5. Interim Milestones to Track Implementation of Management Measures

Interim milestones to track implementation of management measures are described in this section. Documentation of Best Management Practices (BMP's) already implemented or planned in the watershed and assessment their effectiveness is provided. Designated and mapped target areas for additional controls are shown. Selected appropriate BMPs based on nature and magnitude of the pollutant, nature and location of the source, engineering feasibility, and cost effectiveness are given. Finally, model performance of selected BMPs to estimate operational efficiencies, load reductions achieved, maintenance requirements, etc. are presented.

5.1. Documented Best Management Practices (BMPs) already implemented or planned in the watershed and assessment of their effectiveness

Documented agricultural and stream restoration Best Management Practices (BMPs) already implemented and planned in the watershed are listed in tables 5-1 and 5-2, respectively. The source of these data is Pennsylvania's Chesapeake Bay Program's Implementation Strategy. These BMPs include agricultural and nonagricultural practices implemented between 1985 and 2005, and planned from 2006 to 2010.

The York County Conservation District and Natural Resource Conservation Service design and implement BMPs that meet T = ≤4.0 tons/acre per year.

Stream restoration efficiencies have been documented, based on stream bank and channel erosion rates in the East and South Branches of Codorus Creek, between 0.45 and 0.50 tons per foot of streambank per year. A conservative average soil loss value of 0.40 tons (800 pounds) per foot of streambank per year was used to estimate pounds of sediment loading to streams reduced. Effectiveness of stream restoration efforts was determined to be 99.7 percent based on a stream restoration efficiency 2.55 lbs/ft from the Chesapeake Bay Program.

Implemented and planned stream restoration projects in the East and South Branches listed in table 5-2 were previously shown in figures 2-13 and 2-14, respectively.

Table 5-1. Agricultural Best Management Practices Implemented (1985-2005) and Planned (2006-2010) in Codorus Creek Watershed.

Best Management Practice	Units	Implemented CBP	Implemented CBP	CBP Tributary Strategy Targets	Codorus WIP 319 Projects Planned
		1985-2002[1]	2002-2005[1]	2010[1]	2006-2010
Animal Waste Systems	AEU	4001	0	3059	0
C Sequestration	acres	0	0	9160	9160
Conservation Plans	acres	15633	566	56540	40907
Conservation Tillage	acres	28062	0	33513	5451
E&S Control	acres	672	0	533	0
Forest Buffers	acres	71	0	1747	1676
Grass Buffers	acres	5	0	1505	1500
Horse Pasture Management	acres	0	0	4939	4939
Land Retirement	acres	648	0	8947	8299
Precision Ag	acres	0	0	28683	28683
Non-Urban Stream Restoration	feet	0	0	9982	9982
No-till	acres	0	0	16083	16083
Nutrient Management Plans	acres	17755	0	9940	0
Off Stream Watering & Fencing	acres	170	0	3989	3819
Off Stream Watering w/o Fencing	acres	37	0	2393	2356
Precision Rotational Grazing	acres	0	0	957	957
Rotational Grazing	acres	124	13	638	514
Septic Denitrification	EDU	0	0	8442	8442
Street Sweeping	miles	0	0	619	619
SWM Filtration	acres	0	0	4936	4936
SWM Infiltration	acres	0	0	4936	4936
SWM Wet Ponds/Wetlands	acres	0	0	4936	4936
Tree Planting	acres	272	0	274	2
Urban Growth Reduction	acres	0	0	114	114
Urban Nutrient Management	acres	0	0	9713	9713
Wetland Restoration	acres	10	0	97	87
Yield Reserve	acres	0	0	9940	9940

Note: 1. Source DEP Chesapeake Bay Program 1985-2002. Extrapolated to Codorus Creek Watershed

Table 5-2. Stream Restoration Best Management Practices Implemented (1995-2005) and Planned (2006-2010) in Codorus Creek Watershed

Year	Best Management Practices	Linear Feet	Stream	Status	Pounds Sediment Reduced	Documentation
1994	Habitat improvement	1,000	EBCC	Implemented	NA	319 Program
1999	Stream stabilization & riparian forest buffer planting	2,600	SBCC	Implemented	2,080,000	Growing Greener
2000	Stream stabilization & riparian forest buffer planting	400	EBCC	Implemented	320,000	Growing Greener
2000	Stream stabilization & riparian forest buffer planting	2,100	SBCC	Implemented	1,680,000	Growing Greener
2001	Stream stabilization & riparian forest buffer planting	650	EBCC	Implemented	520,000	Growing Greener
2001	Stream stabilization & riparian forest buffer planting	11,000	Seaks Run EBCC	Implemented	8,800,000	319 Program
2001	Stream stabilization & riparian forest buffer planting	4,500	SBCC	Implemented	3,600,000	319 Program
2003	Stream stabilization & riparian forest buffer planting	4,300	EBCC	Implemented	3,440,000	319 Program
2003	Stream stabilization & riparian forest buffer planting	14,000	SBCC	Planned	11,200,000	319 Program
2003	Stream stabilization & riparian forest buffer planting	3,400	Oil Creek	Planned	2,720,000	319 Program
2004	Stream stabilization & riparian forest buffer planting	4,000	SBCC	Planned	3,200,000	319 Program
2004	Stream stabilization & riparian forest buffer planting	4,000	EBCC	Planned	3,200,000	319 Program
2005	Stream stabilization & riparian forest buffer planting	2,300	Pierceville Run SBCC	Implemented	1,840,000	319 Program
2005	Stream stabilization & riparian forest buffer planting	3,300	EBCC	Planned	2,640,000	319 Program
2005	Streambank rehabilitation and protection	150	Mill Creek CC	Implemented	120,000	HELP-Streams
2006	Stream stabilization & riparian forest buffer planting	2,200	EBCC	Planned	1,760,000	319 Program
2006	Stream stabilization & riparian forest buffer planting	3,350	EBCC	Planned	2,680,000	319 Program
2006	Stream stabilization & riparian forest buffer planting	2,270	Pierceville Run SBCC	Planned	1,816,000	319 Program
2006	Streambank rehabilitation and protection	300	Mill Creek CC	Implemented	240,000	HELP-Streams
2007	Stream stabilization & riparian forest buffer planting	2,000	UNT EBCC	Planned	1,600,000	319 Program
2007	Stream stabilization & riparian forest buffer planting	1,500	Mill Creek CC	Planned	1,200,000	319 Program
2007	Stream stabilization & riparian forest buffer planting	3,500	Poorhouse Run CC	Planned	2,800,000	319 Program
2007	Stream stabilization & riparian forest buffer planting	6,000	EBCC	Planned	4,800,000	319 Program
2007	Stream stabilization & riparian forest buffer planting	3,250	EBCC	Planned	2,600,000	319 Program
2007	Stream stabilization & riparian forest buffer planting	8,400	DVT EBCC	Planned	6,720,000	319 Program
2007	Stream stabilization & riparian forest buffer planting	2,400	SBCC	Planned	1,920,000	319 Program
2007	Stream stabilization & riparian forest buffer planting	1,900	SBCC	Planned	1,520,000	319 Program
2007	Stream stabilization	500	Mill Creek CC	Planned	400,000	Growing Greener II
2007	Stream stabilization	1,500	Mill Creek CC	Planned	1,200,000	Growing Greener II
2007	Stream stabilization & riparian forest buffer planting	5,000	Pieceville Run SBCC	Planned	4,000,000	319 Program
2007	Stream stabilization & riparian forest buffer planting	2,000	Hollow Trib EBCC	Planned	1,600,000	319 Program
2008	Stream stabilization & riparian forest buffer planting	3,400	SBCC	Planned	2,720,000	319 Program
2008	Stream stabilization	1,600	SBCC	Planned	1,280,000	Private
	TOTAL	108,770			86,216,000	

5.2. Designate and Map Target Areas for Additional Controls

Designated and mapped target areas for additional controls are described in the section and were previously shown in figure 5-1. Opportunities for stream restoration are fairly uniformly distributed across the watershed. The West Branch has the most opportunities and East Branch the least.

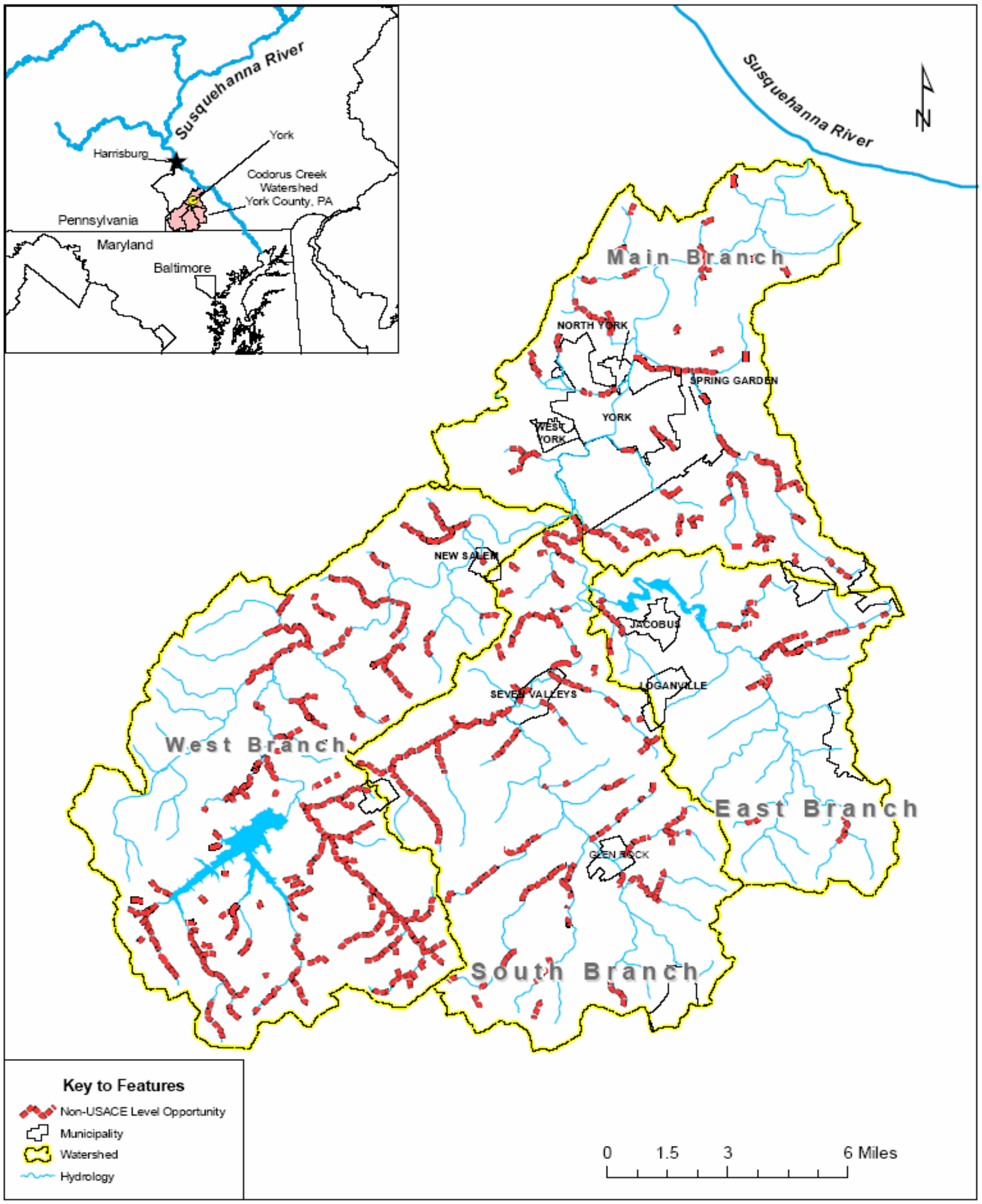

Figure 5-1. Stream Restoration Opportunities in Codorus Creek Watershed

5.3. Selected BMPs for designated and mapped areas targeted for additional controls

Appropriate BMPs for designated and mapped targeted areas listed in table 5-3 and shown in Figure 5-1. These BMPs were evaluated and selected based on nature and magnitude of the pollutant, nature and location of the source, engineering feasibility, cost effectiveness of each BMP, individually and separately. Additionally, they were used to model restoration effectiveness using PRedICT. They include both agricultural and nonagricultural BMPs. These nonpoint source pollutant Best Management Practices that have been Peer-Reviewed and CBP-Approved for Phase 5.0 of the Chesapeake Bay Program Watershed Model (Revised 1/12/06) are included in the appendices.

Table 5-3. Selected Agricultural BMPs for designated and mapped areas targeted for additional controls.

Best Management Practice	Units	Implemented CBP	Implemented CBP	CBP Tributary Strategy Targets	Codorus WIP 319 Projects Planned
		1985-2002[1]	2002-2005[1]	2010[1]	2006-2010
Animal Waste Systems	AEU	4001	0	3059	0
C Sequestration	acres	0	0	9160	9160
Conservation Plans	acres	15633	566	56540	40907
Conservation Tillage	acres	28062	0	33513	5451
E&S Control	acres	672	0	533	0
Forest Buffers	acres	71	0	1747	1676
Grass Buffers	acres	5	0	1505	1500
Horse Pasture Management	acres	0	0	4939	4939
Land Retirement	acres	648	0	8947	8299
Precision Ag	acres	0	0	28683	28683
Non-Urban Stream Restoration	feet	0	0	9982	9982
No-till	acres	0	0	16083	16083
Nutrient Management Plans	acres	17755	0	9940	0
Off Stream Watering & Fencing	acres	170	0	3989	3819
Off Stream Watering w/o Fencing	acres	37	0	2393	2356
Precision Rotational Grazing	acres	0	0	957	957
Rotational Grazing	acres	124	13	638	514
Septic Denitrification	EDU	0	0	8442	8442
Street Sweeping	miles	0	0	619	619
SWM Filtration	acres	0	0	4936	4936
SWM Infiltration	acres	0	0	4936	4936
SWM Wet Ponds/Wetlands	acres	0	0	4936	4936
Tree Planting	acres	272	0	274	2
Urban Growth Reduction	acres	0	0	114	114
Urban Nutrient Management	acres	0	0	9713	9713
Wetland Restoration	acres	10	0	97	87
Yield Reserve	acres	0	0	9940	9940

5.4. Model performance of selected BMP's to estimate operational efficiencies, load reductions achieved, maintenance requirements, etc.

Modeling performance of selected BMPs to estimate operational efficiencies, load reductions achieved, and maintenance requirements was performed by the Pennsylvania Department of Environmental Protection's Bureau of Watershed Management. The Department used the Pollution Reduction Impact Comparison Tool (PRedICT) developed by Penn State University. A companion software tool for use with the ArcView Generalized Loading Function (AVGWLF), PRedICT has been developed for evaluating the implementation of both agricultural and non-agricultural pollution reduction strategies at the watershed level. PRedICT allows the user to create various "scenarios" in which current land uses and pollutant loads (both point and non-point) can be compared against "future" conditions that reflect the use of different pollution reduction strategies, such as agricultural and urban BMPs, the conversion of septic systems to centralized wastewater treatment, and upgrading of treatment plants from primary to secondary to tertiary. This tool includes pollutant reduction coefficients for nitrogen, phosphorus and sediment, and also has built-in cost information for an assortment of pollution mitigation techniques. Two different cost-accounting approaches are used in the present version to help a user identify the most efficient reduction strategy in terms of both pollution reduction and cost. While information for PRedICT can be compiled manually, the most efficient way to accomplish this task is to use the AVGWLF watershed modeling system. Among others things, this tool automatically creates a scenario file that can be used as input to PRedICT. This input file contains useful information on watershed conditions and pollutant loads that can serve as the "initial" conditions from which future scenarios can be developed.

5.4.1. PRedICT Model Inputs

Table 5-4 lists conditions assessed and categorized, units, and sources of data PRedICT uses to calculate load reductions in a watershed. The existing input file for the first run is taken from the AVGWLF model used to develop TMDLs.

Table 5-4. *PRedICT* Model Data Fields

Conditions Assessed and Categorized	Units	Sources of Data
1. Crop residue management & cover crop	acres (ac)	Chesapeake Bay Program
2. Strip cropping/contour farming	ac	Chesapeake Bay Program
3. Crop rotation and cover crops	ac	Chesapeake Bay Program
4. Crop rotation, residue management & strip cropping/contour farming	ac	Chesapeake Bay Program
5. Terraces & diversions on Ag-land	ac	Chesapeake Bay Program
6. Nutrient management	ac	Chesapeake Bay Program
7. Grazing land management	ac	Chesapeake Bay Program
8. User defined BMPs	ac	Growing Greener Assessments
9. Stream miles w/vegetated buffer strips	mi	Growing Greener Assessments
10. Stream miles with fencing	mi	Growing Greener Assessments
11. Stream miles with bank stabilization	mi	Growing Greener Assessments
12. Constructed wetlands in high density urban areas	ac	Growing Greener Assessments
13. Detention basins in high density urban areas	ac	Growing Greener Assessments
14. Detention basins in high density urban areas	qty	Growing Greener Assessments
15. Peak flow	In/hr	Defined by the model
16. Drainage area/wetland area	ac	Defined by the model
17. Settling velocity		Defined by the model
18. Constructed wetlands in low density areas	ac	Defined by the model
19. Detention basins in low density urban areas	Ac	Defined by the model
20. Detention basins in low density urban areas	qty	Defined by the model
21. Streams in high density urban areas with buffers	mi	Growing Greener Assessments
22. Streams in low density urban areas with buffers	mi	Growing Greener Assessments
23. Number of persons on septic systems (normal & failing)	qty	Act 537 Municipal Sewerage Plans
24. Number of persons on public sewer	qty	Act 537 Municipal Sewerage Plans
25. Septic systems converted by treatment type (secondary & tertiary)	qty	Act 537 Municipal Sewerage Plans
26. Distribution of pollutant discharges by treatment type (primary, secondary & tertiary)	qty	Act 537 Municipal Sewerage Plans
27. Distribution of treatment upgrades: Primary to secondary; Primary to tertiary; Secondary to tertiary	%	Act 537 Municipal Sewerage Plans
28. Hay/pasture area as defined for land coverage imagery	ac	Defined by model based on GIS
29. Total row crop area as defined by land cover imagery	ac	Defined by model based on GIS
30. Ag-land on slopes >3% defined through GIS	ac	Defined by model based on GIS
31. Streams in ag-areas defined by GIS	qty	Defined by model based on GIS
32. Total stream length defined by GIS	mi	Defined by model based on GIS
33. Streams in high density urban areas defined by GIS	Mi?	Defined by model based on GIS
34. Streams in low density urban areas defined by GIS	mi	Defined by model based on GIS

5.4.2. PRedICT Model Limitations

There are several flaws or limitations are in the PRedICT model that could have far reaching consequences for this plan. Because of the vast amount of agricultural BMPs that are out there not the entire are listed in the model or results. This is for a number of reasons, the BMP is not used enough, no efficiency values for the BMP are available, the BMP is locally specific and not really needed in a general model, etc. DEP ran into this problem with agricultural waste systems, facilities, and barnyard control BMPs. All of these BMPs are vital for controlling nutrients in a watershed but they are not represented in the model thus there is no place to include there value. Also, these nutrient reduction BMPs have been conservation practices the Conservation District and Natural Resource Conservation Service have really promoted because of all the excess nutrients from concentrated animal operations, in York County. Waste systems, facilities, and barnyard controls have really been embraced by the agricultural community because it not only controls nutrients on their operations but also frees up valuable time for the farmer instead of spreading manure every day. Although in the grand scheme of BMPs these practices might not seem vital compared to conventional cropland BMPs nutrient management in a small watershed like the Codorus Creek is important.

The two TMDLs in the Codorus Creek Watershed are not accurate representations of current or future conditions. While preparing this plan significant flaws were encountered in the TMDL process. For instance, in the South Branch Codorus Creek TMDL stream bank erosion was not considered as a significant source of sediment and phosphorus impairment to the watershed, when in essence a vast majority of the issues in the watershed stem from this area. As discussed earlier, in the Piedmont area of Pennsylvania where rich alluvial soil is easily moved from one point to another, legacy sediment contained behind old historic milldams is a major source of impairment. To not include this in a TMDL is saying it does not exist when in reality it should be one of the main components of the TMDL.

Certain BMP assumptions were included in the PRedICT model that might be difficult to attain, e.g. precision agriculture. These assumptions were needed to meet the goals in the TMDL. Every effort will be made to attain these BMP assumptions, but because of the sheer volume of farms in the watershed and the amount of outreach that is needed for some of the TMDL requirements, achievability will be challenging.

5.5 PRedICT Model Results

Three PRedICT model runs were used for this plan, one each for the South Branch Codorus Creek subbasins 1 and 2 and one for Oil Creek.

A total of eight model scenarios were used, and they are:

1) TMDL implementation of Ag-BMPs
2) TMDL implementation of Ag-BMPs plus Stream Restoration BMPs, and

3) Non-TMDL implementation of Ag-BMPs or Stream Restoration BMPs in those areas of the watershed not covered by the three TMDLs.

PRedICT model run inputs for the South Branch Codorus Creek and Oil Creek and their respective implementation scenarios are summarized in table 5-5 and 5-6. The results of model runs for all South Branch and Oil Creek scenarios, both in TMDL and Non-TMDL area, are given tables 5-7 through 5-14.

In all South Branch Codorus Creek model runs, for both subbasins 1 and 2, both sediment and phosphorus load reductions were met or exceeded for TMDL implementation scenarios 1 and 2, with one exception. The phosphorus load reduction was not achieved in subbasin 2, which is the upstream basin and considered the prime source of sediment and phosphorus impacting subbasin 1 downstream. This is due, at least in part, to the fact that the TMDL grossly underestimates actual phosphorus loading to Subbasin 2 from a point source discharge. Prepared in the fall of 2002, the TMDL assumes an NPDES permit limit of 4,562.5 pounds of total phosphorus load per year for the New Freedom wastewater treatment plant. Due to significant facility expansion since that time, however, the current permit limit is actually 13,687.5 pounds per day of total phosphorus, making the TMDL waste load allocation for that facility unrealistically low.

In Oil Creek model runs all three model scenario runs for TMDL implementation achieved the sediment reduction loadings.

Table 5-5. PRedICT Model Scenario Inputs for Ag-BMP Implementation in the Codorus Creek Watershed

BMP	Category	Units	Watershed Complete	Watershed Planned	Complete Oil TMDL	Complete Oil Creek Non-TMDL	Complete S B 1	Complete S B 2	Complete Codorus Non-TMDL	Future Oil TMDL	Future Oil Non	Future S B 1	Future S B 2	Future Codorus Non
Land Retirement	Ag to Forest	Acres	0	8947	0	0	0	0	0	179	805	2147	1968	3937
Wetland Restoration	Ag to Wetland	Acres	0	97	0	0	0	0	0	2	9	22	21	44
Off Stream Watering w Fencing	Buffers	Acres	0	3989	0	0	0	0	0	40	359	917	917	1795
Conservation Tillage	Conservation Tillage	Acres	0	33513	0	0	0	0	0	670	3016	7708	7373	15081
No Till	Conservation Tillage	Acres	0	16083	0	0	0	0	0	322	1447	4342	3538	7237
Pasture Mgt.	Graze Land Mgt.	Acres	0	4939	0	0	0	0	0	49	445	1185	1136	2124
Rotational Grazing	Graze Land Mgt.	Acres	13	625	0	1	4	2	6	6	56	150	144	275
Precision Ag	Nutrient Mgt	Acres	0	28683	0	0	0	0	0	574	2581	6597	6310	12907
Nutrient Mgt.	Nutrient Mgt	Acres	0	9940	0	0	0	0	0	99	895	2286	2187	4374
Urban Nutrient Mgt.	Nutrient Mgt	Acres	0	9713	0	0	0	0	0	291	0	97	680	8645
Non Urb Stream Restoration	Streambank	Feet	0	9982	0	0	0	0	0	200	898	2296	2196	4492
Forest Buffers	Veg Buffers	Acres	0	1747	0	0	0	0	0	35	157	402	384	786
Grass Buffers	Veg Buffers	Acres	0	1505	0	0	0	0	0	30	135	346	331	677
Conservation Plans		Acres	566	55974	11	51	153	96	255	1119	5038	12874	18471	24629
Off Stream Watering w/o Fencing		Acres	0	2393	0	0	0	0	0	48	215	550	526	1077
SWM Filtration Hi Int		Acres	0	4936	0	0	0	0	0	148	0	0	49	4739
SWM Filtration Lo Int		Acres	0	4936	0	0	0	0	0	444	99	49	346	3998
SWM Infiltration Hi Int			0	4936	0	0	0	0	0	148	0	0	49	4739
SWM Infiltration Lo Int		Acres	0	4936	0	0	0	0	0	444	99	49	346	3998
SWM Wet Ponds/Wetlands Lo		Acres	0	4936	0	0	0	0	0	444	99	49	346	3998
SWM Wet Ponds/Wetlands Hi		Acres	0	4936	0	0	0	0	0	148	0	0	49	4739

Table 5-6. PRedICT Model Scenario Inputs for Stream Restoration BMP Implementation in the Codorus Creek Watershed

Project	Notes	FGM (feet)	Load Reductions							Timeframe
			Sed - Tons	Sed - pounds	Soil/p	Soil/n	P	N	Shed	
ebcc26 Myers	as built-est	650	145	289,840	0.00085	0.003	246	870	Codorus - Non	Current
ebcc III, I	estimate	1,230	200	400,000	0.00085	0.003	340	1,200	Codorus - Non	Future
ebcc III, II	as built	640	115	230,000	0.00085	0.003	196	690	Codorus - Non	Current
ebcc III, III	as built	2,220	213	426,000	0.00085	0.003	362	1,278	Codorus - Non	Current
ebcc IV	monitored	4,400	981	1,962,000	0.00085	0.003	1,668	5,886	Codorus - Non	Current
ebcc V	estimate	2,000	445	890,000	0.00085	0.003	757	2,670	Codorus - Non	Future
ebcc Hollow Trib	estimate	3,800	100	200,000	0.00085	0.003	170	600	Codorus - Non	Future
Codorus Non TMDL				**4,397,840**			**3,738**	**13,194**		
Oil Creek TMDL	estimate	3,000	6,948	**13,895,968**	0.000827	0.003	**11,492**	**41,688**	Oil TMDL	Future
sbcc27 Hanover Junction	estimate	150	25	50,000	0.000908	0.003	45	150	Sub1 TMDL	Future
sbcc McClelland	estimate	2,271	700	1,400,000	0.000908	0.003	1,271	4,200	Sub1 TMDL	Future
sbcc Granary Road	as-built	1,830	4,238	8,476,540	0.000908	0.003	7,697	25,430	Sub1 TMDL	Current
sbcc IV	estimate	11,395	26,391	52,781,520	0.000908	0.003	47,926	158,345	Sub1 TMDL	Future
sbcc V	estimate	3,300	7,643	15,285,564	0.000908	0.003	13,879	45,857	Sub1 TMDL	Future
South Branch Sub 1 TMDL				**77,993,624**			**70,818**	**233,981**		
sbcc16 Koski	as-built	1,000	600	1,200,000	0.000845	0.003	1,014	3,600	Sub2 TMDL	Current
sbcc Dise	estimate	1,550	550	1,100,000	0.000845	0.003	930	3,300	Sub2 TMDL	Future
South Branch Sub 2 TMDL				**2,300,000**		0.003	**1,944**	**6,900**		

Table 5-7. PRedICT Load Reductions for Ag-BMPs Implemented in SBCC-1 TMDL Area

Estimated Load Reductions				
		Existing (lbs)		
UPLAND EROSION/RUNOFF		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
	Row Crops	27868000	124616	26185
	Hay/Pasture	849600	4974	831
	High Density Urban	0	0	0
	Low Density Urban	1600	3	1
	Unpaved Roads	38000	815	39
	Other	87600	35240	79
STREAMBANK EROSION		296994	160	135
GROUNDWATER/SUBSURFACE			245864	4724
POINT SOURCE DISCHARGE			52911	1754
SEPTIC SYSTEMS			405	105
TOTALS		29141794	464988	33853
		Future (lbs)		
LAND EROSION/RUNOFF		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
	Row Crops	4316642	21498	7477
	Hay/Pasture	739152	2835	548
	High Density Urban	0	0	0
	Low Density Urban	1139	3	1
	Unpaved Roads	38000	815	39
	Other	87600	35240	79
STREAMBANK EROSION		162250	107	72
GROUNDWATER/SUBSURFACE			245294	4696
POINT SOURCE DISCHARGE			52911	1754
SEPTIC SYSTEMS			405	105
TOTALS		5306782	358292	14732
PERCENT REDUCTIONS		81.8	23.0	56.5
TOTAL SCENARIO COST		$7,557,687.00		
Ag BMP Cost (%)		82.8		
WW Upgrade Cost (%)		0.0		
Urban BMP Cost (%)		1.7		
Stream Protection Cost (%)		15.5		
Unpaved Road Protection Cost (%)		0		

Table 5-8. PRedICT Load Reductions for Ag Plus Stream Restoration BMPs Implemented in SBCC-1 TMDL Area

Estimated Load Reductions				
		Existing (lbs)		
UPLAND EROSION/RUNOFF		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
	Row Crops	27868000	124616	26185
	Hay/Pasture	849600	4974	831
	High Density Urban	0	0	0
	Low Density Urban	1600	3	1
	Unpaved Roads	38000	815	39
	Other	87600	35240	79
STREAMBANK EROSION		296994	160	135
GROUNDWATER/SUBSURFACE			245864	4724
POINT SOURCE DISCHARGE			52911	1754
SEPTIC SYSTEMS			405	105
TOTALS		29141794	464988	33853
		Future (lbs)		
LAND EROSION/RUNOFF		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
	Row Crops	4316642	21498	7477
	Hay/Pasture	739152	2835	548
	High Density Urban	0	0	0
	Low Density Urban	1139	3	1
	Unpaved Roads	38000	815	39
	Other	87600	35240	79
STREAMBANK EROSION		159871	105	71
GROUNDWATER/SUBSURFACE			245294	4696
POINT SOURCE DISCHARGE			52911	1754
SEPTIC SYSTEMS			405	105
TOTALS		5304403	358290	14731
PERCENT REDUCTIONS		81.8	23.0	56.5
TOTAL SCENARIO COST		$8,349,687.00		
Ag BMP Cost (%)		75.0		
WW Upgrade Cost (%)		0.0		
Urban BMP Cost (%)		1.6		
Stream Protection Cost (%)		23.5		
Unpaved Road Protection Cost (%)		0		

Table 5-9. PRedICT Load Reductions for Ag-BMPs Implemented in SBCC-2 TMDL Area

Estimated Load Reductions				
		Existing (lbs)		
UPLAND EROSION/RUNOFF		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
	Row Crops	16936800	89953	486
	Hay/Pasture	532400	4009	15299
	High Density Urban	1200	15	0
	Low Density Urban	12200	70	455
	Unpaved Roads	6400	119	7
	Other	68000	27446	60
STREAMBANK EROSION		196092	123	86
GROUNDWATER/SUBSURFACE			170319	3220
POINT SOURCE DISCHARGE			162529	5032
SEPTIC SYSTEMS			255	79
TOTALS		17753092	454839	24724
		Future (lbs)		
LAND EROSION/RUNOFF		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
	Row Crops	2162491	13277	119
	Hay/Pasture	510252	2150	11573
	High Density Urban	731	12	0
	Low Density Urban	6073	55	330
	Unpaved Roads	6400	119	7
	Other	68000	27446	60
STREAMBANK EROSION		112357	84	48
GROUNDWATER/SUBSURFACE			169830	3126
POINT SOURCE DISCHARGE			162529	5032
SEPTIC SYSTEMS			255	79
TOTALS		2859904	375639	20366
PERCENT REDUCTIONS		83.9	17.4	17.6
TOTAL SCENARIO COST		$13,399,448.20		
Ag BMP Cost (%)		84.3		
WW Upgrade Cost (%)		0.0		
Urban BMP Cost (%)		8.9		
Stream Protection Cost (%)		6.8		
Unpaved Road Protection Cost (%)		0		

Table 5-10. PRedICT Load Reductions for Ag Plus Stream Restoration BMPs Implemented in SBCC-2 TMDL Area

Estimated Load Reductions			
	Existing (lbs)		
UPLAND EROSION/RUNOFF	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
Row Crops	16936800	89953	486
Hay/Pasture	532400	4009	15299
High Density Urban	1200	15	0
Low Density Urban	12200	70	455
Unpaved Roads	6400	119	7
Other	68000	27446	60
STREAMBANK EROSION	196092	123	86
GROUNDWATER/SUBSURFACE		170319	3220
POINT SOURCE DISCHARGE		162529	5032
SEPTIC SYSTEMS		255	79
TOTALS	17753092	454838	24724
	Future (lbs)		
LAND EROSION/RUNOFF	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
Row Crops	2162491	13277	119
Hay/Pasture	510252	2150	11573
High Density Urban	731	12	0
Low Density Urban	6073	55	330
Unpaved Roads	6400	119	7
Other	68000	27446	60
STREAMBANK EROSION	98754	76	42
GROUNDWATER/SUBSURFACE		169830	3126
POINT SOURCE DISCHARGE		162529	5032
SEPTIC SYSTEMS		255	79
TOTALS	2846301	375630	20360
PERCENT REDUCTIONS	84.0	17.4	17.7
TOTAL SCENARIO COST	$14,545,048.20		
Ag BMP Cost (%)	77.6		
WW Upgrade Cost (%)	0.0		
Urban BMP Cost (%)	9.5		
Stream Protection Cost (%)	12.8		
Unpaved Road Protection Cost (%)	0		

Table 5-11. PRedICT Load Reductions for Ag Plus Stream Restoration BMPs Implemented in Non-TMDL Area

Estimated Load Reductions				
		Existing (lbs)		
UPLAND EROSION/RUNOFF		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
	Row Crops	27399241	114391	16157
	Hay/Pasture	7647151	27102	4220
	High Density Urban	137465	101611	11067
	Low Density Urban	768730	14066	2344
	Unpaved Roads	25	96	14
	Other	3526622	13248	2028
STREAMBANK EROSION		38048941	1902	837
GROUNDWATER/SUBSURFACE			360379	4385
POINT SOURCE DISCHARGE			769684	33366
SEPTIC SYSTEMS			811	224
TOTALS		77528175	1403290	74643
		Future (lbs)		
LAND EROSION/RUNOFF		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
	Row Crops	4363713	8386	3396
	Hay/Pasture	7587503	26403	4134
	High Density Urban	76101	82102	8358
	Low Density Urban	411271	11253	1746
	Unpaved Roads	25	96	14
	Other	3526622	13248	2028
STREAMBANK EROSION		25391009	1436	551
GROUNDWATER/SUBSURFACE			359174	4008
POINT SOURCE DISCHARGE			769684	33366
SEPTIC SYSTEMS			811	224
TOTALS		41356218	1272496	57811
PERCENT REDUCTIONS		46.7	9.3	22.6
TOTAL SCENARIO COST		$56,933,418.40		
Ag BMP Cost (%)		34.2		
WW Upgrade Cost (%)		0.0		
Urban BMP Cost (%)		62.4		
Stream Protection Cost (%)		3.4		
Unpaved Road Protection Cost (%)		0		

Table 5-12. PRedICT Load Reductions for Ag-BMP Implemented in Oil Creek TMDL Area

Estimated Load Reductions			
	Existing (lbs)		
UPLAND EROSION/RUNOFF	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
Row Crops	1086800	5662	1140
Hay/Pasture	235800	1384	264
High Density Urban	8533	62	7
Low Density Urban	21300	23	3
Unpaved Roads	0	0	0
Other	500	5	0
STREAMBANK EROSION	196686	295	82
GROUNDWATER/SUBSURFACE		20672	350
POINT SOURCE DISCHARGE		0	0
SEPTIC SYSTEMS		922	11
TOTALS	1549619	29025	1857
	Future (lbs)		
LAND EROSION/RUNOFF	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
Row Crops	274497	1888	491
Hay/Pasture	229056	1253	244
High Density Urban	4478	44	5
Low Density Urban	12303	17	2
Unpaved Roads	0	0	0
Other	500	5	0
STREAMBANK EROSION	168406	264	70
GROUNDWATER/SUBSURFACE		20651	350
POINT SOURCE DISCHARGE		0	0
SEPTIC SYSTEMS		922	11
TOTALS	689240	25044	1174
PERCENT REDUCTIONS	55.5	13.7	36.8
TOTAL SCENARIO COST	$3,407,030.40		
Ag BMP Cost (%)	26.5		
WW Upgrade Cost (%)	0.0		
Urban BMP Cost (%)	72.8		
Stream Protection Cost (%)	0.7		
Unpaved Road Protection Cost (%)	0		

Table 5-13. PRedICT Load Reductions for Ag-BMP Implemented in Oil Creek TMDL Area

Estimated Load Reductions				
		Existing (lbs)		
UPLAND EROSION/RUNOFF		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
	Row Crops	1086800	5662	1140
	Hay/Pasture	235800	1384	264
	High Density Urban	8533	62	7
	Low Density Urban	21300	23	3
	Unpaved Roads	0	0	0
	Other	500	5	0
STREAMBANK EROSION		196686	295	82
GROUNDWATER/SUBSURFACE			20672	350
POINT SOURCE DISCHARGE			0	0
SEPTIC SYSTEMS			922	11
TOTALS		1549619	29025	1857
		Future (lbs)		
LAND EROSION/RUNOFF		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
	Row Crops	274497	1888	491
	Hay/Pasture	229056	1253	244
	High Density Urban	4478	44	5
	Low Density Urban	12303	17	2
	Unpaved Roads	0	0	0
	Other	500	5	0
STREAMBANK EROSION		133055	211	55
GROUNDWATER/SUBSURFACE			20651	350
POINT SOURCE DISCHARGE			0	0
SEPTIC SYSTEMS			922	11
TOTALS		653889	24991	1159
PERCENT REDUCTIONS		57.8	13.9	37.6
TOTAL SCENARIO COST		$4,515,830.40		
Ag BMP Cost (%)		20.0		
WW Upgrade Cost (%)		0.0		
Urban BMP Cost (%)		55.0		
Stream Protection Cost (%)		25.1		
Unpaved Road Protection Cost (%)		0		

Table 5-14. PRedICT Load Reductions for Ag-BMP Implemented in Oil Creek Non-TMDL Area

Estimated Load Reductions				
		Existing (lbs)		
UPLAND EROSION/RUNOFF		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
	Row Crops	4296872	19204	3032
	Hay/Pasture	1352840	4941	887
	High Density Urban	0	0	0
	Low Density Urban	13954	5	1
	Unpaved Roads	3	11	2
	Other	2527106	8380	1627
STREAMBANK EROSION		575875	29	13
GROUNDWATER/SUBSURFACE			63045	694
POINT SOURCE DISCHARGE			35646	569
SEPTIC SYSTEMS			96	23
TOTALS		8766650	131357	6848
		Future (lbs)		
LAND EROSION/RUNOFF		Total Sed (lbs)	Total N (lbs)	Total P (lbs)
	Row Crops	1004127	1766	739
	Hay/Pasture	1300079	4304	797
	High Density Urban	0	0	0
	Low Density Urban	5908	4	1
	Unpaved Roads	3	11	2
	Other	2527106	8380	1627
STREAMBANK EROSION		267960	18	6
GROUNDWATER/SUBSURFACE			62674	612
POINT SOURCE DISCHARGE			35646	569
SEPTIC SYSTEMS			96	23
TOTALS		5105181	112886	4373
PERCENT REDUCTIONS		41.8	14.1	36.1
TOTAL SCENARIO COST		$5,331,655.60		
Ag BMP Cost (%)		85.2		
WW Upgrade Cost (%)		0.0		
Urban BMP Cost (%)		4.9		
Stream Protection Cost (%)		9.8		
Unpaved Road Protection Cost (%)		0		