A Guide for Forestry Practices in the Chesapeake TMDL

Phase III WIPs

Prepared by the Forestry Workgroup, Chesapeake Bay Program Office

Latest Updates: October 2018

Contents

Introduction

Compared to developed areas and farm land, forests are a less-intensive land use and well-known to be the best for protecting water quality (EPA 2017). By absorbing and processing water from rainfall and floodplains, forests reduce erosion, excess nutrients and sediments, other pollutants, and flooding risks. Along with forest retention, best management practices (BMPs) that establish new forests are a relatively easy and effective way to restore the Bay. In addition to water quality, we know that forest BMPs provide more co-benefits (fish and wildlife habitat, recreation, air quality, human health, etc.) than most other BMPs as reflected in a recent report.

The restoration of the Chesapeake Bay watershed has required detailing the necessary BMPs to be implemented in a series of Watershed Implementation Plans (WIPs) for the Chesapeake Bay Total Maximum Daily Load (TMDL). The Phase III WIPs are due to be completed in 2019. The Forestry Workgroup created this guide early in the planning process to help localities, conservation agencies, community groups, states and others planning and implementing BMPs. Specifically, this guide demonstrates the water quality values and benefits of forest retention, tree planting, and forest harvest BMPs. It also conveys information about the various forestry and tree planting BMPs in the Chesapeake Bay Watershed Model, including the approximate amount of opportunity for a particular forestry BMP (in acres), and other relevant factors. Examples of forest BMP scenarios are provided to show partners what information is available, where to find it, and how to use it.

The forestry BMPs covered in this document are:

- Agricultural Riparian Forest Buffers
- Agricultural Tree Planting
- Urban Forest Buffers
- Urban Tree Canopy Expansion
- Urban Forest Planting
- Forest Harvest Practices
- Forest Conservation BMP (Phase 5, Maryland only)

Phase III WIP Expectations

The Watershed Implementation Plans (WIPs) are the roadmap for how jurisdictions in the Chesapeake Bay watershed will achieve water quality standards and TMDL allocations. There are three phases of WIPs; Phase I and Phase II were developed and submitted to EPA in 2010 and 2012 respectively.

EPA released its Interim Phase III WIP Expectations in January 2017, with guidance from the Chesapeake Bay partnership. When developing Phase III WIPs, states should:

- Include strategies for cooperating at the local, regional and federal levels to implement BMPs and programmatic commitments
- Consider the corollary (supplementary) benefits of targeted BMPs, outside of water quality improvements
- Develop and implement local planning goals below the state-major basin levels
- Account for changed conditions due to climate change, Conowingo Dam, and population growth and development

The partnership expects Phase III WIPs to provide a foundation for success, built on stronger local leadership and involvement, strategically aligned federal-state-local priorities, strong networks, and sufficient financial and programmatic capacity. Draft planning targets (load reductions) for Phase III were approved by the Principal Staff Committee in December 2017. Final planning targets (load reductions) for Phase III will be released by EPA and approved by the Principal Staff Committee by March 2018.

CAST, the Phase 6 Model

The new Phase 6 Chesapeake Bay Model, a.k.a. the Chesapeake Assessment Scenario Tool or CAST, was designed for groups and individuals to be able to run specific restoration and conservation scenarios according to areas of interest. For the first time, users can model restoration scenarios from their desktop and get the most accurate and up-to-date results provided by Chesapeake Bay Partnership (CBP) data.

For CAST, CBP relied on a suite of analytical models to assess what needs to be done to restore water quality and resources, show nutrient and sediment pollution from different land uses, and estimate the pollution reductions obtainable from implementing different BMPs. CAST incorporates many improvements to guide the Phase III WIPs. The latest iteration of CAST or Phase 6, went live in July 2017, and differs from Phase 5 in these notable ways:

- It represents a simplified structure supported by multiple lines of evidence, which can lead to a better understanding of the model by the stakeholder community. High-resolution imagery combined with LiDAR allows more accurate detection of land uses, adding for the first time wetland land uses and several new classes of urban land uses.
- Land uses are now denoted as load sources. Load sources are a more appropriate designation since there are loads that do not have land area (e.g., streams).
- The Phase 6 Watershed Model includes over 270 BMPs, a 23 percent increase over the BMPs simulated in Phase 5.
- BMPs must be input for an agency, load source, and a geographic location. Geographic locations can be general like a state, or specific like a hydrologic unit code (HUC).
- Phase 5.3.2 had edge-of-stream (EOS) loads for big streams (approximately a 3rd order stream or larger) and the delivered (DEL) load to the Chesapeake Bay. The new version will have edge-of-small stream loads (EOS) and the delivered load to the tidal portion of the Chesapeake Bay (EOT).
- Additional monitoring stations were added and the modeling calibration period was extended to cover all years between 1985 and 2013, resulting in a significant amount of information used to inform the calibration process.
- A number of agricultural updates have been added, including the representation of phosphorus in the landscape and rivers.

Information about pollution reduction strategies continues to be added to CAST. For instance, an optimization module was added so users can calculate the relative costs per pound of

pollution reduced for various BMPs. States can use the CAST tool at the county, state, or watershed level to view the cost-effectiveness and load reduction of specific BMPs added by acre or percent value. Jurisdictions can view the effect of adding a BMP in a specific county. The CAST homepage also hosts valuable source data including land use distribution, BMP definitions and load calculation information. Information about pollution reduction strategies continues to be added to CAST.

CAST has an "E3" (Everyone, Everywhere, Everything) scenario which can be tested against base year scenarios to determine which counties have the most opportunity for implementing certain BMPs. These can be a valuable tool for states looking to prioritize certain geographic areas.

The following information can be downloaded using CAST:

- Reports on acreage of reported/credited BMPs in any given year
- Reports comparing BMPs in an E3, No Action, or actual scenario
- County-level and state-level land use data
- Load reductions of implementing specific BMPs in a specified jurisdiction

The Importance of Forest Retention

While forest and tree retention is not a BMP per se, forests count in the watershed model as an existing, beneficial land use that has the lowest loading of nutrients and sediments. Replacement of forest land by other types of land use, especially development, increases the pollutant burden is increased and must be offset with additional BMPs that can be costly. ***The water quality benefits and cost-savings associated with retaining trees on the landscape are very significant.***

Urban centers in the watershed face some of the highest development prospects in the nation. Land conservation and planning practices should be considered when "accounting for growth" in state and local WIPs. Alternative future scenarios that account for forest retention, increased conservation efforts, and changes in zoning can be contrasted to a 2025 land growth projection

scenario (aka, no action or anticipated growth). Only new conservation and zoning changes will be considered to alter the projection of future growth. The partnership adopted a 2025 growth projection, a geospatial analysis that also projects where forest loss is likely.

Anne Arundel Forest Cover

Change in Loading for Anne Arundel County (lbs/yr)			
	1990	2013	Reduced
Nitrogen	4,337,653.11	3,858,558.10	479,095.01
Phosphorus	399,869.34	282,073.70	117,795.64
Sediment	255,467,814.41	234,758,857.46	20,708,956.95

Anne Arundel County projected that forest loss to 2025 would mean an additional 62,009 lbs/year of Nitrogen, 5,975 lbs/year of phosphorus, and 2,381,098 lbs/year sediment.

A recent study conducted by the Virginia Department of Forestry, the Healthy Watersheds Goal Team, and others found that scenarios that retained forest in the Rappahannock River basin saved the region $125 million by avoiding the need for watershed restoration practices.

In Phase 5 of the model, there is a BMP called Forest Conservation. This is different than having permanently protected forests and also different from forest retention. More on the Forest Conservation BMP can be found on page 18, but since there is now a Forest Planting BMP in Phase 6, and better accounting of forests and growth projections, the Forest Conservation BMP used in Phase 5 is likely to be phased out.

Forecasting Land Use

In December 2017, the Principal Staff Committee agreed to use a simulated 2025 forecast of land use conditions as the basis for Phase 3 WIPs. In this way, the jurisdictions must account for growth and work against this by employing conservation policies. States can learn where and how much forest land is projected to be lost by using CAST. This information is also available on USGS's high-resolution land use viewer and is available in tabular form. By electing to use the 2025 forecasted land use, CBP has essentially provided a financial incentive to conserve and retain forests through improved zoning by state and local governments, land acquisition, or conservation easements. States will benefit from retaining as much forested land as possible, as well as high-value forests such as those in riparian areas.

We can use the current land use and 2025 projected land use to predict that Spotsylvania County, VA will face a much higher forest loss than Hanover County, VA in the example below.

Example: Forest Loss Acres Projected in Two Virginia Counties

County	**Forested Acres (2013)**	**Forested Acres (projected 2025)**	**Forest Loss 2013-2025 (Ac)**	**% Forest Loss 2013-2025**

Spotsylvania (VA)	172,396	160,357	12,039	6.9%
Hanover (VA)	161,446	160,682	764	0.4%

*These data are presented as an example of forecasting of current development trends. Actual forecasted numbers in CAST may have changed.

Relative Forest Value

Retaining all forest land cover in the Chesapeake Bay watershed has environmental value, however, in the context of bay water quality restoration, forested acres vary in nutrient and sediment trapping capability depending on their location and composition. Figure 2 illustrates one important variable, the amount of pollution that would result if forests in certain parts of the watershed are lost. States and localities will want to prioritize these high-value acres in their WIPs, and work on retaining all forests for their multiple benefits. This is a visual representation of the relative benefit of forest retention that can be more accurately calculated in CAST.

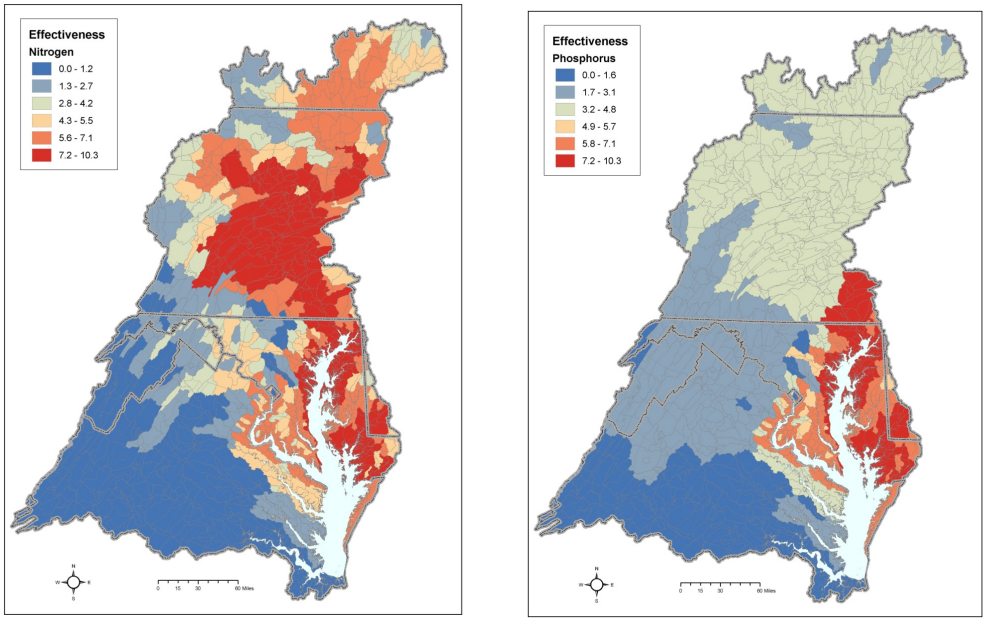


Figure 2. Maps showing relative effect of forest retention on Bay water quality. Map on left shows how nitrogen pollution would increase if certain forests are lost; map on right shows how phosphorus pollution would be affected (Draft data from Jeff Sweeney, EPA).

Tools for Limiting Growth

Some local governments in the watershed have implemented policies to limit growth or direct it away from forested lands. These policy tools can include a Transfer and Purchase of Development Rights, in which development is capped but developers can purchase rights from landowners who chose to conserve their forest. A June 2017 report from the Chesapeake Bay Trust, entitled "Conservation Land-Use Policy Toolkit," lays out different policy options for conserving valuable land, including forests. Other policy tools to help retain forests in Virginia and Pennsylvania are described in a recent report on Healthy Forest Retention Study by the Virginia Department of Forestry. Jurisdictions should use these and other resources to identify effective options for limiting growth and development.

Agricultural Forestry BMPs

Riparian Forest Buffers (Agricultural)

Riparian Forest Buffer	
Definition:	Forest buffers are linear wooded areas that help filter nutrients, sediments and other pollutants from runoff as well as remove nutrients from groundwater. The recommended buffer width is 100 feet, with a 35 feet minimum width required. Enter units of acres or percent of acres.
Efficiency Credited	Land use change to forest, woodland, and wooded (for) and a reduction efficiency for upland areas. 4:1 for N; 2:1 for P/SS
Effectiveness Estimate	TN: 19–65% TP: 30–45% TSS: 40–60%
Credit Expiration	15 years and then it needs to be verified and re-entered
Total Annual Cost per Acre (Watershed-wide avg.)	$99.53

Description

A forest buffer can be 35-300' according to the Standard Practice of the Natural Resources Conservation Service Conservation Practice Standard (Practice 391). All of these buffers (with minimum 35' width) receive the full efficiency in the CBWM. The average forest buffer width currently being restored in the Bay watershed is 101 feet (CBP unpublished).

Riparian Forest Buffers are one of the most important BMPs for restoring the Chesapeake Bay. Except for Maryland, the other 5 Bay states set very high targets in Phase II WIPs in 2012 and did not come close to reaching those targets through 2017.

Difference Riparian Forest Buffers Made in 2013 from CAST (lbs/year)*	
Nitrogen	3,100,761
Phosphorus	159,690
Sediment	190,826,673
*Actual Progress through 2013 of 71,843 acres of RFB showing pounds reduced at edge-of-stream	

Because of the importance of this practice, in 2015, the Principal Staff Committee appointed a Riparian Forest Buffer lead for each state (see table below). These leads have been given responsibility for coordination among the various partners and agencies involved with delivering riparian forest buffer programs so that goals can be met. More on the importance and challenges of implementing this practice can be found in Buffering the Bay.

Forest Buffer Leads by Bay State

Delaware— Marcia Fox (302-739-9922)	Pennsylvania—Matt Keefer (717-214-3814)
New York— Lauren Townley (518) 402-8283)	Virginia— Greg Evans (703-470-8129)
Maryland— Anne Hairston-Strang (410-260-8509)	West Virginia—Herb Peddicord (304-229-2665)

Agriculture Narrow Buffer

Narrow Buffer Strips (between 10- 35' wide) are a distinct practice, separate from riparian forest and riparian grass buffers of 35' and greater. These strips receive the benefit of land-use change only—without the additional upland benefits provided a regular buffer. (Phase 5.3. of the model allows this practice but labels it as a land retirement or tree planting practice.) Narrow forest buffer are linear strips less than 35' wide of wooded areas maintained on agricultural land between the edge of fields and streams, rivers or tidal waters and help filter nutrients, sediment and other pollutants from runoff.

Progress and Opportunity

States can plant agricultural buffers on land adjacent to streams and rivers, commonly these land uses are crop, mixed open and pasture. States should conserve natural buffers (i.e., forests and wetlands) whenever possible because only the net gain in total buffers receives water quality credit.

RFB Restoration Progress reported (2016)

State	Acres of RFB Planting
DE	0
MD	266
NY	721
PA	6955
VA	560
WV	79

The sensitive and limited riparian area should receive careful consideration and planning. By consulting E3 ("everyone, everywhere, everything") estimates, partners have a better idea than ever of the total amount of riparian area that could be restored. Collectively, Bay state WIPs from Phase II promised more acres of forest buffer restoration than was available (i.e., higher than an E3 scenario). A breakdown by county of potential acres of agricultural land that could be planted to riparian forest buffers can be accessed through CAST and is also available in tabular form.

Example: Land Use in 30m Buffer Zone in West Virginia Counties

County Name	Total Area 30m	Crop	Mixed Open	Pasture	Natural 30m (Ac)
Hardy	46944	1271	1183	5431	33878

Jefferson	15453	1962	1149	2489	5595
Mineral	24805	746	373	4083	16552

E3 Potential

The E3 Scenarios in CAST can show how much opportunity (in acres) for Forest Buffer restoration exists by county. See example below of forest buffer opportunity in Delaware.

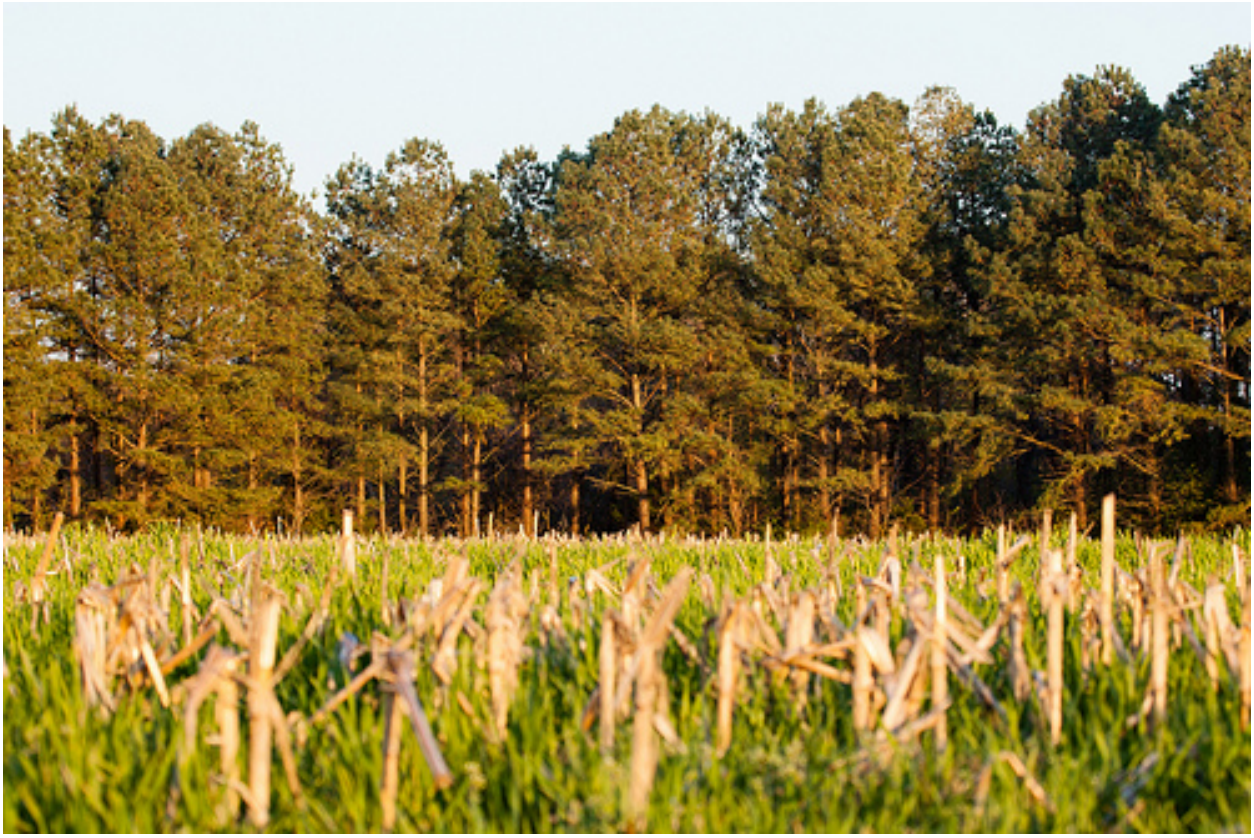
County Name	**Buffer Acres (2013)**	**Buffer Acres (E3)**	**Opportunity (ac)**
Kent	402	6038	5636
New Castle	44	2141	2097
Sussex	902	9328	8426

Tree Planting (Ag)

Agricultural Tree Planting	
Definition:	Tree planting includes any tree planting, except those used to establish riparian forest buffers, targeting lands that are highly erodible or identified as critical resource areas.
Efficiency Credited	Land use change to forest
Effectiveness Estimate	N/A
Credit Expiration	10 years and then it is picked up as Land Use
Total Annual Cost per Acre (Watershed-wide Avg.)	$70.72

Description

Agricultural tree planting can be one or many trees. Lands that are highly erodible or identified as critical resource areas are good targets for tree planting and can save money for farmers and improve soil while they improve water quality. In 2016, 93,000 acres of trees on agricultural land occurred in MD, PA and VA alone. This represents over 9 million trees.



Progress and Opportunity

Agricultural Tree Planting Progress reported (2016)

State	Acres of Ag Tree Planting
DE	579
MD	19,498
NY	1,985
PA	43,739
VA	29,745
WV	5,623

States should work with landowners to identify areas of agricultural land that can most benefit from tree planting.

Virginia Example of N, P, and Sediment Reductions

	Nitrogen	Phosphorus	Sediment
Ag Tree Planting of 29,745 acres	389,900	19,000	16,744,200

Forest Harvest BMPs

Forest Harvest BMPs

Forest Harvest BMPs	
Definition:	Practices to reduce the impact of logging operations
Effectiveness Estimate	TN: 50% TP: 60% TSS: 60%
Credit Expiration	3 years and then land use reverts to forest from Harvested Forest
Total Annual Cost per Acre (Watershed-wide Avg.)	$64.01

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 (see above for credit). CAST 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.

Progress and Opportunity

Reporting of Forest Harvest BMPs has been sporadic, with many states not reporting their acreage. States should attempt to report their BMP progress so that it is credited in CAST.

Forest Harvest BMP Acres Reported (2016)

State	For Harv BMP Acres
DC	0
DE	2,782
MD	13,873
NY	0
PA	16,131
VA	60,800
WV	17,742

Most states do periodic monitoring of Forest Harvest BMPs to determine the rate of their implementation. The rate can be applied to acres of forests harvested in lieu of actual acres of forest harvesting BMPs because these data are not readily available from private lands on an annual basis.

State	Total Forest (Ac)	Estimated Acres Harvested (Annual)	BMP Implementation Rate
MD	2,124,760	21,247	88%
DE	92,767	927	93%
VA	8,691,940	86,919*	96.8%*
PA	8,408,841	84,088	N/A
WV	1,655,944	16,559	N/A
NY	2,291,597	22,915	N/A

*Virginia reports actual acres of forest harvest and forest harvest BMPs.

New York Harvest BMPs

2013 New York Forest Harvests of 15,000 Acres (lbs/yr)			
	No forest harvest BMPs	2013 after 15,000 ac harvest	Change
Nitrogen	89,659,062.14	89,571,593.96	87,468.18
Phosphorus	6,416,088.42	6,413,264.54	2,823.88
Sediment	17,385,095,549.26	17,375,720,460.87	9,375,088.39

Urban Forestry BMPs

Urban Forest Buffers

Urban Forest Buffer	
Definition:	Forest buffers are linear wooded areas that help filter nutrients, sediments and other pollutants from runoff as well as remove nutrients from groundwater. The recommended buffer width is 100 feet, with a 35 feet minimum width.
Efficiency Credited	Land conversion to forest, and 1:1 load reduction (every acre of urban forest buffer converted, receives an efficiency credit on one upland acre): TN: 25%, TP: 50%. TSS: 50%
Total Annual Cost per Acre (Watershed-wide Avg.)	$86.17
Narrow Buffers Only (Urban)	Linear strips of wooded areas between 10 and 35 feet in width.
Efficiency Credited	Land conversion to forest only

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 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.

Progress and Opportunity

Urban Forest Buffers BMP Acres Reported in 2016 (from BayTAS)

State	Urban Forest Buffer Acres
DC	0
DE	0
MD	977
NY	61
PA	260
VA	78
WV	29

Urban forest buffers are typically planted on existing turf grass that is adjacent to a river or stream. From the new high resolution land cover data, the Bay Program has a good idea how many acres of riparian (streamside) turf are available for planting urban forest buffers. For instance, in Delaware, Sussex County has the highest opportunity for this BMP (see below). States should look to conserve the “Natural” land in the riparian zone because loss of these existing buffers will result in additional pollutant loading that has to be managed. Land use data can be accessed in the spreadsheets in the attached document “State Tree Cover and Buffer Data.”

County Name	Total Area 10m	Turf Grass (10m)	Natural 10m (Ac)
Kent	7927	470	4931
New Castle	1514	73	896
Sussex	18792	1238	11129

E3 Potential

By generating a CAST "BMP Summary Report" comparing the "2013 Progress" and "E3 with Allocated Air" scenarios, states can find out the most opportune counties in which to place certain BMPs. For example, a report on Kent, Sussex, and New Castle Counties in Delaware tells us that, of these, Sussex has the most opportunity for Urban Forest Buffers, with 1694 acres possible in a 10m E3 scenario. The E3 number is higher than the turf grass number because it includes other land use categories such as 'mixed open.'

BMP	unit	New Castle		Sussex		Kent	
		2013	E3	2013	E3	2013	E3
Urban Forest Buffers	acres	0	1366	0	1694	0	1140

Urban Tree Canopy Expansion

Urban Tree Canopy Expansion	
Definition:	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.
Efficiency Credited	Land use change to Tree Canopy land uses
Credit Expiration	10 years and then it is picked up as land use
Total Annual Cost per Acre (Watershed-wide Avg.)	$66.75
Reference	Expert Panel Report

Description

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.

Progress and Opportunity

Urban Tree Canopy Expansion BMP Acres Reported in (2016)

State	Acres of New Tree Canopy
DC	623
DE	114
MD	1606
NY	0
PA	98
VA	9
WV	215

Urban Tree Canopy can be planted in areas of turf grass. In Pennsylvania, for example, Lancaster County has a greater amount of turf available for Urban Tree Canopy Expansion than Lebanon or Luzerne Counties (see below). *States should ensure that tree canopy expansion does not occur at the expense of forest.*

Example: Turf grass acres in select Pennsylvania counties

County Name	Total Area (ac)	Acres of Tree Canopy Over Impervious(TCI)	Acres of Tree Canopy Over Turf (TCT)	Total Turf (ac)
Lancaster	627599	4705	23759	99662
Lebanon	197724	1292	6064	22732
Luzerne	494988	3874	17268	31091

Urban Forest Planting

Urban Forest Planting	
Definition:	Urban forest planting includes trees planted in a contiguous area to establish forest-like conditions, with no fertilization and minimal mowing as needed to aid tree and understory establishment. Required planting and maintenance plan that meets State or District standards for forest establishment
Efficiency Credited	Land use change to Forest
Credit Expiration	10 years and then it is picked up as land use
Total Annual Cost per Acre (Watershed-wide Avg.)	$82.57
Reference	Expert Panel Report

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, and 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.

Progress and Opportunity

Urban Forests are usually planted on turf grass. See chart below for total acres of turf in developed land available using Delaware as an example. Information for other states is provided in attached database file.

Acres available for Urban Forest Planting in Delaware (E3)

County Name	**Total Area**	**Total Turf (Ac)**
Kent	129866	10742
New Castle	29250	4421
Sussex	294557	26817

Urban Tree Canopy Expansion v Urban Forest Planting in Delaware (Chart shows additional benefit of doing urban forest planting on same acreage (in lbs/year, edge-of-stream by 2025)

	Additional Reductions from Urban Forest Planting
Nitrogen	11,853 lbs/year
Phosphorus	990 lbs/year
Sediment	142,219 lbs/year

Forest Conservation BMP (Maryland only)

Description

The forest conservation BMP applies only to Maryland at this time. It is not merely the protection of forests. This BMP exists because of the Maryland Forest Conservation Act that requires developers to maintain at least 20% of a development site in trees (forest condition). This is actually a preventative type of BMP which alters the rate of urban conversion. The acreage is calculated from the annual urban increase (population based).

The 20% is specific to the Maryland Act and could be different for each jurisdiction or various locations within a jurisdiction.

Regulatory Framework

The Forest Conservation BMP requires a regulatory framework such as Maryland's Forest Conservation Act. Other localities may have regulatory frameworks, but they must establish that they have not been losing forests at the expected rate.

BMP Cost Information

Average Forestry BMP Costs

BMP Name	Total Annualized Cost per Acre
Forest Buffer (Agriculture)	$99.53
Tree Planting (Agriculture)	$70.72
Forest Harvesting Practices	$64.01
Forest Buffer (Urban)	$86.17
Urban Tree Canopy Expansion	$66.75
Urban Forest Planting	$82.57
Forest Conservation	$0

CAST gives states the opportunity to assess the costs per unit of each specific BMP. Cost information in CAST varies by state. This information was gathered by the CBP and cross-checked with state representatives. In the model, **costs can be altered if a value is assessed to be inaccurate**. To access their own state cost profile, states should downloads reports from the "Cost Profile" tab on the CAST website.

For example, in Delaware, the total annualized cost/acre of all forest-related BMPs is below:

BMP Name	Total Annualized Cost per Acre
Forest Buffer (agriculture)	$28.90
Tree Planting (agriculture)	$19.25
Forest Harvesting Practices	$64.01
Forest Buffer (urban)	$26.81
Urban Tree Canopy Expansion	$11.75
Urban Forest Planting	$133.58

On agricultural land, the riparian forest buffer BMP has a higher cost when placed in pasture since exclusion fencing is necessary. Also, state costs vary because of the way the practice is implemented and the opportunity costs.

Optimization

Optimization tools are currently shown on the CAST homepage. States should use their existing information about pounds of nutrients reduced per acre of forest BMPs to calculate the most cost-effective BMP in their state.

Reporting and Verification

All BMP information submitted to the Chesapeake Bay Program Office must be compatible with National Environmental Information Exchange Network (NEIEN) protocols. See more information at the TMDL Tracking page on the CAST website.

Reporting Contacts

The state contacts for tracking and reporting nonpoint source BMPs are as follows:

Jurisdiction	Name	Office	Email	Phone
New York	Sara Latessa	NY DEQ	sara.latessa@dec.ny.gov	518-402-8279
Pennsylvania	Ted Tesler	PA DEP	thtesler@state.pa.us	717-772-5621
Maryland	Greg Sandi	MDE	gregorio.sandi@maryland.gov	410-537-3742
Delaware	Marcia Fox	DNREC	marcia.fox@state.de.us	302-739-9922
District of Columbia	Martin Hurd	DOEE	martin.hurd@dc.gov	202-299-3344
Virginia	Bill Keeling	VA DEQ	william.keeling@deq.virginia.gov	804-698-4342
West Virginia	Alana Hartman	WV DEP	alana.c.hartman@wv.gov	304-993-6814

Verification Guidelines

The Forestry Workgroup developed Verification Guidance for the Bay Program partners. State forestry BMP verification protocols were developed from the Guidance and excerpts of these were shared with the Forestry Workgroup. This document was pulled together to heighten awareness of what level of verification states are requiring. All BMPs reported in 2018 are expected to be verified.

References

Expert Panel Report on Agricultural Buffers

Expert Panel Report on Tree Canopy Expansion and Urban Forest Planting

CAST Source Data

EPA's Phase III WIP Expectations

BMP Tracking and Reporting Leads