

Appendix 6. Pollutant Load Estimates and Reductions

Quantifiable amounts of pollutant loads delivered to waterbodies within the watershed were modeled to determine overall loading rates. Pollutant load reductions can be calculated based on BMPs installed to reduce targeted pollutants.

The Spreadsheet Tool for Estimating Pollutant Load (STEPL) uses algorithms to calculate nutrient and sediment loads from different land uses and the load reductions that would result from the implementation of various best management practices (BMPs). It computes watershed surface runoff, nutrient loads, including nitrogen, phosphorus, biological oxygen demand, and sediment delivery based on various land uses and practices. Annual nutrient loading is calculated based on runoff volume and the pollutant concentrations in the runoff water as influenced by factors such as the land use distribution and management practices. The annual sediment load is calculated based on the Universal Soil Loss Equation (USLE) and sediment delivery ratio. The sediment and pollutant load reductions that result from the implementation of BMPs are computed using the known BMP efficiencies (<http://it.tetrattech-ffx.com/steplweb/>).

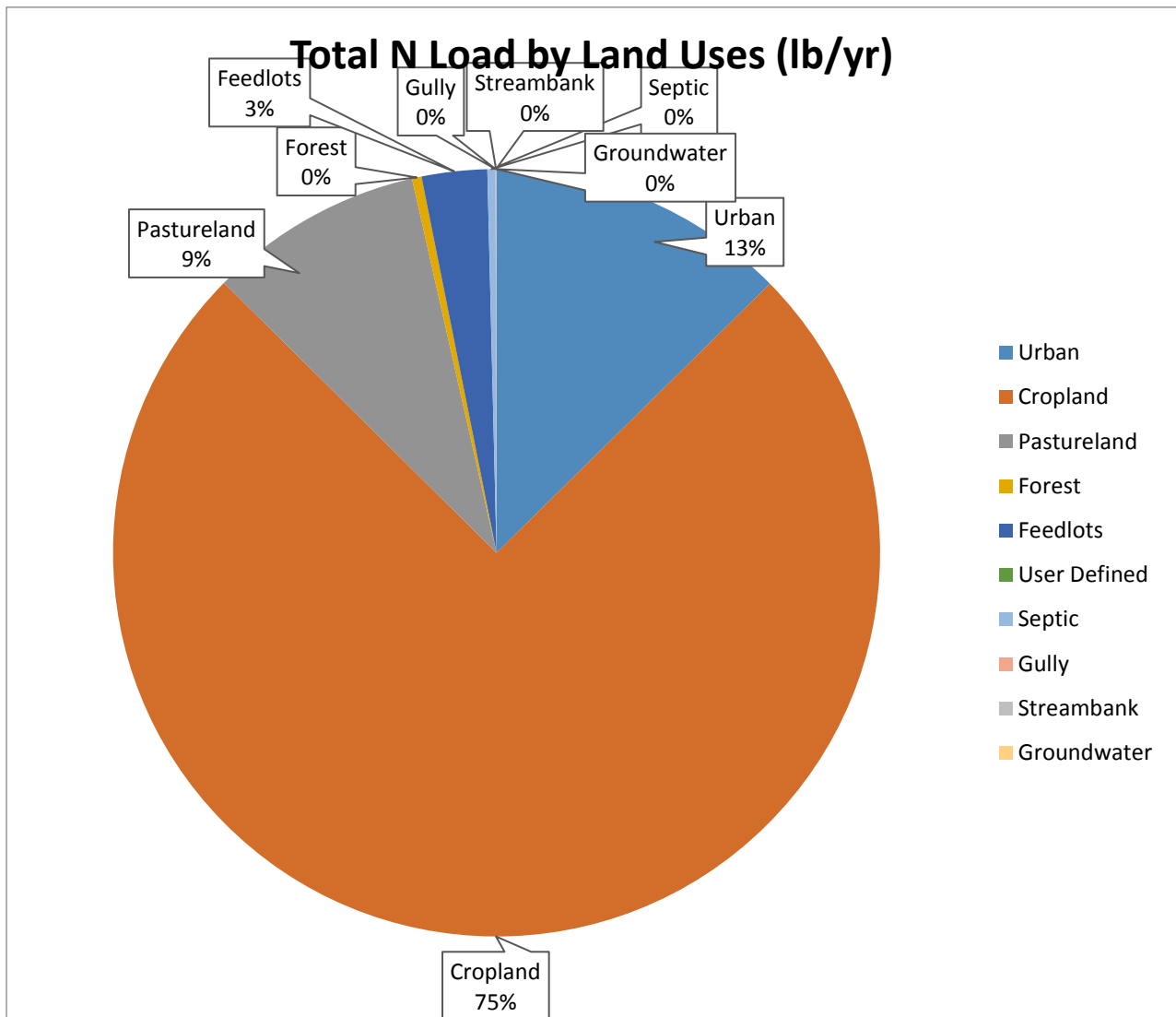
Knowledge of environmental data ensures a more precise model with better empirical data. Input Data Server, a map interface, was used to generate input data for the model at the HUC 12 or sub-watershed level. Watershed-level data used: county data, weather station, land use distribution, agricultural animal populations and number of months manure applied, septic system information, irrigated acreage, stream banks and gullies. Watershed specific data was input based on measurements acquired through specific watershed analysis. STEPL automatically applies a default urban land use distribution to identify the types of land uses. Loadings were calculated for the following sub watersheds and total watershed loading was also determined.

Watershed	HUC 12 Name
W1	City of Florence – Saint Joseph River
W2	Sturgis Dam – Saint Joseph River
W3	Little Portage Creek
W4	Headwaters Little Portage Creek

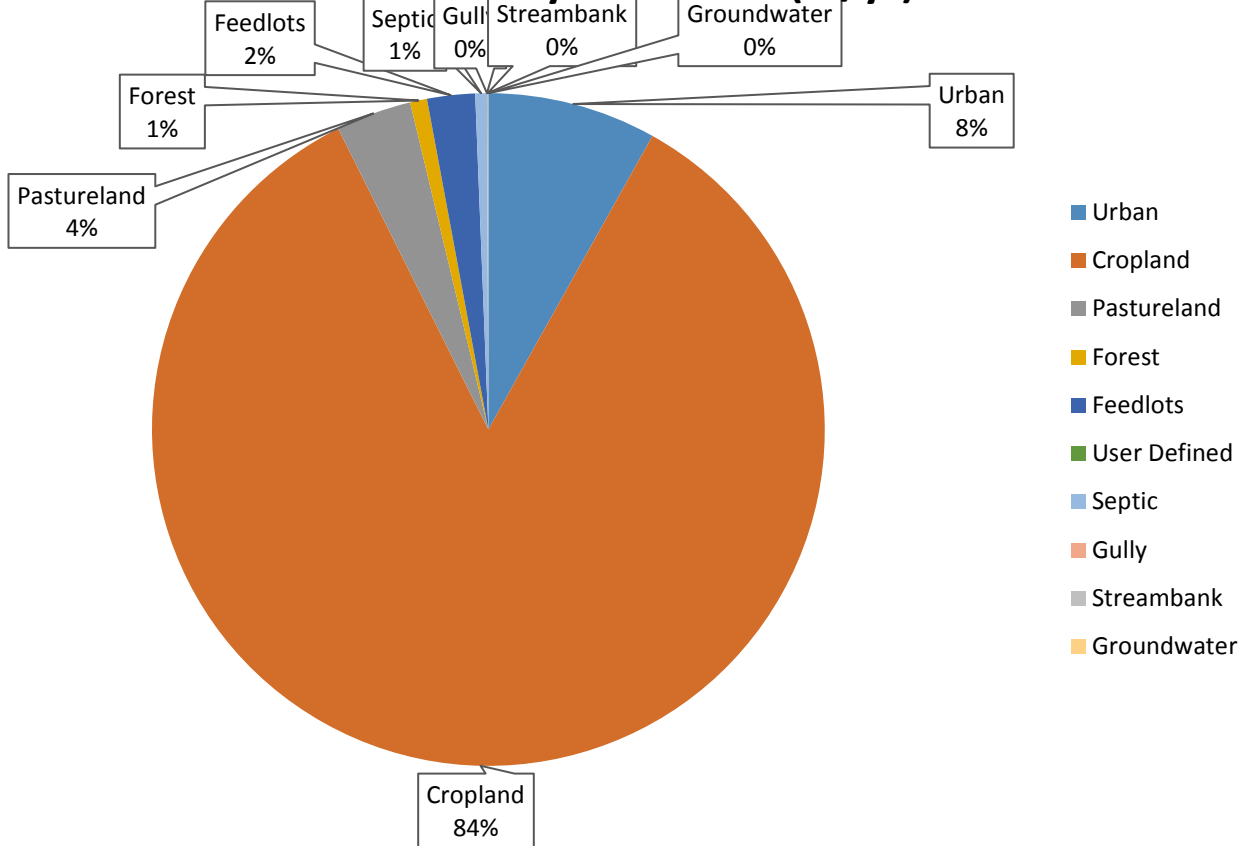
Loading estimates were generated based upon specific inputs to each sub-watershed. A base estimate per sub-watershed was determined:

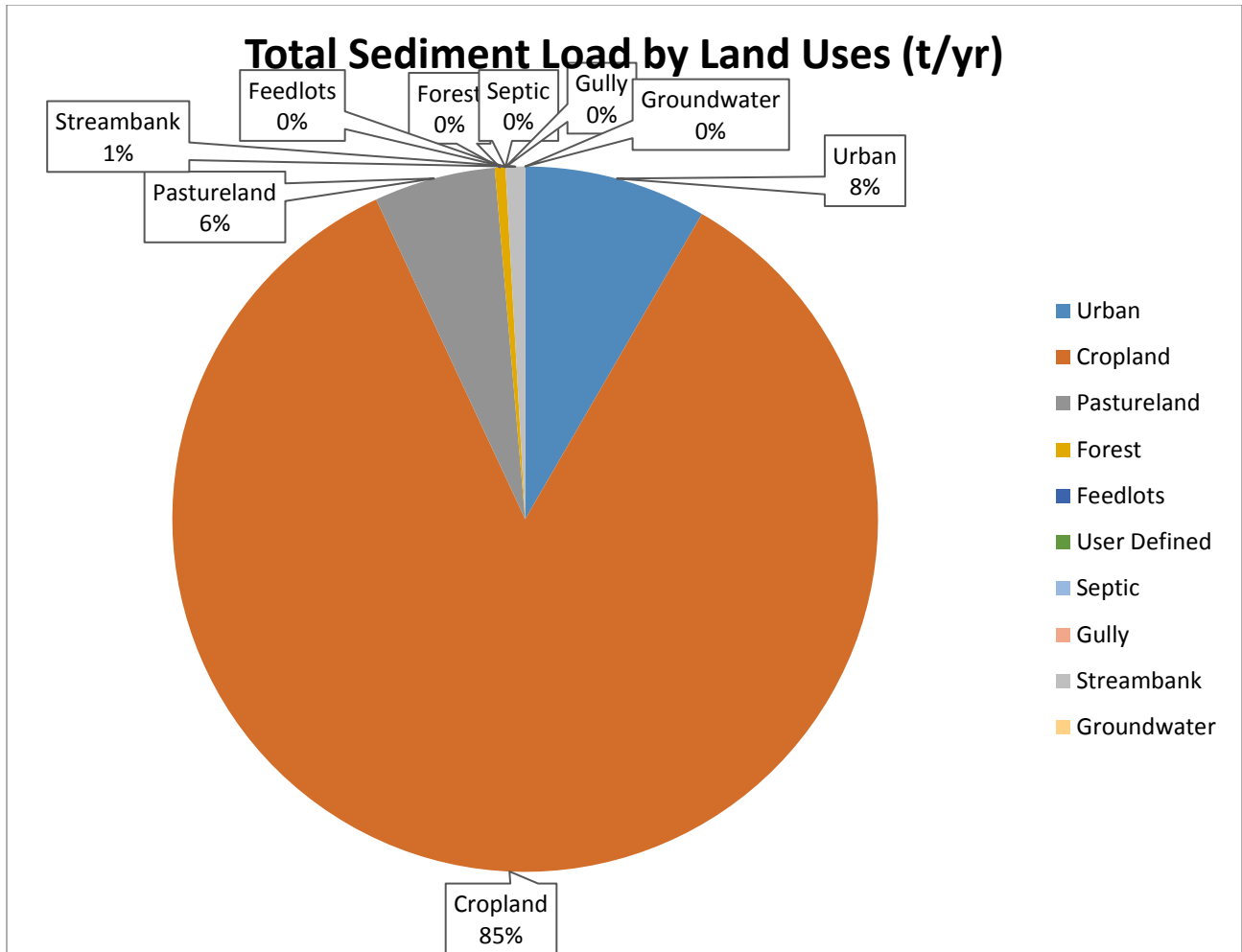
1. Total load by subwatershed(s)				
Watershed	N Load (no BMP)	P Load (no BMP)	BOD Load (no BMP)	Sediment Load (no BMP)
	lb/year	lb/year	lb/year	t/year
W1	131568.5	31456.6	258939.4	5021.4
W2	82967.9	20572.3	151135.7	3697.0
W3	81710.5	20330.1	147100.0	3841.3
W4	120448.3	29275.4	221769.0	5958.9
Total	416695.2	101634.3	778944.1	18518.6

The following depicts the amount of loading for each land use:



Total P Load by Land Uses (lb/yr)





BMPs were applied to known agricultural impairments and agricultural land uses. A combination of cover crops, filter strips, and reduced tillage systems were used. Stream banks and gullies received a bmp restoration with efficiencies of 95%. Urban BMPs were not applied as inventory was directed to agricultural impairments and natural verse unnatural stream degradation.

A 25% rate of land application of agricultural BMPs installed was used. Three combined BMPs were used.

BMP	N	P	BOD	Sediment
Cover Crop	0.3	0.25	ND	0.35
Filter strip	0.7	0.75	ND	0.65
Reduced Tillage Systems	0.55	0.45	ND	0.75
Combined BMPs-Calculated	0.517	0.483	ND	0.583

N Load (with BMP)	P Load (with BMP)	BOD (with BMP)	Sediment Load (with BMP)	%N Reduction	%P Reduction	%BOD Reduction	%Sed Reduction
lb/year	lb/year	lb/year	t/year	%	%	%	%
69044.3	17226.4	237147.5	1616.5	47.5	45.2	8.4	67.8
39978.0	10607.8	134261.3	1060.4	51.8	48.4	11.2	71.3
38934.9	10371.5	129850.8	1047.6	52.4	49.0	11.7	72.7
59926.9	15183.6	197344.7	1474.3	50.2	48.1	11.0	75.3
207884.2	53389.4	698604.2	5198.7	50.1	47.5	10.3	71.9

With agricultural BMPs and stream bank and gully erosion BMPs, nitrogen loading in the watershed was reduced by 50.1%, phosphorus was reduced by 50.1%, and sediment was reduced by 71.9%.

According to the inputs, STEPL modeling results determined that City of Florence (0904) had the highest loads of nitrogen and phosphorus, with the second highest ranking in sediment contribution. Headwaters Little Portage Creek (0901) had the second highest loads of nitrogen and phosphorus, with the largest loading of sediment. Sturgis Dam – Saint Joseph River had the third highest loads of nitrogen and phosphorus, with the lowest loading of sediment. Little Portage Creek (0902) has the lowest loading of nitrogen and phosphorus, and the third most loading of sediment.