Appendix S: Load Reduction Calculations

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: Indiana

County: La Porte

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)	140.00	140.00	**120**	**120**
Soil Erodibility Factor (K)	0.24	0.24	**0.35**	**0.35**
Length-Slope Factor (LS)	0.35	0.35	**0.44**	**0.44**
Cover Management Factor (C<=1.0)*	0.20	0.20	**0.7**	**0.5**
Support Practice Factor (P<=1.0)*	1.00	1.00	**0.775**	**0.11**
Predicted Avg Annual Soil Loss (ton/acre/year)	2.36	2.36	**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)	1	**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

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	1	**92**
Phosphorus Load Reduction (lb/year)	0.75	2	**114**
Nitrogen Load Reduction (lb/yr)	0.70	4	**227**

Total Estimated Load Reductions

	Total	Example
Sediment Load Reduction (ton/year)	1	**177**
Phosphorus Load Reduction (lb/year)	2	**214**
Nitrogen Load Reduction (lb/yr)	4	**427**

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).

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

10	**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
Indiana	Adams	IN VALPARAISO WATERWORK

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
20	Dairy Cow	1,400
5	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 5

Select a Best Management Practice

- ○ No BMP
- ○ Diversion
- ○ Filter Strip
- ○ Runoff Mgmt System
- ○ Terrace
- ◉ Waste Mgmt System
- ○ Waste Storage Facility
- ○ Solids Separation Basin
- ○ Solids Separation Basin w/ Infilt Bed

END **Estimated Load and Load Reductions**

Pollutants	Load before BMP	Load Reduction	Load after BMP
Biochemical Oxygen Demand load (lbs/yr)	**845**	**NA**	**NA**
Phosphorus load (lbs/yr)	**83**	**75**	**8**
Nitrogen load (lbs/yr)	**851**	**681**	**170**

NA indicates no BMP efficiency data available.

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)	100	100	**500**	
Height (ft)	5	5	**15**	
Lateral Recession Rate (ft/yr)*	0.2	0.2	**0.5**	
Soil Weight (tons/ft3)	0.045	0.045	**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	4.5	4.5	**150**
Phosphorus Load Reduction (lb/year)			3.8	3.8	**150**
Nitrogen Load Reduction (lb/yr)			7.7	7.7	**300**

* BMP efficiency values should be between 0 and 1, and 1 means 100% pollutant removal efficiency.

Table 1

LRR (ft/yr)	Category	Description
0.01 - 0.05	Slight	Some bare bank but active erosion not readily apparent. Some rills but no vegetative overhang.
0.06 - 0.2	Moderate	Bank is predominantly bare with some rills and vegetative overhang.
0.3 - 0.5	Severe	Bank is bare with rills and severe vegetative overhang. Many exposed tree roots and some fallen trees and slumps or slips. Some changes in cultural features such as fence corners missing and realignment of roads or trails. Channel cross-section becomes more U-shaped as opposed to V-shaped.
0.5+	Very Severe	Bank is bare with gullies and severe vegetative overhang. Many fallen trees, drains and culverts eroding out and changes in cultural features as above. Massive slips or washouts common. Channel cross-section is U-shaped and streamcourse or gully may be meandering.

Source: Steffen, L.J. 1982. Channel Erosion (personal communication), as printed in "Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual," June 1999 Revision; Michigan Department of Environmental Quality - Surface Water Quality Division - Nonpoint Source Unit. EQP 5841 (6/99).