Estimating Load Reductions For Agricultural and Urban BMPs

This workbook uses the "Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual" (Michigan Department of Environmental Quality, June 1999) to provide a gross estimate of sediment and nutrient load reductions from the implementation of agricultural BMPs. The methodology for the gross estimate of sediment and other constituent load reductions from the implementation of urban BMPs is based on reduction efficiencies and calculations developed by Illinois EPA.

Please note: This workbook uses many simplifying assumptions to provide a general ESTIMATE of pollutant load reductions through BMP implementation. More accurate results of pollutant load reductions may be obtained through direct monitoring and/or a more detailed modeling application. In addition, this workbook does not estimate pollutant load reductions for dissolved constituents.

The workbook is divided into worksheets (see bottom of the Window). Each worksheet is specific to a particular source. In some cases, multiple practices may take place for a specific site, then the various worksheets will all need to be completed; one worksheet must be completed for each BMP. The following are the worksheets and what practices they cover:

Worksheet	Possible Practices
Gully Stabilization	Grade Stabilization Structure Grassed Waterway Critical Area Planting in areas with gullies Water and Sediment Control Basins
Bank Stabilization	Animal Trails and Walkways Stream Channel Stabilization Streambank Protection
Agricultural Fields	Prescribed Grazing Residue Management, Mulch Till Conservation Crop Rotation Conservation Cover Cover and Green Manure Critical Area Planting Stripcropping, Contour Stripcropping, Field Filter Strips
Feedlots	Animal Waste Systems and others
Urban Runoff	Vegetated Filter Strips Grass Swales Infiltration Devises Extended Wet Detention Wetland Detention Dry Detention Settling Basin Sand Filters WQ Inlets Weekly Street Sweeping Infiltration Basin Infiltration Trench Porous Pavement Concrete Grid Pavement Sand Filter/Infiltration Basin WQ Inlet w/ Sand Filter Oil/Grit Separator Wet Pond

Specific instructions are provided within each worksheet area.

Gully Stabilization

These may include:

Grade Stabilization Structure
Grassed Waterway
Critical Area Planting in areas with gullies
Water and Sediment Control Basins

Please select a soil textural class:

○ Sands, loamy sands	○ Silty clay loam, silty clay
○ Sandy loam	○ Clay loam
○ Fine sandy loam	○ Clay
○ Loams, sandy clay loams, sandy clay	○ Organic
◉ Silt loam	

Please fill in the gray areas below:

Parameter	Gully	Example	
Top Width (ft)	13	**15**	
Bottom Width (ft)	2	**4**	
Depth (ft)	1.5	**5**	
Length (ft)	300	**20**	
Number of Years	5	**5**	
Soil Weight (tons/ft3)	0.0425	**0.05**	
Soil P Conc (lb/lb soil)* USER	0.0005	**0.0005**	*
Soil N Conc (lb/lb soil)* USER	0.001	**0.001**	*

* If not using the default values, users must provide input (in red) for Total P and Total N soil concentrations

Estimated Load Reductions

	BMP Efficiency*	Gully	Example
Sediment Load Reduction (ton/year)	1.0	28.7	**10**
Phosphorus Load Reduction (lb/year)		28.7	**8**
Nitrogen Load Reduction (lb/yr)		57.4	**16**

Bank Stabilization

If estimating for just one bank, put "0" in areas for Bank #2.

Please select a soil textural class:

○ Sands, loamy sands	○ Silty clay loam, silty clay
○ Sandy loam	○ Clay loam
○ Fine sandy loam	○ Clay
○ Loams, sandy clay loams, sandy clay	○ Organic
◉ Silt loam	

Please fill in the gray areas below:

Parameter	Bank #1	Bank #2	Example	
Length (ft)	500	500	**500**	
Height (ft)	10	10	**15**	
Lateral Recession Rate (ft/yr)*	0.2	0.2	**0.5**	
Soil Weight (tons/ft3)	0.0425	0.0425	**0.04**	
Soil P Conc (lb/lb soil)** USER	0.0005	0.0005	**0.0005**	**
Soil N Conc (lb/lb soil)** USER	0.001	0.001	**0.001**	**

** If not using the default values, users must provide input (in red) for Total P and Total N soil concentrations
*Lateral Recession Rate (LRR) is the rate at which bank deterioration has taken place and is measured in feet per year. This rate may not be easily determined by direct measurement. Therefore best professional judgement may be required to estimate the LRR. Please refer to the narrative descriptions in Table 1.

Estimated Load Reductions

	BMP Efficiency* Bank #1	BMP Efficiency* Bank #2	Bank #1	Bank #2	Example
Sediment Load Reduction (ton/year)	1.0	1.0	42.5	42.5	**150**
Phosphorus Load Reduction (lb/year)			42.5	42.5	**150**
Nitrogen Load Reduction (lb/yr)			85.0	85.0	**300**

Agricultural Fields and Filter Strips

Please check which BMPs apply:

☑ Agricultural Field Practices
☑ * Filter Strips

Please select a state and a county, and default USLE parameter values will be entered.
Users should use the local USLE parameter values if available!

State: Alabama
County:

Initialized
Initialized

Please fill in the gray areas below:

USLE or RUSLE	Before Treatment	After Treatment	Example Before Treatment	Example After Treatment
Rainfall-Runoff Erosivity Factor (R)			**120**	**120**
Soil Erodibility Factor (K)			**0.35**	**0.35**
Length-Slope Factor (LS)			**0.44**	**0.44**
Cover Management Factor (C<=1.0)*			**0.7**	**0.5**
Support Practice Factor (P<=1.0)*			**0.775**	**0.11**
Predicted Avg Annual Soil Loss (ton/acre/year)	0.00	0.00	**10.03**	**1.02**

* User must use the local C and/or P values (in red) to obtain the reduction due to the field practices.

		Example
Enter contributing area (acres)	50	**14**

Please select a gross soil texture:

- ○ Clay (clay, clay loam, and silt clay)
- ◉ Silt (silt, silty clay loam, loam, and silt loam)
- ○ Sand (sand, sandy clay, sandy clay loam, sandy loam, and loamy sand)
- ○ Peat

Application of BMPs will change C and/or P values in the USLE, and may include:

Prescribed Grazing
Residue Management, Mulch Till
Conservation Crop Rotation
Conservation Cover
Cover and Green Manure
Critical Area Planting
Stripcropping, Contour
Stripcropping, Field
Stripcropping, Field
* Filter Strips may further reduce sediment by 65%, phosphorous by 75%, and nitrogen by 70% based on Pennsylvania state university (1992).

Estimated Load Reductions for Agricultural Field Practices

	Treated	Example
Sediment Load Reduction (ton/year)	0	**85**
Phosphorus Load Reduction (lb/year)	0	**100**
Nitrogen Load Reduction (lb/yr)	0	**200**

Estimated Additional Load Reductions through Filter Strips

	Filter-Strip Efficiency	Filter-Strip Treated	Example
Sediment Load Reduction (ton/year)	0.65	0	**92**
Phosphorus Load Reduction (lb/year)	0.75	0	**114**
Nitrogen Load Reduction (lb/yr)	0.70	0	**227**

Total Estimated Load Reductions

	Total	Example
Sediment Load Reduction (ton/year)	0	**177**
Phosphorus Load Reduction (lb/year)	0	**214**
Nitrogen Load Reduction (lb/yr)	0	**427**

Pennsylvania State University. 1992. Nonpoint Source Database. In U.S. EPA, Guidance specifying management measures for sources of nonpoint pollution in coastal waters, page 2-15.

Feedlot Pollution Reduction

Please fill in the gray areas below.

Notes:
An animal lot refers to an open lot or combination of open lots intended for confined feeding, breeding, raising or holding animals. It is specifically designed as a confinement area in which manure accumulates or where the concentration of animals is such that vegetation cannot be maintained. The purpose of these calculations is to represent Biological Oxygen Demand (BOD), phosphorus (P), and nitrogen reductions after an animal waste system is installed. This method has two assumptions: 1) the feedlot is adjacent to a receiving hydrological system without any buffering areas; and 2) installing the animal waste system will prevent any further pollutants from the lot from reaching the hydrologic system. Feedlots that cannot show impact to the hydrologic system being protected should not be evaluated with this computation.

The fundamental methodology of this worksheet is based on "Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual" (Michigan DEQ, June 1999). However, the Michigan DEQ methodology was modified to calculate annual load through inclusion of climatological data. In addition, biological oxygen demand, phosphorus, and nitrogen constants used in this worksheet were derived from U.S. EPA's STEPL model, developed by Tetra Tech, Inc. in order to enhance consistency between methods.

STEP 1

1.74	**Contributing Area (acres): the area contributing polluted water to the discharge point(s).**

STEP 2

Percent Paved: Percent of the contributing area that is paved

- ○ 0-24%
- ○ 25-49%
- ○ 50-74%
- ◉ 75-100%

STEP 3

Please select your State.	Please select your County.	Nearest Weather Station
Alabama	Autauga	0 Default

Note: Precipitation data for Alaska and Hawaii were unavailable for this version of the workbook.

STEP 4

Animal Numbers	Animal Type	Design Weight*
0	Slaughter Steer	1,000
0	Young Beef	500
100	Dairy Cow	1,400
30	Young Dairy Stock	500
0	Swine	200
0	Feeder Pig	50
0	Sheep	100
0	Turkey	10
0	Chicken	4
0	Duck	4
0	Horse	1,000

*Design weight in pounds. Interpolation of values should be based on the maximum weight animals would be expected to reach.

STEP

URBAN RUNOFF BMP POLLUTANT LOAD REDUCTION WORKSHEET

Please fill in the gray areas below.

Notes:
The methodology and efficiency values used in this worksheet were developed by the Illinois Environmental Protection Agency.

Please Select a Best Management Practice:

○ Vegetated Filter Strips	○ Sand Filters	○ Sand Filter/Infiltration Basin
○ Grass Swales	○ WQ Inlets	○ WQ Inlet w/ Sand Filter
○ Infiltration Device	○ Weekly Street Sweeping	○ Oil/Grit Separator
○ Extended Wet Detention	○ Infiltration Basin	○ Wet Pond
○ Wetland Detention	○ Infiltration Trench	
○ Dry Detention	○ Porous Pavement	
◉ Settling Basin	○ Concrete Grid Pavement	

Please enter landuse of contributing/drainage area in acres:

	Sewered	Unsewered
Commercial	100	10
Industrial	100	10
Institutional	50	10
Transportation	50	0
Multi-Family	100	10
Residential	200	10
Agriculture	0	20
Vacant	20	0
Open Space	250	250

Note: Sewered and Unsewered refer to storm sewers.

Estimated Load and Load Reductions

	Load before BMP (lbs/yr)	Load after BMP (lbs/yr)	Load Reduction (lbs/yr)
BOD	30,640	13,482	17,158
COD	234,750	U	U
TSS	681,250	126,031	555,219
LEAD	531	U	U
COPPER	102	U	U
ZINC	785	U	U
TDS	1,210,084	U	U
TN	7,850	U	U
TKN	4,293	U	U
DP	363	U	U
TP	928	450	478
CADMIUM	6	U	U

U = Removal Efficiency for the particular BMP and constituent unavailable.