

Watershed Implementation Plan

For

South Branch Plum Creek

Stream Code – 46577

Indiana County, PA (17-E)

Prepared by



Crooked Creek Watershed Association

And



Indiana County Conservation District

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I. INTRODUCTION

The Crooked Creek Watershed Association (CrCWA) was established in 1981 with the mission to improve the water quality of Crooked Creek and its tributaries, preserve and enhance natural habitats in the watershed, and increase public awareness and education. Since its inception, CrCWA has worked with numerous partners on Abandoned Mine Drainage (AMD) treatment, streambank restoration, and fish habitat improvement projects. CrCWA has also partnered to build public boat launches and handicapped fishing piers, conduct watershed cleanups, and initiate education and public outreach events.

A grassroots nonprofit organization, CrCWA was founded by a group of concerned volunteers interested in increasing the ecological health of the watershed and quality of life in the community in which they live. The benefits of improving the water quality and condition of the natural habitats of Crooked Creek are: cleaner, safer drinking water for residents; improved recreational opportunities such as fishing, swimming, and boating; and increased ecological health and biodiversity.

The South Branch Plum Creek, the largest tributary to Crooked Creek, is presently polluted throughout most of the watershed and experiencing a reduction in aquatic life. Streams within were identified in Pennsylvania's 2006 Integrated Water Quality Monitoring and Assessment Report as being impaired by siltation resulting primarily from agriculture. The impaired stream segments in the watershed and causes for impairment are shown in Table 1 and Figure 1.

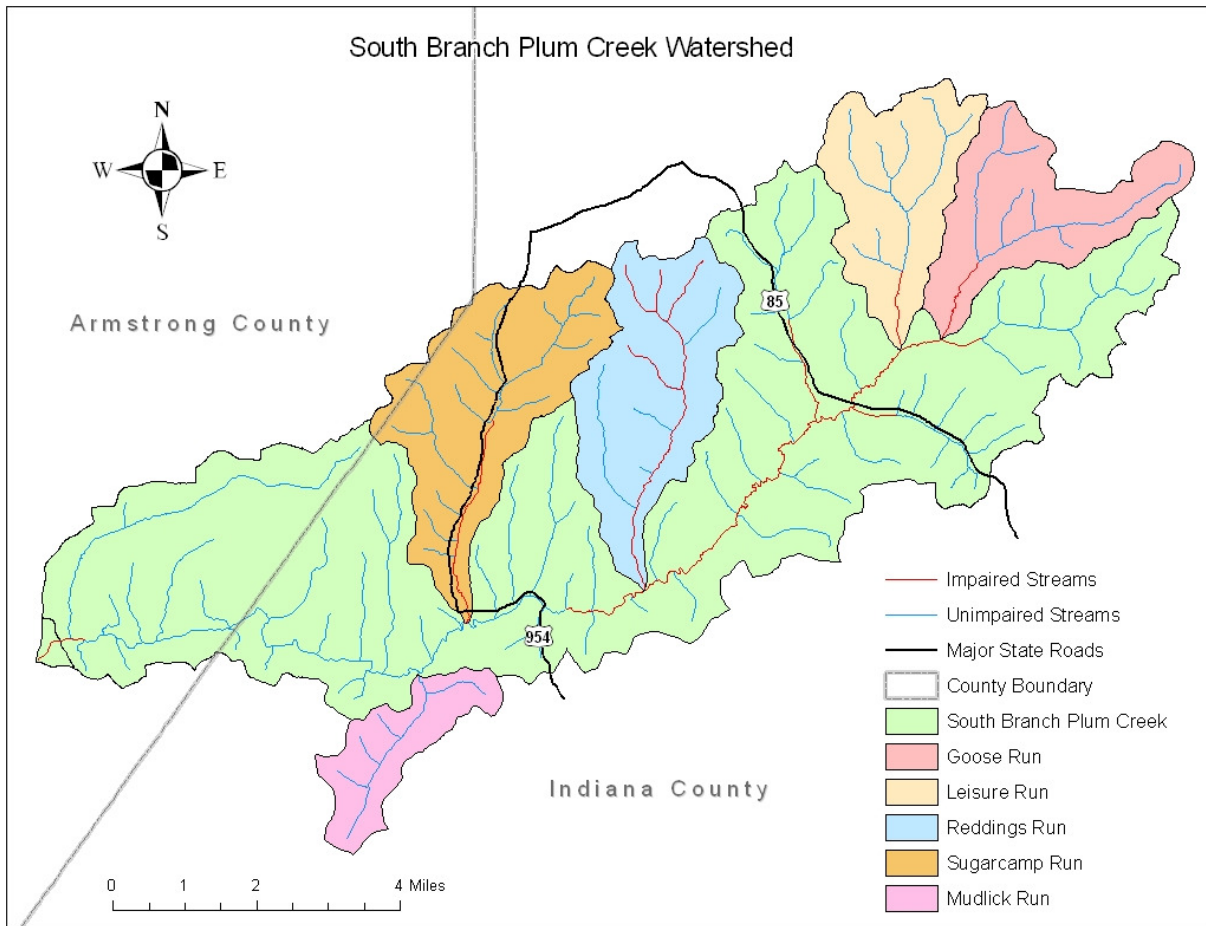
Despite the impaired status of the South Branch Plum Creek, it is designated as one of the few High Quality Cold Water Fisheries in Indiana County and has been identified as a priority watershed for Growing Greener funding by the Pennsylvania Department of Environmental Protection (PADEP).

To accomplish its mission of restoring the Crooked Creek Watershed, CrCWA seeks to work in cooperation with interested farmers and landowners to reduce sediment pollution by conducting restoration projects to improve water quality. These projects, called Best Management Practices (BMPs), may include streambank protection, riparian buffer planting, and streambank fencing.

CrCWA needed to develop a plan for restoring for South Branch Plum Creek Watershed. This Watershed Implementation Plan (WIP) would include an assessment of the watershed and identify potential restoration projects. With a WIP developed, CrCWA could use it to work with landowners to implement BMPs and to pursue grants need to fund projects.

In March 2008, CrCWA partnered with the Indiana County Conservation District (ICCD) and were funded through a Section 319(h) Nonpoint Source Management Grant to develop a WIP for the South Branch Plum Creek.

Figure 1. South Branch Plum Creek Streams and Sub-watersheds



Under the Clean Water Act, if a state determines a stream to be impaired, it must be listed on the Section 303(d) list and must be reported to the Environmental Protection Agency (EPA) every two years. Once streams are placed on the 303(d) list, the Clean Water Act then requires states to develop allowable pollution limits for meeting water quality goals called Total Maximum Daily Loads (TMDLs).

The TMDL process is a nationwide effort to inventory and improve the health of surface waters, requiring a study be completed to determine how to restore impaired water bodies. A TMDL sets a target goal for the total amount of a pollutant that can safely enter a stream while still supporting its designated aquatic life uses, and then works to meet the target goal by distributing load allocations to all pollution sources in the watershed.

The PADEP Southwest Regional Office began developing a Sediment TMDL for the South Branch Plum Creek in 2006, with a final draft completed in 2008. Although the TMDL was never finalized and remains in draft form, it served as a guideline to developing the WIP.

The WIP used the TMDL as a guideline to identify BMP projects to reduce pollutant-loading, working towards the goal of eventually delisting of the impaired stream segments in the

watershed. The WIP was developed by collecting and compiling relevant information from existing studies and previously published plans for the watershed. These plans include: the Crooked Creek Watershed Nonpoint Source Pollution Assessment, prepared by CWM Environmental Inc. for CrCWA in 2005; the Upper Crooked Creek Rivers Conservation Plan, prepared by Mackin Engineering Co. for the Indiana County Office of Planning and Development through the Pennsylvania Department of Conservation and Natural Resources Rivers Conservation Program in 2001; and the Assessment of Nonpoint Source Pollution for Crooked Creek and Cowanshannock Creek Watershed, prepared by the Armstrong and Indiana County Conservation Districts in 1994. An Agricultural Assessment for the entire Crooked Creek Watershed has been drafted by the Armstrong and Indiana County Conservation Districts.

CrCWA and ICCD will utilize the WIP to apply for funds to work with landowners to implement restoration projects outlined in the plan.

II. BACKGROUND

The Crooked Creek Watershed, located within the Pittsburgh Low Plateau Section of the Appalachian Plateau, drains approximately 292 square miles of Indiana and Armstrong Counties of Pennsylvania into the Allegheny River. Crooked Creek's two largest tributaries, the North and South Branches of Plum Creek, are found in the northern portion of the watershed.

The South Branch Plum Creek is an approximately 40 square mile watershed, containing about 103 miles of stream, located in mid-eastern Armstrong County and mid-western Indiana County. It flows southwesterly for approximately 17 miles before its confluence with the North Branch of Plum Creek to form Plum Creek. Major tributaries to the South Branch include Sugarcamp Run, Reddings Run, Leisure Run, and Goose Run. Elevation ranges from 1000 to 1560 feet above sea level. The two underlying geology consists of interbedded sedimentary rocks, and the Casselman and Glenshaw Formation bedrock groups. The Glenshaw Formation, which is dominant, primarily consists of sandstones and mudrocks, with thin limestone and coal seams. Soil associations in the watershed include Gilpin-Wharton-Ernest, Monongahela-Philo-Atkins, and Gilpin-Weikert-Ernest. The dominant hydrologic soil group is C, which is characterized as having a slow infiltration rate when thoroughly wetted.

The South Branch Plum Creek basin exhibits the dendritic drainage pattern characteristic of streams in the Allegheny River. The topography is highly variable, but it is dominated by wide bottomland floodplains extending up to 1000 feet from the stream margin. This feature has led to many of the floodplains in the watershed to be converted to agricultural use.

During PADEP's TMDL development, the estimated dominant land use categories of the South Branch Plum Creek are: Agriculture – 45%; Forest – 53%; Other – 2%.

The water quality impairments of the South Branch Plum Creek can be linked to the large amount of agricultural land use in the watershed. Nonpoint agricultural sources provide a major contribution to the siltation water quality impairment.

South Branch Plum Creek and several of its tributaries were determined to be impaired by siltation, but listings for organic enrichment/low dissolved oxygen are no longer valid (Table 1). Recent sampling found no evidence of low dissolved oxygen; as no excessive algal growth was observed, and measurements taken from previous sampling sites were above 8.0 mg/L. There are currently no point sources of pollution contributing to the listed causes of impairment in the watershed. (TMDL)

Table 1. Current Impairments of South Branch Plum Creek

Stream Name	Miles	Segment ID	Stream Code	Designated Use	Source	Cause
South Branch Plum Creek	2.7	20020801-1230-ALF	46577	HQ-CWF	Grazing Related Agric, Removal of Vegetation	Siltation
South Branch Plum Creek	1.0	20020801-1100-ALF	46577	HQ-CWF	Grazing Related Agric	Siltation; Organic Enrichment/Low DO
South Branch Plum Creek	3.3	20020801-0900-ALF	46577	HQ-CWF	Grazing Related Agric	Siltation; Organic Enrichment/Low DO
South Branch Plum Creek	0.8	20090417-1115-dcounahan	46577	CWF	1) Bank Modifications 2) Other	1) Siltation 2) Exotic Species
UNT 46636	0.7	20020731-0930-ALF	46636	HQ-CWF	On Site Wastewater	Organic Enrichment/Low DO
UNT 46636	0.5	20020731-1130-ALF	46636	HQ-CWF	Removal of Vegetation	Siltation
UNT 46643	0.5	20020731-1330-ALF	46643	HQ-CWF	Construction	Siltation
Goose Run	1.0	20030514-1100-ALF	46659	HQ-CWF	Grazing Related Agric	Siltation
Leisure Run	0.2	20020731-1630-ALF	46652	HQ-CWF	On Site Wastewater	Organic Enrichment/Low DO
Sugarcamp Run	3.8	2002-0722-0945-ALF	46598	CWF	AMD	Metals; Siltation
Reddings Run	6.1	2009-0513-1000-dcounahan	46620	CWF	1) Agriculture 2) Small Residential Runoff 3) Bank Modification 4) Removal of Vegetation 5) Road Runoff	1) Siltation; Nurtients 2) Siltation 3) Siltation 4) Siltation 5) Siltation

* HQ-CWF = High Quality Cold Water Fishery; CWF = Cold Water Fishery; AMD = Abandoned Mine Drainage

Best Management Practices (or BMPs) are structural and non-structural approaches used to prevent or reduce pollutant loads in watersheds to meet water quality goals. BMPs are techniques that can be employed by landowners to either reduce the production of a pollutant, or prevent a pollutant from entering a waterbody.

The TMDL suggests the following BMPs to meet the required sediment reductions in the South Branch of Plum Creek: 1) Pasture Land Management, 2) Vegetated Buffer Strips, and 3) Streambank Protection.

Pasture Land Management refers to the utilization of practices to prevent excessive erosion due to over-grazing and overuse by ensuring adequate vegetative cover. Rotational grazing is a common practice of this type used by farmers seeking to reduce feeding costs. An example of this practice is periodically moving livestock among fenced pastures or paddocks to prevent overuse of any feeding area and allowing vegetation to recover. Planting hay or legumes as part of crop rotations provides feed for livestock, protects land areas from excessive erosion, and adds needed nitrogen to the soil.

Vegetated Buffer Strips are a type of structural BMPs suggested in the South Branch TMDL for implementation in the watershed. They are areas of land containing permanent vegetation that trap pollutants contained in surface runoff from adjacent land, usually cropland or confined animal facilities. Infiltration, deposition, and other natural processes remove pollutants from runoff. Types of vegetated buffer strips include: 1) permanently vegetated strips located between larger strips of crops on sloping land, 2) strips of permanent vegetation established at the edges of agricultural fields, and 3) areas of permanent vegetation adjacent to streams, ponds, or wetlands.

Streambank Protection is a collective term referring to several practices that can be implemented to reduce streambank erosion and decay. The most commonly used practice is streambank fencing, which prohibits cattle from trampling banks and streambeds, removing riparian vegetation, and adding excess nutrients through defecation and urination. Developments of springs and off-stream drinking water sources are often employed in tandem with fencing. Streambank protection also includes developing stable livestock crossings, which allows animals to move across the stream with minimal disturbance to the streambed and banks. The most effective practice of streambank protection, in terms of sediment reduction efficiencies, is streambank stabilization. This practice involves using structural methods to remedy unstable banks by physically reinforcing them with rocks, logs, vegetation, or other protective surfaces. Examples of these practices include traditional stabilization methods, such as rip-rap and gabion walls; and more ecologically beneficial methods such as natural stream design and fish habitat improvement structures (FHIS).

FHIS are constructed using natural materials, such as rock and stone, and include deflectors, vanes, cross-vanes, and mudsill cribbing. FHIS provide protective cover for fish and work by directing the force of the stream flow away from the banks into the stream channel, helping to create and maintain pool habitat. By absorbing some of the force of the stream flow, FHIS help reduce the potential for flood damage during storms. FHIS not only stop sediment from being stripped from the streambanks, they also allow sediment from upstream to be deposited in desirable areas and can actually help rebuild the streambanks they are protecting.

All the BMPs described above are designed to reduce the sediment load reaching streams in the watershed. Therefore, CrCWA and its partners will look to partner with landowners in the South Branch Plum Creek to implement the restoration recommendations outlined in this plan.

DATA COLLECTION

As previously stated, numerous assessments have already been conducted and reports published for the South Branch Plum Creek. After compiling relevant information from these previously published documents, a plan for collecting missing data was developed. Detailed field assessments of current conditions were needed, due to the age of past assessments. Due to limiting funding for this project, a cost-effective strategy for assessing the over 100 miles of stream corridors had to be determined.

Based on PADEP's 2008 TMDL, it was known that a significant amount sediment reducing BMPs would need to be identified for implementation. We determined the best strategy for assessment was to utilize aerial photography and GIS data using ArcMap GIS software. To verify the accuracy of the GIS data and aerial photography, field assessments were conducted to collect data on current conditions of riparian areas.

CrCWA, along with ICCD and U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) staff, began field assessments of existing BMPs in the watershed in September 2009. These existing BMPs were mostly implemented through the Conservation Reserve Enhancement Program (CREP) from 2006-2009. These BMPs were assessed to determine if they were functioning properly and if any repairs were necessary. Unfortunately, most of the existing BMPs in the watershed were cool-season grass and wildlife food plots in areas with little sediment reduction efficiencies.

Field assessments to verify the accuracy of the GIS data and aerial photography were conducted in tandem with public outreach efforts were conducted from June to August 2010. The public outreach efforts consisted of door-to-door visits to watershed residents to distribute a public outreach handout, containing information about the WIP, sedimentation issues, and BMPs. American Highbush Cranberry seedlings were also distributed with the handouts, with residents being encouraged to plant them in riparian areas. During this time, the riparian corridors were assessed to determine if streambank stabilization, fencing, and/or vegetated buffer were needed.

Using ArcMap, the entire South Branch Plum Creek Watershed was mapped by major sub-watersheds. Maps were created containing stream, state and local road, and county tax parcel boundary GIS data layers. Duplicate maps were also created containing the previously mentioned data overlaid onto USDA National Agriculture Imagery Program's (NAIP) aerial photography layer. Using the photos as a reference, verification of the actual current conditions was accomplished, riparian buffers were classified, and required BMPs were determined. Notes, observations, and sketches were drawn on the maps in the field, and then converted into GIS data layers later in the office.

The TMDL determined that the majority of the sedimentation in the South Branch Plum Creek comes from streambank erosion. Accordingly, the majority of the BMPs proposed for implementation require streambank protection. During field assessments, banks and riparian areas were analyzed for specific streambank protection BMPs needed. These BMPs include vegetated buffers, streambank fencing, and streambank stabilization. Based on the field

assessments and aerial photography, lengths and sizes of these BMPs were determined using the ArcMap software for each potential project site.

In the summer and fall of 2010, CrCWA and ICCD collected water quality data at several points in the South Branch Plum Creek through a PADEP Surface Waters Assessment grant. The data was collected following PADEP’s Instream Comprehensive Evaluation and includes field measurements, water and benthic macroinvertebrates samples analyzed by DEP-certified laboratories, and visual habitat assessments. Laboratory water samples were analyzed by Standard Analysis Code 907, which includes pH, biochemical oxygen demand, residue, total suspended solids, ammonia, nitrate, nitrite, and phosphorus. Field measurements were taken including, temperature, pH, alkalinity, dissolved oxygen, and conductivity, using handheld meters and field kits. The results are shown in Table 2. It should be noted that Pennsylvania does not currently have state water quality standards for sediments and nutrients.

Samples were taken at sites on the lower portion of the impaired sections of Leisure Run, Goose Run, and UNT 46636, and on two sites on the impaired section of the mainstem of the South Branch Plum Creek. The locations of these sample points are shown on Figure 2.

Table 2. Recent Waters Quality Sampling in South Branch Plum Creek

Station_ID	Date	Latitude	Longitude	Nitrate (mg/L)	Nitrite (mg/L)	pH	TDS (mg/L)	TSS (mg/L)	Ammonia Nitrogen (mg/L)	BOD (mg/L)	Total Phosphorus (mg/L)
SBPlumD	7/12/2010	40.73059	79.18404	< 0.50	< 0.010	7.0	103	< 5	< 0.05	< 3	< 0.03
SBPlumD*	9/28/2010	40.73059	79.18404	< 0.50	< 0.010	6.5	141	10	< 0.05	< 3	< 0.03
SBPlumM	7/12/2010	40.74871	79.15465	< 0.50	< 0.010	7.3	125	< 5	< 0.05	< 3	< 0.03
SBPlumM*	9/28/2010	40.74871	79.15465	< 0.50	< 0.010	6.8	142	22	< 0.05	< 4	0.06
UNTSBPlum	7/12/2010	40.76132	79.14677	0.5	< 0.010	7.3	229	< 5	0.49	< 3	0.15
UNTSBPlum*	9/28/2010	40.76132	79.14677	< 0.50	< 0.010	6.9	267	6	0.19	< 4	0.1
Leisure	7/12/2010	40.76955	79.12952	< 0.50	< 0.010	7.4	112	5	< 0.05	< 3	0.04
Leisure*	9/28/2010	40.76955	79.12952	< 0.50	< 0.010	7.1	128	< 5	< 0.05	4	0.03
Goose	7/12/2010	40.77008	79.12073	0.6	< 0.010	7.5	107	< 5	< 0.05	< 3	0.05
Goose*	9/28/10	40.77008	79.12073	< 0.50	< 0.010	7.2	115	5	< 0.05	< 3	< 0.03

* Samples taken during elevated flows after storm events

As shown in Table 1, Sugarcamp Run is the only stream in the South Branch Watershed that is impaired by AMD. More research and sampling is needed to characterize the discharges, but Table 3 showing recent sampling results upstream and downstream on the discharges.

Table 3. Recent Instream AMD Sampling in Sugarcamp Run

Date	Time	Site	Acidity (mg/L)	Alkalinity (mg/L)	pH	Iron (mg/L)	Manganese (mg/L)	Zinc (mg/L)
3/22/2010	15:40	SugarcU	1	28	6.5	1.05	0.16	<0.005
3/22/2010	16:00	SugarcD	-1	30	6.4	0.99	0.16	<0.005
4/19/2010	12:30	SugarcU	-12	33	6.5	0.24	0.28	<0.005
4/19/2010	12:40	SugarcD	-14	35	6.5	0.97	0.36	0.013
6/2/2010	16:45	SugarcU	-32	57	6.9	1.39	0.29	0.006
6/2/2010	17:00	SugarcD	-20	43	6.7	2.37	0.29	0.012
7/12/2010	10:00	SugarcU	-68	84	7.6	0.4	0.52	<0.005
7/12/2010	10:30	SugarcD	-25	41	6.8	5.29	0.92	0.061
8/23/2010	9:50	SugarcU	-48	77	6.5	0.36	0.41	<0.005
8/23/2011	10:20	SugarcD	-11	47	6.1	8.31	1.06	0.073
10/4/2010	9:15	SugarcU	-37	63	6.8	0.26	0.63	<0.005
10/4/2010	9:35	SugarcD	-1	32	6.2	9.76	1.1	0.08
10/25/2010	9:40	SugarcU	-117	141	7.8	0.4	0.61	<0.005
10/25/2010	10:10	SugarcD	-28	49	6.6	5.38	0.54	0.038
11/8/2010	7:45	SugarcU	-27	48	6.5	0.24	0.44	<0.005
11/8/2010	8:00	SugarcD	-20	45	6.4	5.59	0.88	0.038

Benthic macroinvertebrates samples were taken in the fall of 2010 for laboratory analysis and visible habitat assessments were also conducted. Macroinvertebrate samples result are show in Tables 4 and 5, and habitat scores are shown in Table 6. The results for Goose and Leisure Runs indicate that these sub-watersheds are close to reaching aquatic life attainment thresholds. These sub-watersheds are priorities for project implementation. Results from Sugarcamp Run, a lower priority sub-watershed, show that physical habitat and aquatic life are still impaired.

Table 5 shows the macroinvertebrate sampling results from a 2009 assessment by PADEP on Reddings Run and a lower segment of the South Branch Plum Creek in Armstrong County. This assessment indicated that these portions of the watershed are now also impaired by siltation.

Table 4. Fall 2010 Goose and Leisure Run Macroinvertebrate Sampling Results

Metric Names	Goose Run		Leisure Run	
	Raw Metric Values	Freestone Riffle-Run (2009 small)	Raw Metric Values	Freestone Riffle-Run (2009 small)
Total Richness	26	78.8	25	75.8
EPT Richness (PTV 0-4)	6	31.6	6	10.5
Beck's Index (v. 3)	4	10.5	4	10.5
Hilsenhoff Biotic Index	6.18	47.1	6.43	44.1
% Intolerant Individuals (PTV 0-3)	10.9	12.9	8.8	10.4
Shannon Diversity	2.4	83.9	2.48	86.6
IBI Score	-	44.1	-	43.2

* EPT = Ephemeroptera, Plecoptera, Trichoptera; PTV = Pollution Tolerance Value; IBI = Index of Biological Integrity

Table 5. Fall 2010 Sugarcamp Run Macroinvertebrate Sampling Results

Metric Names	Sugarcamp Run			
	SugarcD		SugarcU	
	Raw Metric Values	Freestone Riffle-Run (2009 small)	Raw Metric Values	Freestone Riffle-Run (2009 small)
Total Richness	25	75.8	19	57.6
EPT Richness (PTV 0-4)	5	26.3	5	26.3
Beck's Index (v. 3)	0	0	1	2.6
Hilsenhoff Biotic Index	5.77	52.2	5.95	50
% Intolerant Individuals (PTV 0-3)	1.8	2.2	2.2	2.6
Shannon Diversity	2.05	71.6	1.51	52.8
IBI Score	-	38.0	-	32.0

Table 6. 2009 PADEP Assessment Macroinvertebrate Sampling Results

Metric Names	Reddings Run		Lower S. Br. Plum Creek	
	Raw Metric Values	Freestone Riffle-Run (2009 small)	Raw Metric Values	Freestone Riffle-Run (2009 small)
Total Richness	13	39.4	19	57.6
EPT Richness (PTV 0-4)	6	31.6	10	52.6
Beck's Index (v. 3)	6	15.8	8	21.1
Hilsenhoff Biotic Index	5.73	52.7	5.11	60.2
% Intolerant Individuals (PTV 0-3)	7.2	8.5	20.2	23.9
Shannon Diversity	1.07	37.5	1.63	57.0
IBI Score	-	30.9	-	45.4

Table 7. Visual Physical Habitat Assessment Scores

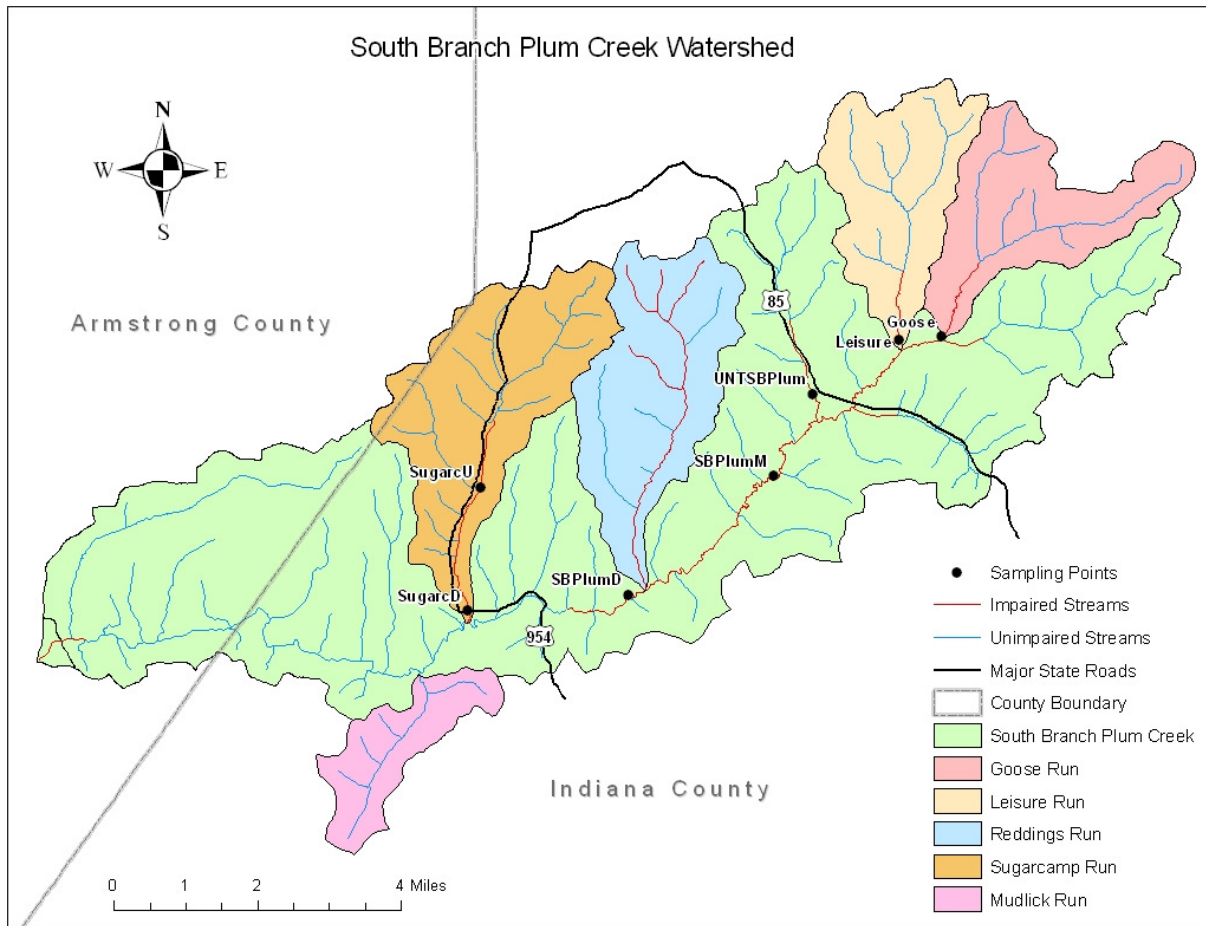
Site	SugarcD	SugarcU	SBrPlumD	SBrPlumM	UNTSBrPlum	Leisure	Goose
Date Sampled	3/24/2010	3/24/2010	10/22/2010	10/22/2010	10/22/2010	10/22/2010	10/22/2010
1. Instream Cover	6	9	18	16	11	18	16
2. Epifaunal Substrate	11	12	12	10	11	12	12
3. Embeddedness	1	1	13	5	9	8	5
4. Velocity/Depth Regimes	15	13	19	15	14	13	14
5. Channel Alteration	15	13	19	18	13	16	15
6. Sediment Deposition	1	1	10	5	10	6	5
7. Frequency of Riffles	10	16	11	8	11	10	12

8. Channel Flow Status	19	19	10	13	15	15	15
9. Condition of Banks	12	11	3	7	10	11	16
10. Bank Vegetative Protection	12	10	10	11	10	12	18
11. Grazing or Other Disruptive Pressure	8	12	11	11	6	14	19
12. Riparian Vegetative Width	3	11	10	11	3	11	13
Total Score	113	128	146	130	123	146	160

In the spring of 2011, ICCD staff conducted visual assessments of the agricultural operations in the watershed to collect animal number data, and assess the need for barnyard, cropland, and pastureland BMPs. These BMPs include roof and barnyard runoff controls, covered manure stacking areas, dry ponds, spring developments, and prescribed grazing. The data was recorded in the field using the same aerial photography/GIS map reference approach used during the prior riparian corridor assessment. The data was again converted into GIS layers at the office.

Since the TMDL has not been finalized and the stream assessments that led to the impaired status of watershed were conducted in 2002, the sediment loading rates had to be remodeled utilizing the best available modeling software. In order to model the changes in sediment loads from 2002 to the present, more detailed data needed to be compiled on changes in land use and rural land BMPs. To accomplish this, ArcMap was used to create a geodatabase of all the row crop and hay/pasture land in each sub-watershed. By comparing older NAIP aerial photography layers with the newest available Microsoft Bing Maps layer, along with data collected in the field, rural land BMPs percentages were estimated. This data was used to model the reductions in sediment loads due to changes in land use and BMP utilization from 2002 to the present.

Figure 2. Sampling Points in South Branch Plum Creek.



The recent water quality samples indicate that nutrient pollution levels are not exceeding impairment thresholds, although visual habitat assessments show that embeddedness and sediment deposition are limiting factors for aquatic life.

Benthic macroinvertebrates samples were also taken on Leisure, Goose, and Sugarcamp Runs during this assessment. The results indicate that the biota is still impaired in the lower segments of these streams.

MODELING

PADEP primarily utilizes GIS technology to collect the data needed to develop watershed assessments, such as TMDLs. Penn State University Institutes of Energy and the Environment assist PADEP in developing GIS-based watershed assessment programs to complete these tasks.

The TMDL for the South Branch Plum Creek was developed using the Generalized Watershed Loading Function (GWLF) model to estimate land use in the South Branch Plum Creek Watershed. Since the TMDL has not been finalized, and there have been both changes in land

use in the watershed and updates to the modeling programs, new models were developed to complete this plan.

PADEP took the lead in modeling sediment loads in the watershed using GWLF, and then assisted ICCD in modeling the sediment load reductions anticipated by the implementation on this plan. To accomplish this task, a version of GLWF model called the Pollution Reduction Impact Comparison Tool (PRedICT) was used to estimate sediment load reductions and BMP costs.

RESULTS

During ICCD’s visual assessment of the watershed, we found that the amount of row crop agriculture had diminished. Farms had been purchased by members of the Plain Sect community whose methods of agriculture tend to limit herd size and amount of ground under cultivation. A large 200-cow dairy farm, which was identified as a major pollution source in the TMDL, has ceased operation. Most of the animal agriculture exists in the sub watersheds or upper reaches of the mainstem. Many former pasturelands are beginning to revert to meadows due to lack of grazing. The sediment reductions from this agricultural land retirement are shown in the following model inputs at BMP 8. Table 8 shows which BMPs are used as modeling inputs.

Table 8. Agricultural Land BMPs Used in PRedICT

BMP #	Description
BMP 1	Cover Crops
BMP 2	Conservation Tillage
BMP 3	Strip-cropping/Contour Farming
BMP 4	Conservation Plan
BMP 5	N/A (no BMP specified)
BMP 6	Nutrient Management
BMP 7	Grazing Land Management
BMP 8	Agricultural Land Retirement

Although, the TMDL was not finalized, the draft TMDL serves to provide a quantitative goal for sediment load reductions. Since the South Branch Plum Creek TMDL only focused on a targeted portion of the watershed, a watershed model was developed for the same area. The results of this model were then compared to the TMDL allocation. The results confirm that the sediment load will be reduced below TDML levels, assuming full project implementation in the target watershed, as shown in Table 9.

The following model in this section (pages 14-16) shows the results of that scenario. Also shown are agricultural land BMPs, efficiencies, and cost estimates.

Table 9. TMDL Targeted Load vs. WIP Implementation Load

Parameter	Sediment (tons/year)
Targeted TMDL Load	3310.1
WIP Implementation Load	2946.5

TMDL TARGETED WATERSHED WIP IMPLEMENTATION LOAD REDUCTION SCENARIO

Agricultural Land BMP Scenario Editor

Land Use	Acres		BMP1	BMP2	BMP3	BMP4	BMP5	BMP6	BMP7	BMP8
Row Crops	4200.79197	% Existing	1	0	77	77	0	2		23
		% Future	70	70	80	77	0	20		23
Hay/Pasture	4025.3471289	% Existing				60	0	0	0	40
		% Future				60	0	0	0	40
Agricultural Land on Slope > 3%			7,566 Acres							
Streams in Agricultural Areas			30.7 Miles							
Total Stream Length			77.0 Miles							
Unpaved Road Length			37.0 Miles							
			Existing		Future					
Stream Miles with Vegetated Buffer Strips			0.6		22.1					
Stream Miles with Fencing			1.1		7.8					
Stream Miles with Stabilization			0.1		16.8					
Unpaved Road Miles w/E & S Controls			2.5		10.4					
			% Existing		% Future					
AWMS (Livestock)			0.0		100.0					
AWMS (Poultry)			0.0		0.0					
Runoff Control			0.0		100.0					
Phytase in Feed			0.0		0.0					

Rural and Urban BMP Load Reduction Efficiency Editor

BMP Type	Nitrogen	Phosphorus	Sediment	Pathogens
BMP 1	0.29	0.50	0.35	
BMP 2	0.08	0.22	0.30	
BMP 3	0.07	0.10	0.17	
BMP 4	0.05	0.10	0.16	
BMP 5	0.00	0.00	0.16	
BMP 6	0.29	0.44		
BMP 7	0.30	0.30	0.38	
BMP 8	0.95	0.95	0.95	
Vegetated Buffer Strips	0.41	0.40	0.53	0.70
Streambank Fencing	0.56	0.78	0.76	1.00
Streambank Stabilization	0.95	0.95	0.95	
Unpaved Roads (lbs/ft)	0.01	0.0024	1.71	
AWMS (Livestock)	0.75	0.75		0.75
AWMS (Poultry)	0.14	0.14		0.14
Runoff Control	0.15	0.15		0.15
Phytase in Feed		0.21		

BMP Cost Editor

Agricultural Cost Editor	
Conservation Tillage (per acre)	\$30.00
Cropland Protection (per acre)	\$25.00
Grazing Land Management (per acre)	\$360.00
Streambank Fencing (per acre)	\$10.00
Streambank Fencing (per mile)	\$15,000.00
Streambank Stabilization (per foot)	\$25.00
Vegetated Buffer Strip (per mile)	\$1,500.01
Terraces and Diversions (per acre)	\$5,000.00
AWMS Livestock (per AEU)	\$1,250.00
AWMS Poultry (per AEU)	\$520.00
Runoff Control (per AEU)	\$300.00
Phytase in Feed (per AEU)	\$2.50
Nutrient Management (per acre)	\$110.00
Ag to Wetland Conversion (per acre)	\$0.00
Unpaved Roads (per foot)	\$5.58
Ag to Forest Conversion (per acre)	\$10.00

Estimated Load Reductions

	Existing (lbs)		
UPLAND EROSION/RUNOFF	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
Row Crops	8758966	33662	4506
Hay/Pasture	961215	8900	983
High Density Urban	24251	906	95
Low Density Urban	2205	71	7
Unpaved Roads	363763	1418	198
Other	198416	1446	101
STREAMBANK EROSION	2128367	1067	183
GROUNDWATER/SUBSURFACE		111644	1850
POINT SOURCE DISCHARGE		0	0
SEPTIC SYSTEMS		2284	77
FARM ANIMALS		7529	3587
TOTALS	12437182	168927	11587
	Future (lbs)		
LAND EROSION/RUNOFF	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
Row Crops	2992781	16871	1487
Hay/Pasture	961215	8900	983
High Density Urban	24251	906	95
Low Density Urban	2205	71	7
Unpaved Roads	166104	1412	198
Other	198416	1446	101
STREAMBANK EROSION	1548056	795	133
GROUNDWATER/SUBSURFACE		103607	1817
POINT SOURCE DISCHARGE		0	0
SEPTIC SYSTEMS		2284	77
FARM ANIMALS		3533	967
TOTALS	5893028	139823	5865
PERCENT REDUCTIONS	52.6	17.2	49.4
TOTAL SCENARIO COST	\$5,964,332.52		
Ag BMP Cost (%)	4.1		
WW Upgrade Cost (%)	0.0		
Urban BMP Cost (%)	0.0		
Stream Protection Cost (%)	78.7		
Unpaved Road Protection Cost (%)	7.8		

The following results (pages 17-18) show the estimated load reduction by each sub-watershed assuming full project implementation.

GOOSE RUN ESTIMATED LOAD REDUCTIONS

	Existing (lbs)		
GOOSE RUN	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
TOTALS	871401	22227	1462
	Future (lbs)		
TOTALS	203740	15514	505
PERCENT REDUCTIONS	76.6	30.2	65.5
TOTAL SCENARIO COST	\$1,207,027.53		

LEISURE RUN ESTIMATED LOAD REDUCTIONS

	Existing (lbs)		
LEISURE RUN	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
TOTALS	997437	16215	1023
	Future (lbs)		
TOTALS	398316	12969	675
PERCENT REDUCTIONS	60.1	20.0	34.1
TOTAL SCENARIO COST	\$653,911.23		

MAINSTEM/UNTS ESTIMATED LOAD REDUCTIONS

	Existing (lbs)		
MAINSTEM/UNTS	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
TOTALS	7921535	122601	7516
	Future (lbs)		
TOTALS	4396490	107159	4318
PERCENT REDUCTIONS	44.5	12.6	42.6
TOTAL SCENARIO COST	\$3,382,459.65		

REDDINGS RUN ESTIMATED LOAD REDUCTIONS

	Existing (lbs)		
REDDINGS RUN	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
TOTALS	1877512	27756	1887
	Future (lbs)		
TOTALS	822401	21209	886
PERCENT REDUCTIONS	56.2	23.6	53.1

TOTAL SCENARIO COST	\$1,012,490.54
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SUGARCAMP RUN ESTIMATED LOAD REDUCTIONS

	Existing (lbs)		
SUGARCAMP RUN	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
TOTALS	1717039	20364	1402
	Future (lbs)		
TOTALS	631390	16595	717
PERCENT REDUCTIONS	63.2	18.5	48.9
TOTAL SCENARIO COST	\$1,412,026.42		

MUDLICK RUN ESTIMATED LOAD REDUCTIONS

	Existing (lbs)		
MUDLICK RUN	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
TOTALS	356141	3148	216
	Future (lbs)		
TOTALS	77134	2550	119
PERCENT REDUCTIONS	78.3	19.0	45.2
TOTAL SCENARIO COST	\$172,946.66		

Complete modeling results are shown in the Appendix starting on page 49.

Sub-Watershed Load Reductions Summary

Sub-watershed	Sediment Load (lbs)		% Reduction
	Existing	Future	
Goose Run	871401	203740	76.6
Leisure Run	997437	398316	60.1
Mainstem/UNTs	7921535	4396490	44.5
Reddings Run	1877512	822401	56.2
Sugarcamp Run	1717039	631390	63.2
Mudlick Run	356141	77134	78.3
Totals	13741065	6529471	52.5

RESTORATION RECOMMENDATIONS

Tables 10 and 11 and Figures 3-11 include all 191 potential project sites identified for implementation in this plan.

Table 10. Potential Agriculture Project Sites

Ag BMP Project #	Priority Rank	Cover Crops	Conservation Tillage	Strip crop/Contour	Conservation Plan	Nutrient Mgmt	Grazing Land Mgmt	Curbed Manure Storage	Roof Gutters	Barnyard Buffers/ Diversions	Lane Stabilization	Spring Developments	Dry Ponds	Stream crossings	Watershed	
		Acres (approx.)							# of BMPs							
1	1	63	63	28	115	115	53	1	1	1	2	1	0	2	Leisure Run	
2	1	78	78	41	122	0	44	0	0	0	0	2	2	1	Leisure Run	
3	1	7	7	0	7	0	0	0	0	0	0	1	0	0	Leisure Run	
4	1	78	78	0	118	118	40	0	0	0	0	0	0	3	Leisure Run	
5	1	6	6	0	0	0	0	0	0	0	0	0	0	0	Leisure Run	
6	1	57	57	0	13	13	13	1	0	0	0	1	2	1	Leisure Run	
7	1	81	81	0	0	110	30	0	1	0	0	2	0	0	Leisure Run	
8	1	14	14	0	0	0	0	0	0	0	0	0	0	0	Mainstem Headwaters	
9	1	0	0	0	0	0	0	1	0	2	0	0	0	0	Leisure Run	
10	1	0	0	0	0	0	0	0	0	0	0	0	0	1	Leisure Run	
11	1	0	0	0	0	0	0	1	0	1	0	1	0	0	Leisure Run	
12	1	0	0	0	0	0	0	0	0	0	0	1	0	0	Leisure Run	
13	1	0	0	0	4	4	4	0	0	0	0	0	0	0	Leisure Run	
14	1	0	0	0	0	0	27	0	0	0	0	0	0	0	Leisure Run	
15	1	0	0	0	0	0	0	1	0	1	0	0	0	0	Leisure Run	
16	1	77	77	0	0	84	0	0	1	1	0	0	0	0	Goose Run	
17	1	15	15	0	23	0	0	0	0	0	0	0	0	0	Goose Run	
18	1	118	118	0	0	143	24	0	0	0	0	0	0	0	Goose Run	

19	1	187	187	0	0	231	44	0	0	0	0	4	4	4	Goose Run
20	1	31	31	31	31	31	0	0	0	0	0	0	0	0	Goose Run
21	1	64	64	0	31	31	0	0	0	0	0	0	0	0	Goose Run
22	1	48	48	0	0	0	0	0	0	0	0	0	0	0	Goose Run
23	1	22	22	0	28	0	0	1	0	0	0	1	0	1	Mainstem Headwaters
24	1	119	119	0	150	0	0	0	0	0	0	0	0	0	Goose Run
25	1	39	39	0	39	0	0	0	0	0	0	0	0	0	Goose Run
26	1	91	91	0	0	0	0	0	0	0	0	0	0	0	Mainstem Headwaters
27	1	57	57	0	57	0	0	0	0	0	0	0	0	0	Mainstem Headwaters
28	1	0	0	0	0	0	0	1	0	1	0	0	0	0	Goose Run
29	1	0	0	0	0	0	0	1	1	0	0	1	0	2	Goose Run
30	1	47	47	47	107	0	0	0	0	0	0	0	0	0	Mainstem Headwaters
31	1	139	139	0	0	0	0	0	0	0	0	0	0	0	Mainstem Headwaters
32	1	66	66	0	100	100	34	0	0	0	0	1	0	0	Mainstem Headwaters
33	1	119	119	0	0	0	0	0	0	0	0	0	0	0	Mainstem Headwaters
34	1	28	28	0	28	28	0	1	1	1	1	2	0	3	Mainstem Headwaters
35	1	31	31	0	37	0	0	0	0	0	0	0	0	0	Mainstem Headwaters
36	1	0	0	0	0	104	104	2	1	0	0	3	3	3	Mainstem Headwaters
37	1	37	37	0	0	0	0	0	0	0	0	0	0	0	Mainstem Headwaters
38	1	42	42	0	42	0	0	1	0	1	0	0	0	0	Mainstem Headwaters
39	1	108	108	0	0	152	44	1	1	1	1	1	1	2	Mainstem Headwaters
40	1	118	118	0	0	0	0	0	0	0	0	0	0	0	Mainstem Headwaters
41	1	207	207	90	491	0	0	0	0	0	0	0	0	0	Mainstem
42	2	35	35	0	0	0	0	0	0	0	0	0	0	0	UNT 46643
43	2	34	34	9	34	0	0	0	0	0	0	0	0	0	Mainstem
44	1	44	44	0	0	0	0	0	0	0	0	0	0	0	Mainstem
45	2	38	38	0	0	0	205	0	0	0	0	0	0	0	Mainstem
46	5	69	69	0	0	136	37	0	0	0	0	0	0	0	Lower Mainstem

47	5	52	52	0	0	0	0	0	0	0	0	0	0	0	Lower Mainstem
48	5	82	82	0	0	0	0	0	0	0	0	0	0	0	Lower Mainstem
49	5	223	223	0	0	223	0	0	0	0	0	0	0	0	Lower Mainstem
50	2	53	53	0	0	0	0	0	0	0	0	0	0	0	Mainstem
51	1	10	10	0	10	0	0	0	0	0	0	0	0	0	Mainstem Headwaters
52	2	91	91	0	0	0	0	0	0	0	0	0	0	0	UNT 46643
53	2	24	24	0	67	67	43	0	0	0	0	0	2	0	Reddings Run
54	2	47	47	0	0	0	0	0	0	0	0	0	0	0	Mainstem
55	1	102	102	0	0	0	0	0	0	0	0	0	0	0	Mainstem
56	2	70	70	0	0	89	0	0	0	0	0	0	0	0	Mainstem
57	2	9	9	0	0	0	0	0	0	0	0	0	0	0	UNT 46636
58	2	8	8	0	0	0	0	0	0	0	0	0	0	0	Mainstem
59	2	78	78	0	0	0	0	0	0	0	0	0	0	0	UNT 46636
60	2	33	33	0	0	0	0	0	0	0	0	0	0	0	UNT 46636
61	1	25	25	0	0	0	0	0	0	0	0	0	0	0	Mainstem Headwaters
62	1	28	28	0	0	0	0	0	0	0	0	0	0	0	Mainstem Headwaters
63	2	0	0	0	0	0	28	0	0	0	0	0	0	0	Mainstem
64	2	58	58	0	0	0	0	0	0	0	0	0	0	0	Mainstem
65	1	79	158	0	0	0	0	3	3	1	1	0	0	0	Mainstem
66	1	0	0	0	0	0	0	1	0	0	0	0	0	1	Mainstem Headwaters
67	2	0	0	0	0	0	0	0	0	1	0	0	2	1	Mainstem
68	1	0	0	0	33	33	33	0	1	1	0	2	3	2	Reddings Run
69	3	30	30	0	36	6	6	0	0	0	0	0	0	0	Reddings Run
70	2	60	60	0	84	0	0	0	0	0	0	0	0	0	Reddings Run
71	3	51	51	0	0	18	0	0	0	0	0	0	0	0	Reddings Run
72	1	0	0	0	0	279	168	1	2	2	0	3	0	6	Reddings Run
73	3	0	0	0	62	62	62	0	0	0	0	0	0	0	Reddings Run
74	5	23	23	23	27	0	0	0	0	0	0	0	0	0	Mudlick Run

75	4	226	226	0	0	0	0	0	0	0	0	0	0	0	Sugarcamp Run
76	4	69	69	0	0	0	0	0	0	0	0	0	0	0	Sugarcamp Run
77	4	46	46	0	0	0	0	0	0	0	0	0	0	0	Sugarcamp Run
78	1	112	112	0	112	0	0	0	0	0	0	0	0	0	Mainstem Headwaters
79	3	0	0	0	0	144	79	0	1	1	0	0	0	2	Reddings Run
80	4	0	0	0	0	0	50	0	0	0	0	1	0	0	Sugarcamp Run

Table 10(b). Agriculture Project Sites BMP Totals by Sub Watershed

Watershed	Cover Crops	Conservation Tillage	Strip crop/Contour	Conservation Plan	Nutrient Mgmt	Grazing Land Mgmt	Curbed Manure Storage	Roof Gutters	Barnyard Buffers/Diversions	Lane Stabilization	Spring Developments	Dry Ponds	Stream crossings
	Acres (approx.)						# of BMPs						
Goose Run	698	698	31	274	520	68	2	2	2	0	5	4	6
Leisure Run	370	370	69	379	360	211	5	2	5	2	9	4	8
Lower Mainstem	426	426	0	0	359	37	0	0	0	0	0	0	0
Mainstem	740	819	99	525	89	233	3	3	2	1	0	2	1
Mainstem Headwaters	1094	1094	47	521	384	182	7	3	3	2	8	4	10
Mudlick Run	23	23	23	27	0	0	0	0	0	0	0	0	0
Reddings Run	165	165	0	282	609	391	1	4	4	0	5	5	10
Sugarcamp Run	341	341	0	0	0	50	0	0	0	0	1	0	0
UNT 46636	120	120	0	0	0	0	0	0	0	0	0	0	0
UNT 46643	126	126	0	0	0	0	0	0	0	0	0	0	0
Total	4103	4182	269	2008	2321	1172	18	14	16	5	28	19	35

Figure 3. Upper South Br Plum Creek Agriculture BMP Project Sites

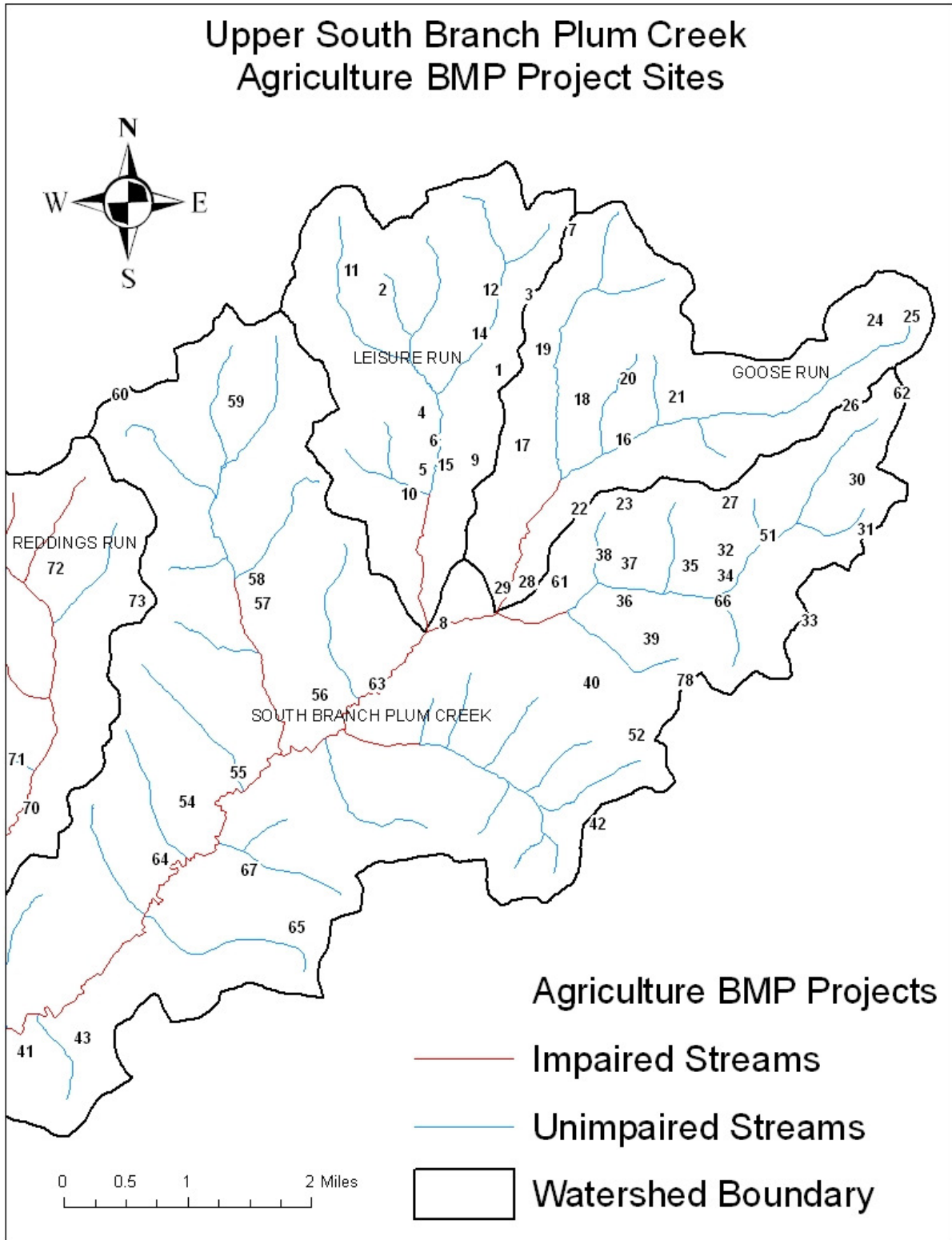


Figure 4. Lower South Branch Plum Creek Agriculture BMP Project Sites

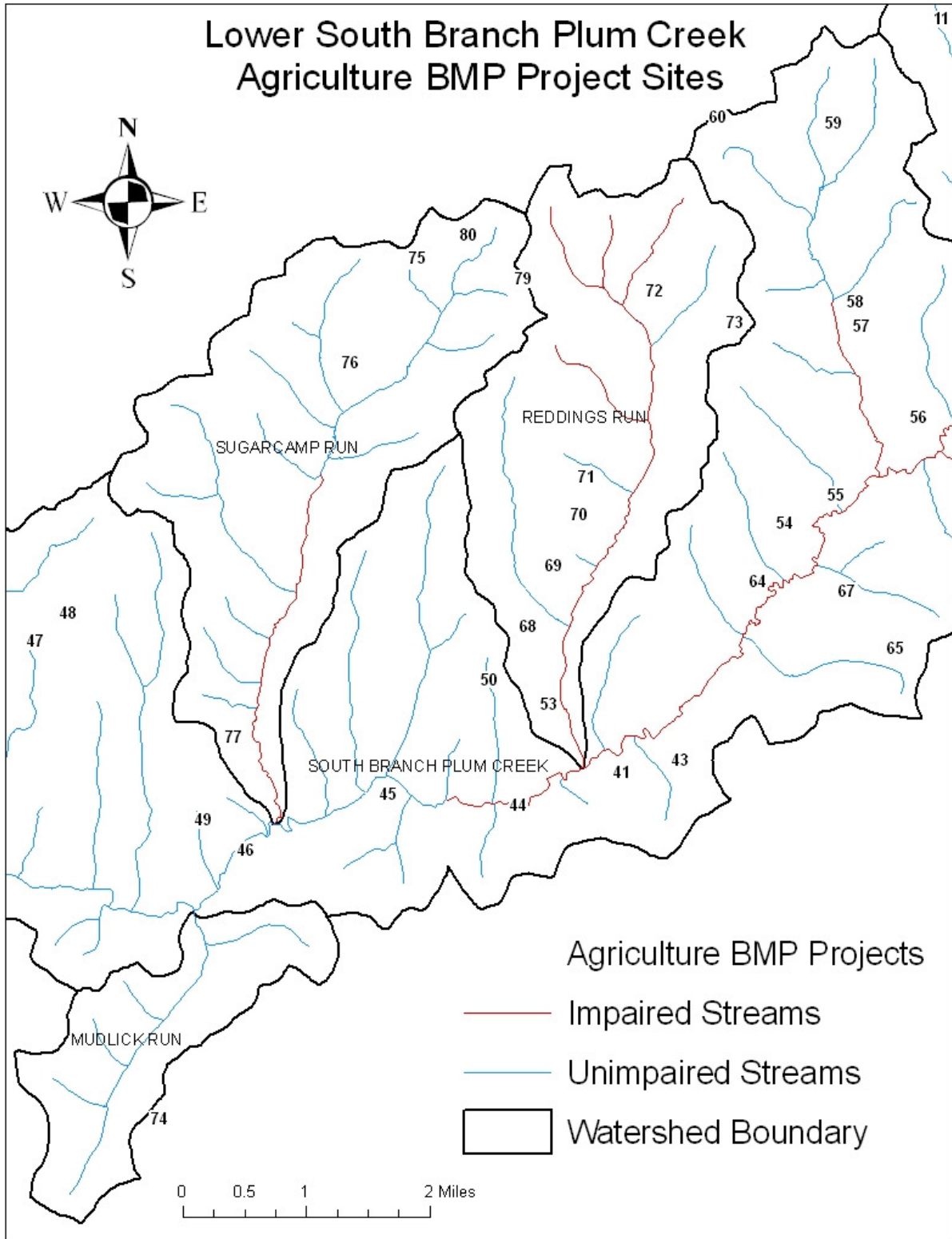


Table 11. Potential Stream Restoration Projects

Stream Restoration Project #	Priority Rank	Streambank Fencing (feet)	Streambank Stabilization (feet)	Vegetated Buffer Strips (feet)	Watershed
4	1	1958	1958	1958	Leisure Run
5	1	1008	1008	1008	Leisure Run
6	1	529	529	529	Leisure Run
7	1	477	0	477	Leisure Run
8	1	0	2565	1964	Mainstem Headwaters
10	1	0	216	1461	Leisure Run
11	1	262	262	676	Leisure Run
12	1	345	0	0	Leisure Run
13	1	177	177	177	Leisure Run
14	1	2256	0	1297	Leisure Run
16	1	6749	6749	6749	Goose Run
18	1	1445	1445	1445	Goose Run
19	1	3073	3073	3073	Goose Run
24	1	220	0	220	Goose Run
26	1	0	0	1091	Mainstem Headwaters
28	1	527	527	527	Goose Run
29	1	373	373	373	Goose Run
34	1	1362	1362	1362	Mainstem Headwaters
35	1	0	0	1120	Mainstem Headwaters
36	1	1635	1635	1635	Mainstem Headwaters
39	1	1848	1848	1848	Mainstem Headwaters
41	1	0	3944	4947	Mainstem
43	2	0	0	1550	Mainstem
44	1	0	2668	2668	Mainstem

51	1	0	0	437	Mainstem Headwaters
53	2	0	2140	2140	Reddings Run
54	2	0	479	479	Mainstem
55	1	0	1944	4619	Mainstem
56	2	0	1564	0	Mainstem
58	2	1094	1460	312	Mainstem
63	2	0	2057	2157	Mainstem
64	2	0	3059	0	Mainstem
66	1	362	362	362	Mainstem Headwaters
68	1	3481	1549	3481	Reddings Run
70	2	0	1972	1972	Reddings Run
71	3	0	0	2268	Reddings Run
72	1	6610	0	6610	Reddings Run
73	3	0	0	358	Reddings Run
76	4	0	1481	1481	Sugarcamp Run
77	4	0	1790	1790	Sugarcamp Run
79	3	0	0	1205	Reddings Run
80	4	1068	1068	1068	Sugarcamp Run
81	1	0	432	432	Goose Run
82	1	0	372	372	Goose Run
83	1	0	1487	1487	Goose Run
84	1	0	1508	1508	Goose Run
85	1	497	0	497	Goose Run
86	1	678	0	678	Goose Run
87	1	0	218	0	Leisure Run
88	1	0	2450	0	Leisure Run
89	1	0	272	0	Leisure Run

90	1	0	1124	0	Leisure Run
91	1	0	204	204	Leisure Run
92	1	0	0	1695	Leisure Run
93	1	0	0	100	Leisure Run
94	1	0	0	221	Leisure Run
95	1	911	0	911	Leisure Run
96	1	458	458	458	Mainstem Headwaters
97	1	0	0	206	Mainstem Headwaters
98	1	0	0	651	Mainstem Headwaters
99	1	0	2271	2271	Mainstem Headwaters
100	1	0	841	0	Mainstem Headwaters
101	2	0	172	0	Mainstem
102	2	0	464	464	Mainstem
103	2	0	494	494	Mainstem
104	1	1853	1853	1853	UNT 46643
105	2	0	618	618	UNT 46643
106	2	0	1172	1172	UNT 46643
107	2	748	647	0	UNT 46643
108	2	0	712	0	Mainstem
109	2	0	769	0	Mainstem
110	2	0	401	401	UNT 46636
111	2	0	392	392	UNT 46636
112	2	0	252	252	UNT 46636
113	2	0	209	209	UNT 46636
114	2	0	565	0	UNT 46636
115	2	0	577	245	UNT 46636
116	2	0	826	424	UNT 46636
117	2	0	471	471	UNT 46636

118	2	0	0	1547	UNT 46636
119	2	0	886	599	Mainstem
120	2	0	2140	2140	Mainstem
121	2	0	500	500	Mainstem
122	2	0	274	274	Mainstem
123	2	0	0	1841	Mainstem
124	2	0	513	0	Mainstem
125	2	0	391	0	Mainstem
126	2	0	1671	0	Mainstem
127	1	0	2740	1329	Mainstem
128	2	0	196	465	Mainstem
129	2	0	0	297	Mainstem
130	2	0	168	168	Mainstem
131	2	0	99	99	Mainstem
132	2	0	1932	0	Mainstem
133	2	0	1699	1699	Mainstem
134	2	0	0	1778	Mainstem
135	2	0	0	769	Mainstem
136	2	0	1255	1255	Reddings Run
137	3	0	308	308	Reddings Run
138	3	0	213	213	Reddings Run
139	3	0	839	839	Reddings Run
140	3	0	254	254	Reddings Run
141	3	0	0	363	Reddings Run
142	3	0	0	788	Reddings Run
143	3	0	749	749	Reddings Run
144	3	0	305	305	Reddings Run
145	3	0	201	201	Reddings Run

146	3	0	287	287	Reddings Run
147	2	0	1680	1880	Reddings Run
148	3	0	0	2091	Reddings Run
149	3	0	0	864	Reddings Run
150	3	0	0	313	Reddings Run
151	3	0	0	75	Reddings Run
152	3	0	0	262	Reddings Run
153	3	0	0	843	Reddings Run
154	3	0	0	1760	Reddings Run
155	3	0	0	1318	Reddings Run
156	3	0	0	1258	Reddings Run
157	4	1948	913	913	Sugarcamp Run
158	4	0	700	700	Sugarcamp Run
159	4	0	1285	1285	Sugarcamp Run
160	4	0	2159	2159	Sugarcamp Run
161	4	0	1200	1200	Sugarcamp Run
162	4	0	119	119	Sugarcamp Run
163	4	0	698	698	Sugarcamp Run
164	4	0	65	65	Sugarcamp Run
165	4	0	1459	1459	Sugarcamp Run
166	4	0	492	492	Sugarcamp Run
167	4	0	528	528	Sugarcamp Run
168	4	0	975	975	Sugarcamp Run
169	4	0	732	732	Sugarcamp Run
170	4	0	687	687	Sugarcamp Run
171	4	0	1215	1215	Sugarcamp Run
172	4	0	927	927	Sugarcamp Run

173	2	0	3145	3145	Sugarcamp Run
174	4	0	537	537	Sugarcamp Run
175	4	385	385	0	Sugarcamp Run
176	4	0	315	0	Sugarcamp Run
177	4	0	912	912	Sugarcamp Run
178	4	0	0	1904	Sugarcamp Run
179	4	0	622	1197	Sugarcamp Run
180	4	0	259	259	Sugarcamp Run
181	4	0	492	492	Sugarcamp Run
182	4	0	0	666	Sugarcamp Run
183	4	0	0	858	Sugarcamp Run
184	4	0	0	209	Sugarcamp Run
185	4	0	0	712	Sugarcamp Run
186	4	0	0	659	Sugarcamp Run
187	4	800	800	800	Sugarcamp Run
188	5	0	591	591	Mudlick Run
189	5	0	813	813	Mudlick Run
190	5	0	1111	1111	Mudlick Run
191	5	0	777	777	Mudlick Run

Figure 5. Goose Run Stream Restoration Projects

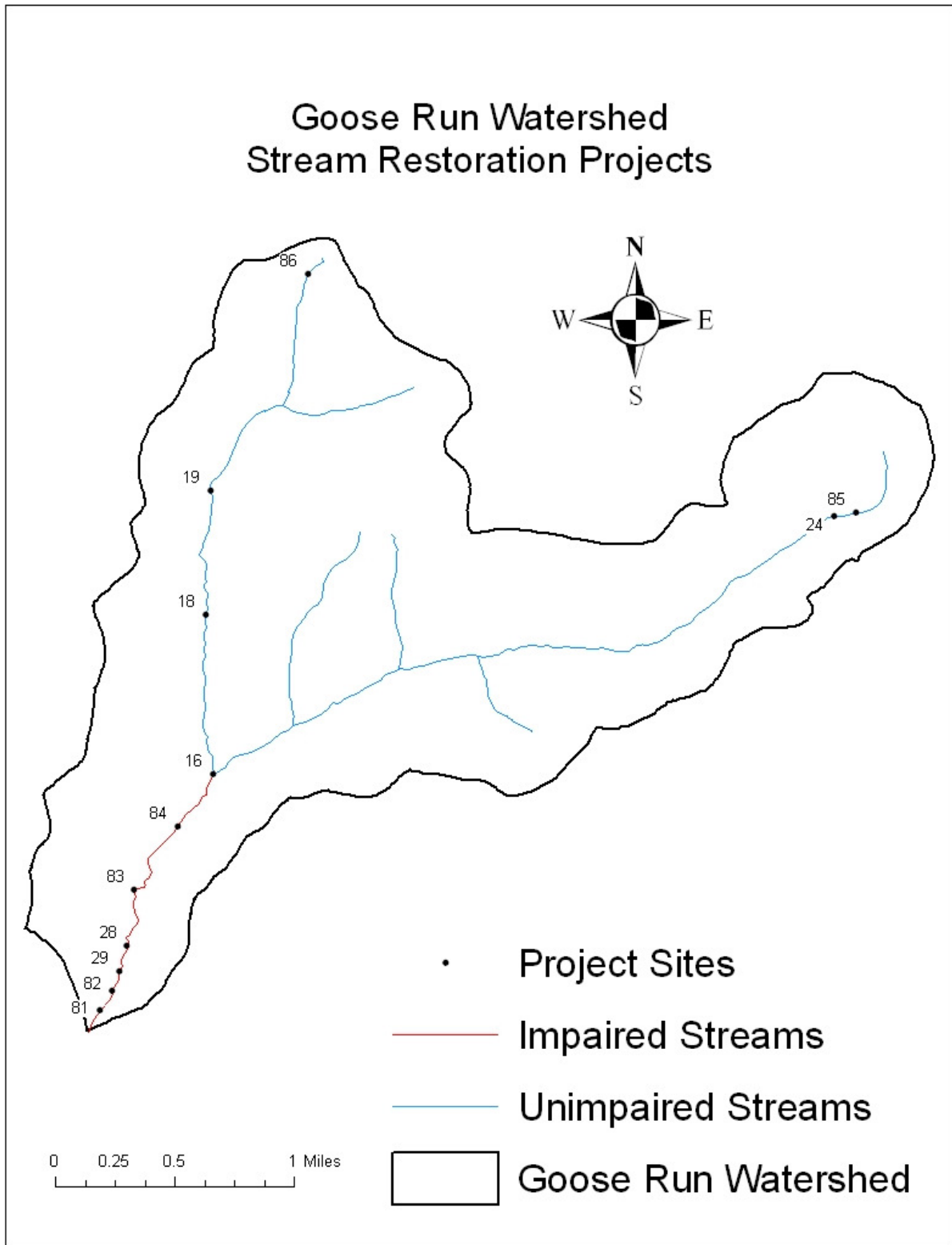


Figure 6. Leisure Run Stream Restoration Projects

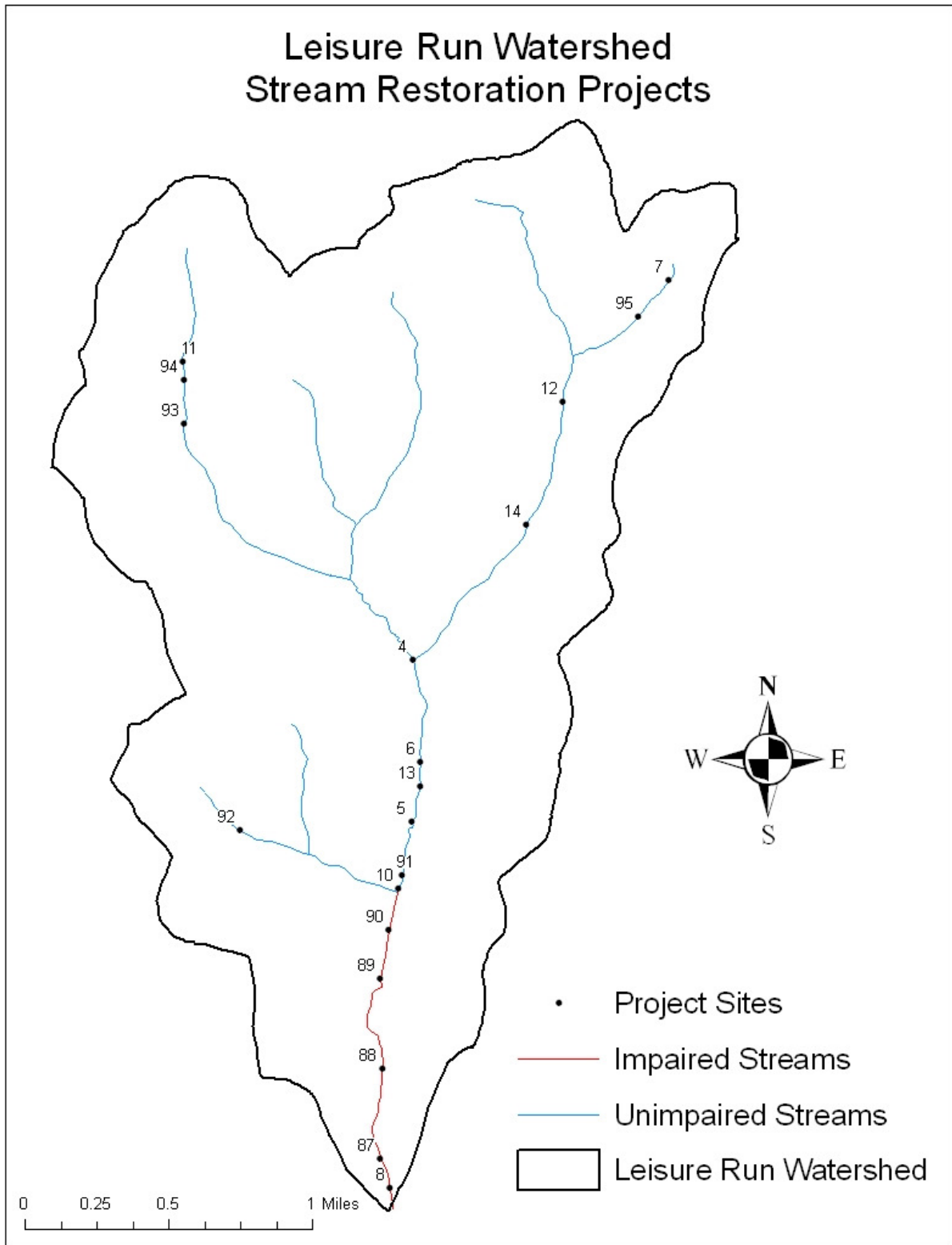


Figure 7. Upper Mainstem and UNTs Stream Restoration Projects

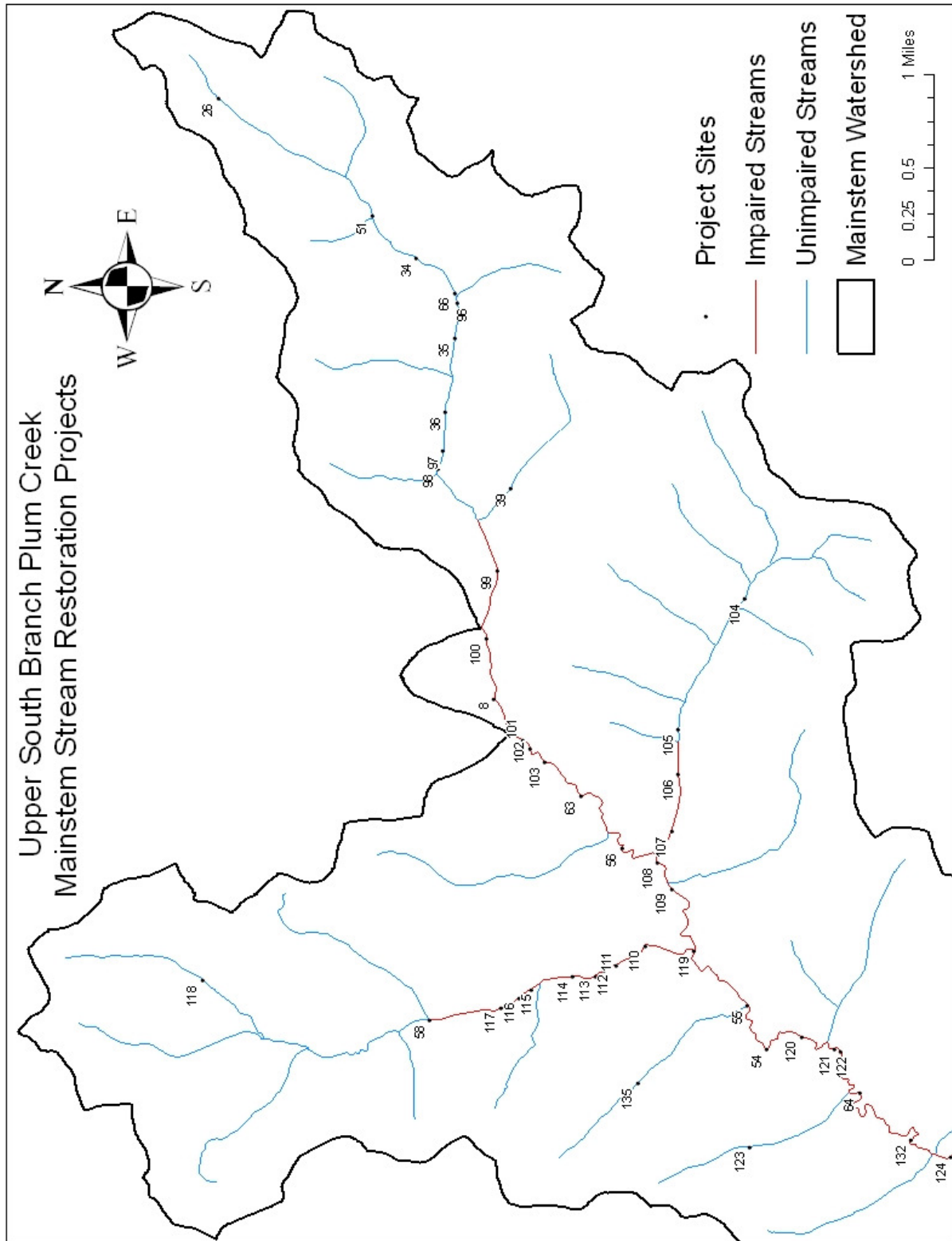


Figure 8. Lower Mainstem and UNTs Stream Restoration Projects

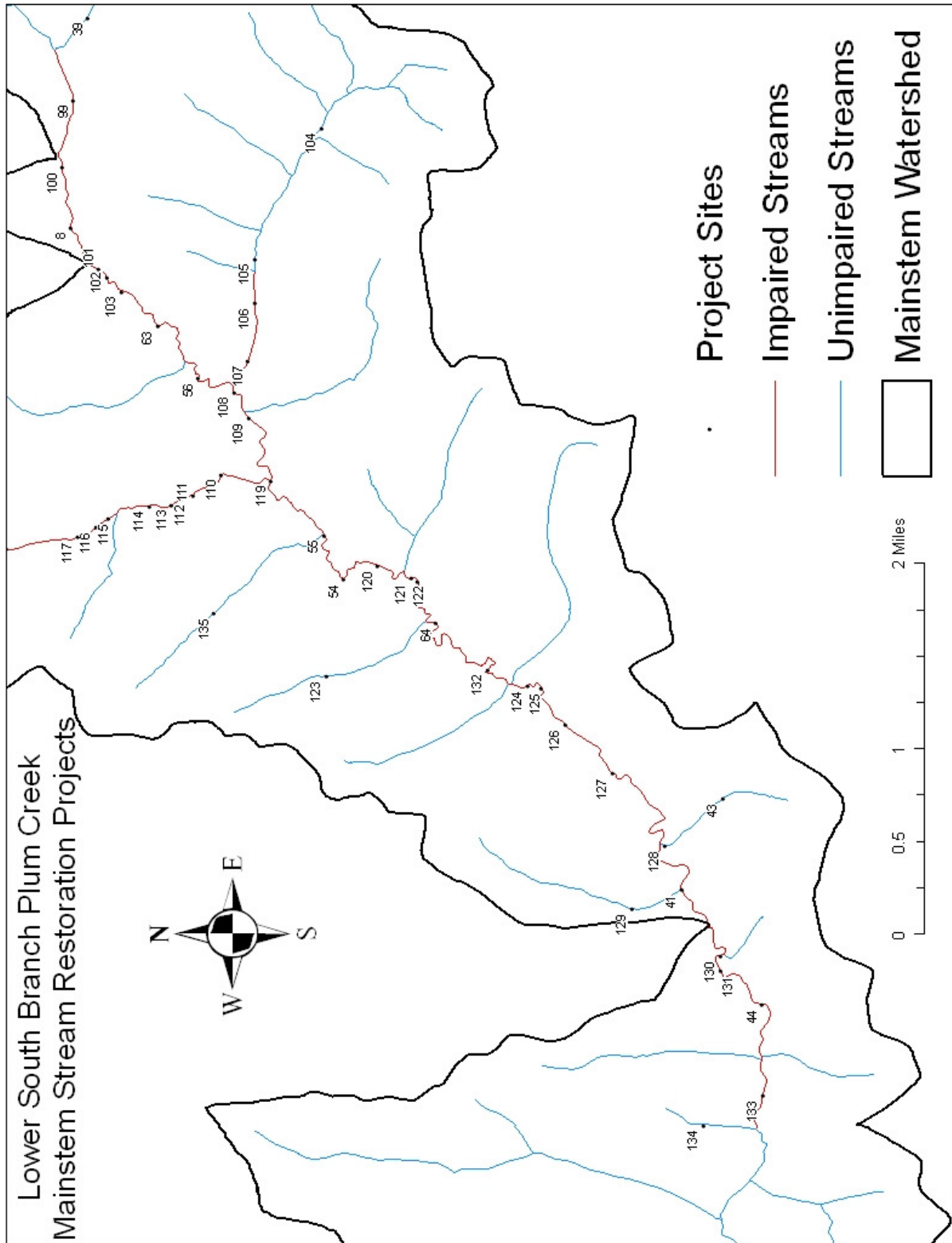


Figure 9. Reddings Run Stream Restoration Projects

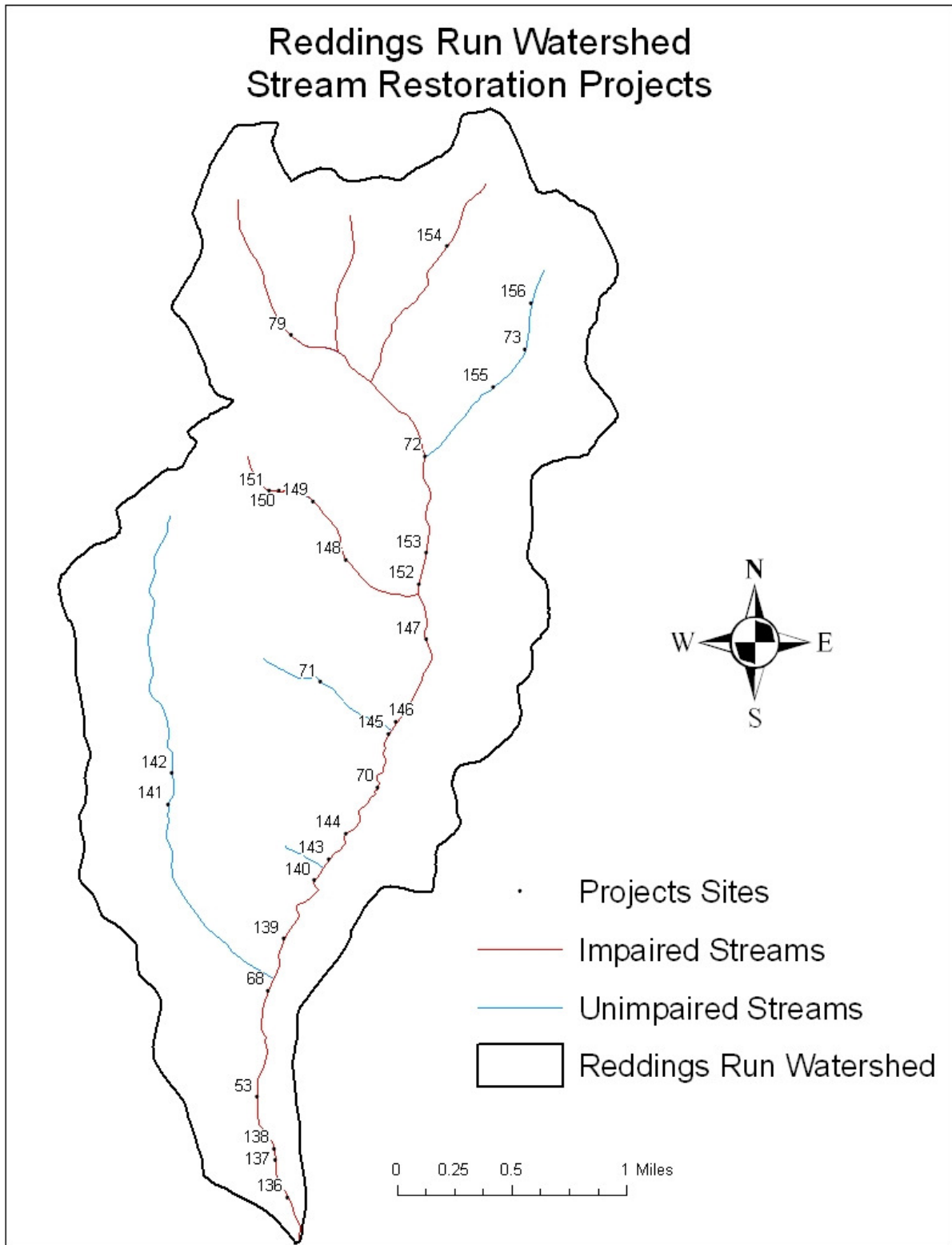


Figure 10. Sugarcamp Run Stream Restoration Projects

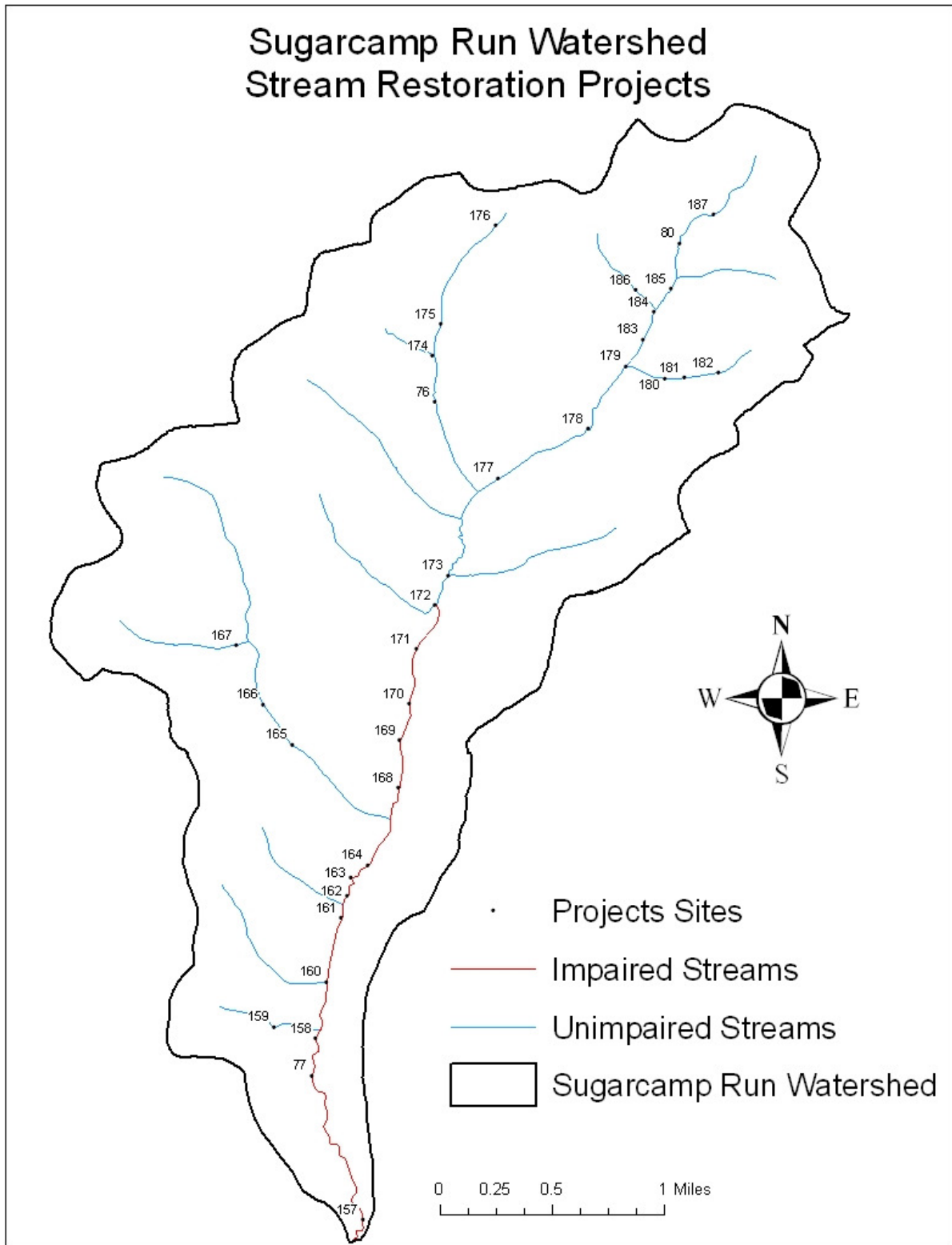


Figure 11. Mudlick Run Stream Restoration Projects

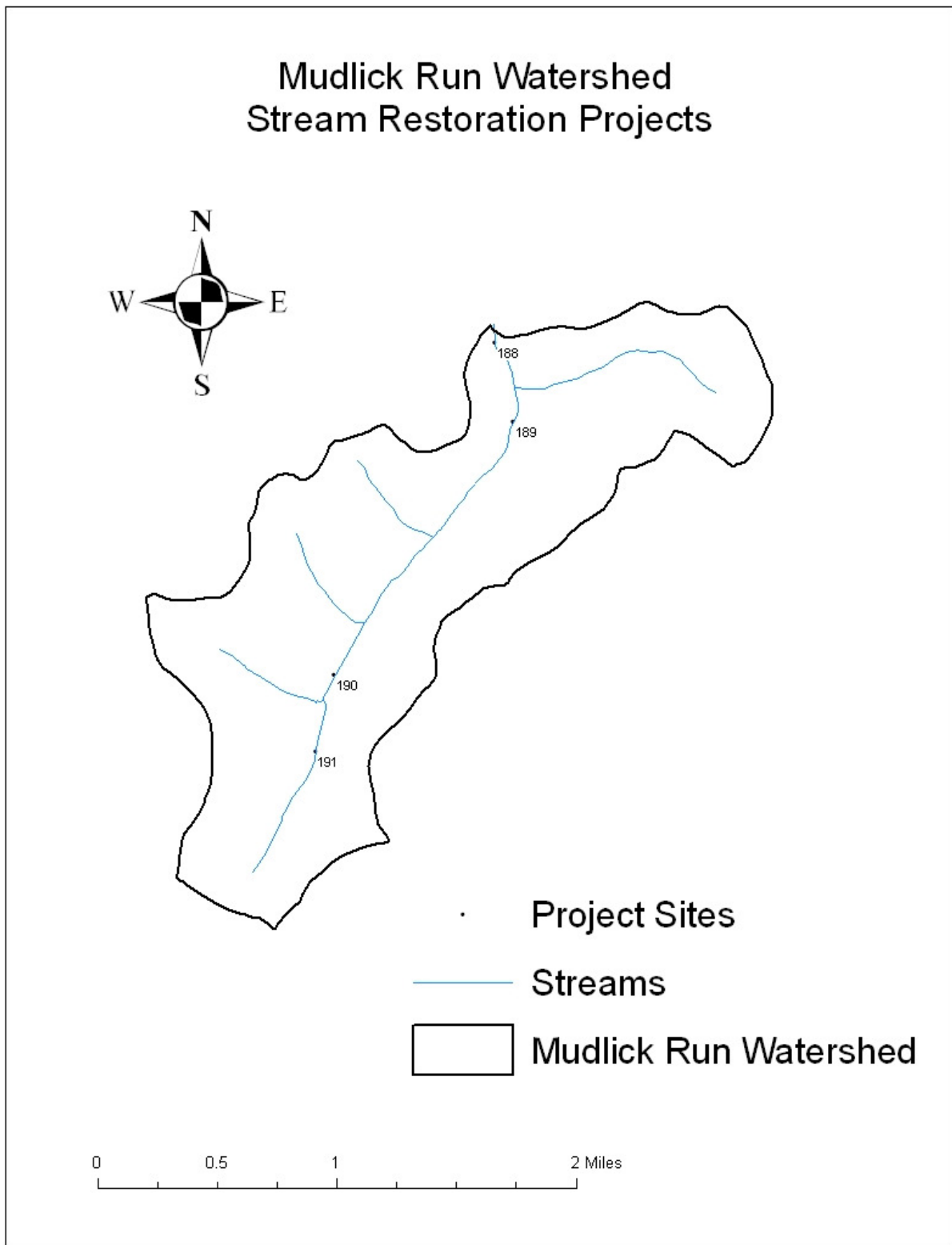


Table 11(b). Stream Restoration Projects Totals by Sub-Watershed

Watershed	Streambank Fencing (feet)	Streambank Stabilization (feet)	Vegetated Buffer Strips (feet)
Goose Run	13562	15966	17361
Leisure Run	7923	8418	10714
Mainstem	1094	32995	29648
Mainstem Headwaters	5665	11342	13405
Mudlick Run	0	3292	3292
Reddings Run	10091	11752	34260
Sugarcamp Run	4201	25960	30843
UNT 46636	0	3693	3941
UNT 46643	2601	4290	3643
Total	45137	117708	147107

ROADS SYSTEMS WITHIN THE WATERSHED

The majorities of the township roads in the watershed are dirt and gravel with periodic private lanes accessing homes, farm fields, and gas wells. Accelerated erosion is evident on most. The road systems, public and private, impact the watershed in two ways. By directly contributing sediments from the erosion of the road surface, and indirectly as the road system changes the overall hydrology within the watershed. Road ditches promote channelization of storm water increasing the overall runoff coefficient. Storm events that had resulted in little short term change in stream flows are now producing faster and more frequent changes in stream elevation. This stream dynamic, coupled with the loss of riparian habitat, promotes streambank erosion. To reduce channelization, BMPs need to be implemented that convert channelized flow into sheet flow and ultimately promote infiltration. The installation of additional cross culverts that divert concentrated ditch flows to filter areas is a cost-effective solution. The vegetated filter areas will capture any road sediments and promote groundwater infiltration. By more frequent direction of ditch flow to filtering areas, we will reduce erosion in the road ditch and any road sediments generated will be captured in the filtering areas. By evaluating the road ditches and cross culvert outlets for erosion we can determine where additional practices are needed.

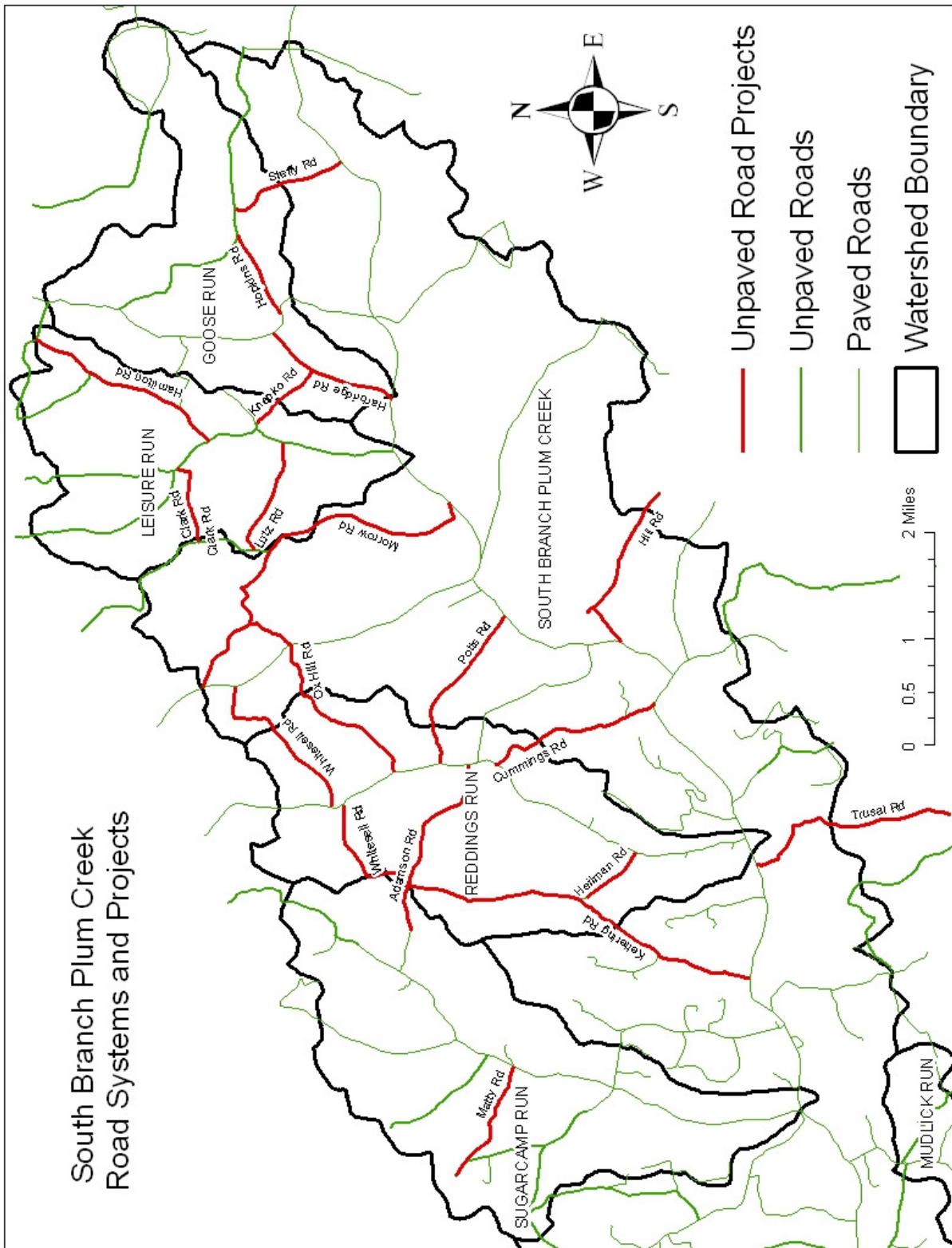
In situations where roads are next to streams and filtering areas are not available, we are proposing to stabilize the road surface with a compacted limestone aggregate mix that will produce a durable road surface less likely to generate sediments that would be deposited in the stream.

For private drives and farm lanes we will be producing a brochure that will illustrate BMPs that landowners can implement.

Table 12. Required Unpaved Road BMPs in the South Branch Plum Creek Watershed

Road Name	Sub-watershed	Township	Crosspipes (#)	Surface Stabilization (ft)	Other
Trusal	Mainstem	Washington	0	300	–
Kettering	Mainstem	Washington	10	0	–
Heilman	Redding	Washington	3	0	–
Cummings	Mainstem	Washington	5	0	48" stream culvert
Adamson	Mainstem	Washington	3	0	36" stream culvert
Hill	Mainstem	Washington	5	300	48" stream culvert, 500' under drain
Potts	Reddings	Washington	3	0	–
Oxhill	Reddings	South Mahoning	8	0	–
Whitesell	Reddings	South Mahoning	3	0	–
Morrow	Mainstem	South Mahoning	8	0	–
Harbridge	Goose	South Mahoning	2	0	–
Hopkins	Goose	South Mahoning	3	0	–
Steffy	Goose	East Mahoning	8	300	–
Knapko	Goose	South Mahoning	4	200	–
Lutz	Leisure	South Mahoning	2	300	36" stream culvert
Clark	Leisure	South Mahoning	2	0	–
Matty	Sugarcamp	Washington	2	0	–
Hamilton	Leisure	South Mahoning	12	0	1600' under drain
Totals			83	1200	–

Figure 12. South Branch Plum Creek Unpaved Road Projects



ABANDONED MINE DRAINAGE WITHIN THE WATERSHED

Although the most of the South Branch Plum Creek is impaired by sedimentation, one sub-watershed, Sugarcamp Run, is impaired by Abandoned Mine Drainage (AMD). Since the TMDL was developed for sediment only, it focused on a target area which did not include Sugarcamp Run. Further studies needs to be conducted to characterize the discharges in this sub-watershed and determine if treatment is feasible.

Although AMD is listed as the cause for impairment in Sugarcamp Run, sedimentation is obvious. Eroding banks are a problem along the majority of the stream due to lack of riparian vegetation, mostly from residents mowing their lawns up to the streambanks.

PRIORITES FOR IMPLEMENTATION

Due to the large number of potential projects identified in this plan, establishing a prioritized list for each of the 191 individual project sites was not a simple task. To accomplish this, ICCD identified project priorities by “top-to-bottom” of the watershed approach, focusing on the headwaters and sub-watersheds first. Sub-watersheds and stream sections were ranked on a one-to-five scale, based on their location in the watershed. Table 13 shows the priority rank assigned to each section:

Table 13. Watershed Priority Ranks

Sub-watershed	Watershed Rank
Mainstem Headwaters (US of Leisure Run), and Goose and Leisure Runs	1
Mainstem, and UNT’s 46636 and 46643	2
Reddings Run	3
Sugarcamp Run	4
Mainstem (DS of Sugarcamp Run) and Mudlick Run	5

* US=Upstream, DS=Downstream

The second major consideration for prioritizing individual stream restoration project sites was project size and sediment reduction efficiency. This was determined by multiplying the length of the proposed BMP by reduction efficiency assigned to that practice. The resulting values from each proposed BMP were then summed to determine a “size-efficiency total” for each project.

Each stream restoration project was also scored on a one-to-three scale based on the impairment status of the stream segment the project was located on. Projects located on impaired stream sections were given a score of one. A score of two was given to projects on unimpaired stream sections that are located upstream of impaired sections, while a score of three was assigned to projects on unimpaired sections below impaired sections. The justification for this scoring system can be easily understood by examining the cases of the Mainstem Headwaters and Goose Run, which are impaired by Grazing Related Agriculture. The impairment of those sub-watersheds is limited to the lower sections of stream downstream of any tributaries, even though the sources of pollutants are from land use above the impaired sections. Therefore, even though the headwaters of those sub-watersheds are listed as unimpaired, they are in need of restoration

and the recovery of downstream, impaired segments depends on projects being implemented there.

A final priority ranking of all stream restoration projects was then determined by sorting the potential project database by watershed priority rank, “size-efficiency total”, and then by impairment status score. Using this sorted database as a guideline, each project site was assigned a final priority rank on a one-to-five scale, while also considering landowner interest and project visibility to the public as incentives. Also, projects ranking in the top 10% in the highest “size-efficiency total” list were automatically assigned a top priority ranking, regardless of watershed priority. These rankings are shown in Table 10 on pages 20-23 .

Any agriculture BMP projects that didn’t require stream restoration were also sorted by watershed priority, project size, and by field scores. Field scores were determined when converting data collected in the field during visual assessment into GIS layers. Each crop and hay/pasture field was given a score from one-to-three, depending on its proximity to the stream. Fields were given a score of one if the stream flowed directly through it, while fields given a score of three were located near the top of the watershed and had no direct impact on the stream. From this sorted list, these projects were also given a final priority rank on a one-to-five scale with the same considerations as the stream restoration projects.

While stream bank erosion has been identified as the major source of sediments impairments, addressing this component will not be our first task. Activities in the upstream sub-watersheds have altered storm water runoff rates and volumes that ultimately lead to excessive stream bank erosion along the mainstem. ICCD would like to first devote its efforts in the upstream sub-watersheds where we will implement practices that promote storm water infiltration and increase the retention time relative to the mainstem. Increased infiltration will reduce volume spikes during storm events, and the establishment of vegetated buffers that will reduce velocities, capture sediments, and increase stormwater retention times to the mainstem.

Our initial objective for the sub-watersheds is to increase storm water infiltration and to capture sediments from the road system and agricultural operations before they reach the stream channel. As we work to implement BMP projects, we will continue to encourage landowners to change their current stream management practices (mowing) and promote the establishment of natural riparian buffers.

Although, we intend to focus our work addressing stormwater issues in the upper reaches of the headwaters first, streambank stabilization projects on impaired sections of the watershed with severe bank erosion are also a high priority due to the high sediment reduction efficiency of those BMPs. Also, landowner interest will play a major role in the implementation schedule for this plan. If landowners on high priority project sites are not willing or interested in completing projects, then lower priority sites may be implemented first based on landowner interest.

PARTNERS AND FUNDING

As landowners become interested in BMP projects and funds are secured, CrCWA and ICCD will do most of the work in implementing this plan. However, there are many other partnering agencies that will assist CrCWA in the implementation of the plan other than ICCD. As the majority of the impairments and BMPs to address them are agriculture related, the USDA's local service offices for the NRCS and Farm Service Agency (FSA) will also play an important role in project implementation. These agencies already have well-established relationships with many farmers in the watershed, the expertise to provide technical assistance, and programs to help with financial assistance in implementing agricultural BMPs. These programs, such as USDA's Conservation Reserve Program (CRP), CREP, and Environmental Quality Incentives Program (EQIP), are all potential funding sources for implementing this plan.

The major source of funds that will be utilized in putting the WIP into action will be through the EPA Section 319 Program and PADEP Growing Greener. These larger funding sources will be integral in funding projects due to the significant cost of total watershed restoration.

According to the TMDL, the major contributor of sediment in the watershed is streambank erosion. Accordingly, a considerable amount of the BMPs proposed in this plan involve streambank stabilization. Often the most cost-effective and ecologically beneficial method of bank stabilization is with fish habitat improvement structures. CrCWA has successfully implemented many of these types of projects in Plum Creek and other Crooked Creek tributaries in the past, through the expertise of Armstrong Conservation District's (ACD) Watershed Specialist, a CrCWA board member, who has a wealth of knowledge and experience in project design and construction.

ACD and CrCWA have completed multiple phases of streambank stabilization projects on Plum Creek and South Branch Plum Creek in Armstrong County, and continuing this restoration remains a priority. Though specific projects are not identified in this plan for lower portion of the watershed due to focusing on the TMDL targeted area and the "top-to-bottom" implementation strategy, projects in this area are also integral in restoring the South Branch to a viable coldwater fishery.

A recent assessment by PADEP in 2009 has found a segment of the lower South Branch in Armstrong County to also be impaired by siltation. ACD will take the lead in identifying specific projects and seeking funding for the restoration on this segment of stream.

CrCWA and ICCD will remain open and willing to seek other partnerships and any other potential funding sources that may become available in the future.

PUBLIC INFORMATION AND INVOLVEMENT

PAST AND CURRENT EFFORTS

CrCWA and ICCD have conducted many public outreach activities since the inception of this project. Soon after receiving the grant to develop the WIP, CrCWA hosted its first public meeting in 2008. The event was held at the Plum Valley Grange, a small historic meeting site located on the banks of the South Branch Plum Creek and near the approximate geographic center of the watershed. This meeting included presentations from CrCWA, ICCD, and PADEP about the goals of developing the WIP and served as an initial introduction and public notice about the project.

In 2009, ICCD received a Pennsylvania Association of Conservation Districts (PACD) Mini-Grant to conduct additional public outreach in the watershed. ICCD used the funds to print invitations to another public meeting, also held at the Grange. The invitations were distributed door-to-door by hanging them on resident's doorknobs throughout the watershed. A door hanger was distributed to approximately 200 residents with streamside property. The meeting again featured presentations by ICCD and a public discussion followed.

In 2010, with remaining funds from the PACD Mini-Grant, ICCD developed a public outreach newsletter highlighting the District's efforts to implement the WIP, along with some BMPs landowners could do on their own. As previously mentioned in the Data Collection section, while collecting field data ICCD individually visited each household in the watershed, providing them with the newsletter along with American Highbush Cranberry seedlings, donated by a local nursery, which they could plant along their riparian corridor. We also discussed some BMPs that could be implemented on each property along with cost-share ICCD may be able to offer. Altogether, approximately 250 newsletters and 1000 seedlings were distributed. A survey to assess landowners' interest in restoring the watershed was also distributed with the newsletter. There was a 20% return rate for the surveys, with the majority of residents willing to implement some form of conservation practice. Townships have indicated a willingness to implement stormwater management practices for their road systems and Letters of Commitment to install conservation practices have been obtained from some farmers.

In another attempt to educate the public and gain support for restoring the South Branch, ICCD partnered with the local newspaper, the Indiana Gazette, to publish an article in the paper highlighting BMPs already installed in the watershed and to increase public awareness about the WIP.

FUTURE EFFORTS

Public outreach and involvement will continue in the watershed through the Public Outreach/Monitoring Database Project established with funding from a S.319 WIP Outreach/Education Mini-Grant. Through this Mini-Grant, CrCWA will conduct public outreach and establish a monitoring program in the South Branch Plum Creek Watershed. CrCWA, under the supervision of ICCD, will work to establish community support for the WIP by visiting farms and distributing educational materials about BMPs that reduce erosion and sedimentation, and

the programs available to fund these BMPs. The ultimate objective of this education and outreach project is to make landowners in this watershed aware of the benefits of sediment-reducing BMPs and the programs available to help implement them. We will distribute copies of our public outreach publication to residents in the watershed, and educate all major agricultural producers with projects identified in the WIP.

MONITORING RESTORATION PROGRESS

A monitoring program will be used to track changes in water quality as restoration projects are completed. The monitoring program will rely heavily on volunteers to regularly take samples and make assessments. Fortunately, Indiana County has a very active chapter of the Pennsylvania Senior Environmental Corps (PASEC) that currently monitors streams throughout the county. The PASEC chapter has recently partnered with the Indiana University of Pennsylvania (IUP) to develop a new publicly accessible, online Western Pennsylvania Water Quality Database. The database is in its infancy, but should be fully functional by early 2012.

The majority of restoration progress monitoring will be accomplished using a GIS database, that will include project implementation details and detailed project construction records. The database will include:

- Changes in land use
- Acres crop, grazing, and nutrient management implemented
- Feet of stream restored
- Miles of unpaved road protected
- Specific structural BMPs implemented
- Sediment and nutrient load reductions achieved

ICCD has already established a rudimentary geodatabase during the data collection process, which will be enhanced and expanded in late 2011-early 2012 through a S.319 Mini-grant Monitoring Database Project.

Through the Monitoring Project, CrCWA and ICCD will compile all the existing assessment data for the watershed and add it to ICCD's internal database and also to the online Western Pennsylvania Water Quality Database hosted by IUP.

Currently, no state water quality standards exist in Pennsylvania for sediments and nutrients. This presents a challenge in evaluating water quality improvements and load reductions for sediments.

ICCD and CrCWA will partner with PASEC to set up the Volunteer Monitoring Program for the South Branch Plum Creek. A schedule for regular water quality sampling is being planned, as well as macroinvertebrate surveys, visual habitat assessments, stream channel cross-section surveys, and pebble counts. The key water quality parameters that the monitoring will focus on

are turbidity, total suspended solids, dissolved oxygen, nitrates, phosphates, pH, conductivity, and temperature.

Monitoring points will be established in relation to each approved projected site before any work begins. These points will be monitored for up to a year prior to project construction, where possible, and will continue for at least two years after project completion. In addition to project-related monitoring, monitoring of the previously established long-term sampling points (Figure 2) will continue regularly. Temporal water quality improvement should be shown using this combination of project-related and long-term monitoring.

In addition to monitoring water quality improvements, computer modeling of sediment load reductions will continue to account for estimated load reductions from project completion. Penn State's PRedICT GIS-based modeling program will again be used to estimate sediment load reductions. These modeling results used in tandem with monitoring data should accurately show the achieved load reductions.

Once a significant amount of projects are completed and improvements are shown through monitoring, an instream comprehensive evaluation reassessment should be conducted by PA DEP to see if any sub-watersheds or stream segments could be removed from the State's impaired waters list.

IMPROVEMENT MILESTONES

CrCWA and ICCD hope to achieve the improvement milestones through the implementation of this plan:

- By implementing 10% of the projects in this plan, we hope to achieve a 5% increase in total macroinvertebrate richness. This should take approximately 5 years to achieve.
- By implementing 25% of the projects in this plan, we hope to achieve a 10% increase in macroinvertebrate EPT Richness. This should take approximately 10 years to achieve.
- By implementing 50% of the projects in this plan, we hope to achieve a 25% reduction in sediment loading in the watershed. This should take approximately 20 years to achieve.

REMEDIAL ACTIONS

The goal of this plan is to provide a guideline for reducing achieving the load reduction to meet the TMDL and restore the aquatic life in the South Branch Plum Creek. As implementation of the plan begins, changes in land use or ownership, improvements in modeling software, results from monitoring, and other unforeseen circumstances may require the plan to be altered. If significant water quality improvements are not seen after implementation of projects in this plan, actions will be taken to address these issues.

However, when dealing with a pollutant like sediment and the types of BMPs needed to alleviate its impacts, it will take time before improvements are seen in the stream biota. It will take time

for farmers to improve their levels of management and adopt better conservation practices. Effective vegetated buffer take time to become established and banks take time to stabilize. It will also take time for the hydrology of the stream to improve after being laden with sediment. Despite these challenges, ICCD and CrCWA are confident that the implementation of this plan will result in restoration of the South Branch Plum Creek Watershed.

REFERENCES

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Armstrong and Indiana County Conservation Districts. 2010. Crooked Creek Watershed Nonpoint Pollution Assessment (Draft).

APPENDIX

PRediCT MODELING RESULTS:

TMDL TARGETED WATERSHED WIP IMPLEMENTATION LOAD REDUCTION SCENARIO

Mean Annual Load Data Editor

Load Data Type	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
UPLAND EROSION/RUNOFF			
Row Crops	8758966	33662	4506
Hay/Pasture	961215	8900	983
High Density Urban	24251	906	95
Low Density Urban	2205	71	7
Unpaved Road	363763	1418	198
Other	198416	1446	101
STREAMBANK EROSION	2128367	1067	183
GROUNDWATER/SUBSURFACE		111644	1850
POINT SOURCE DISCHARGE		0	0
SEPTIC SYSTEMS		2284	77
TOTAL	12437182	168927	11587
BASIN AREA	18748	Acres	

Agricultural Land BMP Scenario Editor

Land Use	Acres		BMP1	BMP2	BMP3	BMP4	BMP5	BMP6	BMP7	BMP8
Row Crops	4200.79197	% Existing	0	0	85	75	0	0		15
		% Future	0	0	85	75	0	0		15
Hay/Pasture	4025.3471289	% Existing				15	0	0	0	30
		% Future				15	0	0	0	30
Agricultural Land on Slope > 3%			7,566 Acres							
Streams in Agricultural Areas			30.7 Miles							
Total Stream Length			77.0 Miles							
Unpaved Road Length			37.0 Miles							
			Existing		Future					
Stream Miles with Vegetated Buffer Strips			0.6		22.1					
Stream Miles with Fencing			1.1		7.8					

Stream Miles with Stabilization	0.1	16.8	
Unpaved Road Miles w/E & S Controls	2.5	10.4	
	% Existing	% Future	
AWMS (Livestock)	0.0	100.0	
AWMS (Poultry)	0.0	0.0	
Runoff Control	0.0	100.0	
Phytase in Feed	0.0	0.0	

Urban Land BMP Scenario Editor

High Density Urban					
		Acres	4200	% Impervious Surface	50
Constructed Wetlands		Bioretention Areas		Detention Basins	
% Existing	0	% Existing	0	% Existing	0
% Future	0	% Future	0	% Future	0
% Drainage Area Used	5	% Drainage Area Used	6	% Drainage Area Used	3
Impervious Acres Drained	0.0	Impervious Acres Drained	0.0	Impervious Acres Drained	0.0
CW Acres Required	0.0	BA Acres Required	0.0	DB Acres Required	0.0

Low Density Urban					
		Acres	93	% Impervious Surface	25
Constructed Wetlands		Bioretention Areas		Detention Basins	
% Existing	0	% Existing	0	% Existing	0
% Future	0	% Future	0	% Future	0
% Drainage Area Used	3	% Drainage Area Used	6	% Drainage Area Used	2
Impervious Acres Drained	0.0	Impervious Acres Drained	0.0	Impervious Acres Drained	0.0
CW Acres Required	0.0	BA Acres Required	0.0	DB Acres Required	0.0

Vegetated Stream Buffers				
			Existing	Future
Stream miles in high density urban areas	.745645428	Stream miles in high density urban areas w/buffers	0	0
		High Density Urban Streambank Stabilization	0	0
Stream miles in low density urban areas	.372822714	Stream miles in low density urban areas w/buffers	0	0
		Low Density Urban Streambank Stabilization	0	0

Septic Systems and Point Source Discharge Scenario Editor

Number of persons on septic systems		Existing	643		
		Future	643		
Spetic systems converted by treatment type %		Secondary	0	Tertiary	0
		Existing Point Source Load	No		
			Primary	Secondary	Tertiary
Distribution of pollutant discharge by treatment type %		Existing	0	0	0
		Future	0	0	0
			Primary to Secondary	Primary to Tertiary	Secondary to Tertiary
Distribution of treatment upgrades %			0	0	0

Rural and Urban BMP Load Reduction Efficiency Editor

BMP Type	Nitrogen	Phosphorus	Sediment	Pathogens
BMP 1	0.29	0.50	0.35	
BMP 2	0.08	0.22	0.30	
BMP 3	0.07	0.10	0.17	
BMP 4	0.05	0.10	0.16	
BMP 5	0.00	0.00	0.16	
BMP 6	0.29	0.44		
BMP 7	0.30	0.30	0.38	
BMP 8	0.95	0.95	0.95	
Vegetated Buffer Strips	0.41	0.40	0.53	0.70
Streambank Fencing	0.56	0.78	0.76	1.00
Streambank Stabilizatio	0.95	0.95	0.95	
Unpaved Roads (lbs/ft)	0.01	0.0024	1.71	
AWMS (Livestock)	0.75	0.75		0.75
AWMS (Poultry)	0.14	0.14		0.14
Runoff Control	0.15	0.15		0.15
Phytase in Feed		0.21		

Urban BMP Load Reduction Efficiency Editor

BMP Type	Nitrogen	Phosphorus	Sediment	Pathogens
Constructed Wetlands	0.53	0.51	0.88	0.71
Bioretention Areas	0.46	0.61	0.10	0.82
Detention Basins	0.40	0.51	0.93	0.71

Wastewater BMP Load Reduction Efficiency Editor

	Nitrogen	Phosphorus
Conversion of Septic Systems to Secondary Treatment Plant	0.14	0.10
Conversion of Septic Systems to Tertiary Treatment Plant	0.56	0.60
Conversion of Primary Treatment to Secondary Treatment	0.14	0.10
Conversion of Primary Treatment to Tertiary Treatment	0.56	0.60
Conversion of Secondary Treatment to Tertiary Treatment	0.42	0.50

BMP Cost Editor

Agricultural Cost Editor	
Conservation Tillage (per acre)	\$30.00
Cropland Protection (per acre)	\$25.00
Grazing Land Management (per acre)	\$360.00
Streambank Fencing (per acre)	\$10.00
Streambank Fencing (per mile)	\$15,000.00
Streambank Stabilization (per foot)	\$25.00
Vegetated Buffer Strip (per mile)	\$1,500.01
Terraces and Diversions (per acre)	\$5,000.00
AWMS Livestock (per AEU)	\$1,250.00
AWMS Poultry (per AEU)	\$520.00
Runoff Control (per AEU)	\$300.00
Phytase in Feed (per AEU)	\$2.50
Nutrient Management (per acre)	\$110.00
Ag to Wetland Conversion (per acre)	\$0.00
Unpaved Roads (per foot)	\$5.58
Ag to Forest Conversion (per acre)	\$10.00
Urban Cost Editor	
Constructed Wetlands (per acre)	\$13,400.00
Bioretention Areas (per acre)	\$8,000.00
Detention Basins (per acre)	\$10,700.00
Septic System and Point Source Upgrades	
Conversion of Septic Systems to Centralized Sewage Treatment (per home)	\$15,000.00
Conversion From Primary to Secondary Sewage Treatment (per capita)	\$250.00
Conversion From Primary to Tertiary Sewage Treatment (per capita)	\$300.00
Conversion From Secondary to Tertiary Sewage Treatment (per capita)	\$150.00

Estimated Load Reductions

	Existing (lbs)		
UPLAND EROSION/RUNOFF	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
Row Crops	8758966	33662	4506
Hay/Pasture	961215	8900	983
High Density Urban	24251	906	95
Low Density Urban	2205	71	7
Unpaved Roads	363763	1418	198
Other	198416	1446	101
STREAMBANK EROSION	2128367	1067	183
GROUNDWATER/SUBSURFACE		111644	1850
POINT SOURCE DISCHARGE		0	0
SEPTIC SYSTEMS		2284	77
FARM ANIMALS		7529	3587
TOTALS		12437182	168927
	Future (lbs)		
LAND EROSION/RUNOFF	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
Row Crops	5507510	23996	3244
Hay/Pasture	961215	8900	983
High Density Urban	24251	906	95
Low Density Urban	2205	71	7
Unpaved Roads	166104	1412	198
Other	198416	1446	101
STREAMBANK EROSION	1548056	795	133
GROUNDWATER/SUBSURFACE		106036	1850
POINT SOURCE DISCHARGE		0	0
SEPTIC SYSTEMS		2284	77
FARM ANIMALS		3533	967
TOTALS		8407757	149377
PERCENT REDUCTIONS	32.4	11.6	33.9
TOTAL SCENARIO COST	\$5,719,212.75		
Ag BMP Cost (%)	0.0		
WW Upgrade Cost (%)	0.0		
Urban BMP Cost (%)	0.0		
Stream Protection Cost (%)	82.1		
Unpaved Road Protection Cost (%)	8.1		

Pathogen Loads		
Source	Existing (orgs/month)	Future (orgs/month)
Farm Animals	9.346e+14	4.386e+14
WWTP	0.000e+00	0.000e+00
Septic Systems	0.000e+00	0.000e+00
Urban Areas	2.628e+10	2.628e+10
Wildlife	3.589e+12	3.589e+12
Totals	9.383e+14	4.422e+14
PERCENT REDUCTIONS		52.87
TOTAL SCENARIO COST	\$5,719,212.75	

GOOSE RUN ESTIMATED LOAD REDUCTIONS

Mean Annual Load Data Editor

Load Data Type	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
UPLAND EROSION/RUNOFF			
Row Crops	707684	3530	392
Hay/Pasture	52911	840	82
High Density Urban	0	0	0
Low Density Urban	0	0	0
Unpaved Road	57320	181	22
Other	13228	110	7
STREAMBANK EROSION	40259	20	2
GROUNDWATER/SUBSURFACE		15626	214
POINT SOURCE DISCHARGE		0	0
SEPTIC SYSTEMS		198	13
TOTAL	871401	22227	1462
BASIN AREA	1888 Acres		

Agricultural Land BMP Scenario Editor

Land Use	Acres		BMP1	BMP2	BMP3	BMP4	BMP5	BMP6	BMP7	BMP8
Row Crops	610.3503627	% Existing	0	0	87	67	0	0		3
		% Future	97	97	87	95	0	63		3
Hay/Pasture	434.9055216	% Existing				33	0	0	0	52
		% Future				42	0	18	17	52

Agricultural Land on Slope > 3%	917 Acres	
Streams in Agricultural Areas	3.3 Miles	
Total Stream Length	7.1 Miles	
Unpaved Road Length	5.6 Miles	
	Existing	Future
Stream Miles with Vegetated Buffer Strips	0.0	3.3
Stream Miles with Fencing	0.0	2.5
Stream Miles with Stabilization	0.0	3.0
Unpaved Road Miles w/E & S Controls	0.8	2.2
	% Existing	% Future
AWMS (Livestock)	0.0	100.0
AWMS (Poultry)	0.0	0.0
Runoff Control	0.0	100.0
Phytase in Feed	0.0	0.0

Urban Land BMP Scenario Editor

High Density Urban					
	Acres	610	% Impervious Surface	50	
Constructed Wetlands	Bioretention Areas		Detention Basins		
% Existing	0	% Existing	0	% Existing	0
% Future	0	% Future	0	% Future	0
% Drainage Area Used	5	% Drainage Area Used	6	% Drainage Area Used	3
Impervious Acres Drained	0.0	Impervious Acres Drained	0.0	Impervious Acres Drained	0.0
CW Acres Required	0.0	BA Acres Required	0.0	DB Acres Required	0.0

Low Density Urban					
	Acres	0	% Impervious Surface	25	
Constructed Wetlands	Bioretention Areas		Detention Basins		
% Existing	0	% Existing	0	% Existing	0
% Future	0	% Future	0	% Future	0
% Drainage Area Used	3	% Drainage Area Used	6	% Drainage Area Used	2
Impervious Acres Drained	0.0	Impervious Acres Drained	0.0	Impervious Acres Drained	0.0
CW Acres Required	0.0	BA Acres Required	0.0	DB Acres Required	0.0

Vegetated Stream Buffers				
			Existing	Future
Stream miles in high density urban areas	0	Stream miles in high density urban areas w/buffers	0	0
		High Density Urban Streambank Stabilization	0	0
Stream miles in low density urban areas	0	Stream miles in low density urban areas w/buffers	0	0

Septic Systems and Point Source Discharge Scenario Editor

Number of persons on septic systems		Existing	56		
		Future	56		
Spetic systems converted by treatment type %	Secondary	0	Tertiary	0	
	Existing Point Source Load	No			
		Primary	Secondary	Tertiary	
Distribution of pollutant discharge by treatment type %	Existing	0	0	0	
	Future	0	0	0	
		Primary to Secondary	Primary to Tertiary	Secondary to Tertiary	
Distribution of treatment upgrades %		0	0	0	

Rural and Urban BMP Load Reduction Efficiency Editor

BMP Type	Nitrogen	Phosphorus	Sediment	Pathogen s
BMP 1	0.29	0.50	0.35	
BMP 2	0.08	0.22	0.30	
BMP 3	0.07	0.10	0.17	
BMP 4	0.05	0.10	0.16	
BMP 5	0.00	0.00	0.16	
BMP 6	0.29	0.44		
BMP 7	0.30	0.30	0.38	
BMP 8	0.95	0.95	0.95	
Vegetated Buffer Strips	0.41	0.40	0.53	0.70
Streambank Fencing	0.56	0.78	0.76	1.00
Streambank Stabilizatio	0.95	0.95	0.95	
Unpaved Roads (lbs/ft)	0.01	0.0024	1.71	
AWMS (Livestock)	0.75	0.75		0.75
AWMS (Poultry)	0.14	0.14		0.14
Runoff Control	0.15	0.15		0.15
Phytase in Feed		0.21		

Urban BMP Load Reduction Efficiency Editor

BMP Type	Nitrogen	Phosphorus	Sediment	Pathogens
Constructed Wetlands	0.53	0.51	0.88	0.71

Bioretention Areas	0.46	0.61	0.10	0.82
Detention Basins	0.40	0.51	0.93	0.71

Pathogen Loads
Wastewater BMP Load Reduction Efficiency
Editor

	Nitrogen	Phosphorus
Conversion of Septic Systems to Secondary Treatment Plant	0.14	0.10
Conversion of Septic Systems to Tertiary Treatment Plant	0.56	0.60
Conversion of Primary Treatment to Secondary Treatment	0.14	0.10
Conversion of Primary Treatment to Tertiary Treatment	0.56	0.60
Conversion of Secondary Treatment to Tertiary Treatment	0.42	0.50

BMP Cost Editor

Agricultural Cost Editor	
Conservation Tillage (per acre)	\$30.00
Cropland Protection (per acre)	\$25.00
Grazing Land Management (per acre)	\$360.00
Streambank Fencing (per acre)	\$10.00
Streambank Fencing (per mile)	\$15,000.00
Streambank Stabilization (per foot)	\$25.00
Vegetated Buffer Strip (per mile)	\$1,500.01
Terraces and Diversions (per acre)	\$5,000.00
AWMS Livestock (per AEU)	\$1,250.00
AWMS Poultry (per AEU)	\$520.00
Runoff Control (per AEU)	\$300.00
Phytase in Feed (per AEU)	\$2.50

Nutrient Management (per acre)	\$110.00
Ag to Wetland Conversion (per acre)	\$0.00
Unpaved Roads (per foot)	\$5.58
Ag to Forest Conversion (per acre)	\$10.00

Urban Cost Editor

Constructed Wetlands (per acre)	\$13,400.00
Bioretention Areas (per acre)	\$8,000.00
Detention Basins (per acre)	\$10,700.00

Septic System and Point Source Upgrades

Conversion of Septic Systems to Centralized Sewage Treatment (per home)	\$15,000.00
Conversion From Primary to Secondary Sewage Treatment (per capita)	\$250.00
Conversion From Primary to Tertiary Sewage Treatment (per capita)	\$300.00
Conversion From Secondary to Tertiary Sewage Treatment (per capita)	\$150.00

Estimated Load Reductions

		Existing (lbs)		
		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
UPLAND EROSION/RUNOFF				
	Row Crops	707684	3530	392
	Hay/Pasture	52911	840	82
	High Density Urban	0	0	0
	Low Density Urban	0	0	0
	Unpaved Roads	57320	181	22
	Other	13228	110	7
STREAMBANK EROSION		40259	20	2
GROUNDWATER/SUBSURFACE			15626	214
POINT SOURCE DISCHARGE			0	0
SEPTIC SYSTEMS			198	13
FARM ANIMALS			1722	730
TOTALS		871401	22227	1462
		Future (lbs)		

LAND EROSION/RUNOFF		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
	Row Crops	107999	1067	47
	Hay/Pasture	49493	756	71
	High Density Urban	0	0	0
	Low Density Urban	0	0	0
	Unpaved Roads	19967	180	22
	Other	13228	110	7
STREAMBANK EROSION		13054	8	1
GROUNDWATER/SUBSURFACE			12576	191
POINT SOURCE DISCHARGE			0	0
SEPTIC SYSTEMS			198	13
FARM ANIMALS			619	154
TOTALS		203740	15514	505
PERCENT REDUCTIONS		76.6	30.2	65.5
TOTAL SCENARIO COST		\$1,207,027.53		
Ag BMP Cost (%)		9.3		
WW Upgrade Cost (%)		0.0		
Urban BMP Cost (%)		0.0		
Stream Protection Cost (%)		73.7		
Unpaved Road Protection Cost (%)		7		
Source		Existing (orgs/month)	Future (orgs/month)	
Farm Animals		2.008e+14	4.861e+13	
WWTP		0.000e+00	0.000e+00	
Septic Systems		0.000e+00	0.000e+00	
Urban Areas		0.000e+00	0.000e+00	
Wildlife		2.944e+11	2.944e+11	
Totals		2.011e+14	4.891e+13	
PERCENT REDUCTIONS			75.68	
TOTAL SCENARIO COST		\$1,207,027.53		

LEISURE RUN ESTIMATED LOAD REDUCTIONS

Mean Annual Load Data Editor

Load Data Type	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
UPLAND EROSION/RUNOFF			
Row Crops	802483	3316	335
Hay/Pasture	59525	877	75
High Density Urban	0	15	2

Low Density Urban	0	4	0
Unpaved Road	79366	260	26
Other	13228	141	7
STREAMBANK EROSION	42836	22	2
GROUNDWATER/SUBSURFACE		10593	181
POINT SOURCE DISCHARGE		0	0
SEPTIC SYSTEMS		192	11
TOTAL	997437	16215	1023
BASIN AREA	1826 Acres		

Agricultural Land BMP Scenario Editor

Land Use	Acres		BMP1	BMP2	BMP3	BMP4	BMP5	BMP6	BMP7	BMP8
Row Crops	467.0292249	% Existing	0	0	71	5	0	0		29
		% Future	67	67	71	56	0	37		29
Hay/Pasture	370.658115	% Existing				6	0	0	0	31
		% Future				38	0	29	44	31
Agricultural Land on Slope > 3%			726 Acres							
Streams in Agricultural Areas			2.9 Miles							
Total Stream Length			7.0 Miles							
Unpaved Road Length			7.8 Miles							
			Existing	Future						
Stream Miles with Vegetated Buffer Strips			0.0	2.1						
Stream Miles with Fencing			0.0	1.5						
Stream Miles with Stabilization			0.0	1.7						
Unpaved Road Miles w/E & S Controls			1.2	1.6						
			% Existing	% Future						
AWMS (Livestock)			0.0	0.0						
AWMS (Poultry)			0.0	100.0						
Runoff Control			0.0	100.0						
Phytase in Feed			0.0	0.0						

Urban Land BMP Scenario Editor

High Density Urban			
	Acres	467 % Impervious Surface	50
Constructed Wetlands	Bioretention Areas	Detention Basins	

% Existing	0	% Existing	0	% Existing	0
% Future	0	% Future	0	% Future	0
% Drainage Area Used	5	% Drainage Area Used	6	% Drainage Area Used	3
Impervious Acres Drained	0.0	Impervious Acres Drained	0.0	Impervious Acres Drained	0.0
CW Acres Required	0.0	BA Acres Required	0.0	DB Acres Required	0.0

Low Density Urban					
		Acres	7	% Impervious Surface	25
Constructed Wetlands		Bioretention Areas		Detention Basins	
% Existing	0	% Existing	0	% Existing	0
% Future	0	% Future	0	% Future	0
% Drainage Area Used	3	% Drainage Area Used	6	% Drainage Area Used	2
Impervious Acres Drained	0.0	Impervious Acres Drained	0.0	Impervious Acres Drained	0.0
CW Acres Required	0.0	BA Acres Required	0.0	DB Acres Required	0.0

Vegetated Stream Buffers				
			Existing	Future
Stream miles in high density urban areas	0	Stream miles in high density urban areas w/buffers	0	0
		High Density Urban Streambank Stabilization	0	0
Stream miles in low density urban areas	0	Stream miles in low density urban areas w/buffers	0	0
		Low Density Urban Streambank Stabilization	0	0

Septic Systems and Point Source Discharge Scenario Editor

Number of persons on septic systems		Existing	54		
		Future	54		
Spetic systems converted by treatment type %		Secondary	0	Tertiary	0
		Existing Point Source Load	No		
			Primary	Secondary	Tertiary
Distribution of pollutant discharge by treatment type %		Existing	0	0	0
		Future	0	0	0
			Primary to Secondary	Primary to Tertiary	Secondary to Tertiary
Distribution of treatment upgrades %			0	0	0

Rural and Urban BMP Load Reduction Efficiency Editor

BMP Type	Nitrogen	Phosphorus	Sediment	Pathogen s
BMP 1	0.29	0.50	0.35	
BMP 2	0.08	0.22	0.30	

BMP 3	0.07	0.10	0.17	
BMP 4	0.05	0.10	0.16	
BMP 5	0.00	0.00	0.16	
BMP 6	0.29	0.44		
BMP 7	0.30	0.30	0.38	
BMP 8	0.95	0.95	0.95	
Vegetated Buffer Strips	0.41	0.40	0.53	0.70
Streambank Fencing	0.56	0.78	0.76	1.00
Streambank Stabilizatio	0.95	0.95	0.95	
Unpaved Roads (lbs/ft)	0.01	0.0024	1.71	
AWMS (Livestock)	0.75	0.75		0.75
AWMS (Poultry)	0.14	0.14		0.14
Runoff Control	0.15	0.15		0.15
Phytase in Feed		0.21		

Urban BMP Load Reduction Efficiency Editor

BMP Type	Nitrogen	Phosphorus	Sediment	Pathogens
Constructed Wetlands	0.53	0.51	0.88	0.71
Bioretention Areas	0.46	0.61	0.10	0.82
Detention Basins	0.40	0.51	0.93	0.71

Pathogen Loads

Wastewater BMP Load Reduction Efficiency Editor

	Nitrogen	Phosphorus
Conversion of Septic Systems to Secondary Treatment Plant	0.14	0.10
Conversion of Septic Systems to Tertiary Treatment Plant	0.56	0.60
Conversion of Primary Treatment to Secondary Treatment	0.14	0.10
Conversion of Primary Treatment to Tertiary Treatment	0.56	0.60
Conversion of Secondary Treatment to Tertiary Treatment	0.42	0.50

BMP Cost Editor

Agricultural Cost Editor

Conservation Tillage (per acre)	\$30.00
Cropland Protection (per acre)	\$25.00
Grazing Land Management (per acre)	\$360.00

Streambank Fencing (per acre)	\$10.00
Streambank Fencing (per mile)	\$15,000.00
Streambank Stabilization (per foot)	\$25.00
Vegetated Buffer Strip (per mile)	\$1,500.01
Terraces and Diversions (per acre)	\$5,000.00
AWMS Livestock (per AEU)	\$1,250.00
AWMS Poultry (per AEU)	\$520.00
Runoff Control (per AEU)	\$300.00
Phytase in Feed (per AEU)	\$2.50
Nutrient Management (per acre)	\$110.00
Ag to Wetland Conversion (per acre)	\$0.00
Unpaved Roads (per foot)	\$5.58
Ag to Forest Conversion (per acre)	\$10.00

Urban Cost Editor

Constructed Wetlands (per acre)	\$13,400.00
Bioretention Areas (per acre)	\$8,000.00
Detention Basins (per acre)	\$10,700.00

Septic System and Point Source Upgrades

Conversion of Septic Systems to Centralized Sewage Treatment (per home)	\$15,000.00
Conversion From Primary to Secondary Sewage Treatment (per capita)	\$250.00
Conversion From Primary to Tertiary Sewage Treatment (per capita)	\$300.00
Conversion From Secondary to Tertiary Sewage Treatment (per capita)	\$150.00

Estimated Load Reductions

		Existing (lbs)		
		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
UPLAND EROSION/RUNOFF				
	Row Crops	802483	3316	335
	Hay/Pasture	59525	877	75
	High Density Urban	0	15	2
	Low Density Urban	0	4	0
	Unpaved Roads	79366	260	26
	Other	13228	141	7
STREAMBANK EROSION		42836	22	2
GROUNDWATER/SUBSURFACE			10593	181
POINT SOURCE DISCHARGE			0	0
SEPTIC SYSTEMS			192	11
FARM ANIMALS			794	384
TOTALS		997437	16215	1023

		Future (lbs)		
LAND EROSION/RUNOFF		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
	Row Crops	240177	1518	93
	Hay/Pasture	49572	698	57
	High Density Urban	0	15	2
	Low Density Urban	0	4	0
	Unpaved Roads	69652	260	26
	Other	13228	141	7
STREAMBANK EROSION		25686	14	1
GROUNDWATER/SUBSURFACE			9514	169
POINT SOURCE DISCHARGE			0	0
SEPTIC SYSTEMS			192	11
FARM ANIMALS			613	308
TOTALS		398316	12969	675
PERCENT REDUCTIONS		60.1	20.0	34.1
TOTAL SCENARIO COST		\$653,911.23		
Ag BMP Cost (%)		16.7		
WW Upgrade Cost (%)		0.0		
Urban BMP Cost (%)		0.0		
Stream Protection Cost (%)		78.0		
Unpaved Road Protection Cost (%)		3.4		
Source		Existing (orgs/month)	Future (orgs/month)	
Farm Animals		6.435e+13	3.679e+13	
WWTP		0.000e+00	0.000e+00	
Septic Systems		0.000e+00	0.000e+00	
Urban Areas		4.905e+08	4.905e+08	
Wildlife		3.393e+11	3.393e+11	
Totals		6.469e+13	3.713e+13	
PERCENT REDUCTIONS			42.60	
TOTAL SCENARIO COST		\$653,911.23		

MAINSTEM/UNTS ESTIMATED LOAD REDUCTIONS

Mean Annual Load Data Editor

Load Data Type	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
UPLAND EROSION/RUNOFF			
Row Crops	5346210	22500	3203
Hay/Pasture	597453	7004	739

High Density Urban	17637	694	73
Low Density Urban	2205	49	4
Unpaved Road	185188	805	121
Other	202825	1475	112
STREAMBANK EROSION	1570018	789	150
GROUNDWATER/SUBSURFACE		83956	1534
POINT SOURCE DISCHARGE		0	0
SEPTIC SYSTEMS		1962	51
TOTAL	7921535	122601	7516
BASIN AREA	15679 Acres		

Agricultural Land BMP Scenario Editor

Land Use	Acres		BMP1	BMP2	BMP3	BMP4	BMP5	BMP6	BMP7	BMP8
Row Crops	3098.7018414	% Existing	2	0	77	77	0	4		23
		% Future	70	70	77	77	0	20		23
Hay/Pasture	3034.4544348	% Existing				60	0	0	0	40
		% Future				60	0	6	11	40
Agricultural Land on Slope > 3%			5,397 Acres							
Streams in Agricultural Areas			19.3 Miles							
Total Stream Length			64.2 Miles							
Unpaved Road Length			22.0 Miles							
			Existing	Future						
Stream Miles with Vegetated Buffer Strips			0.6	10.3						
Stream Miles with Fencing			1.4	3.2						
Stream Miles with Stabilization			0.5	10.2						
Unpaved Road Miles w/E & S Controls			1.7	4.8						
			% Existing	% Future						
AWMS (Livestock)			0.0	100.0						
AWMS (Poultry)			0.0	0.0						
Runoff Control			0.0	100.0						
Phytase in Feed			0.0	0.0						

Urban Land BMP Scenario Editor

High Density Urban			
Acres		3098 % Impervious Surface	50

Constructed Wetlands		Bioretention Areas		Detention Basins	
% Existing	2	% Existing	0	% Existing	0
% Future	0	% Future	0	% Future	0
% Drainage Area Used	5	% Drainage Area Used	6	% Drainage Area Used	3
Impervious Acres Drained	0.0	Impervious Acres Drained	0.0	Impervious Acres Drained	0.0
CW Acres Required	0.0	BA Acres Required	0.0	DB Acres Required	0.0

Low Density Urban					
		Acres	86	% Impervious Surface	25
Constructed Wetlands		Bioretention Areas		Detention Basins	
% Existing	0	% Existing	0	% Existing	0
% Future	0	% Future	0	% Future	0
% Drainage Area Used	3	% Drainage Area Used	6	% Drainage Area Used	2
Impervious Acres Drained	0.0	Impervious Acres Drained	0.0	Impervious Acres Drained	0.0
CW Acres Required	0.0	BA Acres Required	0.0	DB Acres Required	0.0

Vegetated Stream Buffers					
				Existing	Future
Stream miles in high density urban areas	.683508309	Stream miles in high density urban areas w/buffers		0	0
		High Density Urban Streambank Stabilization		0	0
Stream miles in low density urban areas	.497096952	Stream miles in low density urban areas w/buffers		0	0
		Low Density Urban Streambank Stabilization		0	0

Septic Systems and Point Source Discharge Scenario Editor

Number of persons on septic systems		Existing	552		
		Future	552		
Spetic systems converted by treatment type %	Secondary	0	Tertiary	0	
	Existing Point Source Load		No		
		Primary	Secondary	Tertiary	
Distribution of pollutant discharge by treatment type %	Existing	0	0	0	
	Future	0	0	0	
		Primary to Secondary	Primary to Tertiary	Secondary to Tertiary	
Distribution of treatment upgrades %		0	0	0	

Rural and Urban BMP Load Reduction Efficiency Editor

BMP Type	Nitrogen	Phosphorus	Sediment	Pathogens
BMP 1	0.29	0.50	0.35	

BMP 2	0.08	0.22	0.30	
BMP 3	0.07	0.10	0.17	
BMP 4	0.05	0.10	0.16	
BMP 5	0.00	0.00	0.16	
BMP 6	0.29	0.44		
BMP 7	0.30	0.30	0.38	
BMP 8	0.95	0.95	0.95	
Vegetated Buffer Strips	0.41	0.40	0.53	0.70
Streambank Fencing	0.56	0.78	0.76	1.00
Streambank Stabilizatio	0.95	0.95	0.95	
Unpaved Roads (lbs/ft)	0.01	0.0024	1.71	
AWMS (Livestock)	0.75	0.75		0.75
AWMS (Poultry)	0.14	0.14		0.14
Runoff Control	0.15	0.15		0.15
Phytase in Feed		0.21		

Urban BMP Load Reduction Efficiency Editor

BMP Type	Nitrogen	Phosphorus	Sediment	Pathogens
Constructed Wetlands	0.53	0.51	0.88	0.71
Bioretention Areas	0.46	0.61	0.10	0.82
Detention Basins	0.40	0.51	0.93	0.71

Pathogen Loads

Wastewater BMP Load Reduction Efficiency Editor

	Nitrogen	Phosphorus
Conversion of Septic Systems to Secondary Treatment Plant	0.14	0.10
Conversion of Septic Systems to Tertiary Treatment Plant	0.56	0.60
Conversion of Primary Treatment to Secondary Treatment	0.14	0.10
Conversion of Primary Treatment to Tertiary Treatment	0.56	0.60
Conversion of Secondary Treatment to Tertiary Treatment	0.42	0.50

BMP Cost Editor

Agricultural Cost Editor

Conservation Tillage (per acre)	\$30.00
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Cropland Protection (per acre)	\$25.00
Grazing Land Management (per acre)	\$360.00
Streambank Fencing (per acre)	\$10.00
Streambank Fencing (per mile)	\$15,000.00
Streambank Stabilization (per foot)	\$25.00
Vegetated Buffer Strip (per mile)	\$1,500.01
Terraces and Diversions (per acre)	\$5,000.00
AWMS Livestock (per AEU)	\$1,250.00
AWMS Poultry (per AEU)	\$520.00
Runoff Control (per AEU)	\$300.00
Phytase in Feed (per AEU)	\$2.50
Nutrient Management (per acre)	\$110.00
Ag to Wetland Conversion (per acre)	\$0.00
Unpaved Roads (per foot)	\$5.58
Ag to Forest Conversion (per acre)	\$10.00

Urban Cost Editor

Constructed Wetlands (per acre)	\$13,400.00
Bioretention Areas (per acre)	\$8,000.00
Detention Basins (per acre)	\$10,700.00

Septic System and Point Source Upgrades

Conversion of Septic Systems to Centralized Sewage Treatment (per home)	\$15,000.00
Conversion From Primary to Secondary Sewage Treatment (per capita)	\$250.00
Conversion From Primary to Tertiary Sewage Treatment (per capita)	\$300.00
Conversion From Secondary to Tertiary Sewage Treatment (per capita)	\$150.00

Estimated Load Reductions

		Existing (lbs)		
		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
UPLAND EROSION/RUNOFF				
	Row Crops	5346210	22500	3203
	Hay/Pasture	597453	7004	739
	High Density Urban	17637	694	73
	Low Density Urban	2205	49	4
	Unpaved Roads	185188	805	121
	Other	202825	1475	112
STREAMBANK EROSION		1570018	789	150
GROUNDWATER/SUBSURFACE			83956	1534
POINT SOURCE DISCHARGE			0	0

SEPTIC SYSTEMS		1962	51
FARM ANIMALS		3366	1528
TOTALS	7921535	122601	7516
	Future (lbs)		
LAND EROSION/RUNOFF	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
Row Crops	2171579	12749	1206
Hay/Pasture	572479	6655	695
High Density Urban	17637	694	73
Low Density Urban	2205	49	4
Unpaved Roads	118489	802	121
Other	202825	1475	112
STREAMBANK EROSION	1311276	664	125
GROUNDWATER/SUBSURFACE		80449	1505
POINT SOURCE DISCHARGE		0	0
SEPTIC SYSTEMS		1962	51
FARM ANIMALS		1660	424
TOTALS	4396490	107159	4318
PERCENT REDUCTIONS	44.5	12.6	42.6
TOTAL SCENARIO COST	\$3,382,459.65		
Ag BMP Cost (%)	9.2		
WW Upgrade Cost (%)	0.0		
Urban BMP Cost (%)	0.0		
Stream Protection Cost (%)	78.1		
Unpaved Road Protection Cost (%)	5.4		
Source	Existing (orgs/month)	Future (orgs/month)	
Farm Animals	3.787e+14	2.130e+14	
WWTP	0.000e+00	0.000e+00	
Septic Systems	0.000e+00	0.000e+00	
Urban Areas	3.279e+10	3.279e+10	
Wildlife	3.215e+12	3.215e+12	
Totals	3.819e+14	2.162e+14	
PERCENT REDUCTIONS		43.39	
TOTAL SCENARIO COST	\$3,382,459.65		

REDDINGS RUN ESTIMATED LOAD REDUCTIONS

Mean Annual Load Data Editor

Load Data Type	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
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UPLAND EROSION/RUNOFF			
Row Crops	1516780	5531	723
Hay/Pasture	180779	1634	170
High Density Urban	0	0	0
Low Density Urban	0	15	2
Unpaved Road	81571	249	33
Other	26455	190	13
STREAMBANK EROSION	71926	35	7
GROUNDWATER/SUBSURFACE		18905	271
POINT SOURCE DISCHARGE		0	0
SEPTIC SYSTEMS		306	9
TOTAL	1877512	27756	1887
BASIN AREA	2432 Acres		

Agricultural Land BMP Scenario Editor

Land Use	Acres		BMP1	BMP2	BMP3	BMP4	BMP5	BMP6	BMP7	BMP8
Row Crops	553.5161184	% Existing	0	0	29	29	0	0		71
		% Future	29	29	29	29	0	29		71
Hay/Pasture	657.3003906	% Existing				69	0	0	0	26
		% Future				74	0	42	42	26
Agricultural Land on Slope > 3%			1,097 Acres							
Streams in Agricultural Areas			4.8 Miles							
Total Stream Length			9.1 Miles							
Unpaved Road Length			6.3 Miles							
			Existing	Future						
Stream Miles with Vegetated Buffer Strips			0.0	4.8						
Stream Miles with Fencing			0.0	1.9						
Stream Miles with Stabilization			0.0	2.2						
Unpaved Road Miles w/E & S Controls			0.0	1.8						
			% Existing	% Future						
AWMS (Livestock)			0.0	100.0						
AWMS (Poultry)			0.0	0.0						
Runoff Control			0.0	100.0						
Phytase in Feed			0.0	0.0						

Urban Land BMP Scenario Editor

High Density Urban					
		Acres	553	% Impervious Surface	50
Constructed Wetlands		Bioretention Areas		Detention Basins	
% Existing	0	% Existing	0	% Existing	0
% Future	0	% Future	0	% Future	0
% Drainage Area Used	5	% Drainage Area Used	6	% Drainage Area Used	3
Impervious Acres Drained	0.0	Impervious Acres Drained	0.0	Impervious Acres Drained	0.0
CW Acres Required	0.0	BA Acres Required	0.0	DB Acres Required	0.0

Low Density Urban					
		Acres	27	% Impervious Surface	25
Constructed Wetlands		Bioretention Areas		Detention Basins	
% Existing	0	% Existing	0	% Existing	0
% Future	0	% Future	0	% Future	0
% Drainage Area Used	3	% Drainage Area Used	6	% Drainage Area Used	2
Impervious Acres Drained	0.0	Impervious Acres Drained	0.0	Impervious Acres Drained	0.0
CW Acres Required	0.0	BA Acres Required	0.0	DB Acres Required	0.0

Vegetated Stream Buffers				
			Existing	Future
Stream miles in high density urban areas	0	Stream miles in high density urban areas w/buffers	0	0
		High Density Urban Streambank Stabilization	0	0
Stream miles in low density urban areas	1.677702213	Stream miles in low density urban areas w/buffers	0	2.7
		Low Density Urban Streambank Stabilization	0	0

Septic Systems and Point Source Discharge Scenario Editor

Number of persons on septic systems		Existing	86		
		Future	86		
Spetic systems converted by treatment type %	Secondary	0	Tertiary	0	
	Existing Point Source Load		No		
		Primary	Secondary	Tertiary	
Distribution of pollutant discharge by treatment type %	Existing	0	0	0	
	Future	0	0	0	
		Primary to Secondary	Primary to Tertiary	Secondary to Tertiary	
Distribution of treatment upgrades %		0	0	0	

Rural and Urban BMP Load Reduction Efficiency Editor

BMP Type	Nitrogen	Phosphorus	Sediment	Pathogens
BMP 1	0.29	0.50	0.35	
BMP 2	0.08	0.22	0.30	
BMP 3	0.07	0.10	0.17	
BMP 4	0.05	0.10	0.16	
BMP 5	0.00	0.00	0.16	
BMP 6	0.29	0.44		
BMP 7	0.30	0.30	0.38	
BMP 8	0.95	0.95	0.95	
Vegetated Buffer Strips	0.41	0.40	0.53	0.70
Streambank Fencing	0.56	0.78	0.76	1.00
Streambank Stabilization	0.95	0.95	0.95	
Unpaved Roads (lbs/ft)	0.01	0.0024	1.71	
AWMS (Livestock)	0.75	0.75		0.75
AWMS (Poultry)	0.14	0.14		0.14
Runoff Control	0.15	0.15		0.15
Phytase in Feed		0.21		

Urban BMP Load Reduction Efficiency Editor

BMP Type	Nitrogen	Phosphorus	Sediment	Pathogens
Constructed Wetlands	0.53	0.51	0.88	0.71
Bioretention Areas	0.46	0.61	0.10	0.82
Detention Basins	0.40	0.51	0.93	0.71

Pathogen Loads

Wastewater BMP Load Reduction Efficiency Editor

	Nitrogen	Phosphorus
Conversion of Septic Systems to Secondary Treatment Plant	0.14	0.10
Conversion of Septic Systems to Tertiary Treatment Plant	0.56	0.60
Conversion of Primary Treatment to Secondary Treatment	0.14	0.10
Conversion of Primary Treatment to Tertiary	0.56	0.60

Treatment		
Conversion of Secondary Treatment to Tertiary Treatment	0.42	0.50

BMP Cost Editor

Agricultural Cost Editor

Conservation Tillage (per acre)	\$30.00
Cropland Protection (per acre)	\$25.00
Grazing Land Management (per acre)	\$360.00
Streambank Fencing (per acre)	\$10.00
Streambank Fencing (per mile)	\$15,000.00
Streambank Stabilization (per foot)	\$25.00
Vegetated Buffer Strip (per mile)	\$1,500.01
Terraces and Diversions (per acre)	\$5,000.00
AWMS Livestock (per AEU)	\$1,250.00
AWMS Poultry (per AEU)	\$520.00
Runoff Control (per AEU)	\$300.00
Phytase in Feed (per AEU)	\$2.50
Nutrient Management (per acre)	\$110.00
Ag to Wetland Conversion (per acre)	\$0.00
Unpaved Roads (per foot)	\$5.58
Ag to Forest Conversion (per acre)	\$10.00

Urban Cost Editor

Constructed Wetlands (per acre)	\$13,400.00
Bioretention Areas (per acre)	\$8,000.00
Detention Basins (per acre)	\$10,700.00

Septic System and Point Source Upgrades

Conversion of Septic Systems to Centralized Sewage Treatment (per home)	\$15,000.00
Conversion From Primary to Secondary Sewage	\$250.00

Treatment (per capita)	
Conversion From Primary to Tertiary Sewage Treatment (per capita)	\$300.00
Conversion From Secondary to Tertiary Sewage Treatment (per capita)	\$150.00

Estimated Load Reductions

		Existing (lbs)		
UPLAND EROSION/RUNOFF		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
	Row Crops	1516780	5531	723
	Hay/Pasture	180779	1634	170
	High Density Urban	0	0	0
	Low Density Urban	0	15	2
	Unpaved Roads	81571	249	33
	Other	26455	190	13
STREAMBANK EROSION		71926	35	7
GROUNDWATER/SUBSURFACE			18905	271
POINT SOURCE DISCHARGE			0	0
SEPTIC SYSTEMS			306	9
FARM ANIMALS			891	659
TOTALS		1877512	27756	1887
		Future (lbs)		
LAND EROSION/RUNOFF		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
	Row Crops	578508	2668	299
	Hay/Pasture	151927	1254	121
	High Density Urban	0	0	0
	Low Density Urban	0	9	1
	Unpaved Roads	21847	248	33
	Other	26455	190	13
STREAMBANK EROSION		43664	23	4
GROUNDWATER/SUBSURFACE			16151	250
POINT SOURCE DISCHARGE			0	0
SEPTIC SYSTEMS			306	9
FARM ANIMALS			360	155
TOTALS		822401	21209	886
PERCENT REDUCTIONS		56.2	23.6	53.1
TOTAL SCENARIO COST		\$1,012,490.54		
Ag BMP Cost (%)		15.4		
WW Upgrade Cost (%)		0.0		
Urban BMP Cost (%)		0.0		

Stream Protection Cost (%)	66.0	
Unpaved Road Protection Cost (%)	10.5	
Source	Existing (orgs/month)	Future (orgs/month)
Farm Animals	1.546e+14	4.793e+13
WWTP	0.000e+00	0.000e+00
Septic Systems	0.000e+00	0.000e+00
Urban Areas	6.083e+08	1.825e+08
Wildlife	4.178e+11	4.178e+11
Totals	1.550e+14	4.834e+13
PERCENT REDUCTIONS		68.82
TOTAL SCENARIO COST	\$1,012,490.54	

SUGARCAMP RUN ESTIMATED LOAD REDUCTIONS

Mean Annual Load Data Editor

Load Data Type	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
UPLAND EROSION/RUNOFF			
Row Crops	1305137	4687	758
Hay/Pasture	182984	1537	185
High Density Urban	4409	201	22
Low Density Urban	0	2	0
Unpaved Road	68343	209	33
Other	41888	276	24
STREAMBANK EROSION	114279	57	11
GROUNDWATER/SUBSURFACE		12897	258
POINT SOURCE DISCHARGE		0	0
SEPTIC SYSTEMS		359	7
TOTAL	1717039	20364	1402
BASIN AREA	2775 Acres		

Agricultural Land BMP Scenario Editor

Land Use	Acres		BMP1	BMP2	BMP3	BMP4	BMP5	BMP6	BMP7	BMP8
Row Crops	447.2607921	% Existing	0	0	89	85	0	46		9
		% Future	87	87	89	91	0	55		9
Hay/Pasture	600.4661463	% Existing				21	0	2	0	17

	% Future	25	0	8	12	17
Agricultural Land on Slope > 3%	946 Acres					
Streams in Agricultural Areas	4.5 Miles					
Total Stream Length	11.9 Miles					
Unpaved Road Length	5.3 Miles					
	Existing	Future				
Stream Miles with Vegetated Buffer Strips	0.4	4.5				
Stream Miles with Fencing	0.0	0.8				
Stream Miles with Stabilization	0.0	4.9				
Unpaved Road Miles w/E & S Controls	0.0	0.2				
	% Existing	% Future				
AWMS (Livestock)	0.0	100.0				
AWMS (Poultry)	0.0	0.0				
Runoff Control	0.0	100.0				
Phytase in Feed	0.0	0.0				

Urban Land BMP Scenario Editor

High Density Urban					
	Acres	447	% Impervious Surface	50	
Constructed Wetlands		Bioretention Areas		Detention Basins	
% Existing	0	% Existing	0	% Existing	0
% Future	0	% Future	0	% Future	0
% Drainage Area Used	5	% Drainage Area Used	6	% Drainage Area Used	3
Impervious Acres Drained	0.0	Impervious Acres Drained	0.0	Impervious Acres Drained	0.0
CW Acres Required	0.0	BA Acres Required	0.0	DB Acres Required	0.0

Low Density Urban					
	Acres	4	% Impervious Surface	25	
Constructed Wetlands		Bioretention Areas		Detention Basins	
% Existing	0	% Existing	0	% Existing	0
% Future	0	% Future	0	% Future	0
% Drainage Area Used	3	% Drainage Area Used	6	% Drainage Area Used	2
Impervious Acres Drained	0.0	Impervious Acres Drained	0.0	Impervious Acres Drained	0.0
CW Acres Required	0.0	BA Acres Required	0.0	DB Acres Required	0.0

Vegetated Stream Buffers				
			Existing	Future
Stream miles in high density urban areas	.186411357	Stream miles in high density urban areas w/buffers	0	0
		High Density Urban Streambank Stabilization	0	0

Stream miles in low density urban areas	0	Stream miles in low density urban areas w/buffers	0	0
		Low Density Urban Streambank Stabilization	0	0

Septic Systems and Point Source Discharge Scenario Editor

Number of persons on septic systems		Existing	101		
		Future	101		
Spetic systems converted by treatment type %		Secondary	0	Tertiary	0
		Existing Point Source Load	No		
		Primary	Secondary	Tertiary	
Distribution of pollutant discharge by treatment type %		Existing	0	0	0
		Future	0	0	0
		Primary to Secondary	Primary to Tertiary	Secondary to Tertiary	
Distribution of treatment upgrades %		0	0	0	

Rural and Urban BMP Load Reduction Efficiency Editor

BMP Type	Nitrogen	Phosphorus	Sediment	Pathogen s
BMP 1	0.29	0.50	0.35	
BMP 2	0.08	0.22	0.30	
BMP 3	0.07	0.10	0.17	
BMP 4	0.05	0.10	0.16	
BMP 5	0.00	0.00	0.16	
BMP 6	0.29	0.44		
BMP 7	0.30	0.30	0.38	
BMP 8	0.95	0.95	0.95	
Vegetated Buffer Strips	0.41	0.40	0.53	0.70
Streambank Fencing	0.56	0.78	0.76	1.00
Streambank Stabilizatio	0.95	0.95	0.95	
Unpaved Roads (lbs/ft)	0.01	0.0024	1.71	
AWMS (Livestock)	0.75	0.75		0.75
AWMS (Poultry)	0.14	0.14		0.14
Runoff Control	0.15	0.15		0.15
Phytase in Feed		0.21		

Urban BMP Load Reduction Efficiency Editor

BMP Type	Nitrogen	Phosphorus	Sediment	Pathogens
Constructed Wetlands	0.53	0.51	0.88	0.71

Bioretention Areas	0.46	0.61	0.10	0.82
Detention Basins	0.40	0.51	0.93	0.71

Pathogen Loads
Wastewater BMP Load Reduction Efficiency
Editor

	Nitrogen	Phosphorus
Conversion of Septic Systems to Secondary Treatment Plant	0.14	0.10
Conversion of Septic Systems to Tertiary Treatment Plant	0.56	0.60
Conversion of Primary Treatment to Secondary Treatment	0.14	0.10
Conversion of Primary Treatment to Tertiary Treatment	0.56	0.60
Conversion of Secondary Treatment to Tertiary Treatment	0.42	0.50

BMP Cost Editor

Agricultural Cost Editor	
Conservation Tillage (per acre)	\$30.00
Cropland Protection (per acre)	\$25.00
Grazing Land Management (per acre)	\$360.00
Streambank Fencing (per acre)	\$10.00
Streambank Fencing (per mile)	\$15,000.00
Streambank Stabilization (per foot)	\$25.00
Vegetated Buffer Strip (per mile)	\$1,500.01
Terraces and Diversions (per acre)	\$5,000.00
AWMS Livestock (per AEU)	\$1,250.00
AWMS Poultry (per AEU)	\$520.00
Runoff Control (per AEU)	\$300.00
Phytase in Feed (per AEU)	\$2.50

Nutrient Management (per acre)	\$110.00
Ag to Wetland Conversion (per acre)	\$0.00
Unpaved Roads (per foot)	\$5.58
Ag to Forest Conversion (per acre)	\$10.00

Urban Cost Editor

Constructed Wetlands (per acre)	\$13,400.00
Bioretention Areas (per acre)	\$8,000.00
Detention Basins (per acre)	\$10,700.00

Septic System and Point Source Upgrades

Conversion of Septic Systems to Centralized Sewage Treatment (per home)	\$15,000.00
Conversion From Primary to Secondary Sewage Treatment (per capita)	\$250.00
Conversion From Primary to Tertiary Sewage Treatment (per capita)	\$300.00
Conversion From Secondary to Tertiary Sewage Treatment (per capita)	\$150.00

Estimated Load Reductions

		Existing (lbs)		
		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
UPLAND EROSION/RUNOFF				
	Row Crops	1305137	4687	758
	Hay/Pasture	182984	1537	185
	High Density Urban	4409	201	22
	Low Density Urban	0	2	0
	Unpaved Roads	68343	209	33
	Other	41888	276	24
STREAMBANK EROSION		114279	57	11
GROUNDWATER/SUBSURFACE			12897	258
POINT SOURCE DISCHARGE			0	0
SEPTIC SYSTEMS			359	7
FARM ANIMALS			139	104
TOTALS		1717039	20364	1402
		Future (lbs)		

LAND EROSION/RUNOFF		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
	Row Crops	284797	1922	169
	Hay/Pasture	174640	1456	174
	High Density Urban	4409	201	22
	Low Density Urban	0	2	0
	Unpaved Roads	62192	209	33
	Other	41888	276	24
STREAMBANK EROSION		63464	33	6
GROUNDWATER/SUBSURFACE			12077	255
POINT SOURCE DISCHARGE			0	0
SEPTIC SYSTEMS			359	7
FARM ANIMALS			61	26
TOTALS		631390	16595	717
PERCENT REDUCTIONS		63.2	18.5	48.9
TOTAL SCENARIO COST		\$1,412,026.42		
Ag BMP Cost (%)		4.0		
WW Upgrade Cost (%)		0.0		
Urban BMP Cost (%)		0.0		
Stream Protection Cost (%)		94.4		
Unpaved Road Protection Cost (%)		.8		
Source		Existing (orgs/month)	Future (orgs/month)	
Farm Animals		2.440e+13	9.367e+12	
WWTP		0.000e+00	0.000e+00	
Septic Systems		0.000e+00	0.000e+00	
Urban Areas		1.074e+10	1.074e+10	
Wildlife		5.844e+11	5.844e+11	
Totals		2.499e+13	9.962e+12	
PERCENT REDUCTIONS			60.14	
TOTAL SCENARIO COST		\$1,412,026.42		

MUDLICK RUN ESTIMATED LOAD REDUCTIONS

Mean Annual Load Data Editor

Load Data Type	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
UPLAND EROSION/RUNOFF			
Row Crops	291010	911	104
Hay/Pasture	26455	267	24
High Density Urban	0	0	0

Low Density Urban	0	2	0
Unpaved Road	8818	33	4
Other	13228	112	7
STREAMBANK EROSION	16629	9	0
GROUNDWATER/SUBSURFACE		1687	75
POINT SOURCE DISCHARGE		0	0
SEPTIC SYSTEMS		128	2
TOTAL	356141	3148	216
BASIN AREA	956 Acres		

Agricultural Land BMP Scenario Editor

Land Use	Acres		BMP1	BMP2	BMP3	BMP4	BMP5	BMP6	BMP7	BMP8
Row Crops	93.9000558	% Existing	0	0	0	0	0	0		0
		% Future	100	100	100	100	0	0		0
Hay/Pasture	111.1974345	% Existing				27	0	0	0	64
		% Future				31	0	0	0	64
Agricultural Land on Slope > 3%			185 Acres							
Streams in Agricultural Areas			0.9 Miles							
Total Stream Length			3.9 Miles							
Unpaved Road Length			0.9 Miles							
			Existing	Future						
Stream Miles with Vegetated Buffer Strips			0.0	0.6						
Stream Miles with Fencing			0.0	0.0						
Stream Miles with Stabilization			0.0	0.6						
Unpaved Road Miles w/E & S Controls			0.0	0.0						
			% Existing	% Future						
AWMS (Livestock)			0.0	0.0						
AWMS (Poultry)			0.0	0.0						
Runoff Control			0.0	0.0						
Phytase in Feed			0.0	0.0						

Urban Land BMP Scenario Editor

High Density Urban			
	Acres	93 % Impervious Surface	50
Constructed Wetlands	Bioretention Areas	Detention Basins	

% Existing	0	% Existing	0	% Existing	0
% Future	0	% Future	0	% Future	0
% Drainage Area Used	5	% Drainage Area Used	6	% Drainage Area Used	3
Impervious Acres Drained	0.0	Impervious Acres Drained	0.0	Impervious Acres Drained	0.0
CW Acres Required	0.0	BA Acres Required	0.0	DB Acres Required	0.0

Low Density Urban					
Acres		4		% Impervious Surface	
				25	
Constructed Wetlands		Bioretention Areas		Detention Basins	
% Existing	0	% Existing	0	% Existing	0
% Future	0	% Future	0	% Future	0
% Drainage Area Used	3	% Drainage Area Used	6	% Drainage Area Used	2
Impervious Acres Drained	0.0	Impervious Acres Drained	0.0	Impervious Acres Drained	0.0
CW Acres Required	0.0	BA Acres Required	0.0	DB Acres Required	0.0

Vegetated Stream Buffers				
			Existing	Future
Stream miles in high density urban areas	0	Stream miles in high density urban areas w/buffers	0	0
		High Density Urban Streambank Stabilization	0	0
Stream miles in low density urban areas	.062137119	Stream miles in low density urban areas w/buffers	0	0
		Low Density Urban Streambank Stabilization	0	0

Septic Systems and Point Source Discharge Scenario Editor

Number of persons on septic systems		Existing	36		
		Future	36		
Spetic systems converted by treatment type %		Secondary	0	Tertiary	0
		Existing Point Source Load	No		
			Primary	Secondary	Tertiary
Distribution of pollutant discharge by treatment type %	Existing	0	0	0	
	Future	0	0	0	
			Primary to Secondary	Primary to Tertiary	Secondary to Tertiary
Distribution of treatment upgrades %			0	0	0

Rural and Urban BMP Load Reduction Efficiency Editor

BMP Type	Nitrogen	Phosphorus	Sediment	Pathogen s
BMP 1	0.29	0.50	0.35	
BMP 2	0.08	0.22	0.30	

BMP 3	0.07	0.10	0.17	
BMP 4	0.05	0.10	0.16	
BMP 5	0.00	0.00	0.16	
BMP 6	0.29	0.44		
BMP 7	0.30	0.30	0.38	
BMP 8	0.95	0.95	0.95	
Vegetated Buffer Strips	0.41	0.40	0.53	0.70
Streambank Fencing	0.56	0.78	0.76	1.00
Streambank Stabilizatio	0.95	0.95	0.95	
Unpaved Roads (lbs/ft)	0.01	0.0024	1.71	
AWMS (Livestock)	0.75	0.75		0.75
AWMS (Poultry)	0.14	0.14		0.14
Runoff Control	0.15	0.15		0.15
Phytase in Feed		0.21		

Urban BMP Load Reduction Efficiency Editor

BMP Type	Nitrogen	Phosphorus	Sediment	Pathogens
Constructed Wetlands	0.53	0.51	0.88	0.71
Bioretention Areas	0.46	0.61	0.10	0.82
Detention Basins	0.40	0.51	0.93	0.71

Pathogen Loads

Wastewater BMP Load Reduction Efficiency Editor

	Nitrogen	Phosphorus
Conversion of Septic Systems to Secondary Treatment Plant	0.14	0.10
Conversion of Septic Systems to Tertiary Treatment Plant	0.56	0.60
Conversion of Primary Treatment to Secondary Treatment	0.14	0.10
Conversion of Primary Treatment to Tertiary Treatment	0.56	0.60
Conversion of Secondary Treatment to Tertiary Treatment	0.42	0.50

BMP Cost Editor

Agricultural Cost Editor

Conservation Tillage (per acre)	\$30.00
Cropland Protection (per acre)	\$25.00
Grazing Land Management (per acre)	\$360.00
Streambank Fencing (per acre)	\$10.00
Streambank Fencing (per mile)	\$15,000.00
Streambank Stabilization (per foot)	\$25.00
Vegetated Buffer Strip (per mile)	\$1,500.01
Terraces and Diversions (per acre)	\$5,000.00
AWMS Livestock (per AEU)	\$1,250.00
AWMS Poultry (per AEU)	\$520.00
Runoff Control (per AEU)	\$300.00
Phytase in Feed (per AEU)	\$2.50
Nutrient Management (per acre)	\$110.00
Ag to Wetland Conversion (per acre)	\$0.00
Unpaved Roads (per foot)	\$5.58
Ag to Forest Conversion (per acre)	\$10.00

Urban Cost Editor

Constructed Wetlands (per acre)	\$13,400.00
Bioretention Areas (per acre)	\$8,000.00
Detention Basins (per acre)	\$10,700.00

Septic System and Point Source Upgrades

Conversion of Septic Systems to Centralized Sewage Treatment (per home)	\$15,000.00
Conversion From Primary to Secondary Sewage Treatment (per capita)	\$250.00
Conversion From Primary to Tertiary Sewage Treatment (per capita)	\$300.00
Conversion From Secondary to Tertiary Sewage Treatment (per capita)	\$150.00

Estimated Load Reductions

		Existing (lbs)		
UPLAND EROSION/RUNOFF		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
	Row Crops	291010	911	104
	Hay/Pasture	26455	267	24
	High Density Urban	0	0	0
	Low Density Urban	0	2	0
	Unpaved Roads	8818	33	4
	Other	13228	112	7
STREAMBANK EROSION		16629	9	0
GROUNDWATER/SUBSURFACE			1687	75
POINT SOURCE DISCHARGE			0	0
SEPTIC SYSTEMS			128	2
FARM ANIMALS			0	0
TOTALS		356141	3148	216
		Future (lbs)		
LAND EROSION/RUNOFF		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
	Row Crops	14551	337	6
	Hay/Pasture	26455	267	24
	High Density Urban	0	0	0
	Low Density Urban	0	2	0
	Unpaved Roads	8818	33	4
	Other	13228	112	7
STREAMBANK EROSION		14081	7	0
GROUNDWATER/SUBSURFACE			1663	75
POINT SOURCE DISCHARGE			0	0
SEPTIC SYSTEMS			128	2
FARM ANIMALS			0	0
TOTALS		77134	2550	119
PERCENT REDUCTIONS		78.3	19.0	45.2
TOTAL SCENARIO COST		\$172,946.66		
Ag BMP Cost (%)		4.1		
WW Upgrade Cost (%)		0.0		
Urban BMP Cost (%)		0.0		
Stream Protection Cost (%)		95.9		
Unpaved Road Protection Cost (%)		0		
Source		Existing (orgs/month)	Future (orgs/month)	
Farm Animals		0.000e+00	0.000e+00	
WWTP		0.000e+00	0.000e+00	

Septic Systems	0.000e+00	0.000e+00
Urban Areas	5.113e+07	5.113e+07
Wildlife	2.644e+11	2.644e+11
Totals	2.645e+11	2.645e+11
PERCENT REDUCTIONS		0.00
TOTAL SCENARIO COST	\$172,946.66	