Chesapeake Bay Program Forestry Workgroup's 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 since the 2014 version to incorporate comments and also to reflect the high-resolution imagery data that has become available. The organization of this guidance 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 usually 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) have an expected practice life of >75 years. 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 seven forestry BMPs for which verification guidance is presented are: a) agricultural riparian forest buffers; b) narrow agricultural buffers; c) agricultural tree planting; d) expanded tree canopy; e) urban forest planting; f) urban riparian forest buffers; and g) forest harvesting BMPs. 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.

Verification guidance for one practice, "Forest Conservation," was not developed because it's use in Phase 6 is under review. This practice was historically credited for reducing the amount of land developed and the reforestation mandated by the Maryland Forest Conservation Act.

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 recently 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 or reversion to farming.

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 their 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: 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. When both sides of a stream have a forest buffer, an additional 4% nitrogen reduction is assessed.

Narrow Riparian Forest Buffer: A planting of woody species that has a width of 10-35 feet. Narrow buffers receive the credit of conversion to forest.

Tree Planting BMP: 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 conservation or planting plan designed by a knowledgeable professional. 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. According to program rules, NRCS or other CREP partner confirms establishment on 100% of sites between 0.5-4 years after planting. 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.
    ii. Some states include detailed monitoring of plantings. 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. This is a recommended practice that not only ensures survival but contributes valuable information for future plantings (adaptive management).
B. Spot-check Plantings

i. After the practice has been reported as established, USDA has a standard practice of compliance checks on a portion of all contracts; the requirement is for 10% of practices 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 requires spot checks on 5% of practices under contract each year throughout their lifespan.

C. Tracking

Data submitted to the National Environmental Information Exchange Network (NEIEN)/Chesapeake Bay (CB) model will be used to report annual progress. These data include acres of practice, but do not include width of practice. The water quality benefits ceded riparian buffers in the scientific record, as documented in the Expert Panel report, credits this practice so long as they are relatively wide (average of ~100 feet wide). Therefore, the NEIEN data will need to be supplemented with data that suggest new buffers are sufficiently wide.

A jurisdiction wanting to take advantage of the additional nitrogen reduction of 4% when a buffer is on both sides of a stream, needs to document this in NEIEN. There is a "normal" or "one-sided" buffer that does not have trees on the opposite side of the stream. And there is the "double" or "two-sided" buffer that has trees on the opposite side. Only one of these double buffers needs to be newly established to get the additional credit, and only the newly-established acres are counted.

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.*

- Confirm with partners the protocol currently in place for verifying establishment of newly-planted buffers are consistent with rules for the practice.
- Continue established protocol that includes visiting each site to develop the conservation/planting plan. Potential problems on or near the site should be documented. After establishment, each buffer site should be visited a 2nd time to address any problems. 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 (reported) when its installation according to plan is confirmed.
- Reporting jurisdictions will have data indicating the average width of new buffers is near 100' minimum. The width refers to only one side of the stream.

2. Inspections are critical: a) to ensure riparian forest buffers become established effectively; and b) to verify that channelization is not occurring, and trees are getting the required maintenance.

- 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, approximately 10% 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 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 how they plan to conduct follow-up checks that go beyond the 5-10% spot-checking that is the current practice for CREP.

- Ideally, additional plantings to be spot-checked for maintenance would occur between establishment and re-enrollment when there are fewer programmed inspections. 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 a sufficient confidence level of survival.

3. Need for sufficiently wide buffers.

- An average minimum width of 100' is required.
- This width should be measured and reported annually or bi-annually either in NEIEN or to the Forestry Workgroup.
- If a state average is 75' or less for 2 reporting cycles, a reduced efficiency of 20% should be applied.

4. Special attention is needed toward the end of contract life (between 10-15 years), to determine if re-enrollment can and will occur, or if the buffer will be maintained voluntarily without a contract. If there is no survey or confirmation that the buffer is on the landscape, it must be removed from NEIEN.

- This action is recommended to encourage the continence of cost-shared buffers. For simplicity, there are three scenarios that matter when a contract is ending: 1) the landowner re-enrolls the buffer into another 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 partners can lead to: more landowners being in the re-enrollment category (#1), and an understanding of 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. Partners conduct outreach/technical assistance to all landowners with expiring contracts.

b. 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. Re-enrolled acres do not count as progress, but need to be re-entered into NEIEN.
d. Acres not being re-enrolled: 1) can be re-entered into NEIEN if verified, 2) will be removed from NEIEN if not verified or if it does not meet practice standard.

5. Implementation strategies should include approaches to conserve existing forest buffers to help ensure a net gain in overall buffers for a county or watershed segment. The following suggested actions support this:

- Establish laws or ordinances that encourage conservation of existing buffers are in place.
- Conduct monitoring and maintenance on both newly planted buffers and also on existing buffers.
- Sample total buffer area periodically using high-resolution land-cover mapping. The gain or loss will be reflected in the regularly-updated land-use portion of the CB Model. This information will be used to cross-check what has been reported to the Model.

6. *Where agricultural riparian forest buffers are being planted voluntarily and without a contract, jurisdictions may give them credit without inspection, only if such plantings represent a small portion (5% or less) of the total acreage of buffer plantings reported in a given year.*

When more than 5% of annual riparian forest buffers for a jurisdiction in NEIEN are voluntary, the reporting agency should 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'). In addition, it is suggested that similar verification procedures be used as for non-voluntary forest buffers practices.

V. Verification Guidance for Narrow Forest Buffers and Agricultural Tree Planting

1. *Verification methods for cost-shared narrow forest buffers and 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 and documentation put forth by the Agriculture Workgroup;
    - For tracking and crediting purposes, 100 trees will equate to one acre of agricultural tree planting practice; similarly, a narrow forest buffer should have at least 100 trees per acre;
    - 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 has 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.

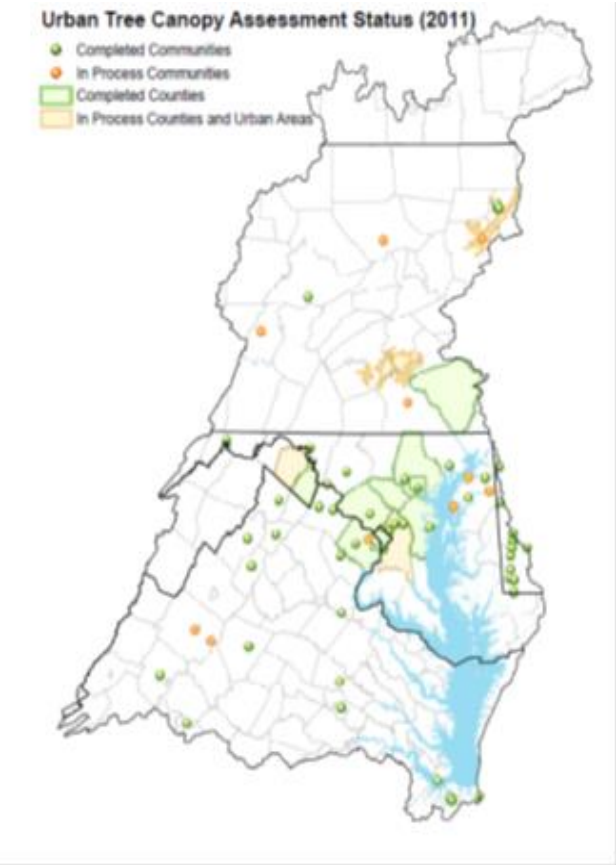

Figure 1. Urban tree canopy assessment status (2011) in the Chesapeake watershed.

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. Even more basic is the use of Google Earth® imagery to view tree canopy.

The three urban forestry practices, Urban Tree Canopy Expansion, Urban Forest Planting, 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.

Urban Tree Canopy Expansion BMP Description - The Urban Tree Canopy Expansion BMP covers tree plantings on developed land (turf grass or impervious) that result in an increase in tree canopy but are not intended to result in forest-like conditions. Urban tree canopy expansion includes the many dispersed tree planting activities that occur across the developed landscape over turf (e.g. parks, schools, yards) or impervious areas (e.g. street trees, parking lots). "Urban" is defined broadly to encompass all developed areas in urban/suburban/rural communities where turf grass and impervious surfaces (roads, buildings, parking lots, etc.) are the underlying land cover. The credit for the Urban Tree Canopy Expansion BMP is based on the number of individual trees planted which gets converted to equivalent acres in the BMP reporting database (NEIEN). The credit for this practice was recently updated (see Expert Panel Report). A credit of 144 ft^2 per tree planted is equivalent to 300 trees planted per acre; however this is not a planting density requirement. Thus, each newly planted tree that is reported converts 1/300 an acre of either turf or impervious to tree canopy land uses, which have lower pollutant loading rates. This BMP credit does not require trees to be planted in a contiguous area and assumes that the understory remains managed as turf or impervious surfaces.

There are several types of tree plantings which should not be reported using the Urban Tree Canopy Expansion BMP. For larger plantings in developed areas that are managed to create forest-like conditions/understory, use the Urban Forest Planting BMP. Tree plantings along streams and rivers with a minimum width of 35 ft. should be reported using the Urban Forest Buffer BMP. The water quality benefits of trees planted as part of a structural BMP (bioretention, enhanced tree pits) are captured separately through stormwater BMP reporting and should not be reported under Urban Tree Canopy Expansion. Finally, because this BMP is intended to capture the water quality benefits of expanded (i.e. additional) tree canopy, mitigation plantings which simply replace existing trees that have been removed should not be reported.

Urban Forest Planting BMP Description: The Urban Forest Planting BMP applies to tree planting projects in developed areas with the intent of establishing forest ecosystem processes and function. Trees are planted in a contiguous area according to a planting and maintenance plan that meets State or District of Columbia definitions for planting density and associated standards for establishing forest conditions, including no fertilization and minimal mowing as needed to aid tree and understory establishment. The credit for this BMP is based on a land use conversion from developed turf grass to forest, which has much greater pollutant load reduction benefits than the Urban Tree Canopy Expansion BMP. Local jurisdictions should consult with their State or District forestry agency to determine eligibility of tree planting projects for this credit.

Urban Forest Buffer BMP Description: Urban forest buffers are linear wooded areas planted along rivers and streams in developed areas that help prevent pollutants from reaching the stream. They also offer complementary benefits such as habitat, shading, recreation and urban beautification. The recommended buffer width is 100 feet, with a 35 feet minimum width. The BMP description does not specify technical details such as how many different species should be

planted, but state and local guidelines and requirements should be followed. Buffers in urban areas have a different efficiency than agricultural buffers. Both types of buffers are credited with changing land use to forest. But, because impervious surfaces like roads and parking lots typically route water into storm sewer systems rather than into riparian areas, urban buffers are not expected to treat upland runoff and do not receive the extra credit for this function that agricultural buffers do. "Urban" is defined broadly to encompass all developed, non-agricultural areas in urban/suburban/rural communities where turf grass is the land cover.

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 Urban Forestry BMPs

The Urban Stormwater Workgroup BMP verification guidance outlines a number of general principles that apply to Urban Forestry BMPs when used by a locality for stormwater management: 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 urban forestry BMPs, which are decentralized practices occurring on a mix of public and private lands, a local urban forestry partner improves confidence in tree survival/health and accuracy in tree reporting in a defined locality. An urban forestry partner may be a local government entity, or a non-governmental organization with necessary expertise who works cooperatively with the locality. The partner should be approved by the state forestry agency, which provides oversight and support with training, tools, etc. In turn, local urban forestry partners can provide outreach and technical assistance on urban tree planting, tree care, and other issues that arise.
- Where there are multiple urban forestry partners implementing tree planting BMPs in a given local jurisdiction, a lead reporting partner should be established to coordinate data collection efforts across partners and to ensure that BMPs are not double-counted. For example, a given tree planting project in a city park might be separately tracked by 1) the non-profit who completes the planting, 2) the local government who manages the park, and 3) the state agency who funded the non-profit's tree planting. In such cases, the state forestry agency should work with local partners to confirm a local reporting lead to ensure the project is only reported once to NEIEN for credit.

2. Urban forestry partner tracks and reports Urban Tree Canopy Expansion, Urban Forest Planting, and/or Urban Forestry Buffer BMPs in locality

- For the Urban Tree Canopy Expansion BMP, the urban forestry partner should track 1) number of trees planted, 2) planting date, 3) underlying land cover – turf or impervious,

and 4) location (county and city/town if applicable), as well as any other data required by the state forestry agency.

- For the Urban Forest Planting BMP, the urban forestry partner should track 1) acres of urban forest planted (projects can be a portion of an acre), 2) planting date, and 3) location (county and lat long/address), as well as any other data required by the state forestry agency. The urban forestry partner must keep on file for each reported project a planting and maintenance plan that meets state forestry guidelines for establishing forest conditions (e.g. stocking rate, no fertilizer application, minimal mowing to aid forest establishment).
- For the Urban Forest Buffer BMP, the urban forestry partner should track 1) acres of buffer planted (projects can be a portion of an acre), 2) average buffer width (35 ft. minimum), 3) planting date, and 4) location (county and lat/long) as well as any other data required by the state forestry agency.
- To receive credit for any of these BMPs, plantings should be site-checked by the local urban forestry partner at or after the time of planting to confirm that planting data is captured accurately.
- To credit plantings voluntarily reported by a landowner or other partner and not overseen by the forestry partner, the states or localities should develop a spot-checking/sampling strategy similar to approaches for some other voluntarily-reported urban practices. A 20% spot check is recommended. Based on the results of spot-checking voluntarily reported BMPs, states should consider possible discounting methods to address survival issues or other sources of uncertainty.

3. Urban forestry partner should maintain Urban Forestry BMPs

- New urban plantings can have a high rate of mortality, succumbing to weed competition, dehydration, physical damage, deer browse, or other injury. Depending on the type of planting, regular summer watering, mulching, and/or removal of competing vegetation is often necessary for 1-2 years or longer to ensure successful establishment. Ongoing maintenance after the establishment period is also necessary and should be planned for by the urban forestry partner.
- The Urban Tree Canopy Expansion BMP credit assumes a 5% mortality rate, so urban forestry partners should implement best planting and maintenance practices to achieve this level of survival or better.
- The Urban Forest Planting BMP requires that a tree planting and maintenance plan be followed that meets state guidelines for establishing forest-like conditions (e.g. stocking rate, no post-planting fertilizer application and minimal mowing to aid establishment). Since Urban Forest Planting BMPs are afforded a much higher level of pollution reduction credit than Urban Tree Canopy Expansion, projects need to be monitored to ensure that forest-like conditions are being established and maintained over time.
- The Urban Forest Buffer BMP should be monitored to confirm successful establishment and maintained over time to manage threats such as invasive species and ensure adequate survival/stocking of trees in the long-term.

4. Reported practice should represent a net gain in tree canopy/forest cover, verified over the long-term via high resolution land-cover datasets.

- The Urban Tree Canopy, Urban Forest Planting, and Urban Forest Buffer BMPs receive credit for a 15-year period. This is the approximate period of time it takes for newly planted trees to grow large enough to be picked up as tree canopy or forest cover in the high-resolution land use data, as stated in the Urban Tree Canopy Expert Panel Report.
- In 2015, the Chesapeake Bay Program agreed to create high-resolution land-cover and land use datasets that include forest and tree canopy among the land use classes used in the Chesapeake Bay modeling tools. These land cover/land use datasets will be updated periodically (e.g., every 5 years or so) to reflect the latest on-the-ground conditions. Thus, the ultimate verification of urban forestry BMPs will be accomplished through the gains and losses in tree canopy and forest that are picked up in the land cover data.
- After the 15 years of BMP credit, successful plantings will continue to receive credit as captured in the updated tree canopy/forest land use data, which are modeled with the same pollutant reduction rates as the BMPs. One exception is the Urban Forest Buffer BMP which is assigned additional pollutant reduction efficiencies above and beyond the forest land use credit. After 15 years, successful Urban Forest Buffer plantings should be picked up and automatically credited in the forest land use data, but for jurisdictions to receive the additional pollutant reduction efficiencies of the BMP, the BMP must be verified in the field and reported to the model as such.

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 for accuracy and thoroughness. This may also entail site visits to tree planting sites on record for Urban Tree Canopy Expansion, Urban Forest Planting, and Urban Forest Buffers 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. Using an adaptive management approach, verification efforts should identify improvements in planting, maintenance, and reporting practices to be incorporated into future verification guidance and protocols. 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. 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.

IX. Verification Guidance for Forest Harvesting BMPs

Appendix B
Forestry BMP Verification Guidance

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 determines an average rate of implementation by conducting a review of forest harvest records every ~5 years.
        - 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. This will help with BMP implementation improvement (#3 below).

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).