# Forestry BMP Verification   −   Principles and Protocols    −   DRAFT

This memo provides guidance on how to verify forestry BMPs.  The principles and protocols described here are consistent with Verification Principles previously established regarding science, performance, technology, and monitoring.  This memo also describes how the work group developed principles and protocols to verify the performance of forestry BMPs in the Bay watershed.  It is organized by the following headings:

1.  Introduction
2.  Forestry BMPs Background
3.  Descriptions of Principles and Protocols for Forestry BMPs
4.  Process for Developing Forestry BMP Verification Protocols

## 1.   Introduction

The Chesapeake Bay Program partners have, over the past several decades, worked to define, credit, and incentivize practices to help restore the Bay.  Due in large part to the issuing of a TMDL for the main stem of the Bay in 2010, pressure to improve the accountability of practices that have been implemented has come from multiple sources including the National Research Council and the Citizens Advisory Committee.   The Partnership is undertaking the development of a framework to allow for expanded and more accurate capture of practice implementation and greater confidence in the outcome of those practices.  This procedural framework will amount to a verification of practices and is called "Verification."

Role of Forestry Work Group in Verification: In 2012, at the request of the Water Quality Goal Implementation Team, the Forestry Work Group began developing principles and protocols for verifying forestry BMPs. The Forestry Work Group, which meets monthly, discussed these principles and protocols at their February, March, June, and August meetings in 2012.  In 2013, they were discussed at the February and June meetings.  Several written versions of this document were shared with the group over this time and many comments received.  Other verbal and written comments were contributed by the Expert Panels for Riparian Forest Buffers and Tree Canopy.  The process was greatly aided by interactions with the Agriculture and Stormwater Work Groups who are keenly interested in the forestry practices taking place on those lands.  This memo combines all the input that was received and is summarized in Table 1.

1. Table 1.  Summary of pertinent information regarding forestry verification protocols.

| Verification Protocol | Assessment Method | Conservation Practice Category | Cost-Sharing Information | Verification Methodology | Verification Issues | Relative Cost | Relative Scientific Defensibility | Relative Accountability | Relative Transparency |
|---|---|---|---|---|---|---|---|---|---|
| Expanded Urban Tree Canopy | Local-> State reporting | Urban manage-ment Practice | Not cost-shared | Professional program and satellite monitoring | Aerial sampling and accurate use of tools | Low | High | High | High |
| Urban Riparian Forest Buffer | Local->State reporting | Urban management Practice | Not cost-shared | Professional program and satellite monitoring | Aerial sampling and accurate use of tools | Med | High | High | High |
| Ag Riparian Forest Buffer | Verified compliance with federal and/or state program contractual requirements. | Agricultural Management Practice | Primarily cost-shared | Through on-site contractual compliance inspections by trained agency personnel. | In frequency compliance inspections during contractual life span. | High | High | High | Med |
| Ag Tree Planting | Verified compliance with federal or state program contractual requirements. | Agricultural Management Practice | Primarily cost-shared | Through on-site contractual compliance inspections by trained agency personnel. | Infrequent compliance inspections during contractual life span. | High | High | High | Med |
| Forest Harvesting BMPs | Verified compliance with state and local regulations in most places. | Suite of Forest Harvesting Management Practices | Not cost-shared | Through on-site contractual compliance inspections by trained agency personnel. | Harvesting on private land is not regulated in PA, NY | Med | High | Med | High |

### 2. Background on Forestry BMPs

The following Best Management Practices are considered to be forestry BMPs for the purposes of the Verification exercise. Four of the five BMP's are types of tree planting, including tree planting in riparian areas. Tree planting practices apply to Agriculture and Urban landscapes. Forest harvesting BMPs are the only BMPs applied to forest land at this time.

    A. Expanded Tree Canopy
    B. Urban Riparian Forest Buffers
    C. Agricultural Riparian Forest Buffers
    D. Agricultural Tree Planting
    E. Forest Harvesting

Forests cover the majority of the landscape in each Bay state. There has been a notable disparity in how and whether jurisdictions collect forestry BMP data. Riparian forest buffers planted on agricultural land are one of the BMP's most relied upon to achieve water quality goals in Phase II of State WIPs (Sweeney, pers. comm). Other forestry BMP's play an increasingly important role—especially in the urban sector. For instance, urban forestry BMPs (urban riparian buffers and expanded tree canopy) have only just begun to be regularly reported by the jurisdictions despite having been defined practices for over 10 years.

<u>Agricultural riparian forest buffers and tree planting</u>-The Forestry Work Group has ample experience in tracking riparian forest buffers on agricultural land having done so since 1997. Each fall, the FWG requests geo-spatial data from the Bay states. The following 10 fields are requested from the state contacts and every year CBPO maps the point data for analysis and record-keeping.

    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

Riparian forest buffer information now also comes through the USDA data agreement with EPA and USGS, however, the Forestry Work Group has not stopped collecting the above data primarily because the USDA data does not include width of the buffer. Acres of agricultural tree planting, while not previously reported with regularity to the Bay Program, could be part of this submission from USDA.

Expanded Tree Canopy and Urban Buffers-- Bay states have had urban forestry programs for the past ~30 years having been established after the 1978 Cooperative Forestry Assistance Act. These programs provide assistance through competitive matching grants for urban and community forestry projects

including tree planting and maintenance. Other urban forestry grants to localities have become established and localities have developed their own programs because they 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 multitudes. Other efforts are grassroots. Many localities in the watershed have had assessments done of their tree canopy and have set goals to increase their urban tree canopy (Figure 1). Still the practice has not been consistently reported to the Bay Program for credit.

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.
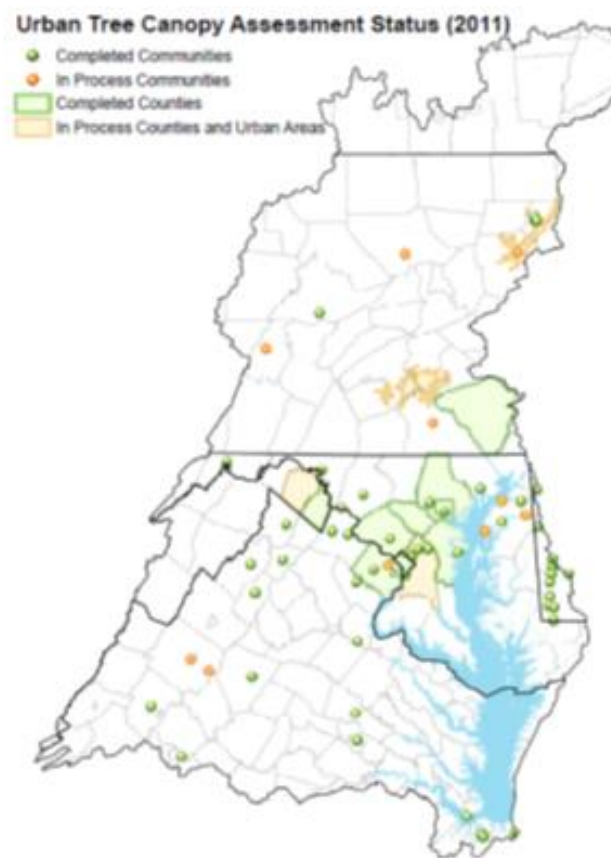


Figure 1. Urban tree canopy assessment status in the Chesapeake watershed.

Forest Harvesting BMPs   All states have adopted recommended BMPs for timber harvesting and forest management activities that have the potential to impact water quality. Consistent and reliable data on the use and effectiveness of BMPs remains the most important evidence of a State's enforcement of and compliance with the Clean Water Act. Forest harvesting BMPs are closely regulated on both public and private land in some Bay states. Other states have no accessible record of where private forests are harvested, much less what BMPs are used on those harvests. Extensive protocols are available for monitoring forest harvest BMPs, also called Silvicultural BMPs. (Welsh et al 2006, Southern Group of State Foresters 2008). Public forests in all states are usually exemplary in following these BMPs. However, roughly 95% of forest harvest is on private land.

On-site visits of harvesting operations are routinely made by agency foresters in most parts of the Bay watershed.

## Description of Principles and Protocols for Forestry BMPs

1) ***Expanded Tree Cover*** (formerly Urban Tree Planting. The name, definition, and credit for this BMP, is currently being updated, pending recommendations from an Expert Panel. )

**Draft Description:** *The primary strategies for expanding tree cover include 1) conserving existing tree cover as much as possible, 2) planting trees, and 3) allowing for natural regeneration. Credit is applied according to the number of new acres intended for tree cover.  If trees are reported as number planted (not acres, non-contiguous) a conversion factor of 100 trees = one acre of new tree cover.  Area of intended tree canopy via natural regeneration should be a minimum of ¼ acre (or adjoin to existing forest) and maintained such that after 4 years there is a density of at least 100 trees/acre (not counting invasive species).*

**There are two steps needed to realize credit for this practice:**
1) The reporting jurisdiction reports acres of new tree cover; and
2) The reporting jurisdiction verifies every 5 years that overall tree cover is being maintained/not decreasing. This is most efficiently done using aerial imagery.

> **Urban forestry partner**— a local government staff or non-governmental partner that is approved by the state forestry agency and likely to satisfy the above 4 principle bullets.

### *Expanded Tree Canopy BMP Principles*

A. *Any new acreage of tree canopy represents a **net gain** in overall tree cover for a reporting jurisdiction.  The following examples support this principle:*
- Conservation measures are in place to help maintain existing canopy.
- Monitoring and maintenance occurs on all acres of tree canopy, whether new or existing (e.g., community street trees are watered during periods of drought).
- Periodic analysis of existing tree canopy within a reporting jurisdiction is used as assurance that overall tree canopy is not decreasing.
- Ordinances protective of tree canopy.

B. *State Oversight of Local Tree Canopy Reporting*. To provide accountability, Bay state forestry agencies should audit a subset of local partners by analyzing their tree canopy records, project files, and/or 5-year assessments of overall canopy expanse. 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.

**Expanded Tree Canopy Protocol:**
**Part 1:  Establish Urban Forestry program support mechanisms**

Reporting jurisdiction has an urban forestry program (e.g., plan or partner) and therefore has more certainty of survival/net gain in tree canopy. Having a program in place will facilitate with all bullets mentioned in the Principle statement above. Land managers and tree stewards are educated about tree care and use good planting techniques.

**Part 2: Urban forestry partner tracks and reports new acres of tree canopy**

A. **For new plantings,** collect 1) acres of planting, 2) dates of planting, 3) anticipated stature of trees at maturity (e.g., large or not), and 4) whether trees are grouped together and whether the understory will be allowed to develop naturally (vs. being mowed). All plantings over ½ acre should be site-checked by partner.
B. **For natural regeneration acres**, three similar pieces of data should be recorded: 1) acres of treatment, 2) date started, and 3) whether the regeneration area adjoins existing forest. Because of the difficulty to establish tree canopy in this way, this information is reported for credit only after 4-year maintenance period. Regeneration areas can be mowed, fenced or signed as deemed necessary.

**Part 3: Urban forestry partner maintains new areas of tree canopy and samples overall canopy**

A. **New urban plantings** can have a high rate of mortality succumbing to weed suppression, dehydration, physical damage, or other injury. Removing competing vegetation is often necessary. An individually planted tree (e.g., tree pit) that dies should be replaced, or removed from the National Environmental Information Exchange Network (NEIEN) database.
B. **For natural regeneration** areas, ensure desirable tree growth is not suppressed, until a density of 100 trees/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).
C. **For existing tree canopy** within reporting area/jurisdiction, every 5 years, a locality should re-assess overall canopy (entire jurisdiction) to show that there has not been a decrease in overall canopy in that location. If tree canopy decreases, NEIEN tree canopy credit for that jurisdiction should be removed.

Use of free aerial imagery and assessment tools such as iTree Canopy (http://itreetools.org/) or the Land Image Analyst (not yet released) can be a cost-effective means of sampling and creating a quick assessment of canopy cover.

iTree Canopy is designed to allow users to easily and accurately estimate tree cover within selected jurisdiction. 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 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.

## 2) *Urban Riparian Forest Buffers*

**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.

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### 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 = √ (pq/N) (i.e., √ (0.33 x 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.

For more information on iTree Canopy and for similar directions on how to calculate Confidence Interval of 95%, go to http://www.itreetools.org/canopy/index.php.

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Verification of this practice is similar to the Expanded Tree Canopy practice (page 5). The principle and protocol are the same except for the need to focus within the riparian area of a jurisdiction.

**Partner maintains information at local level** of each new planting or regeneration area.

i. **For new plantings,** suggested data to record include: 1) location, 2) acres of planting (if appropriate) and width, 3) dates planted, and 4) whether it will be managed or allowed to develop a natural understory. (Jurisdictions need only report number of acres to NEIEN.)
ii. **For natural regeneration acres**, data to be recorded includes: 1) location, 2) acres of treatment, 3) width, and 4) date started. Naturally regenerating urban buffers should be reported after 4 years of regeneration if there are 100 or more live native trees per acre.
iii. **To demonstrate there has been no loss of urban buffer in the jurisdiction,** a similar procedure using iTree Canopy is recommended, with more points being selected in riparian areas. Other software may be equally useful in demonstrating there has not been a loss of buffer. Any known loss of urban buffer in a jurisdiction should be mitigated prior to reporting new acres of this BMP.

## 3) *Agricultural Riparian Forest Buffer*

**Description:** Agricultural riparian forest buffers are linear wooded areas along rivers, stream and shorelines. Forest buffers help filter nutrients, sediments and other pollutants from runoff as well as groundwater. The recommended buffer width for riparian forest buffers (agriculture) is 100 feet, with a 35 foot minimum width required.

**Current Procedures for Verifying Establishment of Buffers**: The vast majority of Forest Buffers and Tree Planting practices are a cost-shared conservation practices on agricultural land that are long-term in nature (once established, the practice often continues in perpetuity without need for management or maintenance) and originate with a Conservation Reserve Enhancement Program (CREP) contract. Often, more than one agency has oversight of these agriculture-tree practices including Farm Services Agency, forestry, and a technical service provider group. For simplicity, and because roles vary from state-to-state all those providing oversight are referred to as CREP partners. For instance, Farm Service Agency 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.

There are well-developed procedures on how to successfully establish a riparian forest buffer (MD DNR 2005). It starts with a planting plan usually made 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. Repeated visits are made during establishment. Sometimes replanting is necessary to comply with contractual specifications.

A minor portion of riparian forest buffers are volunteer plantings and not cost-shared. These are generally orchestrated and reported by larger, organized non-governmental organizations that regularly do this work using volunteers. Until non-cost shared buffers comprise more than 10% of the buffers being reported from a jurisdiction, no verification protocol is recommended at this time.

While the Riparian Forest Buffer practice is similar to other cost-shared agricultural practices, it differs in its Principle (new acres are a net gain in forest buffer) and the need to account for width of the buffer (not currently tracked in USDA state database summaries).

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

   a) Verify Seedling Establishment
   - FSA guidance requires that onsite spot checks be conducted on 10% of CRP/CREP contracts to confirm that the practice is established; for forest buffers, "established" means that the buffer meets the NRCS

forest buffer practice standards (practice 391) and any additional state requirements (required stocking/survival rates vary by state).

- In practice, NRCS or other technical assistance partner (e.g. state forestry) may confirm establishment on every site at the 1 or 2 year point.
- If site visits determine that practice has not yet been established, replanting occurs to get the buffer up to the standard and a site visit to confirm establishment occurs; if practice never becomes established, it is taken out of contract.

b) Verify Practice Establishment

- After practice has been reported as established, FSA has a standard program of compliance checks on a portion of all FSA contracts (CRP as well as non-conservation FSA financial assistance to farmers); the requirement is for 10% of the buffer practices are definitely checked (heard that PA FSA is not doing this spot checking due to staff limitations)
- 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 (including CREP).

## _Agricultural Riparian Buffer BMP Principle_

*Any new acreage of riparian forest buffer reported represents a **net gain** in overall buffer for a county or land-river segment.* The following examples support this principle:

- Laws or ordinances that encourage conservation of existing buffers are in place.
- Monitoring and maintenance occurs on both USDA cost share and non-cost share practices.
- Periodic sampling of existing buffers indicates that overall riparian buffer canopy in the county or watershed segment is increasing (Protocol 3 below).

**Additional Recommended Agricultural Riparian Forest Buffer Protocol**

**Part 1: Collect and review data**
   a. Reporting agency should capture width of buffer in addition to acres of practice and location (lat/long).

**Part 2: Monitor and maintain new plantings or regeneration areas, as well as existence and functioning of other riparian buffers.**

   a. Reporting agency (state forestry or watershed protection division) should establish a baseline for total riparian forest buffer acreage in a given county using high resolution aerial imagery, Land Image Analyst, or other tool. Every 10 years, the reporting agency will re-sample 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. Loss of overall riparian forest buffer coverage in these counties will result in county-wide removal of buffers reported as a "net gain" in the past 10 years.

b. Reporting agency should continue to collect volunteer planting data (non-cost shared). If a jurisdiction has more than 10% of buffers coming from volunteer plantings, these will be subject to similar verification requirements as cost-shared buffers (i.e., revisit 10% of RFB installations after one year). The responsible party for verification compliance on volunteer plantings is the project lead.

**Optional Part 3: Verification at Contract Expiration/Re-enrollment**

This protocol is recommended as an option for encouraging conservation of existing buffers to support the principle of reporting only a net gain in buffers. CRP/CREP contracts expire after 10 or 15 years, and there was a record amount of sign-ups in 2001-2007 that are due to expire. There are three likely scenarios when a contract is ending: 1) the landowner re-enrolls the buffer into another 10 or 15 year contract; the landowner does not re-enroll, but does not plan to get rid of the buffer; or 3) the landowner plans to get rid of the buffer. Actions taken now by CREP partners can translate to more buffers in each of these scenarios. Landowners have a narrow window of time the year the contract expires in which to re-enroll of which they may not be aware. To re-enroll, FSA must determine that the buffer meets the practice standards (survival/stocking rate). To facilitate the re-enrollment process, the following actions are recommended.

a. 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.
b. Acres of buffer that do not meet the practice standard or will not be retained, should be taken out of the CB model. FSA will assign a unique identifier to each project in the future so they can be tracked better and don't become double-counted with re-enrollment.
c. CREP partners conduct outreach/technical assistance to landowners with expiring contracts.

4) *__Agricultural Tree Planting__*
**Description:** Agricultural tree planting includes any tree planting, except those used to establish riparian buffers and those on non-urban land, targeting lands that are highly erodible or identified as critical resource areas.

Agricultural tree planting is a cost-shared practice under the Environmental Quality Improvement Practice. It is not a commonly reported practice to the Bay Program, however there are new and expanding opportunities through agroforestry to plant trees on agriculture 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.) For purposes of verification, this practice will follow guidelines put forth in the Agriculture

Protocols.  For tracking and crediting purposes, it is important to note that 100 trees planted equals one acre of practice (the same as for expanded urban canopy).

## 5) *Forest Harvesting BMP*

**Description:** Forest harvesting practices are a suite of BMPs that minimize the environmental impacts of logging including road building and site preparation.  These practices help reduce suspended sediments and associated nutrients that can result from forest operations.

### *Forest Harvesting BMP Principle*

Track forest harvest acres annually and apply an implementation rate for forest harvest BMPs in that state.  Public and private land harvesting operations should be tracked similarly.  If only public land harvesting is tracked, acres of BMP implementation can only be reported from those lands.

**Forest Harvesting BMP Protocol**

**Part 1—State forestry agency will submit actual number of forest harvest acres to NEIEN** if they are available, overriding the 1% harvest rate assumption made by the Bay Program.

**Part 2-- State forestry agency will submit actual acres of forest harvest BMPs** implemented to NEIEN in lieu of a sampling rate, or

**Part 3-- State forestry agency will determine average rate of implementation in a given jurisdiction** if actual acres of forest harvest BMPs are not available.  The rate of implementation should be determined every 10 years.  Forestry staff or Cooperative Extension Offices can assess the overall rate of BMP implementation in a state by using data collected directly from local forest district offices.  Harvest plan reviews provide one such record.  If the record of BMP implementation is insufficient, forestry staff should interview regional forestry staff most familiar with timber operations.  Private acres reported as using BMPs are calculated by multiplying acres being harvested by the average BMP implementation rate for a given 10-year period.

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