically significant verification protocols.

The Jurisdictional Agriculture Verification Protocol Design Table described in the following section (Tables 4-6) provides specific guidance to identify the default levels of verification inspections by agricultural BMP category (Visual – 1 year, Visual – multi-year, and Non-Visual). Tracked and reported BMPs achieving greater than 5% of the jurisdiction's agricultural sector nutrient and/or sediment load reductions as estimated in the most recent progress scenario should receive the highest level of verification rigor. Those BMPs calculated to achieve ≤5 % of the jurisdiction's agricultural sector nutrient and/or sediment load reductions as estimated in the most recent progress scenario, can be verified with less rigor.

Part 6: Jurisdictional Agricultural Verification Protocol Design Table and Supplementary Information

The CBP's Jurisdictional Agriculture Verification Protocol Design Table provides the jurisdictions, the CBP and public with a streamlined guidance and overview of the default verification levels for agricultural BMP verification (Tables 4-6), supplementary to the "Chesapeake Bay Program Best Management Practice Verification Program Design Matrix" and the "State Protocol Components Checklist" provided in the draft basin-wide framework report by the CBP. The elements of the Jurisdictional Agricultural Verification Protocol Design Table follow:

6a. BMP Priority

As described within the draft basin-wide verification framework report, jurisdictions can choose to vary the level of verification based on the relative importance of a specific practice to achieving the jurisdiction's agricultural sector nutrient and/or sediment load reductions as estimated in the most recent progress scenario. By clearly documenting the relative load reduction priority for a BMP or group of closely related BMPs, a jurisdiction can target its verification investments to those BMPs which provide the greatest pollution reductions, or are employed the most often.

6b. BMP Grouping

Jurisdictions do not need to develop and document detailed protocols for individual BMPs across the universe of BMPs that they track, verify, and report for nutrient and sediment reduction load credit. Instead, jurisdictions should take their complete listing of tracked and reported BMPs and organize them by the categories that best account for the jurisdiction's agricultural sector nutrient and/or sediment load reductions as estimated in the most recent progress scenario, in logical groupings of the data specific to the jurisdiction, and consideration of the BMP types described in the relevant Agriculture Verification Guidance. Then, as presented within the Jurisdictional Agricultural Verification Protocol Design Table, the jurisdiction would document the appropriate protocols and procedures followed for each logical grouping of BMPs.

6c. Initial Inspection and Follow-up Checks

The Jurisdictional Agricultural Verification Protocol Design Table illustrates the CBP partners' BMP Verification Review Panel's recommendation to the jurisdictions for structuring their verification programs to carry out an initial inspection for answering the question "is the BMP there?" and then follow-up checks carried out at the appropriate frequency to answer the question "is the BMP still there and operating" throughout the lifespan of the practice.

6d. Lifespan and Sunsetting Practices

The Jurisdictional Agricultural Verification Protocol Design Table prompts jurisdictions to provide documentation on procedures in place for conducting follow-up checks of BMPs at the end of their approved contractual, permitted or physical lifespan. Jurisdictions would also document procedures for removing BMPs which will not go beyond their lifespans and do not require follow-up checks to confirm the BMP is still present and operational.

6e. Data Quality Assuring, Recording, and Reporting

This section documents the systems and processes utilized by the jurisdictions to confirm that initial inspections and follow-up checks were conducted, to prevent double counting, and to ensure quality assurance of the reported data prior to acceptance by the jurisdiction. Because BMP data will likely be reported to a jurisdiction from multiple sources in addition to the state agencies, written procedures are necessary to assure the quality of the data accepted by the jurisdiction. Any additional steps taken in properly recording the accepted data prior to its reporting through the jurisdiction's NEIEN node should also be documented.

Part 7: Guidance for Development of an Agricultural Practice Verification Protocol

The guidance provided within Sections 2 – 6 above will enable the jurisdictions to select and tailor the verification for agricultural practices that best suits their respective BMP priorities while ensuring conformity in terms (definitions), choices for methods, and approaches basin-wide. Jurisdictions should refer to the *State Protocol Component Checklist*[6] for the key elements of a complete state verification protocol process. If a jurisdiction decides to eliminate a component because it is unnecessary for its state process, it should provide documentation for why that component was deleted.

Once jurisdictions have identified the BMP priorities and BMP groupings, the specific verification methodologies that the state intends to use should be established and documented including the appropriate personnel (training or qualifications) for conducting the data collection, reporting, and verification process.

Jurisdictions will select methods of documentation that provide adequate information about the BMP to enable independent spot-checks by appropriately trained individuals. Jurisdictions will also develop an appropriate statistical selection process with the recommended review cycles of BMP implementation in their State Quality Assurance Plan.

Independent verification of BMP reporting programs and BMP implementation data will be addressed in state verification protocols. The State Quality Assurance Plans will ensure that the reported data is valid and representative of BMP implementation in the state. Independent verification can be conducted by agency personnel or qualified third parties, as long as they are trained to accurately assess BMP implementation data. Quality assurance personnel should be independent reviewers as defined by the Chesapeake Bay Program partners.

All reported BMPs, whether non-cost shared, cost shared, regulatory or permit-required, should have distinct, CBP-approved definitions, appropriate design standards and/or indicators to enable accurate, reliable reporting of the BMP to receive the commensurate credit.

Jurisdictions will develop a method to review data reported to the NEIEN submission system to ensure that it was accurately entered and submitted according to CBP guidance documents. If BMP implementation information reported by states comes from external entities it will be subject to appropriate validation as required by the CBP.

Jurisdictions will develop a methodology to determine when and how to remove data from their BMP reporting system. Long term historical BMP's should have a distinct life spans where they are either re-verified or removed from the reporting system.

Part 8: Supplemental Assistance for Development of an Agricultural Practice Verification Protocol

Because a single verification method will not be relevant to all BMPs, or even across a single category of BMPs, jurisdictions will need to carefully evaluate the resources available for verification and the relative priority or significance of the BMPs it expects to verify. To assist jurisdictions, the Agriculture Workgroup has developed detailed supplemental matrices for the categories of agricultural BMPs described in Part 2:

- Visual Assessment BMPs - Single Year (Table 4)

[6] The full State Protocol Component Checklist is provided in Table 11 in Section 14.

- Visual Assessment BMPs - Multi-Year (Table 5), and
- Non-Visual Assessment BMPs (Table 6).

The supplementary matrices, Tables B-6 through B-8, which are arranged by type of verification method, provide additional detail of specific verification methods and their applicability of use for providing verification and reliability factors as determined by the implementation mechanisms. These tables supplement Tables B-3 through B-5, which provide an overview of verification for each of the three primary BMP categories. Tables B-3 through B-5 include a specific example for each BMP category.

Table B-2. Descriptions of the BMP performance measures provided by Supplementary Matrices for Jurisdictional Use.

BMP Performance Measure	**Description**
BMP detection	Can the practice be physically detected through visual or other assessment methods such as sample analysis, historic images or photographic signatures, or farm and office records.
Meets USDA/State/CBP design specifications	Those practices which are designed and implemented according to applicable federal or state standards which typically form the basis for assigning relative environmental benefits by the Chesapeake Bay Program partners.
Meets federal/state/CBP operation and maintenance (O&M) specifications	Those practice which are being operated and maintained in accordance to applicable federal or state standards which typically form the basis for assigning relative environmental benefits by the Chesapeake Bay Program partners.
Resource Improvement (non-specification)	Those practices which provide similar annual environmental benefits for water quality but may not fully meet all the design criteria of existing governmental design standards.
Installation date	The installation date of the practice is important for determining the period of time it has provided environmental benefits, and if those benefits should be reported for credit, or have been previously accounted for in the Chesapeake Bay Program partners' calibrated modeling tools.
Expiration date	The expiration date of the may refer to the physical effective lifespan of the practice such as the expiration of a management plan, or may refer to the expiration of the associated permit or contract, which could necessitate the use of an alternative verification assessment method for further crediting.

Table B-3. Jurisdictional Agriculture Verification Protocol Design Table: Visual Assessment BMPs—Single Year

Chesapeake Bay Program Agriculture Workgroup

July 28, 2014

A. BMP Priority	B. Data Grouping	C. BMP Type	D. Initial Inspection (*Is the BMP there?*)				E. Follow-up Check (*Is the BMP still there?*)			F. Lifespan/ Sunset (*Is the BMP no longer there?*)	G. Data QA, Recording & Reporting
			Method	Frequency	Who inspects	Documentation	Follow-up Inspection	Statistical Sub-sample	Response if Problem		
High / Low	Visual Assessment: Single Year	Non-Cost Shared BMPs	**On-Site Visual Assessment (Limited Statistical Sampling)**	100% of All Tracked & Reported BMPs	Trained and certified technical agency/NGO field staff or engineers	BMPs meet appropriate government and/or CBP practice standards	Single Year	10%[1] / 5%[2] QA of All Tracked & Reported BMPs (within the year)	Bring into compliance within one year or less, or remove from reported BMPs	Single Year	Document inspections/follow-up checks, prevent double counting, and QA reported data
High / Low	Visual Assessment: Single Year	Cost-Shared Programs	On-Site Visual Assessment Only	100% of All Tracked & Reported BMPs	Trained and certified technical agency/NGO field staff or engineers	BMPs meet appropriate government and/or CBP practice standards	Single Year	10% / 5% QA of All Active Contractual BMPs (within the year)	Bring into compliance within one year or less, or remove from reported BMPs	Single Year	Document inspections/follow-up checks, prevent double counting, and QA reported data

High / Low	Visual Assessment: Single Year	Permit-Issuing Programs	On-Site Visual Assessment Only	100% of All Tracked & Reported BMPs	Trained and certified technical agency field staff or engineers	BMPs meet the appropriate government and/or CBP practice standards	Single Year	20% Annually of All Active Permits	Bring into compliance within one year or less, or remove from reported BMPs	Single Year	Document inspections/follow-up checks, prevent double counting, and QA reported data
EXAMPLE BMP	Visual Assessment: Single Year	Cost-Shared Programs: Traditional Cover Crop-Early Drilled Rye	On-Site Visual Assessment: Cover Crop Establishment	100% of All Active Contracts	County Conservation District USDA-NRCS Certified Field Technician	Cost-Share Program BMP Certification Form	On-Site Visual Assessment: Cover Crop Termination	10% QA of All Active Contractual BMPs	Cost-Share Program Contract Compliance Policy	Contract Year	Cost-Share Program Documentation / 10% QAQC Compliance Checks by State Agency / Tracking & Reporting Protocol

Table B-4. Jurisdictional Agriculture Verification Protocol Design Table: Visual Assessment BMPs—Multi-Year
Chesapeake Bay Program Agriculture Workgroup
July 28, 2014

A. BMP Priority	B. Data Grouping	C. BMP Type	D. Initial Inspection (*Is the BMP there?*)				E. Follow-up Check (*Is the BMP still there?*)			F. Lifespan/ Sunset (*Is the BMP no longer there?*)	G. Data QA, Recording & Reporting
			Method	Frequency	Who inspects	Documentation	Follow-up Inspection	Statistical Sub-sample	Response if Problem		
High / Low	Visual Assessment: Multi-Year	Non-Cost Shared BMPs	**On-Site Visual Assessment (Limited Statistical Sampling)**	100% of All Tracked & Reported BMPs	Trained and certified technical agency/NGO field staff or engineers	BMPs meet appropriate government and/or CBP practice standards	Multi-Year	10%[1] / 5%[2] Annually of All Tracked & Reported BMPs	Bring into compliance within one year or less, or remove from reported BMPs	Multi-Year	Document inspections/follow-up checks, prevent double counting, and QA reported data
High / Low	Visual Assessment: Multi-Year	Cost-Shared Programs	On-Site Visual Assessment Only	100% of All Tracked & Reported BMPs	Trained and certified technical agency/NGO field staff or engineers	BMPs meet appropriate government and/or CBP practice standards	Multi-Year	10% / 5% of All Active Contractual BMPs	Bring into compliance within one year or less, or remove from reported BMPs	Multi-Year	Document inspections/follow-up checks, prevent double counting, and QA reported data

High / Low	Visual Assessment: Multi-Year	Permit-Issuing Programs	On-Site Visual Assessment Only	100% of All Tracked & Reported BMPs	Trained and certified technical agency field staff or engineers	BMPs meet the appropriate government and/or CBP practice standards	Multi-Year	20% Annually of All Active Permits	Bring into compliance within one year or less, or remove from reported BMPs	Multi-Year	Document inspections/follow-up checks, prevent double counting, and QA reported data
EXAMPLE BMP	Visual Assessment: Multi-Year	State CAFO Permit Program: Animal Waste Storage Structure	On-Site Visual Assessment: Initial CAFO Permit Inspection	100% of All Active CAFO Permits	State Agency CAFO Certified Inspector	State CAFO Permit Inspection Certification Form	On-Site Visual Assessment: State CAFO Permit Compliance Inspection	20% of All Active CAFO Permits	State CAFO Program Permit Compliance Policy	State CAFO Permit Lifespan: 5 Years	State CAFO Program Documentation / 5% QAQC Compliance Checks by EPA / Tracking & Reporting Protocol

[1]BMP High: Default verification levels for follow-up sub-sampling of BMPs which are known to collectively account for greater than 5% of a jurisdiction's agricultural sector nutrient and/or sediment load reductions as estimated in the most recent progress scenario.
[2] BMP Low: Default verification levels for follow-up sub-sampling of BMPs which are known to collectively account for equal to or less than 5% of a jurisdiction's agricultural sector nutrient and/or sediment load reductions as estimated in the most recent progress scenario.

Table B-5. Jurisdictional Agriculture Verification Protocol Design Table: Non-Visual Assessment BMPs
Chesapeake Bay Program Agriculture Workgroup
July 28, 2014

A. BMP Priority	B. Data Grouping	C. BMP Type	D. Initial Inspection (*Is the BMP there?*)				E. Follow-up Check (*Is the BMP still there?*)			F. Life-span / Sunset (*Is the BMP no longer there?*)	G. Data QA, Recording & Reporting
			Method	Frequency	Who inspects	Documentation	Follow-up Inspection	Statistical Sub-sample	Response if Problem		
High / Low	Non-Visual Assessment	Non-Cost Shared BMPs	On-Site Non-Visual Assessment Only	100% of All Tracked & Reported BMPs	Trained and certified technical agency/NGO field staff or engineers	BMPs meet the appropriate government and/or CBP practice standards	Single Year	10%[1] / 5%[2] Annually of All Tracked & Reported BMPs	Bring into compliance within one year or less, or remove from reported BMPs	Single Year	Document inspections/follow-up checks, prevent double counting, and QA reported data
High / Low	Non-Visual Assessment	Cost-Shared Programs	On-Site Non-Visual Assessment Only	100% of All Tracked & Reported BMPs	Trained and certified technical agency/NGO field staff or engineers	BMPs meet the appropriate government and/or CBP practice standards	Single Year	10% / 5% of All Active Contractual BMPs	Bring into compliance within one year or less, or remove from reported BMPs	Single Year	Document initial inspections/follow-up checks, prevent double counting, and QA reported data

High / Low	Non-Visual Assessment	Regulatory Programs	On-Site Non-Visual Assessment Only	100% of All Tracked & Reported BMPs	Trained and certified technical agency field staff or engineers	BMPs meet the appropriate government and/or CBP practice standards	Single Year	10% / 5% Annually of All Tracked & Reported BMPs	Bring into compliance within one year or less, or remove from reported BMPs	Single Year	Document initial inspections/follow-up checks, prevent double counting, and QA reported data
High / Low	Non-Visual Assessment	Permit-issuing Programs	On-Site Non-Visual Assessment Only	100% of All Tracked & Reported BMPs	Trained and certified technical agency field staff or engineers	BMPs meet the appropriate government and/or CBP practice standards	Single Year	20% Annually of All Active Permits	Bring into compliance within one year or less, or remove from reported BMPs	Single Year	Document initial inspections/follow-up checks, prevent double counting, and QA reported data
EXAMPLE BMP	Non-Visual Assessment	State Regulatory Programs: Nutrient Application Management	On-Site Non-Visual Assessment: Nutrient Management Plan Implementation	100% of All Tracked & Reported Nutrient Application Management Plans	County Conservation District Technician - State Nutrient Management Program Certified	State Nutrient Management Program Certification Form	On-Site Non-Visual Assessment: Nutrient Application Management O&M Compliance	10% of All Tracked & Reported Nutrient Application Management Plans	State Nutrient Management Regulatory Compliance Policy	3 Year Plans	State Nutrient Management Program Documentation / 5% QAQC Compliance Checks by State Agency / Tracking & Reporting Protocol

Table B-6. Agricultural BMP Verification Guidance Matrix: Visual Assessment BMPs – Single Year

Chesapeake Bay Program Agriculture Workgroup

The following BMP verification methods have been identified by the Agriculture Workgroup as representing primary pathways for BMP verification and reporting being utilized by the Bay Program partners. The associated opportunities and limitations inherent for each method and BMP category type represent the current level of confidence that a sufficient level of verification can be implemented to ensure that the BMPs have been (1) implemented, are currently operational, and are being maintained to meet the BMP definition and relevant practice standards and requirements; and (2) be in compliance with the Chesapeake Bay Program partners' BMP Verification Principles, including any supporting addendums.

Visual Assessment BMPs - Single Year: Conservation Tillage; High-Residue Minimum Soil Disturbance; Cover Crops; Commodity Cover Crops / **Interim BMPs-** Dairy Manure Injection; Annual No-till; Poultry Litter Injection

Agricultural BMP Verification Methods	Assessment Methods	Verification Expectations	Visual Assessment BMPs - Single Year	Cost-Sharing Information					BMP Performance					
				Federal C/S	State C/S	NGO C/S	Private Funded	Previously C/S BMPs (Expired Contract)	BMP Detection	Meets USDA/ State Design Specs	Meets Federal/State O&M Specs	Resource Improvement (Non-Spec)	Installation Date (M/Y)	Expiration Date (M/Y)
1.) Permit Issuing Programs	Verified compliance with federal NPDES (CAFO) or state agricultural operational permit program requirements.	Annual frequency of permit compliance inspections for all or sufficient statistical percentage of permitted operations during permit life span. Review of office/farm records.	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Non-Applicable	Eligible	Eligible

2.) Regulatory Programs	Verified compliance with federal or state agricultural regulatory requirements (non-operational permit).	Annual frequency of regulatory compliance inspections for all or sufficient statistical percentage of regulated operations. Review of office/farm records.	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Non-Applicable	Eligible	Eligible
3.) Financial Incentive Programs	Verified compliance with federal program contractual requirements.	Annual frequency of contractual compliance inspections for all or sufficient statistical percentage of contracted operations during contractual life span. Review of office/farm records.	Eligible	Eligible	Potentially Eligible	Potentially Eligible	Not Eligible	Not Eligible	Eligible	Eligible	Eligible	Non-Applicable	Eligible	Eligible
4.) Financial Incentive Programs	Verified compliance with state or county program contractual requirements.	Annual frequency of contractual compliance inspections for all or sufficient statistical percentage of contracted operations during contractual life span. Review of office/farm records.	Eligible	Potentially Eligible	Eligible	Potentially Eligible	Not Eligible	Not Eligible	Eligible	Eligible	Eligible	Non-Applicable	Eligible	Eligible

5.) Financial Incentive Programs	Verified compliance with NGO program contractual requirements.	Annual frequency of contractual compliance inspections for all or sufficient statistical percentage of contracted operations during contractual life span. Review of office/farm records.	Eligible	Potentially Eligible	Potentially Eligible	Eligible	Not Eligible	Not Eligible	Eligible	Potentially Eligible	Potentially Eligible	Non-Applicable	Eligible	Eligible
6.) Farm Inventory	Farm inventory by trained and certified federal, state, and/or county agency personnel.	Annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span. Review of office/farm records.	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Non-Applicable	Eligible	Eligible
7.) Farm Inventory	Farm inventory by trained and certified NGO personnel.	Annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span. Review of office/farm records.	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Non-Applicable	Eligible	Eligible
8.) Farm Inventory	Farmer completes self-certified inventory survey and trained and certified federal, state and/or county personnel verify on-site.	Annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span. Review of office/farm records.	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Non-Applicable	Eligible	Eligible

9.) Farm Inventory	Farmer completes self-certified inventory survey and trained and certified NGO personnel verify on-site.	Annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span. Review of office/farm records.	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Non-Applicable	Eligible	Eligible
10.) Farm Inventory	Farmer completes in-office self-certified inventory with assistance of trained and certified federal, state and/or county agency personnel. No on-site verification.	Annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span. Review of office/farm records.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
11.) Farm Inventory	Farmer completes in-office self-certified inventory with assistance of trained and certified NGO personnel. No on-site verification.	Annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span. Review of office/farm records.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
12.) Farm Inventory	Farmer with training and certification completes self-certified inventory survey.	Annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible

13.) Farm Inventory	Farmer without training and certification completes self-certified inventory survey.	Annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
14.) Office Records	Review of existing office records by trained and certified federal, state and/or county agency personnel. No on-site verification.	Annual frequency of office records review and verification for all or sufficient statistical percentage of operations during BMP life span.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
15.) Farm Records	Review of existing on-farm records by trained and certified federal, state and/or county agency personnel. No on-site verification.	Annual frequency of on-farm records review and verification for all or sufficient statistical percentage of operations during BMP life span.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
16.) Farm Records	Review of existing on-farm records by trained and certified NGO personnel. No on-site verification.	Annual frequency of on-farm records review and verification for all or sufficient statistical percentage of operations during BMP life span.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
17.) Transect Survey	Statistically designed and recognized transect survey completed by trained and certified federal, state and/or county personnel.	Annual frequency of statistical transect surveys for a sufficient statistical percentage of operations during BMP life span.	Potentially Eligible	Potentially Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible

18.) Transect Survey	Statistically designed and recognized transect survey completed by trained and certified NGO personnel.	Annual frequency of statistical transect surveys for a sufficient statistical percentage of operations during BMP life span.	Potentially Eligible	Potentially Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
19.) CEAP Survey	CEAP statistical survey conducted in-person at field-level scale following NASS verification protocols.	Non-annual frequency of statistical CEAP surveys for a sufficient statistical percentage of operations during BMP life span may limit verification.	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
20.) NASS Survey	NASS statistical survey conducted at farm-level scale following NASS verification protocols.	Annual frequency of statistical NASS surveys for all or sufficient statistical percentage of operations during BMP life span.	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
21.) NRI Point (NRCS) or some other statistically selected sites	Statistical survey conducted in-person at field-level with NASS trained and certified personnel.	Non-annual frequency of statistical NRI surveys for a sufficient statistical percentage of operations during BMP life span may limit verification.	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible

22.) Remote Sensing	Statistically designed and recognized remote sensing surveys with supporting field-level scale ground-truthing verification.	Annual frequency of statistical remote sensing surveys implemented by trained and certified agency personnel, for all or sufficient statistical percentage of operations during BMP life span.	Potentially Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
23.) Remote Sensing	Statistically designed and recognized remote sensing surveys with supporting field-level scale ground-truthing verification.	Annual frequency of statistical remote sensing surveys implemented by trained and certified NGO personnel, for all or sufficient statistical percentage of operations during BMP life span.	Potentially Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible

Table B-7 Draft Agricultural BMP Verification Guidance Matrix: Visual Assessment BMPs – Multi-Year

Chesapeake Bay Program Agriculture Workgroup

The following BMP verification methods have been identified by the Agriculture Workgroup as representing primary pathways for BMP verification and reporting being utilized by the Bay Program partners. The associated opportunities and limitations inherent for each method and BMP category type represent the current level of confidence that a sufficient level of verification can be implemented to ensure that the BMPs have been (1) implemented, are currently operational, and are being maintained to meet the BMP definition and relevant practice standards and requirements; and (2) be in compliance with the Chesapeake Bay Program partners' BMP Verification Principles, including any supporting addendums.

Visual Assessment BMPs - Multi-Year: Animal Waste Management Systems; Barnyard Runoff Control; Bio-filters; Continuous No-Till; Forest Buffers; Grass Buffers; Land Retirement; Steam-Side Forest Buffers; Stream-Side Grass Buffers; Stream-Side Wetland Restoration; Tree Planting; Lagoon Covers; Loafing Lot Management; Mortality Composters; Non-Urban Stream Restoration: Shoreline Erosion Control; Off-Steam Watering w/o Fencing; Stream Access Control with Fencing; Prescribed Grazing; Precision Intensive Rotational Grazing; Horse Pasture Management; Pasture Alternate Watering Systems; Soil Conservation & Water Quality Plan Elements; Water Control Structures; Wetland Restoration / **Interim BMPs-** Alternative Crops; Dirt & Gravel Road Erosion & Sediment Control; Cropland Irrigation Management; Irrigation Water Capture Reuse; P-Sorbing Materials in Ag Ditches; Vegetative Environmental Buffers- Poultry

Agricultural BMP Verification Methods	Assessment Methods	Verification Expectations	Visual Assessment BMPs - Multi-Year	Cost-Sharing Information					BMP Performance					
				Federal C/S	State C/S	NGO C/S	Private Funded	Previously C/S BMPs (Expired Contract)	BMP Detection	Meets USDA/ State Design Specs	Meets Federal/State O&M Specs	Resource Improvement (Non-Spec)	Installation Date (M/Y)	Expiration Date (M/Y)

1.) Permit Issuing Programs	Verified compliance with federal NPDES (CAFO) or state agricultural operational permit program requirements.	Non-annual frequency of permit compliance inspections for all or sufficient statistical percentage of permitted operations during permit life span. Review of office/farm records.	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Not Eligible	Eligible	Eligible
2.) Regulatory Programs	Verified compliance with federal or state agricultural regulatory requirements (non-operational permit).	Non- annual frequency of regulatory compliance inspections for all or sufficient statistical percentage of regulated operations. Review of office/farm records.	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Not Eligible	Eligible	Eligible
3.) Financial Incentive Programs	Verified compliance with federal program contractual requirements.	Non- annual frequency of contractual compliance inspections for all or sufficient statistical percentage of contracted operations during contractual life span. Review of office/farm records.	Eligible	Eligible	Potentially Eligible	Potentially Eligible	Not Eligible	Not Eligible	Eligible	Eligible	Eligible	Not Eligible	Eligible	Eligible

4.) Financial Incentive Programs	Verified compliance with state or county program contractual requirements.	Non-annual frequency of contractual compliance inspections for all or sufficient statistical percentage of contracted operations during contractual life span. Review of office/farm records.	Eligible	Potentially Eligible	Eligible	Potentially Eligible	Not Eligible	Not Eligible	Eligible	Eligible	Eligible	Potentially Eligible	Eligible	Eligible
5.) Financial Incentive Programs	Verified compliance with NGO program contractual requirements.	Non-annual frequency of contractual compliance inspections for all or sufficient statistical percentage of contracted operations during contractual life span. Review of office/farm records.	Eligible	Potentially Eligible	Potentially Eligible	Eligible	Not Eligible	Not Eligible	Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Eligible	Eligible
6.) Farm Inventory	Farm inventory by trained and certified federal, state, and/or county agency personnel.	Non-annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span. Review of office/farm records.	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible
7.) Farm Inventory	Farm inventory by trained and certified NGO personnel.	Non-annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span. Review of office/farm records.	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible

8.) Farm Inventory	Farmer completes self-certified inventory survey and trained and certified federal, state and/or county personnel verify on-site.	Non-annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span. Review of office/farm records.	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible
9.) Farm Inventory	Farmer completes self-certified inventory survey and trained and certified NGO personnel verify on-site.	Non-annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span. Review of office/farm records.	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible
10.) Farm Inventory	Farmer completes in-office self-certified inventory with assistance of trained and certified federal, state and/or county agency personnel. No on-site verification.	Non-annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span. Review of office/farm records.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Potentially Eligible
11.) Farm Inventory	Farmer completes in-office self-certified inventory with assistance of trained and certified NGO personnel. No on-site verification.	Non-annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span. Review of office/farm records.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Potentially Eligible

12.) Farm Inventory	Farmer with training and certification completes self-certified inventory survey.	Non-annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Potentially Eligible
13.) Farm Inventory	Farmer without training and certification completes self-certified inventory survey.	Non-annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Potentially Eligible
14.) Office Records	Review of existing office records by trained and certified federal, state and/or county agency personnel. No on-site verification.	Non-annual frequency of office records review and verification for all or sufficient statistical percentage of operations during BMP life span.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Potentially Eligible
15.) Farm Records	Review of existing on-farm records by trained and certified federal, state and/or county agency personnel. No on-site verification.	Non-annual frequency of on-farm records review and verification for all or sufficient statistical percentage of operations during BMP life span.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Potentially Eligible
16.) Farm Records	Review of existing on-farm records by trained and certified NGO personnel. No on-site verification.	Non-annual frequency of on-farm records review and verification for all or sufficient statistical percentage of operations during BMP life span.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Potentially Eligible

17.) Transect Survey	Statistically designed and recognized transect survey completed by trained and certified federal, state and/or county personnel.	Non-annual frequency of statistical transect surveys for a sufficient statistical percentage of operations during BMP life span.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible
18.) Transect Survey	Statistically designed and recognized transect survey completed by trained and certified NGO personnel.	Non-annual frequency of statistical transect surveys for a sufficient statistical percentage of operations during BMP life span.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible
19.) CEAP Survey	CEAP statistical survey conducted in-person at field-level scale following NASS verification protocols.	Non-annual frequency of statistical CEAP surveys for a sufficient statistical percentage of operations during BMP life span may limit verification.	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible
20.) NASS Survey	NASS statistical survey conducted at farm-level scale following NASS verification protocols.	Non-annual frequency of statistical NASS surveys for all or sufficient statistical percentage of operations during BMP life span.	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible
21.) NRI Point (NRCS) or some other statistically selected sites	Statistical survey conducted in-person at field-level with NASS trained and certified personnel.	Non-annual frequency of statistical NRI surveys for a sufficient statistical percentage of operations during BMP life span may limit verification.	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible

22.) Remote Sensing	Statistically designed and recognized remote sensing surveys with supporting field-level scale ground-truthing verification.	Non-annual frequency of statistical remote sensing surveys implemented by trained and certified agency personnel, for all or sufficient statistical percentage of operations during BMP life span.	Potentially Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Not Eligible	Not Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible
23.) Remote Sensing	Statistically designed and recognized remote sensing surveys with supporting field-level scale ground-truthing verification.	Non-annual frequency of statistical remote sensing surveys implemented by trained and certified NGO personnel, for all or sufficient statistical percentage of operations during BMP life span.	Potentially Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Not Eligible	Not Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible

Table B-8 Draft Agricultural BMP Verification Guidance Matrix: Non-Visual Assessment BMPs

Chesapeake Bay Program Agriculture Workgroup

The following BMP verification methods have been identified by the Agriculture Workgroup as representing primary pathways for BMP verification and reporting being utilized by the Bay Program partners. The associated opportunities and limitations inherent for each method and BMP category type represent the current level of confidence that a sufficient level of verification can be implemented to ensure that the BMPs have been (1) implemented, are currently operational, and are being maintained to meet the BMP definition and relevant practice standards and requirements; and (2) be in compliance with the Chesapeake Bay Program partners' BMP Verification Principles, including any supporting addendums.

Non-Visual Assessment BMPs: Dairy Precision Feeding; Swine Phytase; Poultry Litter Transport; Poultry Litter Treatment; Poultry Phytase; Decision/Precision Ag, Enhanced Nutrient Management; Nutrient Application Management; Soil Conservation & Water Quality Plans

Agricultural BMP Verification Methods	Assessment Methods	Verification Expectations	Non-Visual Assessment BMPs	Cost-Sharing Information					BMP Performance					
				Federal C/S	State C/S	NGO C/S	Private Funded	Previously C/S BMPs (Expired Contract)	BMP Detection	Meets USDA/ State Design Specs	Meets Federal/State O&M Specs	Resource Improvement (Non-Spec)	Installation Date (M/Y)	Expiration Date (M/Y)
1.) Permit Issuing Programs	Verified compliance with federal NPDES (CAFO) or state agricultural operational permit program requirements.	Annual frequency of permit compliance inspections for all or sufficient statistical percentage of permitted operations during permit life span. Review of office/farm records.	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible

2.) Regulatory Programs	Verified compliance with federal or state agricultural regulatory requirements (non-operational permit).	Annual frequency of regulatory compliance inspections for all or sufficient statistical percentage of regulated operations. Review of office/farm records.	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
3.) Financial Incentive Programs	Verified compliance with federal program contractual requirements.	Annual frequency of contractual compliance inspections for all or sufficient statistical percentage of contracted operations during contractual life span. Review of office/farm records.	Eligible	Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Eligible	Eligible	Eligible	Non-Applicable	Eligible	Eligible
4.) Financial Incentive Programs	Verified compliance with state or county program contractual requirements.	Annual frequency of contractual compliance inspections for all or sufficient statistical percentage of contracted operations during contractual life span. Review of office/farm records.	Eligible	Potentially Eligible	Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Eligible	Eligible	Eligible	Non-Applicable	Eligible	Eligible

5.) Financial Incentive Programs	Verified compliance with NGO program contractual requirements.	Annual frequency of contractual compliance inspections for all or sufficient statistical percentage of contracted operations during contractual life span. Review of office/farm records.	Eligible	Potentially Eligible	Potentially Eligible	Eligible	Potentially Eligible	Potentially Eligible	Eligible	Potentially Eligible	Potentially Eligible	Non-Applicable	Eligible	Eligible
6.) Farm Inventory	Farm inventory by trained and certified federal, state, and/or county agency personnel.	Annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span. Review of office/farm records.	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Potentially Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
7.) Farm Inventory	Farm inventory by trained and certified NGO personnel.	Annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span. Review of office/farm records.	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Potentially Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
8.) Farm Inventory	Farmer completes self-certified inventory survey and trained and certified federal, state and/or county personnel verify on-site.	Annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span. Review of office/farm records.	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Potentially Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible

9.) Farm Inventory	Farmer completes self-certified inventory survey and trained and certified NGO personnel verify on-site.	Annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span. Review of office/farm records.	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Eligible	Potentially Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
10.) Farm Inventory	Farmer completes in-office self-certified inventory with assistance of trained and certified federal, state and/or county agency personnel. No on-site verification.	Annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span. Review of office/farm records.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
11.) Farm Inventory	Farmer completes in-office self-certified inventory with assistance of trained and certified NGO personnel. No on-site verification.	Annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span. Review of office/farm records.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
12.) Farm Inventory	Farmer with training and certification completes self-certified inventory survey.	Annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible

13.) Farm Inventory	Farmer without training and certification completes self-certified inventory survey.	Annual frequency of inventories for all or sufficient statistical percentage of operations during BMP life span.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
14.) Office Records	Review of existing office records by trained and certified federal, state and/or county agency personnel. No on-site verification.	Annual frequency of office records review and verification for all or sufficient statistical percentage of operations during BMP life span.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
15.) Farm Records	Review of existing on-farm records by trained and certified federal, state and/or county agency personnel. No on-site verification.	Annual frequency of on-farm records review and verification for all or sufficient statistical percentage of operations during BMP life span.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
16.) Farm Records	Review of existing on-farm records by trained and certified NGO personnel. No on-site verification.	Annual frequency of on-farm records review and verification for all or sufficient statistical percentage of operations during BMP life span.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Potentially Eligible	Not Eligible	Not Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
17.) Transect Survey	Statistically designed and recognized transect survey completed by trained and certified federal, state and/or county personnel.	Annual frequency of statistical transect surveys for a sufficient statistical percentage of operations during BMP life span.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Non-Applicable	Not Eligible	Not Eligible

18.) Transect Survey	Statistically designed and recognized transect survey completed by trained and certified NGO personnel.	Annual frequency of statistical transect surveys for a sufficient statistical percentage of operations during BMP life span.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Non-Applicable	Not Eligible	Not Eligible
19.) CEAP Survey	CEAP statistical survey conducted in-person at field-level scale following NASS verification protocols.	Non-annual frequency of statistical CEAP surveys for a sufficient statistical percentage of operations during BMP life span may limit verification.	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
20.) NASS Survey	NASS statistical survey conducted at farm-level scale following NASS verification protocols.	Annual frequency of statistical NASS surveys for all or sufficient statistical percentage of operations during BMP life span.	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible
21.) NRI Point (NRCS) or some other statistically selected sites	Statistical survey conducted in-person at field-level with NASS trained and certified personnel.	Non-annual frequency of statistical NRI surveys for a sufficient statistical percentage of operations during BMP life span may limit verification.	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Potentially Eligible	Non-Applicable	Potentially Eligible	Potentially Eligible

22.) Remote Sensing	Statistically designed and recognized remote sensing surveys with supporting field-level scale ground-truthing verification.	Annual frequency of statistical remote sensing surveys implemented by trained and certified agency personnel, for all or sufficient statistical percentage of operations during BMP life span.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Non-Applicable	Not Eligible	Not Eligible
23.) Remote Sensing	Statistically designed and recognized remote sensing surveys with supporting field-level scale ground-truthing verification.	Annual frequency of statistical remote sensing surveys implemented by trained and certified NGO personnel, for all or sufficient statistical percentage of operations during BMP life span.	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Not Eligible	Non-Applicable	Not Eligible	Not Eligible

Relative Influence of BMPs To-Date on Load Reductions <u>Agriculture Sector</u>

Objectives

- Identify the agricultural BMPs reported by states to-date (through 2013 Progress) and quantify their relative contribution to nutrient and sediment load reductions from a No-Action condition to 2013 Progress.
- Results in the following slides are focused on the agricultural sector.

Method

- Create a NO ACTION Scenario.
- Determine load reductions between 2013 Progress Scenario and NO ACTION.
- Isolate each 2013 Progress BMP in a separate scenario using CAST processing rules.
- Determine load reductions from the isolated BMP scenario to the NO ACTION.
- Compare the relative load reductions among the BMPs.

Agriculture Practices

LandRetire	Land Retirement	PrecRotGrazing	Prescribed Grazing
ForestBuffers	Forest Buffers	UpPrecIntRotGraze	Precision Intensive Rotational Grazing
ConserveTill	Conservation Tillage	MortalityComp	Mortality Composting
CoverCrop	Cover Crop	EffNutManDecAgVA	Decision Agriculture
AWMS	Animal Waste Management Systems	ForestBuffersTrp	Forest Buffers on Fenced Pasture Corridor
GrassBuffers	Grass Buffers	NoTill	Continuous NoTill
EnhancedNM	Enhanced Nutrient Application Management	WaterContStruc	Water Control Structures
CarSeqAltCrop	Carbon Sequestration	Cropirrmgmt	Crop Irrigation Management
ConPlan	Conservation Plans	EffNutManEnhanceVA	Enhanced Nutrient Application Management
ComCovCrop	Commodity Cover Crop	NonUrbStrmRest	NonUrban Stream Restoration
WetlandRestore	Wetland Restoration	LoafLot	Loafing Lot Management
DecisionAg	Decision Agriculture	OSWnoFence	Pasture Alternative Watering
PastFence	Stream Access Control with Fencing	ConserveTillom	Conservation-Till Specialty Crops
GrassBuffersTrp	Grass Buffers on Fenced Pasture Corridor	TreePlantTrp	Tree Planting on Fenced Pasture Corridor
DairyPrecFeed	Dairy Precision Feeding	PoultryPhytase	Poultry Phytase
PoultryInjection	Poultry Injection	SwinePhytase	Swine Phytase
TreePlant	Tree Planting	BioFilters	BioFilters
CaptureReuse	Capture & Reuse	HorsePasMan	Horse Pasture Management
ManureTransport	Manure Transport	LagoonCovers	Lagoon Covers
ContinuousNT	Continuous NoTill	NutMan	Nutrient Application Management on Crop
BarnRunoffCont	Barnyard Runoff Control	Alum	Ammonia Emission Reductions (Alum)
LiquidInjection	Liquid Injection		

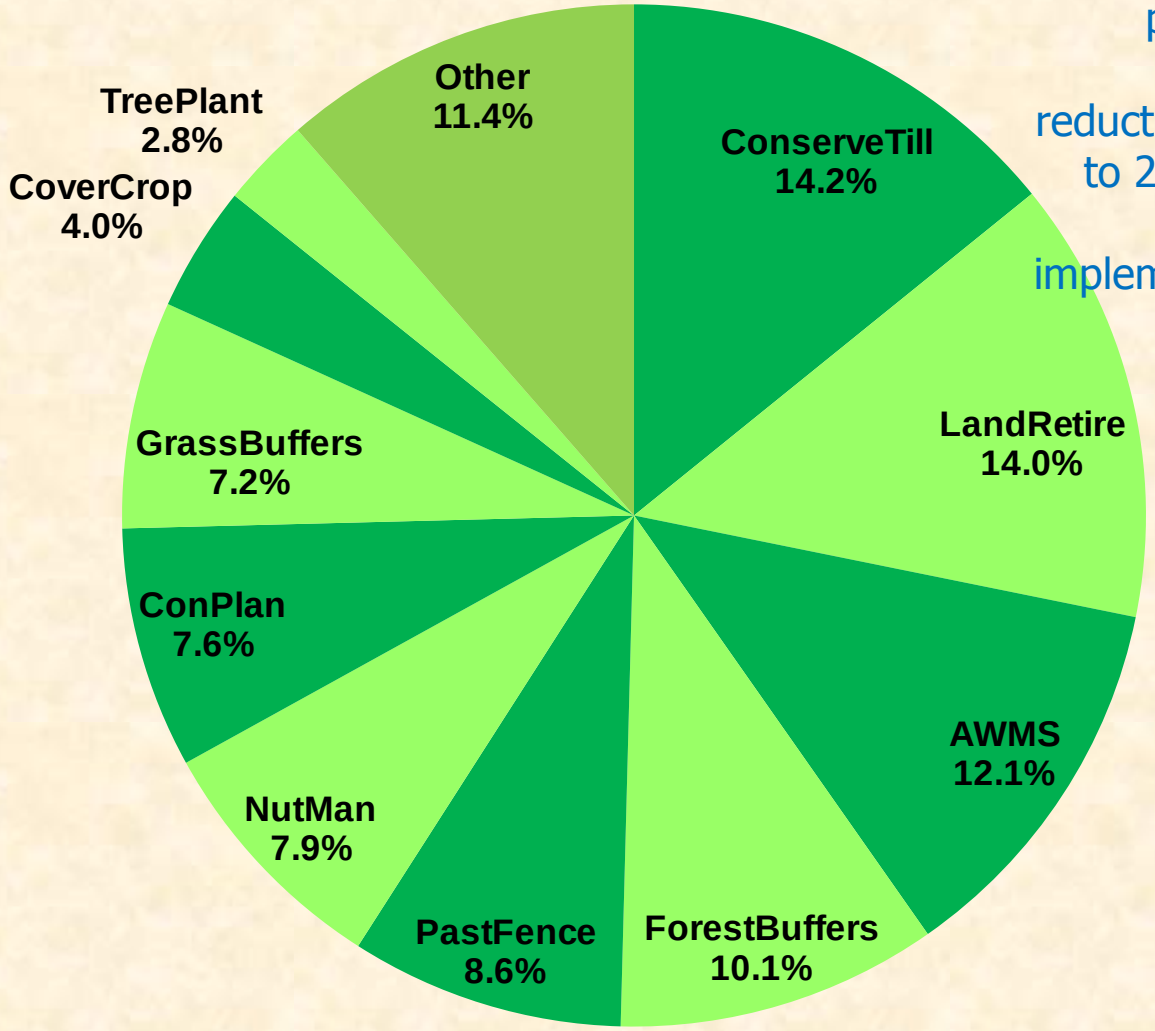
Agricultural Nitrogen Reductions

Relative influence of 2013 Progress BMPs on load reductions

Agriculture Nitrogen Load Reduction by BMP

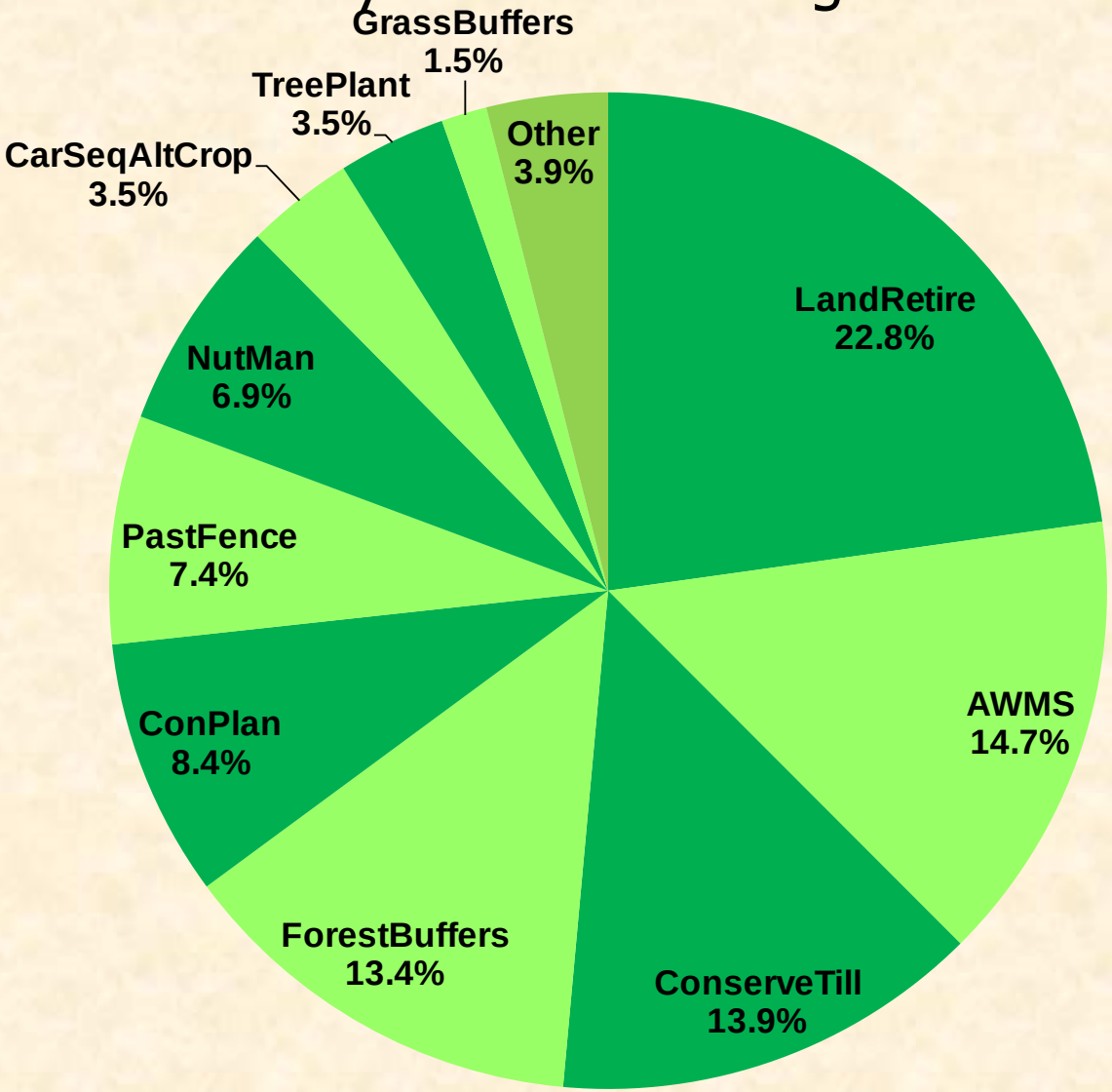
All Jurisdictions' – 2013 Progress

Each slice represents the percent of the total agricultural load reduction from No-Action to 2013 attributable to state-reported implementation levels for that BMP.



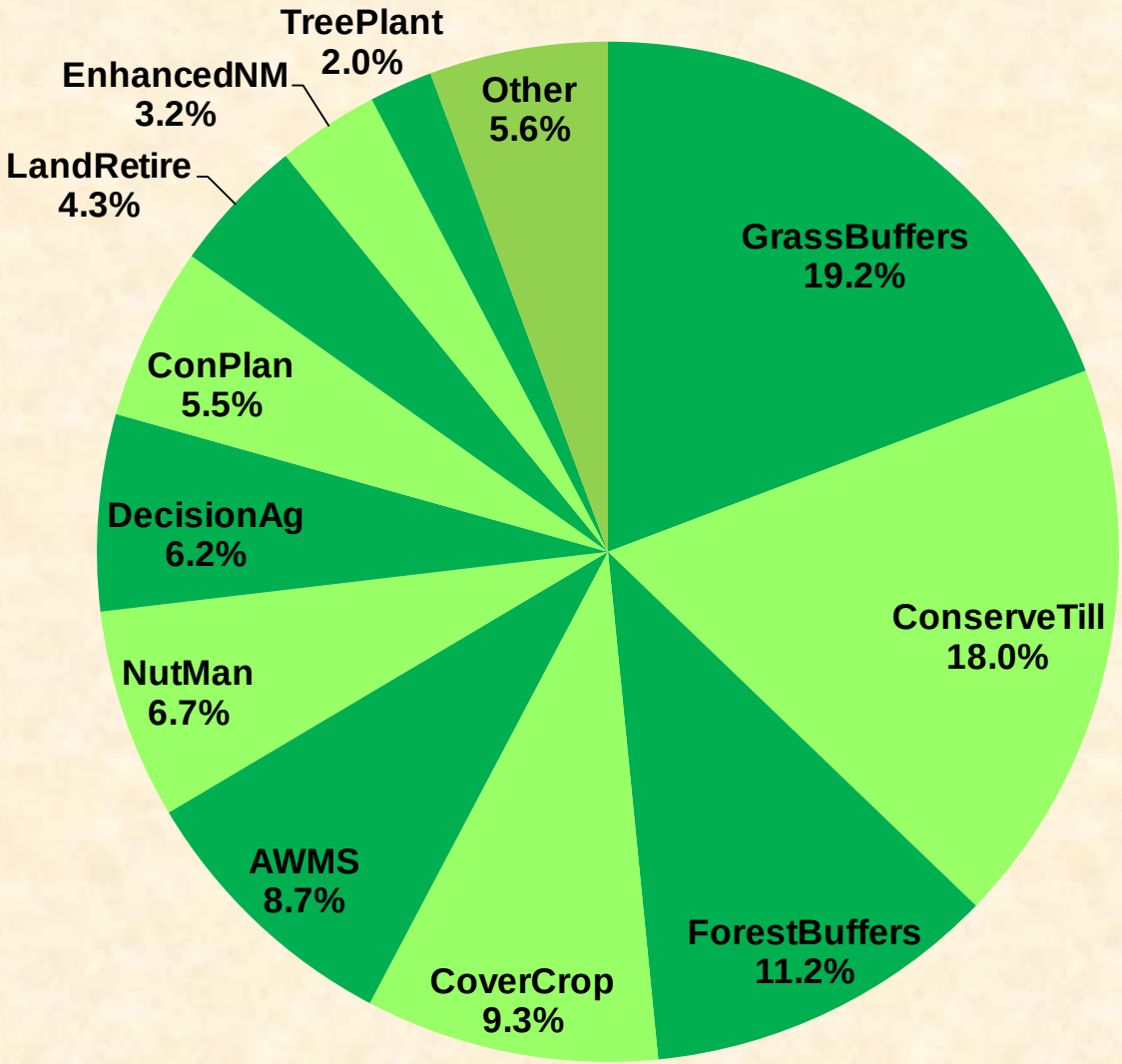
Agriculture Nitrogen Load Reduction by BMP

Pennsylvania 2013 Progress



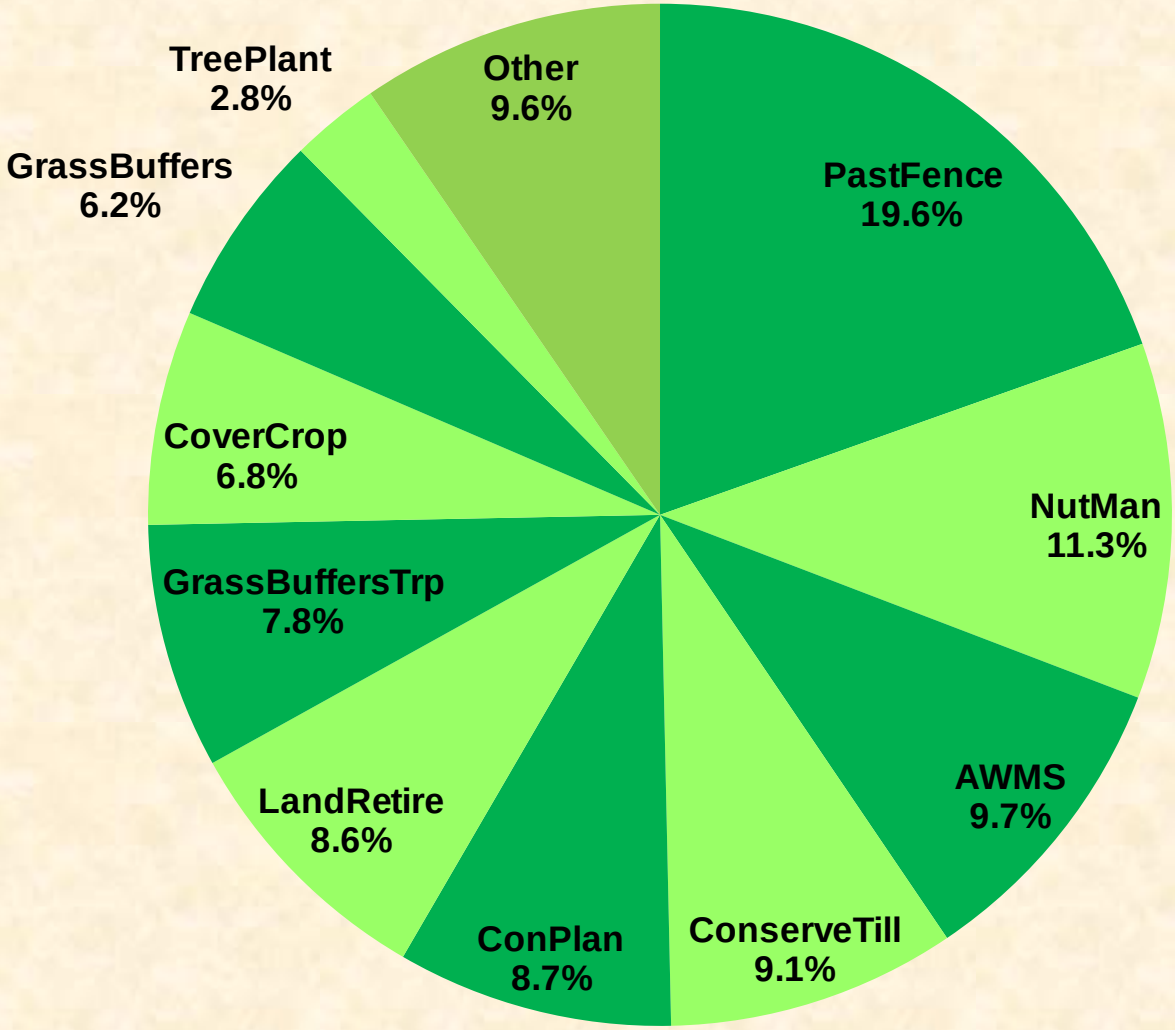
Agriculture Nitrogen Load Reduction by BMP

Maryland 2013 Progress



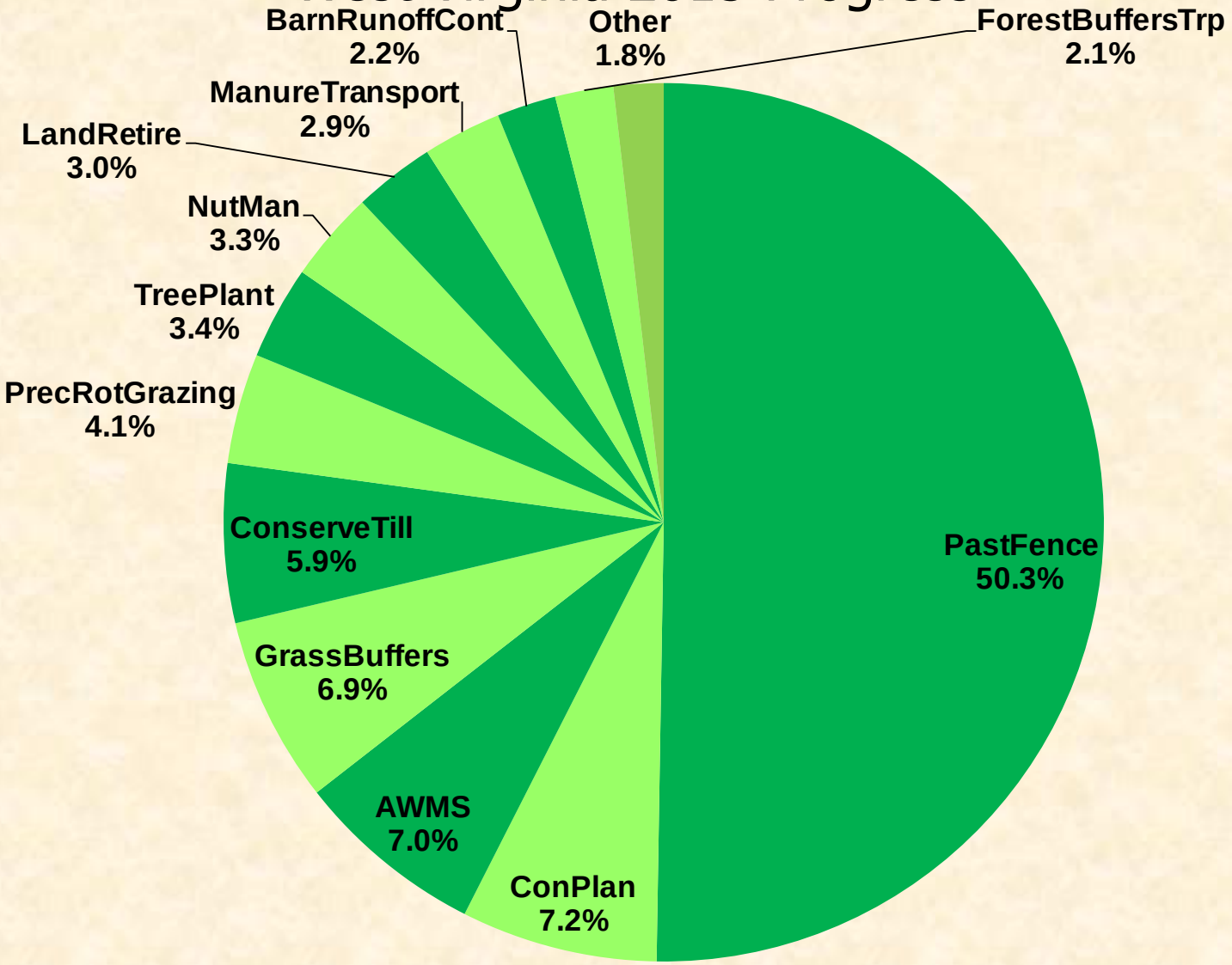
Agriculture Nitrogen Load Reduction by BMP

Virginia 2013 Progress



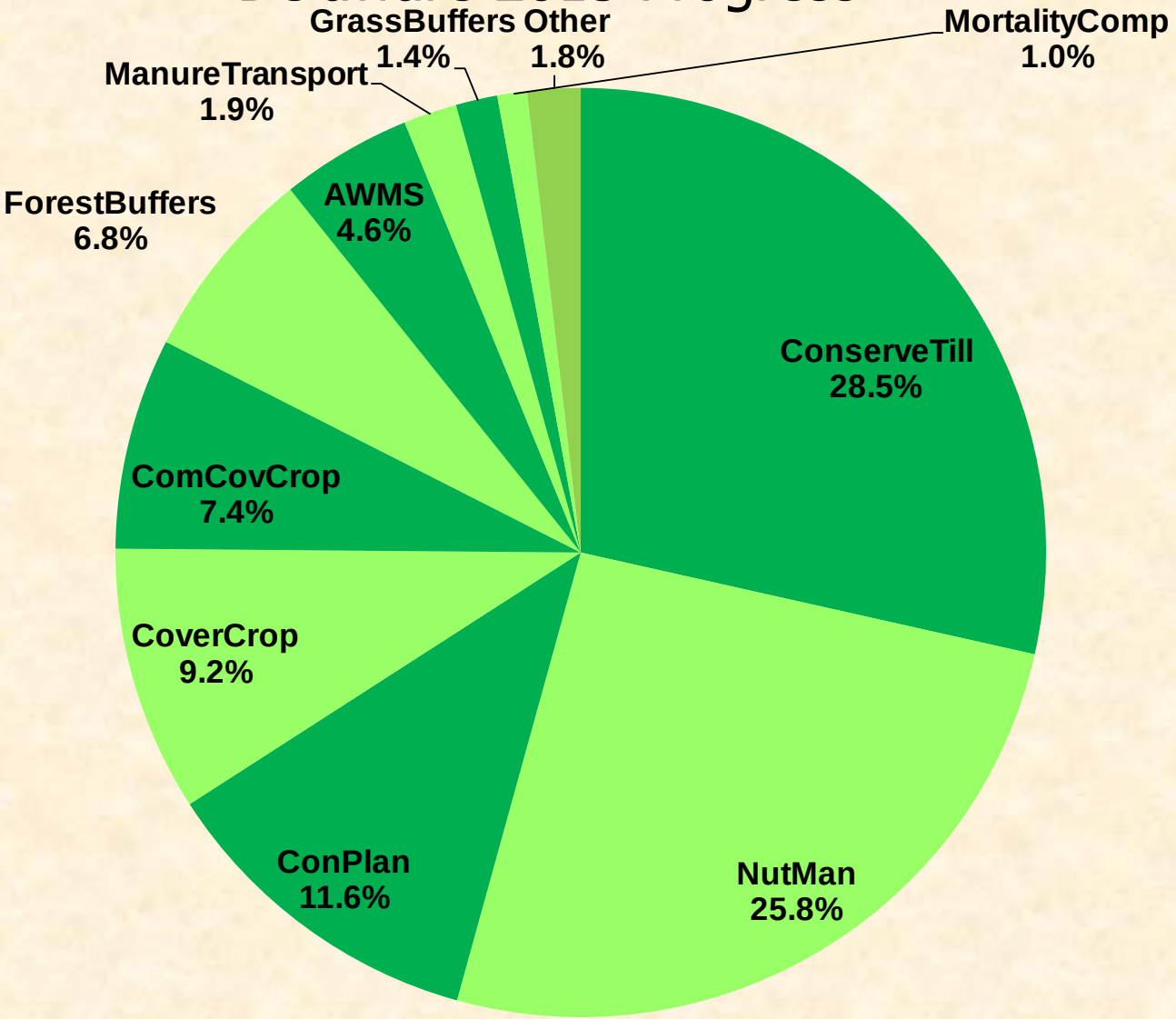
Agriculture Nitrogen Load Reduction by BMP

West Virginia 2013 Progress



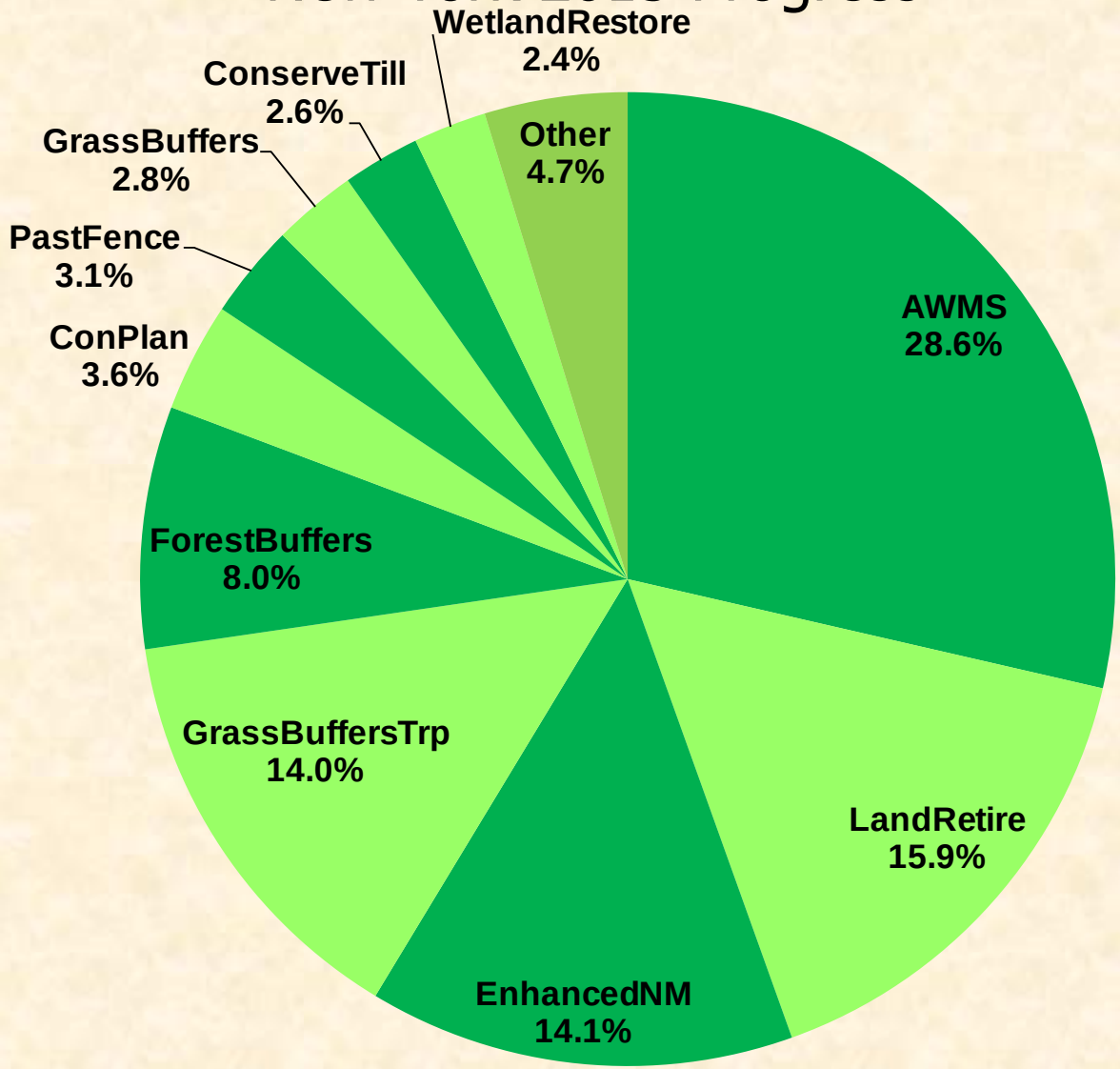
Agriculture Nitrogen Load Reduction by BMP

Delaware 2013 Progress



Agriculture Nitrogen Load Reduction by BMP

New York 2013 Progress

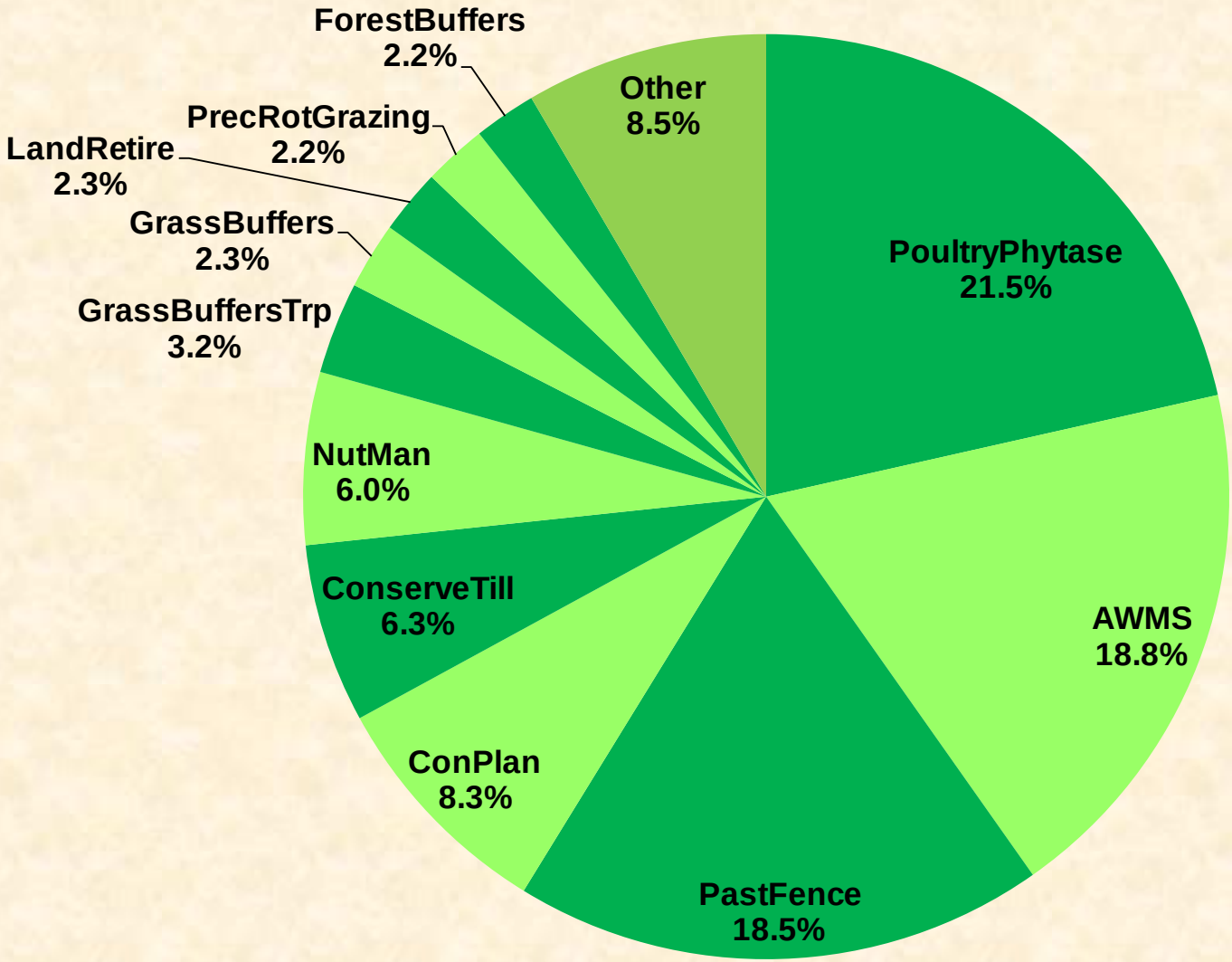


Agricultural Phosphorus Reductions

Relative influence of 2013 Progress BMPs on load reductions

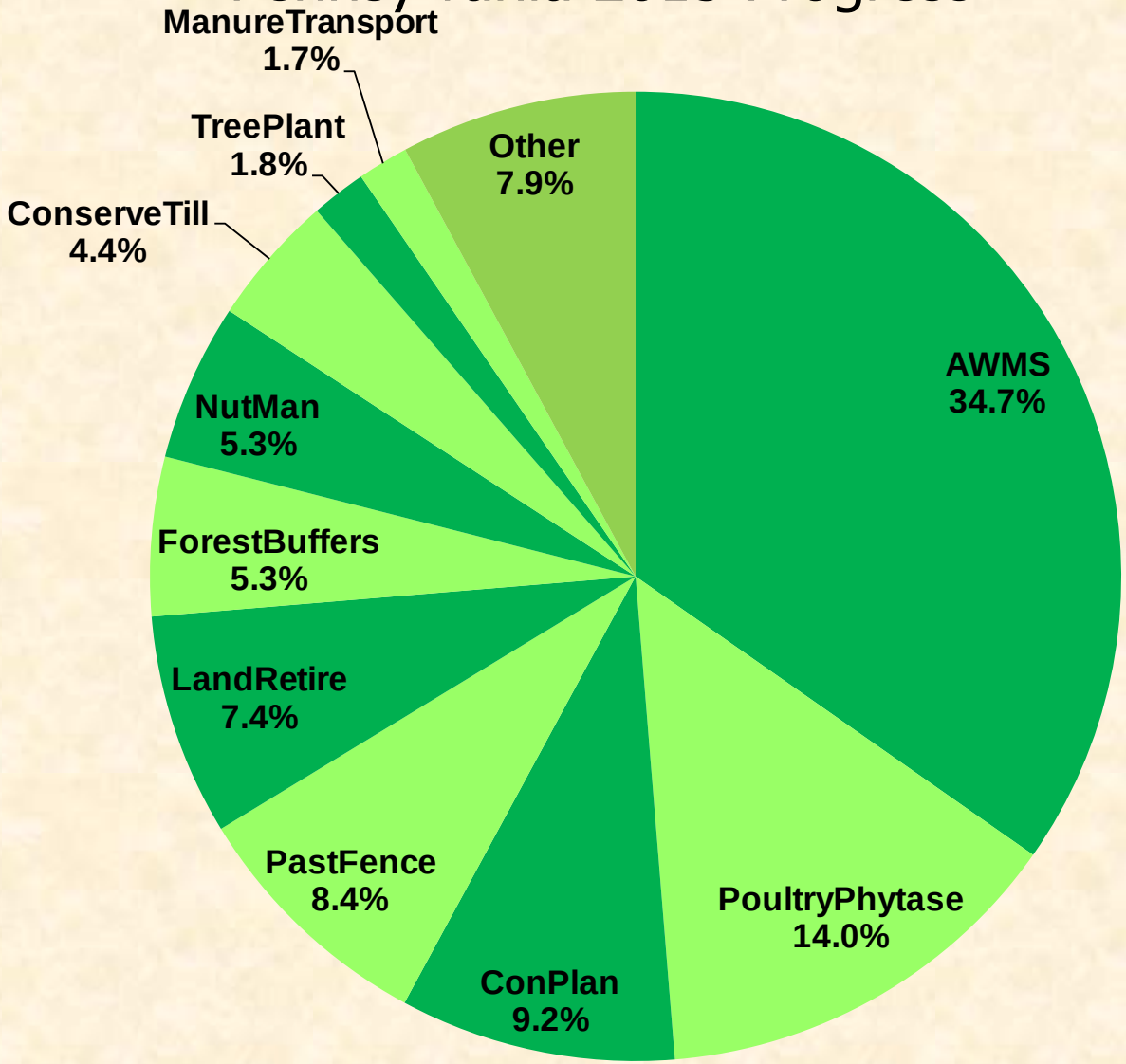
Agriculture Phosphorus Load Reduction by BMP

All Jurisdictions' – 2013 Progress



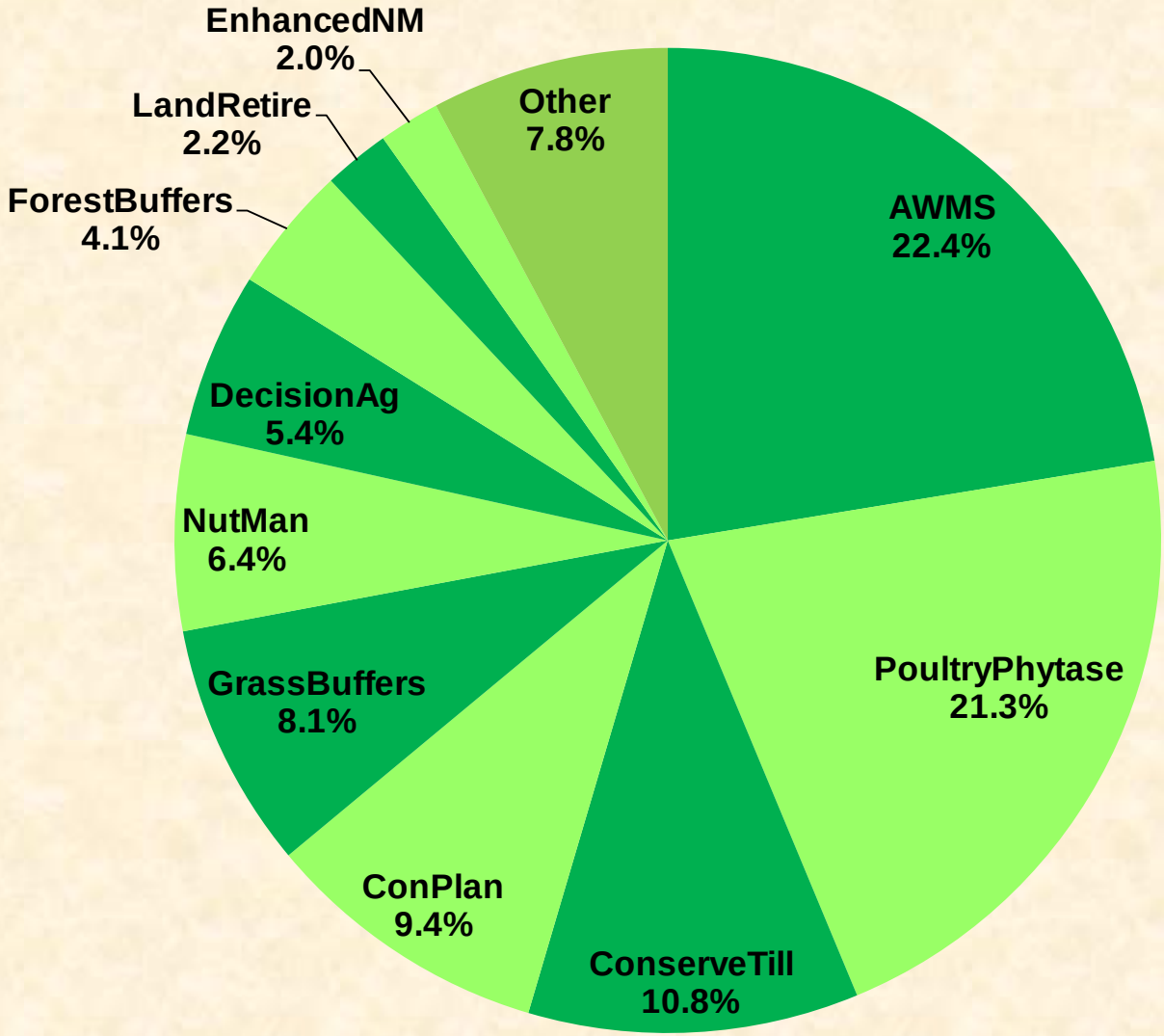
Phosphorus Relative Load Reductions

Pennsylvania 2013 Progress



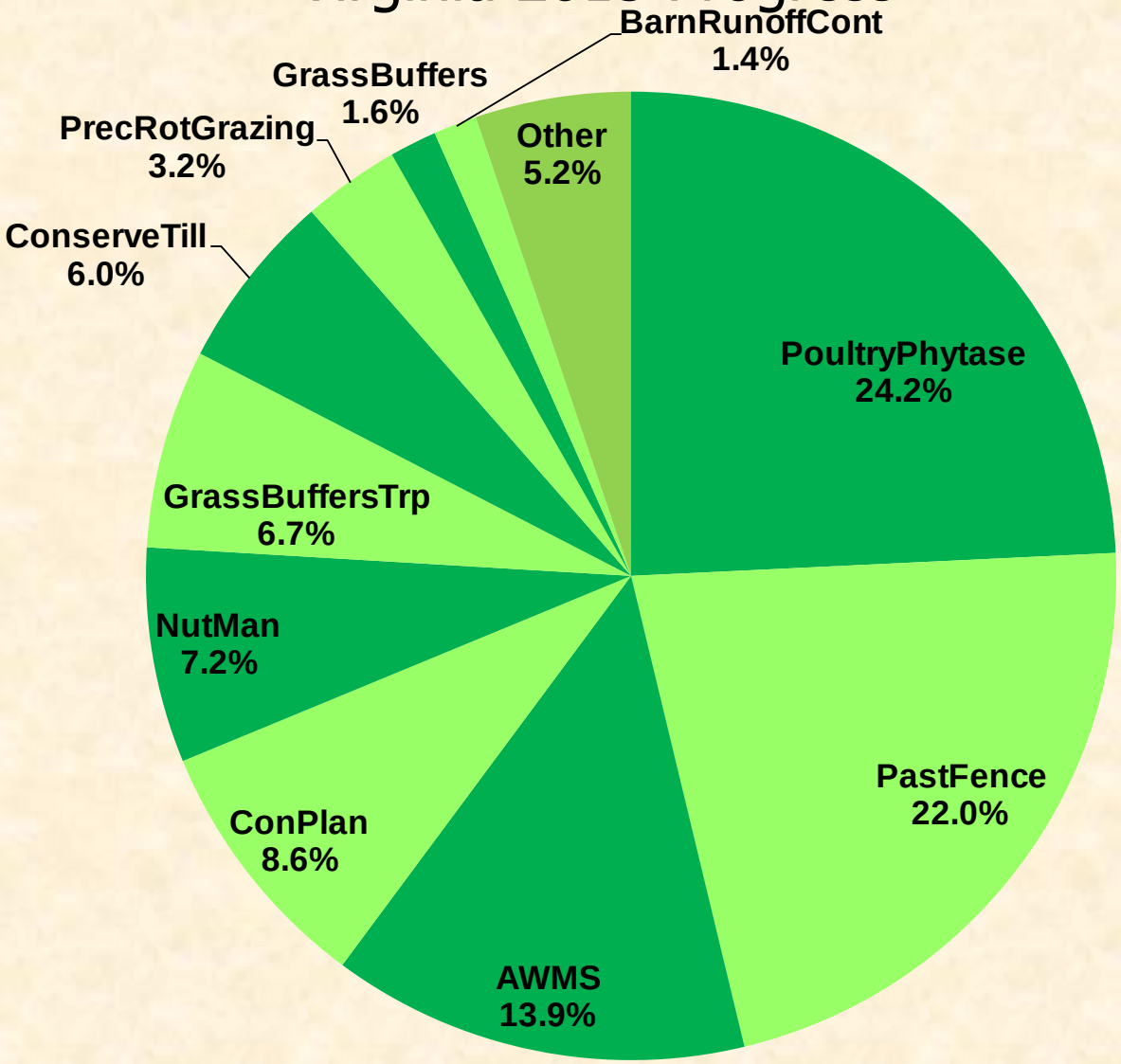
Agriculture Phosphorus Load Reduction by BMP

Maryland 2013 Progress



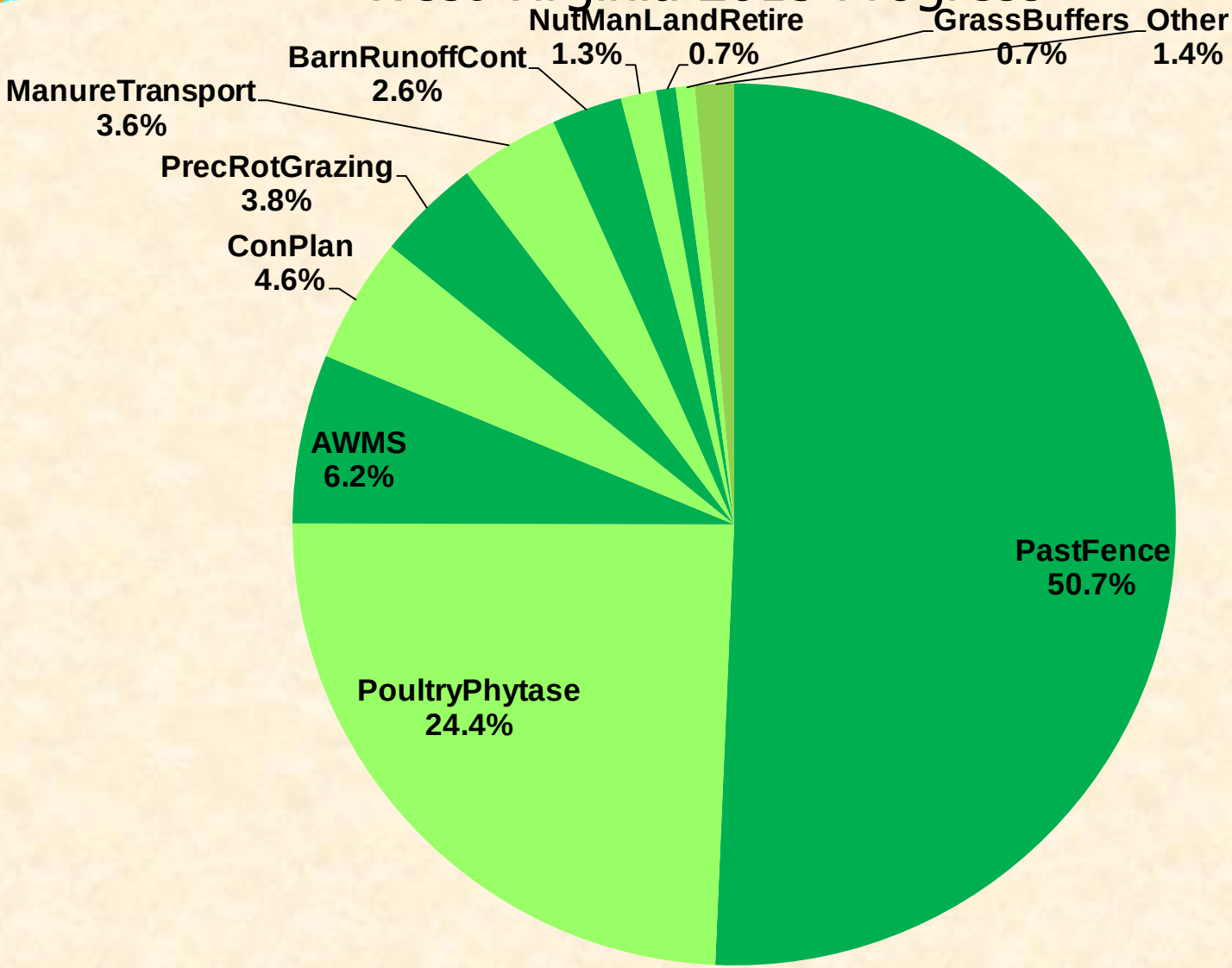
Agriculture Phosphorus Load Reduction by BMP

Virginia 2013 Progress



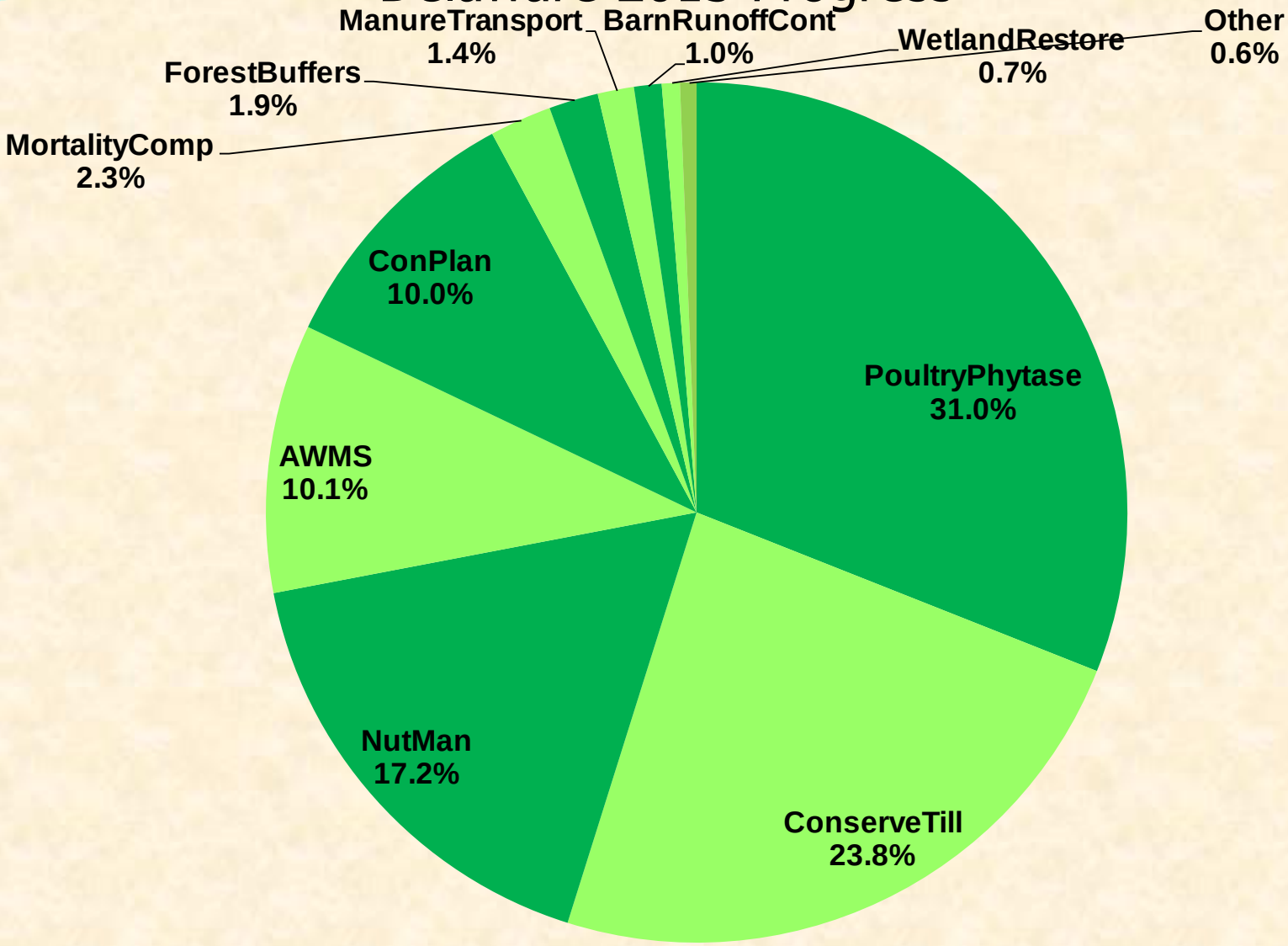
Agriculture Phosphorus Load Reduction by BMP

West Virginia 2013 Progress



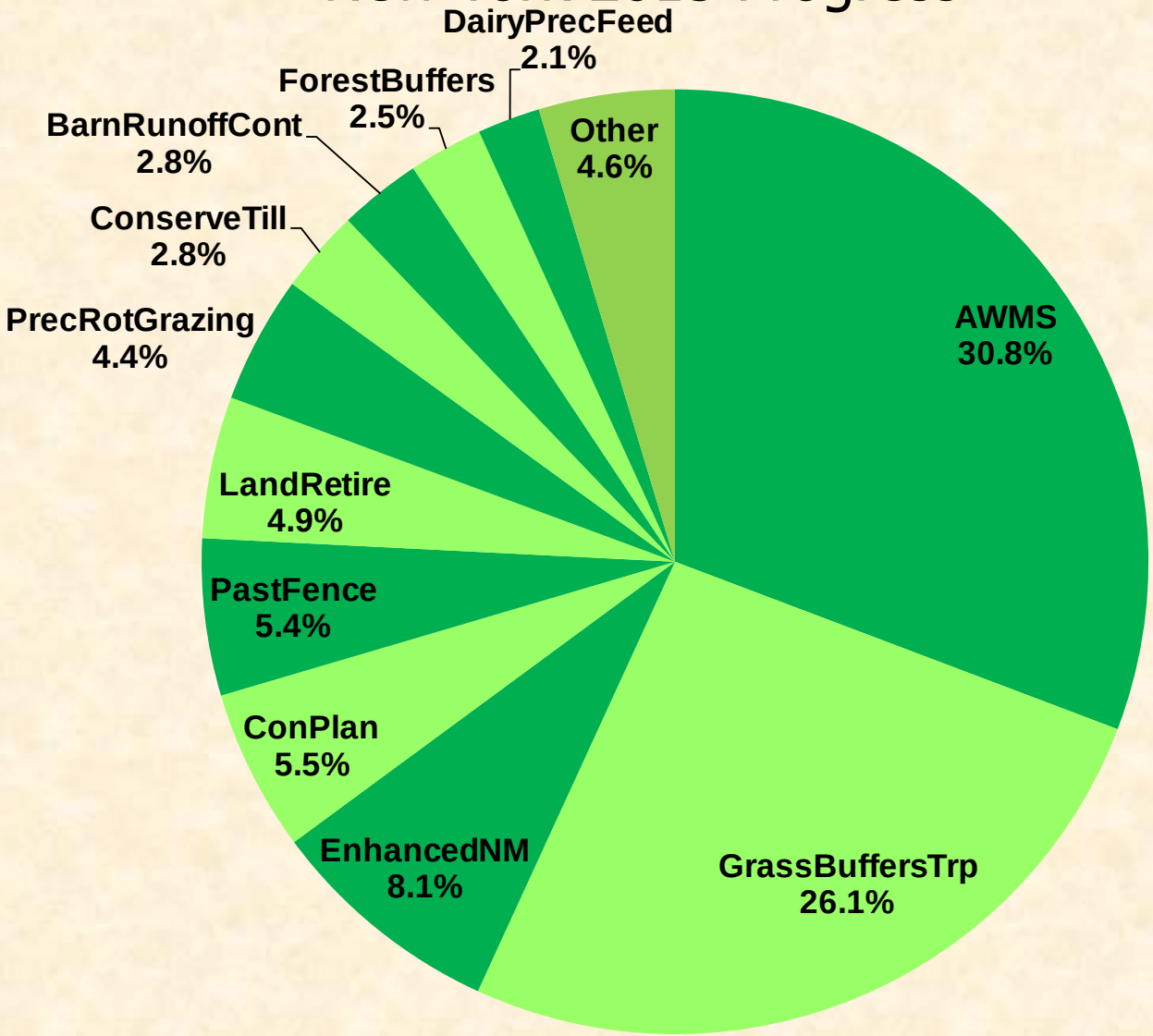
Agriculture Phosphorus Load Reduction by BMP

Delaware 2013 Progress



Agriculture Phosphorus Load Reduction by BMP

New York 2013 Progress

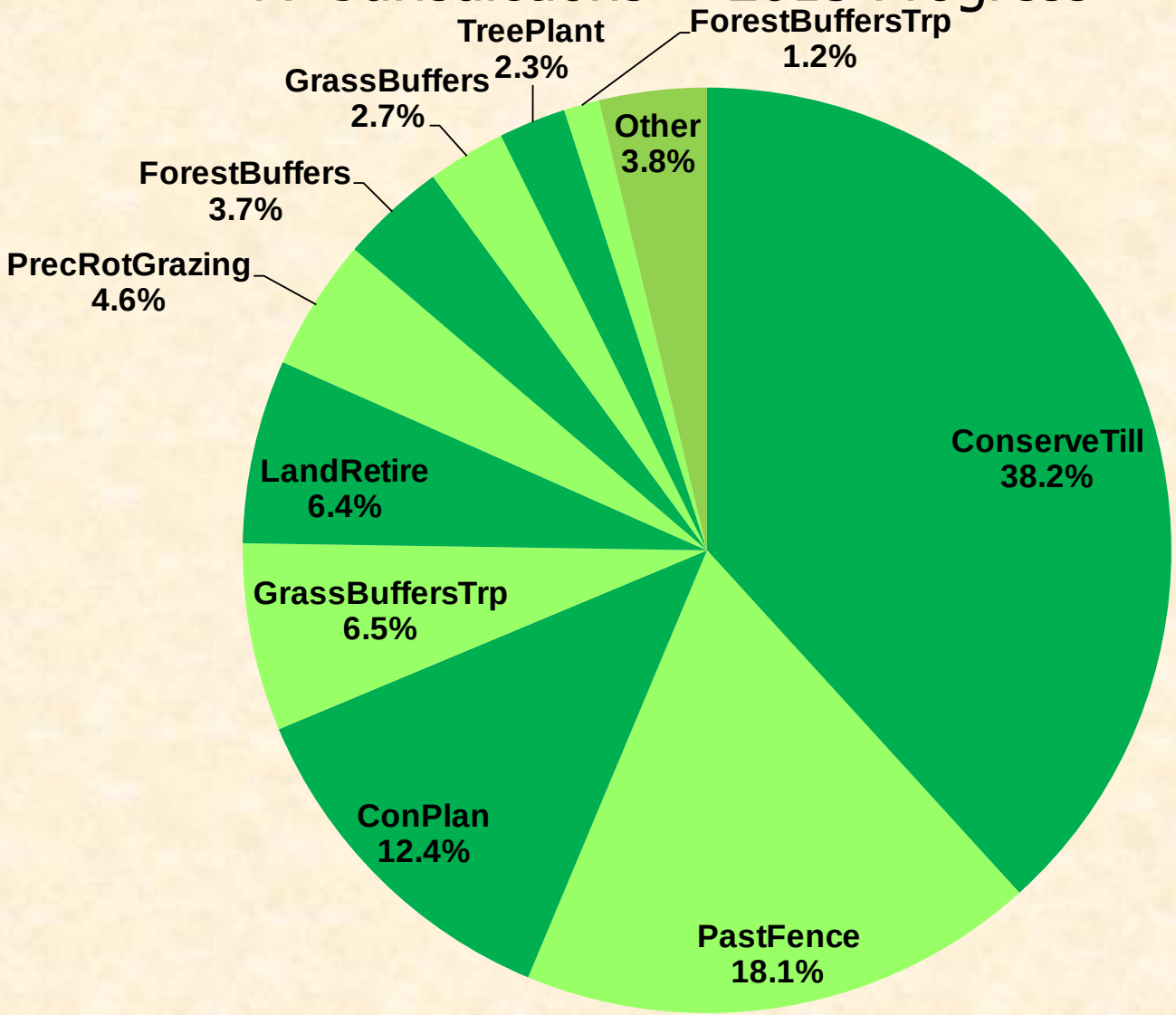


Agricultural Sediment (Total Suspended Solids) Reductions

Relative influence of 2013 Progress BMPs on load reductions

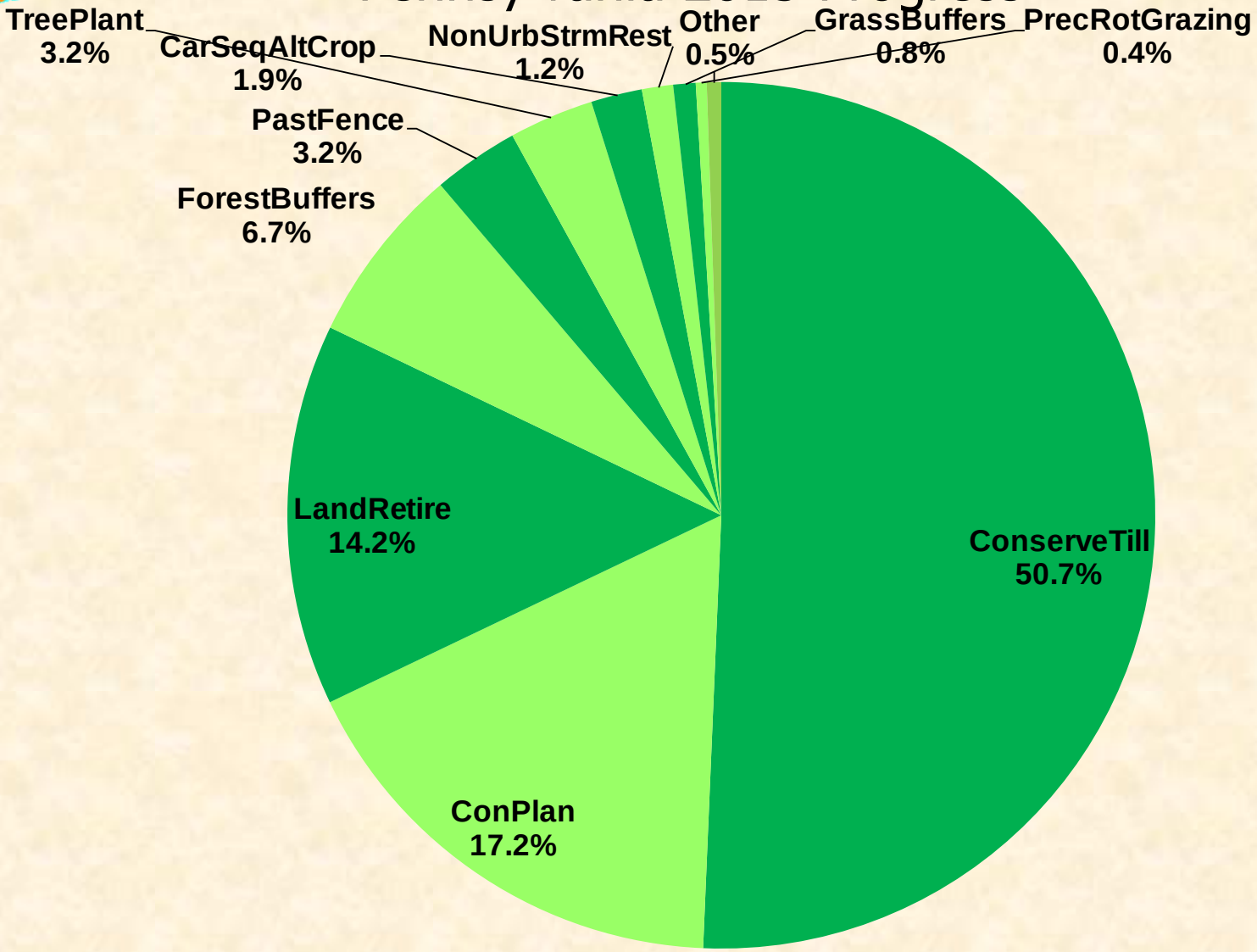
Agriculture Sediment Load Reduction by BMP

All Jurisdictions' – 2013 Progress



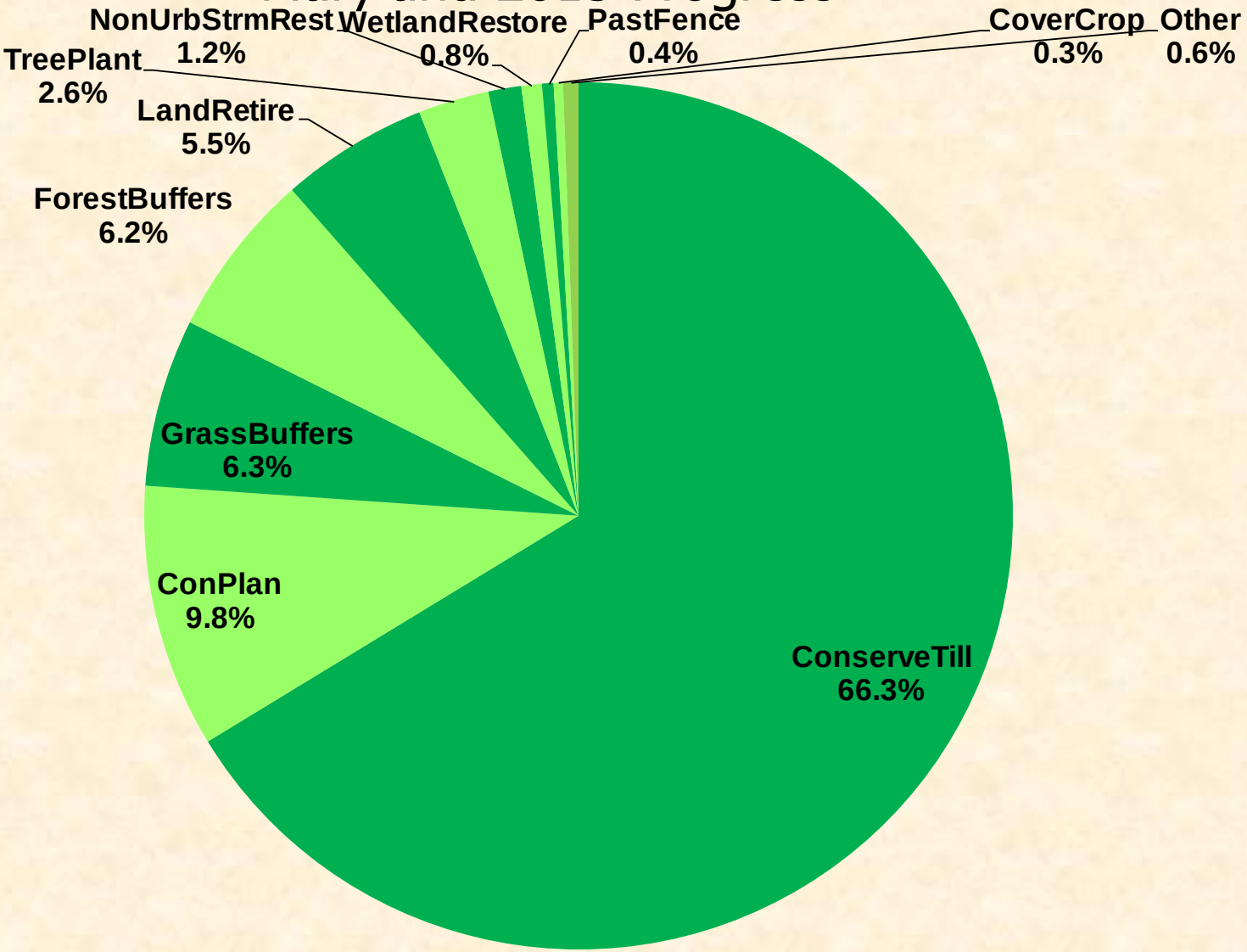
Agriculture Sediment Load Reduction by BMP

Pennsylvania 2013 Progress



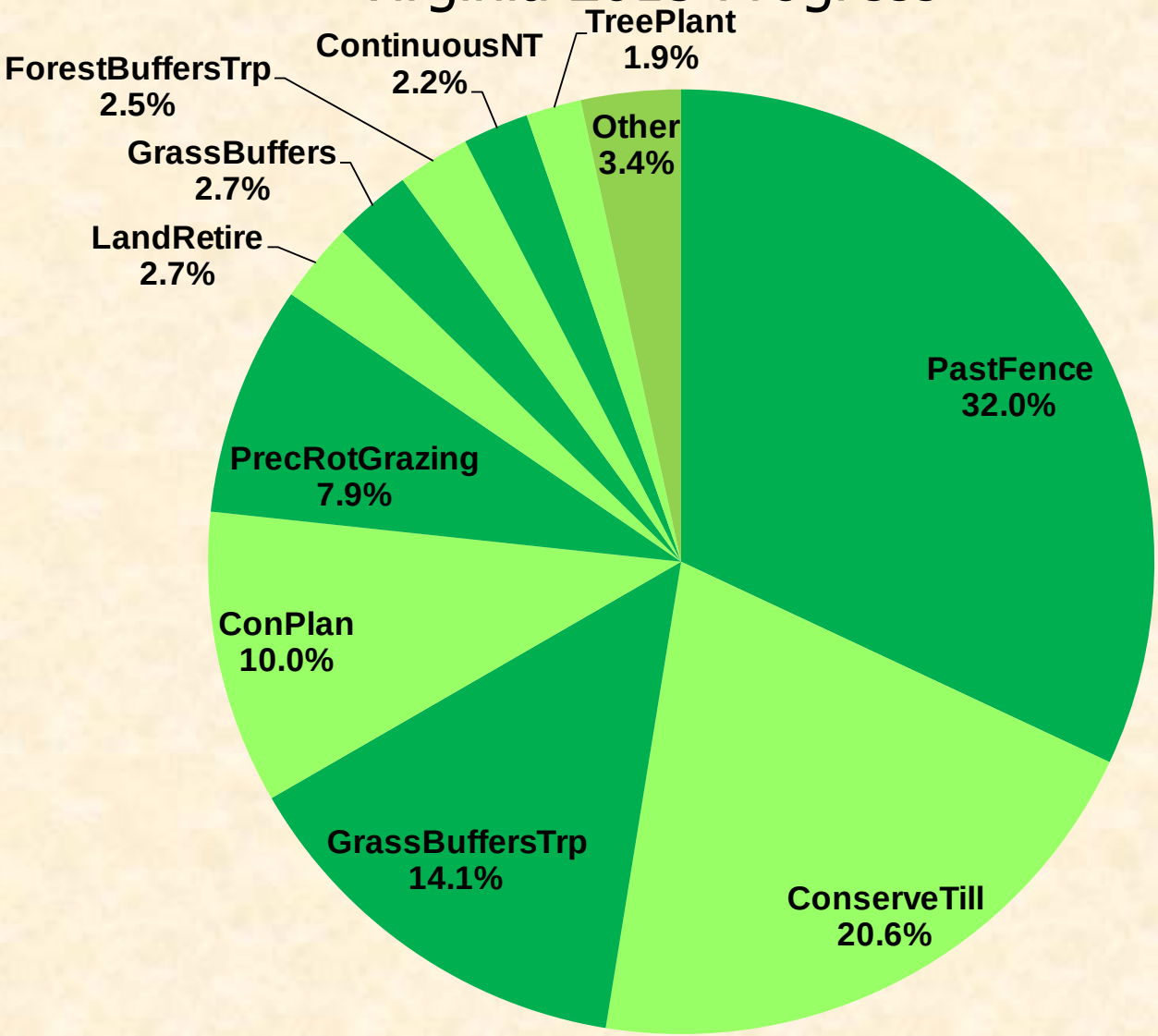
Agriculture Sediment Load Reduction by BMP

Maryland 2013 Progress



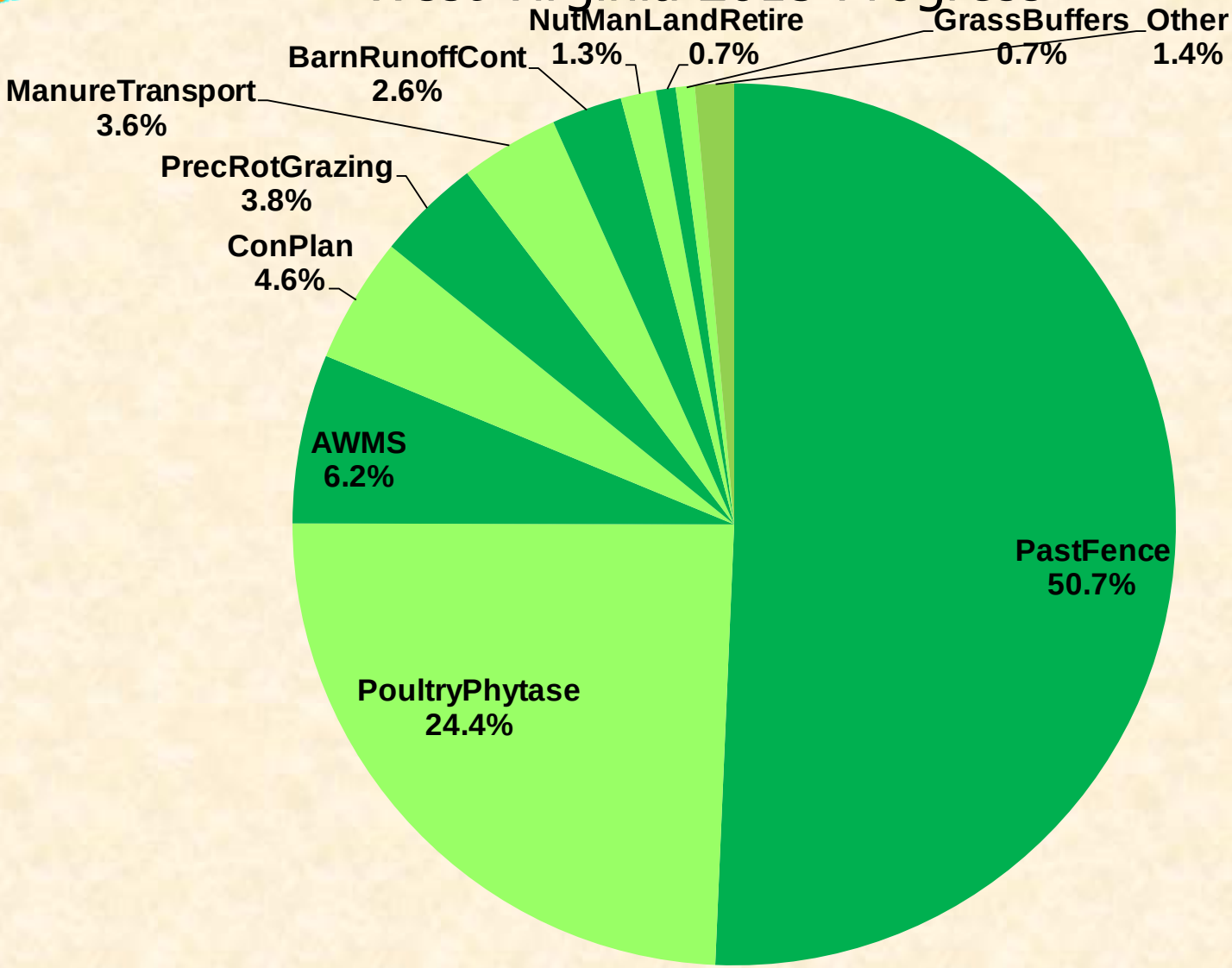
Agriculture Sediment Load Reduction by BMP

Virginia 2013 Progress



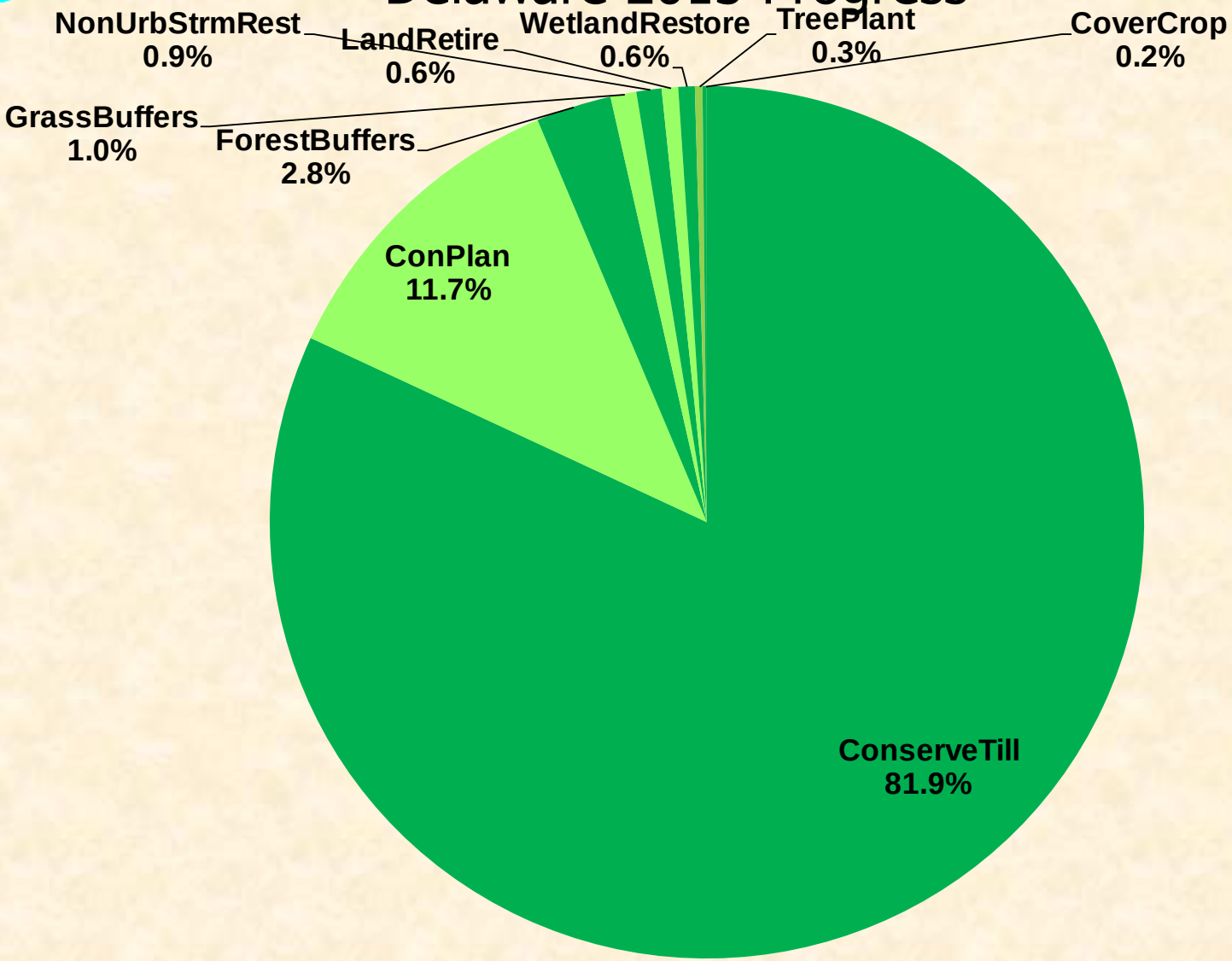
Agriculture Sediment Load Reduction by BMP

West Virginia 2013 Progress



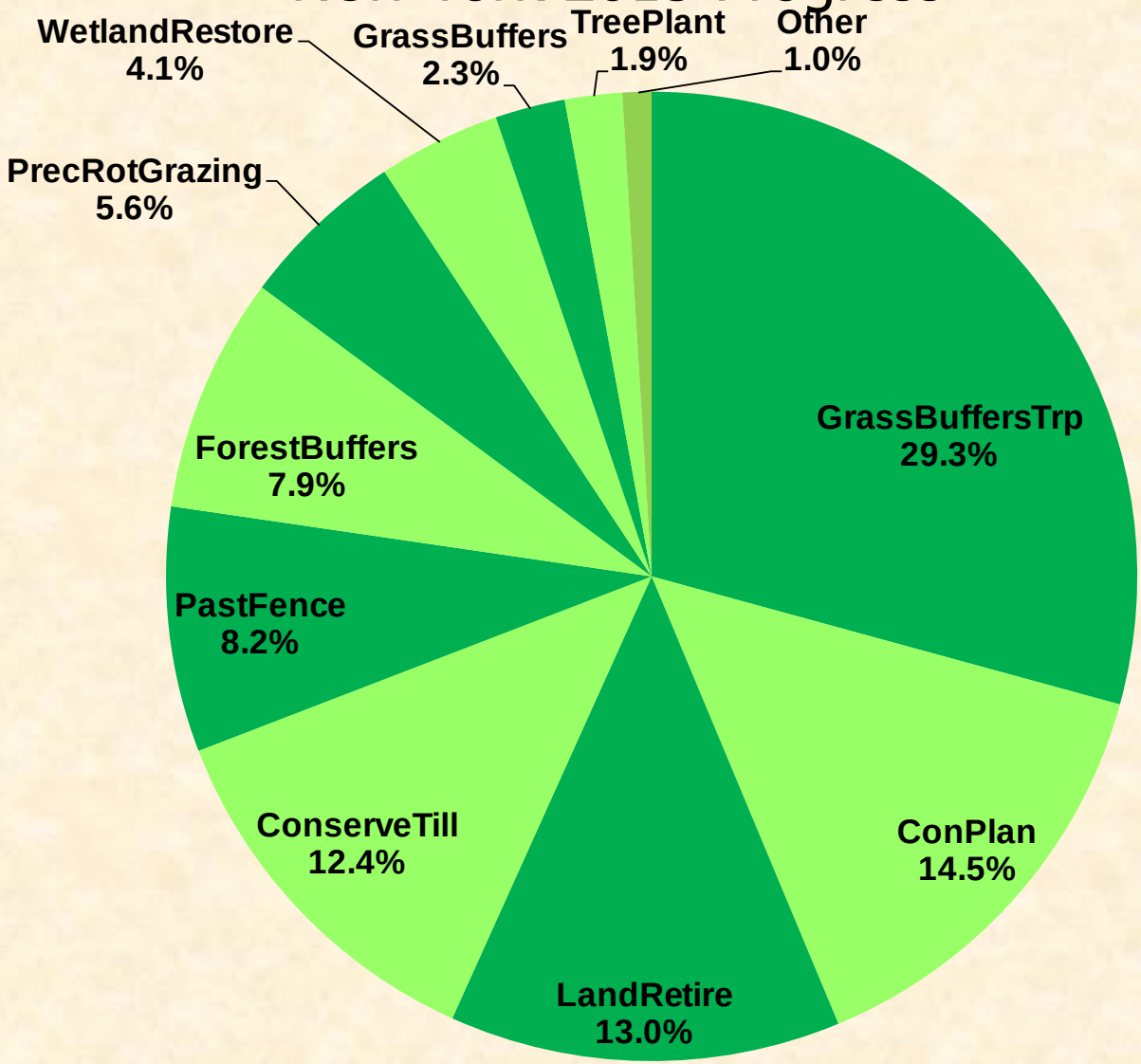
Agriculture Sediment Load Reduction by BMP

Delaware 2013 Progress



Agriculture Sediment Load Reduction by BMP

New York 2013 Progress



Forestry BMP verification guidance

This section describes guidance on how to verify the existence and performance of forestry BMPs in the Bay watershed. It has been revised to incorporate comments delivered by the Chesapeake Bay Program Partnership's BMP Verification Review Panel at their most recent meeting in April 2014. In addition, further comments submitted by June 30, 2014, from the CBP community are addressed. The organization is as follows:

I. Introduction

This guidance provides information on Forestry Best Management Practices (BMPs) and how best to verify that they have been correctly reported, installed, and maintained so they are deserving of the water quality benefits (nutrient and sediment load reductions) bestowed upon such Practices.

Forests cover the majority of the landscape in each Bay state. Protection of forested lands and restoration of trees in priority areas, such as riparian forest buffers (RFBs) along streams and shorelines, are vital for Bay watershed water quality and ecological health. The CBP Executive Council adopted an ambitious, science-based RFB goal in 2007 as part of the Forest Conservation Directive. Riparian forest buffers planted on agricultural land are one of the BMPs on which the states are most relying to achieve Bay water quality goals in their Phase II Watershed Implementation Plans. In addition to RFBs, other forestry BMPs play an increasingly important role, especially in the urban sector (see Section VI.).

Forests are not generally pollution sources. Instead, they absorb and use nutrients (greatly reducing nutrients from airborne sources, for example) and retain and use sediment, thus aiding pollution prevention. Four of the five Forestry BMPs covered by this guidance are types of tree planting designed to improve environmental and water quality conditions in currently non-forested areas, including tree planting in riparian areas. These tree planting practices apply to Agriculture and Urban landscapes. The Forest Harvesting BMPs are the only BMPs applied specifically to current Forest landscapes at this time.

Generally speaking, forest planting BMPs (riparian forest buffers and tree planting) are intended to last for a very long time. After verifying that buffer and tree planting projects have been installed and surviving according to plans, and after performing site inspection and maintenance

during the initial growth period or until considered established), forest BMPs will become easier to verify by aerial photography and inexpensive to maintain over the long term compared with other types of BMPs. Once the tree planting is established, the principal remaining concern is whether effectiveness of buffers will be undermined by concentrated flow or channelization circumventing the benefits of the buffer.

The five forestry BMPs for which verification guidance is presented are: a) agricultural riparian forest buffers; b) agricultural tree planting; c) expanded tree canopy; d) urban riparian forest buffers; and e) forest harvesting BMPs. Because of similarities in how the two agricultural BMPs are implemented, and how the urban forestry BMPs are implemented, they are grouped accordingly. This guidance is for use by the Chesapeake Bay states and, in general applies to federal installations as well, so they may use it to write Protocols for verification.

The Forestry Workgroup is mindful of the extensive resources needed to support BMP verification, and fully supports the "verification intensity" concept recommended by the CBP-VRP (2013). The intensity of verification efforts should be in direct proportion to contribution that a BMP makes to overall TMDL pollutant reduction in a state's Watershed Implementation Plan. The basic notion is to prioritize local and state verification resources on the BMPs that produce the greatest modeled load reduction in each state as reported in their annual progress runs to CBP. The converse also applies: less verification resources should be devoted to BMPs that make minor contributions to overall load reductions.

II. Role of the Forestry Workgroup in Verification

Since the late 1990s, the Forestry Workgroup has worked with Bay states to improve tracking and implementation of the oldest and most important BMP for water quality improvement: riparian forest buffers on agricultural lands. Bay watershed state forestry agencies are involved to varying degrees in inspecting newly-installed buffers and providing guidance and assistance for other forest restoration activities. When the Workgroup reviewed jurisdictions' tracking practices for all forestry BMPs in a December 2011 workshop, it saw a notable disparity in how and whether jurisdictions collected BMP implementation data. For example, regulation and oversight of forest harvesting vary considerably among states. Urban forestry BMPs (urban riparian buffers and expanded tree canopy) have only begun to be reported regularly by jurisdictions, despite having been defined Bay Program practices for over 10 years.

Seeing the disparities, the Forestry Workgroup was primed to work on BMP verification and more consistent BMP tracking in 2012. The Workgroup responded to the Water Quality Goal Implementation Team's request to develop guidance for verifying BMPs as part of the CBP's overall initiative to improve accountability of restoration practices. Multiple versions of the guidance were reviewed and discussed during Workgroup meetings in 2012 and 2013. The Expert Panels for Riparian Forest Buffers and Urban Tree Canopy provided input. In addition to BMP verification, the Forestry Workgroup tackled an even more difficult accounting issue: the extent to which agricultural riparian buffer planting has resulted in a net gain of forest buffers watershed-wide, given the loss of riparian forest to development and, in some areas, to crops. The Workgroup also looked at tools for assessing the net effect of urban tree planting.

The process was aided by interactions with the Agriculture and Stormwater Workgroups, who are keenly interested in forestry practices taking place on agricultural and urban lands. These Workgroups have agreed that the Forestry Workgroup should develop technical verification definitions and guidance for forestry practices which supplement the general verification guidance they produce. In particular, the Forestry Workgroup guidance goes beyond that guidance to focus on net gain in riparian forest buffers and tree cover.

III. Background on Forestry BMPs Implemented on Agricultural Lands

Agricultural riparian forest buffers and tree planting are most often implemented in the Chesapeake Bay watershed through the USDA and state agricultural cost-sharing programs. In fact, a single project may be funded by multiple agencies. Cost-shared project design and implementation are guided by technical standards, and there are verification programs already being implemented by the funding agencies. In some states, state forestry departments provide additional monitoring for agriculture cost-share projects involving tree planting.

Riparian forest buffers and tree planting may also be carried out voluntarily by a farmer at his own expense. To date, such projects are a small fraction of the total projects credited in the Chesapeake Bay Program, but there is a current initiative under the 2010 Chesapeake Executive Order Strategy to develop a program for recognizing and giving credit to voluntary agricultural BMPs, including forestry BMPs. The voluntary riparian buffer plantings reported to date have generally been orchestrated by large non-governmental organizations that regularly do this type of work with volunteers.

Riparian Forest Buffer Description: Agricultural riparian forest buffers are linear wooded areas along rivers, streams, and shorelines with at least 2 types of woody vegetation. Forest buffers help filter nutrients, sediments and other pollutants from runoff as well as groundwater. The recommended buffer width for agricultural riparian forest buffers is 100 feet, with acceptable widths from 35-300 feet.

Tree Planting BMP Description: Agricultural tree planting includes any tree planting on agricultural land, except those used to establish riparian buffers. Lands that are highly erodible or identified as critical resource areas are good targets for tree planting.

Current Procedures:
The vast majority of forest practices on agriculture land are cost-shared conservation practices on agricultural land that are long-term in nature (once established, the practice often continues in perpetuity needing relatively little maintenance), and originate with a Conservation Reserve Enhancement Program (CREP) or Environmental Quality Improvement Practice (EQIP) contract. Procedures for approving contracted practices are established by USDA. Often, more than one agency has oversight of these agricultural tree planting practices, including the federal USDA's Farm Services Agency (FSA) and Natural Resources Conservation Service (NRCS), state forestry, Conservation Districts, etc. For simplicity, and because roles vary from state-to-state, all those providing oversight of tree planting activities are referred to as CREP partners. For instance, FSA will keep contracts for CREP, a forestry agency will write a planting plan and

check for compliance, and a technical service providing agency may make multiple site visits and have landowner contact. Sometimes multiple databases track the same practice.

Until now, agricultural tree planting has not been a commonly-reported practice to the Bay Program. However, there are new and expanding opportunities through agroforestry to plant trees on agricultural land. Agroforestry is the intentional mixing of trees and shrubs into crop and animal production systems for environmental, economic, and social benefits, and includes practices such as windbreaks, silvopasture, and alley cropping.

Procedures on how to establish a riparian forest successfully are well-documented (for example, MD DNR 2005). It starts with a planting plan designed by a forester. Aspects of a good plan include: species selection, site preparation, and spacing of trees, among other factors. Forest buffer plantings almost always use tree shelters (e.g. 98% of the time in VA) to protect against herbivory. Shelters increase survival from 12% (no shelter) to 74% (with 4-foot shelter). Herbicide treatment is also highly recommended. Some of the trees planted are expected to perish but most must survive or be replanted to comply with contractual specifications. Repeated visits are made during establishment.

After establishment, a buffer planting may need additional maintenance to be fully functional. Adverse impacts include excessive traffic, livestock or wildlife damage, fire, pest or invasive plant infestations, and concentrated or channelized flows. The NRCS standard for this practice (Code 391) says the buffer will be inspected periodically and protected from these impacts. Maintenance is the responsibility of the landowner, and a portion of the public funding provided to the landowner is designated for maintenance expenses.

Below is the current protocol for verifying contractual agreements in CREP:

A. Verify Planting Establishment
    i. In practice, NRCS or another technical assistance partner (e.g., CREP partner) confirms proper establishment on every site at the 1 or 2-year point, and every year thereafter until the planting is determined to be established. “Established” means that the buffer meets the NRCS forest buffer practice standards and any additional state requirements (required stocking/survival rates vary by state).
    ii. If the site visit determines that the practice has not yet been established, replanting is usually required to get the buffer up to standard, and further site visits may be needed until the replanting is established. If the buffer never becomes established, it is taken out of contract.
    iii. Some states include detailed monitoring of plantings as well. Virginia CREP partners - VA Department of Forestry is the primary forestry technical expert - visit every planting site 3 times and have routine documentation about species planted, survival rate, and other issues.
B. Spot Check Plantings
    i. After the practice has been reported as established, USDA has a standard program of compliance checks on a portion of all contracts; the

requirement is for a minimum of 5% of the buffer contracts to be spot-checked each year.

ii. State agriculture conservation programs that provide a portion of CREP cost-share may have additional verification requirements, for example, VA DCR also requires spot checks on 5% of practices under contract each year throughout their lifespan.

C. Tracking

Currently, USDA data are used by most states to report accomplishments to the CBP model. These data include acres of practice, but do not currently include width of practice. Because of the CBP agreements and directives emphasizing the need for riparian forest buffer restoration, and to assure consistent, good reporting by jurisdictions, a second complimentary process was developed by the Forestry Workgroup. Since 1997, the Workgroup has been tracking buffers installed on agricultural lands. Each fall, the Workgroup requests geo-spatial data from the Bay states. The following 10 fields are requested from the state contacts and every year CBP maps the point data for analysis:

Field 1: Unique identifier (parcel ID, etc.)
Field 2: State
Field 3: Latitude
Field 4: Longitude
Field 5: Miles of forest buffer
Field 6: Width of forest buffer
Field 7: Planting date
Field 8: Ownership type (public/private: Federal, state, other public, private)
Field 9: Notes/Comments field
Field 10: Watershed name or HUC

The Forestry Workgroup's specialized tracking has been a means of cross-checking what is reported to the National Environmental Information Exchange Network (NEIEN)/Chesapeake Bay (CB) model--- it helps prevent double-counting and it establishes an average width of practice. As improvements are made to riparian forest buffer information coming through the USDA agreement with EPA and USGS, and confidence in the information improves, the Forestry Workgroup will evaluate whether to continue its complementary tracking procedures.

IV. Verification Guidance for Agricultural Riparian Buffers

1. *Verification methods for cost-shared agricultural riparian forest buffers will utilize and build upon the verification programs already implemented for cost-share contracts.*

- Continue following the current protocol for verifying contractual agreements in CREP and verifying the buffer has been installed according to plan. In the plan, it is suggested to note likely site impacts that need to be addressed with maintenance. After installation, a buffer site should be visited at least twice during the time it is becoming established to assure the buffer will meet practice standards and any problems are corrected. The minority of buffers that are cost-shared using other programs (e.g., EQIP) should follow the same protocol used for CREP buffers.

- A buffer can be credited when its installation according to plan is confirmed. When reporting the buffer for CBP credit, the reporting agency should capture width of the buffer in the NEIEN in addition to acres of practice.

2. Inspection and maintenance are critical: a) to insure riparian forest buffers become established effectively; and b) to verify that the buffer is being maintained throughout the contract and channelization is not occurring.

- After establishment is verified per contractual procedures, proceed with periodic inspections (spot checks) to see how well maintenance issues are being addressed by the landowner. Currently, a minimum of 5% of contracted practices are spot-checked. But additional spot checks are needed to ensure that impacts do not threaten the performance of the buffer.

- States should be 80% confident that water quality impacts are being avoided in the most likely places. Statistical sampling is recommended as a targeted and cost-effective means to have confidence that maintenance is happening effectively. Sampling design should focus on common and specific maintenance issues that have the most potential to impact water quality, such as channelization/concentrated flows. For instance, to protect from concentrated flows, a stratified sampling design could look at all buffer sites that are on slopes of 7% or greater –i.e., where the impact is most likely to occur.

- States should describe in detail how they plan to conduct follow-up checks that go beyond the 5% spot-checking that is the current practice.

- Plantings to be spot-checked for maintenance should be between 5 and 10 years old because this is the period between establishment and re-enrollment when the least number of inspections occur. Most maintenance issues are easily detected, and state protocols should describe typical maintenance violations that need to be checked. If statistical sampling design help is not available, states can recommend other means of spot-checking to reach an 80% confidence level.

3. Special attention is needed at the end of contract life (10 or 15 years), to determine if a new contract will ensure continuation of the buffer or if the buffer will be maintained voluntarily without a contract. In lieu of confirmation that the buffer will still be on the landscape, it will need to be removed from NEIEN after the contract expires.

- This action is recommended to encourage the conservation of existing buffers. CREP contracts expire after 10 or 15 years, and a record amount of sign-ups in 2001-2007 are due to expire in the next few years. There are three likely scenarios when a contract is ending: 1) the landowner re-enrolls the buffer into another 10 or 15-year contract; 2) the landowner does not re-enroll, but plans to keep the buffer; or 3) the landowner does not re-enroll and plans to get rid of the buffer. Actions taken now by CREP partners can lead to more landowners being in the re-enrollment category (#1), and to knowing what to expect for those lands coming out of contract (#2 or #3). To re-enroll, CREP partners must determine that the buffer still meets the practice standards (survival/stocking rate).

To facilitate the re-enrollment process (and thus retain functioning buffers), the following actions are recommended:

a. CREP partners conduct outreach/technical assistance to landowners with expiring contracts.
b. CREP partners field check buffer sites in the last 2-3 years of contract to assess whether buffers meet standards and will be continuing after contract expiration, either through re-enrollment in CREP or voluntary retention of buffer.
c. Acres of buffer that do not meet the practice standard or will not be retained should be removed from NEIEN/CB model. FSA will assign a unique identifier to each project in the future so it can be tracked better and doesn't become double-counted when re-enrollment occurs.

4. Implementation strategies should include approaches to conserve existing forest buffers so that newly planted buffers represent a net gain in overall buffers for a county or watershed segment. The following examples support this point:

a) Laws or ordinances that encourage conservation of existing buffers are in place.
b) Monitoring and maintenance occurs on both newly planted buffers and also on existing buffers.
c) Periodic sampling of total buffer area to indicate that overall riparian buffer canopy in the county or watershed segment is increasing (Part 3 below).

- CREP partners should establish a baseline for total riparian forest buffer acreage in a given county using high resolution aerial imagery to be able to determine whether there has been a loss in riparian forest cover. A number of software tools and geospatial programs are available to help with this. For example, every 5 years, the reporting agency will sample the three counties in each state that have experienced the most development or increase in agriculture (per agriculture census) to show there has not been a loss in total buffer cover—this is not information that is "entered" in the model, but a way of assuring that what is reported is a net gain. If a loss in overall riparian forest buffer coverage in these counties is detected, it would result in county-wide removal of buffers reported as a "net gain" for those years. The theory is that if a state can show that it is maintaining buffers in the counties with the most threat, then it is assumed that buffers are being protected in less critical counties.

5. *Where agricultural riparian forest buffers are being planted voluntarily and reported by farmers or non-governmental organizations, jurisdictions may give them credit for an initial four years without inspection, only if such plantings represent a small portion of the total acreage of buffer plantings reported in a given year.*

- To credit riparian forest buffers installed voluntarily by a landowner or non-governmental organization, the reporting agency must obtain information (e.g., description of the project plan and photographs) to verify that the buffer has been installed, and has the characteristics of an effective buffer (at least two tree species and a minimum width of 35 feet). In addition, credit requires the same tracking information as described for cost-shared practices.

- When voluntary riparian forest buffers account for 5% or less of a state's reported buffer acreage, initial verification does not require a site-inspection. Practices that are inspected at the 4-5 year mark can remain in the NEIEN record if the site visit shows that the buffers are established, and they are included in the spot check protocol (similar to cost-share practice) outlined in Part 2.

V. Verification Guidance for Agricultural Tree Planting

1. *Verification methods for cost-shared agricultural tree planting will utilize the verification programs already implemented for cost-share contracts.*

    - For purposes of verification, this practice will follow the BMP Verification Guidance put forth by the Agriculture Workgroup.
    - For tracking and crediting purposes, 100 trees planted equals one acre of practice (the same as for expanded urban canopy).
    - For plantings over an acre, a forester-developed planting plan is recommended.

VI. Background on Forestry Practices on Urban Lands

Bay jurisdictions have had urban forestry programs for the past ~30 years, having been established after the 1978 Cooperative Forestry Assistance Act and other means. These programs provide assistance to improve the health of urban trees including tree planting and maintenance to ultimately expand the urban tree canopy. There are multiple grant opportunities in the Bay watershed to encourage the development of urban forestry programs and urban tree canopy expansion. In many cases, grassroots urban forest programs have developed because individuals and organizations realize the many benefits (water quality being one) that urban trees bring people and because the investment by the programs in planning and maintenance of trees has been shown to pay back in multiples.

Increasing tree cover in communities is one of the most sustainable and cost-effective practices to improve both societal well-being and the environment.

Tree planting can be a cost-effective way to meet regional air quality goals and is increasingly included in air quality improvement plans as a voluntary measure. In 2007, the Chesapeake Bay Executive Council committed to having 120 communities develop urban tree canopy expansion goals by 2020. The Chesapeake Bay Agreement of 2014 will have a goal to plant 2,400 acres of urban forest by 2025. Urban forest buffer restoration is another practice that is increasing in importance: i.e., it has not been reported regularly in the past, but is expected to be a significant part of certain states WIPs.

Many localities in the watershed have had assessments done of their tree canopy and set goals to increase their urban tree canopy (Figure B-1). In recent years, the number of tools available for assessing and monitoring an urban canopy has soared, especially those using aerial imagery and software technology. In 2004, the Science and Technology Advisory Committee (STAC) held a workshop introducing these tools (STAC 2004). One leading program, the iTree suite of tools, is a free, peer-reviewed software suite from the USDA Forest Service that provides urban forestry analysis and benefits assessment tools (www.itree.com). Even more basic is the use of Google Earth® imagery to view tree canopy.

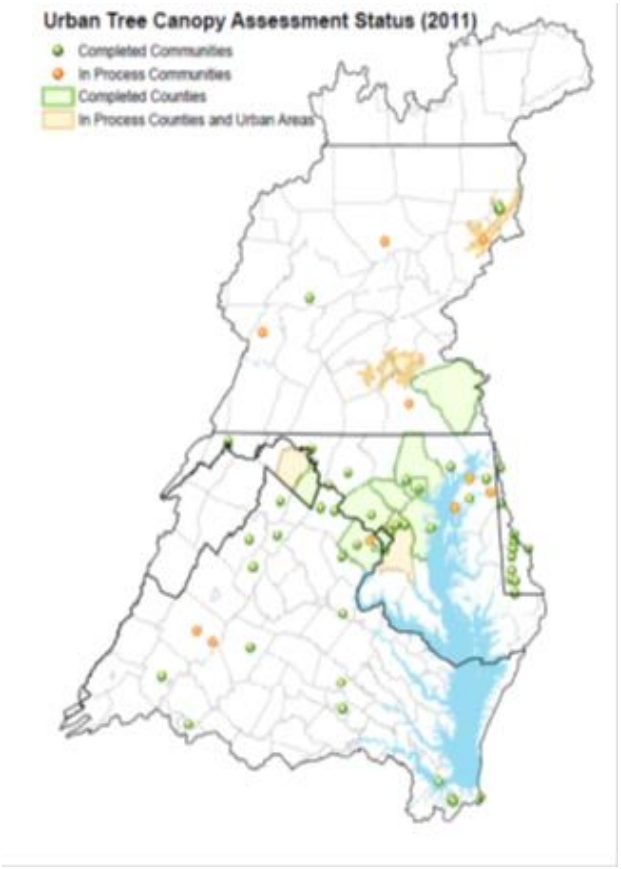


Figure B-1. Urban tree canopy assessment status (2011) in the Chesapeake watershed.

The two urban forestry practices, Expanded Tree Canopy and Urban Riparian Forest Buffers, overlap with practices covered by the BMP Verification Guidance of the Urban Stormwater Workgroup. As noted in that guidance, the practices may be implemented as part of a program to meet regulatory requirements, such as Clean Water Act MS4 permits. Tree planting has received a boost as federal, state and local stormwater requirements have strengthened provisions for maintaining and restoring natural hydrologic conditions in developed and developing areas.

Expanded Tree Canopy Description: Expanding tree canopy is the overall percent of tree cover in a geographically defined locality on developed land. Credit is applied according to the number of new acres (net gain) of tree cover, i.e., amount of canopy expansion. If trees are not planted in a contiguous area, such as for street trees, then number of trees can be converted to acres using the following conversion factor:

100 trees = 1 acre of new tree cover

All tree planting data is aggregated and submitted to the state by a locality, for further aggregation to the CB model per land-river segment.

Urban Forest Buffer Description: 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. An urban riparian forest buffer is any riparian buffer not in an agriculture or forest setting-- it is on developed land.

Current Procedures: At present, reporting of urban forestry practices by jurisdictions is not well-established, and procedures have been limited. In particular, there are questions about follow-up inspections and maintenance after initial planting. Also, there has been no means of assessing that tree planting projects are resulting in a net gain of tree cover.

VII. Verification Guidance for Expanded Tree Canopy

The Urban Stormwater Workgroup BMP verification guidance outlines a number of general principles that apply to Expanded Tree Canopy when used by a locality for stormwater management. Those that pertain to Tree Canopy include: 1) verification methods will be appropriate for the level of enforcement (e.g., consent decree or voluntary homeowner practice; 2) maintenance is essential to performance; and 3) BMP reporting must be consistent with the CBP standards.

The Forestry Workgroup adds the following forestry-specific guidance:

1. Establish urban forestry partner and support mechanisms

- For a decentralized practice, primarily on private land, a local urban forestry partner would improve confidence in tree survival/health and accuracy in tree reporting in a defined locality. An urban forest partner may be a local government entity, or a non-governmental organization with necessary expertise who works cooperatively with the locality. The partner would be endorsed by the state forestry agency, which provides oversight and support with training, tools, etc. In turn, urban forest partners can provide outreach and technical assistance on urban tree planting, tree care, and other issues that arise.

2. Urban forestry partner tracks and reports new acres of tree canopy in locality

- For new plantings, the following information should be collected: 1) acres of planting, 2) dates of planting, and 3) anticipated stature of trees at maturity (e.g. large or small). Urban tree canopy plantings can be credited once planting is confirmed. All plantings over ½ acre should be site-checked by the urban forestry partner.
- For natural regeneration acres, two similar pieces of data should be recorded: 1) acres of treatment, and 2) date started. But because of the difficulty to establish tree canopy in this way, this information should be reported for credit only after a 4-year maintenance period. Regeneration areas can be mowed, fenced or signed as deemed necessary.
- To credit new acres reported voluntarily by a landowner or other partner, the states should develop a strategy similar to approaches for some other urban practices. A 20% spot check is recommended. Protocols should indicate how much total acreage is pro-rated by survival rate, by information source, or other means of uncertainty.

3. Urban forestry partner should maintain new areas of canopy

- New urban plantings can have a high rate of mortality, succumbing to weed competition, dehydration, physical damage, or other injury. Removing competing vegetation is often necessary. A planted tree (e.g., one in a tree pit or open-planted, i.e., non-contiguous) that dies should be replaced, or removed from the NEIEN database.

- For natural regeneration areas, maintain desirable tree growth until a density of 100 trees per acre is reached and the trees are of a height where they can grow unhampered (above competing vegetation and deer browsing level of 4 feet). Area of intended tree canopy via natural regeneration should be a minimum of 1/4 acre (or adjoin to existing forest).

4. Reported practice should represent a net gain

- Every 5 years, a locality should re-assess the tree canopy in its defined boundaries to show that there has not been a decrease in overall canopy. This is important especially since tree canopy losses may occur despite good policies and practices for urban forestry. Ongoing problems for tree canopy are the expansion of invasive pests such as emerald ash borer, required tree trimming for electrical reliability standards, and natural aging of trees.
- If the tree canopy decreases, the acres of progress credited during the prior period (5 year max) should be reduced by the percentage of decrease (e.g., 50 new acres planted over 5 years, 5% decrease found, 47.5 acres remain credited).

High-resolution imagery (1 or 2 meter/pixel) is becoming more common and can help a locality discern changes in tree canopy. There are experts available to help interpret the imagery and non-expert tools such as iTree Canopy (http://itreetools.org/) and the Land Image Analyst can be used as a cost-effective means of sampling and doing a quick assessment of canopy cover.

iTree Canopy is designed to allow users to easily and accurately estimate tree cover within identified localities. This tool randomly lays points (number determined by the user) onto Google Earth imagery and the user then classifies what cover class each point falls upon. The user can define any cover classes that they like and the program will show estimation results throughout the interpretation process. The more points completed per size of the area to be sampled, the better the cover estimate. From this classification of points, a statistical estimate of the amount or percent tree

Example Canopy Assessment from iTree Canopy

To illustrate how to use iTree Canopy to estimate canopy cover, let us assume 1,000 points have been interpreted and classified within a city as either "tree" or "non-tree" as a means to ascertain the tree cover within that city, and 330 points were classified as "tree".

To calculate the percent tree cover and Standard Error (SE), let:

N = total number of sampled points (i.e., 1,000)

n = total number of points classified as tree (i.e., 330), and

p = n/N (i.e., 330/1,000 = 0.33)

q = 1 – p (i.e., 1 - 0.33 = 0.67)

$SE = \sqrt{(pq/N)}$ (i.e., $\sqrt{(0.33 \times 0.67 / 1{,}000)} = 0.0149$)

Thus in this example, tree cover in the city is estimated at 33% with a SE of 1.5%.

This process should take an average user several hours to complete and is requested once every five years.

canopy can be calculated along with an estimate of uncertainty of the estimate (standard error (SE)). A confidence interval of 95% should be reached to show no loss of canopy in the 5 year period.

5. State oversight of reporting localities

To provide accountability, state forestry agencies regularly spot-check a subset of a locality/urban forest partner BMP project files and/or 5-year assessments of net gain for accuracy and thoroughness. This may also entail site visits to tree planting sites on record. The state oversight process needs to be transparent and publicly accessible so that NGOs, watershed groups and other stakeholders can be confident that BMP implementation is real. Improvements on reporting are suggested. The state forestry agency should coordinate with the state MS4 oversight program, where local partners are implementing tree planting BMPs regulated by that program.

VIII. Verification Guidance for Urban Riparian Forest Buffers

- Partner should maintain information at local level of each new urban riparian forest buffer.
- For new plantings, data to be recorded should include: location (lat/long) and name of property, 2) acres planted (if appropriate) and width, and date(s) planted.
- For natural regeneration acres, data to be recorded should include: location, acres of treatment, width, and date started. Naturally regenerating urban buffers are reported after 4 years of establishment if there are 100 or more live native trees per acre.
- All new buffer areas will be visited by the local urban partner.

1. *Urban forestry partner maintains riparian buffer*
    - New buffer plantings can have a high rate of mortality, succumbing to weed suppression, dehydration, physical damage, or other injury. Competing vegetation should be removed.
    - Reporting localities should be 80% confident that maintenance is occurring to avoid impacts to water quality pollution reduction efficiencies. Spot checking and/or statistical sampling is recommended. The sampling design should focus on specific maintenance issues that have the biggest potential impact on water quality such as concentrated flow. See guidance for maintenance of Agricultural Riparian Forest Buffers for more direction.

2. *Reported practice represents a net gain*
    - Assessment of total urban forest buffer cover in a locality should be done every 5 years to ascertain that there is not a net loss of urban buffer. A procedure like the one described for Expanded Tree Canopy (using iTree Canopy) is recommended. For this practice, iTree Canopy data points would be located in the riparian area of a given locality. Other software may be equally useful in demonstrating there has not been a loss of buffer. If a loss of urban buffer in a locality is detected, the credits received over that 5-year period will be deducted by the same amount.

3. State oversight of reporting localities

- To provide accountability, state forestry agencies should regularly spot-check a locality/urban forest partner BMP project files on urban forest buffer establishment and/or 5-year assessments of net gain in for accuracy and thoroughness. This may also entail site visits to buffer sites on record. The state oversight process needs to be transparent and publicly accessible so that NGOs, watershed groups and other stakeholders can be confident that BMP implementation is real. An oversight report should be communicated with the locality/urban forest partner to underscore what is being done well and what needs improvement.

IX. Background on Forest Harvesting BMPs

Forest Harvest BMPs Description: Forest harvesting practices are a suite of BMPs that minimize the environmental impacts of logging, including road building and site preparation. These practices can greatly reduce the suspended sediments and other pollutants that can enter waterways as a result of timber operations. The CB model currently assumes an average of 1% of forest is harvested in any given year, unless more accurate data are supplied by the state. The modeled pollution load from forest harvesting is reduced based on the annual number of acres of forest harvesting BMPs reported.

Current procedure: All States have adopted recommended BMPs for timber harvesting and forest management activities (also called Silvicultural BMPs) that have the potential to impact water quality. These water quality BMPs have common elements although they may vary from state-to-state and their use is site dependent. For the purposes of monitoring, BMPs are grouped by area of concern such as:

- Roads and timber loading areas
- Stream crossings
- Stream Management Zones or Riparian areas
- Wetlands
- Use of chemicals

Consistent and reliable data on the use and effectiveness of forest harvest BMPs are the most important evidence of a state's compliance with the Clean Water Act during timber harvest, and extensive protocols are available for monitoring (Welsh et al. 2006, Southern Group of State Foresters 2008). Such monitoring may be part of a state's nonpoint source management program, Sec. 319 of the Clean Water Act. EPA approves state harvesting guidelines which considers forest harvest BMP compliance to be voluntary when coupled with education and monitoring (West Virginia, where BMP compliance is mandatory, is an exception).

On-site visits of harvesting operations are routinely made by state agency foresters in most parts of the Bay watershed. If the forestry agency does not receive permission to access harvest sites and is not the authorized agency, request certification from the authorized agency. BMPs are widely implemented in practice and crediting should have every opportunity to be verified and credited.

Some forest harvesting BMPs are designed to have a short life—only for the duration of the harvest operation (e.g., temporary stream crossings), while others are intended to last several years-- until the forest grows back (e.g., erosion control plantings).

Public Land vs. Private Land: In some states, forest harvesting is closely controlled and monitored on both public and private land. Other states control harvesting on public lands and can thus monitor BMP implementation there, but have no accessible record of where private forests are being harvested or what BMPs are used during those harvests. Public forests in all states are typically models in following BMPs, and many in the watershed comply with third-party certification programs such as Forest Stewardship Council to minimize impact. Only a small percentage (~4-8%) of private forest lands ascribe to third-party certification (through American Tree Farm membership or on their own).

As roughly 95% of harvesting is on private lands, it is important to apply the following verification guidelines to those lands. In some states, there is no authority for state forestry agents to access private lands after harvest. If states are not able to obtain permission to check enough randomly selected privately-owned harvesting sites, no forest harvesting BMP credit can be sought for those lands.

X. Verification Guidance for Forest Harvesting BMPs

1. *Track total acres of forest harvest BMP implementation, or rate of implementation, on private land, and conduct site visits after harvest to ensure proper installation. There are several options for tracking BMP implementation:*
    - State forestry agency documents that the project sites were visited and evaluated for forest harvest BMP establishment within 6 months of site preparation (or long enough to see results) and submits actual acres to NEIEN annually.

OR

    - State forestry agency determines average rate of BMP implementation by on-site sampling (spot-checking) private land harvest sites within 6 months of harvest activity. A rate of implementation is determined and can be used for up to 5 years. Derived, assumed, or anecdotal information on implementation is insufficient. A good source of information on designing a statistically valid sampling procedure for implementation monitoring and analyzing the results can be found in *"Sampling and Estimating Compliance with BMPs*" produced by the Southern Group of State Foresters.

OR

    - State forestry agency will determine an average rate of implementation by conducting a review of forest harvest records every 5 years. If using a sampling regime to determine rate of BMP implementation, use a confidence level of 80% (+/-5%).
        - Forestry staff or Cooperative Extension Offices can assess the overall rate of BMP implementation by using data collected from local forest district offices or county environmental protection offices. Harvest plan reviews and harvest permits are examples. BMP implementation rates can be credited after the first such review has been completed.

- To complement a review of forest harvesting records, it is also recommended to interview local timber operators and forestry field staff to document consistency of practice implementation. Photographs of BMPs and some site visits are highly encouraged to further complement the analysis of harvest records.

2. *States should describe their existing and planned inspection programs for Forest Harvest BMPs in Verification Protocols.*

3. *Monitor use of forest harvest BMPs for Process Improvement*
   Assessing forest harvesting BMP implementation and function, and looking at specific categories of BMP practices, will address issues such as training needs for forestry personnel and forestry practitioners. It can also provide insights about whether BMPs themselves are adequate or need improvement. States should describe how they plan to analyze their verification of forest harvest BMPs—e.g., how inspections and data records could more accurately capture what is happening with forest harvest BMP's during the most vulnerable periods (i.e., during a storm event soon after harvest).

Urban Stormwater Verification Guidance

Version: Final, July 16, 2014

This section describes guidance on how to verify the performance of urban BMPs in the Bay watershed, and is organized into eight parts:

1. The Need for BMP Verification and the Chesapeake Bay Program partners' Process to Define it.
2. Key Verification Definitions
3. Background on Urban BMP Verification
4. Verification Guidance for BMPs Located in MS4 areas
5. Verification Guidance for BMPs Located in non-MS4 areas
6. Verification Guidance for Non-Regulatory BMPs
7. Verification Guidance for Legacy BMPs
8. Process for Developing Urban BMP Verification Protocols

The guidance has been revised to incorporate comments provided by the Chesapeake Bay Program partners' BMP Verification Review Panel (CBP-VRP, 2013) and feedback submitted on the May 2014 draft BMP Verification Framework.

Part 1: The Need for Verification and the Chesapeake Bay Program partners' Process to Define it

At the request of the Water Quality Goal Implementation Team (WQGIT), the Urban Stormwater Workgroup (USWG) devoted much of 2012 and 2013 to developing guidance on urban BMP verification. Eight drafts of this guidance were made in response to verbal and written comments by local and state Chesapeake Bay Program partners. In addition, recommendations for BMP reporting, tracking and verification were an integral element of the deliberations of four urban BMP expert panels:

- Stormwater Retrofits
- New State Stormwater Performance Standards
- Urban Nutrient Management
- Stream Restoration

This section represents a synthesis of the consensus reached by the Workgroup on urban sector verification issues.

Part 2: Key Definitions for Urban BMP Verification

The following terms are defined to clarify the issues related to urban BMP verification.

Urban BMPs: In this context, they are defined as stormwater practices for which definitions and removal rates have been developed and approved through the Bay Program BMP review protocol (WQGIT, 2010). These urban BMPs fall into four broad categories:

1. *Traditional stormwater BMPs* that were historically installed through a local stormwater plan review process in response to state stormwater requirements (primarily stormwater treatment (ST) practices as defined by SPSEP, 2012).

2. *New runoff reduction BMPs* that will be implemented in the future to meet new state stormwater performance standards that typically go through a local stormwater review process (primarily runoff reduction (RR) practices as defined by SPSEP, 2012).

3. *Non-structural or operational BMPs* that are typically applied by a municipal agency (e.g., street sweeping, urban nutrient management, illicit discharge elimination).

4. *Restoration BMPs* installed by localities to treat existing impervious cover (e.g., stormwater retrofits and stream restoration).

Regulated BMPs: Refers to any BMP that is installed in a jurisdiction that has a Phase 1 or 2 Municipal Separate Storm Sewer System (MS4) permit. These permits establish a requirement that a locality have a BMP maintenance program and the capacity to inspect all of their BMPs within a portion or all of each permit cycle (typically 5 years). As can be seen in Figure B-2, however, only a portion of the developed/developing land in the Bay watershed occurs within communities that are regulated under MS4 permits.

Semi-Regulated BMPs: Refers to any BMP that is installed locally under a state construction general permit (CGP) outside of a MS4 community. While the permit applicant must sign an agreement that they will maintain the BMP, the locality is not required to have an inspection program to enforce maintenance, and the state may not have sufficient staff resources to do so on their behalf.

National Environmental Information Exchange Network (NEIEN): In the context of the Chesapeake Bay partnership, a state-federal data sharing partnership to share, integrate and submit BMP data to get credit for pollutant reduction in Scenario Builder. The BMP data is then credited in the Chesapeake Bay Watershed Model to track progress made in overall load reduction within each state. Some of the requirements for submitting BMP data into NEIEN include the geographic location of each individual BMP, as well as the year it was installed and other BMP-specific data to ensure proper tracking and verification.

Non-regulated BMPs: Refers to any BMP that is voluntarily installed in a community that was not triggered by an explicit MS4 requirement or stormwater regulation. Examples might include rain gardens built by homeowners or demonstration BMPs constructed through grants.

Legacy BMPs: Refers to the population of urban BMPs in a community that the state has reported to EPA for inclusion into any past version of the CBWM for sediment or nutrient reduction credit. Legacy BMPs fall into three categories:

- *Actual BMPs with a geographic address*

- *Actual BMPs that lack a specific geographic address*

- *Estimated BMPs* that were projected based on some assumed level of development activity and compliance with state stormwater regulations.

Discovered BMPs: Refers to any BMP that was installed in the past but was never reported to the state or Bay Program, and has not received any prior nutrient removal credit. These often include older BMPs installed prior to the establishment of state BMP reporting systems.

Part 3: Background on Verification of Urban Stormwater BMPs

As part of the development review process, localities in the Chesapeake Bay watershed typically conduct a post-construction inspection of stormwater BMPs to ensure that they are functional, maintain project engineering files and then periodically inspect them to ensure they are still working.

Phase 1 and Phase 2 communities have NPDES MS4 permit conditions which require them to have programs and staff in place to ensure that maintenance inspections are done according to a prescribed cycle. The frequency of maintenance inspections ranges from 3 to 5 years, depending on the permit status of the jurisdiction.

In addition, most MS4 communities have an annual BMP reporting requirement, and often provide aggregate information to the state on the number and type of BMPs that are installed during the reporting period.

Existing local and state procedures to review, inspect and verify many urban BMPs have existed for many years. Some of their common elements are outlined in Table B-9. With some minor adaptations (primarily in the area of reporting and ongoing performance inspection), these existing procedures provide a strong foundation for a reliable BMP reporting, tracking and verification system in the watershed.

Table B-9: Existing Review and Inspection Procedures for Select Urban BMPs *

Urban BMP Type	*Key Procedures*
Stormwater BMPs for New Development or Redevelopment	Detailed engineering review, geotechnical feasibility tests, performance bond, multiple inspections during BMP construction, final inspection to accept the facility, preparation of "as-built" drawing, release of performance bond, prescribed maintenance agreement, creation and maintenance of local BMP file, local reporting to state stormwater authority, routine owner maintenance, periodic regulatory inspections
Erosion & Sediment Control BMPs	Site analysis, detailed engineering review of ESC plan, pre-construction meeting, weekly self-inspection by contractor, routine regulatory inspections (weekly to monthly), final inspection, release of ESC performance bond.
Stream Restoration	Stream reach data collection and analysis, detailed engineering review, state and federal environmental permit review, multiple environmental and engineering inspections during project construction, final inspection and preparation of as-built drawings, post-construction project monitoring, ongoing project maintenance.
Stormwater Retrofits	Generally the same as for new stormwater BMPs, but the inspection and maintenance requirements may be vested with the property owner or the governmental jurisdiction that is financing the retrofit

* the exact procedures will differ somewhat from locality to locality and from state to state, depending on their land development ordinance and review procedures, and state permit and regulatory requirements.

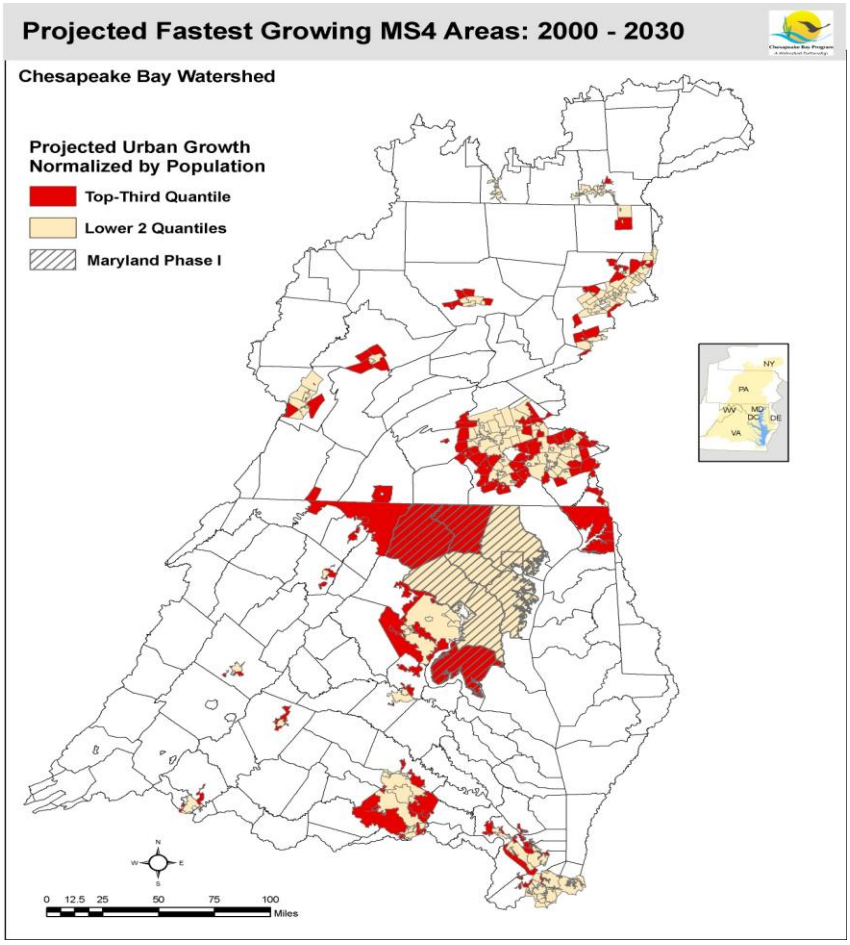


Figure B-2: Distribution of MS4 Communities in the Bay Watershed
Source: Claggett, 2010

Several challenges still need to be addressed to develop an effective verification system for the Bay watershed.

- Larger MS4 communities have an existing urban BMP inventory that numbers in the thousands, with hundreds more being added each year.

- Some Ms4s do not currently report all of the individual BMP information needed by the state to prepare the input deck for the Chesapeake Bay Watershed Model (CBWM), such as Chesapeake Bay Program (CBP) BMP classification, drainage area served, geographic location and year of installation.

- Very few localities have yet digitized their individual BMP files and integrated them within a spreadsheet and/or GIS system.

- In the absence of good geo-spatial data, the prospect for double counting of BMPs is significant, particularly when multiple BMPs of different ages are located within same drainage area. In other cases, BMPs that have failed or don't really meet the CBP BMP definition are counted when they should not be.

- Most non-MS4 localities have little experience in reporting BMP implementation data for new or existing development (e.g., retrofits). These communities are classified as being semi-regulated, in that they have limited authority to inspect or enforce maintenance on private land.

- Several urban BMPs are routinely implemented outside the MS4 permit or local/state/federal stormwater review process, and therefore may not be properly counted or reported (e.g., street sweeping, reforestation, urban nutrient management, tree planting and stream restoration). Localities may need to internally coordinate with multiple agencies and/or departments to accurately report this BMP data.

- Most localities do not currently report on voluntary BMPs that are installed by homeowners or watershed groups, even if they provide them financial or other incentives to do so.

- Most Bay watershed states are just now developing BMP reporting systems to track the BMPs installed by individual localities and federal facilities, and several have not been able to keep up with BMP information submitted by 70 to 400 MS4s in their jurisdiction.

- Up to now, few states have allocated sufficient staff resources to fully enforce MS4 permit maintenance conditions, verify that local BMP information is accurate, and cull out BMPs from the CBWM input deck that are no longer achieving their intended nutrient or sediment removal rate.

- Some urban BMPs are installed in non-regulated areas in the watershed (i.e., not covered by MS4 permits). Consequently some of these communities may not yet have in place all of the legally required BMP inspection and maintenance provisions found in MS4 communities. As a consequence, BMP reporting and verification may be challenging in non-MS4 communities, particularly in smaller communities with limited staff resources.

- Perhaps the greatest weakness of the current system is that current post construction and maintenance inspection efforts are not oriented toward verifying the actual pollutant removal performance of the BMP in the field. Instead, local inspections primarily focus on whether a BMP was installed per design, and that its future condition will not cause harm to public safety and/or cause nuisance problems in the community. Consequently, it will be necessary to develop improved inspection guidelines that utilize visual indicators to verify that the hydrologic performance of the BMP is adequate to still achieve the intended nutrient and sediment removal rate.

- The past assumption is that nearly all structural urban BMPs are permanent in nature. This means that a twenty year old wet pond keeps on performing in perpetuity, with no discount for their age, diminished capacity and lack of maintenance.

Part 4: Guidance for Verifying Regulated BMPs (e.g., MS4s)

The following guidance is offered on 18 aspects of the urban BMP verification process for MS4s in each of the Bay watershed states:

1. *Verification methods will differ depending on the class of urban BMPs (traditional, runoff reduction, operational, and restoration)*. Historically, the Bay Program partners have approved nearly 20 different BMPs in the urban sector, and new expert panels are adding more every year. Consequently, specific verification protocols need to be crafted to address each class of BMPs.

2. *Key Role of Maintenance in BMP Performance*. Regular inspections and maintenance of BMPs are critical to ensure their pollutant removal performance is maintained and extended over time, as well as maintain other local design objectives (e.g., flood control, public safety, stream protection and landscape amenity). Therefore, a core verification principle is to ensure that BMPs are installed and maintained properly over their design life to qualify for their pollutant removal rates. To ensure this, verification protocols are needed to define (1) the cycle for field verification of BMPs and (2) the process for BMP downgrades if maintenance is not performed.

These protocols also need to reflect the recent shift to Low Impact Development (LID) practices in the Bay states, which has fundamentally changed how BMPs are maintained. LID practices require more frequent but less intense maintenance activity, as well as routine inspections to ensure they perform properly over time (CSN, 2013).

3. *Utilize Existing MS4 Framework.* The existing MS4 inspection and maintenance framework should be the foundation of any BMP verification system for the Bay TMDL. Ongoing BMP reporting and maintenance inspections requirements in MS4 permits may need to be adjusted slightly to verify BMP performance, but the modifications should be limited to reduce the administrative burden for local and state agencies, as well as federal facilities.

4. *Removal Rate Tied to Visual Inspections*. The basic concept is that urban BMPs will have a defined time-frame in which the pollutant removal rate applies, which can be renewed or extended based on a visual inspection that confirms that the BMP still exists, is adequately maintained and is operating as designed. An example of how BMP verification can be integrated with ongoing MS4 BMP inspections is shown Figure B-3.

A rapid inspection is conducted to quickly assess urban BMP performance in the field using simple visual indicators. This approach was refined and tested through an extensive analysis of BMPs located in the James River basin of the Chesapeake Bay watershed. More detail on the methods and results can be found in CWP, 2009. The basic form can be modified or adapted to meet the unique BMP terminology and design criteria employed in each Bay watershed jurisdiction. CSN (2013) has also developed a broader visual indicator framework to assess BMP performance.

5. *Verification to Enhance the Pollutant Removal Performance of Existing and Future Local Stormwater Infrastructure Assets*. Field assessments are used to identify which BMPs are working well and which ones require preventative or corrective maintenance to maintain their function. In addition, field verification enables local governments to analyze their historical inventory of private and public stormwater BMPs to identify which individual projects present the best opportunities for additional nutrient reduction through retrofits or restoration.

6. *Applying BMP Data to Inform Adaptive Management.* Real world data collected on actual BMP performance also enables local and state agencies to improve the next generation of BMPs in an adaptive management process (Williams and Brown, 2012). This process can isolate the specific site conditions, design features and maintenance tasks that improve BMP longevity and performance, which can then be incorporated into better design specifications and maintenance practices. Future BMP expert panels could review such data to determine if these improved BMPs would qualify for a higher removal rate.

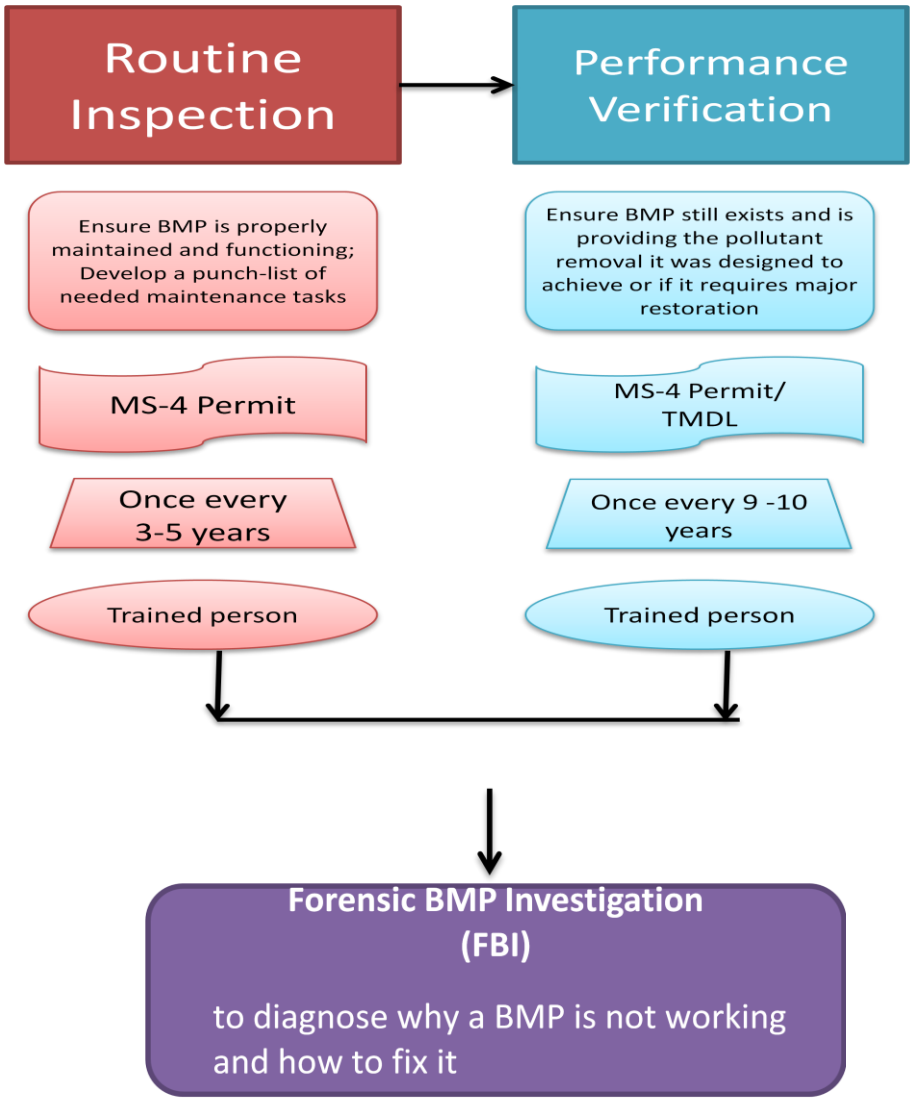


Figure B-3: Relationship of Routine MS4 BMP Inspections to Verification Inspections

7. *BMP Reporting Must Be Consistent with Bay Program Standards.* Each state has a unique system to report BMPs as part of their MS4 permit. In some cases, states are still developing and refining their BMP reporting systems. Consequently, it may not be possible or even desirable to implement a Bay-wide BMP reporting format. However, to get credit in the context of CBWM progress runs, states will need to report BMP

implementation data using Bay Program-approved rates or methods, reporting units and geographic location (generally consistent with NEIEN standards), and periodically update data based on local field verification of BMPs.

8. *More flexible NEIEN reporting standards are needed for certain classes of urban BMPs.* Several operational BMPs, such as street sweeping, urban nutrient management plans, enhanced erosion and sediment control, inappropriate discharge elimination, do not lend themselves well to the specific geographic requirements of NEIEN. In addition, some non-regulated urban BMPs, such as homeowner practices, are so small but potentially so numerous that it is neither practical or useful to give them a specific individual geographic address in NEIEN.

In these situations, it is recommended that only aggregate BMP data be reported for the county/river basin segment in which it occurs. Local governments that report the data are still required to retain specific geographic data records individual practices in order to track and verify them over time.

9. *Initial Verification of BMP Installation*. MS4s and federal facilities will need to verify that urban BMPs are installed properly, meets or exceeds the design standards for its Bay Program BMP classification, and function in the hydrologic manner they were designed for prior to submitting the BMP for credit in the state tracking database. This initial verification is provided either by the BMP designer or the local inspector as a condition of project acceptance, as part of the normal local stormwater BMP plan review process. The BMP data may need to be validated by spot-checks before it is reported to the state. In addition, MS4 communities should outline their BMP review and inspection procedures and staffing in their required MS4 annual reports.

10. *Recommended Cycle for Field Verification of Urban BMPs.* Local inspectors should perform field performance verification for all of their BMPs at least once every other MS4 permit cycle (typically a permit cycle is 5 years). It is recommended that these rapid investigations of visual indicators be integrated into the routine stormwater BMP inspections already required under MS4 permits.

11. *Suggested Process for BMP Downgrades*. If a field inspection indicates that a BMP is not performing to its original design, localities and/or federal facilities would have a defined time frame (e.g., one year) to take corrective maintenance or rehabilitation actions to bring it back into compliance. If a facility is not fixed during the defined timeframe, the pollutant reduction rate for the BMP would be eliminated, and the locality would report this to the state in its annual MS4 report. If corrective maintenance actions were verified for the BMP at a later date, the MS4 could take credit for it then.

12. *Special Procedures for Urban BMPs Used for Offsets, Mitigation and Trading*. Some urban BMPs are built to offset, compensate or otherwise mitigate for impacts caused by development elsewhere in the watershed. Examples include stream restoration mitigation and stormwater retrofit offsets when full compliance with stormwater performance standards is not possible at a new development site.

In other cases, urban BMPs may be built for purposes of trading nutrient credits within a community or a state. Special procedures need to be developed in both cases to prevent double counting of BMPs. In addition, states and localities may elect to require more frequent BMP field inspection for these types of projects to assure they are meeting their intended nutrient reduction objectives.

13. *The Intensity of Verification Efforts Should be in Direct Proportion to Contribution that a BMP makes to overall TMDL Pollutant Reduction in a State's Urban Source Sector.* The workgroup was mindful of the extensive resources needed to support BMP verification, and fully supports the "verification intensity" concept recommended by the CBP-VRP (2013). The basic notion is to prioritize local and state verification resources on the BMPs that produce the greatest load reduction for each state's urban source sector, as reported in their progress runs over time.

This also implies that less verification resources be devoted to BMPs that make only minor overall load reductions, although any BMP should still meet certain minimum criteria for initial inspection and reporting. Operationally, the workgroup defines "minor BMPs" as those that collectively contribute less than 1% to the overall total urban source sector nutrient reduction in the most recent progress run year submitted to the Bay Program.

14. *State Oversight of Local BMP Reporting*. To provide accountability, Bay watershed states should spot-check a subset of local and federal facility BMP project files to validate the reported BMP data. This may entail an analysis of local maintenance inspection records, or joint field BMP inspections to verify performance under their existing MS4 regulatory authority. The state oversight process needs to be transparent and publicly accessible so that NGOs, watershed groups and other stakeholders can be confident that BMP implementation is real.

15. *EPA Review of State Verification Oversight*. EPA Regions 2 and 3, under their existing NPDES MS4 permit oversight role, should periodically review the implementation of state BMP verification protocols to ensure they are being effectively implemented.

16. *Review and Verification of Bay Program partners' BMP Accounting*: The accounting methods and verification procedures used by the Chesapeake Bay Program Office must be clear and transparent so that local governments and the states can readily understand how the urban BMPs they report are being used to calculate pollutant reductions in the Bay Program partners' Chesapeake Bay Watershed Model. Better communication among the Chesapeake Bay Program Office and its state and local government partners will help to improve BMP reporting and ensure a fair representation of State and local program implementation.

17. More Tools and Technology are Needed to Streamline the BMP Verification Process. Actual implementation of the BMP performance verification protocols will require considerable investment in tools and technologies by federal, state and local partners. Some major needs include:

- Development of visual indicators to rapidly assess BMP performance in the field
- Training and certification programs for the "verifiers" that go out in the field

- GIS/website platforms to upload BMP data to local and state databases
- Quality control checks to validate the uploaded data

18. Urban BMP Definitions Preclude the Need for "Functional Equivalency". The policy of the USWG has been to develop Bay-wide urban BMP definitions that can be easily interpreted in the context of each individual Bay state's stormwater design manual and regulations (i.e., sizing and design specifications for individual urban BMPs). Each Expert Panel has developed detailed protocols to estimate removal rates for individual practices based on common design and sizing elements for that class of BMP (see SPSEP, 2012 and SREP, 2012). The BMP design specification in each Bay state are very prescriptive as to the minimum sizing and design criteria that each urban BMP must meet in order to receive permit approval. Consequently, the issue of "functional equivalency" among BMPs, as defined by the agricultural sector in the Chesapeake Bay, does not apply to the urban sector.

Part 5: Guidance for Verification for Semi-Regulated BMPs

The Workgroup created several options to address verification for semi-regulated BMPs (see definition in Part 2). These BMPs are typically installed locally under a state construction general permit (CGP) outside of a MS4 community. Some of these semi-regulated communities are not required to have an inspection program to enforce maintenance, or rely on the state to do it on their behalf (who in turn, may currently lack inspection/enforcement resources). In general, states should focus verification accountability efforts in the fastest growing semi-regulated communities, since they will produce the greatest number of BMPs reported.

The following options are recommended in these situations:

Option 1: Local/state agency or federal facility follows the verification inspection process outlined in Part 4 and gets the same credit as a MS4 community.

Option 2: Local or third party performs verification inspections on a sub-sample of their BMP inventory at least once during the prescribed credit duration of the BMP. Non-MS4 communities may elect to reduce the scope of their visual inspections by sub-sampling a representative fraction of their local BMPs and applying the results to their entire population of BMPs that are credited in the CBWM. The sub-sampling method must be designed to have at least an 80% confidence level that the BMPs are reported accurately. There are several well accepted approaches to determining the sample size. These include using a census for a small population of BMPs, imitating a sample size of similar studies, using published tables, and/or applying formulas to calculate a sample size.

Option 3: State or third party conducts a sub-sample to verify BMPs reported within several non-MS4 communities, and applies the results to reported BMP data in other comparable non-Ms4s in their portion of the Chesapeake Bay watershed.

If a local government or federal facility fails to perform verification inspections, it will receive a gradual downgrade in BMP performance over time. Full performance credit will be given for the first five years, followed by a 20% downgrade each year over the next five years, such that entire BMP credits expires after ten years. Hopefully, smaller communities will develop effective verification programs over the next decade to prevent the downgrades from occurring.

Given the importance of BMP verification, states may wish to allocate some of their Chesapeake Bay Regulatory and Accountability Program (CBRAP) grants to support BMP targeting and verification efforts in targeted non-MS4 communities.

Part 6: Guidance for Verifying Non-Regulatory BMPs

Non-regulatory refers to any BMP that is voluntarily installed in a community (i.e., not triggered by a MS4 permit requirement or stormwater management regulation). The most common examples are homeowner BMPs that are installed on private land (e.g., rain gardens, permeable pavers, downspout disconnection, etc.). To promote greater engagement by land owners in Bay restoration, the work group developed streamlined verification procedures for this class of non-regulatory BMPs (USWG, 2013) which is considered a minor source of state-wide urban sector nutrient reductions, as defined by the CBP-VRP (2013).

The basic premise is to simplify the homeowner BMP reporting process while still retaining a high degree of verification rigor, using the following measures:

- Allow localities to aggregate individual homeowner BMP data into a single practice at the county level, which is then reported to the state without any specific geographic location data (apart from the river-basin segment in which it occurred).

- To receive credit, local governments must maintain records for each individual homeowner BMP, including contact information and geographic information (lat/long or street address).

- The actual installation of each homeowner BMP must be field-verified by the local government or designated third party at the time of construction, and homeowner submitted BMP data will require validation, by spot checking it against typical default values for the practice.

- The credit duration for homeowner BMPs has been reduced to 5 years as compared to the 10 years afforded to larger retrofits (UREP, 2012). The credit can be renewed based on verification that the practice still exists and is working.

- Local governments may opt to use the sub-sampling approach outlined in Part 5, Option 2 of this memo. Alternatively, they may request homeowners to submit digital photos to confirm their practices, with the final decision on BMP condition made by the locality.

Part 7: Guidance for Verifying Legacy BMPs

The Workgroup discussed the process by which states and MS4 communities would account for both legacy and discovered BMPs.

Legacy BMPs are those that have been reported to EPA for inclusion into any past version of the CBWM for reduction credit over the past two decades. The goal over time is to clean up local and/or state BMP databases so that all entries are actual BMPs with a geographic address that can be subject to inspection verification. This implies that desktop and/or field inspections will be needed to confirm the geographic address of the BMP and determine whether estimated BMPs actually exist. Assembling an actual BMP inventory from historical data is a major task, and may take several years in some communities.

Localities may benefit when the clean up their BMP inventory since it is likely they will discover BMPs that were installed in the past but was never reported to the state for credit in the CBWM. They may also find cost-effective retrofit opportunities involving BMP conversion, enhancement or restoration (SREP, 2012).

The Workgroup noted that the MS4 communities should seek to assess their entire BMP population with two MS4 permit cycles using the methods outline in the recently approved Stormwater Performance Standards Expert Panel report (SPSEP, 2012). The Workgroup also noted that the burden of assessing legacy BMPs could be sharply reduced if the most problematic older BMPs were targeted first. For example:

- Assess all pre-2000 BMPs in first permit cycle, and focus on pre-1990 BMPs in the first two years of that cycle.
- Initially sub-sample their population of BMPs by type and year installed to look for problematic BMP types and design eras, and then focus inspection efforts on the problem BMPs in future years.
- Focus initial efforts to confirm whether estimated BMPs actually exist, and what their current condition is.

Part 8: Process for Developing More Specific BMP Verification Protocols

The process for developing specific urban BMP protocols relies on the work of numerous expert panels, as shown in Table B-10. Additional verification protocols for other urban BMPs will be developed as new expert panels are formed.

Table B-10: Status of Verification Guidance for Individual Urban BMP Categories

BMP Class	BMP Types	Developed By	Status
Traditional Stormwater BMPs (Bay Program-approved)	Wet ponds, Dry ED Ponds, Constructed Wetlands, Bioretention, Infiltration, Filtering Practices, Grass Channels, Bioswales, Permeable Pavement	Use Verification Protocol Developed by Stormwater Performance Standards Panel	Agreed to at 10/16/2012 USWG Meeting
Runoff Reduction Practices	ESD and LID practices installed in response to new state SWM regulations	Stormwater Performance Standards Panel	Approved by WQGIT
Operational BMPs	Urban Nutrient Management	Expert Panel	Approved by WQGIT
	Street Sweeping	Expert Panel	Projected in 2014
	Illicit Discharge Elimination	Expert Panel	Projected in 2014
	Erosion and Sediment Control	Expert Panel	Approved by WQGIT
Restoration BMPs	Stormwater Retrofits	Expert Panel	Approved by WQGIT
	Stream Restoration	Expert Panel	Approved by WQGIT
	Reforestation/Tree Planting	Expert Panel	Projected in 2014
	Shoreline Management	Expert Panel	Projected in 2014

References Cited

Center for Watershed Protection. 2009. *Technical Report: Stormwater BMPs in Virginia's James River Basin – An Assessment of Field Conditions and Programs*. Center for Watershed Protection. Ellicott City, MD

Chesapeake Bay Partners Verification Review Panel (CBP-VRP). 2013. *Verification Guidance and Recommendations to Six Source Sector Workgroups, the BMP Verification Committee and the Seven Watershed Jurisdictions.* November 19, 2013.

Chesapeake Stormwater Network (CSN). 2013. *Bioretention Illustrated: A Visual Guide for Constructing, Inspecting, Maintaining and Verifying the Practice*. Ellicott City, MD. http://chesapeakestormwater.net/wp-content/uploads/downloads/2013/04/REVIEW-DRAFT-OF-BIORETENTION-ILLUSTRATED-040113.pdf).

Claggett, P. 2010. Unpublished Maps showing MS4 Distribution in the Bay Watershed. Research Geographer. United States Geological Survey. Chesapeake Bay Program. Annapolis, MD.

Stormwater Performance Standards Expert Panel (SPSEP). 2012. Recommendations of the expert panel to define removal rates for new state stormwater performance standards. Approved by Chesapeake Bay Water Quality Goal Implementation Team. Annapolis, MD. www.chesapeakebay.net/.../Final_CBP_Approved_Expert_Panel_Report_on_Stormwater_Performance_Standards_SHORT.pdf

Stormwater Retrofit Expert Panel (SREP). 2012. Recommendations of the expert panel to define removal rates for urban stormwater retrofit projects. Approved by Chesapeake Bay Water Quality Goal Implementation Team. Annapolis, MD. http://www.chesapeakebay.net/publications/title/stormwater_retrofits_expert_panel_report_with_appendices

Urban Stormwater Workgroup (USWG). 2013. Application of CBP-approved urban BMP protocols to credit nutrient reduction associated with installation of homeowner practices. Chesapeake Bay Program. Approved November 21, 2013.

Water Quality Goal Implementation Team (WQGIT). 2010. Protocol for the development, review and approval of loading and effectiveness estimates for nutrient and sediment controls in the Chesapeake Bay Watershed Model. US EPA Chesapeake Bay Program. Annapolis, MD.

Williams, B. and E. Brown. 2012. Adaptive Management: The U.S. Department of Interior Applications Guide. Adaptive Management Working Group. USDOI. Washington, DC.

Wastewater BMP Verification Guidance

Version: May 8th, 2014

A. Need for Verification and the CBP Process to define it

Over the past two years there have been numerous requests and commitments to improve the accountability of actions taken to install BMPs that prevent or reduce the loads of nutrients and sediment to Chesapeake Bay.

- The Citizens Advisory Committee has repeatedly called on the Bay Program partners to provide for transparent and open verification of cost shared as well as non-cost shared best management practices tracked and reported by the watershed's seven jurisdictions.

- The President's Chesapeake Bay Executive Order Strategy committed the U.S. Department of Agricultural (USDA) and the U.S. Environmental Protection Agency (EPA) to develop and implement "mechanisms for tracking and reporting of voluntary conservation practices and other best management practices installed on agricultural lands" by July 2012.

- Within its Chesapeake Bay Independent Evaluation Report, the National Research Council's (NRC) panel put forth a series of five specific science-based conclusions focused on their finding that "accurate tracking of BMPs is of paramount importance because the CBP relies upon the resulting data to estimate current and future nutrient and sediment loads to the Bay."

- The 2010 Chesapeake Bay TMDL's Appendix S outlines the common elements from which EPA expects the watershed jurisdictions to develop and implement offset programs.

In response to these calls for improved BMP verification, the Water Quality Goal Implementation Team formed a BMP Verification Committee, which tasked the six sector workgroups to develop narrative principles and guidance for the jurisdictions as they build and improve upon their existing verification programs. As a part of its purview, the Wastewater Treatment Workgroup (WWTWG) was instructed to address wastewater treatment facilities, combined sewer overflow areas, and advanced on-site treatment systems.

B. Key Verification Definitions

The following terms are defined to clarify issues related to wastewater BMP verification.

The National Pollutant Discharge Elimination System (NPDES) permit program, as authorized by the Clean Water Act (Section 402), controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are discrete conveyances such as pipes or man-made ditches. Individual homes that are connected to a municipal system, use a septic system, or do not have a surface discharge do not need an NPDES permit; however,

industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. In most cases, the NPDES permit program is administered by authorized states.[1]

Wastewater Treatment Facilities are municipal sewage treatment facilities and industrial facilities with direct discharges to waters of the United States. These facilities can be classified as *significant* or *non-significant* based on their treatment volume.

> *Significant facilities* are dischargers that are subject to NPDES permits for nutrient pollutants and meet one of the following criteria.
>
> - District of Columbia - Blue Plains Wastewater Treatment Plant
> - West Virginia, Delaware and New York - Facility treating domestic wastewater and the design flow is greater than or equal to 0.4 million gallons per day (MGD).
> - Pennsylvania - Facility treating domestic wastewater and discharging greater than or equal to 0.4 MGD.
> - Maryland - Facility treating domestic wastewater and the design flow is greater than or equal to 0.5 MGD.
> - Virginia - Facility treating domestic wastewater with a design capacity of greater than or equal to 0.5 MGD west of the fall line or 0.1 MGD east of the fall line or an industrial facility discharging an equivalent load in either location.
> - Industrial facilities with a nutrient load equivalent to 3,800 total phosphorus (TP) lbs/year or 27,000 total nitrogen (TN) lbs/year.
> - Any other municipal and industrial wastewater treatment plants identified as significant facilities within a jurisdictional Watershed Implementation Plan (WIP).
>
> *Non-significant facilities* are municipal or industrial dischargers that do not meet the above criteria for significant facilities.

Combined Sewer Overflow (CSO) areas are communities or portions of communities with combined sewer systems that convey both stormwater and wastewater in the same underground system of drains and pipes. Combined sewer systems are designed to overflow occasionally and discharge excess untreated wastewater directly to nearby streams, rivers or other water bodies.

> A *Long Term Control Plan* is a phased approach for control of combined sewer overflows that will ultimately result in compliance with the Clean Water Act requirements.

Septic systems are on-site systems that provide basic storage and treatment to a household's or a development's sewage and discharge into ground. Some septic systems are *Advanced On-Site Wastewater Treatment Systems* that provide additional nitrogen reduction beyond that of a conventional septic system.

Advanced On-Site Wastewater Treatment Systems can be a range of technologies that provide denitrification treatment and reduce nitrogen discharges from the systems.

[1] http://cfpub.epa.gov/npdes/

C. Background on Verification in the Wastewater Sector

Wastewater treatment facilities, including municipal sewage treatment facilities and industrial facilities, contributed 17.4 percent of the total nitrogen (TN) and 16.3 percent of the total phosphorus (TP) loads delivered to Chesapeake Bay tidal waters in 2011. Of these total nutrient loads from wastewater dischargers, the 468 *significant* facilities contributed 90 percent of nitrogen and 72 percent of phosphorus. The remaining 10 and 28 percent of the TN and TP loads, respectively, came from the estimated 5,215 *non-significant* facilities. In 1985, wastewater facilities accounted for 27.6 and 38 percent of the respective TN and TP loads to the Bay. By 2011, the total wastewater loads to the Bay were reduced 51% for TN and 70% for TP from 1985 levels. This significant decline in point source loads is one of the major success stories of Bay restoration and is the result of many factors, including the rigorous implementation of new technologies, the accountability of the NPDES permitting program, and reliable sources of funding.

In the Chesapeake Bay watershed, there are currently 50 active reported *combined sewer overflow* (CSO) communities. A total of 64 CSO areas have been tracked by the Bay Program, with 14 of them currently documented as eliminated. In 2011, based on modeling estimates, the remaining 50 CSO areas contributed 0.57 percent of the total nitrogen (TN) and 0.87 percent of the total phosphorus (TP) loads delivered to Chesapeake Bay tidal waters.

The Chesapeake Bay Program estimates that about 25 percent of the homes in the Bay watershed have *on-site treatment/septic systems* that provide basic treatment to household wastewater. Based on the Partnership's Phase 5.3.2 Chesapeake Bay Watershed Model, these on-site treatment systems contributed approximately 8.3 million pounds or 3.4% of the total nitrogen load to the Bay in 2011.

The existing national and state regulatory systems for wastewater treatment facilities and CSOs meet or exceed the Bay Program partners' BMP verification principles through a rigorous system of permits, inspections and monitoring requirements that ensure accountability, proper design, implementation, operation and maintenance. For on-site treatment systems, the Workgroup's recommended verification guidance is based on the best existing regulations and programs. Verification through existing regulatory programs will confirm if the upgraded wastewater facilities, CSOs, or on-site treatment systems are designed, installed, and maintained over time and meeting their assigned load reduction targets.

The Workgroup's process to develop these verification principles and guidance was as follows:

1. Evaluate the existing verification/inspection programs among the seven Chesapeake Bay watershed jurisdictions;

2. Determine what needed to be improved to meet the Bay Program partners' BMP verification principles; and

3. Develop principles and guidance based on the best existing BMP verification/inspection programs that met or exceeded the BMP verification principles for the jurisdictions' use as they build upon their existing verification elements.

At multiple points throughout the process, the Workgroup has received and considered feedback from its members and interested parties, together with substantive input from the BMP Verification Committee, BMP Verification Review Panel, and Bay Program staff.

D. Verification Principles and Guidance for Wastewater Treatment Facilities

All significant facilities have or will have nutrient permit limits and specific nutrient monitoring requirements in place under the Chesapeake Bay TMDL. These numeric nutrient limits will ensure that significant wastewater treatment facilities continue to provide the most reliably verified load reductions in the restoration effort.

The NPDES compliance system and monitoring requirements provides the most stringent verification for implementation of a facility upgrade. Some Chesapeake Bay watershed jurisdictions also have or will have individual nutrient permit limits or monitoring requirements on some of their non-significant facilities.

The wastewater load reduction goals in the Chesapeake Bay TMDL and jurisdictions' WIPs for the most part are applied to significant facilities. With the exception of Maryland, there are currently no load reduction goals for non-significant facilities in the remaining six Chesapeake Bay watershed jurisdictions; there are only aggregate waste load allocations set at existing loads. Maryland and Virginia NPDES permits for new, expanding, and certain upgraded non-significant facilities include nutrient wasteload allocations and discharge monitoring report (DMR) reporting requirements.

For non-significant wastewater facilities, the existing federal and state NPDES regulations and the DMR reporting system will provide sufficient verification. The DMRs will be used to report the load reductions from a non-significant facility that undergoes any upgrades or offsets new or expanding flows. Jurisdictions will annually track the universe of nutrient- and sediment-contributing non-significant wastewater discharging facilities against established inventories for aggregated waste-load allocations, reporting on loads using the various mechanisms described in jurisdictions' WIPs. Jurisdictions will document and report any allocation redistribution or changes that result from trading or offsets.

The existing national regulations and delegated state NPDES permitting programs have very specific verification and inspection requirements for wastewater treatment facilities, which meet or exceed the Bay Program partners' BMP verification principles. The verification/inspection programs for all non-significant wastewater treatment facility upgrades will rely on the existing NPDES regulations and DMR reporting system.

Table B-11 below provides a summary of the Workgroup's recommended approach for the jurisdictions' wastewater treatment facilities.

TABLE B-11 – Summary of recommended verification principles and guidance for wastewater treatment facilities

	Significant Wastewater Treatment Facilities	***Non-Significant Wastewater Treatment Facilities***
Principles and guidance for the	Monitoring and monthly reporting of flows and loads via DMRs. In addition, (a) annual	• The existing NPDES DMRs will be used to report the load reductions due to BMPs for non-significant wastewater treatment facilities

jurisdictions	loading reports are also submitted where trading or general permit conditions apply to a facility, and; (b) annual WIP reporting also applies**.**	that include upgrades and offsets of new or expanding non-significant facilities. • Track the universe of nutrient- and sediment-contributing non-significant facilities against established aggregate wasteload allocations, annually report loads using various mechanisms including those described in the jurisdictions' WIPs and document any allocation redistribution or changes in reporting structure that result from trading, offsetting, or assimilation by other facilities.
Applicable jurisdictions	All seven jurisdictions.	All seven jurisdictions.
How to apply the principles and guidance	Use existing NPDES DMR and state-defined procedures. Document those procedures in the jurisdictions' quality assurance project plans (QAPPs) submitted to EPA.	Use existing NPDES DMR and state defined procedures. Document those procedures in the jurisdictions' QAPPs submitted to EPA.

E. Verification Principles and Guidance for Combined Sewer Overflows (CSOs)

CSO Long Term Control Plans

Long-term control plans are required by the national CSO control policy to reduce overflows from CSO outfalls (59 FR 18688, April 19, 1994). The existing national regulations and delegated state NPDES permitting programs have very specific verification/inspection requirements for CSOs, which meet or exceed the Bay Program partners' BMP verification principles.

TABLE B-12 – Summary of recommended verification principles and guidance for Combined Sewer Overflow Areas

	Combined Sewer Overflows
Principles and guidance for the jurisdictions	• Construction Verification: properly designed, installed, and maintained by the certified service providers. • Post construction monitoring and inspection. • Existing compliance and enforcement procedures. • Tracking and reporting.
Applicable jurisdictions	All seven jurisdictions.
How to apply the principles and guidance	Use the existing CSO regulatory process.

F. Verification Guidance for Advanced On-site Treatment Systems

There is no national regulation for on-site treatment systems. Existing state regulations or programs vary dramatically among the six Chesapeake Bay states[2], ranging from construction permits to more complex regulation through operating permits with inspection and monitoring requirements. The recommended verification principles and guidance were developed based on the best existing state regulations for on-site treatment system that meet or exceed the Bay Program partners' BMP verification principles.

Verification of on-site treatment systems only applies to nitrogen-reducing treatment systems, or *advanced on-site treatment systems* that are reported by a state for load reduction credit, and not other septic systems that do not receive credit as a BMP. The jurisdictions that intend to seek nitrogen load reduction credit for installation, operation and maintenance of on-site treatment systems will need to adopt and implement the recommended protocols through their regulations (existing or upcoming) or management programs required for advanced on-site treatment systems. These on-site treatment system regulations or programs should have specific maintenance and inspection requirements tailored to specific on-site treatment systems.

Currently, Delaware[3], Maryland[4], and Virginia[5] have advanced on-site treatment system regulations in place (see Appendices A, B, and C, respectively, for detailed descriptions). The District of Columbia has no on-site treatment systems within its jurisdictional boundaries. West Virginia is committed to meeting the Workgroup's minimum verification guidance described in this section if they seek credit for advanced on-site treatment systems. Pennsylvania and New York currently do not plan to seek nitrogen load reduction credit for installation, operation, and maintenance of on-site treatment systems, so they will not need to document verification for these systems unless they wish to seek credit in the future.

Verification of advanced on-site systems will ensure proper installation and continued operation and maintenance of the systems. **Specific requirements (e.g., inspection or sampling frequency) will be based on existing state regulations <u>or</u> will follow the below set of minimum elements for verification based on existing state programs**:

- State or local authorities will verify, track and report proper installation and operation and maintenance of new advanced on-site treatment systems. Verification may also occur through inspections performed by a certified design professional.

[2] The District of Columbia has no on-site treatment systems within its jurisdictional boundaries.
[3] Delaware Department of Natural Resources and Environmental Control, Division of Water, Groundwater Discharges Section, 7Del.C.Ch. 60, Delaware Regulations Governing the Design, Installation, Operation of On-Site Wastewater Treatment and Disposal System (amended January 11, 2014) http://www.dnrec.delaware.gov/wr/information/gwdinfo/documents/delawarefinalonsiteregulations_01112014.pdf
[4] Maryland Regulation of Water Supply, Sewage Disposal, and Solid Waste. Chapter 02 Sewage Disposal and Certain Water Systems for Homes and Other Establishments in the Counties of Maryland Where a Public Sewage System is Not Available Authority http://www.dsd.state.md.us/comar/SubtitleSearch.aspx?search=26.04.02
[5] Virginia Regulations for Alternative On-Site Sewage Systems http://lis.virginia.gov/000/reg/TOC12005.HTM#C0613

- The design and installation of on-site BMP systems will be done and reported by certified service providers and verified in the permitting processes.

- The maintenance and inspection of on-site BMP systems will be conducted and reported annually, or more frequently, by certified service providers and tracked by the authorities. For some technologies, state or local authorities may stipulate an inspection frequency that is less than annual.[6]

- Tracking and reporting through databases managed by state agencies.

Maryland and Virginia already have comprehensive regulations for advanced on-site systems; Delaware amended its regulations, effective January 11, 2014. Key verification elements of these three states' regulations are summarized in Table B-13 below, along with management recommendations from the On-Site Wastewater Treatment Systems (OWTS) Expert Panel. Table 3 relates the three states' program elements with the verification principles and guidance described in the above section. For full details on the Delaware, Maryland, and Virginia programs, please see Appendices A, B, and C, respectively.

TABLE B-13 –Summary of recommended verification principles and guidance for advanced on-site treatment systems

State or local authorities will verify, track and report proper installation and operation and maintenance (O&M) of on-site BMP systems. Verification may also occur through inspections performed by a certified design professional.	*Reference* **Maryland**: COMAR 26.04.02.07 Best Available Technology (BAT) Systems **Virginia**: Sewage Handling and Disposal Regulations (SHDR), 12VAC5-610, and Regulations for Alternative Onsite Sewage Systems (AOSS Regulations),12VAC5-613 **Delaware:** Delaware Department of Natural Resources and Environmental Control (DNREC), Division of Water, Groundwater Discharges, Section 7 Delaware Code Chapter 60, Delaware Regulations Governing the Design, Installation, Operation of On-Site Wastewater Treatment and Disposal System (amended Jan. 11, 2014)
The design and installation of on-site BMP systems will be performed and reported by certified service providers and verified in the permitting process.	**Maryland**: See COMAR 26.04.02.07E-F **Virginia**: Confirmation of installation based on inspections by design professional. **Delaware**: All on-site BMP systems inspected by DNREC and system designer. Certificate of Satisfactory Completion is not issued until specific conditions and requirements are met.

[6] The Chesapeake Bay Program partners' on-site treatment systems BMP expert panel recommended O&M inspection frequencies by practice. Upon approval by the Bay Program's Wastewater Treatment Workgroup (WWTG) and the Water Quality Goal Implementation Team (WQGIT), the recommended inspection frequency will be ready for adoption by the states into their written verification procedures. However, states may stipulate different requirements in their own regulations or programs for on-site BMP systems. For example, Delaware does not require annual inspections for shallow placed pressure dosed, or elevated sand mound systems because they are confident in the performance of these technologies based on decades of experience. Additionally, there are other requirements in place, such as an inspection of any on-site system when a property is sold, that act as sufficient verification mechanisms for these technologies.

The maintenance and inspection of on-site BMP systems will be conducted and reported annually by certified providers and tracked by the authorities. For some technologies, state or local authorities may stipulate an inspection frequency that is less than annual.	*Inspection and O&M frequencies* **Maryland:** COMAR 26.04.02.07D. Once per year. **Virginia**: Once per year for advanced systems <1,000GPD. Retroactive and applies to all systems. **Delaware**: I/A systems less than or equal to 2,500 GPD. Systems permitted after 2/1/2007 inspected every 6 mos. by certified service provider. Systems installed prior to 2/1/2007 do not have to follow O&M requirements, and are inspected by DNREC every three years. On-site systems must also be inspected when a property is sold.
Tracking and reporting through databases managed by state agencies.	Delaware, Maryland and Virginia each maintain their own database.
OWTS Expert Panel recommended O&M frequency, by technology[7]	
Secondary treatment systems certified under NSF Standard 40 Class I or equivalent	Annual inspection may be needed
Intermittent (Single Pass) Media Filters	Annual
Subsurface constructed wetlands/ vegetated submerged beds (VSB)	Annual, with monthly visual inspections of the VSB media, screens, berms, etc. to assess damage from muskrats or similar animals.
Recirculating media filters	Semiannual (twice/year)
Anne Arundel County integrated fixed-film activated sludge (IFAS)	Semiannual
Shallow placed, pressure dosed dispersal	Annual. Additional O&M visits might be necessary. Delaware does not require annual inspections for shallow placed pressure dosed, or elevated sand mound systems because they are confident in the performance of these technologies based on decades of experience. Additionally, there are other requirements in place, such as an inspection of any on-site system when a property is sold, that act as sufficient verification mechanisms for these technologies.
Elevated sand mounds	Annual. Additional O&M visits might be necessary. Delaware does not require annual inspections for shallow placed pressure dosed, or elevated sand mound systems because they are confident in the performance of these technologies based on decades of experience. Additionally, there are other requirements in place, such as an inspection of any on-site system when a property is sold, that act as sufficient verification mechanisms for these technologies.
Permeable reactive barriers	Annual

[7] See previous footnote. Actual O&M or inspection frequency for specific technologies may vary according to states' regulations or requirements.

Verification of Septic Pumping BMP

OWTS Expert Panel recommended keeping septic pumping as a BMP with a 5% TN reduction rate for conventional septic systems that have no other BMPs, since other BMPs include a requirement for routine septic tank pumping. For any given system, this 5% credit should not be given more frequently than every 5 years, even though more frequent pumping for some systems may be appropriate for other reasons. Verification principles and guidance for advanced on-site treatment systems also apply to septic pumping BMPs. Septic pumping should be performed by licensed service providers. Reported septic pumping events should be tracked and documented by the state or local authorities.

Table B-14. Summary of recommended verification guidance for wastewater treatment facilities, CSOs and on-site treatment systems

	Significant Wastewater Treatment Facilities	***Non-Significant Wastewater Treatment Facilities***	***Combined Sewer Overflows***	***On-Site BMP Treatment Systems***
Principles and guidance for jurisdictions	Monitoring and monthly reporting of flows and loads via DMRs. In addition, (a) annual loading reports are also submitted where trading or general permit conditions apply to a facility, and; (b) annual WIP reporting also applies**.**	• The existing NPDES DMR will be used to report the load reductions due to non-significant wastewater treatment facilities' BMPs that include upgrades and offsets of new or expanding non-significant facilities. • Track the universe of nutrient- and sediment-contributing non-significant facilities against aggregate wasteload allocations, annually report loads using various mechanisms including those described in the jurisdictions' WIPs and document any allocation redistribution or changes in reporting structure that result from trading, offsetting or assimilation by other facilities.	• Construction Verification: properly designed, installed, and maintained by the certified service providers. • Post construction monitoring and Inspection. • Existing compliance and enforcement procedures. • Tracking and reporting	Verification of advanced on-site treatment systems will ensure proper installation and continued operation and maintenance of the systems. Specific requirements (e.g., inspection or sampling frequency) will be based on existing state regulations or will follow the below set of minimum elements for verification based on existing state programs in Delaware (DE), Maryland (MD) and Virginia (VA). • State or local authorities will verify, track and report proper installation and O&M of on-site BMP systems. • The design and installation on-site BMP systems will be done and reported by certified service providers and verified in the permitting processes. • The maintenance and inspection of on-site BMP systems will be conducted and reported annually by certified providers and tracked by the authorities. For some technologies, state or local authorities may stipulate an inspection frequency that is less than annual. The OWTS Expert Panel recommended the O&M inspection frequencies by practice, summarized in Table B-13. Upon approval from the WWTWG and WQGIT, the final recommended inspection frequency may be adopted by the states. • Tracking and reporting through the databases managed by state agencies.
Applicable jurisdictions	All seven jurisdictions	All seven jurisdictions	All seven jurisdictions	DE, MD, VA and WV
How to apply the principles and guidance	Use existing NPDES DMR and state-defined procedures	Use existing NPDES DMR and state-defined procedures	Use the existing CSO regulatory process	• DE, MD, VA and WV agreed to verify on-site BMP systems. PA and NY do not currently plan to seek credit for on-site BMP systems so do not have plans for verification. • Use existing state regulations for on-site treatment systems. • The expert panel recommended septic BMP inspection frequencies, but inspection frequency may vary by technology and state.

Wastewater APPENDIX A

Summary of Delaware's regulatory program for onsite systems

Delaware has language in the on-site regulations allowing guidelines to be developed for Innovative/Alternative (I/A) systems by the Delaware Department of Natural Resources & Environmental Control (DNREC) that permittees must follow. Because of this language, the Department developed Operation and Maintenance (O&M) Guidelines for all I/A systems permitted after February 1st, 2007 (attached). Onsite BMP systems are part of the I/A system category. This guideline has been incorporated into DE regulation update that became effective January 11, 2014.

Systems permitted and installed prior to Feb 1st, 2007 do not have to follow the O&M requirement and are inspected by the Department every three years. This is tracked by an Access database at DNREC.

Systems permitted after Feb 1st 2007 fall under the O&M guidelines. BMP systems are inspected every 6 months by the service provider. Tracking of systems with O&M requirements is also done through an Access database.

All Innovative/Alternative Onsite systems are inspected by the Department and system designer when installation is complete and before the system has been covered and backfilled. A "Certificate of Satisfactory Completion" (COC) is not granted until: the installation has been found to be satisfactory by the Department and system designer (a DNREC licensed PE), a service contract for a minimum for two years has been submitted for the system, the manufacturer representative submits in writing, if not present at the time of inspection, that the installation has been performed correctly. A system cannot be put into use until a COC has been issued. The construction phase of all I/A system is tracked with a database accessible by the Ground Water Discharge Section.

Innovative and Alternative On-Site Wastewater Treatment and Disposal Systems

Operation & Maintenance

Guideline issued February 1, 2007; amended to 7 Del. C., Chapter 60, January 11, 2014

Applicability:

For all Innovative and Alternative On-Site Wastewater Treatment and Disposal Systems ≤ 2,500 gallons per day.

Overview:

Innovative and Alternative (IA) on-site wastewater treatment and disposal systems are classified as anything other than conventional systems. These systems include but are not limited to advanced treatment units, peat biofilters, drip dispersal or a combination thereof. In order to ensure the proper operation and maintenance of IA systems, DNREC requires the permittee, through permit conditions and Regulation, to maintain service contracts with certified service providers for the life of the system.

Definition:

For the purpose of this guideline, a **certified service provider** shall be defined as the following:

1. An individual representative of a manufacturer/supplier who holds a DNREC Class E System Contractor or Class H System Inspector license; or,

2. A Class E System Contractor who is certified, through DNREC approved training, on the operation and maintenance of the advanced treatment unit or system; or,

3. A Class H System Inspector who has become certified through DNREC approved training on the operation and maintenance of the advanced treatment unit or system; or,

4. A Homeowner who has obtained DNREC individual homeowner service provider certification and has been certified through DNREC approved training on the operation and maintenance of the advanced treatment unit or system. The DNREC homeowner certification allows the homeowner to operate and maintain their IA system at their primary place of residence only.

Operation and Maintenance with Permit Conditions

1. Prior to the Ground Water Discharges Section (GWDS) of DNREC granting a Certificate of Completion, the permittee must enter into a service contract with a certified service provider initially, for a minimum of two (2) years starting at the onset of initial system operation. Specifically the service contract shall prescribe an Inspection Program and Homeowner Training Program as outlined below:

5.5.5 The Department may impose specific operation and maintenance requirements for on-site wastewater treatment and disposal systems to assure continuity of performance. All innovative/alternative systems have operation and maintenance requirements. These requirements follow;

5.5.5.1 For new construction, **prior to the Department granting a Certificate of Completion, the permittee, unless certified by the homeowner training program, must enter into a service contract with a certified service provider initially, for a minimum of two (2) years starting at the onset of initial system operation.** For replacement systems, this service contract must be submitted with the permit application. Specifically, the service contract shall prescribe an Inspection Program and Homeowner Training Program as outlined below:

5.5.5.1.1 Inspection Program

The inspection program shall include the following: a schedule indicating inspection frequency, inspection objective(s), inspection details, necessary operation and maintenance activities, additional sampling if required, and record keeping requirements.

5.5.5.1.1.1 Inspection Frequency/Objective: The service contract must outline that the certified service provider is to inspect the system once every six (6) months or otherwise as approved by the Department.

5.5.5.1.1.2 Inspection Reports: The contract must outline that the certified service provider must document all inspections. Operation

inspection reports shall indicate the following: date and time of the inspection, sampling and laboratory analysis results, operation and maintenance performed, repairs, an assessment indicating the current performance status of the entire treatment and disposal system, and any corrective actions that must be taken prior to the next inspection. All inspection reports shall be on forms approved by the Department.

5.5.5.1.2 Homeowner Training Program

The service contract must state that the certified service provider is required to meet with the homeowner during the first sixth month inspection. The certified service provider is to educate the homeowner on the components of the system and on the proper operation and maintenance requirements. At this time, the certified service provider shall provide the homeowner with an operation and maintenance manual.

5.5.5.2 Following the initial two (2) year period, the permittee is required to maintain a service contract for the system by: renewing the existing contract annually, at a minimum, contracting with another certified service provider or being certified by the homeowner training program. The service contract must contain the inspection program requirements from Section 5.5.5.1.1.

5.5.5.3 All reports and contract renewals from the previous year shall be submitted by February 1st of each year to the Department. The certified service provider must submit all inspection reports to the Department and permittee. The permittee shall submit any contract renewals as necessary to the Department.

5.5.5.4 The Department reserves the right to collect and analyze samples to ensure proper treatment levels and system performance.

5.5.5.5 The Department may increase inspection frequencies as warranted. A notice outlining new frequencies and cause will be provided to the permittee prior to initiation.

5.5.5.6 Transferability

Within 90 days after the transfer of the real property which utilizes an innovative/alternative system, the owner shall notify the Department. Transfer of the maintenance agreement must also be completed within this 90 day period.

5.5.6 Innovative/Alternative systems without permit conditions requiring a certified service provider shall be inspected by the Department or its designee once every three (3) years and a fee may be required.

All BMP conventional systems such as shallow pressure dosed systems and Elevated Sand mounds have construction inspections inspected system designer when installation is complete and before the system has been covered and backfilled. A "Certificate of Satisfactory Completion" (COC) is not granted until: the installation has been found to be satisfactory by the Department and system designer (a DNREC licensed PE).

<u>Operation and Maintenance for conventional systems:</u>

5.5 Operation and Maintenance

5.5.1 The owner shall be responsible for operating and maintaining their on-site wastewater treatment and disposal systems.

5.5.2 Each on-site wastewater treatment and disposal system shall be pumped by a licensed Class F liquid waste hauler once every three (3) years and innovative/alternative treatment systems shall be pumped according to manufacturer recommendations unless determined that the tank is less than one-third ($^1/_3$) full of solids. The schedule shall be prescribed in accordance with current Department guidelines based on the size of the treatment unit and anticipated number of residents. The owner of the on-site wastewater treatment and disposal system shall maintain a record indicating the system has been pumped and provide such documentation to the Department upon request.

5.5.2.1 Effluent filters shall be cleaned as per manufacturer's recommendations, at a minimum, or as necessary to prevent backing up into the dwelling. Cleaning is accomplished by hosing off the filter over the open inlet cover riser.

5.5.3 Grease traps shall be cleaned when 75% of the grease retention capacity has been reached.

5.5.4 The sites of the initial and replacement absorption facilities shall not be covered by asphalt or concrete or subject to vehicular traffic or other activity which would adversely affect the soils. These sites shall be maintained so that they are free from encroachments by accessory buildings and additions to the main building.

5.5.4.1 There shall be no lawn irrigating systems installed over the absorption facility when the absorption facility is active.

Inspections for sale of a property using on-site wastewater treatment and disposal systems:

5.4.6.3 Class H

5.4.6.3.1 For all properties utilizing an OWTDS that are sold or otherwise transferred to other ownership, the persons must have the system pumped out and inspected by a Class F and Class H licensee, respectively, prior to the completion of sale. An extension will be given to sheriff sales, short sales, cash sales and auctions for a period not to exceed 90 days from date of sale. All inspections of on-site wastewater treatment and disposal systems shall be submitted to the Department on forms approved by the Department (see Exhibit A). These forms shall be submitted within 72 hours of inspection completion.

5.4.6.3.2 Must be performed by a Class H system inspector.

NOTE: If an inspection has occurred within the previous 36 months and the property owner can provide documentation of such pump out and inspection, then such documentation will fulfill the requirements of 5.4.6.3.

5.4.6.3.3 For transfers of new property, the certificate of completion will fulfill the requirements of this section if issued within the previous 24 months.

5.4.6.3.4 If the owner of an individual OWTDS provides proof of a licensed operator or has an annual service contract with a certified service provider then such documentation will fulfill the requirements of 5.4.6.3.

Wastewater APPENDIX B

Overview of Maryland's processes and regulation in regards to best available technologies for removal of nitrogen (BAT)

- WWTWG protocol: State or local authorities should verify, track and report proper installation and O&M of on-site BMP systems.
- COMAR 26.04.02.07F. "Within 1 month of the completion of an installation, a person installing a BAT system shall report to the Department, or the Department's designee, in a manner acceptable to the Department, the address and date of completion of the BAT installation and the type of BAT installed."
- WWTWG protocol: The design and installation on-site BMP systems should be done and reported by the certified service providers and verified in the permitting processes.
- COMAR 26.04.02.07E "A person who has completed a course of study approved by the Department for the installation of BAT, and has a certification of qualification for installing BAT systems from the manufacturer, must be present on the property while a BAT unit is installed." The design of the BAT must be approved by MDE."
- WWTWG protocol: The maintenance and inspection of on-site BMP systems should be conducted and reported annually by certified providers and tracked by the authorities. For some low maintenance systems, such as the enhanced conventional systems, the inspection frequency could be lower. The CBP on-site BMP expert panel will recommend the inspection frequency by practice, which will be available in April 2013. Upon approval from the WWTWG, the final recommended inspection frequency may be adopted by the states.

COMAR 26.04.02.07D

D. Operation and Maintenance of BAT Systems.

(8) A BAT system shall be operated by and maintained by a certified service provider.

(2) The owner shall ensure that each BAT system is inspected and has necessary operation and maintenance performed by a certified service provider at a minimum of once per year.

(3) The Department shall maintain a list of certified service providers.

(4) Individuals may become certified upon completion of a course of study on operation and maintenance of BAT systems approved by the Department. The course of study must include instruction on how BAT systems function as well as elements on operation, maintenance, and repair of BAT systems.

(5) Certification as a service provider for BAT systems may be revoked at any time by the Department for violation of these regulations.

(6) The certified service provider shall report on inspection, operation, and maintenance activities to the Department, or the Department's designee, in a manner acceptable to the Department on a yearly basis prior to the yearly anniversary of the date of installation.

(7) The certified service provider must have a certificate of qualification from the manufacturer of the BAT system being serviced.

(8) A property owner may obtain certification as a service provider to maintain the property owner's system, subject to all the requirements of this regulation pertaining to operating and maintaining BAT systems."

- WWTWG protocol: Tracking and reporting through the databases managed by state agencies.

26.04.02.07D (6) "The certified service provider shall report on inspection, operation, and maintenance activities to the Department, or the Department's designee, in a manner acceptable to the Department on a yearly basis prior to the yearly anniversary of the date of installation."

COMAR 26.04.02.07F. "Within 1 month of the completion of an installation, a person installing a BAT system shall report to the Department, or the Department's designee, in a manner acceptable to the Department, the address and date of completion of the BAT installation and the type of BAT installed."

Wastewater APPENDIX C

Summary of Virginia's regulatory program for onsite systems

The onsite program is regulated by two different regulations. The *Sewage Handling and Disposal Regulations* (SHDR), 12 VAC 5-610, and the *Regulations for Alternative Onsite Sewage Systems* (AOSS Regulations), 12 VAC 5-613. The regulations can be found at http://lis.virginia.gov/000/reg/TOC12005.HTM#C0610 and

http://lis.virginia.gov/000/reg/TOC12005.HTM#C0613 respectively.

The SHDR provide the administrative and procedural regulations along with prescriptive design criteria for conventional and some alternative systems. Mechanisms to ensure that systems are designed and constructed properly are found here. Those mechanisms include:

1. Submittal of a construction application with supporting soils work; site layout; verification of horizontal separation to wells, surface waters, shellfish, etc.; supporting calculations; and other pertinent design information.

2. Review of the application by environmental health specialists and, as needed, by staff engineers.

3. Confirmation of installation according to plans through completion statements based on inspections by the design professional.

The AOSS Regulations expand upon the design options for alternative systems using performance standards and require monitoring and operation and maintenance to verify compliance. All onsite BMPs are expected to be alternative systems and would be subject to the requirements of this regulation. For small systems (≤1,000 gpd), the following requirements apply:

1. The procedural requirements of the SHDR apply as described above.

2. An operation and maintenance manual is required.

3. At a minimum all AOSSs must be visited by a licensed operator at least once a year and a report submitted to VDH. Additional operator visits may be needed as described by the O&M manual.

4. Generally Approved treatment units (systems that have gone through 3rd party testing) have an initial sample collected within 180 days of startup and then every 5 years. Sampling is for BOD_5 and, if disinfection is in place, for total residual chlorine (TRC) or fecal coliform.

5. Non-generally Approved treatment units (systems that have not gone through 3rd party testing) have an initial sample collected within 180 days of startup and then semi annually for two years. If the mean of the samples complies with the given effluent limit, then the sampling is reduced to annually. Sample parameters are as in 4 above.

6. The annual inspection frequency is retroactive and applies to all AOSSs in Virginia. The sampling requirement only applies to systems constructed under the new regulation.

For large AOSSs, the requirements increase as the design flow increases. For large AOSSs, the following requirements apply:

1. The procedural requirements of the SHDR apply.
2. An operation and maintenance manual is required.
3. A renewable operating permit is required.
4. Sampling required in accordance with Table B-15 below.
5. Operator attendance in accordance with Table B-16 below for facilities over 1,000 gpd and up to 40,000 gpd.
6. For facilities with design flows >40,000 gpd, the frequency reverts to the same frequency for systems under the VPDES discharging permit program as found in 9 VAC 5-790. http://lis.virginia.gov/cgi-bin/legp604.exe?000+reg+9VAC25-790-300.
7. Reports required by 15th of month.

Table B-15. Sampling and Monitoring for Large AOSSs

PLANT SIZE	>2.0 MGD	>1.0 - to 2.0 MGD	> 100,000 GPD to 1.0 MGD	> 40,000 GPD to 100,000 GPD	>10,000 GPD to 40,000 GPD	>1,000 GPD to 10,000 GPD
Flow	Totalizing, Indicating, & Recording	Totalizing, Indicating, & Recording	Totalizing, Indicating, & Recording	Totalizing, Indicating, & Recording	Measured	Measured or Estimate
BOD_5, TSS	24-HC* 1/day	24-HC 5 days/wk	8-HC 3 days/wk	4-HC 1 day/wk	Grab quarterly	Grab 1/yr
Total Nitrogen	24-HC weekly	24-HC weekly	8-HC monthly	4-HC quarterly	Grab quarterly	Grab 1/yr
TRC, End of Contact Tank**	Grab daily	Grab daily	Grab weekly	Grab weekly	Grab weekly	Grab 1/yr
Fecal Coliform***	Grab weekly	Grab weekly	Grab monthly	Grab monthly	Grab quarterly	Grab 1/yr

*HC – hourly, flow weighted composite samples
**if disinfection required and chlorine used
***if disinfection required and a disinfectant other than chlorine used

Table B-16. Minimum Operator Visit Frequency for AOSSs up to 40,000 GPD

Avg. Daily Flow	Initial Visit	Regular visits following initial visit
≤1,000 GPD	Within 180 calendar days of the issuance of the operation permit	Every 12 months
>1,000 GPD to 10,000 GPD	First week of actual operation	Quarterly
>10,000 GPD to 40,000 GPD	First week of actual operation	Monthly

Therefore, the annual inspections for the small systems will verify that the system is operating according to its intended design and the BMP is functioning as designed. For the larger systems, monitoring will verify compliance with the required effluent limit.

Nitrogen limits became effective December 7, 2013, for all new AOSS construction applications received after that date. For small systems, the requirement is for a 50% reduction in TN as compared to a conventional system. The AOSS Regulations reference approved BMPs as suitable for compliance, but the detail on acceptable BMPs is in development. Larger systems have more stringent TN limits and will utilize end of pipe (prior to application to soil) sampling for TN. Those limits are 20 mg/l TN for systems 10,000 gpd or less and 8 mg/l TN for larger systems. Additional removal through the soil dispersal field and then attenuation rates from the edge of drainfield to edge of stream will effectively reduce the input of TN from large systems to negligible amounts.

Wetlands Verification Guidance

Version: August 11, 2014

I. The need for wetlands BMP verification

Restoration, creation, and enhancement of wetlands provide a range of benefits for wildlife, fish, and other aquatic species. Wetlands also filter nitrogen, phosphorus, and sediment from overland flow, thereby providing quantifiable water quality benefits. As such, wetland restoration and creation are recognized best management practices (BMPs) in the Chesapeake Bay Program's (CBP) Watershed Model. This document provides guidance on verifying wetland projects to ensure their pollutant removal performance is appropriately credited toward watershed jurisdictions' two-year milestone commitments and their Watershed Implementation Plans.

The Wetlands Workgroup was charged with developing principles/guidance for verifying wetland BMP projects in order for such projects to continue receiving nutrient and sediment load reduction credit. Workgroup members first received a background document and were asked to describe their monitoring efforts, what level of project verification would be reasonable given existing resources, and what could be accomplished if more resources were available. Personal solicitation by the Workgroup co-chair was also made to certain practitioners. Responses were received from the Maryland Department of the Environment (MDE), Natural Resources Conservation Service (NRCS), U.S. Fish and Wildlife Service (USFWS), Ducks Unlimited, U.S. Environmental Protection Agency (USEPA), New York State Department of Environmental Conservation, Maryland Department of Natural Resources (MD DNR), the National Association of Home Builders, and U.S. Army Corps of Engineers (USACE).

The draft principles were revised and further developed based on feedback received from the Bay Program partners' BMP Verification Review Panel on December 6, 2012 and the Comparison Matrix of source sector and habitat workgroup BMP verification protocols. The wetland principles were then reformatted and enhanced based on comments received in May 2013 during the Habitat Goal Implementation Team's review and comment process. Based on feedback received from the BMP Verification Review Panel in November 2013 and additional verbal feedback from practitioners in December 2013 and January 2014, the wetlands BMP verification principles were restructured into guidance to support the seven watershed jurisdictions in developing their own jurisdiction-specific protocols for wetland BMP verification.

Wetland restoration, creation, and enhancement projects are primarily driven by financial assistance incentive programs (federal and/or state) or regulatory requirements for mitigation of impacts to existing wetlands.

Financial assistance programs (voluntary)

Implementation of wetland projects is usually conducted through incentives from a variety of federal and state financial assistance programs. Some of these programs may be more focused on water quality benefits while others may be more focused on wildlife habitat conservation. Wetland projects implemented under these programs have differing goals that are very site specific and dependent on what is appropriate for the landowner's situation and objectives.

The major federal financial assistance programs for wetland projects include:

- **Wetland Reserve Easements** (WRE): formerly the Wetlands Reserve Program, to be implemented under the 2014 Farm Bill under the Agricultural Conservation Easement Program): Under WRE, the NRCS provides technical and financial assistance to landowners for voluntary wetland protection, restoration, and enhancement projects on privately owned property. WRE projects require a specific monitoring regime throughout the lifespan of the project, as discussed in more detail in a later section. These projects are either maintained in perpetuity or under a 30-year easement contract depending on the selected enrollment option.

- **Conservation Reserve Program** (CRP): The CRP is administered by the Farm Service Agency (FSA) and is a private lands conservation program. Under the CRP, farmers who enroll in the program agree to take environmentally sensitive land out of agricultural production and plant species that support improvement of environmental health and quality. The contracts for agricultural land enrolled in CRP are 10 to 15 years in length with the long-term goal of re-establishing valuable land cover to assist in water quality improvement, soil erosion prevention, and reduction of wildlife habitat loss. Wetland buffers and wetland restoration are practices included in the CRP.

- **Conservation Reserve Enhancement Program** (CREP): CREP is also administered by the FSA and is a state-federal partnership implemented under the authority of the CRP. As such, the CREP serves a similar purpose and contract length as described for CRP above. Under CREP, high-priority conservation issues identified by state, local, or tribal governments are targeted with incentive payments.

- **Environmental Quality Incentives Program** (EQIP): EQIP is a voluntary program providing technical and financial assistance to agricultural producers for planning and implementing conservation practices. This assistance is administered via contracts with a maximum 10- year term. The purpose of EQIP differs from other financial assistance programs in that it is typically focused on wildlife habitat benefits.

Jurisdictional partners within the watershed provide additional financial assistance incentives for wetland projects in each state. Specific state financial assistance programs are listed below:

- Virginia's Agricultural Cost-Share program provides a 25 percent state tax credit of costs up to $17,500 per year for constructed wetland and wetland restoration BMPs. http://www.dcr.virginia.gov/water_quality/costshar.shtml

- The Maryland Agricultural Water Quality Cost-Share (MACS) Program administered by the Maryland Department of Agriculture provides grants covering up to 87.5 percent of BMP installation costs for various practices implemented on agricultural land, which include wetland restoration BMPs. Wetland restoration projects implemented via the MACS program must be maintained for a minimum of 15 years. http://mda.maryland.gov/resource_conservation/Pages/macs.aspx

Mitigation

Some wetland restoration projects are built to offset, compensate or otherwise mitigate for impacts caused by development elsewhere in the watershed. This includes projects implemented in accordance with the compensatory mitigation regulations under Section 404 of the Clean Water Act, as amended, as well as applicable state wetland mitigation regulations. States reporting wetland acreage gains to the Chesapeake Bay Program are asked to distinguish between wetland increases due to voluntary projects versus those constructed as compensation from regulated losses. Wetland restoration or creation projects implemented for compensatory mitigation do not receive BMP credit.

Department of Army permits include:

- Nationwide Permit (NWP): The NWP provides federal authorization on a nationwide basis for commonly recurring activities that have minimal individual and cumulative adverse impacts to the environment. Many NWPs are suspended in Maryland since they are duplicated by the Maryland State Programmatic General Permit-4 (MDSPGP-4) and some NWPs are retained.

- Individual Permit (IP): The IP applies to large/complex projects exceeding thresholds and conditions of nationwide and general permits. This applies to projects with the potential for more than minimal impacts.

- MSPGP-4: The MSPGP-4 is issued by the USACE Baltimore District, providing federal authorization and expedited permitting for activities with minimal impacts. The majority of projects authorized are verified by MDE without the need for USACE's review of the application.

II. Definitions

Restoration, creation and enhancement

Wetland restoration, creation and enhancement projects, while having differing definitions, will undergo similar verification processes. These projects are defined as follows (STAC, 2008):

- **Created wetlands** - manipulation of the physical, chemical or biological characteristics present to develop a wetland that did not previously exist on an upland or deepwater site; results in a gain of wetland acres.

- **Restored wetlands** - manipulation of the physical, chemical or biological characteristics of a site with the goal of returning natural/historic functions to a former wetland; results in a gain of wetland acres.

- **Enhanced/rehabilitated wetlands** - manipulation of the physical, chemical or biological characteristics of an existing wetland (undisturbed or degraded) site to heighten, intensify, or improve specific function(s) or for a purpose such as water quality improvement, flood water retention, or wildlife habitat; results in gain of wetland function, not acres. The significant difference between rehabilitate and enhance is

rehabilitation usually refers to a site that currently has hydrology degradation, while enhancement is usually more about invasive species control.

Projects authorized under a permitting authority as well as those implemented under WRE are subject to specific monitoring requirements, which constitute a built-in level of verification. When performed, it is generally a review of whether or not the project was built as designed, but it is not performed on a set schedule or for great detail. Vegetation or water levels are not necessarily considered. Any consideration of how the regulatory and compliance process might fit with CBP verification must be discussed with regulatory authorities, and not presumed.

The existing wetland restoration BMP efficiencies for nutrient and sediment removal apply to restoration and creation projects; wetland enhancement projects do not yet have approved BMP efficiencies. However, enhancements are accepted in the model under CAST, and aggregated with "restoration." The same efficiency is used in this case.

Stream restoration (floodplain reconnections)

Some overlap exists with regard to stream restoration projects and wetland projects, specifically in hydrologically reconnecting a stream to its floodplain as part of a stream restoration project. In this scenario, the floodplain reconnection allows overflow from the stream during storm events to spread out onto the floodplain, which may include wetland areas. In addition, these floodplain reconnection projects may increase groundwater levels also influencing floodplain wetlands.

Areas of the floodplain may include existing wetlands, agricultural wetlands or wetlands that have been converted as a result of stream channelization and drainage. In many cases where the floodplain is currently forested, the reconnection to the stream results in a rehabilitation of the wetlands, but not an acreage gain. This particular rehabilitation may be more significant in terms of water quality than some wetland re-establishment projects, because of the potential to receive and treat high levels of nutrient and sediment loadings. Stream restoration including floodplain reconnection where the floodplain is currently in agricultural use may include wetland restoration, which would result in acreage gains and significant increases in function, including water quality functions, base-flow support, flood storage, and fish and wildlife habitat.

Under the stream restoration BMP, a floodplain is defined as follows: "For flood hazard management purposes, floodplains have traditionally been defined as the extent of inundation associated with the 100-year flood, which is a flooding event that has a one-percent probability of being equaled or exceeded in any one year. However, in the context of this document, floodplains are defined as relatively flat areas of land between the stream channel and the valley wall that will receive excess storm flows when the channel capacity is exceeded. Therefore, water access to the floodplain is defined much more frequently than what is typically considered a flooding event." (Schueler and Stack, 2013)

Stream restoration can consist of stabilizing eroded banks with vegetation, raising channel bed grade in incised channels, reintroducing meanders in channelized streams, and complete realignment of a stream channel to circumvent a blockage or provide capacity for current flows. Floodplain reconnection is typically combined with all of these stream restoration activities, except perhaps when only stabilizing eroded banks.

In regard to wetland projects as part of the floodplain reconnection, the following are defined:

- **Stream restoration BMP** – under Protocol 3 of the stream restoration BMP, efficiencies are provided for nutrient and sediment load reductions as a result of floodplain reconnection implemented as part of a stream restoration project (Schueler and Stack, 2013); this includes reconnection to floodplain wetlands.

- **Floodplain reconnection** – Restoring the hydrologic connection between the stream channel and its floodplain to allow overflow from the stream to contact the adjacent floodplain area, including floodplain wetlands. This usually involves one or more of the following: removal of historical spoil levees created by the placement of dredge spoil on stream banks; raising of the channel bed grade on incised stream channels to promote overbank flow; or creation of floodplains within channelized streams when the channel grade cannot be raised.

III. Project design and siting

Project information obtained prior to and immediately after implementation provides a baseline level of data. This baseline information can then be used for comparison against monitoring/inspection data to determine if the project is still in existence and functioning as intended. Enabling this comparison is a key part of verification so that the project can continue receiving credit for nutrient and sediment load reductions. Thus the baseline information needed is discussed here in order to set up the project to succeed and to elucidate what initial information is required to enable comparison to monitoring/inspection data, thus facilitating the verification process.

Pre-construction

A wetland project, if designed properly, will continue to function indefinitely, so it is important to focus on the quality of design as well as the siting of the project. Planning and site selection criteria have a great influence on the success of projects. Projects should be located in areas suitable for wetland creation or restoration and to meet clear project objectives. This includes siting projects at locations capable of supporting suitable hydrology, hydrophytic vegetation, and hydric soils.

Hydrology. Hydrology is the most critical factor in most wetland restoration projects. Hydrology analysis can be simple or complicated. In farm fields that have been ditched and contain hydric soils (which is usually where there are ditches), hydrologic analysis is usually minimal because we know the ditch is there to allow crop production. The typical commodity crops planted in Maryland cannot grow well in areas with wetland hydrology. Ditches were often designed and installed based on rating curves that are based on providing sufficient drainage to allow crop production for corn and soybeans. In many cases, in implementation, the ditches were constructed to larger dimensions than were recommended by the rating curves.

For many wetland projects in agricultural fields, in addition to restoration of baseline hydrology, the water levels are increased somewhat from what it may have been historically. This is done to enhance functions for wildlife habitat, as well as to overcome the limits of effects on drainage of adjacent lands. Usually this involves installing a berm adjacent to or across a ditch to prevent

drainage. A control structure is installed at a specific elevation, which only allows water to drain off the site when that elevation is reached.

Topographic information informs practitioners as to the areal extent of the water surface at the control elevation. In Maryland, maximum water levels in wetlands usually occur in late winter and early spring when precipitation is high and evapotranspiration is low, which is concurrent with the start of the growing season. Unlike with a deep water pond, the shallow water surface of a wetland does not require a large contributing drainage area to maintain ponded conditions into the growing season. In fact, in the humid east climate, precipitation alone can provide sufficient water to create an inundated wetland so long as the water is prevented from draining off the surface. Practitioners therefore can safely assume that the areal extent of the water surface at the control elevation is the minimum wetland acreage that will be achieved. In most cases, the full wetland area is not limited to the areal extent of the water surface, or normal pool, because saturation of the soil extends some distance beyond the extent of the water surface.

Hydric soils. The soils on these sites, in addition to being hydric, typically are silt loams or clay loams. These soils contain sufficient silt and clay content to severely restrict water infiltration and subsequent losses through shallow subsurface flow and groundwater to drainage features. In some cases, sandy soils may be present at the surface, but a clayey horizon exists within a couple feet of the soil surface. Water may also be impounded on these soils by installing a cut-off trench below the berm. The cut-off trench is excavated down to the clayey horizon and filled with a clayey soil to inhibit seepage under the berm.

Success of wetland rehabilitation projects can be slightly more difficult to evaluate because they typically occur in areas that are currently wetlands. However, the same concepts that apply to the examples described above also apply to most wetland rehabilitation: where ditches were installed, they were installed and maintained for a reason – to provide sufficient drainage to support production of food and/or fiber. On heavy soils, they often result in the reduction of surface ponding or the reduction in the duration of surface ponding. This occurs because the drainage features, when in sufficient quantity, significantly reduce the travel time of water moving across the surface, thus reducing the effects of the high precipitation to evapotranspiration ratio in the winter and early growing season.

Thus the keys to site assessment for many wetland rehabilitation projects are the presence of drainage features and hydric soils. Manmade drainage features in hydric soils equals a loss of wetland functions. Mitigation of the drainage features equals rehabilitation of those functions. On heavy soils, the area of influence can be determined by the topography, from which acreage can be easily calculated. On sandy soils, the area of influence is more difficult to determine, because much of the effects may be occurring just below or at the surface. The primary available and legally recognized methods are the groundwater flow equations (e.g. ellipse equation), from which the distance of influence perpendicular to drainage ditches can be calculated. Normally, a combination of groundwater flow equations and site visits to look for changes in surface ponding are used to determine the areal extent of rehabilitation. However, the NRCS and USFWS in cooperation with the Agricultural Research Service, the U.S. Forest Service, and the EPA, are evaluating methods using remote sensing technologies to more accurately determine the area of effect.

For rehabilitation projects where the primary form of rehabilitation is reconnection of a stream to its floodplain, hydraulic models of stream flow (e.g. HEC-RAS) are used in combination with topographic data for design and to determine the area of effect. Validation of the model is conducted through site visits during storm flows for visual confirmation of water movement into the floodplain from the stream.

Field indicators providing evidence of the periodic occurrence of inundation or soil saturation can include (per USACE):

- Standing or flowing water
- Waterlogged soil
- Water marks on trees
- Drift lines (piles of debris oriented in direction of water movement
- Debris lodged in trees
- Thin layers of sediment deposited on leaves or other objects

Presence of hydric indicators can be determined by examining the soil for:

- Predominance of decomposed plant material (e.g. peat, muck)
- Bluish gray or gray in color at 10 to 12 inches below the ground surface
- Dark and dull (brownish black or black) soil and hydrogen sulfide odor
- could be sandy with dark stains or streaks of organic material in the upper layer, which is 3 to 12 inches below the ground surface

Post-construction

Sites should be visited after construction and planting to ensure that the project was completed as designed; that structures (e.g. berms, water control structures) are operating properly; that there is a predominance of native wetland vegetation; and hydrology is as planned. For wetland restoration projects, it will also be noted that the project is on hydric soil. Invasive species should be managed to maintain desired plant species composition and abundance. However, the WWG does believe that presence of certain invasive species (e.g., cattail, Phragmites) should not disqualify a project from receiving credit as a BMP. The installing agency should provide a post-construction certification that the wetland restoration project was installed properly, prior to submitting the project for credit in the state tracking database. Wetland practices reported by the various agencies and organizations are compiled by a state-designated data steward and cross-checked for duplication.

IV. Existing inspection, maintenance, monitoring frameworks

Inspection and maintenance frameworks routinely performed as part of state and federal agricultural financial assistance programs in the Bay watershed should serve as the foundation of

each of the jurisdictions' wetland restoration verification protocols. If a state designs its wetland BMP verification protocols around existing inspection and monitoring frameworks associated with a financial assistance program , then those protocols or procedures are fully consistent with this guidance. Protocols or procedures associated with permits may or may not be consistent with this guidance.

The monitoring requirements for financial assistance programs are possible options for verification and are as follows:

- WRE projects are monitored annually for three years, followed by an ownership review in the fourth year, and then three years of remote sensing review. Onsite monitoring should occur every five years after that. Monitoring may be more frequent if there are violations or if compatible uses of the wetland (e.g. prescribed grazing, habitat management) have been approved. However, many WRE projects occur in existing wetlands and count as rehabilitation, which does not have BMP efficiencies for nutrient and sediment removal.

- CRP/CREP projects are verified for correct installation. Annual monitoring is required for 10% of contracts. A fully implemented project is not subject to further status reviews, but a project that is not successful or has a problem may be monitored for two more years. All of these projects are implemented on private lands where landowners typically inspect the sites a few times throughout the year. Landowners contact NRCS regarding any problems noted during these inspections (e.g., structural failure or invasive species).

- Except for WRE, all other projects implemented under U.S. Department of Agriculture and Maryland Department of Agriculture financial assistance programs would be monitored the same as CRP/CREP projects.

- In West Virginia, verification practices for projects reported by NRCS/FSA fall under spot checking in the NRCS/FSA protocols, while grant funded projects follow guidance similar to those listed in this guidance document.

Monitoring requirements under federal/state permits are as follows:

- Permits issued by USACE require background information as part of the permit application process including: location, waterway, detailed project description, wetland delineation, impacts, baseline data on resource, proposed improvements, concept plans, onsite and aerial photos, description/documentation for net increases in aquatic resources functions and services, maintenance plan, monitoring plan. Projects requiring a Department of the Army authorization may have additional monitoring and maintenance requirements.

- MDE has specific requirements for nontidal wetland creation, restoration, and enhancement projects implemented for mitigation of development and agricultural activities. These requirements include project monitoring for five years, submission of annual monitoring reports, and performance of maintenance activities. The mitigation site must also be protected in perpetuity.

- West Virginia has strict follow up requirements for mitigation projects.

V. Verification guidance

Field assessments are used to identify which projects are still in place and functioning as intended and which ones require preventative or corrective maintenance. In addition, field verification enables local governments to analyze their historical inventory of private and public wetland restoration projects to identify which individual projects present the best opportunities to retrofit for additional sediment and nutrient reduction. The assessment tools used in verification may also be adapted to allow local governments to determine if other wetland restoration objectives (e.g., habitat) are being achieved. States can also use the Wetland BMP Matrix (Figure B-4) to address the 'overlapping' BMP verification guidance on riparian forest buffers, wetlands, shoreline erosion control, and stream restoration that are cross-referenced in other (Agriculture, Urban Stormwater) sets of guidance.

The verification process must be simple, preferably following a short checklist that can be completed with minimal examination. The WWG recommends the following checklist for verifying wetland BMP projects; these criteria match the requirements for onsite monitoring of WRE easements, which has also been accepted by the Corps for monitoring projects authorized through NWP27. On small project sites, verification should take no more than twenty minutes and on larger sites, no longer than one to two hours.

- Estimated acreage of restored, created, or enhanced wetland(s)
- Wetland hydrology
- Predominance of hydrophytic vegetation
- Is vegetation primarily herbaceous, trees, or shrubs
- Presence of wetland wildlife; note species observed
- Water control structures and/or berms or ditch plugs functioning properly (note if repairs are needed)
- Planned buffers being maintained
- Meets plan objectives
- Presence of invasive or non-native plants (if so, briefly note species, density, and acreage covered)
- Measures to address threatened and endangered species functioning are being implemented
- Stability/instability/erosive areas

- Compatible uses, if authorized, being implemented in compliance with management plan (Any authorized uses that remove vegetation, other than maintenance of trails as identified in the plan, will be monitored annually for all years for which they are authorized.)
- Conflicting uses (e.g., ATVs, livestock)
- Encroachment of unauthorized activities (e.g. cropping, roads, unallowed mowing, structures other than those allowed)
- Land ownership changes (if so, has new landowner been provided copy of management plan)
- Document areas of concern, required maintenance, recommendations for enhancement

The WWG feels that it would not be appropriate to consider the project's success or failure in meeting other functional objectives through the BMP process since the verification is about properly crediting the project as a water quality BMP. Wetland projects should not be rejected as water quality BMPs due to a failure to meet standards not related to the water quality objective (i.e. habitat-based objectives).

State oversight of local wetland restoration reporting

The installing agency should submit basic documentation to the appropriate state agency for each individual wetland restoration/creation project installed. Localities should check with their state agency on the specific data to report for individual projects. In addition, it is recommended that the installing agency maintain a project file for each wetland restoration project installed (i.e., construction drawings, as-build survey, digital photos, post construction monitoring, inspection records, and maintenance agreement). This file should be maintained for the lifetime for which the load reduction will be claimed. This information would be used as a basis for comparison to long-term monitoring/verification information per the above checklist to determine if the project is still functioning as designed.

Inspection, maintenance, monitoring

Monitoring is the actual part of verification which can be used to determine if the project is functioning as designed. Field experience has shown that if a wetland project is functioning adequately approximately three years following completion of construction, then it will likely continue to function indefinitely. Therefore, onsite monitoring within the three years following construction is recommended. For any long-term monitoring, use of aerial imagery for remote observations is highly recommended for verification of wetland BMPs; remote observations can indicate encroachment of agricultural activities, clearing, and tree removal. Any issues or concerns with projects implemented on private lands are typically reported by the landowner to the installing agency and addressed as needed.

Most wetland projects are designed to minimize long-term maintenance and, therefore, should remain effective indefinitely. Wetland restoration practices implemented under CRP/CREP have a fifteen year contract; however, in most cases, the wetland continues to exist and function

beyond the contract period. Wetland projects enrolled in WRE must be maintained for the duration of the easement, either 30 years or in perpetuity.

Appropriate Verification Guidance to Follow for Multi-BMP Projects

Tracking, reporting, and verification of wetland projects presents a challenge for the Bay Program partners in that these projects cross various pollutant source sector and habitat restoration and protection groups. Verification for wetlands falls under different sets of guidance developed by the Bay Program partners' workgroups including those for wetland restoration projects, stream restoration projects (as related to floodplain reconnection), the agriculture sector (as a structural BMP), and the urban stormwater sector. In addition, various types of wetlands are covered under different BMPs approved by the Partnership and ongoing/upcoming BMP expert review panels convened by different workgroups.

Urban wet ponds/wetlands are not equivalent to a wetland project implemented in an agricultural setting. Therefore, jurisdictions should verify any urban wet pond/wetland projects following the Urban Stormwater Workgroup's BMP verification guidance. In the case of wetland restoration, creation, and enhancement projects, the jurisdictions should follow the guidance provided in this document by the Wetlands Workgroup.

Any wetland projects that are defined as reconnecting a stream to the floodplain are credited according to the revised stream restoration BMP efficiencies adopted by the Partnership (Schueler and Stack, 2013). Therefore, projects of this nature should be verified for their continued existence and proper functioning by jurisdictions following the Streams Workgroup's stream restoration BMP verification guidance. In cases where floodplain reconnection also involves wetland restoration within the floodplain, the wetland BMP verification guidance should be followed for verifying the wetland portion of the project.

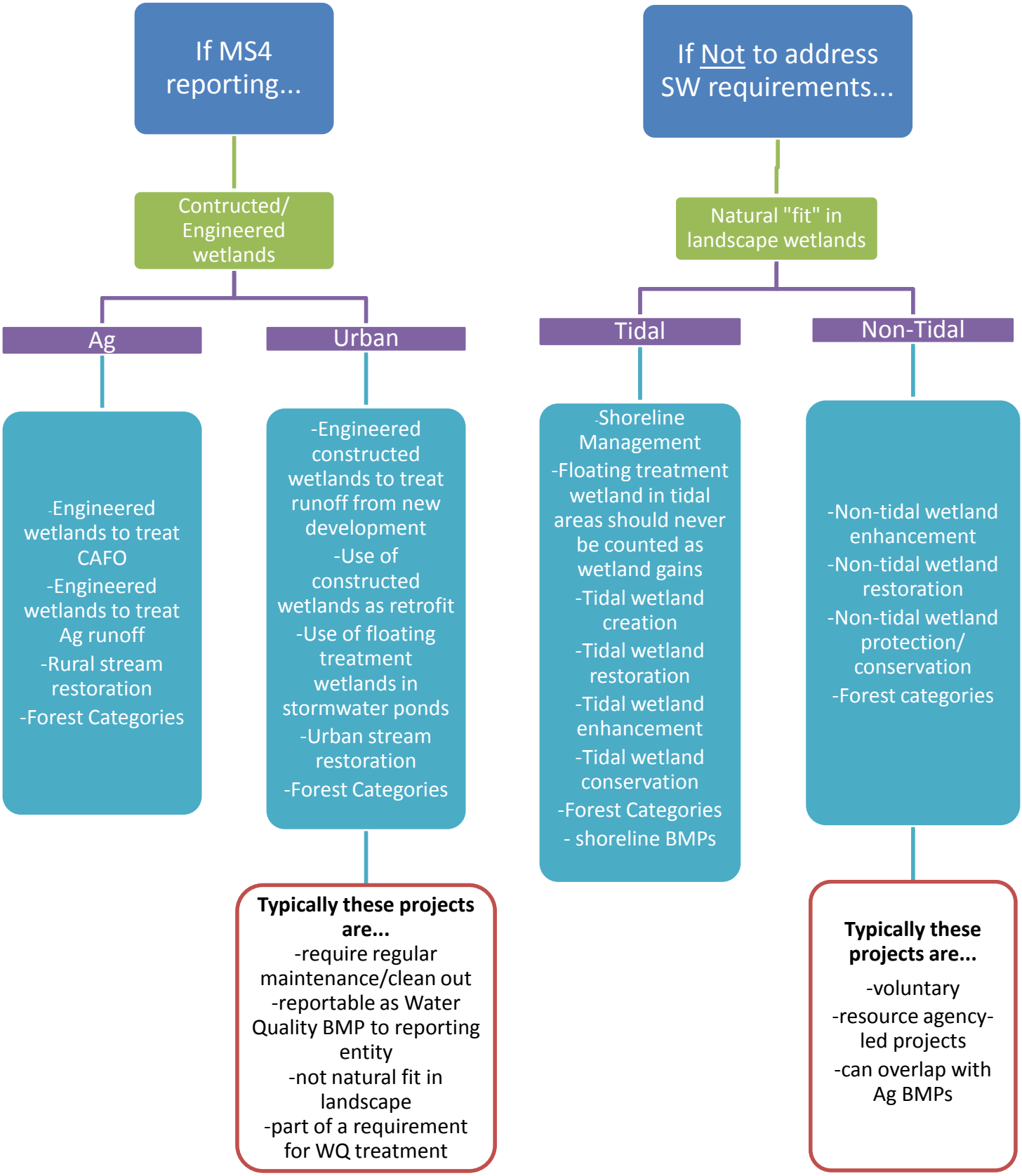
Figure B-4 below provides visual guidance to address the overlapping BMP verification guidance on riparian forest buffers, wetlands, shoreline erosion control, and stream restoration that are cross-referenced in other sets of guidance. This matrix could potentially be used as a reference document by states when addressing verification practices for these BMPs.

References

Chesapeake Bay Program Scientific and Technical Advisory Committee (STAC) (November, 2008). Quantifying the role of wetlands in achieving nutrient and sediment reductions in Chesapeake Bay. *Chesapeake Bay Program STAC Responsive Workshop.* STAC publication 08-006. Retrieved from http://www.chesapeake.org/pubs/238_2008.pdf

Schueler, T. and B. Stack (May, 13, 2013). Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects. http://www.chesapeakebay.net/documents/Final_CBP_Approved_Expert_Panel_Report_on_Stream_Restoration_revised102813_LONG.pdf

Figure B-4. Wetland BMP Matrix



Stream Restoration Verification Guidance

Version: Final, July 16, 2014

The guidance is revised to incorporate comments provided by the Chesapeake Bay Program Verification Review Panel (CBP Water Quality GIT Verification Committee, 2013a and b). Additional changes were not needed following the Panel's April 2014 meeting. Minor edits and clarifications were added in response to feedback on the May 2014 draft BMP Verification Framework document.

Part 1: The Need for Verification

Verification of the initial and long term performance of urban and non-urban stream restoration projects is critical to ensure that nutrient and sediment pollutant load reductions are achieved and sustained across the Chesapeake Bay watershed and provides a means by which state agencies/regulators can also measure functional loss or gain related to these projects. The need for verification is underscored by the estimated 700 miles of planned stream restoration projects by the six Bay watershed states and the District of Columbia in their respective Watershed Implementation Plans and the need to address biological impairments identified as part of local TMDLs across the Bay watershed. While this guidance focuses on individual stream restoration projects, it is recognized that stream restoration is part of watershed-wide efforts to restore the health of the Chesapeake Bay.

The Center for Watershed Protection (Center) in their role as the Chesapeake Bay Program's Sediment Reduction and Stream Corridor Restoration Coordinator, developed guidance with input from the Chesapeake Bay Program (CBP) partners' Habitat Goal Implementation Team (GIT). The guidance is adapted from the 2013 Urban Stormwater Workgroup Memo, *Final Recommended Principles and Protocols for Urban Stormwater BMP Verification* (Goulet and Schueler, 2013) and *Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects* (Schueler and Stack, 2013). Additional guidance for stream restoration projects, specific to riparian wetlands, should also refer to verification guidance on wetlands prepared by the Habitat GIT's Wetlands Workgroup as indicated in Part 4 of this report.

The guidance included in this document is based on the premise that the most important step to assure a project is performing correctly is to first determine that the project is designed correctly and supports clearly articulated goals and objectives. Tools, such as checklists, that standardized information on stream restoration projects may facilitate implementation of this guidance by the Bay jurisdictions. Forthcoming tools as a result of efforts by the Maryland Department of the Environment (MDE) and U.S. Fish and Wildlife Service (USFWS) may provide additional guidance for verification methods that may assist in these efforts.

The Habitat GIT has asked the Center to help coordinate the work of the Stream Health Workgroup (SHWG) with the USFWS, who will be charged with promoting and coordinating the adoption of the Stream Restoration Verification Guidance among the seven Bay watershed jurisdictions.

Part 2: Key Definitions for Stream Restoration Project Verification

The following terms are defined to clarify the application of this guidance to stream restoration project verification.

Stream Restoration Projects*:* Refers to any natural channel design, baseflow channel design, or legacy sediment removal, or other restoration project that meets the qualifying conditions for credits as described in Schueler and Stack (2013), including environmental limitations and stream functional improvements. The types of stream restoration projects are defined as:

1. ***Legacy Sediment Removal*** *(LSR)* - A class of aquatic resource restoration that seeks to remove legacy sediments and restore the natural potential of aquatic resources including a combination of streams, floodplains, and palustrine wetlands.

2. ***Natural Channel Design*** *(NCD*) - Application of fluvial geomorphology to create stable channels that maintain a state of dynamic equilibrium among water, sediment, and vegetation such that the channel does not aggrade or degrade over time. This class of stream restoration utilizes data on current channel morphology, including stream cross section, plan form, pattern, profile, and sediment characteristics for a stream classified according to the Rosgen (1996) classification scheme, but which may be modified to meet the unique constraints of urban streams.

3. ***Wet Channel Regenerative Stormwater Conveyance*** *(RSC)* - Also known as baseflow channel design, these practices can be located in intermittent and ephemeral waters as well as further down the perennial stream network and use instream weirs to spread storm flows across the floodplain at minor increases in the stream stage for events much smaller than the 1.5-year storm event, which has been traditionally been assumed to govern stream geomorphology and channel capacity. Wet channel RSC may also include sand seepage wetlands or other wetland types in the floodplain that increase floodplain connection or interactions with the stream. This description is not what is described in additional MDE guidance: the projects are also constructed in ephemeral and intermittent waters; location in perennial streams may face serious challenges in obtaining permits. The definitions here and verification should not be setting design or siting criteria.

Legacy Stream Restoration Projects*:* Refers to the population of stream restoration projects in a community that the state has reported to EPA for inclusion into any past version of the CBWM for sediment or nutrient reduction credit.

Non-Conforming Stream Restoration Project*:* Projects that do not conform to the reporting requirements of the stream restoration protocols outlined in Schueler and Stack (2013) and instead receive credit using the interim rate.

Part 3: Background on Verification of Stream Restoration Projects

Stream restoration projects are subject to a series of permits, including National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permits, U.S. Army Corps of Engineers permits, and state-specific permits. These permits are summarized in Table B-17. Each permit may have requirements for monitoring and reporting. However, the current post construction and maintenance inspections are not oriented toward

verifying the actual pollutant removal performance of the stream restoration projects. Instead, local inspections primarily focus on whether the project was installed per design, and that its future condition will not cause harm to public safety and/or cause nuisance problems in the community. For verification purposes related to the Chesapeake Bay TMDL requirements, the development of inspection guidelines that utilize visual indicators is highly recommended to verify that the performance of the project is adequate to still achieve the intended nutrient and sediment pollutant load removal rate.

Table B-17. Permits Required for Stream Restoration Projects

Permit	Description
All States	
Nationwide Permits (NWPs)	Nationwide permits are general permits implemented by the U.S. Army Corps of Engineers (ACE) for commonly recurring activities that have minimal individual and cumulative adverse impacts to the environment. Most NWPs have been suspended in Maryland and Pennsylvania since they are duplicated by State Programmatic General Permits already in place. However, NWP 27 (Aquatic Habitat Restoration, Establishment, & Enhancement Activities) is still in place and states that activities must result in net increase in aquatic resource functions and services over the existing conditions.
State Programmatic General Permits (SPGPs)	SPGSs authorize work in Waters of the United States within individual states for activities that would cause no more than minimal adverse environmental effects. They are administered by the U.S. Army Corps of Engineers in conjunction with state agencies. Within individual states there are specific enforcement thresholds on the size of the area impacted that are included under the general permits. In most cases, projects authorized by the state agencies do not need ACE review of the application.
Individual Permits (IPs)	Individual permits, also known as a standard permits, are implemented by the ACEand are generally reserved for projects with potential for substantial environmental impacts. An individual permit (IP) requires a full public interest review, including public notices and coordination with involved agencies, interested parties and the general public. IPs involve large/complex projects exceeding thresholds and conditions of nationwide and state general permits (highways on new alignment, subdivisions, dredging).
NPDES MS4 Permits	Phase 1 and Phase 2 communities have NPDES MS4 permit conditions which require them to have programs and staff in place to ensure that maintenance inspections are done according to a prescribed cycle. The frequency of maintenance inspections ranges from 3 to 5 years, depending on the permit status of the jurisdiction. In addition, most MS4 communities have an annual BMP reporting requirement, and often provide aggregate information to the state on the number and type of BMPs that are installed during the reporting period.
State-Specific	
Virginia Marine	The subaqueous permit program enforced by the Virginia Marine

Permit	Description
Resources Commission Subaqueous Permit	Resources Commission applies to activities impacting perennial streams with drainage areas that exceed 5 mi^2 or with a mean annual instream flow of 5 cubic feet per second. A joint local/state/federal permit application is required and is subject to a public interest review. The permit may include restrictions on the time of year for construction activities and specific construction methodologies. Monitoring reports are required every year for 5 years, the 7^{th} and 10^{th} years, and every year thereafter until the project is demonstrated to be stable for 2 successive years.
Virginia Water Protection (VWP) Permits	The Virginia Water Protection (VWP) permit program is administered by the Virginia Department of Environmental Quality's Office of Wetland and Stream Protection and involves the regulation of water withdrawal projects, excavation, filling, or activities that affect the biological, chemical or physical properties of surface waters (including streams, lakes and wetlands). Generally, activities requiring a permit include dredging, filling, or discharging any pollutant into or adjacent to surface waters, or otherwise altering the physical, chemical or biological properties of surface waters. The VWP general permits include separate permits for impacts less than ½ acre, utility projects, linear transportation projects, and development activities. A joint local/state/federal permit application is required.

The *Final Recommended Principles and Protocols for Urban Stormwater BMP Verification* (Goulet and Schueler, 2013) documents several challenges that still need to be addressed to develop an effective verification system for urban stormwater BMPs in the Chesapeake Bay watershed. Most of these challenges also apply to stream restoration projects. This guidance identifies additional challenges specific to stream restoration projects.

- There are a variety of stream restoration techniques, such as natural channel design, RSC/baseflow channel design and valley/floodplain restoration, which regulators may not necessarily have experience reviewing. Additional challenges arise when the design for a particular site may not meet regulatory requirements and will adversely affect other resource benefits.

- Stream restoration projects often do not follow a consistent design process where the project's goals and objectives are established through an analysis of the restoration potential which in turn is determined through a systematic assessment of stream functions.

- Post construction monitoring is typically required to satisfy permits. The duration can vary depending on the complexity of the project and is often between 3 to 5 years. However, stream restoration projects are subject to catastrophic damage from extreme flood events. To ensure that the projects still exist and are operating as designed, monitoring is needed on an indefinite basis. The Stream Restoration Expert Panel recommended the maximum duration for removal credits as 5 years, with indefinite renewal of the credit pending field performance inspections.

Part 4. Guidance for Verifying Stream Restoration Projects

The following guidance is recommended to verify stream restoration projects are implemented and operating correctly in each of the seven Chesapeake Bay watershed jurisdictions.

1. *Methods to Verify Individual Stream Restoration Projects.* The level of detail needed for verification will be based on the type of project (natural channel design, baseflow channel design, and removal of legacy sediments), as well as the size, complexity, and landscape position of the proposed project. It is important that the method used to verify stream restoration projects identifies key features that relate to stream function and project goals and objectives. The USFWS and EPA have developed a function-based framework for stream restoration projects and is presented in the "*A Function-Based Framework for Stream Assessment and Restoration Projects.*" (http://www.fws.gov/chesapeakebay/stream/protocols.html, http://water.epa.gov/lawsregs/guidance/wetlands/upload/12-natural_channel_design.pdf) This framework provides an excellent example of how the assessment, design and project goals can be an integral part of the verification process. The USFWS has also developed the *Function-based Stream Restoration Project Process* that illustrates how the framework can be applied to stream restoration projects (http://www.fws.gov/chesapeakebay/stream/demoprojects.html). Using the framework will greatly benefit non-conforming projects that use the interim rate for estimating nutrient and sediment load reduction. These projects may lack the detail necessary to use the protocols developed by the expert panel, however, a post construction checklist can establish a baseline that can verify that the project is meeting minimum performance standards to warrant the interim rate reductions.

2. *Maintenance and Monitoring tied to Performance.* Regular inspections and maintenance of stream restoration projects are critical to ensure their benefits in preventing sediment and nutrient pollution are maintained and extended over time, as well as to maintain other local design objectives (e.g., habitat improvement, channel stability, and landscape amenity). Therefore, the verification process should ensure that stream restoration projects are installed and maintained properly over their design life to qualify for their sediment and nutrient reduction credits. This will require verification protocols to define: (1) the frequency for field verification of stream restoration practices; and (2) the process for downgrades if maintenance is not performed. All qualifying projects must have a designated authority responsible for development of a project maintenance program that includes routine maintenance and long-term repairs. Monitoring is the actual part of verification which can be used to determine if the project is functioning as designed. If it is not functioning as designed, then the monitoring data may be used to identify factors responsible such as improper construction or the need for maintenance. The USWS is in the process of developing a *Rapid Function-based Stream Restoration Monitoring Protocol* that will be available in April 2014 and can be obtained at http://www.fws.gov/chesapeakebay/stream/protocols.html.

3. *Utilize Existing Maintenance and Monitoring Inspection Frameworks.* The existing MS4 inspection and maintenance framework and local sediment control regulations for hundreds of communities in the Chesapeake Bay watershed should be the foundation of any stream restoration verification system. Use of the existing 404 Permit/401 Certification inspection

framework may also have potential, but requires concurrence and support from pertinent agencies. Routine maintenance data collected under these frameworks will ultimately inform the verification process described in #8 below. In addition, maintenance and inspection requirements included in state and federal agricultural cost-share programs should be incorporated into verification of non-urban stream restoration projects. Many of the monitoring and inspection requirements under Nationwide 27 and local permits are limited to 3 - 10 years. It is therefore important for the installing agency to continue inspections throughout the project life. The Habitat GIT will work with the state and federal regulatory agencies to determine if their existing maintenance and inspection programs can be used to support implementation the Chesapeake Bay Program partners' basin-wide BMP verification framework.

4. *Removal Rate Tied to Field-based Measurement Methods that verify stream design criteria*. The verification of nutrient and sediment removal rates using the *Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects* should be based on design criteria that can be field verified using measurement methods. Design criteria should be established after a stream function-based assessment determines what restoration potential (goals and objectives) is achievable. Instructions for how to develop function-based assessment, design criteria and measurement methods can be found in Harman and Starr (2011). The maximum duration for which the stream restoration pollutant removal rate applies is 5 years, which can be renewed based on a field performance inspection that verifies the project still exists, is adequately maintained, and is operating as designed. The protocols being developed by USFWS for MDE may be helpful in defining performance indicators to assess project performance.

5. *Stream Restoration Verification as Adaptive Management.* It is recommended that field assessments provide the information needed to verify which projects are functioning as designed to achieve their defined goals and objectives and those projects that require preventative or corrective maintenance to maintain their function(s). Such assessments may also identify factors contributing to the project's success or failure that may be used to inform changes, as needed to existing designs or future monitoring.

Until recently, post-project monitoring has been rarely conducted to assess how well stream restoration projects meet their intended design objectives over time. Real world data collected on actual stream restoration performance enables local and state agencies to improve the next generation of projects in an adaptive management process. This process can isolate the specific site conditions, design features and maintenance tasks that influence stream restoration longevity and performance, and incorporate these into improved design specifications, review and inspection procedures and maintenance requirements. It is recommended that future stream restoration expert panels would review such data to determine if these improved projects would qualify for a higher removal rate, and refine restoration methods and practices that ultimately ensure greater project success.

Bay jurisdictions are encouraged to keep informed of the development of guidance and tools that may assist in these efforts. For example, workshop findings from an upcoming STAC workshop *Designing Sustainable Stream Restoration Projects within the Chesapeake Bay Watershed* may help to identify methods to evaluate projects, in addition to the guidelines for a detailed function-based stream assessment method, a rapid function-based stream assessment method, and a stream

restoration design review method under development by Maryland Department of the Environment (MDE) and U.S. Fish and Wildlife Service (USFWS), along with input from stream restoration professionals.

6. *Stream Restoration Reporting Must be Consistent with Bay Program Approved Practices and Definitions.* Each state has a unique system to report stream restoration projects as part of their MS4 and 404/401 permits. In some cases, states are still developing and refining their reporting systems. Consequently, it may not be possible or even desirable to implement a basin-wide stream restoration reporting format. However, to get credit in the implementation of nutrient and sediment pollutant load reducing practices, stream restoration implementation data using Bay Program-approved rates or methods, reporting units and geographic location (consistent with NEIEN standards), and periodically updated data based on the local verification of projects in the field is needed. The Habitat GIT will initiate discussions with regulatory agencies to determine how their operations may support this data reporting, with a goal of not increasing the burden on regulatory agencies.

7. *Initial Verification of Stream Restoration Installation.* The installing agency will need to provide a post-construction certification that the stream restoration project was installed properly, meets or exceeds its functional restoration objectives, and is hydraulically and vegetatively stable, prior to submitting the project for credit in the state tracking database. This includes non-conforming projects as well. To receive sediment and nutrient reduction credit for stream restoration projects that involve the restoration of riparian wetlands, the installing agency will need to verify that the riparian area associated with the project meets the state's legal definition of a wetland (e.g., hydrophytic vegetation, hydric soils) as well as the guidance for wetland verification (Habitat GIT, 2014)

8. *Recommended Cycle for Field Verification of Stream Restoration Projects.* The installing agency needs to conduct inspections two years after initial construction, as this is the most critical period, especially for assurance that vegetative practices are surviving. After this initial three year period, the frequency of inspections should be once every 5 years to ensure that individual projects are still capable of removing nutrients and sediments. The installing agency should consider more frequent inspections after large flood producing storms as defined by local or state agencies. The routine maintenance and inspection frameworks referenced in #3 are a critical component to assure that stream restoration projects are functioning between the verification periods.

9. *Suggested Process for Stream Restoration Project Downgrades.* If a field inspection indicates that a project is not performing to its original design criteria, the locality would have up to one year to take corrective maintenance or rehabilitation actions to bring it back into compliance. If a project is not fixed after one year, the pollutant reduction rate for the project would be eliminated, and the locality would report this to the state in its annual MS4 report. Non-permitted municipalities would be expected to submit annual progress reports. The load reduction can be renewed, however, if evidence is provided that corrective maintenance actions have restored its performance.

10. *Special Procedures for Stream Restoration Projects Used for Offsets, Mitigation and Trading.* Some stream restoration projects are built to offset, compensate or otherwise mitigate for impacts caused by development elsewhere in the watershed. In other cases,

stream restoration projects may be built for purposes of trading nutrient credits within a community or a state. Special procedures need to be developed in both cases to prevent double counting of practices.

11. *State Oversight of Local Stream Restoration Reporting.* The installing agency must submit basic documentation to the appropriate state agency to document the nutrient and sediment reduction claimed for each individual stream restoration project installed. Localities should check with their state agency on the specific data to report for individual projects. Some typical reporting information includes:

    a. Type, length and width of stream restoration project

    b. Location coordinates

    c. Year of installation and maximum duration of credit

    d. 12 digit watershed in which it is located

    e. Protocol(s) used

    f. Projected sediment, nitrogen, and phosphorus load reduction

For non-conforming projects that use the interim rate to estimate nutrient and sediment load reduction, only a – d would apply. Projects that involve the restoration of riparian wetlands will need to provide basic information, such as wetland area and drainage area and will also need to address guidance for riparian wetlands as developed by the Habitat GIT. In addition, the installing agency should maintain an extensive project file for each stream restoration project installed (i.e., construction drawings, as-build survey, credit calculations, digital photos, post construction monitoring, inspection records, and maintenance agreement). The file should be maintained for the lifetime for which the load reduction will be claimed.

To provide accountability, Bay states will be asked to use their existing MS4 regulatory authority that could include periodic field inspections review of local maintenance inspection records, to verify performance of local stream restoration practices. The state oversight process should be transparent and publicly accessible so that NGOs, watershed groups, and other stakeholders can be confident that BMP implementation is real.

12. *EPA Review of State Verification Oversight.* So as to not create an additional regulatory burden, the Habitat GIT will discuss with EPA Region 3 the feasibility of using its existing NPDES MS4 permit review process to provide periodic reviews the implementation of state BMP verification protocols to ensure they are being effectively implemented.

13. *Review and Verification of Bay Program partners' BMP Accounting.* The accounting methods and verification procedures used by the Bay Program for stream restoration projects must be clear and transparent so that local governments and the states can readily understand how the projects they report are being used to calculate pollutant reductions in the Chesapeake Bay Watershed Model. Better communication among the Bay Program and

its state and local government partners will help to improve BMP reporting and ensure a fair representation of state and local program implementation.

References:

CBP Water Quality GIT BMP Verification Committee. 2013a. *Strengthening Verification Best Management Practices Implementation in the Chesapeake Bay Watershed: A Basinwide Framework (Draft July 15, 2013)*. Chesapeake Bay Program Partnership, Annapolis, MD.

CBP Water Quality GIT BMP Verification Committee. 2013b. *Chesapeake Bay Program Partnership BMP Verification Review Panel's Guidance and Recommendations to the Six Source Sector Workgroups, the CBMP BMP Verification Committee, and the Seven Watershed Jurisdictions.*

Flores, H. 2011. Design guidelines for regenerative step pool storm conveyance. Revision 3. Anne Arundel County Department of Public Works. Annapolis, MD.

Harman, W., R. Starr, M. Carter, K. Tweedy, M. Clemmons, K. Suggs, C. Miller. 2012. *A Function-Based Framework for Stream Assessment and Restoration Projects.* US Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, Washington, D.C. EPA 843-K-12-006.

Harman, W. and R. Starr. 2011. *Natural Channel Design Review Checklist*. US Fish and Wildlife Service, Chesapeake Bay Field Office, Annapolis, MD and US Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, Wetlands Division. Washington, D.C. EPA 843-B-12-005.

Goulet, N., and T. Schueler. 2013. Final Recommended Guidance for Verification of Urban Stormwater BMPs (USWG Final Review Draft 12/31/13).

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology. Pagosa Springs, CO

Schueler, T. R. and W. Stack. 2013. *Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects.* Chesapeake Stormwater Network.