The Middle Creek Watershed Assessment Report

Updated – January 8, 2016

Written by the

Watershed Alliance of Adams County

And

Adams County Conservation District

With funding from the

Coldwater Heritage Partnership

Acknowledgements

This project was completed by a dedicated staff of volunteers. The Watershed Alliance of Adams County, Adams County Trout Unlimited, and Strawberry Hill Nature Preserve thanks the following people for participation in various aspects of the chemical, physical and macroscopic invertebrate data needed to evaluate and document the health of Middle Creek.

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Historical Landscape of Middle Creek

Middle Creek appears as early as 1792 on Reading Howell's map of Pennsylvania as a prominent waterway between Marsh and Tom's Creek. During this time, from the middle of the 18th century until after the American Revolution the population in Adams County lived a frontier-like existence. Settlement in the area began with the felling of trees, clearing rocks, burning brush, and cultivation.

One of the documented mills on Middle Creek was subsequently a wool and cloth factory. The mill sat on the creek, two miles from Emmitsburg on the main road to Gettysburg. On February 6, 1829, Reverend David Pfoutz bought the Middle Creek Factory for $4,020 and sold it 30 years later to Samuel McNair for $5,500. The factory carded wool into rolls that was manufactured into cloth, cassimere, cassette, blanketing, and flannels. The mills depended on the flow of water in the creek to serve local families and villages.

The author of *A History of Cumberland and Adams Counties*, written in 1886, writes that in 1758 the house of Richard Baird (Bard), who "resided on the southeast side of South Mountain, near the mill now known as Myers Mill, on Middle Creek about one and one half miles from Fairfield" was attacked by Delaware Indians. Native Americans used the land in the watershed before the European settlers, although there is no written history of their experiences in this watershed.

Middle Creek is known today as one the best quality streams in Adams County and its health is important for the Monocacy watershed. In recent history, there have been development pressures throughout the Middle Creek Watershed.

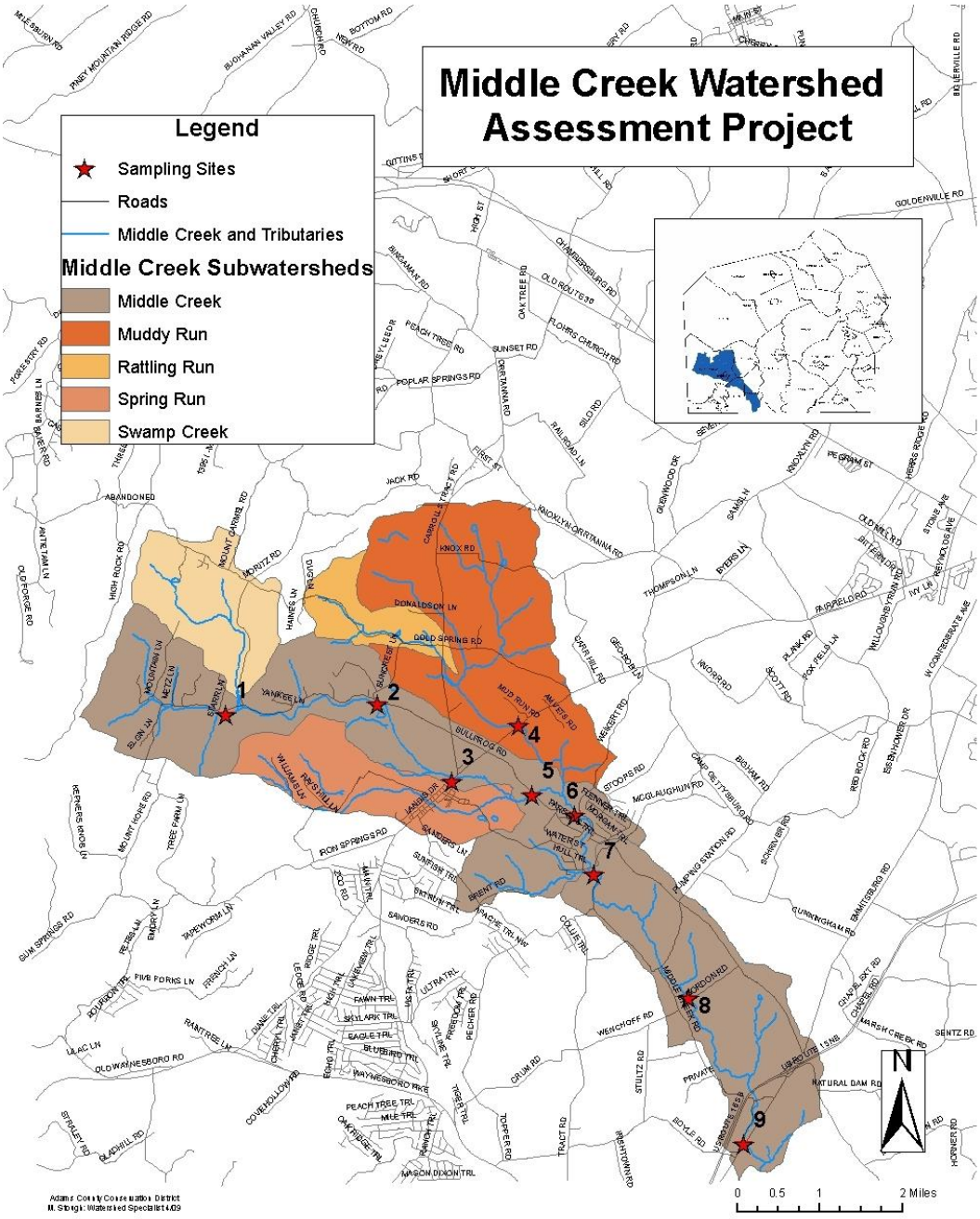
The Watershed

The Middle Creek Watershed is approximately 24 square miles (mi^2) located along the face of South Mountain in southwestern Adams County. Approximately 7.5 mi^2 of the watershed is designated as Special Protection waters by the Pennsylvania Department of Environmental Protection: 4.5 mi^2 Exceptional Value Coldwater Fishes, and 3 mi^2 High Quality Coldwater Fishes. The Pennsylvania Fish and Boat Commission have designated portions of the stream as Approved Trout Water. Middle Creek is considered one of the county's highest quality streams, by the state of Pennsylvania as well as the local residents and anglers. The Middle Creek Watershed covers portions of 6 different municipalities, including the townships of Hamiltonban, Highland, Liberty, and Freedom. The entire borough of Fairfield and a small portion of Carroll Valley are included in the watershed.

The watershed landscape includes large forested tracts of land, fruit orchards, crop and grazing lands, residential housing developments, a golf course, an active limestone quarry, and the borough of Fairfield. Middle Creek joins Toms Creek in Maryland, forming a tributary to the Monocacy River. The Monocacy enters the Potomac River which eventually empties into the Chesapeake Bay.

The Problem

The Watershed Alliance of Adams County decided to record the current health of Middle Creek in light of the impact of expanding development in this watershed. The entire stream is threatened by agricultural runoff, failing sewer systems, and large scale land development along its banks. A study of the chemical, physical and biological health of the stream needed to be documented.



Introduction

In August 2007, the Watershed Alliance of Adams County in partnership with Strawberry Hill Nature Preserve, Adams County Trout Unlimited and the Adams county Conservation District, received a $4,300 grant from the Coldwater Heritage Partnership to develop a baseline assessment of Middle Creek. The study included a survey of the in-stream insects, a survey of existing fish populations, collection of water chemistry data, and an evaluation of the streamside habitat. This project was the initial step in developing a comprehensive watershed evaluation and improvement plan.

The Middle Creek partners have developed the following goals:

- To promote the values and benefits of the Middle Creek Watershed
- To develop an appreciation of a local water resource
- To encourage the continued preservation and protection of the Middle Creek Watershed

The Middle Creek Watershed is approximately 24 mi^2, and stretches from the headwaters in South Mountain near Strawberry Hill Nature Preserve to the Pennsylvania-Maryland border. Approximately 7.5 mi2 of the watershed is designated as Special Protection waters by the Pennsylvania Department of Environmental Protection: 4.5 mi2 Exceptional Value Coldwater Fishes, and 3 mi2 High Quality Coldwater Fishes. The remainder of the stream is designated as a Coldwater Fishes. Middle Creek is considered one of Adams County's highest quality streams, by both the state of Pennsylvania as well as local residents and anglers. The Pennsylvania Fish and Boat Commission and other local organizations stock trout annually in the section of approved trout waters.

The Alliance for Aquatic Resource Monitoring (ALLARM) trained volunteers on every aspect of the stream study. Throughout the year, ALLARM was invited to Strawberry Hill Nature Preserve to train volunteers in water chemistry analysis, macroscopic invertebrate (macroinvertebrate) analysis, and streamside habitat surveys.

Materials and Methods

The water quality and overall health of Middle Creek were determined by collecting and analyzing the chemical, physical and biological factors in and around the stream. An introduction to the creek was organized by Adams County Trout Unlimited. A representative of the Pennsylvania Fish and Boat Commission accompanied a small group of volunteers on a reconnaissance of the stream. A special concern regarding fish barriers and issues of engineering in-stream habitat were observed and discussed.

Chemical Factors

The stream was divided into nine sampling stations located at points of easy access, near bridges, and fords starting at Strawberry Hill Nature Preserve and ending at the Pennsylvania – Maryland line. Each site, numbed 1-9, was assigned to a volunteer who conducted multiple chemical and physical tests of the water on the second weekend of each month. Sampling started in October 2007 and ended in October 2008. (see appendix A)

Chemical kits produced by HACH Company were used to test the water for dissolved oxygen, nitrates, phosphates, and sulfates. The acid-base measurement of the water was determined by a simple dip pH strip colorpHast, by EMD. Temperature was recorded by a simple alcohol thermometer designed for aquatic study. The turbidity was measured using a clear plastic secchi disk tube. Dissolved oxygen was measured on site. A water sample was collected on site and brought back to the lab or kitchen for the remaining chemical tests. Each volunteer collected weather and stream

condition data during each bimonthly sampling event. This information was recorded on EASI Tally Sheets. (see appendix D)

The chemical data was collected and was entered into multiple spread sheets for analysis and graph development. "Box and Whisker" graphs were developed to show both the yearlong averages by site and annual chemistry of the creek for the year for each chemical tested.

Biological Factors

The in-stream insects also known as macroinvertebrates are very good indicators of stream health. Macroinvertebrates were collected at three sites in the creek. Sites #1, #7, and #9 represented the top, middle, and bottom of the streams reaches. Kick nets were placed in a single reach at each location and one square meter of benthic material was vigorously disturbed and the stream's current carried the macroinvertebrates into the net. The sampling method was repeated nine times and the collected organisms were placed in a bucket. ALLARM trained the volunteers in identifying macroinvertebrates and how to use the EASI method. (see appendix B)

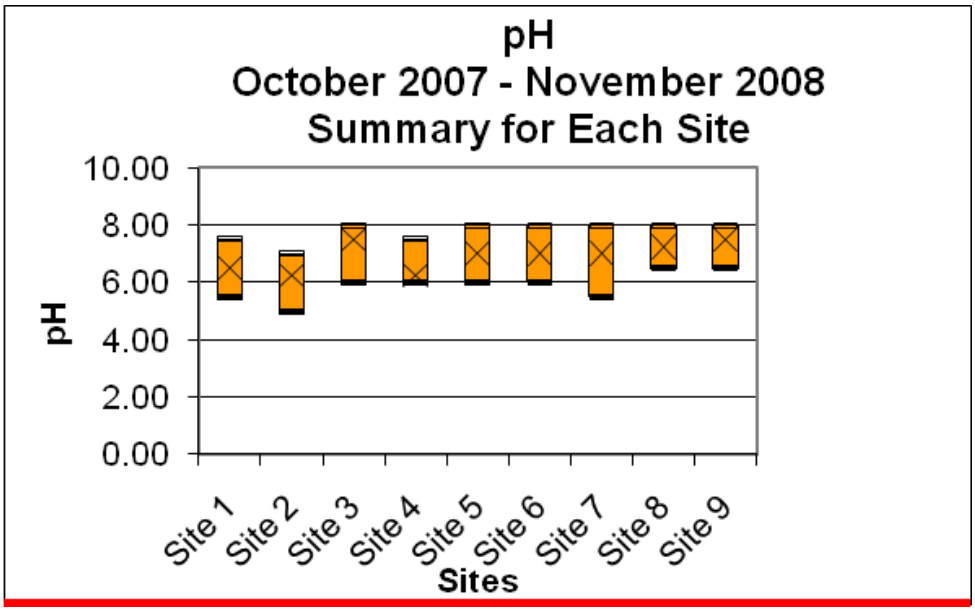
Streamside Habitat

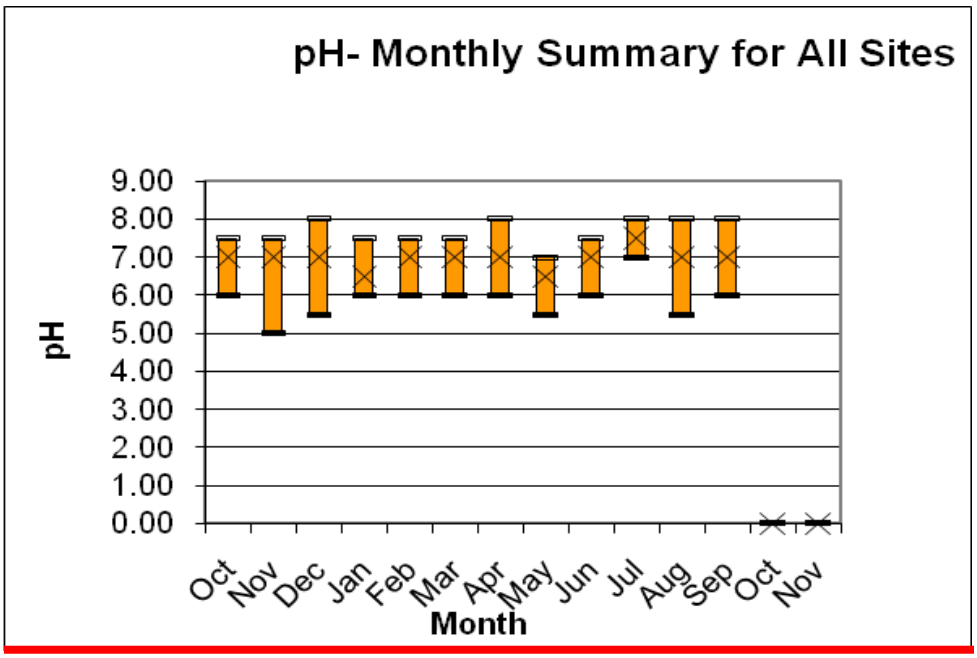
ALLARM was invited to Strawberry Hill Nature Preserve to train volunteers to conduct habitat surveys. Volunteers were assigned sections of the creek to walk and complete an extensive visual survey of the stream and streamside habitat. Every attempt was made to contact all the land owners along Middle Creek to seek permission to enter their property. All land owners, except a very few, provided permission to access their property and many were excited about the project. Within three months, all of the visual surveys were completed.

Chemical Results:

pH

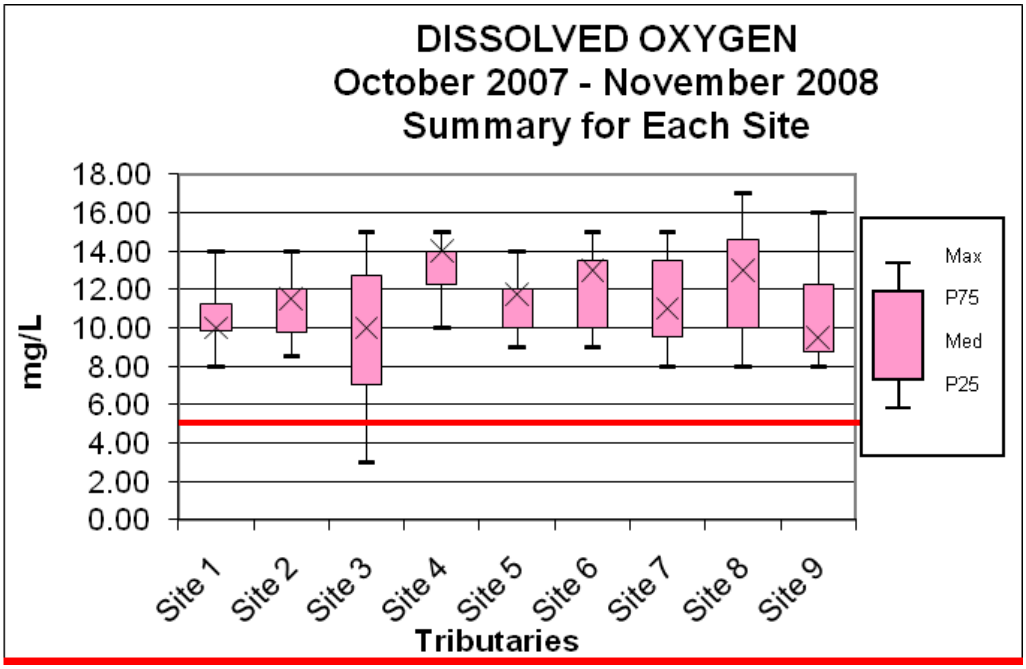
Each month, pH was measured and the data was projected into graphs. The measured and averaged pH at each site had little variation from 6 to 7. The average pH of the entire stream appears to vary slightly from month to month from pH of 6.0 to 7.5.

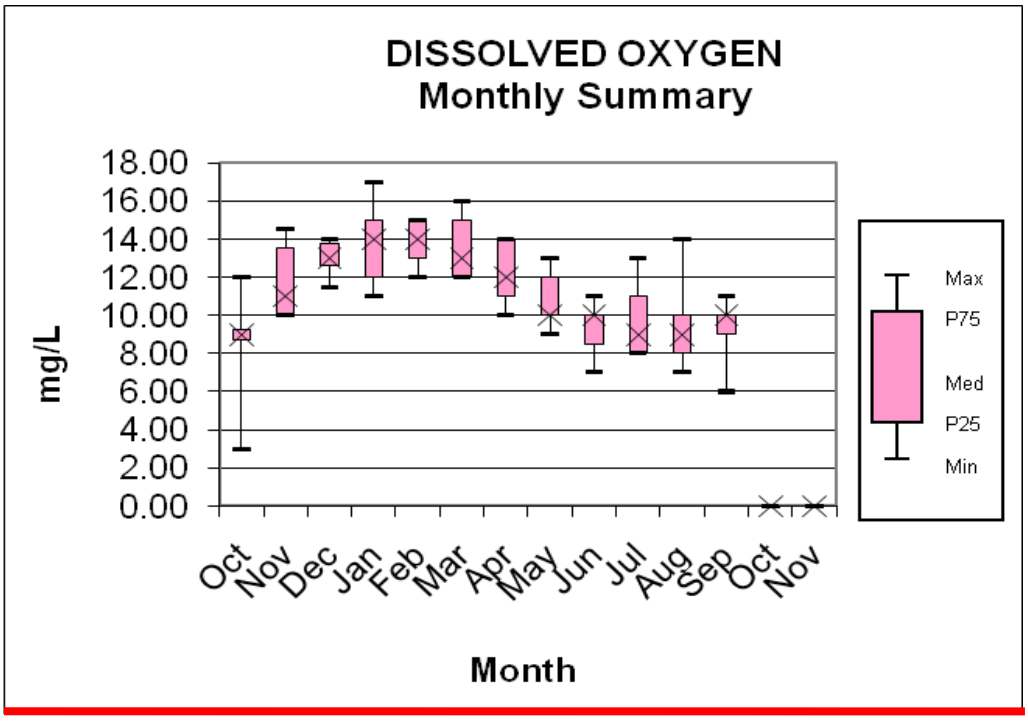




Dissolved Oxygen

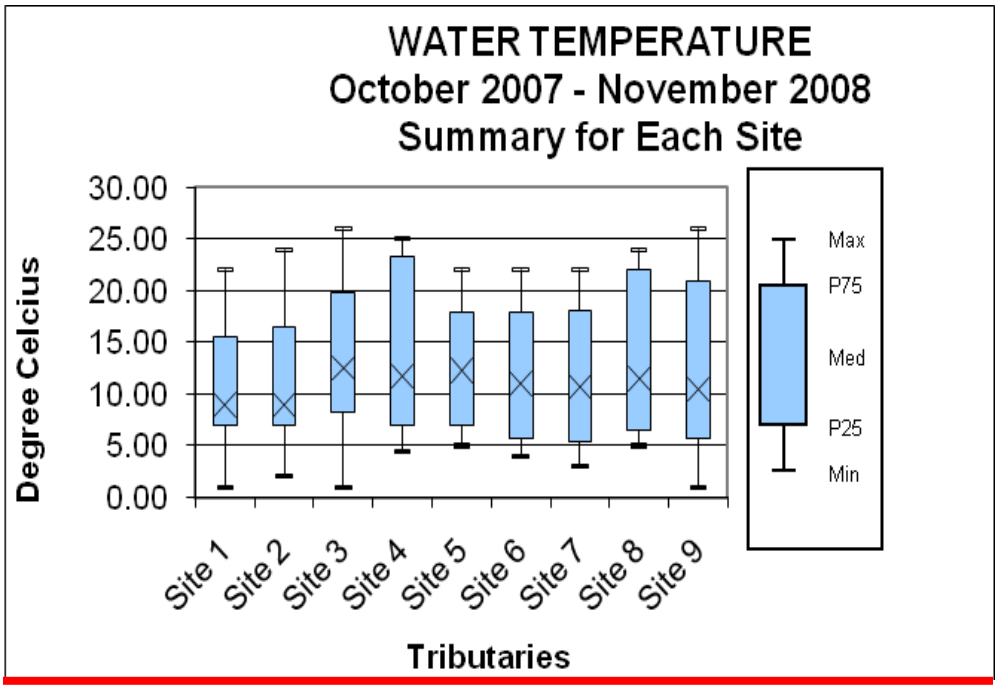
The dissolve oxygen (DO) varied among the sites from 8.0 mg/L to 13.0 mg/L. There was not much data used to project Sites #1 and # 6 due to problems with collecting consistent data. The mean averages of all sites show a seasonal variation ranging from low values in the summer months to higher values in the fall, winter and spring months. Water temperature is a major factor in the amount of DO. As water temperature increases, DO levels decrease. Coldwater or trout fisheries require DO levels >5 mg/L. The red line on the graph below indicates that level.

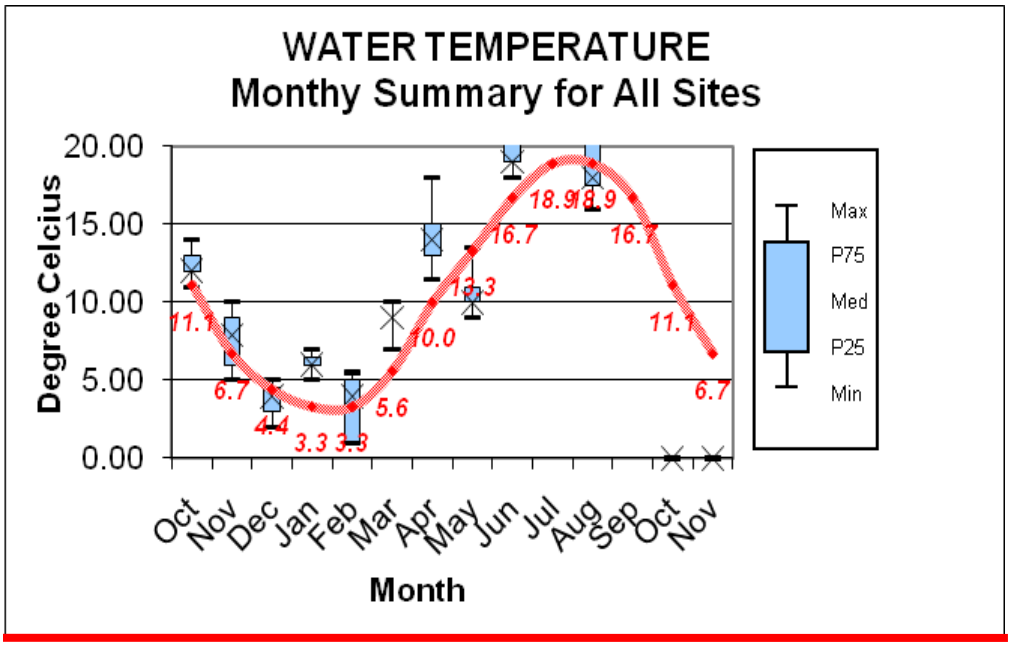




Water Temperature

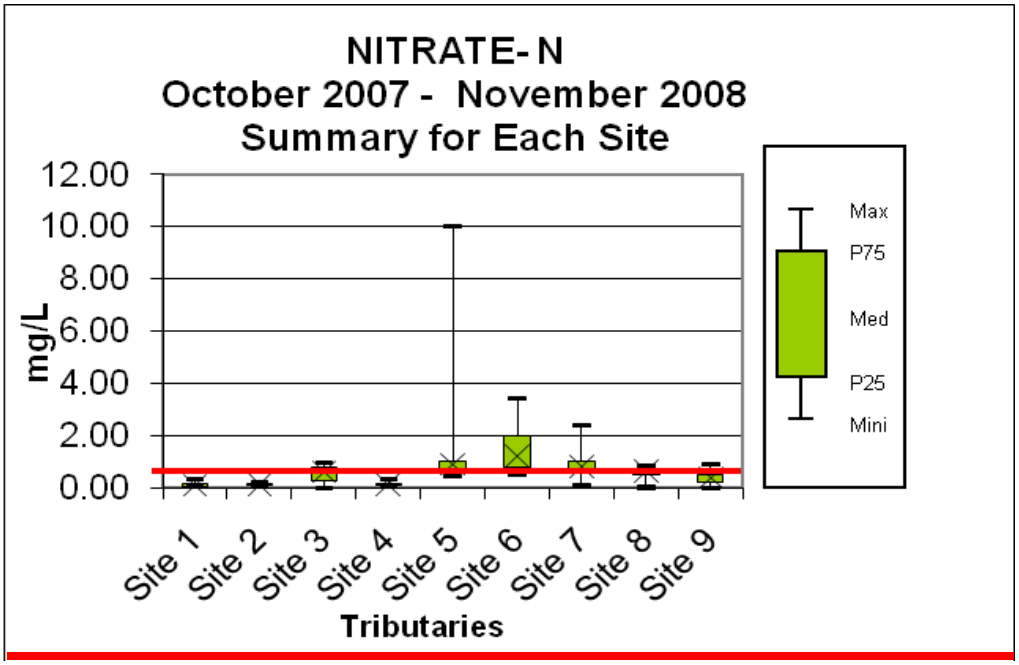
The water temperature for Middle Creek was generally very good for a stream that is classified as exceptional value coldwater fishery, high quality coldwater fishery, and a coldwater fishery. Average temperatures at each site never exceeded 15° C. The yearlong averages indicate a high of less than 20° C in the summer months, and a low of 3.3° C in the winter. Sites 1-5 were expected to have average lower temperatures than sites 6-9 because sites 1-5 represent data collected from the upper reaches of the stream and correspond to the exceptional value and high quality coldwater fishery portion of the study.

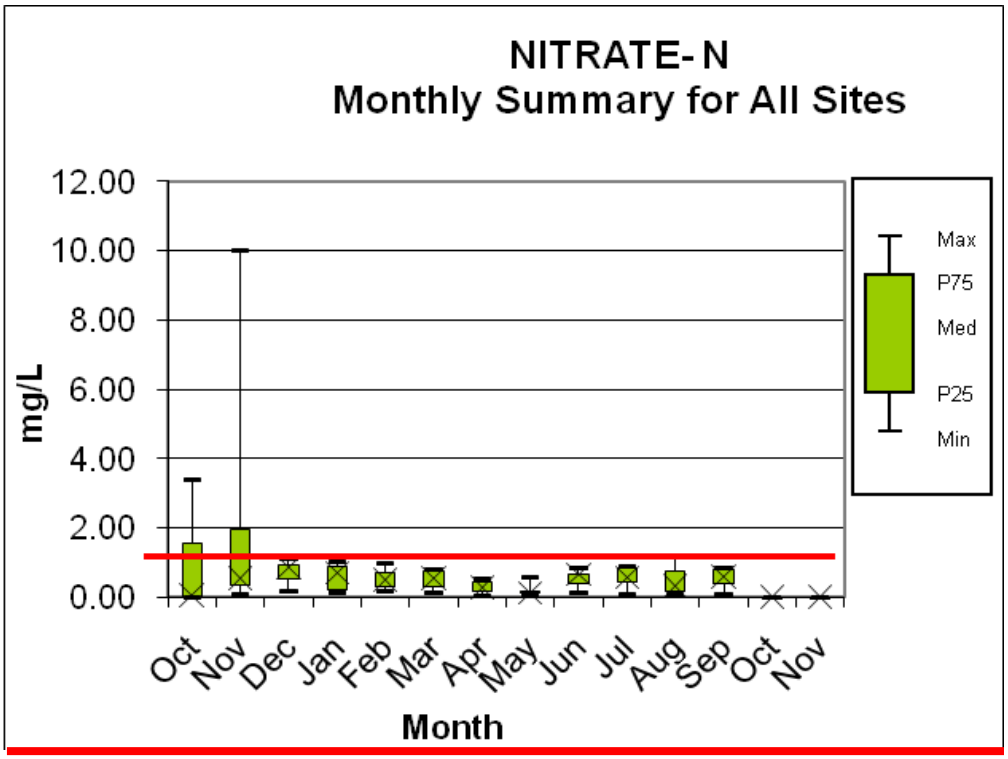




Nitrate-Nitrogen

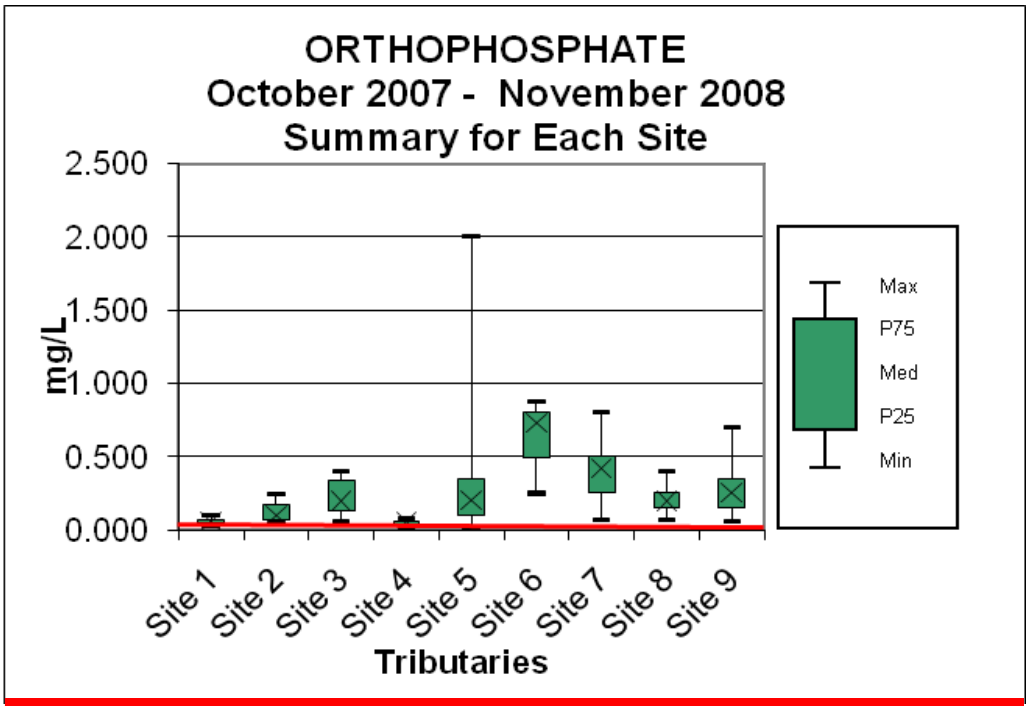
Nitrate-Nitrogen concentrations for the yearlong study were well below the 1.00 mg/L. The monthly means of all sites show a slight upward fluctuation in concentration in January and September. The October, November, and February concentrations show a wide range of variability from site to site that may cast question on the methods employed by the samplers. The red line on the graph indicates an acceptable level of nitrate concentration for a coldwater fishery.

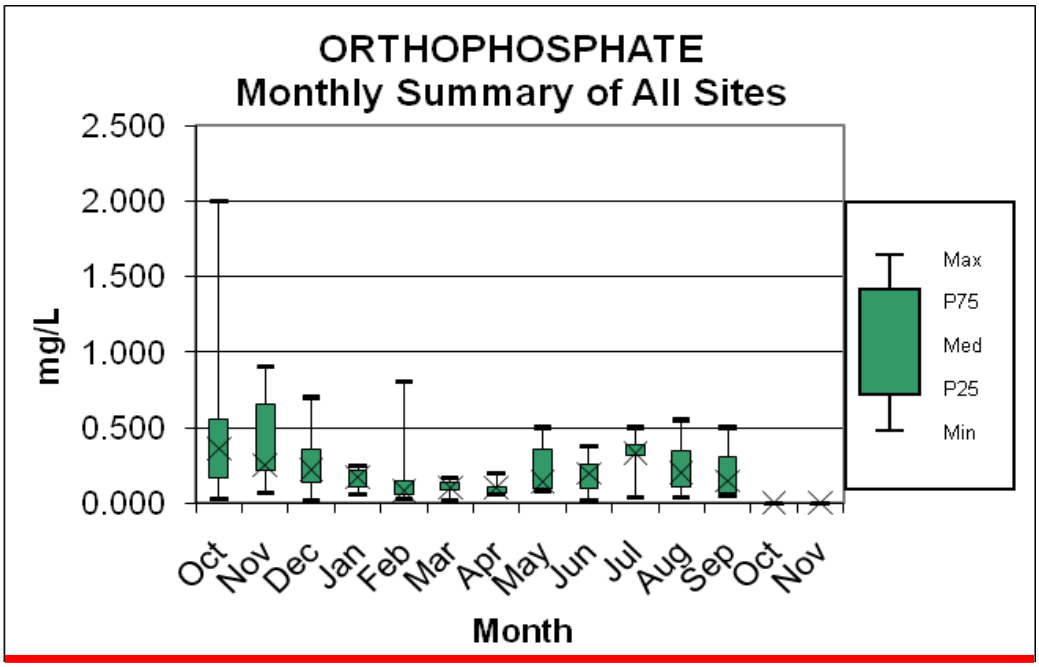




Orthophosphates

The orthophosphate concentrations show the greatest fluctuations throughout the year of this study. The mean orthophosphate concentrations fluctuate from approximately 0.300 mg/L to 0.100 mg/L. Concentrations of orthophosphates are higher in the coldwater fishery portion (sites 6-9) of this stream then in the exceptional value and high quality coldwater fishery sections (sites 1-5). The red line on the graph indicates an acceptable level of orthophosphate concentrations for a coldwater fishery.





Sulfate

Sulfate concentrations were less than 50 mg/L and no precise value was obtained below that concentration.

Biological Survey Results

The results of the macroinvertebrate sampling were compiled from three locations on Middle Creek. Site #1 is near the headwaters of the creek and is located at Strawberry Hill Nature Preserve. Site #7 is located near the center of Middle Creek as it traverses Adams County. Site # 7 was sampled near a bridge on McGlaughlin Road, in Fairfield. Site #9 is located near the Pennsylvania-Maryland line under a bridge on Emmitsburg Road. Macroinvertebrates were sampled on three different dates as indicated in table 1 and the EASI Method was used to calculate a stream score.

The first sample was collected in the fall of 2007 at Strawberry Hill. This was part of the macroinvertebrate analysis workshop directed by ALLARM. The remainder of the dates selected involved analysis of all three sites. The September analysis indicted the stream had a good rating with a EASI score of 42.4. In November, Sites 1, 7 and 9 resulted in ratings of Fair, Good and Good, and a Fair across all sites for the April 2008 sample date.

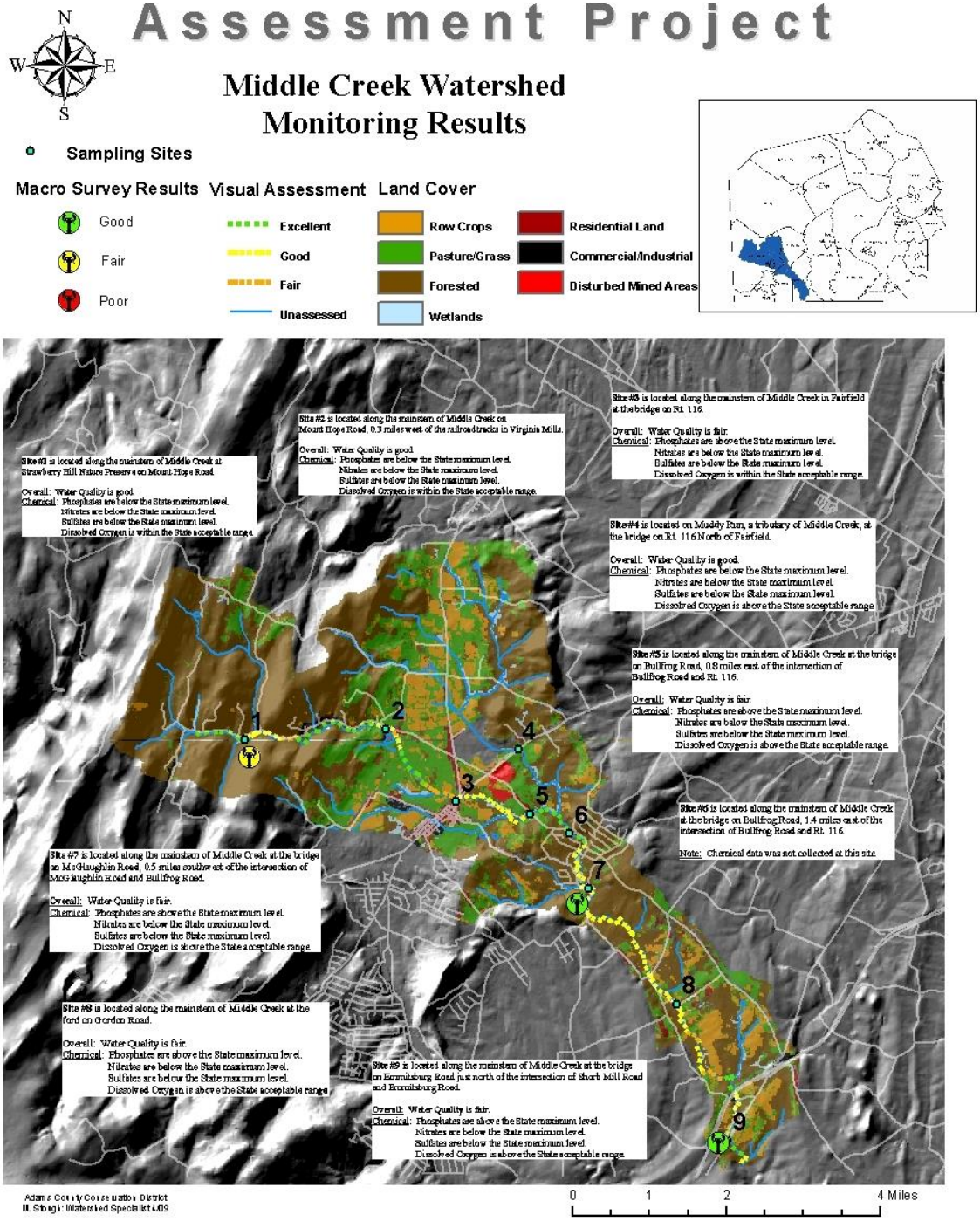
Table 1: On the dates indicated, three sites on Middle Creek were analyzed.

Date	Site #1	Site #7	Site #9
September 27 2007	Score: 42.4 Good	N/A	N/A
November 15 2007	Score: 34.4 Fair	Score: 53.4 Good	Score: 56.1 Good
April 14 2008	Score: 29.9 Fair	Score: 38.1 Fair	Score: 36.7 Fair

Habitat Results

Some of the physical characteristics of a stream that indicate good quality are stable banks with a wide forested buffer zones on both sides of the stream, also known as a riparian buffer. Another physical indicator of good water quality is the absence of fish barriers within the stream itself that prevents the natural migration of aquatic organisms up or down stream. A modified rapid bio-assessment protocol was used to assess habitat along the entire length of Middle Creek. The total score of Middle Creek is indicated in a color code on the legend of the map below. This poster was created to show the results of all sampling throughout the project including chemical, biological and physical data and helps to visualize and compare different stream sections.

Middle Creek Watershed Assessment Project



Discussion

After reviewing the results of our yearlong sampling effort, pH, dissolved oxygen, water temperature, and nitrate concentration levels all fell within the range considered to be healthy by the PADEP.

Orthophosphates concentrations at all sites in the study are greater than those expected for a healthy stream. Many of the sample sites below site 5 were much higher than those upstream. Directly above this area, there is a wastewater treatment plant, golf course, agriculture, and residential areas lacking riparian buffers. Since phosphates are typically binding to soils particles, the lack of riparian buffers and increase soil erosion could be the cause of the elevated phosphate levels. Further study may be required to focus on phosphates above and below these influences.

Sulfate levels were too low to make any reasonable explanation of how this chemical would influence life in the stream and the stream's overall health.

Middle Creek Macroinvertebrates

The EASI Method employed by the participants allowed for a quick and easy method to determine stream health. Macroinvertebrates were sampled using this method three times during the study and samples were taken from three sites, one at the upper reach, one near the middle, and one near the bottom of the stream's length in Adams County.

The results of the study indicate the stream is in good to fair health. Site 1, near the upper reach of the stream varied from good to fair quality from fall to spring when sites 7 and 9 matched that site's quality. The macroinvertebrate study indicates that the chemicals found in the stream had very little effect on the health of the stream.

The results of the 2007-2008 study of Middle Creek stream in Adams County Pennsylvania indicate the stream is in good health with some concern about orthophosphate concentrations.

Recommendations

Although Middle Creek is a fairly healthy watershed, further measures could be taken to improve the stream. The following six recommendations would reduce nutrient and/or sediment runoff, improve wild trout habitat, and/or improve the migration of native fishes.

1. Plant Forested Riparian Buffers: plant trees along the tributaries and main stem to decrease water temperatures, increase dissolved oxygen, and reduce nutrient and soil runoff.

2. Install Stream Bank Fencing: install fencing along appropriate sections of the stream to exclude cattle to help keep the stream banks stable.

3. Stabilize Stream Bank Erosion: install practices that stabilize banks to reduce soil erosion.

4. Install Instream Fish Habitat Devices: install devices that improve instream habitat for trout and other species.

5. Restore Floodplains: taper banks to an appropriate slope so the adjacent land can function as a healthy floodplain to settle out suspended soil during high flows.

6. Remove Fish Barriers: remove barriers that block fish migration.

References

Adams County Historical Society

History of Cumberland and Adams Counties, PA. (HCA) Werner, Beers and Co., Chicago 1886, 1974 reproduction. Pages 8, 52, 261, 262, 276, 277, 298, 472

Bloom, Robert L. A History of Adams County, Pennsylvania: 1700-1990, Adams County Historical Society, 1992

Adams Sentinel "Middle Creek Mill and Factory" April 15, 1833, April 16, 1823

Living Places "Fairfield Borough" http://www.livingplaces.com/PA/Adams_County/Fairfield_Borought.html 9/1/2007

Middle Creek Chemical Monitoring Calendar

2007

SEPTEMBER						
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2008

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October 12-14, 2007- Don't forget to collect extra samples in the Whirl-Pak bags and drop them off to me at the Ag Center for quality control. Please give me a call at **334-0636 ext 344** or email at vtrinh@adamscounty.us if you have questions or want me to come along.

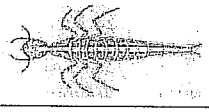
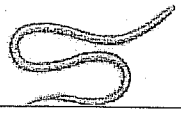
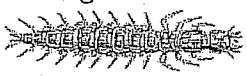
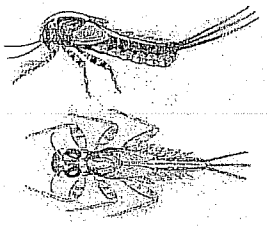
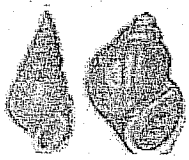
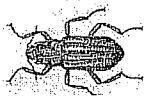
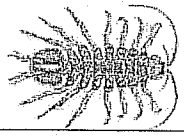
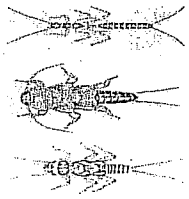
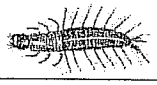
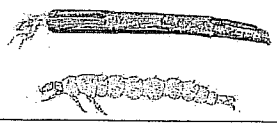
Monthly Monitoring Window- Monthly monitoring has been set up from Friday-Monday the second full weekend of the month. Dates in **RED** are county holidays, so I will not be in the office to answer questions. My home phone is **(717) 642-5525**.

If for any reason, you are not able to monitor your site, please let me know prior to the "window". Thanks!

Appendix B

Tally Sheet for EASI Method

Enter:
Rare (R) = 1 – 9 organisms
Common (C) = 10 – 99 organisms
Dominant (D) = ≥ 100 organisms

Group I Sensitive	Count	Group II Somewhat Sensitive	Count	Group III Tolerant	Count
Water Penny Larvae 		Beetle Larvae 		Aquatic Worms 	
Hellgrammites 		Clams 		Blackfly Larvae 	
Mayfly Nymphs 		Cranefly Larvae 		Leeches 	
		Crayfish 			
Gilled Snails 		Damselfly Nymphs 		Midge Larvae 	
		Scuds 			
Riffle Beetles (adult) 		Sowbugs 		Snails 	
Stonefly Nymphs 		Fishflies 		Site Designation:	
		Alderflies 			
Non Net-Spinning Caddisfly Larvae 		Net-Spinning Caddisfly Larvae 		Team Members:	

Calculating the EASI Index Value to Rate the Water Quality of the Stream

(From EPA Volunteer Monitoring Methods Manual)

To calculate the index value, add the number of Rs, Cs, and Ds for each group and multiply by the indicated weighting factor:

Group I (Sensitive)	**Group II** (Somewhat Sensitive)	**Group III** (Tolerant)
#Rs _____ x 5.0 = _____	#Rs _____ x 3.2 = _____	#Rs _____ x 1.2 = _____
#Cs _____ x 5.6 = _____	#Cs _____ x 3.4 = _____	#Cs _____ x 1.1 = _____
#Ds _____ x 5.3 = _____	#Ds _____ x 3.0 = _____	#Ds _____ x 1.0 = _____
Group I Sum = _____	**Group II Sum** = _____	**Group III Sum** = _____

To calculate the water quality score for the stream site, add the index values for each group. The sum of these values represents the water quality score.

Group I Sum _____ + Group II Sum _____ + Group III Sum _____ = _____
(WQ score)

Water Quality Scores
Good = > 40
Fair = 20 – 40
Poor = < 20

Note: The tolerance grouping (Group I, II, and III) and the water quality rating categories were developed for streams in the Mid-Atlantic states. A trained biologist familiar with local stream fauna should help determine if these tolerance and water quality rating categories should be modified for your geographic region and program.

Stream Name: _____ Site #: _____ Date: _____

Monitor's Name: _____ Owner's Name: _____

Reach location: Start Lat. _____ Start Long. _____

End Lat. _____ End Long. _____

Land use (%): Row crop_____ Grazing/pasture_____ Forest_____

Residential_____ Conservation Reserve_____ Park_____

Industrial_____ Commercial_____ Other_____

Weather conditions: Today_____ Past 2-5 days_____

Active channel width (bankfull):_____Approximate reach length:_____

Dominant substrate: Boulder____Cobble____Gravel____Sand____ Silt____ Mud____
(>10in) (2.5-10in) (0.5-2.5in) (<0.5in)

Site Diagram:

Notes:

Categories	**Scores (1-10)**
Channel Condition	_____
Bank Stability	_____
Riparian Zone	_____
Water Appearance	_____
Nutrient Enrichment	_____
Fish Barriers	_____
In-stream Fish Cover	_____

Cover types (check when present):
Logs/large woody debris____ Deep pools____ Overhanging vegetation____
Boulders/cobbles____ Riffles____ Isolated/backwater pools____
Thick root mats____ Undercut banks___ Dense beds of aquatic plants__
Other___

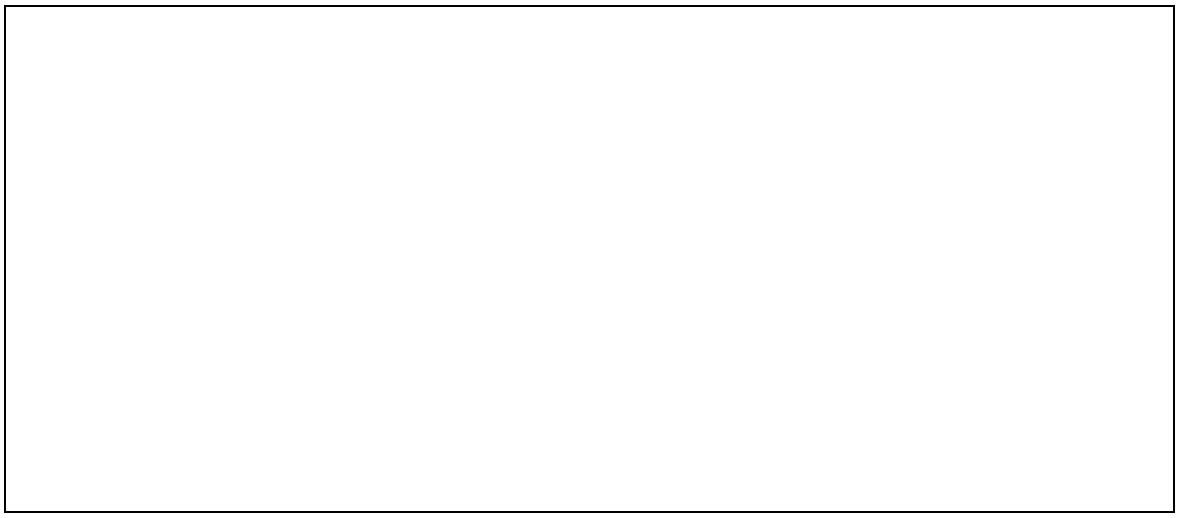
Insect/invertebrate Habitat _____

Habitat examples (check when present)
Fine woody debris____ Submerged logs____ Leaf packs____ Cobbles____
Boulders____ Coarse gravel____ Undercut banks___ Other____

Embeddedness	_____
Canopy Cover	_____
Manure Presence	_____
Sewage	_____

Overall score (total/#scores):_____

Problem Diagram:
Type of problem:_____



Middle Creek Water Monitoring Data Sheet Appendix D

Monitor's Name:_____

Sample Site #/Location:_____ **Date**:_____ **Time**:_____

Weather Conditions: ☐Clear ☐Partly Cloudy ☐Cloudy ☐Rain ☐ Snow

Precipitation in the Past 48 hours: ☐None ☐Trace ☐Light ☐Moderate ☐Heavy

Water Appearance: ☐Scum ☐Foam ☐Oily Sheen ☐Muddy ☐Milky ☐Clear ☐Other:_____

Streambed Coating: ☐Orange/Red ☐Yellowish ☐Green ☐Black ☐Brown ☐None ☐Other:_____

Odor: ☐Rotten Egg ☐Musky ☐Acrid ☐None ☐Other:_____

Air Temperature: _____° C **Stream Flow**: ☐Low ☐Moderate ☐High

*Prepare all tubes, sample cells and droppers by rinsing 3 times in sample water. Do *3rd replicate only as needed.*

TEMPERATURE

1. Tie a string to the end of the thermometer and lower it about 4 inches below the surface.
2. Keep the thermometer in the water for about 2 minutes or until a constant reading is obtained.

_____° C

TRANSPARENCY/TURBIDITY TUBE

1. Rinse tube 3 times in the stream.
2. Make sure drain is closed and fill the tube.

Or

1. Collect sample in a bucket or bottle.
2. Shake the sample to re-suspend particles, then pour into tube.

Then

3. Stand with your back to the sun and slowly release clamp while looking down through the opening. Tighten clamp when you can faintly see the black and white pattern in the bottom of the tube.
4. Read and record the height of the column of water.

_____cm #1

DISSOLVED OXYGEN

1. Rinse bottle 3 times in the stream.
2. Slowly fill the bottle, tap sides to dislodge any air bubbles.
3. Place the stopper while the bottle is still submerged. (there should still be a small amount of water around the cap)
4. Uncap the bottle and add one Dissolved Oxygen 1 powder pillow.
5. Add one Dissolved Oxygen 2 powder pillow.
6. Replace the stopper, avoid trapping air bubbles, and shake to mix.
7. Allow precipitate to settle to the line on bottle.
8. Shake again, allow precipitate to settle to the line again.
9. Uncap and add one Dissolved Oxygen 3 powder pillow.
10. Replace the stopper, avoid trapping air bubbles, and shake until most of the precipitate has dissolved. Sample will now be a clear yellowish color.

Sample is now fixed and can be stored for 6 hours until testing can be completed.

11. Fill plastic tube level to the top.
12. Pour into the square mixing bottle.
13. Add Sodium Thiosulfate, drop by drop, counting each drop as you go.
14. Add drops until the sample is colorless.
15. Number of drops = mg/L of DO.

_____mg/L DO #1 _____mg/L DO #2 _____mg/L DO #3* +/-1 unit

pH

Collect sample in beaker, let sit for 10 minutes, dip strip in water and compare and match color(s).

_____pH #1 _____pH #2 _____pH #3* +/-0.5 unit

Appendix D

Phosphorus as ORTHOPHOSPHATES

1. Fill one of the test tubes to the top line. Use dropper if needed. Place in left hand opening of the color comparator.
2. Fill square mixing bottle exactly to the 20mL mark with sample water.
3. Add one PhosVer 3 powder pillow. Swirl for 30 seconds. Wait for 8 minutes, but not more than 10 minutes.
4. Transfer sample to the test tube. Fill tube to the top line. Use dropper if needed. Place in right hand opening.
5. **Leave tubes uncapped.** Hold comparator up to a light source and rotate disc to match the colors. **Divide the scale reading by 50 to obtain mg/L orthophosphate.**

_____/50 = _____mg/L Orthophosphates #1
scale reading

_____/50 = _____mg/L Orthophosphates #2
scale reading

_____/50 = _____mg/L Orthophosphates #3* +/-.04 unit
scale reading

SULFATES

1. Fill square cell with 25mL of sample.
2. Add one SulfaVer4 powder pillow.
3. Cap and shake for 15 sec. Wait for 5 min.
4. Invert sample cell to mix any remaining solids.
5. Pour contents into graduated cylinder.
6. Hold cylinder vertically, looking down through the opening.
7. Slowly lower dipstick in to the cylinder until the black dot is no longer visible.
8. Read mg/L on the dipstick at the water surface.

☠**Dispose of water in your toxic waste bottle.**

_____mg/L Sulfates #1 _____mg/L Sulfates #2 _____mg/L Sulfates #3* +/-10 units

NITRATES- Choose either low range or high range process

Low Range-

1. Fill test tube to the 5.0mL mark (bottom line) with sample water. Go to step 3.

High Range-

1. Fill dropper to the 0.5 mL mark and transfer to a tube.
2. With distilled water, fill the test tube to the 5.0mL mark (bottom line).
3. Add one NitraVer 6 powder pillow. Shake vigorously for 3 minutes.
4. Isolate the cadmium particles by pouring the sample into an empty test tube. Leave about 0.5mL to be sure the cadmium stays behind.
5. Add one NitroVer 3 powder pillow to the new sample tube. Shake for 30 seconds. Place the treated sample tube in the right hand opening of the color comparator. Wait 10 minutes for color to develop.
6. While you are waiting, prepare the blank. Rinse the original sample tube, ☠**collect rinse water in your toxic waste bottle.** Fill tube with untreated sample water and place in the left hand opening.
7. After 10 minutes, but before 20 minutes, read the color comparator by holding it up to a light source and rotate the color disc and match the color.

Low Range- mg/L is indicated on the scale.

_____ = mg/L Nitrates #1
scale reading

_____ = mg/L Nitrates #2
scale reading

_____ = mg/L Nitrates #3* +/-0.04 unit
scale reading

High Range- Multiply scale by 10 = mg/L.

_____ * 10 = _____mg/L Nitrates #1
scale reading

_____ * 10 = _____mg/L Nitrates #2
scale reading

_____ * 10 = _____mg/L Nitrates #3* +/-0.1 unit
scale reading

Perform all tests on this page at room temperature