Chesapeake Bay Program Best Management Practices

Agriculture BMPs – Approved for CBP Watershed Model

BMP	Description	Units	Nitrogen Efficiency	Phosphorus Efficiency	Sediment Efficiency	Cost
Animal Waste Management System – Livestock	Animal Waste Management Systems are designed for the proper handling, storage, and utilization of wastes generated from animal confinement operations and include a means of collecting, scraping, or washing wastes from confinement areas into appropriate waste storage structures. Lagoons, ponds, or steel or concrete tanks are used for the treatment and/or storage of liquid wastes, and storage sheds or pits are common storage structures for solid wastes. Landuse applied to: manure acre Reductions per system = system AEU's/145 times manure acre loading rate times reduction efficiency** (see footnote)	AEU's*	75%	75%	N/A	
Animal Waste Management System – Poultry	Animal Waste Management Systems are designed for the proper handling, storage, and utilization of wastes generated from animal confinement operations and include a means of collecting, scraping, or washing wastes from confinement areas into appropriate waste storage structures. Landuse applied to: manure acre Reductions per system = system AEU's/145 times reduction efficiency** (see footnote)	AEU's*	14%	14%	N/A	

BMP	Description	Units	Nitrogen Efficiency	Phosphorus Efficiency	Sediment Efficiency	BMP Implementation
Barnyard Runoff Controls - With Storage & Without Storage	This practices includes the installation of practices to control runoff from barnyard areas. This includes practices such as roof runoff control, diversion of clean water from entering the barnyard and control of runoff from barnyard areas. Use the first percent efficiency if controls are installed on an operation with a manure storage; and the second percent if the controls are installed on a loafing lot without a manure storage. The sediment efficiency has not been incorporated into the current watershed model but will be included in the updated model that is under development at this time. Landuse applied to: manure acre Reductions = Total animals using barnyard (counted as AEU's)/145 times manure acres loading rate times reduction efficiency.	Acres/ AEU's	10%/20%	10%/20%	40%	
Carbon Sequestration	Carbon Sequestration refers to the conversion of cropland to hay land (warm season grasses). The hay land is managed as a permanent hay land providing a mechanism for sequestering carbon within the soil. (Note: this practice has not be incorporating into the watershed model nor has specifications been developed for its use as an approved BMP) Landuse conversion: conventional till and conservation till to hayland Reduction = original landuse loading rate – hayland loading rate times total acres converted. (Temporary reduction methodology not officially approved for use)	Acres	Landuse Conversion	Landuse Conversion	Landuse Conversion	
Cereal Cover Crops	Cover crops grown to provide winter cover of cropland, non-harvested Landuse applied to: conventional till and conservation till	Acres	Convent. Till Early - 45% Late --- 30%	Convent. Till Early - 15% Late --- 7%	Convent. Till Early - 20% Late --- 10%	

BMP	Description	Units	Nitrogen Efficiency	Phosphorus Efficiency	Sediment Efficiency	BMP Implementation
Cereal Cover Crops (cont)	Reduction = landuse loading rate times total acres planted times reduction efficiency. Efficiency varies by when planted. If planted up to 7 days prior to published first frost date use early value. If planted up to 7 days after published first frost date use late value.		Conserv. Till Early – 45% Late – 30%	Conserv. Till Early – 0% Late – 0%	Conserv. Till Early – 0% Late – 0%	
Commodity Cereal Cover Crops	Commodity cover crops grown to provide winter cover of cropland, harvested. Landuse applied to: conventional till and conservation till Reduction = landuse loading rate times total acres planted times reduction efficiency. Efficiency varies by when planted. If planted up to 7 days prior to published first frost date use early value. If planted up to 7 days after published first frost date use late value.	Acres	Convent. Till Early - 25% Late --- 17% Conserv. Till Early – 25% Late – 17%	Convent. Till Early - 0% Late --- 0% Conserv. Till Early – 0% Late – 0%	Convent. Till Early - 0% Late --- 0% Conserv. Till Early – 0% Late – 0%	
Conservation Plans (Farm Plans)	This is a comprehensive plan that addresses natural resource management on agricultural lands and utilizes best management practices that control erosion and sediment loss and manage runoff. These plans include conservation tillage, crop rotations and structural practices such as grassed waterways, sediment basins and grade stabilization structures. Landuse Applied to: conventional till, conservation till, hayland and pasture Reductions = landuse loading rate times acres of BMP implemented times landuse percent efficiency.	Acres	Convent. Till - 8% Conserv. Till - 3% Hayland 3% Pasture 20%	15% 5% 5% 10%	25% 8% 8% 14%	
Conservation Till	Conservation Tillage involves planting and growing crops with minimal disturbance of the surface soil. No-till farming is a form of conservation tillage in which the crop is seeded directly into vegetative cover or crop residue with no disturbance of the surface soil. Minimum tillage farming involves some disturbance of					

BMP	Description	Units	Nitrogen Efficiency	Phosphorus Efficiency	Sediment Efficiency	BMP Implementation
Conservation Till (cont.)	the soil, but uses tillage equipment that leaves much of the vegetative cover or crop residue on the surface. Landuse conversion – conventional till to conservation till Reductions = conventional till loading rate minus conservation till loading rate times total acres converted Note: Through 2002 progress reporting, the amount of conservation-tilled land for Pennsylvania has been based on data acquired by the Chesapeake Bay Program from the Conservation Technology Information Center (CTIC). The CTIC provides an estimate of the amount of conservation-tilled acres by year. PA has not reported this practice as a BMP and has deferred to the CTIC data.	Acres	Landuse conversion	Landuse conversion	Landuse conversion	
Nutrient Management-Agriculture	Nutrient Management is a comprehensive plan that describes the optimum use of nutrients to minimize nutrient loss while maintaining yield. These plans detail the type, rate, timing, and placement of nutrients for each crop. Landuse applied to: conventional till, conservation till and hay The reductions associated with implemented nutrient management plans are computed by the model for each model run. Reductions vary by landuse and by model segments and range between 20 to 30 percent.	Acres	Built into model simulation	Built into model simulation	Built into model simulation	
Phytase Feed Additives – Poultry	Use of Phytase as a poultry feed to reduce phosphorus concentrations in poultry litter. Reduction applies as a change in manure phosphorus content. This practice is currently being credited	AEUs	N/A	16%-26%	N/A	

BMP	Description	Units	Nitrogen Efficiency	Phosphorus Efficiency	Sediment Efficiency	BMP Implementation
	automatically in all model assessment runs					
Retirement of Highly Erodible Land	Retirement takes marginal and highly erosive Agricultural land cropland out of production by planting permanent vegetative cover such as shrubs, grasses, and/or trees. Land retired and planted to trees would be reported under the "tree planting" BMP Landuse conversion: conventional till and conservation till conversion to mixed open landuse Reductions = original landuse loading rate minus mixed open landuse loading rate times total acres converted	Acres	Landuse Conversion	Landuse Conversion	Landuse Conversion	
Riparian Forest Buffers – Agriculture	Riparian Forest Buffers are linear wooded areas planted along rivers and streams. Reduction credits for riparian include both a percentage reduction and a landuse credit for the acres of trees planted Landuse conversion: conventional till, conservation till, hayland or pasture to forest land Reductions = original landuse loading rate minus forest loading rate times acres of total acres converted Plus: Upland landuse loading rate time's total acres treated times percent efficiency. For nitrogen every 435.6 linear feet of buffer is estimated to treat 5 upland acres of land and for phosphorus and sediment every 435.6 linear feet of buffer is estimated to treat 2 upland acres of land (100 foot buffers).	Acres	Landuse Conversion Plus	Landuse Conversion Plus	Landuse Conversion Plus	

BMP	Description	Units	Nitrogen Efficiency	Phosphorus Efficiency	Sediment Efficiency	BMP Implementation
Riparian Forest Buffers – Agriculture (cont.)	Upland landuse efficiency varies by hydrologic setting as follows: Appalachian Plateau Blue Ridge Mesozoic Lowlands Piedmont – Carbonate Piedmont – Crystalline Valley and Ridge – Carbonate Valley and Ridge - Silicicastic		 60% 45% 70% 45% 60% 45% 44%	 60% 50% 70% 50% 60% 50% 45%	 60% 50% 70% 50% 60% 50% 45%	
Riparian Grass Buffers	Grassed Buffers are linear strips of maintained grass or other non-woody vegetation between the edge of fields and streams, rivers or tidal waters. Reduction credits for riparian grass buffers include both a percentage reduction and a landuse credit for the acres of trees planted Landuse conversion: All landuses except manure acre and developed land converted to mixed open Reductions = Original landuse loading rate minus mixed open loading rate times total number of acres planted. Plus: Upland landuse loading rate time's total acres treated times percent efficiency. For nitrogen every 435.6 linear feet of buffer is estimated to treat 5 upland acres of land and for phosphorus and sediment every 435.6 linear feet of buffer is estimated to treat 2 upland acres of land (100 foot buffers). Upland landuse efficiency varies by hydrologic setting as follows: Appalachian Plateau	Acres	Landuse Conversion Plus 41%	Landuse Conversion Plus 60%	Landuse Conversion Plus 60%	

BMP	Description	Units	Nitrogen Efficiency	Phosphorus Efficiency	Sediment Efficiency	BMP Implementation
	Blue Ridge Mesozoic Lowlands Piedmont – Carbonate Piedmont – Crystalline Valley and Ridge – Carbonate Valley and Ridge – Silicicastic		31% 48% 31% 41% 31% 37%	50% 70% 50% 60% 50% 65%	50% 70% 50% 60% 50% 65%	
Rotational Grazing/ Grazing Land Protection with Stream Fencing	This practice involves dividing pasture areas into cells or paddocks. Each paddock is intensively grazed for a short period, and then allowed to rest and recover before being grazed again. The amount of time each cell is grazed and then rested relates to the time of year, quality of the forage and the growth stage of the forage. Landuse applied to: pasture Reductions = Pasture land loading rates times acres of pasture with rotational grazing times percent efficiency. A second reduction is calculated to account for the portion of land between the installed fence and the stream that is no longer pastured. This reduction is calculated as landuse conversion of pasture to mixed open land Reductions = pasture loading rate minus mixed open land loading rate times total aces excluded.	Acres 0f grazed land and Acres of excluded Land	20% and Landuse Conversion	20% and Landuse Conversion	20% and Landuse Conversion	
Stream Protection with Fencing and with Off-Stream Watering	Stream protection with fencing involves the fencing of narrow strips of land along streams to completely exclude livestock. The fenced areas may be planted to trees or grass. Landuse applied to: pasture Percent efficiency reductions = upland landuse loading	Length of Fence and	60% and	60% and	75% and	

BMP	Description	Units	Nitrogen Efficiency	Phosphorus Efficiency	Sediment Efficiency	BMP Implementation
Stream Protection w/ Fencing and Off-Stream Watering cont.)	rate times total acres treated times percent efficiency (for this calculation every 208 linear feet of buffer is estimated to treat two upland acres of land) A second reduction is calculated to account for the portion of land between the installed fence and the stream that is no longer pastured. This reduction is calculated as a landuse conversion of pasture to mixed open land Reductions = pasture loading rate minus mixed open loading rates times total acres excluded	Acres of Excluded Land	Landuse Conversion	Landuse Conversion	Landuse Conversion	
Stream Protection without Fencing with Off Stream Watering	This option involves the use of troughs or "watering holes" in remote locations away from streams, as well as the placement of stream crossings. Stream crossings usually have some length of fencing adjacent so that livestock will not bypass the crossings. In some instances, trees are planted away from the stream to provide shade for the livestock. The protected area acts as a buffer between stream and livestock. Landuse applied to: pasture Percent efficiency reductions = upland landuse loading rate times total acres treated times percent efficiency (for this calculation every 208 linear feet of protected area is estimated to treat two upland acres of land)	Acres	30%	30%	38%	
Tree Planting	Reforestation practices or planting of trees that are not classified as riparian forest buffers. Planted trees are considered permanent.	Acres	Landuse Conversion	Landuse Conversion	Landuse Conversion	

BMP	Description	Units	Nitrogen Efficiency	Phosphorus Efficiency	Sediment Efficiency	BMP Implementation
	Landuse conversion: any combination of conventional till, conservation till, hayland, pasture, mixed open, and pervious developed land to forest Reductions = original landuse loading rate minus forest loading rate times number of acres planted					
Wetlands – Ag land	Wetland Restoration is the reestablishment of wetlands on agricultural lands where they used to exist. Restored wetlands may be any wetland classification including forested, scrub-shrub or emergent marsh. Landuse conversion: conventional till, conservation till, hay or pasture to forest Reductions = original landuse loading rate minus forest loading rate times acres converted. Plus: Upland landuse loading rate time's total acres treated times percent efficiency. For nitrogen every 435.6 linear feet of buffer is estimated to treat 5 upland acres of land and for phosphorus and sediment every 435.6 linear feet of buffer is estimated to treat 2 upland acres of land (100 foot buffers). Upland landuse efficiency varies by hydrologic setting as follows: Appalachian Plateau Blue Ridge Mesozoic Lowlands Piedmont – Carbonate Piedmont – Crystalline	Acres	Landuse Conversion plus 60% 45% 70% 45% 60%	Landuse Conversion Plus 60% 50% 70% 50% 60%	Landuse Conversion Plus 60% 50% 70% 50% 60%	

BMP	Description	Units	Nitrogen Efficiency	Phosphorus Efficiency	Sediment Efficiency	BMP Implementation
	Valley and Ridge – Carbonate Valley and Ridge - Silicicastic		45% 44%	50% 45%	50% 45%	
Yield Reserve	Agricultural Yield Reserve programs are intended to provide incentives through yield insurance for crop losses to farmers who apply nitrogen and phosphorus at levels below their recommended application rates. Participating farmers would be paid to apply 15 percent to 25 percent less nutrients on crops than is recommended in their Nutrient Management Plan. Landuse applied to: conventional till and conservation till Reductions estimated for using watershed model simulations. An approved reduction methodology has not been developed. Efficiency varies by landuse and model segment.	Acres	15%-25%	15%-25%	N/A	
Agriculture BMPs – CBP Watershed Model approval pending						
Advanced No-Till	Advanced No Till involves planting and growing crops with minimal disturbance of the surface soil. No-till farming is a form of conservation tillage in which the crop is seeded directly into vegetative cover or crop residue with minimal or no disturbance of the surface soil. To qualify as advanced no-till, a minimum of 50% crop residue must be maintained. Landuse applied to: Conservation tillage Reductions = conservation till loading rate times total acres of advanced no-till times reduction efficiency	Acres	N/A	35%	35%	

BMP	Description	Units	Nitrogen Efficiency	Phosphorus Efficiency	Sediment Efficiency	BMP Implementation
Ammonia Emission Controls	This practice involves a reduction in livestock housing ammonia emissions through use of capture or control technologies. Currently, ammonia emission controls will focus on poultry, swine and dairy production. Landuse applied to: N/A – results in a reduction in nitrogen emissions and subsequent air deposition Emission Reductions = Animal Equivalent Units (AEU) within the housing facility times the reduction in pounds per AEU. Reductions apply to nitrogen only. The watershed model will simulate reductions in deposition and subsequent delivered loads.	Reductions per AEU	Nitrogen Reductions Only Poultry - Layers Belt house – 5.31 lbs/yr High Rise – 38.16 lbs/yr Poultry Broilers – 1.68 lbs/yr Swine Finishers – 19.22 lbs/yr Producers – 4.79 lbs/yr Dairy – 2.96 lbs/yr	N/A		
Horse Pasture Management	Use of rotational grazing practices to minimize nutrient and sediment loss from equine pastures. Practices may include streambank fencing, cross fencing to create paddock areas, off-stream watering structures and stabilization of heavy use areas. This practice assumes 5 acres per AEU is available for full pasturage based operations and 2 acres per AEU for limited pasturage operations that include stabilized heavy use aeas or roofed shelters in additional to rotational paddocks. Landuse applied to: mixed open – within the current	Acres	20%	20%	20%	

BMP	Description	Units	Nitrogen Efficiency	Phosphorus Efficiency	Sediment Efficiency	BMP Implementation
	watershed model, horse pasture areas are not included in the agricultural pasture acres, but are accounted for within the mixed open landuse category Reductions = mixed open loading rate times efficiency times acres of horse pasture being managed.					
Managed Precision Agriculture	Use of multiple management systems beyond standard nutrient management practices to further minimize nutrient loses. This practice identifies variables such as soil types, weather conditions and yield data to more specifically apply and vary nutrients within field areas. Landuse applied to: conventional till and conservation till Reductions associated with implemented managed precision agriculture are computed by the watershed model for each model run. Reductions vary by landuse and by model segments and vary between 25% to 38%.	Acres	An Additional 15% over regular Nutrient Management	An Additional 15% over regular Nutrient Management	An Additional 15% over regular Nutrient Management	
Manure Transport	Transport of livestock manure from areas of high concentration to areas of low concentration, or the transport of manure out of the Chesapeake Bay watershed. Because of the difficulty in tracking manure transport and possible transportation issues, this practice has not been considered in the nutrient reduction strategy at this time.	Tons				
Mortality Composter	Composting of mortality carcasses for future land application as a nutrient source. Animal manure is typically used as a nitrogen and carbon source to aid in the composting process. Facilities utilize roof structure and stabilized surface pads to prevent nutrient loses.	AEU	14%	14%	N/A	

BMP	Description	Units	Nitrogen Efficiency	Phosphorus Efficiency	Sediment Efficiency	BMP Implementation
	Landuse applied to: manure acre Reductions per system = system AEU's/145 times manure acre loading rate times reduction efficiency** (see footnote)					
Phytase Feed Additives – Swine	Use of Phytase as a swine feed additive to reduce phosphorus concentrations in swine manure Reduction applies as a change in manure phosphorus content.	AEUs	N/A	17%	N/A	
Precision Feeding of Dairy Livestock	Reduction in overfeeding of dairy livestock through the formulation of improved feed rations to meet specific nutrient needs of individual operations. Includes the targeting of minimum nitrogen and phosphorus feed concentrations while maintaining acceptable production levels so as to minimize the quantity and nutrient content of livestock manure. Landuse applied to: N/A - results in a reduction in manure nutrient content The watershed model simulates the reductions for this practice as a decrease in the nitrogen and phosphorus content of manure being land applied based on the AEUs of livestock being precision feed. Within the model, manure is considered a nutrient input. This practice, in effect, reduces the manure nutrient concentrations used by the model to estimate nutrient loads.	AEU	27%	17%	N/A	
Precision Rotational Grazing	The purpose of this BMP is to increase the level of forage and livestock implementation, increase forage nutrient removal, density and average height resulting in improved infiltration and decreased runoff. It Utilizes	Acres 0f Grazed land	25% and	25% and	25% and	

BMP	Description	Units	Nitrogen Efficiency	Phosphorus Efficiency	Sediment Efficiency	BMP Implementation
	a Resource Management System (RMS) level grazing plan. Landuse applied to: pasture Reductions = Pasture land loading rates times acres of pasture with rotational grazing times percent efficiency. A second reduction is calculated to account for the portion of land between the installed fence and the stream that is no longer pastured. This reduction is calculated as landuse conversion of pasture to mixed open land Reductions = pasture loading rate minus mixed open land loading rate times total aces excluded.	and Acres of excluded Land	Landuse Conversion	Landuse Conversion	Landuse Conversion	
Urban and Mixed Open BMPs – Approved for CBP Watershed Model						
Erosion and Sediment Controls – Urban Land	This practice involves erosion and sediment controls applied during construction activities on urban (developed) land. Due to the relative short nature of permitted construction activities, permitted acres are reported on a yearly basis (not cumulatively). Landuse affected: pervious developed land Reductions = pervious developed landuse loading rate times acres permitted times percent efficiency	Acres	33%	50%	50%	
Impervious Surface Reduction – Non-structural Practices	This practices involves the removal of urban impervious surfaces with pervious surfaces which increases water infiltration and deceases surface water runoff. Landuse conversion: impervious developed land to pervious developed land	Acres	Landuse Conversion	Landuse Conversion	Landuse Conversion	

BMP	Description	Units	Nitrogen Efficiency	Phosphorus Efficiency	Sediment Efficiency	BMP Implementation
	Reductions = impervious developed landuse loading rate minus pervious developed landuse loading rate times acres converted.					
Nutrient Management (Developed Land and Mixed Open Land)	Optimum use of nutrients (principally chemical fertilizers) to minimize loss. Includes applications by commercial and residential lawn care companies. Landuse applied to: mixed open land and pervious developed land Reduction = landuse loading rate times number of acres with <u>implemented</u> nutrient management times efficiency	Acres	17%	22%	N/A	
Non-urban Stream Restoration	Reduction in 2010 projections for the conversion of urban land. This results in "returning" urban land to forest, mixed open and agricultural land. (see footnote) Landuse conversion: impervious and pervious developed land to forest, mixed open and agricultural landuses Reduction = urban land loading rate minus new (non-urban) loading rate times acres of land not converted to urban. This will be credited as a landuse projection and not a field practice	Acres	Landuse Change	Landuse Change	Landuse Change	
Voluntary Air Emission Controls	Riparian Forest Buffers are linear wooded areas planted along rivers and streams. Reduction credits for riparian include both a percentage reduction and a landuse credit for the acres of trees planted Landuse conversion: pervious developed land to forest land Reductions = original landuse loading rate minus forest loading rate times acres of total acres converted	Acres	Landuse Conversion Plus	Landuse Conversion Plus	Landuse Conversion Plus	

BMP	Description	Units	Nitrogen Efficiency	Phosphorus Efficiency	Sediment Efficiency	BMP Implementation
	Plus: Upland landuse loading rate time's total acres treated times percent efficiency. (for this calculation every 435.6 linear feet of buffer is estimated to treat 5 upland acres of land)		25%	50%	50%	
Riparian Grass Buffers-Developed Land	Grassed Buffers are linear strips of maintained grass or other non-woody vegetation between the edge of fields and streams, rivers or tidal waters. Applies to conversion of impervious land to grass. Landuse conversion: impervious developed land to mixed open land Reduction = impervious developed land loading rate minus mixed open land loading rate times total acres converted.	Acres	Landuse Conversion	Landuse Conversion	Landuse Conversion	
SWM Wet Ponds & Wetlands	This stormwater management category includes practices such as wet ponds, wet extended detention ponds, retention ponds, pond/wetland systems, shallow wetlands, and constructed wetlands. Landuse applied to: pervious and impervious developed land Reductions = Urban loading rate times BMP drainage area times percent efficiency	Acres	30%	50%	80%	
SWM Dry Detention & Hydro-dynamic Structures	This stormwater management category includes practices such as dry detention basins and hydrodynamic structures designed to moderate flows. The structures remain dry between storm events Landuse applied to: pervious and impervious developed land Reductions = Urban loading rate times BMP drainage area times percent efficiency	Acres	5%	10%	10%	

BMP	Description	Units	Nitrogen Efficiency	Phosphorus Efficiency	Sediment Efficiency	BMP Implementation
SWM Dry Extended Retention Ponds	This stormwater management category includes practices such as dry extended detention ponds and extended detention basins. Landuse applied to: pervious and impervious developed land Reductions = Urban loading rate times BMP drainage area times percent efficiency	Acres	30%	20%	60%	
SWM Infiltration Practices	This stormwater management category includes practices such as infiltration trenches, infiltration basins, and porous pavement that reduce or eliminate the runoff. Landuse applied to: pervious and impervious developed land Reductions = landuse loading rate times BMP drainage area times percent efficiency	Acres	50%	70%	90%	
SWM Filtering Practices	This stormwater management category includes swales (dry, wet, infiltration, and water quality), open channel practices, and bioretention that transmit runoff through a filter medium. Landuse applied to: pervious and impervious developed land Reductions = landuse loading rate times BMP drainage area times percent efficiency	Acres	40%	60%	85%	
Stream Restoration – Urban	Restoration of urban (developed) stream channel to stable configuration Landuse applied to: pervious and impervious developed land Reductions = linear feet of channel restored times	Linear Feet	0.02 lbs/ft	0.0035 lbs/ft	2.55 lbs/ft	

BMP	Description	Units	Nitrogen Efficiency	Phosphorus Efficiency	Sediment Efficiency	BMP Implementation
	indicated reduction in lbs per foot.					
Tree Planting Urban and Mixed Open land	Reforestation practices or planting of trees that are not classified as riparian forest buffers. Planted trees are considered permanent Landuse conversion: mixed open and pervious developed land to forest land Reductions = original landuse loading rate minus forest loading rate times number of acres planted	Acres	Landuse Conversion	Landuse Conversion	Landuse Conversion	
Wetlands – Mixed Open Land	Wetland Restoration is the reestablishment of wetlands on mixed open land where they used to exist. Restored wetlands may be any wetland classification including forested, scrub-shrub or emergent marsh. Landuse conversion: mixed open Reductions = mixed open landuse loading rate minus forest loading rate times acres converted.	Acres	Landuse Conversion	Landuse Conversion	Landuse Conversion	
Other BMPs - Approved for CBP Watershed Model						
Abandoned Mined Land Reclamation	This practice involves reclamation of abandoned mined land through planting of grass, shrubs or trees. Applied to: mixed open land Reductions = Mixed Open land loading rate times total acres reclaimed times 2 times percent efficiency (1 to 2 effectiveness)	Acres	43%	38%	50%	
Forest Harvesting Practices	Erosion and sediment control practices used during harvesting of timber Landuse applied to: forest	Acres	50%	50%	50%	

BMP	Description	Units	Nitrogen Efficiency	Phosphorus Efficiency	Sediment Efficiency	BMP Implementation
	Reductions = forest loading rate times efficiency times acres of forest land protected by harvest practices					
Septic System Hookups	Removal of On-lot septic systems by hooking up to a POTW or other treatment system. Since septic systems are accounted for as nonpoint source loads within the watershed model, this action results in a decrease in nonpoint loads and an increase in point source loads for the facility now treating the increased flow. Credit is on the premise that treatment system hook-ups are done because of a need (e.g., failing or aging systems) and not normally for correctly functioning septic systems Applied to: septic systems Reductions: Credited as number of systems removed	Equivalent Domestic Units	Units Removed	N/A	N/A	
Septic System Denitrification (new and refit)	System design that includes an anaerobic biological reduction of nitrate nitrogen (e.g., nitrates in soil or wastewater) to nitrogen gas and/or the removal of total nitrogen from a system. Landuse applied to: N/A – applies to individual septic systems Reductions = number of septic systems times loading rate times reduction efficiency.	Units	50%	N/A	N/A	

Other BMPs - CBP Watershed Model approval pending

Street Sweeping in Urban Areas	This practice reduces the wash off of detritus and air deposited compounds from urban areas by regular sweeping of impervious streets.	Acres	10%	10%	10%	

BMP	Description	Units	Nitrogen Efficiency	Phosphorus Efficiency	Sediment Efficiency	BMP Implementation
	Landuse applied to: impervious developed land Reductions = Impervious developed land loading rate times acres swept times percent efficiency					
Dirt and Gravel Road Erosion and Sediment Controls	Implementation of practices to stabilize dirt and gravel roads adjacent to streams. The purpose of this BMP is to significantly reduce the erosion of sediment and the nutrients within the sediment from the road and adjacent areas into the stream. Landuse applied to: forest and mixed open Reductions = length of road with controls times reduction in lbs per foot.	Feet	.02 lbs/ft	.0035 lbs/ft	2.55 lbs/ft	
Non-urban Stream Restoration	Restoration of stream channels in non-urban areas to stable configuration. The purpose of this BMP is to restore natural stream hydrology and landscape so the stream is neither aggrading nor degrading. Landuse applied to: all landuses except pervious or impervious developed land Reductions = linear feet of channel restored times indicated reduction in lbs per foot.	Feet	.02 lbs/ft	.0035 lbs/ft	2.55 lbs/ft	
Voluntary Air Emission Controls	Voluntary practices implemented to reduce air emissions of nutrients. Type and nature of practices will vary depending on the nature and type of the emission source (e.g., utility versus industrial/commercial facility) and the methodology employed. Landuse applied to: N/A Reductions calculated from actual reduction measurements or estimated from process change or equipment efficiency.	Pounds Reduction	Varies by source	Varies by source	N/A	

BMP	Description	Units	Nitrogen Efficiency	Phosphorus Efficiency	Sediment Efficiency	BMP Implementation

AEU = Animal Equivalent Units.

** Animal waste management systems credits are applied against the manure acre landuse within the watershed model. For modeling purposes each manure acre is defined as a pasture acre having the equivalent of 145 AEU's of manure applied. The number of manure acres treated by an AWM system is defined as the AEU's that the system services divided by 145. For example, a dairy operation with 218 AEU's of livestock would be credited with 218/145 = 1.5 manure acres effectively treated.

***Change in urban growth is based on a comparison of the projected yearly growth in urban acres through 2010 to the estimated actual urban acres for each year leading to 2010. Reductions are realized as a change (i.e., reduction) in the amount of non-urban land that is consumed by urban growth. If increases in urban land acres occur over that currently projected, increases in the modeled load will also occur.

CBP Watershed Model approval pending:
Note: Efficiencies shown for these BMPs are interim and are subject to revision. These efficiencies need to be reviewed and approved by the Chesapeake Bay Program's Tributary Strategy Workgroup before they can be considered as final efficiencies.