

Storm Water Best Management Practice Categories and Pollutant Removal Efficiencies

Background:

The Urban Storm Water Workgroup developed a list of BMP categories with associated pollutant removal efficiencies and hydrologic effects. The workgroup developed this information so that the Chesapeake Bay Program can better model the urban pollutant load reductions of TN, TP, and TSS from storm water BMPs in the watershed.

Phase 4.3 of the Chesapeake Bay watershed model does not account for differences in pollutant removal efficiencies among different categories of urban storm water BMPs. Currently, all BMPs are lumped into one category called “storm water management” and are given one efficiency for TN, TP, and TSS. For example, a wet pond will have the same pollutant removal efficiency as a dry pond, an infiltration trench, and an oil/grit separator. Additionally, Phase 4.3 does not account for reductions in pollutant loads that may result from hydrologic effects of the urban storm water BMPs. In reality, many urban storm water BMPs reduce peak runoff flows and volumes and increase time of concentration. When peak runoff flows are reduced, stream flow velocities are reduced, which may result in reduced stream bank erosion. Currently, the model does not account for reductions in sediment loads from reduced stream bank erosion that may result from urban storm water BMP implementation.

It is important to note that these pollutant removal efficiencies apply to reductions of loads to surface waters only. Also, these efficiencies are meant for modeling purposes and not for the design and construction of BMPs.

Approach:

The Urban Storm Water Workgroup compiled data on the pollutant removal efficiencies of commonly employed urban storm water management BMPs. Based on the BMP pollutant removal efficiencies and general hydrologic effects these BMPs were grouped into categories. Each category contains a number of BMP types that have similar pollutant removal efficiencies and hydrologic effects.

Confidence Limits

It's important to note the studies on BMP pollutant removal efficiencies are variable and oftentimes scarce. Additionally, many factors affect performance of BMPs such as the design, frequency of inspection and maintenance, seasonality, and the life span and age of the BMP. Given these uncertainties, the Workgroup rounded its estimates to the nearest 5%.

Maintenance

The Workgroup did not fully account for changes in pollutant removal efficiencies based on the level of BMP maintenance and the life span of the BMPs. Due to lack of data on storm water maintenance programs in the watershed, the group was unable to use a “multiplier” to account for reductions in efficiencies due to insufficient maintenance. However, the workgroup did not neglect maintenance altogether. Many of the studies evaluated for this effort were focused on BMPs that were not regularly maintained. Therefore, the efficiencies, in part, may reflect some lower reduction of pollutant loads due to insufficient maintenance. However, the BMPs are fairly “young” and, therefore, probably do not fully account for reductions in pollutant removal

efficiencies due to aging BMPs.

Low Impact Development/Environmental Site Design

The Workgroup decided not to include Low Impact Development (LID) or Environmental Site Design as a BMP Category because no jurisdiction is reporting the number of acres under LID. Jurisdictions are reporting number of acres under certain BMP practices that can be considered a component of LID, such as bioretention or rooftop disconnection. These practices are already accounted for in the BMP categories. In the future, if more and more jurisdictions use LID and start to report the number of acres under LID, then a separate category.

Treatment Trains

Treatment trains are a number of BMPs that are connected in series to treat the same volume of runoff. The Workgroup has concluded that there is not enough hard data to account for pollutant removal efficiencies for “treatment trains”. Funding opportunities to obtain literature and field data are currently being pursued.

The following table summarizes the BMP categories and the pollutant removal efficiencies. See the Support Document for a complete list of BMP types, BMP definitions, pollutant removal efficiencies, and references that were used in this analysis.

Category	% Pollutant Removal Efficiency			Comments
	TN	TP	TSS	
<u>Category A:</u> Wet Ponds and Wetlands	30	50	80	This category includes practices such as wet ponds, wet extended detention ponds, retention ponds, pond/wetland systems, shallow wetlands, and constructed wetlands.
<u>Category B:</u> Dry Detention Ponds and Hydrodynamic Structures	5	10	10	Hydrodynamic structures are not considered a stand alone BMP. It acts similar to a dry detention pond and therefore it is included in this group.
<u>Category C:</u> Dry Extended Detention Ponds	30	20	60	This category includes practices such as dry extended detention ponds and extended detention basins.
<u>Category D:</u> Infiltration Practices	50*	70*	90*	This category includes practices such as infiltration trenches, infiltration basins, and porous pavement that reduce or eliminate the runoff. *These efficiencies are based on limited studies.
<u>Category E:</u> Filtering Practices	40	60	85	This category includes swales (dry, wet, infiltration, and water quality), open channel practices, and bioretention that transmit runoff through a filter medium. Grass swales were excluded because they have minimal water quality benefits.

Category	% Pollutant Removal Efficiency			Comments
	TN	TP	TSS	
<u>Category F:</u> Roadway Systems	TBD	TBD	TBD	We acknowledge that roadways make up a large portion of the urban acreage in the watershed and that there are practices that are on the ground today that result in some water quality benefit. Due to lack of data, the workgroup has not assigned pollutant removal efficiencies to this category. Your data will help the workgroup to develop an approach for crediting these BMPs
<u>Category G:</u> Impervious Surface Reduction	Model Generated	Model Generated	Model Generated	This category includes a number of practices that essentially turn impervious surfaces into pervious surfaces. Examples of these practices are green roofs, disconnected roofs, rain barrels, removal of impervious surfaces. Pollutant load reductions will be modeled based on the conversion of impervious surfaces to pervious urban surfaces.
<u>Category H:</u> Street Sweeping and Catch Basin Inserts	TBD	TBD	TBD	This category includes municipal efforts such as street sweeping, catch basins cleaning that prevent pollutant loads from entering the Bay. Pollutant load reduction efficiencies will be determined based on the number of pounds of TN, TP, and/or TSS removed through these practices.

Category	% Pollutant Removal Efficiency			Comments
	TN	TP	TSS	
<u>Category I:</u> Stream Restoration	0.02 lb/linear ft	0.0035 lb/linear ft	2.55 lb/linear ft	These numbers are based on a study conducted on Spring Branch Stream, an urban watershed in Baltimore County. The Urban Storm Water Workgroup will work with other stream restoration experts to refine these efficiencies, as data become available and to develop criteria for what constitutes water quality-based stream restoration. Please provide details on the types of stream restorations activities you undertook.