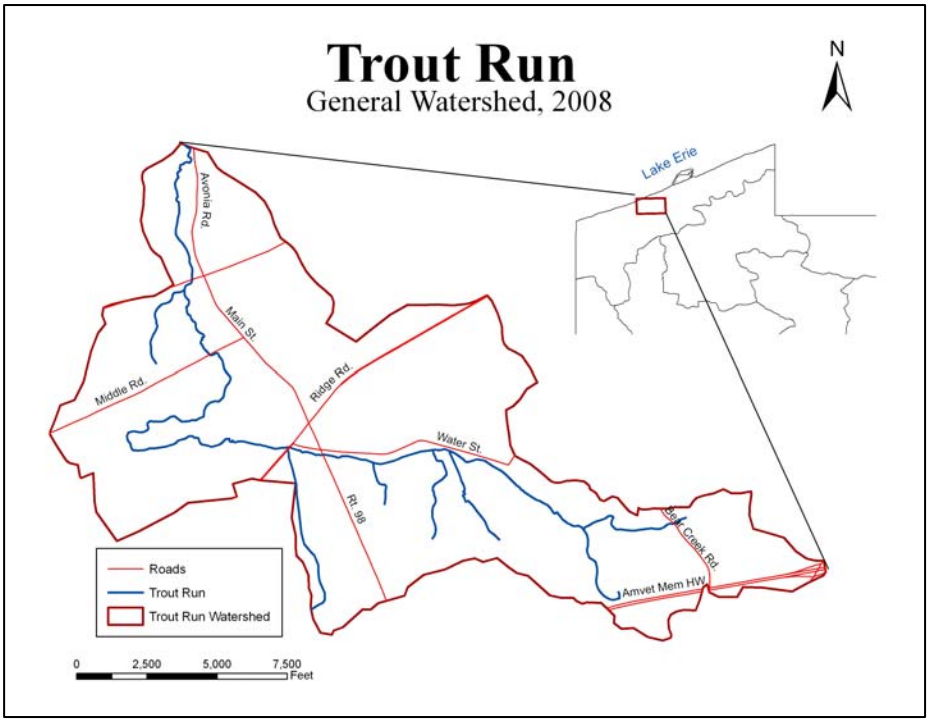
I. Watershed Background

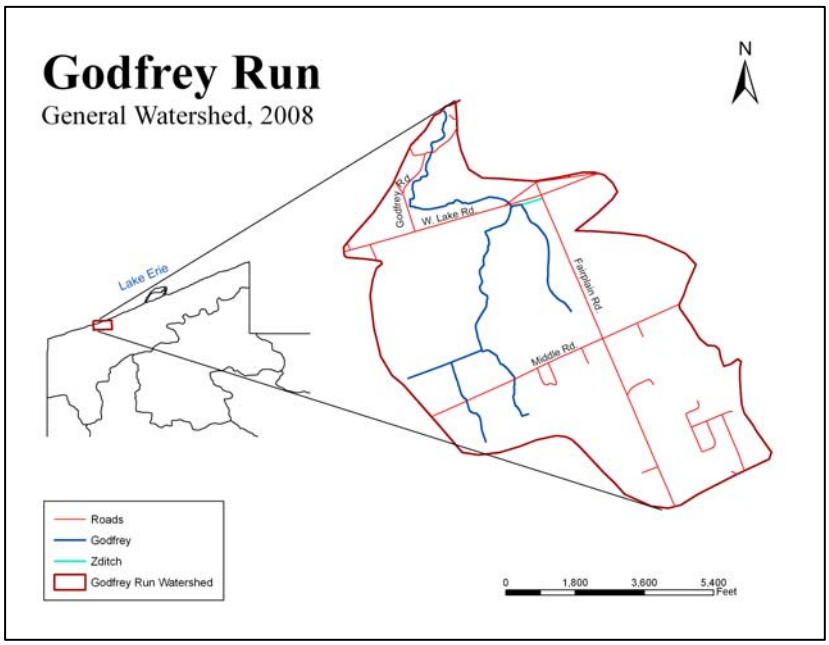
The watersheds of Trout Run and Godfrey Run are located in the municipalities of Fairview Township, Girard Township, Girard Borough, and McKean Township. Combined the two basins drain approximately 9.24 square miles. The two streams drain directly into Lake Erie.

Both watersheds are characterized by growing residential development with historically vast agriculture stretches becoming fragmented with developed residential communities. With continued agriculture practices located along several stream side areas and increased stormwater and septic issues, sedimentation and nutrient loading are issues within the streams. Of particular concern over the last couple of years have been the high levels of *E. coli* counts found in the Trout Run waterway.

This plan will attempt to identify sources of pollution that are affecting designated uses and attainment. Recommendations will then be made for methods (Best Management Practices or BMPs) to reduce the sources of pollution; these will include indentifying key people and organizations that will participate and cost estimates for improvement measures. Lastly, load reductions will be estimated for the recommended BMPs. Taking the load reductions, cost estimate and participation level of stake holders, priorities will be set for the BMPs and a timeline will be developed with milestones and measurable outcomes.



Trout Run has 11.7 stream miles and has a drainage area of 7 square miles. The watershed transcends three municipalities in Erie County. The waterway is currently listed on the 303(d) list for non-attainment due to agricultural activities.



Godfrey Run has 1.7 stream miles and a drainage area of 2.24 square miles. The watershed transcends three municipalities in Erie County. The waterway is currently listed on the 303(d) list for non-attainment due to agricultural activities. The waterway also has a designated use for High Quality.

For the purposes of this plan the watershed is delineated as shown. There are several sources that show the watershed as all drainage between the Trout Run watershed and the Elk Creek watershed. This is not a correct representation of the Godfrey Run watershed. Efforts are currently being made to re-delineate and re-designate uses for the drainage area. Since the watershed has a current designation of High Quality it is important to assess sources of impairment and recommendations for improvement for the appropriate drainage area.

Watershed topography and soils

Topography:

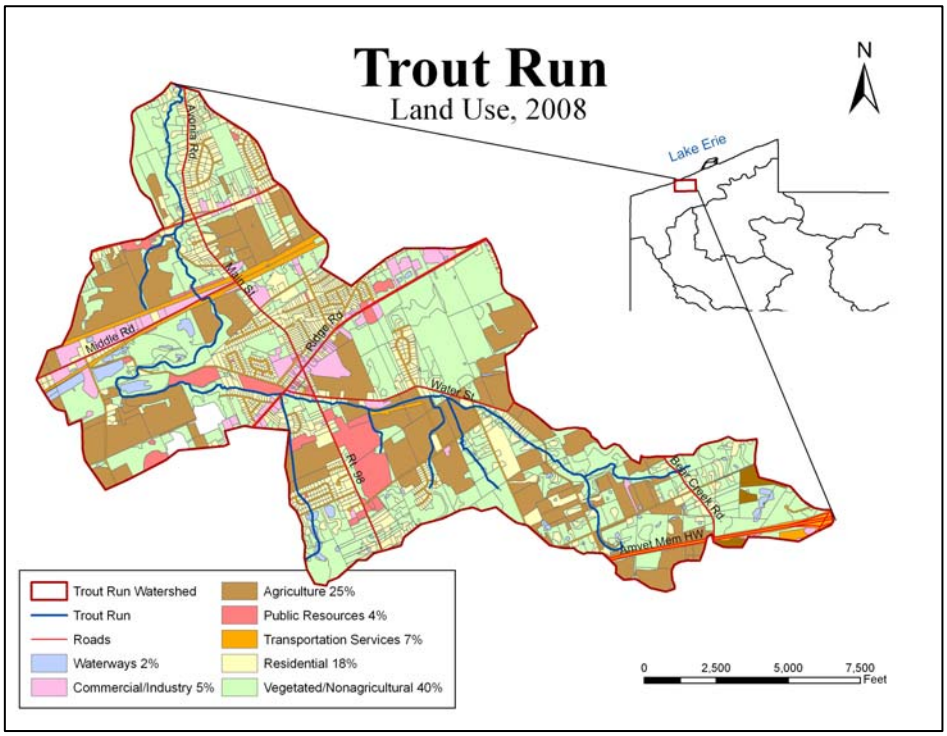
The Lake Erie watershed in general is a part of the physiographic province of the Central Lowlands that extends eastward into western New York and northwestward into Minnesota and south westward to central Texas. This province consists of gently rolling land. It contains low ridges of sand and gravel that are old beaches formed by Lake Erie at the end of the Pleistocene glaciation (DCNR, PA Physiographic Provinces).

Soils:

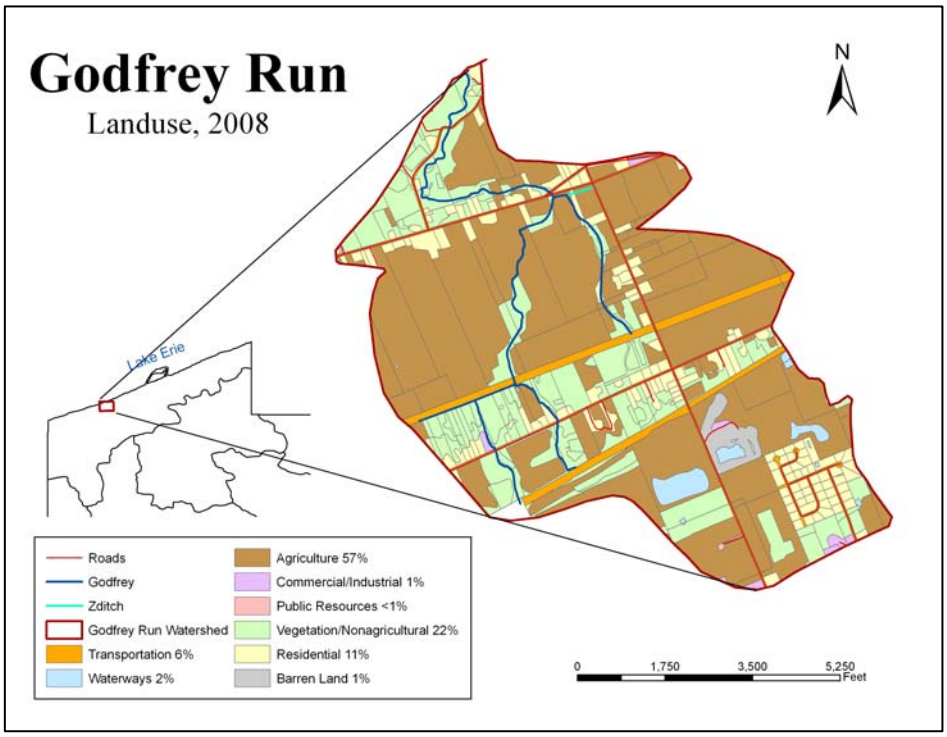
The formation of soils throughout the watersheds was influenced by the movement of the retreating Wisconsin glaciers only 10,000 to 15,000 years ago. With relatively young soils some areas have not had long enough time for distinct horizons to form and in many areas there are very shallow topsoil zones.

Land use

The land use in these two areas has changed greatly in the last several years. Many of the agricultural areas are quickly being developed into residential developments. The Trout Run watershed in particular has high potential for a large amount of future development. The following maps illustrate the current (Erie County, 2008) land use data for these watersheds.



Land use for the Trout Run watershed is dominated by agriculture, vegetated and residential areas. The agriculture activities consist solely of crop rotations, evergreen nurseries and orchards. It is important to note that there are no livestock activities in the watershed. The small tributary closest to the mouth is a major source for the PFBC hatchery.



Land use for the Godfrey Run watershed is dominated by agricultural activities. The headwaters for the western branch of the watershed are used as nursery water for a local fishing group known as 3CU Trout Association.

II. Assessment of Water Quality and Water Quality Standards

In accordance with the Clean Water Act (CWA), the primary federal law that protects our nation's waters, all states must identify and report on water quality. The waterways for this plan were surveyed in 1998 and found impaired for siltation and nutrients from agricultural sources. However, the state is currently working on resurveying the streams using Instream Comprehensive Evaluation (ICE) protocols to verify the attainment status of the earlier surveys. The streams are assessed for biological and habitat impairment. The data collection for the follow-up assessment took place during the development of this plan. The results verify impairment of most reaches of Trout Run and all of Godfrey Run.

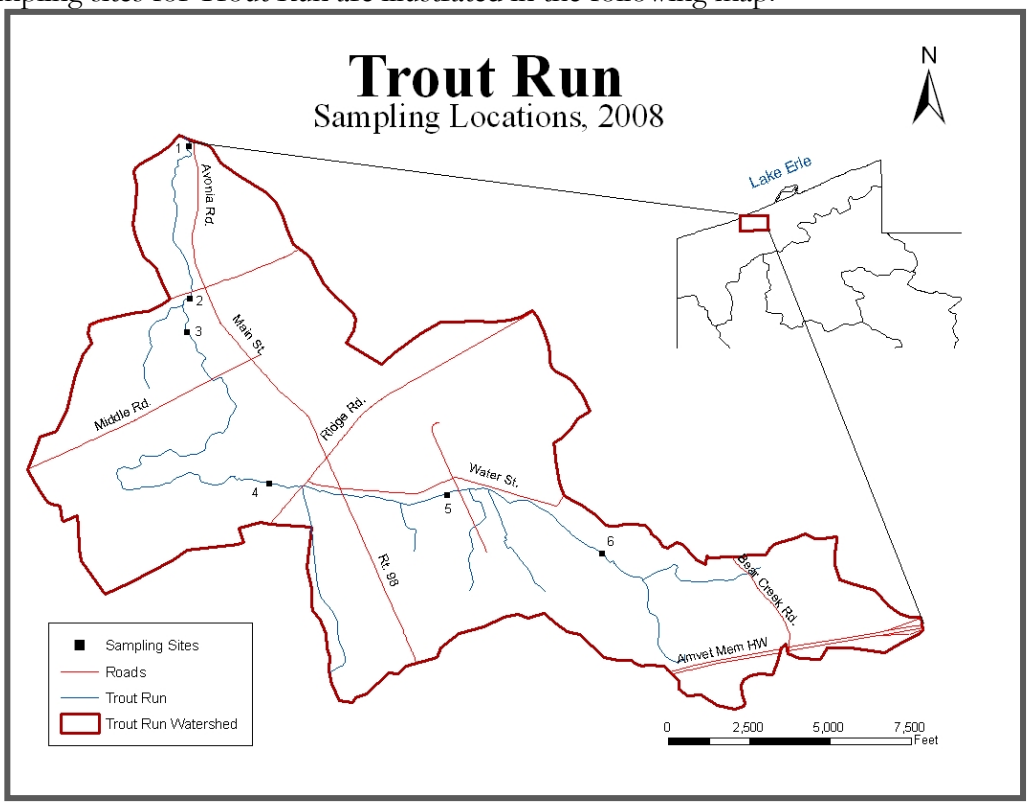
Water quality standards used for threshold indicator values are from EPA's Quality Criteria for Water [The Gold Book] and Pennsylvania Code Chapter 93: Water Quality Standards. The following table illustrates which water quality parameters were used and the threshold values.

Table 1: Water Quality Criteria

Criteria	Threshold	Negative Impacts
Alkalinity	20 mg/L or more	Poor pH buffering ability
Nitrates-N	10 mg/L	Increased algal growth
Total Phosphates	50 µg/L at mouth 100µg/L elsewhere	Increased algal growth Decreased dissolved oxygen
TDS	750 mg/L	Harmful to aquatic organisms and restricts beneficial use of the water
DO_1	6.0 mg/L min 5.0 mg/L	Harmful to aquatic organisms
DO_2 (high quality)	7.0 mg/L	
Temperature	Less than 66°F in Fall Less than 52°F in Spring	Decreased dissolved oxygen, organisms are more sensitive to diseases and algal growth
pH	6-9	Organisms become stressed and may lead to fatality; and may cause dissolved ammonia to form in a toxic state

It is important to note that comparable data for this plan was limited. For most criteria there are only two sample values, per site. Therefore, survey results can be used to suggest possible problems and sources, but this plan is a tool to give "best judgment" suggestions for problems and sources of impairment. The data is used in conjunction with modeling results to help determine target areas for specific BMP's. The visual assessment of the stream is also used to help make opinions, but without a more in-depth assessment of the stream this plan cannot point out specific areas as issues with data to back up the claim.

Sampling sites for Trout Run are illustrated in the following map.

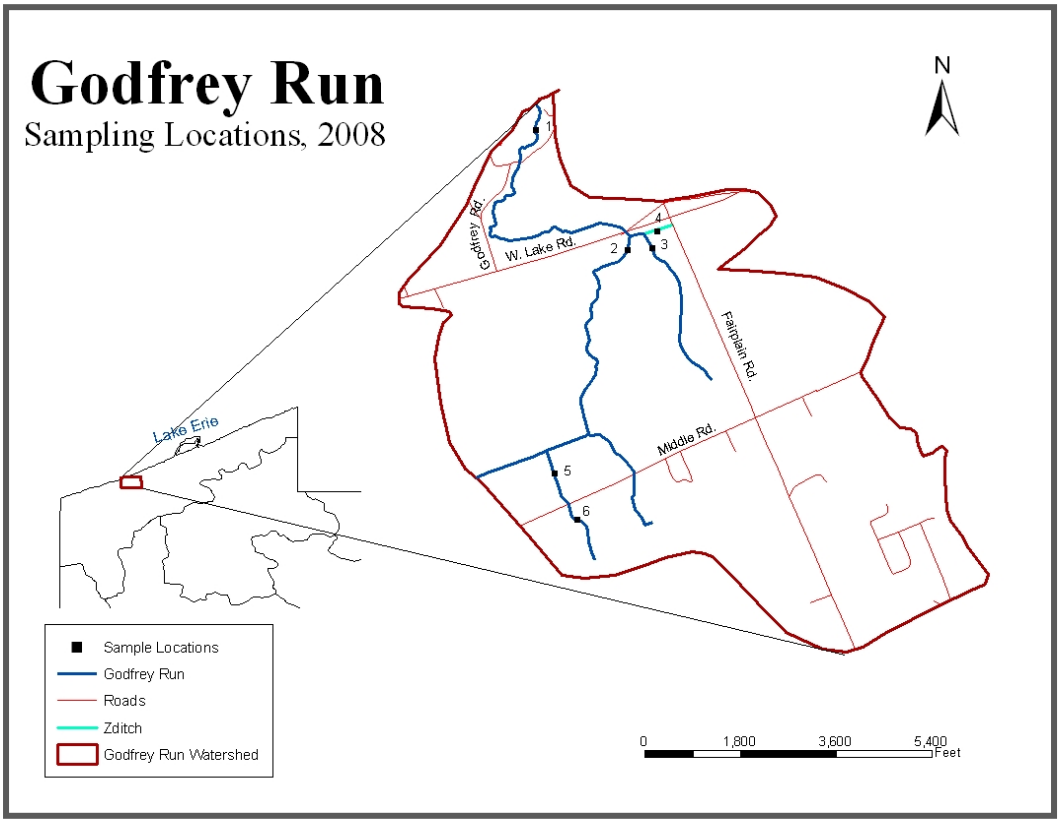


Sampling results for the sites are organized in Table 2. The data is analyzed using the methods described in the PA DEP document titled "Instream Comprehensive Evaluation Surveys". Threshold values for impairment are derived through a variety of calculations and observation criteria. More information about these methods can be found in the attached document: ICE.

Table 2: Trout Run Results

Trout Run Sampling Results—Spring				
Site #	Site Name	Biology Impaired	Habitat Impaired	Water Quality Standards (not met)
1	Mouth	Yes	No	Temperature
2	Below PFBC	Yes	No	Temperature
3	Above PFBC	Yes	No	Temperature
4	American Legion	Yes	No	Temperature
5	Kell Road	Yes	No	None
6	Headwaters	Yes	No	None
Trout Run Sampling Results—Fall				
Site #	Site Name	Biology Impaired?	Habitat Impaired?	Water Quality Standards (not met)
1	Mouth	Yes	No	None
2	Below PFBC	Yes	No	None
3	Above PFBC	Yes	No	None
4	American Legion	Yes	No	Temperature
5	Kell Road	Yes	Yes	Temperature
6	Headwaters	Yes	Yes	None

Sampling sites for Godfrey Run are illustrated in the following map.



Sampling results for the sites are organized in Table 3. The data is collected and analyzed using the methods described in the PA DEP document titled "Instream Comprehensive Evaluation Surveys". Threshold values for impairment are derived through a variety of calculations and observation criteria. More information about these methods can be found in the attached document: ICE.

Table 3:Godfrey Run Results

Godfrey Run Sampling Results—Spring				
Site #	Site Name	Biology Impaired?	Habitat Impaired?	Water Quality Standards (not met)
1	Mouth	Yes	No	None
2	West Branch	N/A ***	Yes	None
3	East Branch	N/A	Yes	Phosphorus
4	Z-Ditch	N/A	N/A	None
5	Above Hatchery	N/A	Yes	None
6	Below Hatchery	Yes	Yes	Temperature
Godfrey Run Sampling Results—Fall				
Site #	Site Name	Biology Impaired?	Habitat Impaired?	Water Quality Standards (not met)
1	Mouth	Yes	No	None
2	West Branch	Yes	Yes	None
3	East Branch	N/A	Yes	None
4	Z-Ditch	N/A	N/A	None
5	Above Hatchery	N/A	N/A	None
6	Below Hatchery	Yes	Yes	None

Bacteriological samples were also collected at sites 1 and 4 on Trout Run. The results from that sampling effort show that the percentage of the bacteroides present in the stream that is of human origin ranges from 95% to less than 1% on any given day (N=37). These samples were taken over a 22 week period during summer months. Results from the sampling suggest that, on average, 20-25% of the bacteroides present are of human origin (Mauro, 2008). Many assumptions can be made from these results, however for the purposes of this plan the only assumption being made is that human pathogens are making their way to the stream. Efforts to reduce the ability of pathogens and waste water from impacting the ground water and streams are encouraged. The most cost effective way for this is through education, routine maintenance and regular testing.

To summarize the results and observation from the sampling efforts for the two tributaries the biological degradation is evident throughout all reaches, habitat degradation is present in headwaters, and temperature may be an issue in Trout Run. Human waste is making its way into the stream and entering the lake. Water quality impairments that need improved include, water temperatures and habitat degradation due to stream flow issues and lack of riparian areas.

III. Current Pollutant Loads

Using AVGWLF modeling (Arc View Generalized Watershed Loading Function), current theoretical loads were determined. These loads are used to determine management measures needed to meet load reduction goals. This model was developed by Penn State University and provides the ability to simulate non-point source pollution loads for sediment, nitrogen and phosphorus. The model takes into account land use data and weather data over a twenty year period.

Trout Run:
Current pollutant loads that are of concern sedimentation, nutrients, and pathogens. The following table illustrates the mean annual load for sediment, nitrogen, phosphorus based on land use. The watershed size is composed of 4,401 acres.

Table 4: Trout Run Loads

Load Data Type	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
UPLAND EROSION/RUNOFF			
Row Crops	327,384	2,551	207
Hay/Pasture	27,686	899	90
High Density Urban	1,144	216	24
Low Density Urban	46,540	384	51
Other	881,986	3,635	192
STREAMBANK EROSION	627,026	44	20
GROUNDWATER/SUBSURFACE		22,977	392
POINT SOURCE DISCHARGE		0	0
SEPTIC SYSTEMS		157	13
TOTAL	1,911,765	30,863	990

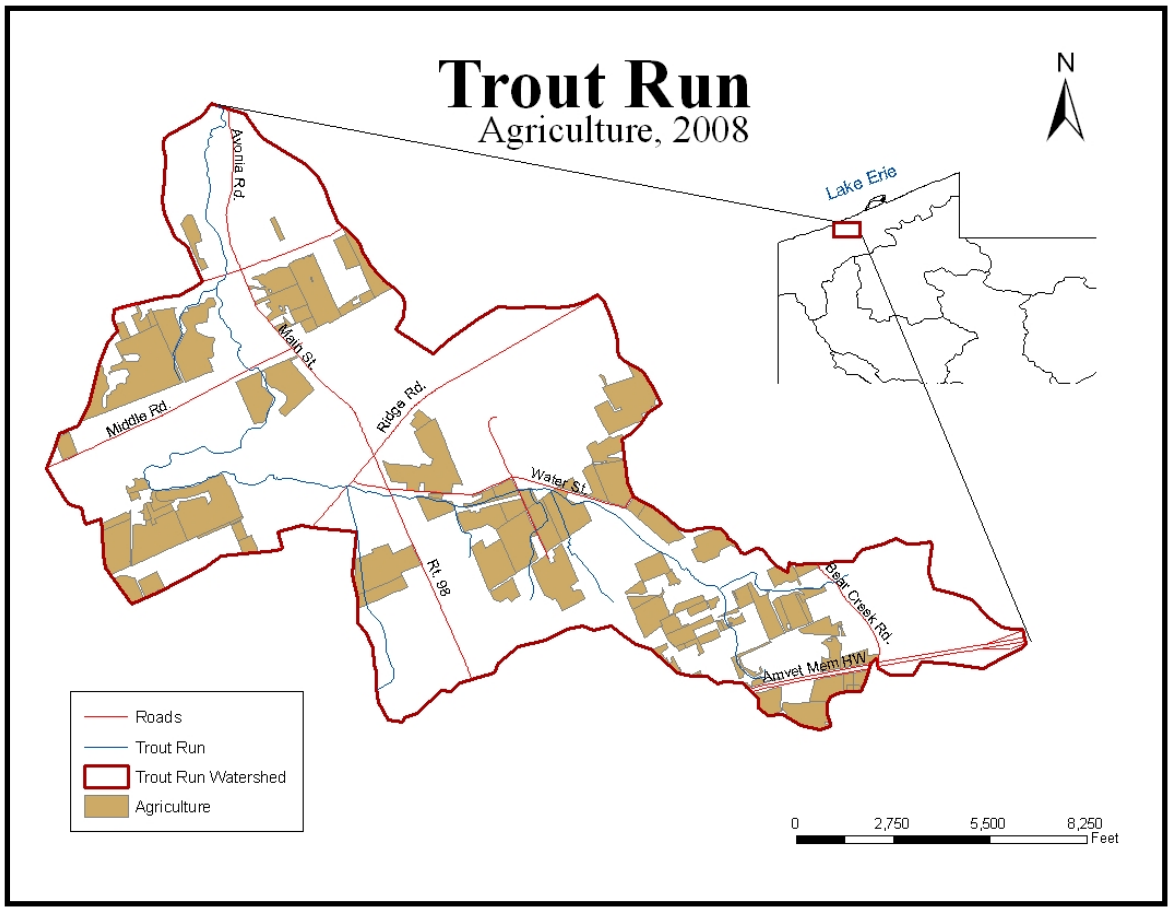
Godfrey Run:
Current pollutant loads that are of concern sedimentation, nutrients, and pathogens. The following table illustrates the mean annual load for sediment, nitrogen, phosphorus based on land use. The watershed size is composed of 1,401 acres.

Table 6: Godfrey Run Loads

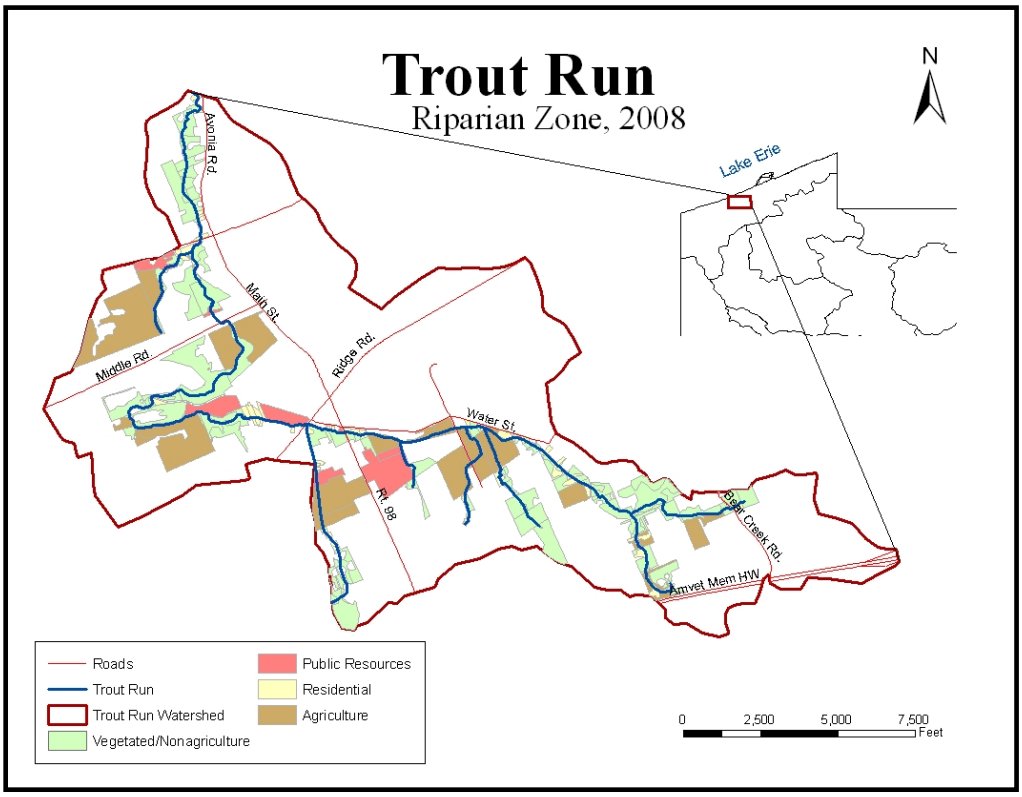
Load Data Type	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
UPLAND EROSION/RUNOFF			
Row Crops	165915	6301	414
Hay/Pasture	7846	2754	168
High Density Urban	15	15	2
Low Density Urban	6654	82	11
Other	136076	3309	212
STREAMBANK EROSION	163777	7	2
GROUNDWATER/SUBSURFACE		15102	196
POINT SOURCE DISCHARGE		0	0
SEPTIC SYSTEMS		18	0
TOTAL	480284	27586	1005

IV. Problem Identification

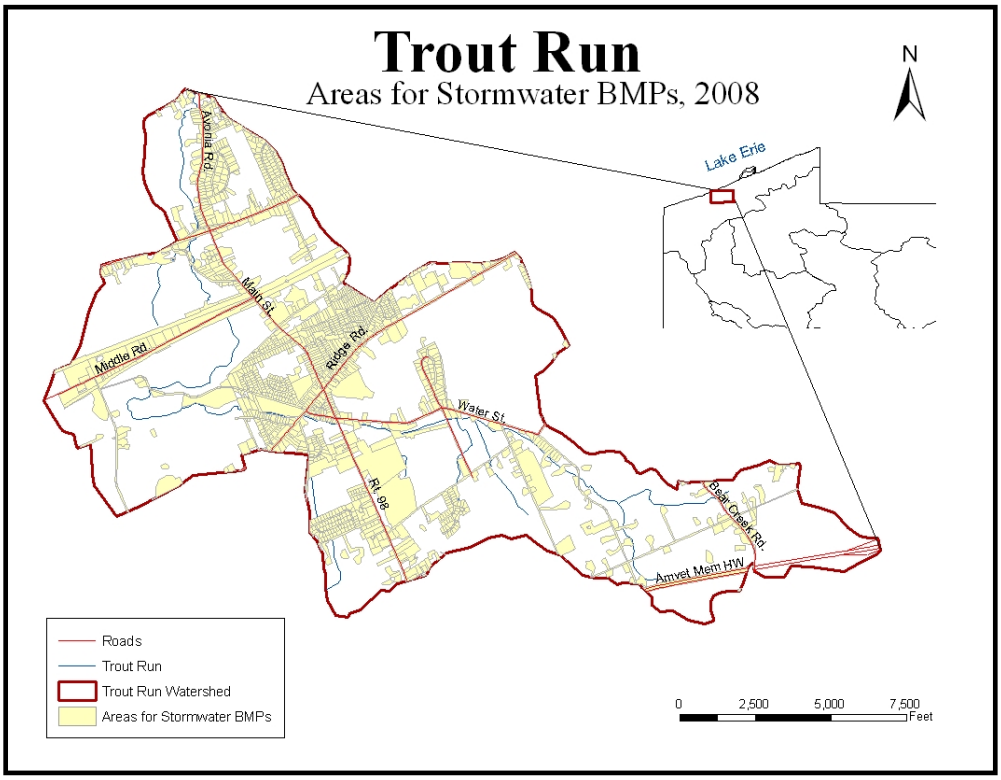
Trout Run: There were several methods for identifying sources and potentials sources of pollution for the watershed. First, the 303(d) list includes the entire stream length (11.7 miles) as non-attaining. The source of impairment is listed as crop related agriculture activities resulting in nutrients and siltation. Visual and physical assessment of the stream identified several areas of stream bank erosion and possible stormwater and septic system impacts that could impact the siltation and nutrient loads on the stream. Chemical, biological and habitat assessment of the stream noted several areas of water quality impairments. Bacteriological samples were also taken for this watershed, suggesting possible pathogen impacts to water quality. The following maps illustrate where potential projects can be located.



This map illustrates where all agriculture activities are taking place. Any of these areas have potential for future implementation of agricultural related BMPs. Areas along the stream have potential to take part in streambank buffers and restoration. The highest priorty for implementation projects are the parcels closest to the stream.

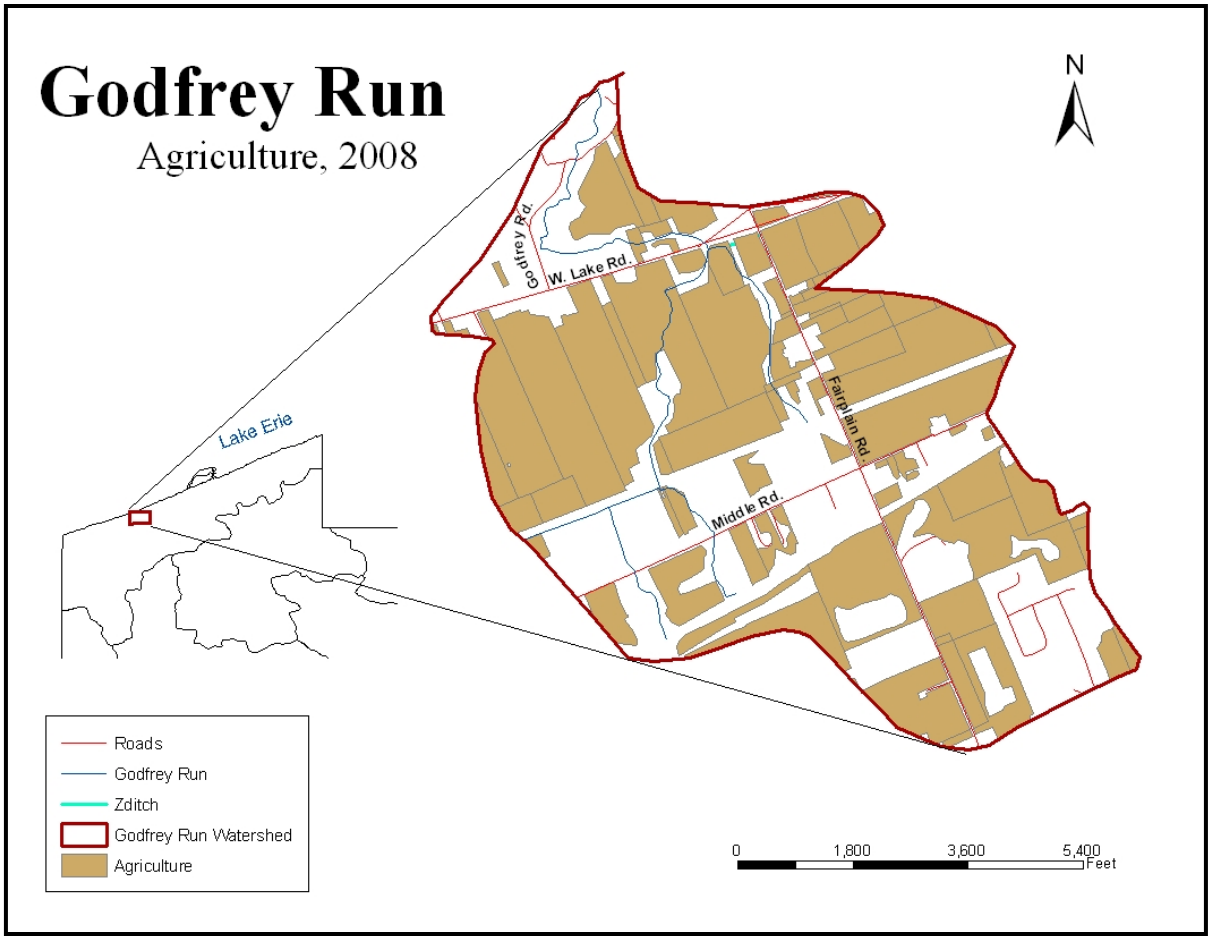


The above map illustrates the parcels where the stream runs through a portion of the property. These areas will be targeted for activities such as stream restoration, stream riparian protection, educational mailing and/or workshops.

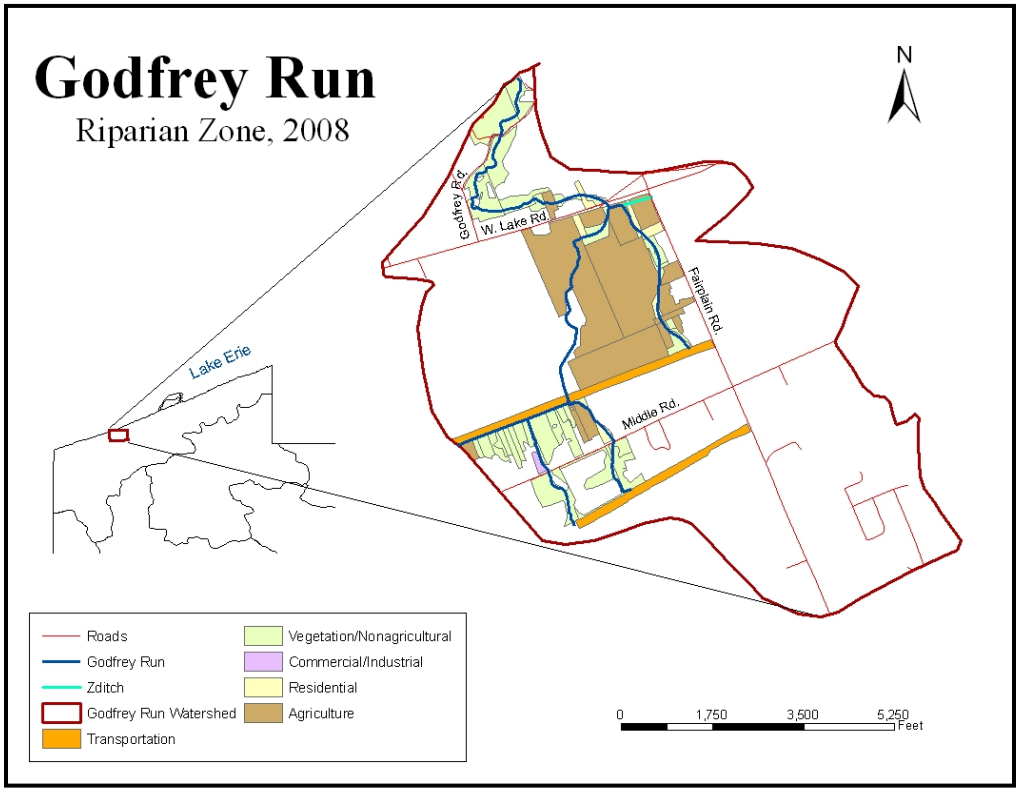


The above map highlights areas to target urban BMPs. These may include septic system maintenance programs, workshop and educational events, stormwater BMPs, and backyard conservation.

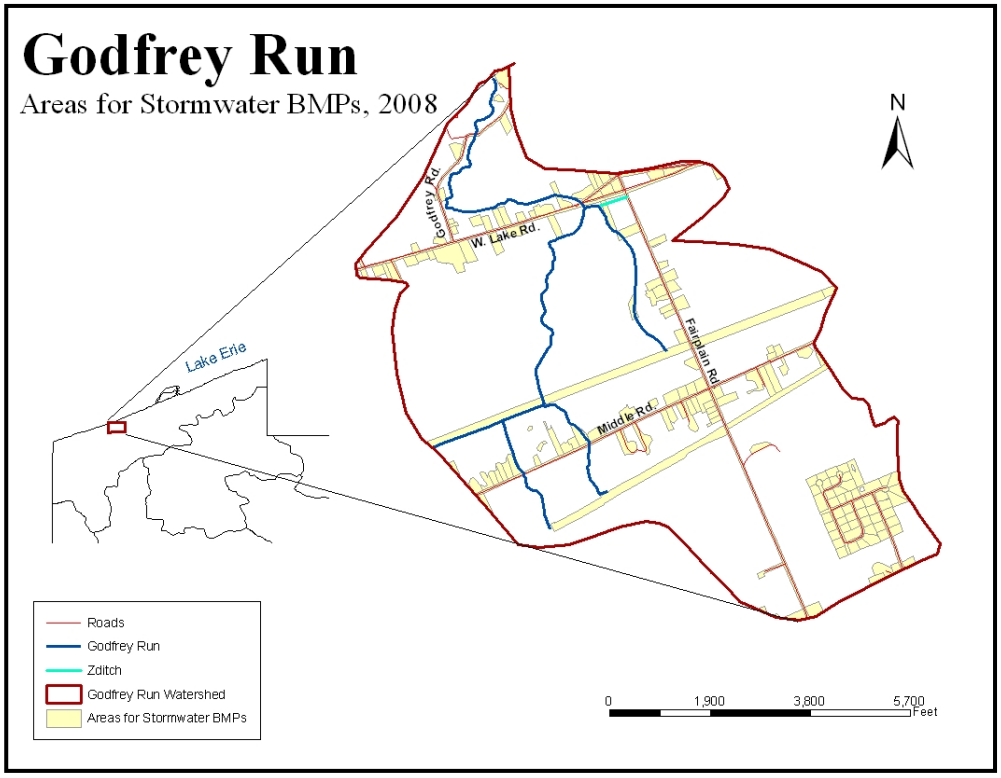
Godfrey Run: The same methods for identifying problems for Trout Run were used for Godfrey Run. First, the 303(d) list includes the entire stream length (1.7 miles) as non-attaining. The source of impairment is listed as agriculture related activities resulting in siltation. Visual and physical assessment of the stream identified several areas of stream degradation from possible loads of nutrients onto the stream. Chemical, biological and habitat assessment of the stream noted several areas of water quality impairments. The following maps illustrate where potential projects can be located.



This map illustrates where all agriculture activities are taking place. Any of these areas have potential for future implementation of agricultural related BMPs. Areas along the stream have potential to take part in streambank buffers and restoration. The highest priority for implementation projects are the parcels closest to the stream.



The above map illustrates the parcels where the stream runs through a portion of the property. These areas will be targeted for activities such as stream restoration, stream riparian protection, educational mailing and/or workshops.



The above map highlights areas to target urban BMPs. These may include septic system maintenance programs, workshop and educational events, stormwater BMPs, and backyard conservation.

IV. Improved Water Quality Goals

Through modeling calculations in the PRedICT program (*P*ollutant *Red*uction *I*mpact *C*omparison *T*ool) load goals were determined. The program uses data from the AVGWLF model to estimate load reduction to the watershed as a whole based on the suggested practices. First, load reduction goals were set. Then practices were input into the PRedICT program until the desired reductions were met.

These goals were determined based on the proposed activities, feasibility of the projects and cost-benefit ratio. The model works by inputting the proposed activities and calculating the reductions percentage from the existing loads. The district and partners feel that these goals are feasible and will make impactful positive improvements in the watersheds. Sediment reduction is set between 29-35% based on proposed activities. Nitrogen reduction is set between 9-20% based on proposed activities. Lastly, phosphorus reduction is set between 24-29% based on proposed activities.

Trout Run Estimated Load Reductions

	Existing (lbs)		
UPLAND EROSION/RUNOFF	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
Row Crops	327384	2551	207
Hay/Pasture	27686	899	90
High Density Urban	1144	216	24
Low Density Urban	46540	384	51
Other	627026	3635	192
STREAMBANK EROSION	881986	44	20
GROUNDWATER/SUBSURFACE		22977	392
POINT SOURCE DISCHARGE		0	0
SEPTIC SYSTEMS		157	13
FARM ANIMALS		0	0
TOTALS	1911766	30863	989
	Future (lbs)		
LAND EROSION/RUNOFF	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
Row Crops	96663	413	64
Hay/Pasture	27686	521	75
High Density Urban	1122	213	24
Low Density Urban	0	0	0
Other	627026	3635	192
STREAMBANK EROSION	591053	29	13
GROUNDWATER/SUBSURFACE		22948	371
POINT SOURCE DISCHARGE		0	0
SEPTIC SYSTEMS		157	13
FARM ANIMALS		0	0
TOTALS	1343551	27917	752
PERCENT REDUCTIONS	29.7%	9.5%	24.0%

Godfrey Run Estimated Load Reductions

	Existing (lbs)		
UPLAND EROSION/RUNOFF	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
Row Crops	165915	6301	414
Hay/Pasture	7846	2754	168
High Density Urban	15	15	2
Low Density Urban	6654	82	11
Unpaved Roads	0	0	0
Other	163777	3309	212
STREAMBANK EROSION	136076	7	2
GROUNDWATER/SUBSURFACE		15102	196
POINT SOURCE DISCHARGE		0	0
SEPTIC SYSTEMS		18	0
FARM ANIMALS		0	0
TOTALS	**480283**	**27588**	**1005**

	Future (lbs)		
LAND EROSION/RUNOFF	Total Sed (lbs)	Total N (lbs)	Total P (lbs)
Row Crops	59336	1590	162
Hay/Pasture	7846	2176	154
High Density Urban	15	15	2
Low Density Urban	0	0	0
Unpaved Roads	0	0	0
Other	163777	3309	212
STREAMBANK EROSION	84367	4	1
GROUNDWATER/SUBSURFACE		15074	186
POINT SOURCE DISCHARGE		0	0
SEPTIC SYSTEMS		18	0
FARM ANIMALS		0	0
TOTALS	**315341**	**22186**	**717**
PERCENT REDUCTIONS	34.3%	19.6%	28.7%

V. Management Measures and Initiatives

With little to no current measures being taken to reduce impacts on the watershed there is a great potential for management measures and initiatives in both watersheds. The following tables outline the BMPs that can be used within each watershed and what potential they have for load reductions and/or water quality improvements.

Trout Run

BMP type	Total Size or Quantity	Load Reduction Potential	Water Quality Improvement Potential
Streambank Erosion/Riparian Enhancement	4,752 ft	Sediment Nutrients	Temperature Aquatic organism health Algal growth
CPs for row crops	430 acres	Sediment Nutrients	Aquatic organism health Algal growth
NMP Plans	860 acres	Nutrients	Algal growth
Stormwater BMPs-Low Density	22 acres	Sediment Nutrients	Flow rate and volume and overall water quality
Stormwater BMPs-High Density	1 acres	Sediment Nutrients	Flow rate and volume and overall water quality
Maintenance Program for Septic Systems	100 households approx	Nutrients-thousands of gallons of waste water	Drinking water protection, algal growth

Godfrey Run

BMP type	Total Size or Quantity	Load Reduction Potential	Water Quality Improvement Potential
Streambank Erosion/Riparian Enhancement	6,336 ft	Sediment Nutrients	Temperature Aquatic organism health Algal growth
CPs for row crops	160 acres	Sediment Nutrients	Aquatic organism health Algal growth
NMP Plans	320 acres	Nutrients	Algal growth
Stormwater BMPs-Low Density	10.5 acres	Sediment Nutrients	Flow rate and volume and overall water quality
Maintenance Program for Septic Systems	25 households approx.	Nutrients-thousands of gallons of waste water	Drinking water protection, algal growth

VI. Cost Estimates and Potential Financial Assistance for BMPs

Using the list of BMPs from the previous section the following table outlines what source can be used for design and implementation. There is also a section that describes appropriate potential sources for funding. Totals for the implementation are approximately 3.5 million dollars in funding needed. Please note these are estimates only.

Trout Run

BMP	Cost Estimate	Units	Total	Potential Funders
Streambank Stabilization	$150.00 (per foot)	4,752 ft	$712,800	Growing Greener, 319 NPS, Great Lakes Commission, Coastal Zone Management, PA Fish and Boat Commission, Great Lakes Restoration Funding
Cropland Protection	$25.00 (per acre)	430 acres	$10,750	Growing Greener, 319 NPS, Great Lakes Commission, Coastal Zone Management, PA Fish and Boat Commission, Great Lakes Restoration Funding
Nutrient Management	$12.00 (per acre)	860 acres	$10,320	PEDIP
Stormwater Low & High Density	$4,330.14 (per acre)	23 acres	$99,593.28	Growing Greener, 319 NPS, Coastal Zone Management
Maintenance Program for Septic Systems	$ 5,000.00 (per home)	100 homes	$500,000.00	PENN VEST, DCED, Growing Greener, 319 NPS

Godfrey Run

BMP	Cost Estimate	Units	Total	Potential Funders
Streambank Stabilization	$150 (per foot)	6,336 ft	$950,400.00	Growing Greener, 319 NPS, Great Lakes Commission, Coastal Zone Management, PA Fish and Boat Commission, Great Lakes Restoration Funding
Cropland Protection Irrigation systems	$25.00 (per acre) $20,000 per system	160 acres 4 systems	$4,000.00 $80,000	Growing Greener, 319 NPS, Great Lakes Commission, Coastal Zone Management, PA Fish and Boat Commission, Great Lakes Restoration Funding
Nutrient Management	$12.00 (per acre)	320 acres	$3,840.00	PEDIP
Stormwater Low Density	$4,330.14 (per acre)	10.5 acres	$45,466.47	Growing Greener, 319 NPS, Coastal Zone Management
Maintenance Program for Septic Systems	$ 5,000.00 (per home)	25 homes	$125,000.00	PENN VEST, DCED, Growing Greener, 319 NPS
Hatchery Upgrades	$200,000 (per upgrade)	5 hatcheries	1,000,000.00	DCED, Trout Unlimited, GLB, Growing Greener, 319 NPS

VII. Public Information and Participation

Public participation is important because many of the problems result from impacts from local residents. Even more important is that activities to correct the problem are mostly voluntary practices.
For the purposes of helping maintain the sustainability of the watershed plan an outline for an information and educational component was developed.

Information and Educational Component

Activities include:
Meetings Public meetings will be held at the municipal buildings. The first public meeting was held June 15, 2009 at the Fairview Township building. At this meeting the draft plan was presented to the residents and business owners within the Trout Run and Godfrey Run watersheds. From this meeting a mailing list will be developed to keep interested individuals informed on activities to be taken place throughout the implementation of the watershed plan.

Website

Area on the ECCD site (www.erieconservation.com) is dedicated to provide up to date information. Meeting notices, educational material, surveys and the finalized plan will be published and free for access.

Newspaper

Pages in the local newspaper will be utilized for education on implementation plans within the schools. Every Tuesday during the school year a full page is used for the "Times News In Education" program. The newspaper is sent to thousands of students that participate in the program.

Mailings

A large mailing to inform property owners in the watersheds was completed in June 2009. Follow mailing will take place periodically throughout the implementation of the plan to help measure milestones, track public participation, and encourage new individuals to become involved. An example would include a target mailing to stream side owners to provide tips on stream side care.

Major goals and objectives:
The following table details the goals and objectives to be met throughout the implementation of the plan.

Topic	Goal/Objective	Method/Evaluation
Stream side care	Reduce sedimentation from poor streamside practices and encourage BMPs along the stream to improve water quality and habitat.	Provide printed materials to individuals along the stream for proper practices along the stream, install BMP's where appropriate, hold site visits, and distribute surveys to measure progress
Septic system impacts	Reduce nutrients and pathogen impacts from septic system due to poor maintenance and conservation practices	
Land Management	Reduce nutrient loads into the streams, from agricultural practices and lawn care	
Stormwater impacts	Reduce increased run off from impervious areas	

VIII. Prioritization and Implementation Schedule

Prioritization of the BMPs was determined by several factors; direct impact to address the 303(d) causes of impairment, load reduction prediction, BMP's distance from the stream, current progress and public concern. Implementation of the recommended activities, as currently outlined below, takes into consideration, land owner cooperation, permits, cost, feasibility, availability of technical services and funding. With these considerations five phases of implementation were developed; which include BMPs, education, and monitoring activities.

Phases needed for implementation:

Phase	Years	Activities
Phase One	1-2	Streambank restoration, ag BMPs, septic system programming, education, monitoring
Phase Two	3-4	Streambank restoration, ag BMPs, septic system programming, hatchery improvements, stormwater BMPs education, monitoring
Phase Three	5-7	Streambank restoration, septic system programming, ag BMPs, stormwater BMPs, hatchery improvements, education, monitoring
Phase Four	7-9	Streambank restoration, ag BMPs, stormwater BMPs, hatchery improvements, education, monitoring
Phase Five	10+	Streambank restoration, stormwater BMPs, hatchery improvements, education, monitoring

Phase One: July 2009-June 2011

1. Streambank Restoration
   - Detail: 1,500ft
   - Cost/Technical Assistance: $225,000 will be needed for design and construction costs.
   - Description: For phase one, properties with the greatest need will be targeted for streambank restoration as determined by a ranking sheet. Criteria will include; length of bank, proposed riparian width, height of bank, etc.
   - Goals/Outcomes: Reduce sedimentation due to bank erosion
   - Key players: Erie County Conservation District , PA Fish and Boat Commission, Township officials, Department of Environmental Protection, and property owners

2. Agricultural BMPs
   - Detail: Irrigation systems for Godfrey Run producers, buffer strips along Trout Run
   - Cost/Technical Assistance: $60,000
   - Description: For phase one, areas near the confluence of the west and east branch of Godfrey Run will be targeted, and buffers along the stream are needed in Trout Run.
   - Goals/Outcomes: Reduce sedimentation, reduced nutrients from fertilizers, improved stream flow and habitat
   - Partners: Erie County Conservation District , PA Fish and Boat Commission, Township officials, Department of Environmental Protection, Natural Resource Conservation District, and property owners

3. Septic System Programming
   - Detail: Testing for 60-100 households, two workshops for 100 individuals each
   - Cost/Technical Assistance: $20,000 for testing, $5,000 educational workshops
   - Description: Work with property owners to better understand the mechanics of their septic system and what maintenance is required to keep it operating correctly. Provide technical assistance for testing their systems and guidance on how to improve it.
   - Goals/Outcomes: Reduce nutrient impacts, behavior changes in septic system ownership
   - Partners: Erie County Conservation District, Townships, Erie County Health Department, Department of Environmental Protection, and property owners

4. Education
   - Detail: Focus will be on property owners along the streams.
   - Cost/Technical Assistance: $5,000 will be needed to develop workshops and materials
   - Description: Workshops will be provided to property owners along stream. Topics will include stream side BMPs, septic systems, and backyard conservation.
   - Goals/Outcomes: Educate property owners on day to day impacts that land use has on a stream. Reduce non-point source pollution and encourage conservation practices.
   - Partners: Erie County Conservation District, PA Sea Grant, Fairview and Girard School Districts, Townships, Science Education Partners

5. Monitoring
   - Detail: Phase one monitoring and evaluation efforts.
   - Cost/Technical Assistance: $7,500
   - Description: For phase one monitoring will include basic water quality readings, habitat assessments, photographic documentation and landowner surveys. (more detail is included in section IX)
   - Goals/Outcomes: Evaluate and track progress
   - Partners: Erie County Conservation District, PA Fish and Boat, Trout Unlimited, PA Sea Grant and Department of Environmental Protection

Phase Two: July 2011-June 2013

1. Streambank Restoration
   - Detail: 1,500ft
   - Cost/Technical Assistance: $225,000 will be needed for design and construction costs.
   - Description: For phase two, the areas targeted will be determined by the interest list developed from the public meetings and mailing list; a ranking sheet will help focus efforts to areas with greatest impacts Goals/Outcomes: Reduce sedimentation due to bank erosion
   - Goals/Outcomes: Reduce sedimentation due to bank erosion
   - Key players: Erie County Conservation District, PA Fish and Boat Commission, Township officials, Department of Environmental Protection

2. Agricultural BMPs

- Detail: Crop BMPs will be implemented on 180 acres (30%), irrigation systems will be developed for both watersheds
- Cost/Technical Assistance: $25,000
- Description: Cropland protection and BMPs to reduce sedimentation, stormwater run-off and nutrient loading.
- Goals/Outcomes: Reduce sedimentation, reduced nutrients from fertilizers, improved stream flow and habitat
- Partners: Erie County Conservation District , PA Fish and Boat Commission, Township officials, Department of Environmental Protection, Natural Resource Conservation District, and property owners

3. Septic System Programming
   - Detail: Maintenance assistance for approximately 60
   - Cost/Technical Assistance: $300,000 ($5,000 max per household)
   - Description: Work with property owners to better understand the mechanics of their septic system and what maintenance is required to keep it operating correctly. Provide technical assistance for maintenance or repairs that are needed.
   - Goals/Outcomes: Reduce nutrient impacts, behavior changes in septic system ownership
   - Partners: Erie County Conservation District, Townships, Erie County Health Department, Department of Environmental Protection, and property owners

4. Stormwater BMPs
   - Detail: Install ten acres of swales, roadside BMPs, rain gardens, or other retention and diversion.
   - Cost/Technical Assistance: $75,000 for design and construction of BMPs.
   - Description: For phase two, stormwater BMPs will be targeted in high density areas around the major road corridors.
   - Goals/Outcomes: Improved filtration capacity of the watershed, reduction in sediment, nutrients and other pollution sources from stormwater run-off, stream flow impacts
   - Partners: Erie County Conservation District, Township officials, Department of Environmental Protection

5. Hatchery Improvements
   - Detail: Install water reuse systems for one hatchery along Godfrey Run.
   - Cost/Technical Assistance: $200,000 will be needed for this BMP.
   - Description: A capture and reuse system will be installed to be used with one of the hatcheries. A solar system will be implemented to operate the system and a filtration system will also be included.
   - Goals/Outcomes: Reduce impacts on the stream especially flow and nutrient issues.
   - Partners: Trout Unlimited, Erie County Conservation District, PA Fish and Boat Commission

6. Education
   - Detail: Residential landowner
   - Cost/Technical Assistance: $5,000 will be needed to develop workshops and materials

- Description: Workshops will be provided to property owners within the two watersheds information on backyard conservation, stormwater BMPs and other residential topics such as lawn care, well-head protection and MS4s.
- Goals/Outcomes: Educate property owners on day to day impacts that land use has on a stream. Reduce non-point source pollution and encourage conservation practices.
- Partners: Erie County Conservation District, PA Sea Grant, Fairview and Girard School Districts, Townships, Science Education Partners

7. Monitoring
   - Detail: Phase two monitoring and evaluation efforts.
   - Cost/Technical Assistance: $10,000
   - Description: For phase two, monitoring will include basic water quality readings, water chemistry samples, habitat assessments, photographic documentation and landowner surveys. (more detail is included in section IX)
   - Goals/Outcomes: Evaluate and track progress
   - Partners: Erie County Conservation District, PA Fish and Boat, Trout Unlimited, PA Sea Grant and Department of Environmental Protection

Phase Three: July 2013-June 2016

1. Streambank Restoration
   - Detail: 1,500ft
   - Cost/Technical Assistance: $225,000 will be needed for design and construction costs.
   - Description: For phase three, we will continue working off of the priority list.
   - Goals/Outcomes: Reduce sedimentation due to bank erosion
   - Key players: Erie County Conservation District , PA Fish and Boat Commission, Township officials, Department of Environmental Protection, and property owners

2. Agricultural BMPs
   - Detail: Crop BMPs will be implemented on 180 acres (30%), irrigation systems will be developed for both watersheds
   - Cost/Technical Assistance: $25,000
   - Description: Cropland protection and BMPs to reduce sedimentation, stormwater run-off and nutrient loading.
   - Goals/Outcomes: Reduce sedimentation, reduced nutrients from fertilizers, improved stream flow and habitat
   - Partners: Erie County Conservation District , PA Fish and Boat Commission, Township officials, Department of Environmental Protection, Natural Resource Conservation District, and property owners

3. Septic System Programming
   - Detail: Maintenance assistance for approximately 60
   - Cost/Technical Assistance: $300,000 ($5,000 max per household)
   - Description: Work with property owners to better understand the mechanics of their septic system and what maintenance is required to keep it operating correctly. Provide technical assistance for maintenance or repairs that are needed.

- Goals/Outcomes: Reduce nutrient impacts, behavior changes in septic system ownership
- Partners: Erie County Conservation District, Townships, Erie County Health Department, Department of Environmental Protection, and property owners

4. Stormwater BMPs
   - Detail: Install ten acres of swales, roadside BMPs, rain gardens, or other retention and diversion.
   - Cost/Technical Assistance: $75,000 for design and construction of BMPs.
   - Description: For phase three, stormwater BMPs will be targeted in high and low density areas around the major and local road corridors.
   - Goals/Outcomes: Improved filtration capacity of the watershed, reduction in sediment, nutrients and other pollution sources from stormwater run-off, stream flow impacts
   - Partners: Erie County Conservation District, Township officials, Department of Environmental Protection

5. Hatchery Improvements
   - Detail: Install water reuse systems for one hatchery along Godfrey Run.
   - Cost/Technical Assistance: $200,000 will be needed for this BMP.
   - Description: A capture and reuse system will be installed to be used with one of the hatcheries. A solar system will be implemented to operate the system and a filtration system will also be included.
   - Goals/Outcomes: Reduce impacts on the stream especially flow and nutrient issues.
   - Partners: Trout Unlimited, Erie County Conservation District, PA Fish and Boat Commission

6. Education
   - Detail: Opportunities for agricultural producers
   - Cost/Technical Assistance: $5,000 will be needed to develop workshops and materials
   - Description: Workshops will be provided to workshops to agriculture producers within the two watersheds.
   - Goals/Outcomes: Educate producers on day to day impacts that activities have on a stream. Reduce non-point source pollution and encourage conservation practices.
   - Partners: Erie County Conservation District, PA Sea Grant, Fairview and Girard School Districts, Townships, Science Education Partners

7. Monitoring
   - Detail: Phase three monitoring and evaluation efforts.
   - Cost/Technical Assistance: $10,000
   - Description: For phase three monitoring will include basic water quality readings, water chemistry samples, habitat assessments, photographic documentation and landowner surveys. (more detail is included in section IX)
   - Goals/Outcomes: Evaluate and track progress
   - Partners: Erie County Conservation District, PA Fish and Boat, Trout Unlimited, PA Sea Grant and Department of Environmental Protection

Phase Four: July 2016-June 2019

1. Streambank Restoration
   - Detail: 1,500ft
   - Cost/Technical Assistance: $225,000 will be needed for design and construction costs.
   - Description: For phase four, we will continue working off of the priority list. Goals/Outcomes: Reduce sedimentation due to bank erosion
   - Key players: Erie County Conservation District , PA Fish and Boat Commission, Township officials, Department of Environmental Protection, and property owners

2. Agricultural BMPs
   - Detail: Crop BMPs will be implemented on 60 acres (10%)
   - Cost/Technical Assistance: $10,000
   - Description: Cropland protection and BMPs to reduce sedimentation, stormwater run-off and nutrient loading.
   - Goals/Outcomes: Reduce sedimentation, reduced nutrients from fertilizers, improved stream flow and habitat
   - Partners: Erie County Conservation District , PA Fish and Boat Commission, Township officials, Department of Environmental Protection, Natural Resource Conservation District, and property owners

3. Stormwater BMPs
   - Detail: Install ten acres of swales, roadside BMPs, rain gardens, or other retention and diversion.
   - Cost/Technical Assistance: $75,000 for design and construction of BMPs.
   - Description: For phase three, stormwater BMPs will be targeted in high and low density areas around the major and local road corridors.
   - Goals/Outcomes: Improved filtration capacity of the watershed, reduction in sediment, nutrients and other pollution sources from stormwater run-off, stream flow impacts
   - Partners: Erie County Conservation District, Township officials, Department of Environmental Protection

4. Hatchery Improvements
   - Detail: Install water reuse systems for one hatchery along Godfrey Run.
   - Cost/Technical Assistance: $200,000 will be needed for this BMP.
   - Description: A capture and reuse system will be installed to be used with one of the hatcheries. A solar system will be implemented to operate the system and a filtration system will also be included.
   - Goals/Outcomes: Reduce impacts on the stream especially flow and nutrient issues.
   - Partners: Trout Unlimited, Erie County Conservation District, PA Fish and Boat Commission

5. Education
   - Detail: Business owners within the watersheds
   - Cost/Technical Assistance: $5,000 will be needed to develop workshops and materials

- Description: Workshops will be provided to businesses with education on where they may have impacts on the watershed, such as stormwater run off.
- Goals/Outcomes: Educate business owners on day to day impacts that land use has on a stream. Reduce non-point source pollution and encourage conservation practices.
- Partners: Erie County Conservation District, PA Sea Grant, Fairview and Girard School Districts, Townships, Science Education Partners

6. Monitoring
   - Detail: Phase four monitoring and evaluation efforts.
   - Cost/Technical Assistance: $10,000
   - Description: For phase four monitoring will include basic water quality readings, water chemistry samples, habitat assessments, photographic documentation and landowner surveys. (more detail is included in section IX)
   - Goals/Outcomes: Evaluate and track progress
   - Partners: Erie County Conservation District, PA Fish and Boat, Trout Unlimited, PA Sea Grant and Department of Environmental Protection

Phase Five: July 2019 and beyond

1. Streambank Restoration
   - Detail: 1,500ft
   - Cost/Technical Assistance: $225,000 will be needed for design and construction costs.
   - Description: For phase five, we will continue working off of the priority list until all willing property owners have participated.
   - Goals/Outcomes: Reduce sedimentation due to bank erosion
   - Key players: Erie County Conservation District , PA Fish and Boat Commission, Township officials, Department of Environmental Protection, and property owners

2. Stormwater BMPs
   - Detail: Install 2-3 acres of swales, roadside BMPs, rain gardens, or other retention and diversion.
   - Cost/Technical Assistance: $25,000 for design and construction of BMPs.
   - Description: For phase three, stormwater BMPs will be targeted in high and low density areas around the major and local road corridors.
   - Goals/Outcomes: Improved filtration capacity of the watershed, reduction in sediment, nutrients and other pollution sources from stormwater run-off, stream flow impacts
   - Partners: Erie County Conservation District, Township officials, Department of Environmental Protection

2. Hatchery Improvements
   - Detail: Install water reuse systems for one hatchery along Godfrey Run.
   - Cost/Technical Assistance: $200,000 will be needed for this BMP.
   - Description: A capture and reuse system will be installed to be used with one of the hatcheries. A solar system will be implemented to operate the system and a filtration system will also be included.
   - Goals/Outcomes: Reduce impacts on the stream especially flow and nutrient issues.

- Partners: Trout Unlimited, Erie County Conservation District, PA Fish and Boat Commission

2. Education
   - Detail: Brining it all together.
   - Cost/Technical Assistance: $5,000 will be needed to develop workshops and materials
   - Description: Workshops will be provided watershed stakeholders information on what activities have taken place for watershed restoration and what impact has it made..
   - Goals/Outcomes: Educate property owners on day to day impacts that land use has on a stream. Reduce non-point source pollution and encourage conservation practices.
   - Partners: Erie County Conservation District, PA Sea Grant, Fairview and Girard School Districts, Townships, Science Education Partners

2. Monitoring
   - Detail: Phase five monitoring and evaluation efforts.
   - Cost/Technical Assistance: $10,000
   - Description: For phase five monitoring will include basic water quality readings, water quality samples, habitat assessments, photographic documentation and landowner surveys. (more detail is included in section IX)
   - Goals/Outcomes: Evaluate and track progress
   - Partners: Erie County Conservation District, PA Fish and Boat, Trout Unlimited, PA Sea Grant and Department of Environmental Protection

IX. Water Quality Monitoring and Evaluation

Monitoring criteria for the duration of the implementation schedule will include environmental sampling and social surveying. The following list describes each criterion, how often sampling/surveying will take place, who will participate, and where the funding will come from. These monitoring efforts will be used in combination to other tracking and modeling efforts to determine success or failure in reaching the milestones described further in this section.

1. Biological and Habitat Data Collection
   The data is collected and analyzed using the methods described in the PA DEP document titled "Instream Comprehensive Evaluation Surveys". Threshold values for impairment are derived through a variety of calculations and observation criteria. More information about these methods can be found in the attached document: ICE. This sampling will take place in years 3, 6, and 9. ECCD staff, Sea Grant staff and DEP staff will participate in sampling.

2. Chemical Data Collection
   Water samples will be collected from the streams and sent to either the Department of Environmental Protection lab or a local lab depending on funding. This sampling will take place in years 3, 6, and 9. ECCD staff, Sea Grant staff and DEP staff will participate in sampling.

3. Basic Water Parameters
   This will include pH, temperature, conductivity and dissolved oxygen. Samples will be taken at the six sampling sites on each stream and will be taken twice a year. This will be performed the ECCD staff.

4. Physical/Visual Data Collection
   This will include before and after photographs of project/problem areas, site visits with landowners and streambank erosion areas. This will take place on an on-going basis each year and will involve ECCD staff.

5. Landowner Surveying
   Surveys will be distributed to landowners that participate in workshops, mailings, and other public involvement opportunities. This will take place on an on-going basis each year and will involve ECCD staff.

6. Fish Hatchery Data
   Ttemperature information at the six hatcheries and nurseries along Godfrey Run and Trout run are taken on a daily basis. This information will be shared with ECCD from the PA Fish and Boat Commission and used for evaluation.

The following table describes milestones that we expect to meet with the implementation of the plan.

Indicator	Target Value	Short-term Goal	Mid-term Goal	Long-term Goal	Method for evaluation
IBI Score	Higher than 63	Increase by 5 points	Increase by 10 points	Increase by 20 points	ICE Protocols
Habitat Score		Increase by 10 points	Increase by 20 points	Increase by 30 points	ICE Protocols
Sediment Load	Decrease by 30%	Decrease load by 15%	Decrease by 25%	Decrease by 30%	PreDict modeling
Phosphorus Load	Decrease by 15%	Decrease by 5%	Decrease by 10%	Decrease by 15%	PreDict modeling
Nitrogen Load	Decrease by 25%	Decrease by 5%	Decrease by 10%	Decrease by 25%	PreDict modeling
Riparian Areas	10,000 ft restored	3,000 ft	3,000 ft	4,000 ft	Measure/track project length
Septic System Improvements	150 systems improved	85	65	0	Workshop surveys and program participants
Public Involvement	250 participants	150	50	50	Workshop and project participants

A formal evaluation of the data and the milestones will take place in years 3, 6 and 9. There will be various methods and tools for evaluation such as baseline surveys, focus groups, direct measurements, modeling, and stake holder interviews. Summaries of these evaluations will be shared with partners, cooperative agencies, property owners and township officials. The information will be shared through direct mailings, website postings, email, and meetings. In between years 3, 6, and 9 however progress will be tracked on an on-going basis. Keeping detailed information in-between major years will help ensure a thorough evaluation process. It will also help make small changes when needed.

Environmental Component—This component will be tracked using a spread sheet system and corresponding GIS system. Activities for this component will include: agriculture BMPs, low/high density BMPs and streambank restoration. Details on size, activity, property owners, and potential benefits will be entered into an excel sheet that can be linked to a GIS created map to view location and geographical reference of the BMPs. Pre and post questionnaires will also be kept for the BMPs to help evaluate the procedures and make future implementation more productive.

Administrative Component —This component will be tracked using progress reports, detailed budget sheets, worksheets and formal signed contracts. Activities for this component will include: grants/funding sources, partners, key staff, landowner contracts and operation and maintenance plans. The system for tracking grants and funding sources will be defined by the grantor/grantee contracts. Worksheet will be developed to keep track of the program management on the responsibilities of key staff and partners. Detailed landowner

contracts will be used to define the responsibilities of landowners and the long-term operation and maintenance needed for BMPs.

Social/Public Involvement Component—This component will be tracked using progress reports and program evaluations. Activities for this component will include: mailings, website updates, newspaper articles, workshops and focus group discussions. Tracking the response from mailings, website hits and newspaper responses will be entered into an excel sheet. Participants in workshops and focus groups will be provide evaluation sheets to complete.

Monitoring data, milestone evaluations, and progress tracking will help to maintain forward progress on the implementation plan. It will also be vital to help in an areas that may need remedial action.

X. Remedial Actions Management

If the monitoring data, milestone evaluation and progress tracking suggest that we are not meeting our goals and objectives a worksheet has been developed to help explore reasons why this may be happening. This worksheet was developed from the EPA's "Handbook for Developing Watershed Plans to Restore and Protect Our Waters"; a manual for writing an implementation plan. Suggestions will be followed on the worksheet which range from simply modifying the implementation schedule to re-evaluating the cause of impairment. Please review the worksheet for more information.