

Perkiomen Creek

BERKS, MONTGOMERY AND LEHIGH COUNTIES

**WATER QUALITY STANDARDS REVIEW
STREAM REDESIGNATION EVALUATION REPORT**

**Segment: Basin
Stream Code: 01017
Drainage List: F**

**WATER QUALITY MONITORING SECTION
DIVISION OF WATER QUALITY STANDARDS
BUREAU OF POINT & NON-POINT SOURCE MANAGEMENT
DEPARTMENT OF ENVIRONMENTAL PROTECTION**

JANUARY 2014

INTRODUCTION

The Department conducted an evaluation of the Perkiomen Creek basin from its source to and including the Macoby Creek basin and the West Branch Perkiomen Creek and Hosensack Creek basins in response to a petition from the Delaware Riverkeeper Network that was accepted for study by the Environmental Quality Board (EQB) on February 20, 2007. Co-petitioners include the Perkiomen Valley Trout Unlimited, Perkiomen Watershed Conservancy, and the Lehigh and Montgomery County Conservation Districts. The petition requests the Perkiomen Creek basin including the West Branch Perkiomen Creek and Hosensack Creek basins be redesignated to Exceptional Value Waters (EV) and the Macoby Creek basin be redesignated to High Quality Waters (HQ). The Perkiomen Creek basin is currently designated HQ-CWF, MF (Migratory Fishes) from its source to State Route (SR) 1010 and Trout Stocking, Migratory Fishes (TSF, MF) from SR-1010 to the Green Lane Reservoir Dam. Perkiomen Creek from its source to SR 1010 was designated HQ-CWF as part of a September 28, 2002 final rulemaking based on 93.4b(a)(2)(ii), *Class A wild trout stream qualifier*. Molassess Creek enters Green Lane Reservoir downstream of SR-1010, and had previously been omitted from § 93.4f. It has since been determined that Molassess Creek was designated TSF in a November 27, 1971 final rulemaking, and was not carried through a subsequent September 8, 1979 publication. The West Branch Perkiomen Creek basin is currently designated Cold Water Fishes, Migratory Fishes (CWF, MF) from its source to SR1022, Exceptional Value, Migratory Fishes (EV, MF) from SR-1022 to SR-2069, and CWF, MF from SR-2069 to the mouth. The Hosensack Creek and Macoby Creek basins are currently designated CWF, MF and TSF, MF, respectively. These current designated uses of the petitioned area are depicted in Figure 1. One component of this evaluation is based on field surveys conducted March 26 - May 17, 2007. A majority of the survey was conducted March 26 – 28, 2007. One additional sample was collected May 17, 2007 on an Unnamed Tributary to Hosensack Creek to better delineate the assessment.

GENERAL WATERSHED DESCRIPTION

Perkiomen Creek is a freestone tributary to the Schuylkill River in the Delaware River watershed. The surveyed portion of these upper Perkiomen Creek basins has a combined drainage area of 95 square miles and 141 stream miles. The surrounding area is characterized by relatively flat topography with some gently rolling hills of low relief. The current land use in the petitioned area consists mostly of forested (57.4%) and agriculture (38.8%) lands with some urban/developed areas (3.8%).

WATER QUALITY AND USES

Surface Water

Biological data was collected to evaluate water quality conditions in the petitioned basins, since the indigenous aquatic community is a better indicator of long-term water quality conditions. There are a total of 43 NPDES permits issued and 3 surface water withdrawals within the petitioned watersheds.

Water Chemistry

A limited amount of water chemistry data collected by Stroud Water Research Center was submitted by the petitioner. Data was collected from approximately nine locations throughout the Perkiomen basin. Results indicate slightly elevated nitrate and total dissolved phosphorus levels, pH hovering in the 7 – 8 range, with moderate alkalinity.

Aquatic Biota

The indigenous aquatic community is an excellent indicator of long-term conditions and is used as a measure of water quality. Department staff collected habitat and benthic macroinvertebrate data at 21 locations within the petitioned basin March 26 – May 17, 2007, and from one station each on Pine Creek (small tributary EV reference; Berks County) and Muncy Creek (mainstem EV reference; Sullivan County) on May 9 and April 11, 2007, respectively (Figure 1, Table 1).

Habitat. Instream habitat was assessed at each station within the petitioned basin and the Pine Creek and Muncy Creek reference stations. Total habitat scores (Table 2) ranged from a suboptimal score of 164 at 3PC to an optimal score of 209 at 3WB. Optimal scores were found at reference stations 1MCY (216) and 1PNC (206).

Benthos. Benthic macroinvertebrate samples were collected at all twenty-three stations (Table 3) using the Department's PA-DEP RBP benthic sampling methodology, which is a modification of EPA's Rapid Bioassessment Protocols (RPBs; Plafkin, et al 1989; Barbour, et al 1999). Taxonomic diversity was fair-to-good ranging from a low of 17 at 4PC and 1HC to a high of 29 at 4WB and 2UNT. Taxa sensitive to water quality degradation were not prevalent at most stations. This lack of sensitive taxa and relatively high abundances of tolerant taxa at these stations, when compared to the reference station taxa, reflect the cumulative impacts of human activity on these streams. Stations 3PC, 2UNT, 2HC, 4PC, 1WB, 2WB, 3WB, and 4WB, while not dominated by taxa sensitive to pollution, did contain a significant number of these taxa, indicating fewer impacts from human activity.

BIOLOGICAL USE QUALIFICATIONS

The biological use qualifying criteria applied to the petitioned basins were the DEP integrated benthic macroinvertebrate scoring tests described at 25 Pa. Code § 93.4b(a)(2)(i)(A) and § 93.4b(b)(1)(v). Selected benthic macroinvertebrate community metrics from petitioned basins (Table 4) were compared to those from reference streams with a comparable drainage area. Stations 3PC, 2HC, 4PC, 2WB, 3WB, 4WB, and 2MC were compared to a reference station on Muncy Creek (1MCY) in Sullivan County (Table 4). Stations 1PC, 2PC, 1UNT, 2UNT, 1UNTHC, 1HC, 1IC, 2UNTHC, 1MO, 1WB, 1UNTWB, 1MCB, 1MC, and 1SC were compared to a station on Pine Creek (1PNC) (Table 4). The stations on Pine Creek and Muncy Creek were used as references because both are freestone streams and have similar drainage areas to the candidate stations. In addition, both Pine Creek and Muncy Creek have served as EV reference streams in several other Departmental surveys. The comparisons were done using the following metrics that were selected as being indicative of community health: taxa richness; modified EPT index; modified Hilsenhoff Biotic Index; percent dominant taxon; and percent modified mayflies.

Based on these five metrics, candidate stations had Biological Condition Scores (BCS) that ranged from 3% (1MC) to 80% (3WB) (Table 4). As a result, these candidate stations do not meet the 83% comparison standard required to qualify as High Quality Waters (§ 93.4b(a)(2)(i)(A)) or the 92% comparison standard required to qualify as Exceptional Value Waters (§ 93.4b(b)(1)(v)).

ADDITIONAL EXCEPTIONAL VALUE WATERS QUALIFYING CRITERIA

Based on petitioner information suggesting that additional EV regulatory criteria may apply, the Department evaluated additional antidegradation criteria listed in § 93.4b(b). These additional criteria include:

- A. The water is an outstanding National, State, regional or local resource water [§ 93.4b(b)(1)(iii) – see Appendix A¹];
- B. The water is a surface water of exceptional ecological significance [§ 93.4b(b)(2) – see Appendix A²].

A. Waters qualifying as EV as outstanding National, State, regional or local resource waters under § 93.4b(b)(1)(iii):

This “outstanding resource waters” EV qualifier may be considered for the Perkiomen Creek basin from its source to SR-1010 since this portion of the petitioned basin already has the

prerequisite HQ designation. This qualifier establishes requirements for national, state, regional and local resource waters.

Outstanding National or State Resource Waters

To qualify for outstanding National or State resource waters, a government agency must adopt water quality protection measures for such waters.

No waters that meet this criterion have been identified in the petition. In addition, no public lands encompass Perkiomen Creek basin from its source to SR-1010.

Outstanding Regional or Local Resource Waters

To qualify for outstanding regional and local resource waters, a regional or local government must adopt “coordinated water quality protection measures,” as that phrase is defined in 25 Pa. Code Section 93.1, along a watershed corridor. (See Appendix A for definitions.) The Department evaluated whether any municipally-owned lands or other municipal real estate interests in land, such as conservation easements, are located along a watershed corridor and whether any such lands are “coupled with” sound land use water quality protective measures. In addition, the Department evaluated local ordinances adopted by Hereford Township, Berks County and Upper and Lower Milford Townships, Lehigh County along the Perkiomen Creek basin from its source to SR-1010.

1. Hereford Township, Berks County has adopted ordinances that include the following:
 - a. A land and subdivision ordinance.
 - b. A stormwater management and land disturbance ordinance.
2. Upper Milford Township, Lehigh County has adopted ordinances that include the following:
 - a. A floodplain ordinance.
 - b. A stormwater management ordinance.
3. Lower Milford Township, Lehigh County has adopted ordinance that include the following:
 - a. A floodplain ordinance.
 - b. A riparian buffer and wetland margin protection ordinance.

Although the protective measures provided by Hereford, Upper Milford, and Lower Milford Townships may enhance water quality protection, the regulations require that such measures be “coupled with” an interest in real estate, as described at § 93.1. Definitions - “*Coordinated water quality protective measures*”. Such requisite real estate interests have not been identified along Perkiomen Creek basin from its source to SR-1010.

B. Waters Qualifying as EV as Surface Waters of Exceptional Ecological Significance under § 93.4b (b)(2):

The Department reviewed information gathered for the Pennsylvania Natural Heritage Program and reported in County Natural Areas Inventories for Berks (1991, 2003) and Lehigh (1999, 2005) Counties. The information did not identify any surface waters with statewide or local ecological significance. No areas were identified that tie the petitioned surface waters to rare or endemic ecological community types. Further, the Lehigh County bog and redbelly turtle survey and natural areas reports received in response to the Pennsylvania Bulletin public notices were also reviewed under this EV exceptional ecological significance qualifier. The bog turtle is listed as a PA endangered and federal threatened species and redbelly turtle is a PA and federal threatened species. Although threatened and endangered species status alone, is not an EV qualifier, such species are provided protection through the Department's permitting process (See implementation of antidegradation regulations at 25 Pa. Code Section 93.4c(a)(2).)

PUBLIC RESPONSE AND PARTICIPATION SUMMARY

Notice of acceptance of the petition by the EQB for study was published in the Pennsylvania Bulletin on March 10, 2007 (37 PaB 1193). The Department provided public notice of intent to assess the candidate waters and requested technical data from the general public through publication in the Pennsylvania Bulletin on March 10, 2012 (42 PaB 1329). In addition, District, Hereford, Longswamp, Pike, and Washington Townships and Bally Borough (Berks County); Milford Township (Bucks County); Lower Macaungie and Upper and Lower Milford Townships (Lehigh County); and Douglas, Marlborough, New and Upper Hanover, and Upper Frederick Townships and East Greenville, Green Lane, Pennsburg, and Red Hill Boroughs (Montgomery County); and the Berks, Bucks, Lehigh, and Montgomery County Planning Commissions were notified of this redesignation evaluation in a letter dated February 23, 2012. Water quality data, benthic macroinvertebrate data, local ordinance and open space information, and the Montgomery County Natural Areas Inventory Update were received from the Delaware Riverkeeper Network. In addition, the petitioner provided data from Stroud Water Research Center, Patrick Center for Environmental Research and US Geological Survey. The data provided by the petitioner was used as documentation and support for acceptance of the Upper Perkiomen basin petition for redesignation. The data submitted by the Stroud Water Research Center was used as supporting documentation of the water quality of the Upper Perkiomen basin in conjunction with the findings of the Department's survey on March 26 - May 17, 2007. The petition submittal also included a list of 79 local stakeholders (land owners; businesses; agencies; municipalities; former State Representative Karen Baker and Senator Robert Wonderling; and Senator Bob Mensch) described as petition supporters.

As a result of both PaB notices, the Department received significant responses in the form of many letters of support from local citizens and some of those 79 mentioned stakeholders. Also, some information that the Department already had in its possession and considered during the petition study was submitted again by some stakeholders. Some new information regarding a Lehigh County bog and redbelly turtle survey and natural areas report was received in response to the PaB March 10, 2012 public notice. In addition, letters and some information offered in support of their opposition to the petition were received from Upper Hanover Township (Montgomery County) and Pennridge Wastewater Treatment Plant.

Final Draft Notice, Comments and Response. Once the final draft was completed, it was made available to the petitioners and stakeholders on September 18, 2013 with a with an initial public comment period ending October 18, 2013. This comment period was subsequently extended to November 18, 2013.

At least 81 local stakeholders offered comments during the original October 18, 2013 comment period. A compiled summary of these comments are: please lengthen the comment period to 12 months; the petitioned redesignation upgrade request is strongly supported by over 120 local citizens, businesses, landowners, and townships; and the Upper Perkiomen provides: good quality drinking water, unique natural areas for recreational activities, critical wildlife and fisheries habitat, forested areas and riparian buffers, and attracts tourists to the area.

In immediate response to these initial comments, the comment period was extended to November 18, 2013. Once the local stakeholders were aware of this extended date, DWQS staff received additional comments and information to review and consider. In addition to the comments summarized above, two additional and detailed sets of comments were received from Princeton Hydro, LLC and the Co-petitioners (Delaware Riverkeeper network; Perkiomen Valley Trout Unlimited, Chapter #22; Lehigh County Conservation District; and Perkiomen Watershed Conservancy).

Because of the length and breadth of the comments received from Princeton hydro and the Co-petitioners, a compiled summary of their comments and the Department's responses are presented in a separate document provided as Attachment 1 of this report.

RECOMMENDATION

Based on applicable regulatory definitions and requirements of § 93.4b, the Department recommends that the Perkiomen Creek basin (from its source to and including the Macoby Creek basin, the West Branch Perkiomen Creek basin and the Hosensack Creek basin) maintain their current designated uses as depicted in the table below and in Figure 1. These recommendations do not reflect the special protection designations sought in the petition.

Stream	Segment	County	Current Designation¹	Recommendation
Perkiomen Creek	Basin, Source to SR 1010 Bridge at Hereford	Berks	HQ-CWF, MF	No Change
Perkiomen Creek	Main Stem, SR 1010 Bridge to Green Lane Reservoir Dam	Montgomery	TSF, MF	No Change
UNTs to Perkiomen Creek	Basins, SR 1010 Bridge to Green Lane Reservoir Dam	Montgomery	TSF, MF	No Change
Hosensack Creek	Basin	Montgomery	CWF, MF	No Change
Molasses Creek	Basin	Montgomery	Missing	TSF, MF
West Branch Perkiomen Creek	Basin, Source to SR 1022 Bridge (RM 12.9)	Berks	CWF, MF	No Change
West Branch Perkiomen Creek	Basin, SR 1022 Bridge to SR 2069 Bridge (RM 8.0)	Berks	EV, MF	No Change
West Branch Perkiomen Creek	Basin, SR 2069 Bridge to Mouth	Montgomery	CWF, MF	No Change
Perkiomen Creek	Main Stem, Green Lane Reservoir Dam to Mouth	Montgomery	WWF, MF	No Change
Unnamed Tributaries to Perkiomen Creek	Basins, Green Lane Reservoir Dam to Mouth	Montgomery	TSF, MF	No Change
Macoby Creek	Basin	Montgomery	TSF, MF	No Change

1 - HQ = High Quality; CWF = Cold Water Fishes; TSF = Trout Stocking; WWF = Warm Water Fishes; MF = Migratory Fishes

APPENDIX A

¹Definition at § 93.1: *Outstanding National, State, regional or local resource water*—A surface water for which a National or State government Agency has adopted water quality protective measures in a resource management plan, or regional or local governments have adopted coordinated water quality protective measures³ along a watershed corridor.

² Definition at § 93.1: *Surface water of exceptional ecological significance*—A surface water which is important, unique or sensitive ecologically, but whose water quality as measured by traditional parameters (for example, chemical, physical or biological) may not be particularly high, or whose character cannot be adequately described by these parameters. These waters include:

- (i) Thermal springs.
- (ii) Wetlands which are exceptional value wetlands under § 105.17(1) (relating to wetlands).

³ Definition at § 93.1: *Coordinated water quality protective measures*—

(i) Legally binding sound land use water quality protective measures coupled with an interest in real estate which expressly provides long-term water quality protection of a watershed corridor.

(ii) Sound land use water quality protective measure include: surface or ground water protection zones, enhanced stormwater management measures, wetland protection zones or other measures which provide extraordinary water quality protection.

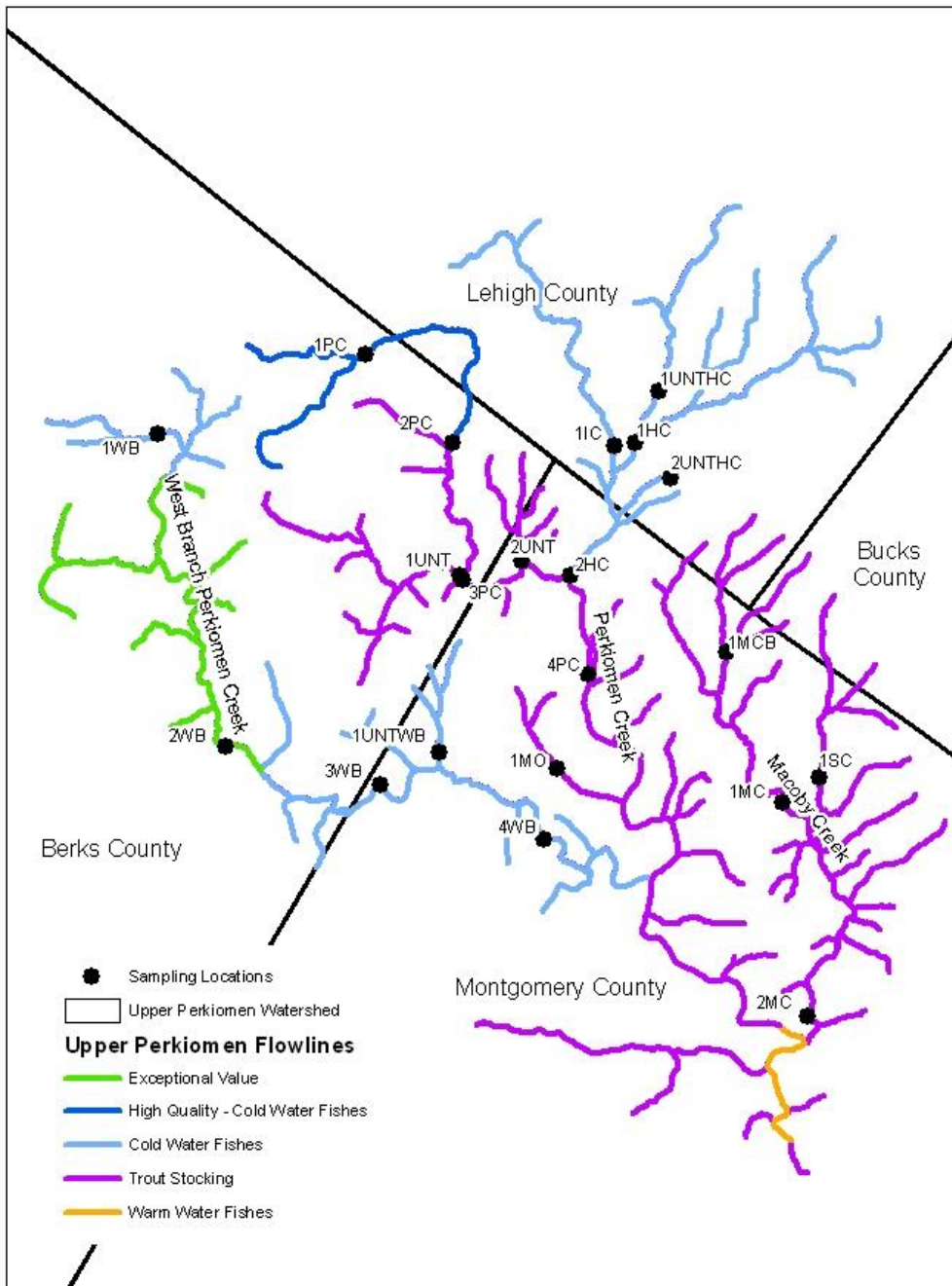
(iii) Real estate interests include:

- (A) Fee interests.
- (B) Conservation easements.
- (C) Government owned riparian parks or natural areas
- (D) Other interests in land which enhance water quality in a watershed corridor area.

REFERENCES

- Barbour, Michael T., Jeroen Gerritsen, Blaine D. Snyder, James B Stribling. 1999. Rapid Bioassessment Protocols For Us in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish. Second Edition. United States Environment Protection Agency. EPA 841-B-99-002
- Plafkin, JL, MT Barbour, KD Porter, SK Gross, & RM Hughes. 1989. Rapid Bioassessment Protocols for use in streams and rivers: Benthic Macroinvertebrates and Fish. United States Environmental Protection Agency. EPA/444/4-89-001.
- The Nature Conservancy (Pennsylvania Science Office). 2003. A Natural Areas Inventory of Berks County, Pennsylvania. The Berks County Planning Commission.
- The Nature Conservancy (Pennsylvania Science Office). 2003. A Natural Areas Inventory of Lehigh and Northampton Counties, Pennsylvania. The Lehigh Valley Planning Commission.

**FIGURE 1
STATION LOCATIONS
UPPER PERKIOMEN BASIN
BERKS, MONTGOMERY AND LEHIGH COUNTIES**



**TABLE 1
STATION LOCATIONS
UPPER PERKIOMEN BASIN
BERKS, MONTGOMERY AND LEHIGH COUNTIES**

STATION	LOCATION
1PC	Perkiomen Creek (01017) @ Weaver Road. Hereford Township, Berks County Lat: 40° 28' 01" Long: 75° 34' 27"
2PC	Perkiomen Creek (01017) @ Hereford Estates. Hereford Township, Berks County Lat: 40° 27' 01" Long: 75° 33' 14"
1UNT	Unnamed Tributary to Perkiomen Creek (01492) @ Toll Gate Road. West Hereford Township, Berks County Lat: 40° 25' 33" Long: 75° 33' 11"
3PC	Perkiomen Creek (01017) @ Toll Gate Road. West Hereford Township, Berks County Lat: 40° 25' 30" Long: 75° 33' 08"
2UNT	Unnamed Tributary to Perkiomen Creek (01485) @ State Route 29. Upper Hanover Township, Montgomery County Lat: 40° 25' 41" Long: 75° 32' 17"
1UNTHC	Unnamed Tributary to Hosensack Creek (01479) @ State Highway 2029. Lower Milford Township, Lehigh County Lat: 40° 27' 30" Long: 75° 30' 14"
1HC	Hosensack Creek (01473) @ Shultz Bridge Road. Lower Milford Township, Lehigh County Lat: 40° 26' 57" Long: 75° 30' 35"
1IC	Indian Creek (01477) @ Mouth. Lower Milford Township, Lehigh County Lat: 40° 26' 56" Long: 75° 30' 53"
2UNTHC	Unnamed Tributary to Hosensack Creek (01475) @ Shultz Bridge Road. Lower Milford Township, Lehigh County Lat: 40° 26' 33" Long: 75° 30' 07"
2HC	Hosensack Creek (01473) @ State Route 29. Upper Hanover Township, Montgomery County Lat: 40° 25' 31" Long: 75° 31' 35"
4PC	Perkiomen Creek (01017) @ Treatment Plant on Fruitville Road. Upper Hanover Township, Montgomery County Lat: 40° 24' 25" Long: 75° 31' 22"
1MO	Molasses Creek (01466) @ Mack Road. Upper Hanover Township, Montgomery County Lat: 40° 23' 23" Long: 75° 31' 51"

- 1WB** West Branch Perkiomen Creek (01439) @ Back-A-Ways Farm. District Township, Berks County Lat: 40° 27' 12" Long: 75° 37' 28"
- 2WB** West Branch Perkiomen Creek (01439) @ Forgedale Road. Washington Township, Berks County Lat: 40° 23' 44" Long: 75° 36' 39"
- 3WB** West Branch Perkiomen Creek (01439) @ Himmelwright Road. Douglas Township, Montgomery County Lat: 40° 23' 17" Long: 75° 34' 25"
- 1UNTWB** Unnamed Tributary to West Branch Perkiomen Creek (01433) @ Wentling Schoolhouse Road. Upper Hanover Township, Montgomery County Lat: 40° 23' 36" Long: 75° 33' 33"
- 4WB** West Branch Perkiomen Creek (01439) @ Bowers Mill Road. Upper Hanover Township, Montgomery County Lat: 40° 22' 37" Long: 75° 32' 05"
- 1MCB** Macoby Creek Branch (01431) @ Quakertown Road. Upper Hanover Township, Montgomery County Lat: 40° 24' 37" Long: 75° 29' 22"
- 1MC** Macoby Creek (01413) @ James Road. Upper Hanover Township, Montgomery County Lat: 40° 22' 57" Long: 75° 28' 38"
- 1SC** Stoney Creek (01427) @ Gerryville Pike. Upper Hanover Township, Montgomery County Lat: 40° 23' 13" Long: 75° 28' 06"
- 2MC** Macoby Creek (01413) @ Mouth. Marlborough Township, Montgomery County
Lat: 40° 20' 36" Long: 75° 28' 21"
- 1MCY (REF)** Muncy Creek (19402) 400 Meters Upstream of Deep Hollow Run. Laporte Township, Sullivan County Lat: 41° 22' 14" Long: 76° 30' 29"
- 1PNC (REF)** Pine Creek (01701) 200 Meters Upstream UNT 01705. Pike Township, Berks County Lat: 40° 25' 38" Long: 75° 41' 56"

TABLE 2
HABITAT ASSESSMENT RESULTS
PERKIOMEN CREEK WATERSHED
BERKS, MONTGOMERY AND LEHIGH COUNTIES
March 26 – May 17, 2007

PARAMETER	STATION ¹						
	1PC	2PC	1UNT	3PC	2UNT	1UNTHC	1HC
1. instream cover	16	17	16	12	15	14	14
2. epifaunal substrate	17	16	16	12	18	13	16
3. embeddedness	15	17	15	12	17	17	17
4. velocity/depth regimes	20	15	20	20	10	17	20
5. channel alteration	14	17	16	16	15	15	15
6. sediment deposition	16	15	14	12	17	8	12
7. frequency of riffles	17	18	16	14	18	14	16
8. channel flow status	20	19	20	20	20	20	20
9. condition of banks	15	14	15	11	16	12	13
10. bank vegetative protection	16	16	16	12	17	15	14
11. disruptive pressure	11	14	16	11	14	14	14
12. riparian zone width	13	13	16	12	12	13	14
Total Score	190	191	196	164	189	172	185
Rating ²	SUB	SUB	OPT	SUB	SUB	SUB	SUB

PARAMETER	STATION ¹							
	1IC	2UNTHC	2HC	4PC	1MO	1WB	2WB	3WB
1. instream cover	17	16	17	14	15	16	17	16
2. epifaunal substrate	16	16	17	17	14	15	18	16
3. embeddedness	16	13	17	16	14	17	16	16
4. velocity/depth regimes	19	10	20	18	16	20	20	20
5. channel alteration	16	18	15	16	16	15	16	16
6. sediment deposition	16	16	15	16	11	15	17	16
7. frequency of riffles	17	17	18	16	17	17	20	20
8. channel flow status	20	17	20	20	18	20	20	20
9. condition of banks	15	16	13	12	14	19	15	16
10. bank vegetative protection	17	16	14	13	16	19	16	16
11. disruptive pressure	16	15	16	16	15	10	16	17
12. riparian zone width	14	15	14	16	13	20	15	20
Total Score	199	185	196	190	179	203	206	209
Rating ²	OPT	SUB	OPT	SUB	SUB	OPT	OPT	OPT

TABLE 2 (continued)
HABITAT ASSESSMENT RESULTS
PERKIOMEN CREEK WATERSHED
BERKS, MONTGOMERY AND LEHIGH COUNTIES
March 26 – May 17, 2007

PARAMETER	STATION ¹						REFERENCE	
	1UNTWB	4WB	1MCB	1MC	1SC	2MC	1MCY ²	1PNC ²
1. instream cover	16	17	16	13	16	17	17	18
2. epifaunal substrate	16	20	17	15	12	17	17	19
3. embeddedness	15	16	12	11	15	14	17	17
4. velocity/depth regimes	10	20	15	20	18	20	20	19
5. channel alteration	16	15	18	18	18	15	19	19
6. sediment deposition	17	17	12	11	14	17	16	16
7. frequency of riffles	20	19	17	17	17	18	20	16
8. channel flow status	20	20	18	20	14	20	20	15
9. condition of banks	17	16	14	11	15	17	17	16
10. bank vegetative protection	17	17	14	15	18	16	17	20
11. disruptive pressure	15	17	11	15	16	16	19	16
12. riparian zone width	13	17	9	15	15	18	17	15
Total Score	192	211	173	181	188	205	216	206
Rating ³	OPT	OPT	SUB	SUB	SUB	OPT	OPT	OPT

¹ Refer to Figure 1 and Table 1 for station locations

² Reference Stations – Refer to Table 1 for locations

³ OPT=Optimal(≥192) ; SUB=Suboptimal (132-180)

TABLE 3
SEMI-QUANTITATIVE BENTHIC MACROINVERTEBRATE DATA
PERKIOMEN CREEK WATERSHED
BERKS, MONTGOMERY AND LEHIGH COUNTIES
March 26 – May 17, 2007

TAXA	STATION ¹												REFERENCE	
	1PC	2PC	1UNT	3PC	2UNT	1UNTHC	1HC	1IC	2UNTHC	2HC	4PC	1MO	1MCY ²	1PNC ²
<u>MAYFLIES</u>														
Ameletidae	<i>Ameletus</i>					1							1	
Baetidae	<i>Acentrella</i>													3
	<i>Acerpenna</i>			1										1
	<i>Baetis</i>	87	52	27	2	2	52	61	71	2	16	7	12	23
	<i>Dipheter</i>					2				27			6	1
Caenidae	<i>Caenis</i>											5		
Ephemeridae	<i>Ephemera</i>					1								
Ephemerellidae	<i>Drunella</i>			1	1		1		1				21	20
	<i>Ephemerella</i>	66	90	46	90	12	108	77	39	3	103	28	4	12
	<i>Eurylophella</i>					1							3	
	<i>Serratella</i>				1	2					3			1
Heptageniidae	<i>Epeorus</i>	1	3					1	2	1	1		12	5
	<i>Rhithrogena</i>												2	9
	<i>Stenacron</i>						2	2					1	
	<i>Stenonema</i>		3		10				2			2		1
	<i>Cinygmula</i>	2	1	1	3								67	18
Isonychiidae	<i>Isonychia</i>	1	1		3				1				1	
Leptophlebiidae	<i>Habroplebiodes</i>								1	17				
	<i>Paraleptophlebia</i>	1			2					4			12	2

¹ Refer to Figure 1 and Table 1 for station locations

² Reference Stations – Refer to Table 1 for locations

TABLE 3 (continued)
SEMI-QUANTITATIVE BENTHIC MACROINVERTEBRATE DATA
PERKIOMEN CREEK WATERSHED
BERKS, MONTGOMERY AND LEHIGH COUNTIES
March 26 – May 17, 2007

TAXA		STATION ¹											REFERENCE		
		1PC	2PC	1UNT	3PC	2UNT	1UNTHC	1HC	1IC	2UNTHC	2HC	4PC	1MO	1MCY ²	1PNC ²
STONEFLIES															
Chloroperlidae	<i>Alloperla</i>						1					1			
	<i>Haploperla</i>			1						1					
	<i>Suwallia</i>	1												10	
	<i>Sweltsa</i>							1		1			2	1	1
Leuctridae	<i>Leuctra</i>									28					4
Nemouridae	<i>Amphinemura</i>	1	4			1	6		29	43	3		8	1	1
	<i>Ostrocerca</i>		7												
	<i>Prostoia</i>	2					1	1	5		2	1	14		
Peltoperlidae	<i>Tallaperla</i>									3					7
Perlidae	<i>Agnetina</i>											1		1	
	<i>Acroneuria</i>		2						2		1			2	7
	<i>Eccoptura</i>									2					
	<i>Perlesta</i>				1	1									
Perlodidae	<i>Isoperla</i>	2					1				1		14	11	7
Pteronarcyidae	<i>Pteronarcys</i>														2
Taeniopterygidae	<i>Strophopteryx</i>								1		1			1	

¹ Refer to Figure 1 and Table 1 for station locations

² Reference Stations – Refer to Table 1 for locations

TABLE 3 (continued)
SEMI-QUANTITATIVE BENTHIC MACROINVERTEBRATE DATA
PERKIOMEN CREEK WATERSHED
BERKS, MONTGOMERY AND LEHIGH COUNTIES
March 26 – May 17, 2007

TAXA		STATION ¹											REFERENCE			
		1PC	2PC	1UNT	3PC	2UNT	1UNTHC	1HC	1IC	2UNTHC	2HC	4PC	1MO	1MCY ²	1PNC ²	
<u>CADDISFLIES</u>																
Glossosomatidae	<i>Agapetus</i>														1	
Hydropsychidae	<i>Ceratopsyche</i>	9	25	13	4	7	15	11			8		10		2	
	<i>Cheumatopsyche</i>		2	15	13	8	7	6	4	3	4		14			
	<i>Diplectrona</i>														2	
	<i>Hydropsyche</i>								3				5	12		
Philopotamidae	<i>Chimarra</i>	3	2	34	8	23	3	13	4		12	6	62			
	<i>Dolophilodes</i>		1	1					1	9					13	
Polycentropidae	<i>Polycentropus</i>	2													1	
Ryhacophilidae	<i>Rhyacophila</i>		1						3						1	3
Uenoidae	<i>Neophylax</i>			1	2	8					1	3				
<u>TRUE FLIES</u>																
Ceratopogonidae						2										
	<i>Probezzia</i>												5	5		
Chironomidae		8	15	28	18	24	3	14	11	65	29	32	8	13	5	
Empididae	<i>Clinocera</i>			1		3			1				3			
	<i>Hemerodromia</i>			1	1	1							1			
Simuliidae	<i>Prosimulium</i>	31	7	2		28	10	5	33		4	1	5		2	
	<i>Simulium</i>		1	6	1	1									6	
Tipulidae	<i>Antocha</i>			1		1	2	1	1		1			2		
	<i>Dicranota</i>	1			1	1								2		
	<i>Hexatoma</i>													3		
	<i>Limnophila</i>									2						
	<i>Oreogeton</i>													1		
	<i>Tipula</i>			1									2		1	

¹ Refer to Figure 1 and Table 1 for station locations

² Reference Stations – Refer to Table 1 for locations

TABLE 3 (continued)
SEMI-QUANTITATIVE BENTHIC MACROINVERTEBRATE DATA
PERKIOMEN CREEK WATERSHED
BERKS, MONTGOMERY AND LEHIGH COUNTIES
March 26 – May 17, 2007

TAXA		STATION ¹											REFERENCE		
		1PC	2PC	1UNT	3PC	2UNT	1UNTHC	1HC	1IC	2UNTHC	2HC	4PC	1MO	1MCY ²	1PNC ²
<u>MISC. INSECT TAXA</u>															
Coenagrionidae	<i>Argia</i>					1									
Corydalidae	<i>Nigronia</i>														2
Elmidae	<i>Ancyronyx</i>												1		
	<i>Dubiraphia</i>					2							1		
	<i>Macronychus</i>												1		
	<i>Optioservus</i>	9	1	14	11	32	8	6	8		7	39	12	1	3
	<i>Oulimnius</i>	3		1				3		6	1		1	1	12
	<i>Promoresia</i>														1
	<i>Stenelmis</i>		2	31	28	39	2	12			5	87	8		
Psephenidae	<i>Ectopria</i>					1				1					
	<i>Psephenus</i>	1	1	5	4	20	1	1	1		3	5	3		2
Gomphidae	<i>Lanthus</i>												1		
	<i>Stylogomphus</i>							1							
Crambidae	<i>Pertophila</i>											1			
<u>NON-INSECT TAXA</u>															
Crangonyctidae	<i>Crangonyx</i>					15									
	Hydracarina					1									
Isopoda	<i>Gammarus</i>			1											
	Oligochaeta					1									
	Richness	19	20	22	21	29	18	17	22	18	20	17	25	27	32
	Total Taxa	231	221	232	205	241	224	216	224	218	206	223	193	208	211

¹ Refer to Figure 1 and Table 1 for station locations

² Reference Stations – Refer to Table 1 for locations

TABLE 3 (continued)
SEMI-QUANTITATIVE BENTHIC MACROINVERTEBRATE DATA
PERKIOMEN CREEK WATERSHED
BERKS, MONTGOMERY AND LEHIGH COUNTIES
March 26 – May 17, 2007

TAXA		STATION ¹								REFERENCE		
		1WB	2WB	3WB	1UNTWB	4WB	1MCB	1MC	1SC	2MC	1MCY ²	1PNC ²
<u>MAYFLIES</u>												
Ameletidae	<i>Ameletus</i>	1							1		1	
Baetidae	<i>Acentrella</i>											3
	<i>Acerpenna</i>											1
	<i>Baetis</i>	44	53	4	1	1	4				12	23
	<i>Diphedor</i>				1				3		1	
Caenidae	<i>Caenis</i>				1		1	7		4		
Ephemerellidae	<i>Drunella</i>	1	3								21	20
	<i>Ephemerella</i>	53	88	99	3	28	3			1	12	44
	<i>Eurylophella</i>				2			1				
	<i>Serratella</i>			13	2	5		1		9	1	
Heptageniidae	<i>Cinygmula</i>	1	1								67	18
	<i>Epeorus</i>	2	4	1		1	1				12	5
	<i>Stenacron</i>	1	1	5								
	<i>Stenonema</i>					6	11	13		2		1
	<i>Rhithrogena</i>										2	9
Isonychiidae	<i>Isonychia</i>			8		2				2	1	
Leptophlebiidae	<i>Paraleptophlebia</i>	1	1			2					12	2

¹ Refer to Figure 1 and Table 1 for station locations

² Reference Stations – Refer to Table 1 for locations

TABLE 3 (continued)
SEMI-QUANTITATIVE BENTHIC MACROINVERTEBRATE DATA
PERKIOMEN CREEK WATERSHED
BERKS, MONTGOMERY AND LEHIGH COUNTIES
March 26 – May 17, 2007

TAXA		STATION ¹									REFERENCE	
		1WB	2WB	3WB	1UNTWB	4WB	1MCB	1MC	1SC	2MC	1MCY ²	1PNC ²
<u>STONEFLIES</u>												
Capniidae	<i>Allocapnia</i>			1						1		
Chloroperlidae	<i>Suwallia</i>										10	
	<i>Sweltsa</i>										1	1
Leuctridae	<i>Leuctra</i>											4
Nemouridae	<i>Amphinemura</i>	1	1	2	1	1	67	7	85	15	1	1
	<i>Prostoia</i>	2	6	2		1	3		4	7		
Peltoperlidae	<i>Tallaperla</i>											7
Perlidae	<i>Acroneuria</i>		3	1		2					2	7
	<i>Agnatina</i>										1	
	<i>Neoperla</i>					2						
Perlodidae	<i>Isoperla</i>	1			5		5		12	4	11	7
Pteronarcyidae	<i>Pteronarcys</i>											2
Taeniopterygidae	<i>Strophopteryx</i>										1	

¹ Refer to Figure 1 and Table 1 for station locations

² Reference Stations – Refer to Table 1 for locations

TABLE 3 (continued)
SEMI-QUANTITATIVE BENTHIC MACROINVERTEBRATE DATA
PERKIOMEN CREEK WATERSHED
BERKS, MONTGOMERY AND LEHIGH COUNTIES
March 26 – May 17, 2007

TAXA		STATION ¹								REFERENCE		
		1WB	2WB	3WB	1UNTWB	4WB	1MCB	1MC	1SC	2MC	1MCY ²	1PNC ²
<u>CADDISFLIES</u>												
Brachycentridae	<i>Micrasema</i>	1										
Glossosomatidae	<i>Agapetus</i>											1
Hydropsychidae	<i>Ceratopsyche</i>	6	5	6		4	18		16	9		2
	<i>Cheumatopsyche</i>	3	2	26	9	16	21		49	8		
	<i>Diplectrona</i>											2
	<i>Hydropsyche</i>	1		1		1				6	12	
Philopotamidae	<i>Chimarra</i>		3	24	11	31	27	18	1	40		
	<i>Dolophilodes</i>	2										13
	<i>Wormaldia</i>	1							2			
Polycentropidae	<i>Polycentropus</i>			1								1
Ryhacophilidae	<i>Rhyacophila</i>	5	2								1	3
Uenoidae	<i>Neophylax</i>	4			2	11	1					

¹ Refer to Figure 1 and Table 1 for station locations

² Reference Stations – Refer to Table 1 for locations

TABLE 3 (continued)
SEMI-QUANTITATIVE BENTHIC MACROINVERTEBRATE DATA
PERKIOMEN CREEK WATERSHED
BERKS, MONTGOMERY AND LEHIGH COUNTIES
March 26 – May 17, 2007

TAXA		STATION ¹								REFERENCE		
		1WB	2WB	3WB	1UNTWB	4WB	1MCB	1MC	1SC	2MC	1MCY ²	1PNC ²
TRUE FLIES												
Athericidae	<i>Atherix</i>						1					
Ceratopogonidae	<i>Probezzia</i>										5	
Chironomidae		14	7	10	87	23	22	91	25	83	13	5
Empididae	<i>Clinocera</i>					4	2	3		1		
	<i>Hemerodromia</i>			2	2	2		7				
Simuliidae	<i>Prosimulium</i>	54	17	2	18	1	5	6	15	5		2
	<i>Simulium</i>	1	1		36			4		2		6
Tabanidae	<i>Chrysops</i>			1								
Tipulidae	<i>Antocha</i>		3	1	1	2	2				2	
	<i>Hexatoma</i>										3	
	<i>Limonia</i>		1									
	<i>Oreogeton</i>										1	
	<i>Tipula</i>	1		1								1

¹ Refer to Figure 1 and Table 1 for station locations

² Reference Stations – Refer to Table 1 for locations

TABLE 3 (continued)
SEMI-QUANTITATIVE BENTHIC MACROINVERTEBRATE DATA
PERKIOMEN CREEK WATERSHED
BERKS, MONTGOMERY AND LEHIGH COUNTIES
March 26 – May 17, 2007

TAXA		STATION ¹								REFERENCE		
		1WB	2WB	3WB	1UNTWB	4WB	1MCB	1MC	1SC	2MC	1MCY ²	1PNC ²
<u>MISC. INSECT TAXA</u>												
Coenagrionidae	<i>Argia</i>				3					1		
Corydalidae	<i>Nigronia</i>					1						2
Elmidae	<i>Dubiraphia</i>							1				
	<i>Macronychus</i>		1					1				
	<i>Optioservus</i>	4	4	8	3	18	9	7		1	3	
	<i>Oulimnius</i>	5	1	1	2	1				1	12	
	<i>Promoresia</i>	1										1
	<i>Stenelmis</i>		2	6	20	12	3	28		3		
Hydrophilidae	<i>Berosus</i>							2				
Psephenidae	<i>Psephenus</i>		1	9		7	1	14		1		2
<u>NON-INSECT TAXA</u>												
Crangonyctidae	<i>Crangonyx</i>					3		1				
Isopoda	<i>Caecidota</i>					1						
	<i>Gammarus</i>			1								
Oligochaeta				1		7						
Richness		26	24	27	20	29	20	18	11	20	27	32
Total Taxa		211	211	237	210	196	207	212	213	204	208	211

¹ Refer to Figure 1 and Table 1 for station locations

² Reference Stations – Refer to Table 1 for locations

TABLE 4
RBP METRIC COMPARISON
PERKIOMEN CREEK WATERSHED
BERKS, MONTGOMERY AND LEHIGH COUNTIES
March 26 – May 17, 2007

METRIC	CANDIDATE STATIONS							REF
	3PC	2HC	4PC	2WB	3WB	4WB	2MC	1MCY
1. TAXA RICHNESS	21	20	17	24	27	29	20	27
Cand/Ref (%)	78	74	63	89	100	107	74	xxx
Biol. Cond. Score	7	5	1	8	8	8	5	8
2. MOD. EPT INDEX	10	10	7	11	10	12	9	17
Cand/Ref (%)	59	59	41	65	59	71	53	xxx
Biol. Cond. Score	3	3	0	4	3	5	1	8
3. MOD. HBI	3.01	2.88	4.36	2.91	2.98	4.06	4.72	2.02
Cand-Ref	0.99	0.86	2.34	0.89	0.96	2.04	2.70	xxx
Biol. Cond. Score	4	6	0	5	5	0	0	8
4. % DOMINANT TAXA	44	50	39	42	42	16	41	32
Cand-Ref	12	18	7	10	10	-16	9	xxx
Biol. Cond. Score	7	3	8	8	8	8	8	8
5. % MOD. MAYFLIES	54	52	14	46	53	22	7	62
Ref-Cand	8	10	48	16	9	40	55	xxx
Biol. Cond. Score	8	8	0	6	8	1	0	8
TOTAL BIOLOGICAL CONDITION SCORE	29	25	9	31	32	22	14	40
% COMPARABILITY TO REFERENCE	73	63	23	78	80	55	35	

TABLE 4 (continued)
RBP METRIC COMPARISON
PERKIOMEN CREEK WATERSHED
BERKS, MONTGOMERY AND LEHIGH COUNTIES
March 26 – May 17, 2007

METRIC	CANDIDATE STATIONS							REF
	1PC	2PC	1UNT	2UNT	1UNTHC	1HC	1IC	1PNC
1. TAXA RICHNESS	19	20	22	29	18	17	22	32
Cand/Ref (%)	59	63	69	91	56	53	69	xxx
Biol. Cond. Score	0	1	5	8	0	0	5	8
2. MOD. EPT INDEX	10	11	7	8	9	6	12	19
Cand/Ref (%)	53	58	37	42	47	32	63	xxx
Biol. Cond. Score	1	2	0	0	0	0	4	8
3. MOD. HBI	3.65	3.24	4.19	4.16	2.99	3.70	3.64	2.08
Cand-Ref	1.57	1.16	2.11	2.08	0.91	1.62	1.56	xxx
Biol. Cond. Score	0	2	0	0	5	0	0	8
4. % DOMINANT TAXA	38	41	20	16	48	36	32	21
Cand-Ref	17	20	-1	-5	27	15	11	xxx
Biol. Cond. Score	4	2	8	8	0	5	7	8
5. % MOD. MAYFLIES	31	44	21	7	50	37	20	48
Ref-Cand	17	4	27	41	-2	11	28	xxx
Biol. Cond. Score	6	8	4	0	8	8	3	8
TOTAL BIOLOGICAL CONDITION SCORE	11	15	17	16	13	13	19	40
% COMPARABILITY TO REFERENCE	28	38	43	40	33	33	48	

TABLE 4 (continued)
RBP METRIC COMPARISON
PERKIOMEN CREEK WATERSHED
BERKS, MONTGOMERY AND LEHIGH COUNTIES
March 26 – May 17, 2007

METRIC	CANDIDATE STATIONS							REF
	2UNTHC	1MO	1WB	1UNTWB	1MCB	1MC	1SC	1PNC
1. TAXA RICHNESS	18	25	29	20	20	18	11	32
Cand/Ref (%)	56	78	91	63	63	56	34	xxx
Biol. Cond. Score	0	7	8	1	1	0	0	8
2. MOD. EPT INDEX	10	8	12	7	8	5	6	19
Cand/Ref (%)	53	42	63	37	42	26	32	xxx
Biol. Cond. Score	1	0	4	0	0	0	0	8
3. MOD. HBI	3.97	4.02	4.06	5.14	4.00	5.07	4.05	2.08
Cand-Ref	1.89	1.94	1.98	3.06	1.92	2.99	1.97	xxx
Biol. Cond. Score	0	0	0	0	0	0	0	8
4. % DOMINANT TAXA	30	32	16	41	32	43	40	21
Cand-Ref	9	11	-5	20	11	22	19	xxx
Biol. Cond. Score	8	7	8	2	7	1	2	8
5. % MOD. MAYFLIES	4	4	22	3	7	7	0	48
Ref-Cand	44	44	26	45	41	41	48	xxx
Biol. Cond. Score	0	0	4	0	0	0	0	8
TOTAL BIOLOGICAL CONDITION SCORE	9	14	24	3	8	1	2	40
% COMPARABILITY TO REFERENCE	23	35	60	8	20	3	5	