

# **An Introduction to StepL (Spreadsheet Tool for the Estimation of Pollutant Loads)**

Estimating Load  
Reductions From Non-  
Point Pollution Sources



# **Assessing Non-point Source Load Reductions Through StepL Modeling ( Simple & Effective)**

**The characteristics of a simple, StepL model include:**

- Minimal data preparation**
- No calibration requirements**
- Can accommodate long averaging periods**
- Can serve with minimal testing/validation**

After Thomann & Mueller



# The StepL Model

- Employs simple algorithms to calculate nutrient and sediment loads from different land uses
- Includes estimates of load reductions that would result from the implementation of various BMPs
- Data driven and highly empirical
- It's a customized MS Excel spreadsheet model
- It's simple and easy to use



# STEPL Users Should Have:

- A Basic understanding of hydrology, erosion, and pollutant loading processes
- A Knowledge (use and limitation) of environmental data (e.g., land use, agricultural statistics, and BMP efficiencies)
- A Familiarity with MS Excel and Excel Formulas.



## StepL Model Described in 4 Steps

- Step 1 – Source Representation or Definition
- Step 2 – System Calculates Load before BMPs
- Step 3 – Select BMPs
- Step 4 – System Calculates Load after BMPs



# Sample StepL Model

Home Insert Page Layout Formulas Data Review View

Paste Font Alignment Number Styles

Clipboard Font Alignment Number Styles

Conditional Formatting as Table Cell Styles

D15

fx

**STEPL Input Sheet:** Values in RED are required input. Change worksheets by clicking on tabs at the bottom. You

This sheet is composed of eight input tables. The first four tables require users to change initial values. The next four tables (ini

**Step 1:** Select the state and county where your watersheds are located. Select a nearby weather station. This will automatica

**Step 2:** (a) Enter land use areas in acres in Table 1; (b) enter total number of agricultural animals by type and number of month

(c) enter values for septic system parameters in Table 3; and (d) if desired, modify USLE parameters associated with t

**Step 3:** You may stop here and proceed to the BMPs sheet. If you have more detailed information on your watersheds, click th

**Step 4:** (a) Specify the representative Soil Hydrologic Group (SHG) and soil nutrient concentrations in Table 5; (b) modify the c

(c) modify the nutrient concentrations (mg/L) in runoff in Table 7; and (d) specify the detailed land use distribution in the

**Step 5:** Select BMPs in BMPs sheet. **Step 6:** View the estimates of loads and load reductions in Total Load

Show optional input tables?

Yes

No

 Treat all the subwatersheds as parts of a single watershed

State

Georgia

County

Oconee

Weather Station (for rain correction factors)

GA ATHENS MUNI AP

## 1. Input watershed land use area (ac) and precipitation (in)

| Watershed | Urban | Cropland | Pastureland | Forest | User Defined | Feedlots | Feedlot Percent Paved | Total |
|-----------|-------|----------|-------------|--------|--------------|----------|-----------------------|-------|
| W1        | 200   | 200      | 200         | 200    | 0            | 10       | 0-24%                 |       |
| W2        | 200   | 200      | 200         | 200    | 0            | 10       | 0-24%                 |       |
| W3        | 200   | 200      | 200         | 200    | 0            | 10       | 0-24%                 |       |
| W4        | 200   | 200      | 200         | 200    | 0            | 10       | 0-24%                 |       |

## 2. Input agricultural animals

| Watershed | Beef Cattle | Dairy Cattle | Swine (Hog) | Sheep | Horse | Chicken | Turkey |
|-----------|-------------|--------------|-------------|-------|-------|---------|--------|
| W1        | 100         | 100          | 100         | 100   | 100   | 100     | 100    |

Home Insert Page Layout Formulas Data Review View

Paste Font Alignment Number

Clipboard Font Alignment Number

Conditional Formatting Styles

Format as Table

Cell Styles

D15

A B C D E F G H I

31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
97  
98  
99  
100  
101  
102  
103  
104

### 3. Input septic system and illegal direct wastewater discharge data

| Watershed | No. of Septic Systems | Population per Septic System | Septic Failure Rate, % | Wastewater Direct Discharge, # of People | Direct Discharge Reduction, % |
|-----------|-----------------------|------------------------------|------------------------|--|-------------------------------|
| W1        | 600                   | 2.43                         | 2                      | 0  | 0                             |
| W2        | 600                   | 2.43                         | 2                      | 0  | 0                             |
| W3        | 600                   | 2.43                         | 2                      | 0  | 0                             |
| W4        | 600                   | 2.43                         | 2                      | 0  | 0                             |

### 4. Modify the Universal Soil Loss Equation (USLE) parameters

| Watershed | Cropland |       |       |       |       | Pastureland |       |    |
|-----------|----------|-------|-------|-------|-------|-------------|-------|----|
|           | R        | K     | LS    | C     | P     | R           | K     | LS |
| W1        | 273.046  | 0.255 | 1.017 | 0.200 | 0.944 | 273.046     | 0.255 |    |
| W2        | 273.046  | 0.255 | 1.017 | 0.200 | 0.944 | 273.046     | 0.255 |    |
| W3        | 273.046  | 0.255 | 1.017 | 0.200 | 0.944 | 273.046     | 0.255 |    |
| W4        | 273.046  | 0.255 | 1.017 | 0.200 | 0.944 | 273.046     | 0.255 |    |

Home Insert Page Layout Formulas Data Review View

Clipboard Font Alignment Number Styles

General

Conditional Formatting as Table Cell Styles

lstBx31    fx    =EMBED("Forms.ListBox.1","")

1 **Best Management Practice**    Select an appropriate BMP except "Combined BMPs-Calculated" for each subwatershed  
 2 using the pull-down list-box if interactions between BMPs are not considered. Select "Combined BMPs-Calculated" if multiple BMPs  
 3 in the subwatersheds are considered; use BMP calculator (under STEPL menu) to obtain the combined BMP efficiencies and e

Urban BMP Tool

Gully and  
Streambank Erosion

### 1. BMPs and efficiencies for different pollutants on CROPLAND, ND=No Data

| Watershed | Cropland |       |     |          |                         |
|-----------|----------|-------|-----|----------|-------------------------|
|           | N        | P     | BOD | Sediment | BMPs                    |
| W1        | 0.55     | 0.45  | ND  | 0.75     | Reduced Tillage Systems |
| W2        | 0.275    | 0.225 | ND  | 0.375    | Reduced Tillage Systems |
| W3        | 0.55     | 0.45  | ND  | 0.75     | Reduced Tillage Systems |
| W4        | 0.55     | 0.45  | ND  | 0.75     | Reduced Tillage Systems |

### 2. BMPs and efficiencies for different pollutants on PASTURELAND, ND=No Data

| Watershed | Pastureland |     |     |          |                          |
|-----------|-------------|-----|-----|----------|--------------------------|
|           | N           | P   | BOD | Sediment | BMPs                     |
| W1        | 0.5         | 0.6 | 0.6 | 0.8      | Combined BMPs-Calculated |
| W2        | 0           | 0   | 0   | 0        | 0 No BMP                 |
| W3        | 0           | 0   | 0   | 0        | 0 No BMP                 |
| W4        | 0           | 0   | 0   | 0        | 0 No BMP                 |

### 3. BMPs and efficiencies for different pollutants on FOREST, ND=No Data

| Watershed | Forest |    |     |          |                               |
|-----------|--------|----|-----|----------|-------------------------------|
|           | N      | P  | BOD | Sediment | BMPs                          |
| W1        | ND     | ND | ND  | 0.41     | Road dry seeding              |
| W2        | ND     | ND | ND  | 0.71     | Road grass and legume seeding |
| W3        | ND     | ND | ND  | 0.71     | Road grass and legume seeding |
| W4        | ND     | ND | ND  | 0.71     | Road grass and legume seeding |

Home Insert Page Layout Formulas Data Review View

Clipboard Font Alignment Number Styles

General

Conditional Formatting as Table Cell Styles

lstBx31  $f_x$  =EMBED("Forms.ListBox.1","")

|    | A | B  | C  | D    | E  | F  | G            |
|----|---|----|----|------|----|----|--------------|
| 43 |   | W4 | ND | 0.85 | ND | ND | Filter strip |

## 6. BMPs and efficiencies for different pollutants on URBAN

To change/set BMP/LID for urban land uses, click the 'Urban BMP Tool' button on the top-left of this sheet.

## 7. Combined watershed BMP efficiencies from the BMP calculator

| Watershed  | Watershed Combined BMP Efficiencies |     |     |          |               |
|------------|-------------------------------------|-----|-----|----------|---------------|
|            | N                                   | P   | BOD | Sediment | BMPs          |
| W1-Crop    | 0                                   | 0   | 0   | 0        | Combined BMPs |
| W2-Crop    | 0                                   | 0   | 0   | 0        | Combined BMPs |
| W3-Crop    | 0                                   | 0   | 0   | 0        | Combined BMPs |
| W4-Crop    | 0                                   | 0   | 0   | 0        | Combined BMPs |
| W1-Pasture | 0.5                                 | 0.6 | 0.6 | 0.8      | Combined BMPs |
| W2-Pasture | 0                                   | 0   | 0   | 0        | Combined BMPs |
| W3-Pasture | 0                                   | 0   | 0   | 0        | Combined BMPs |
| W4-Pasture | 0                                   | 0   | 0   | 0        | Combined BMPs |
| W1-Forest  | 0                                   | 0   | 0   | 0        | Combined BMPs |
| W2-Forest  | 0                                   | 0   | 0   | 0        | Combined BMPs |
| W3-Forest  | 0                                   | 0   | 0   | 0        | Combined BMPs |
| W4-Forest  | 0                                   | 0   | 0   | 0        | Combined BMPs |
| W1-User    | 0                                   | 0   | 0   | 0        | Combined BMPs |
| W2-User    | 0                                   | 0   | 0   | 0        | Combined BMPs |
| W3-User    | 0                                   | 0   | 0   | 0        | Combined BMPs |
| W4-User    | 0                                   | 0   | 0   | 0        | Combined BMPs |



# Calculate Load Reductions after BMPs

View Loads and Load Reductions in  
the Total Load and Graphs sheets

Home Insert Page Layout Formulas Data Review View

Clipboard Font Alignment Number Styles

General

Conditional Formatting as Table Styles

Cell Styles

A1

1 **Total Load** This is the summary of annual nutrient and sediment load for each subwatershed. This sheet is initially protected.

### 1. Total load by subwatershed(s)

| Watershed | N Load (no BMP) | P Load (no BMP) | BOD Load (no BMP) | Sediment Load (no BMP) | N Reduction | P Reduction | BOD Reduction | Sediment Reduction | N Load (with BMP) | P Load (with BMP) | BOD (with BMP) |
|-----------|-----------------|-----------------|-------------------|------------------------|-------------|-------------|---------------|--------------------|-------------------|-------------------|----------------|
|           | lb/year         | lb/year         | lb/year           | t/year                 | lb/year     | lb/year     | lb/year       | t/year             | lb/year           | lb/year           | lb/year        |
| W1        | 31417.6         | 4797.8          | 48870.7           | 742.9                  | 13256.3     | 2833.5      | 6402.4        | 532.0              | 18161.3           | 1964.3            | 42468.3        |
| W2        | 31394.0         | 4788.7          | 48823.5           | 726.7                  | 1610.7      | 2610.0      | 1379.2        | 215.5              | 29783.3           | 2178.6            | 47444.3        |
| W3        | 31394.0         | 4788.7          | 48823.5           | 726.7                  | 3201.3      | 3026.9      | 2718.1        | 424.7              | 28192.7           | 1761.8            | 46105.4        |
| W4        | 31394.0         | 4788.7          | 48823.5           | 726.7                  | 3201.3      | 3026.9      | 2718.1        | 424.7              | 28192.7           | 1761.8            | 46105.4        |
| Total     | 125599.7        | 19163.8         | 195341.1          | 2923.0                 | 21269.6     | 11497.3     | 13217.8       | 1596.9             | 104330.1          | 7666.5            | 182123.3       |

### 2. Total load by land uses (with BMP)

| Sources      | N Load (lb/gr) | P Load (lb/gr) | BOD Load (lb/gr) | Sediment Load (t/gr) |
|--------------|----------------|----------------|------------------|----------------------|
| Urban        | 7274.80        | 1120.26        | 28141.31         | 166.88               |
| Cropland     | 9404.86        | 2659.80        | 27760.31         | 767.08               |
| Pastureland  | 6687.09        | 865.14         | 19711.06         | 378.37               |
| Forest       | 266.71         | 128.59         | 646.06           | 12.95                |
| Feedlots     | 70653.59       | 1928.33        | 99768.90         | 0.00                 |
| User Defined | 0.00           | 0.00           | 0.00             | 0.00                 |
| Septic       | 1492.23        | 584.46         | 6093.29          | 0.00                 |
| Gully        | 1.08           | 0.42           | 2.16             | 0.74                 |
| Streambank   | 0.10           | 0.04           | 0.20             | 0.07                 |
| Groundwater  | 8549.62        | 379.48         | 0.00             | 0.00                 |
| Total        | 104330.10      | 7666.51        | 182123.30        | 1326.08              |

Home Insert Page Layout Formulas Data Review View

Arial 10

B I U

Font

Alignment

General

\$ %

Number

Conditional Formatting as Table Cell Styles

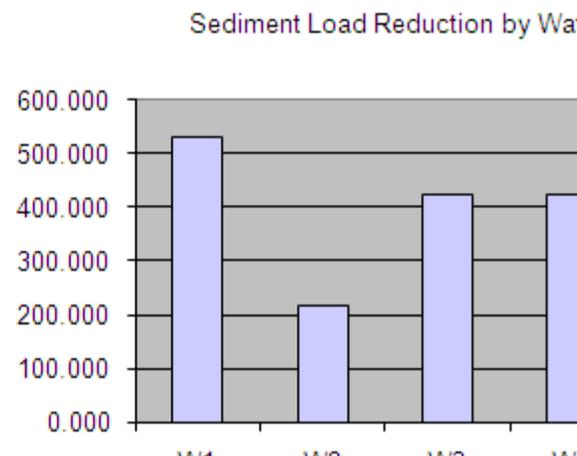
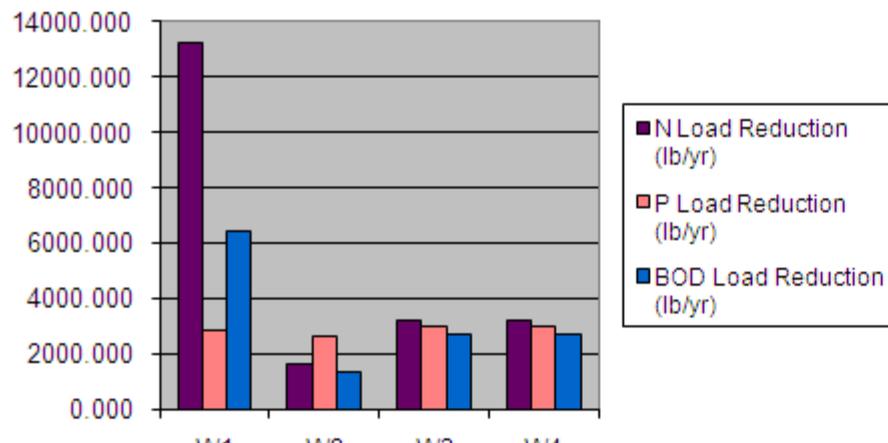
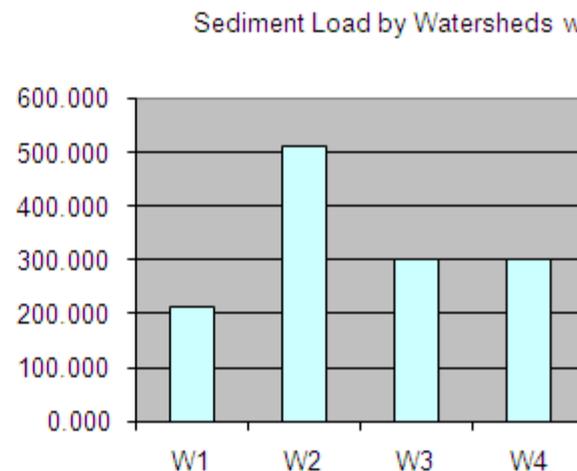
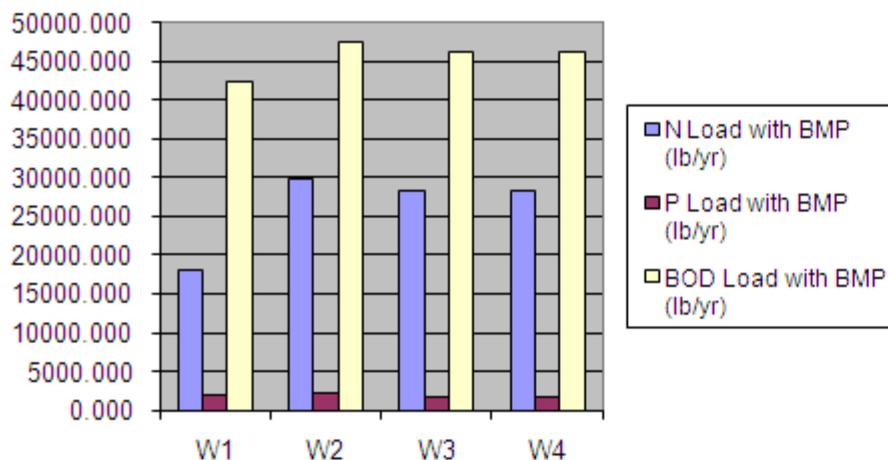
Styles

A1

fx

Graphs

This sheet is protected. To copy specific objects, remove the protection by clicking Tools -&gt; Protection -&gt; Unprotect sheet.



Input

BMPs

Total Load

Graphs



# **STEPL Output Efficiency Is Mainly Affected BY:**

- BMP Efficiencies are MAJOR driving force for load reductions
- Need to have a very good sense of the true efficiencies in each situation
- Rainfall data must be accurate or loads can vary considerably



# Other Features of STEPL

Lots of default values/options:

- Rainfall and USLE parameters based on location and nearby weather station
- BMPs can be added and efficiencies can be edited
- Urban BMP Tool for BMPs or LIDs for urban land uses

US EPA <http://iaspub.epa.gov/pls/waters/f?p=110:1:1878045620623157>  

File Edit View Favorites Tools Help

US EPA GRTS Home

**U.S. Environmental Protection Agency**

## Grants Reporting and Tracking System - GRTS

[EPA Home](#) > [GRTS Home](#)

### Grant Reporting and Tracking System, Release 4.1

Welcome to the Grant Reporting and Tracking System (GRTS). This application allows users at the national, regional, and tribal levels to enter and view information relevant to NPS projects.

Please click on the links at the left to enter various database views and external databases, including the GRTS Online Help, which is a good starting place for first time users.



  
GRTS HOME

- State Records
- Tribal Grants
- Pre-Award
- Watershed Plan Tracker
- Reports
- Load Reduction Models
- XML Data Import
- Online Help
- Update My Profile
- Change Password
- Report an Issue
- Logout

[EPA Home](#) | [Privacy and Security Notice](#) | [Contact Us](#)

Version 1.21 - November 24 2008

URL: <http://iaspub.epa.gov/pls/waters/f?p=110:1:1878045620623157>

http://it.tetrattech-ffx.com/steplweb/models\$docs.htm

File Edit View Favorites Tools Help

EPA - STEPL - Spreadsheet Tool for Estimating Polluta...

Recent Additions | [Contact Us](#) | [Print Version](#) Search:  [GO Advanced Search](#)

[EPA Home](#) > [STEPL](#)

## Models and Documentation

- [BMP Efficiency Calculator](#)  
(Last updated: 06/30/2010. Please send your comments to [STEPL support](#).)
  - [BMP Efficiency Calculator 1.0 Package](#) 
- [STEPL 4.1](#)  
(Last updated: 06/30/2010. Please send your comments to [STEPL support](#).)
  - [STEPL 4.1 Installation Package](#) 

Note: This update was to make the STEPL model compatible with Excel 2007. The STEPL 4.0 User's version.

- [STEPL 4.0](#)  
(Last updated: 06/30/2010.)
  - [STEPL 4.0 Installation Package](#) 
  - [STEPL 4.0 and Region 5 Model New Features](#) 
  - [STEPL 4.0 User's Manual](#) 
- [STEPL 3.1 Installation Package](#)   
(Last updated: 06/30/2010)
- [STEPL 3.1 User's Manual](#)   
(Last updated: 06/30/2010)
- [STEPL Example \(Microsoft Excel 2000\)](#)   
(Last updated: 06/30/2010)
- [STEPL 2.2 Field Data Entry Sheets](#)   
(Last updated: 07/01/03)
- [Region 5 Load Estimation Spreadsheet Model \(Microsoft Excel\)](#) 

Home

Access STEPL Data  
Server for Input Data

Models and  
Documentation

Frequently Asked  
Questions