

WTM Parameterization for Retrofit Exercise

The purpose of this exercise is to become familiar with the WTM to estimate the impact of stormwater retrofits using the “Retrofit worksheet”. An instructional guide is provided to learn more about the WTM and how to use it.

The objective of the exercise is to introduce the main element of the “Retrofit Worksheet” of the WTM to include:

- Retrofit an existing stormwater practice
- A new stormwater practice
- Practices from new education programs.

Watershed Parameterization

The base file for this exercise is parameterized with basic watershed information. While these data are not integral to the retrofit design process, they are needed for the WTM to run successfully. Input data for the “Primary Sources,” “Secondary Sources,” and Existing Management Practices” tabs are described below.

Primary Sources

Land Use

- LDR: 300
- MDR: 100
- Commercial: 5
- TOTAL: 405 acres

Watershed Data

- Annual rainfall: 40 inches
- Area: 405 acres
- Stream Length: 3 miles
- Soils: 100% C soils
- Depth to Groundwater: 100% < 5feet

Secondary Sources

Dwelling Units: 500

Nutrient Concentrations in Stream Channels: 0.19% TP, 0.2%

Septic systems: none

SSOs: 10 miles

CSOs: none

Illicit Connections:

- Watershed population illicit connections : 0
- 5 businesses

Watershed Treatment Model Webcast

June 16, 2010

Exercise

Stream Channel Erosion

- Method 1 with moderate sediment loading (signs of erosion present)

Livestock: none

Marinas: none

Road sanding: none

Point Sources: none

Existing Management Practices

Lawns

- Accept default
- 50% lawns compacted

Pet Waste Education

- Pet waste education program: No

Erosion and Sediment Control

- Default, no data entered

Street Sweeping

- Mechanical: 20 acres residential
- Frequency: monthly
- Discount: 0.75

Existing BMPs

- Dry detention basin with 100 acres drainage area and 20 acres impervious

Riparian Buffers, Catch basin cleanout, Marina pumpouts

- None

Retrofit Worksheet

This exercise evaluates five separate scenarios. The input data and resulting outputs for each scenario is as follows;

Scenario 1

- Retrofit dry pond to dry extended detention
- Full drainage area of existing dry pond
- Does not provide full WQv ~ 80%, 171,336
- Discounts
 - Design = 1.0
 - Maintenance = 90%

Net Effects of Each Retrofit							
Pollutant Removal				Runoff Reduction (ac-feet)	Loads to Groundwater		
TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)	Bacteria (billion/year)		TN Load to GW	TP Load to GW	Bacteria Load to GW
38.3	12.3	9541.6	0.0	0.0	0.0	0.0	0.0

Percent Reduction from Total Storm Load					
	TN	TP	TSS	Fecal Coliform	Runoff Volume (acre-feet/year)
Total Storm Load (lb/yr)	2,729	915	167,801	164,584	6,834
% Total Storm Load	1.4%	1.3%	2.5%	0	0

Scenario 2: Scenario 1 + Bioretention for commercial land use

- Primary Sources the commercial land use is 5 acres with the default 72% impervious, or 3.6 acres
- Retrofit: area captured is 2 acres, 100% impervious
- Treats 90% of the WQv = 6,207.3
- Discounts
 - Design = 1.0
 - Maintenance = 90%

Net Effects of Each Retrofit							
Pollutant Removal				Runoff Reduction (ac-feet)	Loads to Groundwater		
TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)	Bacteria (billion/year)		TN Load to GW	TP Load to GW	Bacteria Load to GW
38.3	12.3	9541.6	0.0	0.0	0.0	0.0	0.0
15.6	3.6	635.9	1088.6	1.9	2.2	0.0	0.0
53.9	15.9	10087.5	1088.6	1.9	2.2	0.0	0.0

Percent Reduction from Total Storm Load					
	TN	TP	TSS	Fecal Coliform	Runoff Volume (acre-feet/year)
Total Storm Load (lb/yr)	2,729	915	167,801	164,584	6,834
% Total Storm Load	2.0%	1.7%	6.0%	0.7%	0.03%

Scenario 3: Scenarios 1,2 + Rooftop disconnection

- 60 acres of rooftop based on 400 acres of residential land use where mix of low & medium density residential (average 15% of the land use is rooftops)
- Apply to C soils
- Treats 100% WQv
- No ability to modify design or maintenance discounts
- Discount:
 - Design = 1
 - Maintenance = 90%

Net Effects of Each Retrofit							
Pollutant Removal				Runoff Reduction (ac-feet)	Loads to Groundwater		
TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)	Bacteria (billion/year)		TN Load to GW	TP Load to GW	Bacteria Load to GW
38.3	12.3	9541.6	0.0	0.0	0.0	0.0	0.0
15.6	3.6	635.9	1088.6	1.9	2.8	0.0	0.0
288.8	72.0	20,673.3	9651.1	39.0	99.0		
342.7	87.9	30760.8	10739.7	40.9	101.2	0.0	0.0

Percent Reduction from Total Storm Load					
	TN	TP	TSS	Fecal Coliform	Runoff Volume (acre-feet/year)
Total Storm Load (lb/yr)	2,729	915	167,801	164,584	6,834
% Total Storm Load	12.6%	9.6%	18.3%	6.5%	0.6%

Scenario 4: Scenarios 1- 3 + Soil Amendments

- 273 acres of turfgrass (from primary sources where low density residential has 70% turf cover and medium density has 63% turf cover)
- Soil amendment treats 25% of turfgrass area for 68.25 acres to be treated
- Apply on C Soils
- Provide 100% WQv
- Discount:
 - Design = 1
 - Maintenance = 90%

Net Effects of Each Retrofit							
Pollutant Removal				Runoff Reduction (ac-feet)	Loads to Groundwater		
TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)	Bacteria (billion/year)		TN Load to GW	TP Load to GW	Bacteria Load to GW
38.3	12.3	9541.6	0.0	0.0	0.0	0.0	0.0
15.6	3.6	635.9	1088.6	1.9	2.2	0.0	0.0
288.8	72.0	20673.3	9651.1	39.0	99.0	0.0	0.0
310.2	77.3	12027.4	14555.8	58.9	99.6	0.0	0.0
653.0	165.1	42788.2	25295.6	99.8	200.8	0.0	0.0

Percent Reduction from Total Storm Load					
	TN	TP	TSS	Fecal Coliform	Runoff Volume (acre-feet/year)
Total Storm Load (lb/yr)	2,729	915	167,801	164,584	6,834
% Total Storm Load	23.9%	18.0%	25.5%	15.4%	1.5%

Scenario 5: Scenarios 1 - 4 and Bioretention in Right-of-way (ROW)

- Bioretention as bump-outs at end of residential blocks to capture runoff from small blocks with multiple residential parcels (e.g. bioretention cells constructed on 4 blocks to collect runoff from 10 parcels, assume ½ acre parcels for a total area treated of 20 acres assume 20% IC)
- 90% WQv provided
- Discounts
 - Design = 1.0
 - Maintenance = 90%

Net Effects of Each Retrofit							
Pollutant Removal				Runoff Reduction (ac-feet)	Loads to Groundwater		
TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)	Bacteria (billion/year)		TN Load to GW	TP Load to GW	Bacteria Load to GW
38.3	12.3	9541.6	0.0	0.0	0.0	0.0	0.0
15.6	3.6	635.9	1088.6	1.9	2.2	0.0	0.0
288.8	72.0	20673.3	9651.1	39.0	99.0	0.0	0.0
93.2	21.5	3788.8	6486.0	11.2	13.2	0.0	0.0
436.0	109.3	34549.5	17225.8	52.1	114.5	0.0	0.0

Percent Reduction from Total Storm Load					
	TN	TP	TSS	Fecal Coliform	Runoff Volume (acre-feet/year)
Total Storm Load (lb/yr)	2,729	915	167,801	164,584	6,834
% Total Storm Load	16.0%	11.9%	20.6%	10.5%	0.8%