Watershed Modeling with the Spreadsheet Tool for Estimating Pollutant Load

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Download STEPL at:

http://it.tetratech-ffx.com/stepl

Why Estimate Pollutant Loads?

- Watershed planning (one of the 9 key elements)
- Target future management efforts
- BMP load reductions
- Required for 319 funded watershed planning and on-the ground implementation

Load Reduction Estimation

- Load estimation techniques
- Using models to estimate loads
- Available models
- Model selection

What Approach to Estimate Loads?

Depends on:

- water quality parameters
- time scale
- data needs
- user experience

“simplest approach that meets your needs”

BUT justify your choice

Spreadsheet Models

- Spreadsheet Tool for Estimating of Pollutant Load (STEPL) model

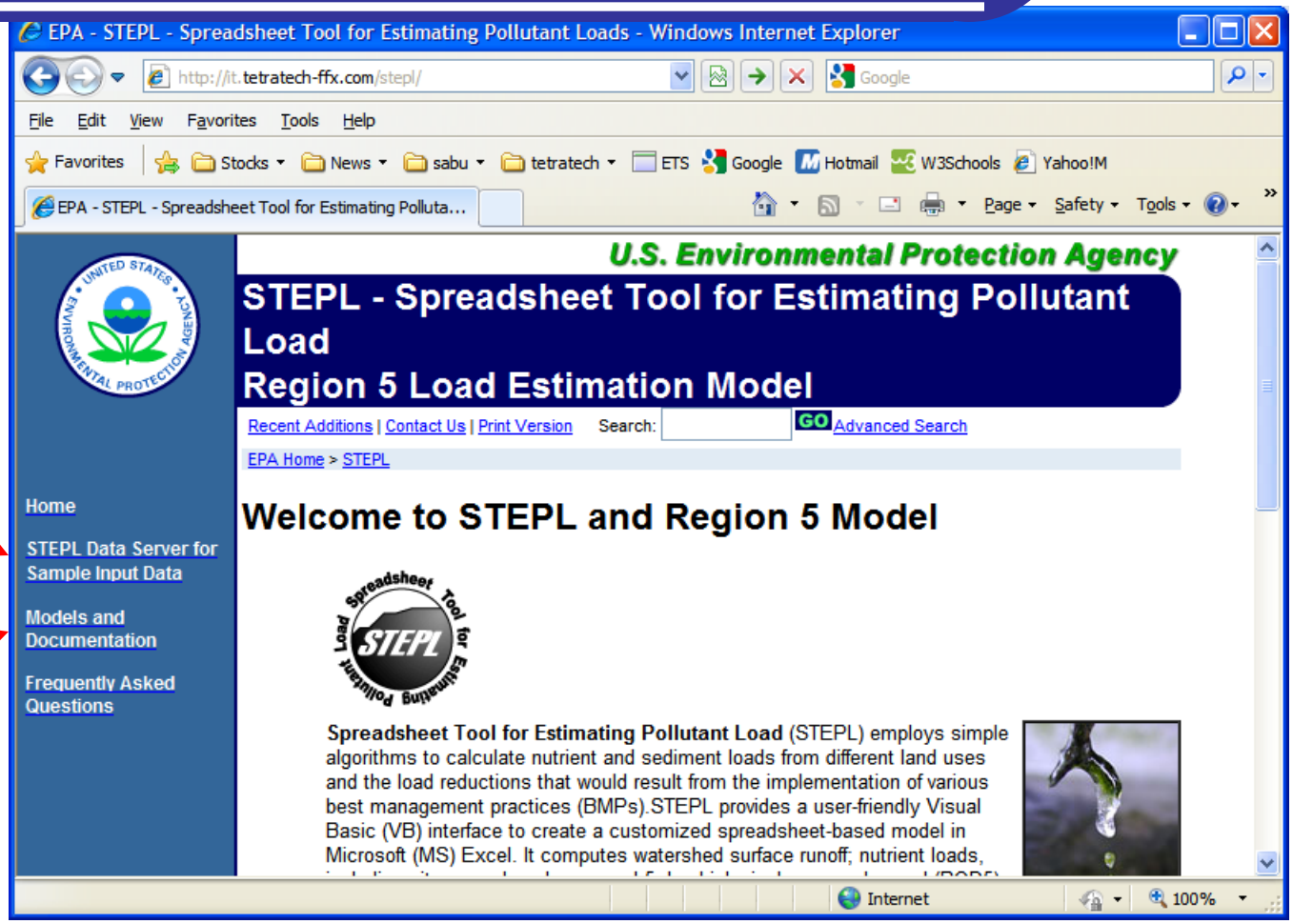
- Region 5 model

(a simple model not just for EPA Region 5)

Website

Link to on-line Data server

Link to download setup program to install STEPL and Region 5 programs and documents



http://it.tetratech-ffx.com/stepl

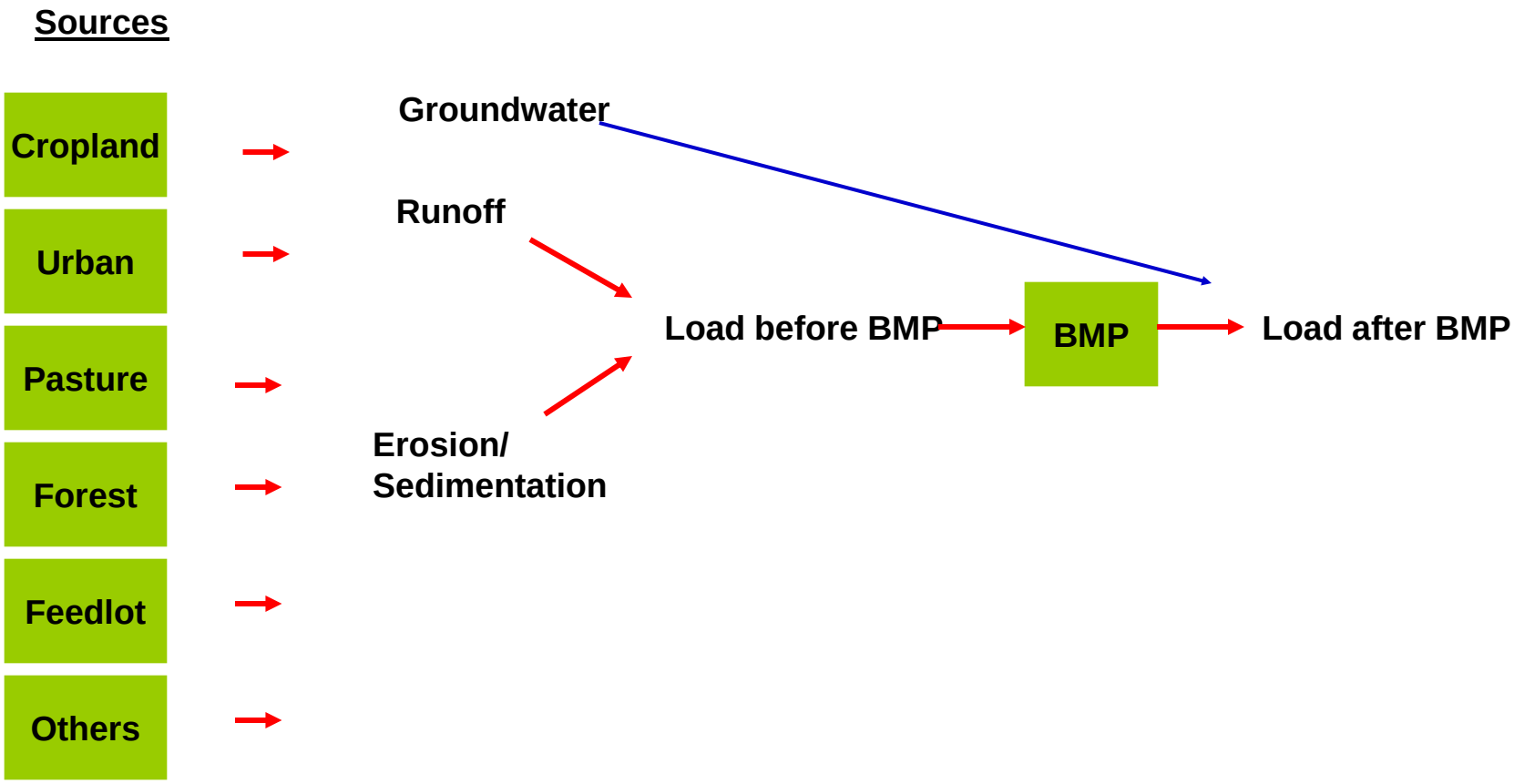
What is STEPL?

- Calculates nutrient and sediment loads by land use type
- Calculates load reductions from Best Management Practice (BMP) implementation
- A customized MS Excel spreadsheet model
  - Simple and easy to use
  - Data driven
  - Formulas and default parameter values can be modified by users with no programming required

Users

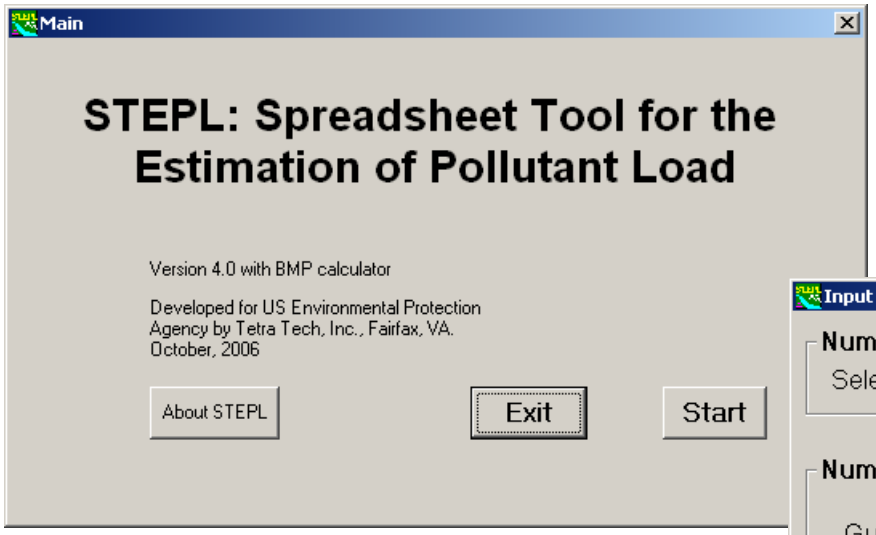
- Basic understanding of hydrology, erosion, and pollutant loading processes
- Environmental data (e.g., land use, agricultural statistics, and BMP efficiencies)
- Familiarity with MS Excel

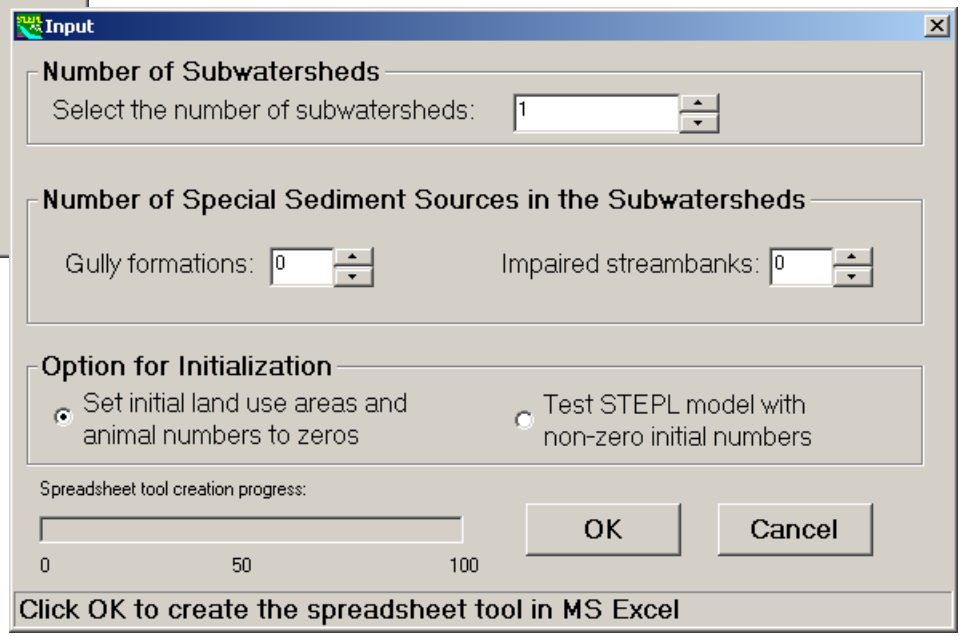
Process


Sources
Cropland
Urban
Pasture
Forest
Feedlot
Others
Groundwater
Runoff
Erosion/
Sedimentation
Load before BMP
BMP
Load after BMP
STEP 1
STEP 2
STEP 3
STEP 4

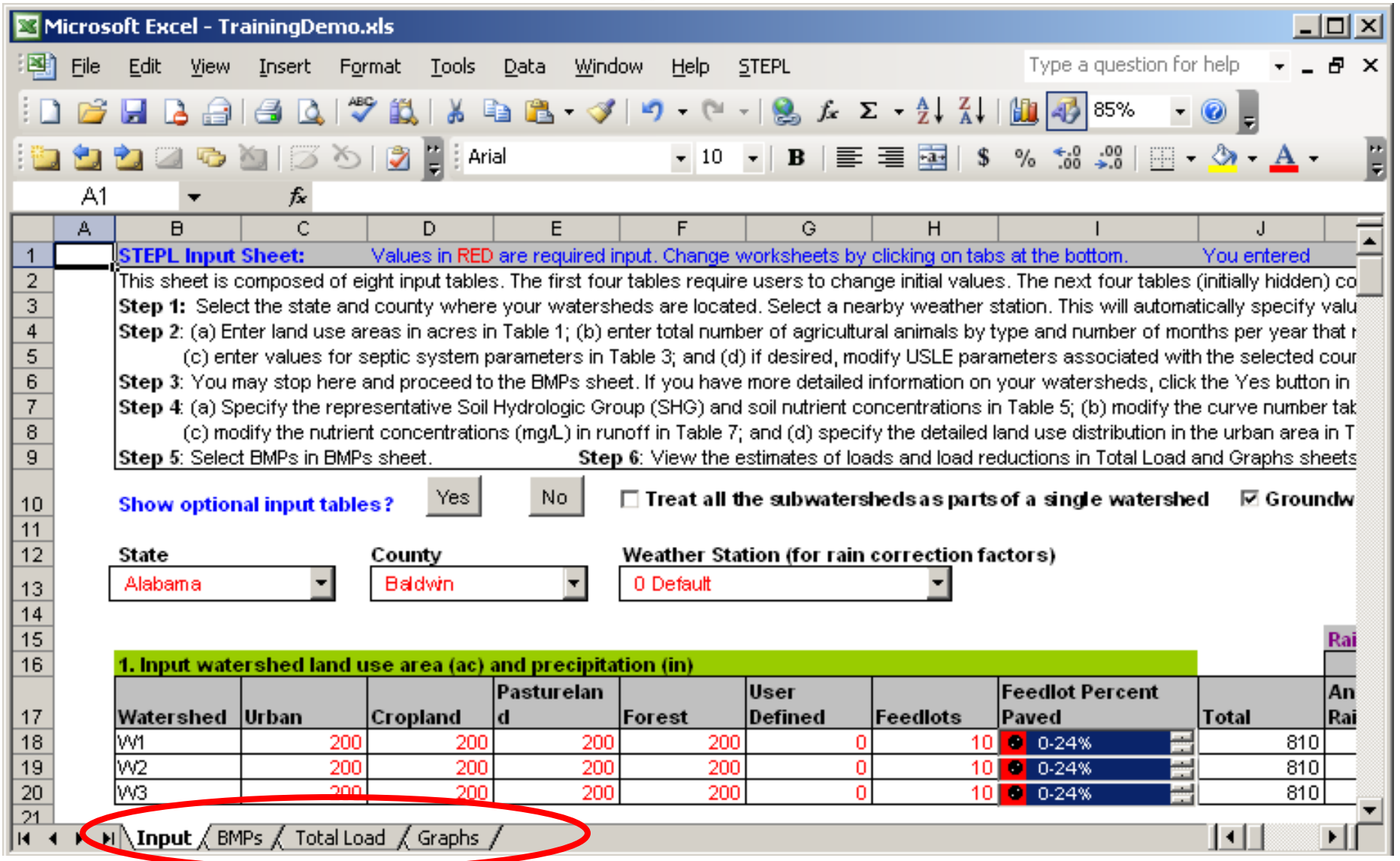
STEPL Main Program

- Run STEPL executable program to create and customize spreadsheet





STEPL Spreadsheet



Composed of four worksheets

BMPs Worksheet

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	% Area BMP Applied
W1	0.485	0.55	ND	0.405	Contour Farming	100
W2	0.1	0.3	ND	0.35	Diversion	100
W3	0	0	0	0	0 No BMP	100

Each land use type within each watershed can have a separate BMP or combinations of BMPs.

Can be partial application using the % Area BMP applied.

Can change the initial BMP efficiencies if local data are available.

Gully and Streambank Erosion Calculation Tool

1. Gully dimensions in the different watersheds

Watershed	Gully	Top Width (ft)	Bottom Width (ft)	Depth (ft)	Length (ft)	Years to Form	BMP Efficiency (0-1)	Soil Textural Class
W1	Gully1	5	5	5	5	1	0.95	Clay

2. Impaired streambank dimensions in the different watersheds

Watershed	Strm Bank	Length (ft)	Height (ft)	Lateral Recession	Rate Range (ft/yr)	Rate (ft/yr)	BMP Efficiency (0-1)	Soil Textural Class
W1	Bank1	5	100	1. Slight	0.01 - 0.05	0.03	0.95	Clay

Gully Stabilization Worksheet

- Load

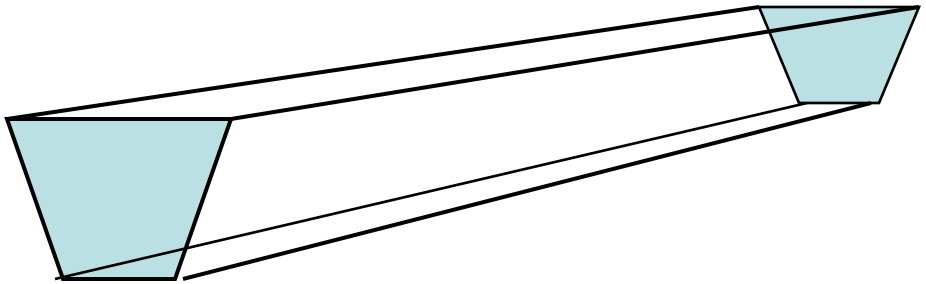
  Average annual erosion during the life of the gully (t/y)

  = Volume x Soil Weight / Years

  Nutrient load

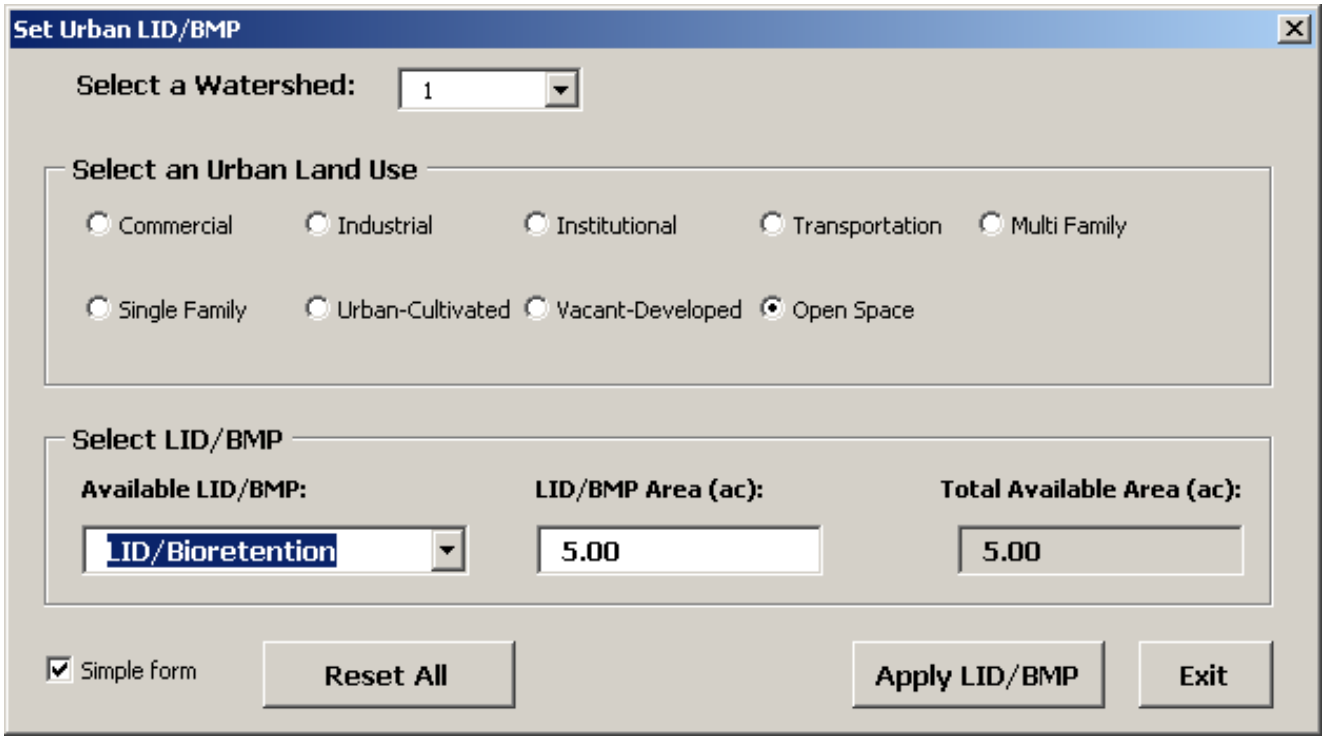
  = Annual Erosion x Soil Nutrient Conc. x Correction Factor

- Load Reduction after implementing gully stabilization
  - Specify reduction efficiency (100% efficiency by default)
  - Reduction is equal to annual erosion x user-specified efficiency



Volume = (Top Width +Bottom Width) x Depth x Length / 2

Urban BMP Tool



Add New Data to BMP List

If a certain BMP is not in the selection list, can add your BMP to the database

A	B	C	D	E	F	G
Landuse	**BMP & Efficiency**	**N**	**P**	**BOD**	**Sediment**	
Cropland						<Don't Delete
Cropland	0 No BMP	0	0	0	0	<Don't Delete
Cropland	Combined BMPs-Calculated	0	0	0	0	
Cropland	Contour Farming	0.485	0.55	ND	0.405	
Cropland	Diversion	0.1	0.3	ND	0.35	
Cropland	Filter strip	0.7	0.75	ND	0.65	
Cropland	Reduced Tillage Systems	0.55	0.45	ND	0.75	
Cropland	Streambank stabilization and fencing	0.75	0.75	ND	0.75	
Cropland	Terrace	0.2	0.7	ND	0.85	
Pastureland						<Don't Delete
Pastureland	0 No BMP	0	0	0	0	<Don't Delete
Pastureland	Combined BMPs-Calculated	0	0	0	0	
Pastureland	User Defined	0.5	0.5	0.5	0.75	
Forest						<Don't Delete
Forest	0 No BMP	0	0	0	0	<Don't Delete

Instruction:
1. Do not delete the greyed rows.
2. BMP efficiencies should be <=1.
3. If you add a row for a new BMP, you must specify landuse, BMP name, and pollutant removal efficiencies.
4. Type "ND" for no data.
5. Click "Update BMP Data" to update selection boxes on the BMPs sheet.
6. Click "Save Updates" to save the BMP list to external text files in the STEPL\Support folder.

Update BMP Data

Update BMP button

(BMPList worksheet)

New BMP added!

New BMP added!

(BMPs worksheet)

2. BMPs and efficiencies for different pollutants on pastureland, ND=No Data					
Watershed	**Pastureland**				
	N	P	BOD	Sediment	BMPs
W1	0.5	0.5	0.5	0.75	User Defined

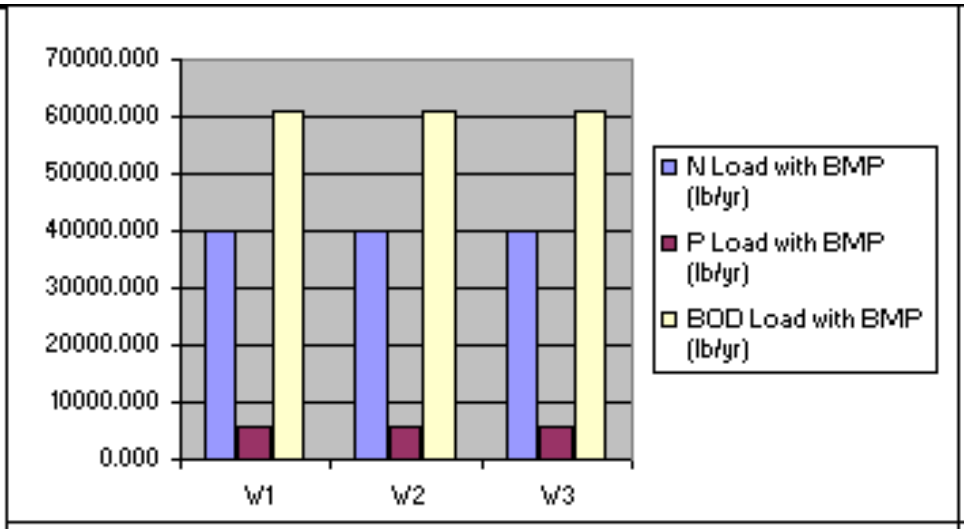
Total Load Worksheet

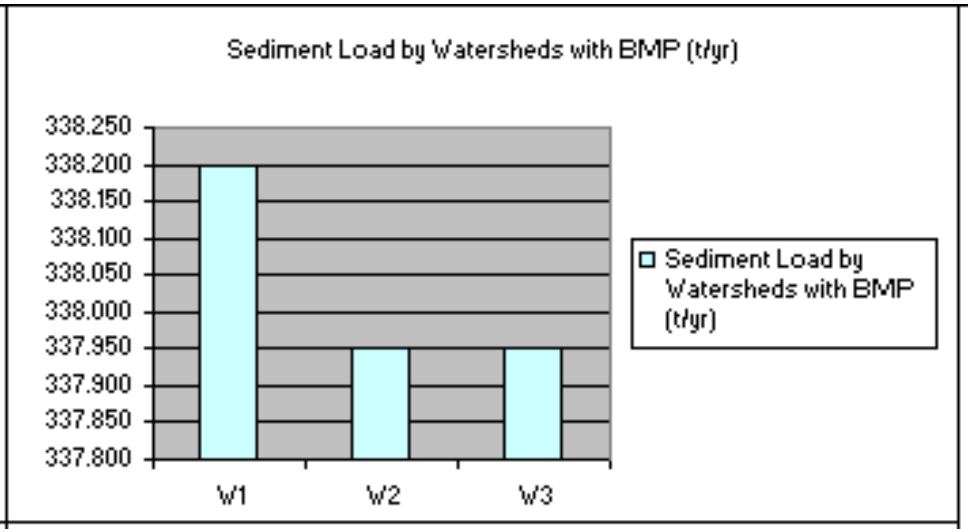
1. Total load by subwatershed(s)

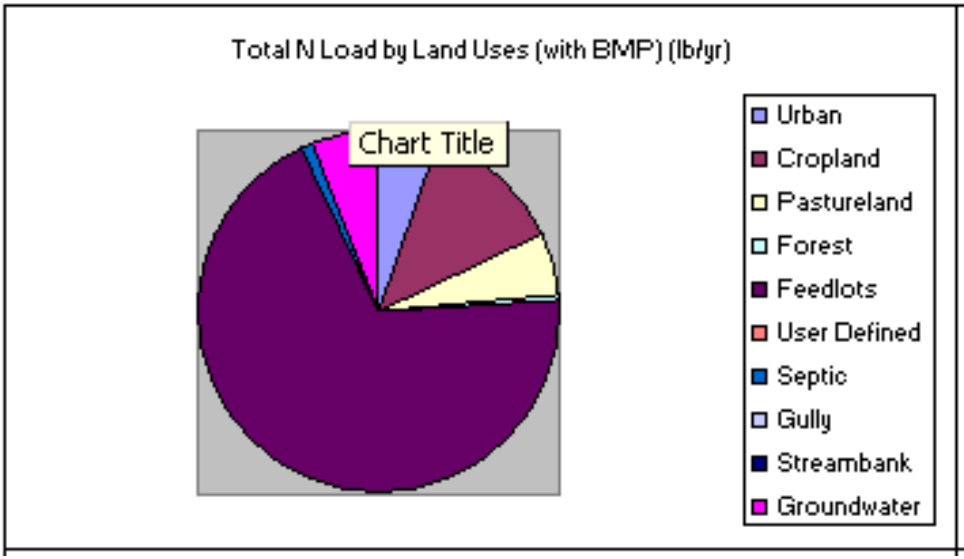
Watershed	N Load (no BMP)	P Load (no BMP)	BOD Load (no BMP)	Sediment Load (no BMP)	N Reduction	P Reduction	BOD Reduction	Sediment Reduction
	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year
W1	39888.8	5615.6	60882.3	342.9	8.6	3.3	17.1	4.7
W2	39879.8	5612.2	60864.2	338.0	0.0	0.0	0.0	0.0
W3	39879.8	5612.2	60864.2	338.0	0.0	0.0	0.0	0.0
Total	119648.4	16839.9	182610.8	1018.8	8.6	3.3	17.1	4.7

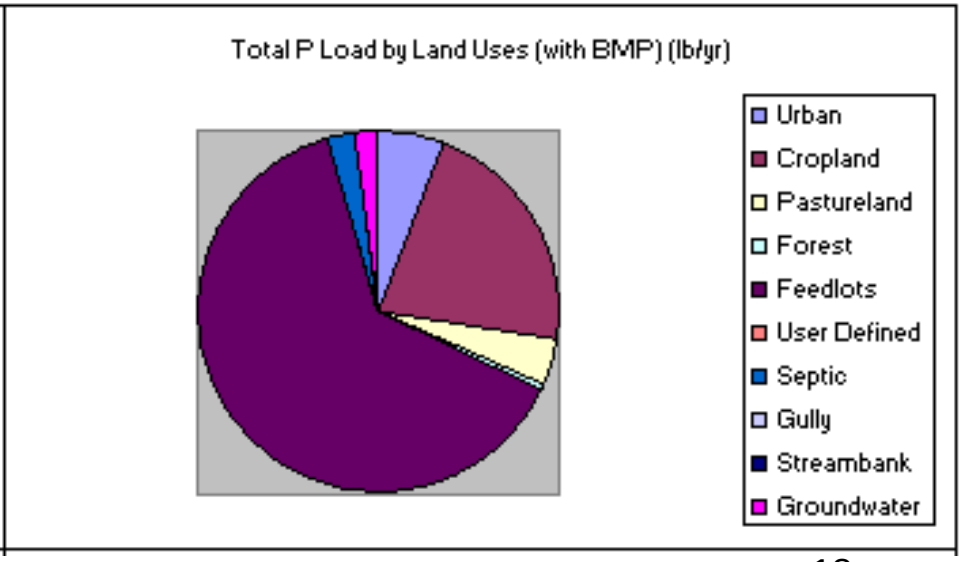
Each row of results corresponds to a different watershed or project.

Graphs Worksheet



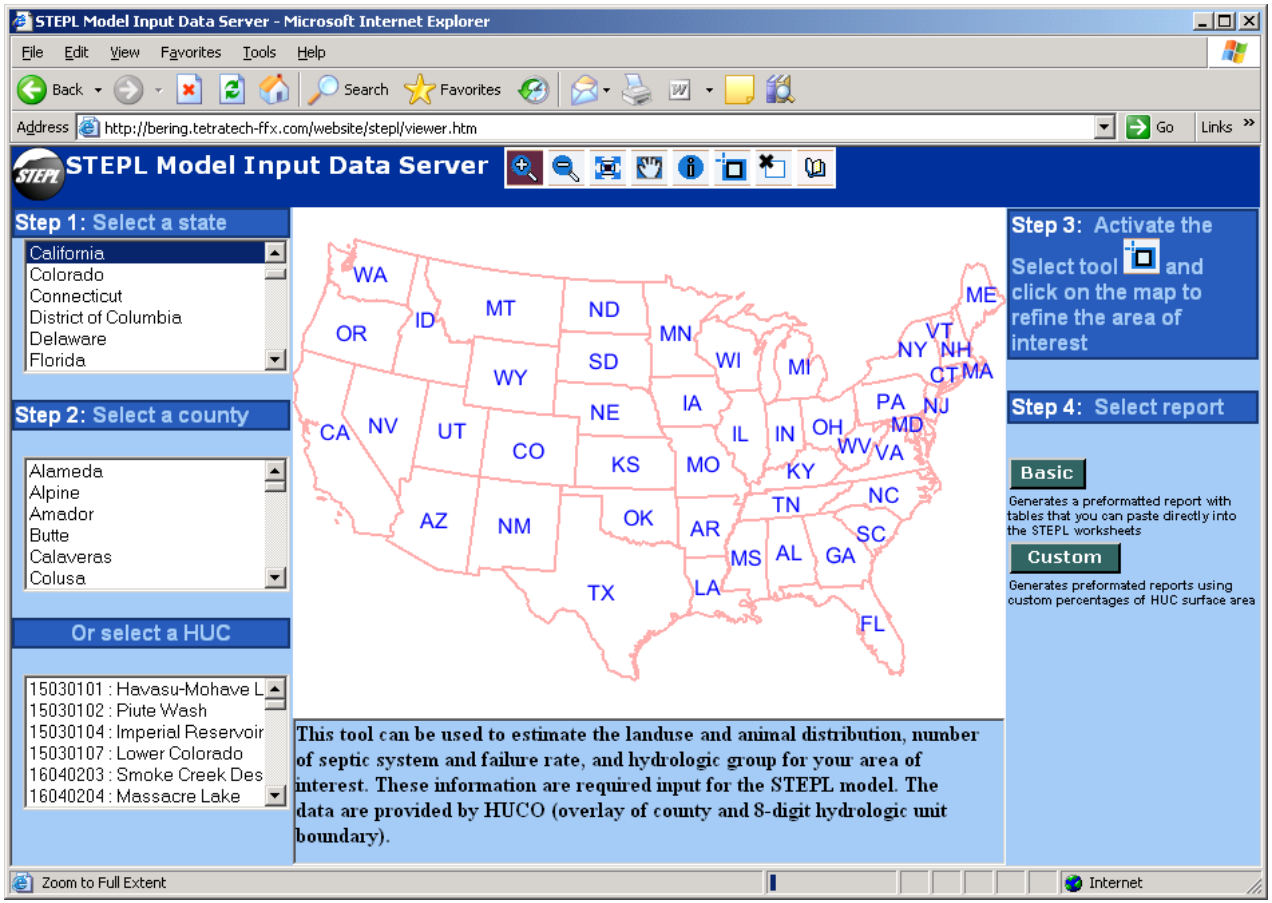






STEPL Online Input Data Server

http://bering.tetratech-ffx.com/website/stepl/viewer.htm



Or try

USDA United States Department of Agriculture
National Agricultural Statistics Service

http://www.nass.usda.gov/

Questions?

www.nmenv.state.nm.us