

LITTLE LEHIGH CREEK
LEHIGH AND BERKS COUNTIES

WATER QUALITY STANDARDS REVIEW
STREAM REDESIGNATION EVALUATION REPORT

Segment: Mainstem
Stream Code: 03420
Drainage List: D

WATER QUALITY MONITORING SECTION (GLW)
DIVISION OF WATER QUALITY STANDARDS
BUREAU OF WATER STANDARDS AND FACILITY REGULATION
DEPARTMENT OF ENVIRONMENTAL PROTECTION

MAY 2010

INTRODUCTION

The Department conducted an evaluation of the mainstem of Little Lehigh Creek in response to a petition from the Mid-Atlantic Environmental Law Center on behalf of the Little Lehigh Watershed Coalition. The petition requests that the main stem of the Little Lehigh Creek be redesignated as an Outstanding National Resource Water based on qualifying criteria at 40 C.F.R. 131.32(3). This request was based on the candidate waters being located in the Delaware and Lehigh Canal National Heritage Corridor and Heritage State Park and the presence of an exceptional recreational fishery. The Environmental Quality Board (EQB) accepted the petition on May 21, 2003 for further study in accordance with the review criteria in 25 Pa. Code § 93.4b(b). The petitioner provided information regarding the wild brown trout fishery and its recreational value, which includes Pennsylvania Fish and Boat Commission (PFBC) designated Class A Wild Trout and Heritage Trout Angling segments. The Little Lehigh Creek mainstem is currently designated High Quality-Cold Water Fishes, Migratory Fishes (HQ-CWF, MF). The HQ-CWF designation was a final rulemaking in September 1979; prior to which it was designated as CWF and a Conservation Area. This evaluation is based on file and petitioner information and a field survey conducted in April 2004.

GENERAL WATERSHED DESCRIPTION

Little Lehigh Creek, a combination of freestone (headwaters) and limestone influenced stream habitat, is a tributary to the Lehigh River in the Delaware River watershed (Figure 1). The candidate basin is located in Longswamp Township (Berks County) and Lower Macungie and Salisbury Townships and the City of Allentown (Lehigh County). The Little Lehigh Creek basin has a drainage area of 189.8 square miles and the mainstem consists of 25.4 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 watershed consists mostly of single-family residential (40%) and forested areas (25%). Remaining land use is a mixture of cropland (15%), pasture (10%), industrial (5%), and commercial (5%) uses. One major population center, the City of Allentown partially lies within the lower basin area.

WATER QUALITY AND USES

Surface Water

Long-term chemistry data were available from the City of Allentown to allow a direct comparison to water quality criteria. The City collected this data from April 2001 to October 2002 at 4 stations on the mainstem and at 6 stations on 5 tributaries. Parameters sampled included alkalinity, dissolved oxygen, nitrate, ortho-phosphate, pH, fecal coliform bacteria, and total coliform bacteria. Analysis of the data indicates a stream with high alkalinity (indicative of good buffering capacity) and moderate levels of nitrate and phosphate. Analysis of the fecal-coliform bacteria and total coliform bacteria revealed chronic exceedences of the water-

contact-recreation and potable-water-supply criteria throughout the basin. In addition, field water chemistry parameters were collected at six stations on Little Lehigh Creek on April 28, 2004 (Table 2). There are two NPDES permits associated with the mainstem: one for a sewage treatment plant and one for a waste water discharge. There is one permitted surface water withdrawal from the mainstem of the petitioned area.

Aquatic Biota

The indigenous aquatic community is an excellent indicator of long-term conditions and is used as a measure of both water quality and ecological significance. Department staff collected habitat and benthic macroinvertebrate data at six locations on Little Lehigh Creek on April 28, 2004, and from an EV reference station (1EC) on Elk Creek (Centre County) on April 21, 2004 (Figure 1, Table 1). Fishery data were provided by the PFBC.

Habitat. Instream habitat was assessed at each station on Little Lehigh Creek and Elk Creek. Total habitat scores (Table 3) ranged from 152 (5LLC) to 190 (3LLC) and all were suboptimal, compared to an optimal score at 1EC (211). Low scoring parameters indicated moderate vegetative disruptive pressure, eroded banks, and a lack of epifaunal substrate and adequate riparian buffering at most stations (Table 3).

Benthos. Benthic macroinvertebrate samples were collected at all six stations (Table 4) 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 moderately low at all stations ranging from 13 taxa at 2LLC to 19 taxa at 5LLC. While a few pollution sensitive taxa were present at all stations, the relatively high abundances of tolerant taxa at these stations reflect the cumulative impacts of human activity in the basin.

Fish. The PFBC surveyed 8 sections (total of 22 stations) of the Little Lehigh Creek from 1997 to 2004. Wild brown trout were found at 21 of 22 stations along with wild brook and rainbow trout at 4 stations and wild rainbow trout at an additional 4 stations (Table 5). The fish species composition at nearly all stations was a mix of both cold and warm water species (Table 5). A 1.6 mile segment of Little Lehigh Creek was designated Class A Wild Trout by PFBC in 1995 (Table 5, Section 3) and an additional 1 mile segment was designated Heritage Trout Angling in 1994 but was removed in 2005. In addition, the mainstem of Little Lehigh Creek has been designated wild trout waters by PFBC. Trout biomass for the Class A Wild Trout section was determined at two stations (RMI 17.15 and RMI 17.8) as 77.57 and 89.92 kg/ha respectively, in August of 2004 (Table 5A).

BIOLOGICAL USE QUALIFICATIONS

The qualifying criteria applied to Little Lehigh Creek was the DEP integrated benthic macroinvertebrate scoring test described at § 93.4b(a)(2)(i)(A) and § 93.4b(b)(1)(v). Selected benthic macroinvertebrate community metrics from Little Lehigh Creek (Table 5) were compared to those from a reference stream. All stations on Little Lehigh Creek were

compared to a reference station on Elk Creek (1EC). Elk Creek, an Exceptional Value (EV) stream was used as a reference because both Elk Creek and Little Lehigh Creek are limestone-influenced streams and are found in similar geologic settings. In addition, Elk Creek is the only available EV reference for limestone-influenced streams; having served as an EV reference stream in several other Departmental surveys. Sampling of all stations was conducted within one week to minimize seasonal variation.

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 scoring metrics, none of the six stations in the candidate basin had Biological Condition Scores (BCS) greater than 80% of the reference station (Table 6). As a result, the candidate basin does not meet the 83% comparison standard required to qualify as High Quality Waters; a pre-requisite for redesignation to EV waters (§ 93.4b(1)(v)). A 1.6 mile section of the mainstem from TR 476 to Spring Creek has been designated Class A Wild Trout Waters by the PFBC, which is a qualifying criterion for High Quality Waters (§ 93.4b(a)(2)(ii)). None of the other antidegradation criteria listed in § 93.4b, pertaining to Exceptional Value waters, apply to this basin.

In addition to applying the above antidegradation scoring test, the Department's benthic metric Index of Biotic Integrity (IBI) was also employed. The Department's IBI for benthic macroinvertebrates in wadeable freestone riffle-run streams (Chalfant, 2007; modified in 2008) is calculated as the arithmetic mean of six adjusted, standardized metric scores: Beck's index (a tolerance value-weighted richness metric based on the most sensitive taxa defined as having Hilsenhoff tolerance values of 2 or less); sensitive (having Hilsenhoff tolerance values of 4 or less) EPT taxa richness; total taxa richness; Shannon Diversity; Hilsenhoff Biotic Index; and percent individuals of sensitive (having Hilsenhoff tolerance values of 3 or less) taxa in a 200 (+/- 20%) count sub-sample. The six raw metric scores are standardized to reference values, which results in standardized metric scores adjusted to a scale of 0 to 100. These six adjusted standardized scores are averaged to calculate the total IBI score. IBI scores closer to 100 represent reference-quality conditions and scores closer to 0 represent more impacted conditions. The IBI scores at the 6 sampled stations (Table 6) revealed stressed conditions that are consistent with aquatic life use impairment. As a result of these IBI scores, the mainstem of Little Lehigh Creek from Lower Longswamp to the mouth was listed on Pennsylvania's 2008 303(d) list of impaired waters.

PUBLIC RESPONSE AND PARTICIPATION SUMMARY

The Department provided public notice of this redesignation evaluation and requested technical data from the general public through publication in the Pennsylvania Bulletin on June 21, 2003 (33 Pa.B 2933). A similar notice was also published in The Morning Call newspaper (Allentown, PA) on June 20, 2003. In addition, Longswamp Township, Berks County; Lower Macungie, Salisbury Townships, Borough of Emmaus, and the City of Allentown, Lehigh County were notified of the redesignation evaluation in a letter dated June 19, 2003. Long-term water quality data were received as a result of these requests from the City of Allentown, Bureau of Water Resources. Letters in support of the redesignation evaluation were received

from Lower Macungie Township, Lehigh County Fish and Game Protective Association, Partners for Community Preservation, 25 students from Salisbury High School, and two members of the public.

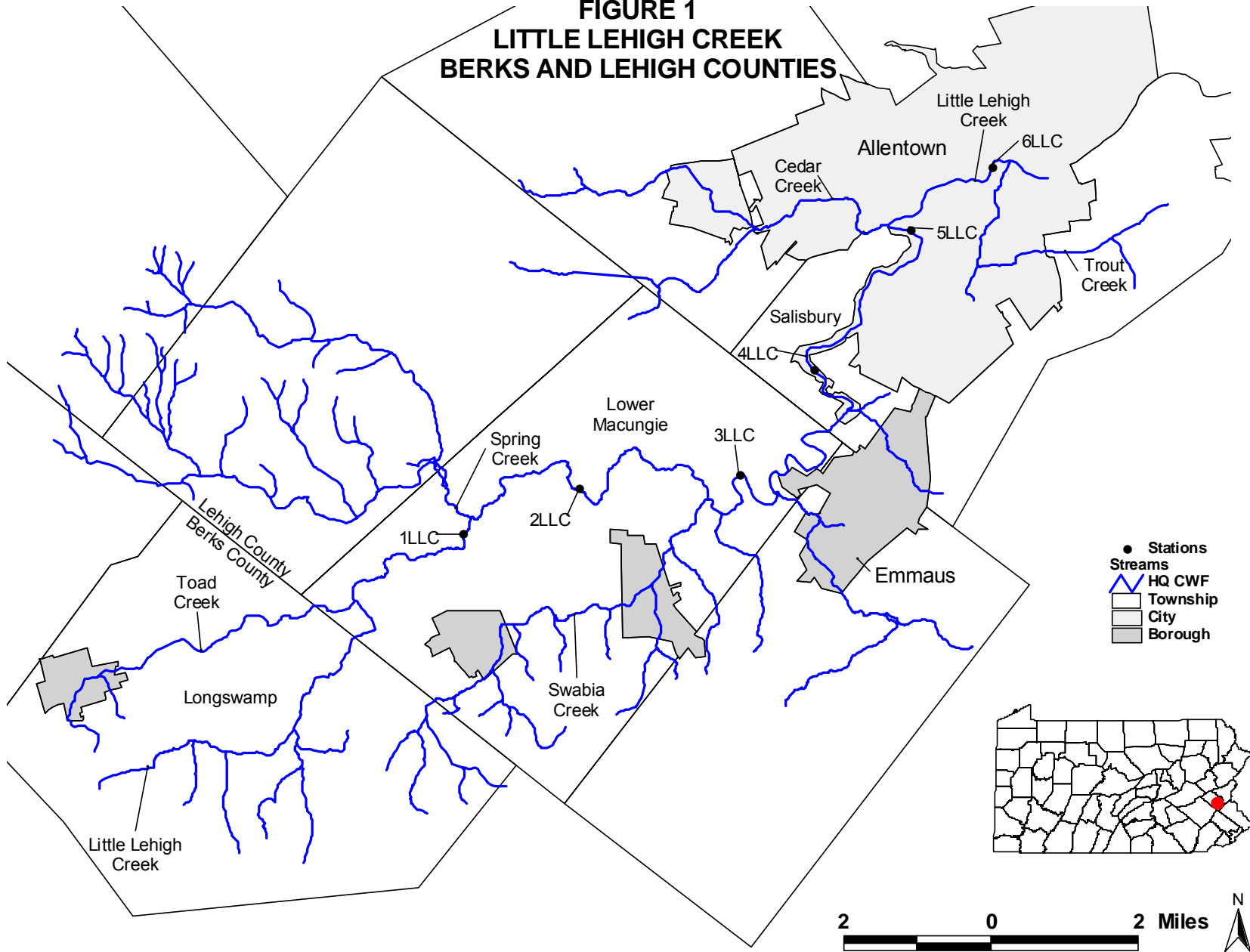
The petitioner and local municipality and planning commission representatives were notified by a postcard mailing that the report was available on the Department's web page for review with a 30-day comment period, which closed on April 16, 2010. No comments were received in response to this notice.

RECOMMENDATION

Based on the applicable regulatory definitions and requirements of § 93.4b, the Department recommends that Little Lehigh Creek mainstem from its source to its mouth retain its current High Quality-Cold Water Fishes, Migratory Fishes (HQ-CWF, MF) designation.

A total of 25.4 mainstem stream miles will retain their current HQ-CWF, MF designation. This recommendation does not reflect the EV designation sought in the petition.

**FIGURE 1
LITTLE LEHIGH CREEK
BERKS AND LEHIGH COUNTIES**



**TABLE 1
STATION LOCATIONS
LITTLE LEHIGH CREEK
LEHIGH AND BERKS COUNTIES**

STATION	LOCATION
1LLC	Little Lehigh Creek (03420) approximately 100 meters upstream of State Route 100. Lower Macungie Township, Lehigh County Lat: 40° 31' 48" Long: 75° 36' 09" RMI: 17.3
2LLC	Little Lehigh Creek (03420) approximately 30 meters upstream of –Mill Creek Road (TR 498). Lower Macungie Township, Lehigh County Lat: 40° 32' 18" Long: 75° 34' 19" RMI: 14.6
3LLC	Little Lehigh Creek (03420) approximately -- meters upstream of Mill Race Road (TR 510). Lower Macungie Township, Lehigh County Lat: 40° 32' 26" Long: 75° 31' 50" RMI: 10.6
4LLC	Little Lehigh Creek (03420) approximately 250 meters upstream of Hatchery Road. City of Allentown, Lehigh County Lat: 40° 33' 37" Long: 75° 30' 40" RMI: 6.2
5LLC	Little Lehigh Creek (03420) approximately 150 meters upstream of Road at Lehigh Parkway. City of Allentown, Lehigh County Lat: 40° 35' 15" Long: 75° 29' 06" RMI: 3.1
6LLC	Little Lehigh Creek (03420) approximately 50 meters upstream of confluence with Jordan Creek (03421) at Warwick County Park. City of Allentown, Lehigh County Lat: 40° 35' 58" Long: 75° 27' 50" RMI: 1.0

**TABLE 2
WATER CHEMISTRY
LITTLE LEHIGH CREEK
LEHIGH AND BERKS COUNTIES
APRIL 28, 2004**

STATIONS ¹							
	1LLC	2LLC	3LLC	4LLC	5LLC	6LLC	1EC ²
Field Parameters							
Temp (°C)	14.2	13	11.3	10.7	10.9	11.3	11
pH	8.03	8.26	8.24	7.81	7.84	7.93	6.73
Cond (µS/cm)	300	395	360	385	406	463	238
Dissolved Oxygen	10.8	12.3	12.1	9.73	10.4	10.2	10.7
Total Alkalinity	100	110	90	100	100	130	100

¹ Refer to Figure 1 and Table 1 for station locations

² Elk Creek, Centre County, April 21, 2004

**TABLE 3
HABITAT ASSESSMENT RESULTS
LITTLE LEHIGH CREEK
LEHIGH AND BERKS COUNTIES
APRIL 28, 2004**

PARAMETER	STATION ¹						
	1LLC	2LLC	3LLC	4LLC	5LLC	6LLC	1EC
1. instream cover	15	15	15	15	14	15	16
2. epifaunal substrate	15	16	17	13	12	14	18
3. embeddedness	11	8	10	12	12	13	16
4. velocity/depth regimes	16	18	18	16	16	16	16
5. channel alteration	15	15	18	18	16	16	19
6. sediment deposition	16	16	13	14	8	15	18
7. frequency of riffles	15	15	16	15	15	15	17
8. channel flow status	20	20	20	20	20	20	18
9. condition of banks	16	16	16	16	14	12	18
10. bank vegetative protection	16	16	17	16	14	11	18
11. disruptive pressure	16	11	15	13	10	11	18
12. riparian zone width	16	11	15	12	1	11	19
Total Score	187	177	190	180	152	169	211
Rating ²	SUB	SUB	SUB	SUB	SUB	SUB	OPT

¹ Refer to Figure 1 and Table 1 for station locations

² OPT=Optimal (≥ 192); SUB=Suboptimal (132-180)

TABLE 4
SEMI-QUANTITATIVE BENTHIC MACROINVERTEBRATE DATA
LITTLE LEHIGH CREEK, LEHIGH AND BERKS COUNTIES
APRIL 28, 2004

TAXA	STATION ¹						
	1LLC	2LLC	3LLC	4LLC	5LLC	6LLC	1EC ²
Ephemeroptera (mayflies)							
Baetidae; <i>Acerpenna</i>			9			12	
<i>Baetis</i>	4	3		18	11	15	22
<i>Callibaetis</i>			2				
Caenidae; <i>Caenis</i>							1
Ephemerellidae; <i>Drunella</i>							5
<i>Ephemerella</i>	3	20	51	119	46	20	114
<i>Serratella</i>							1
Heptageniidae; <i>Epeorus</i>				1			2
<i>Stenacron</i>					2	1	
<i>Stenonema</i>	2	1	2	4			
Leptophlebiidae; <i>Paraleptophlebia</i>							6
Plecoptera (stoneflies)							
Nemouridae; <i>Amphinemura</i>		1				1	3
Perlidae; <i>Paragnetina</i>			1				
Perlodidae; <i>Isoperla</i>				1			1
Trichoptera (caddisflies)							
Brachycentridae; <i>Micrasema</i>							2
Hydropsychidae; <i>Cheumatopsyche</i>	5	3	26	21	10	3	5
<i>Hydropsyche</i>	2	18	14	13	4	18	16
Odontoceridae; <i>Psilotreta</i>							1
Philopotamidae; <i>Chimarra</i>	4		3	3	1	1	
Polycentropodidae; <i>Polycentropus</i>			1				
Rhyacophilidae; <i>Rhyacophila</i>					2		1
Other Insect Taxa							
DIPTERA (true flies)							
Chironomidae	13	1	10	18	22	32	8
Empididae; <i>Chelifera</i>	5		1	2	2		
<i>Clinocera</i>	1						
<i>Hemerodromia</i>	8	3			2	1	1
Simuliidae; <i>Simulium</i>	2	6	7	1	4	38	10
Tipulidae; <i>Antocha</i>	3	3	6	5	14	5	
<i>Dicranota</i>							
COLEOPTERA (aquatic beetles)							
Elmidae; <i>Dubiraphia</i>	1		1				

TAXA	STATION ¹						
	1LLC	2LLC	3LLC	4LLC	5LLC	6LLC	1EC ²
<i>Optioservus</i>	135	130	24	24	34	18	3
<i>Oulimnius</i>				1	23	9	
<i>Promoresia</i>							6
<i>Stenelmis</i>	51	37	41	8	10	39	
Psephenidae; <i>Psephenus</i>			9	1			
Non-Insect Taxa							
TURBELLARIA (flat worms)							
Planariidae						2	
OLIGOCHETA					1	1	
HYDRACARINA					1		2
AMPHIPODA							
Gammaridae; <i>Gammarus</i>	1			1	15		1
DECOPODA							
Cambaridae		1					
ISOPODA							
Asellidae; <i>Caecidotea</i>					2		
<i>Lirceus</i>				1			
Number of taxa in total sample	16	13	17	18	19	17	19

¹Refer to Figure 1 for station location

²Elk Creek, Centre County, April 21, 2004

**TABLE 5
FISH DATA
LITTLE LEHIGH CREEK, BERKS AND LEHIGH COUNTIES
July 8, 1996 through August 27, 2004**

Species (Common Name)	Section 2			Section 3 ¹		Section 4	Section 5			Section 6	Section 7		Section 8 ²	
	RMI 21.03	RMI 20.44	RMI 18.61	RMI 17.8	RMI 17.15	RMI 11.58	RMI 11.01	RMI 10.38	RMI 9.79	RMI 9.59	RMI 6.02		RMI 4.94	RMI 4.44
	July 23, 1996	July 8, 1996	July 23, 1996	August 27, 2004	July 8, 1996	June 12, 1997	June 16, 1997	June 12, 1997	June 24, 1997	June 23, 1997	August 14, 2001	July 25, 2002	July 30, 2003	July 31, 2003
Trout (<i>Salmonidae</i>)														
Brook trout (stocked) <i>Salvelinus fontinalis</i>						X	X	X		X		X	X	X
Brook trout (wild) <i>S. fontinalis</i>													X	X
Brown trout (stocked) <i>Salmo trutta</i>						X	X	X	X	X	X	X	X	X
Brown trout (wild) <i>S. trutta</i>	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Rainbow trout (stocked) <i>Oncorhynchus mykiss</i>				X		X	X	X		X	X	X	X	X
Rainbow trout (wild) <i>O. mykiss</i>							X	X	X				X	X
Bass and Sunfish (<i>Centrarchidae</i>)														
Largemouth bass <i>Micropertus salmoides</i>				X					X	X		X		
Rock bass <i>Ambloplites rupestris</i>	X		X			X	X	X	X	X	X	X		
Green Sunfish <i>Lepomis cyanellus</i>				X										
Redbreast sunfish <i>L. auritus</i>			X		X									
Pumpkinseed <i>L. gibbosus</i>	X			X		X	X		X	X				
Bluegill <i>L. macrochirus</i>	X						X				X	X		
Minnows (<i>Cyprinidae</i>)														
Common shiner <i>Luxilus cerasinus</i>		X			X	X	X	X	X					
Goldfish <i>Carassius auratus</i>												X		
Spottail shiner <i>Notropis hudsonius</i>				X			X							
Comely shiner <i>N. amoenus</i>				X										
Satinfin shiner <i>Cyprinella analostana</i>			X				X							
Blacknose dace <i>Rhinichthys atratulus</i>	X	X	X	X	X	X	X	X	X	X	X	X		
Longnose dace <i>R. cataractae</i>	X	X	X		X				X	X	X			
Cutlips minnow <i>Exoglossum maxillingua</i>	X	X	X	X	X	X	X	X	X	X		X		
Fallfish <i>Semotilus corporalis</i>					X									
Creek chub <i>S. atromaculatus</i>	X	X	X	X	X							X		
Perches and Darters (<i>Percidae</i>)														
Tessellated darter <i>Etheostoma olmstedi</i>	X	X	X	X	X	X	X	X				X		
Shield Darter <i>Percina peltata</i>						X		X						
Suckers (<i>Catostomidae</i>)														
White sucker <i>Catostomus commersoni</i>	X	X	X	X	X				X	X	X	X		
Catfishes (<i>Ictaluridae</i>)														

Species (Common Name)	Section 2			Section 3 ¹		Section 4	Section 5			Section 6	Section 7		Section 8 ²	
	RMI 21.03	RMI 20.44	RMI 18.61	RMI 17.8	RMI 17.15	RMI 11.58	RMI 11.01	RMI 10.38	RMI 9.79	RMI 9.59	RMI 6.02		RMI 4.94	RMI 4.44
	July 23, 1996	July 8, 1996	July 23, 1996	August 27, 2004	July 8, 1996	June 12, 1997	June 16, 1997	June 12, 1997	June 24, 1997	June 23, 1997	August 14, 2001	July 25, 2002	July 30, 2003	July 31, 2003
Margined madtom <i>Noturus insignis</i>	X	X	X		X									
Pikes (<i>Esocidae</i>)														
Redfin pickerel <i>Esox americanus</i>					X	X				X				
Sculpins (<i>Cottidae</i>)														
Slimy sculpin <i>Cottus cognatus</i>								X			X	X		
Killifishes (<i>Fundulidae</i>)														
Banded Killifish <i>Fundulus diaphanus</i>	X		X	X			X							
Eels (<i>Anguillidae</i>)														
American eel <i>Anguilla rostrata</i>	X	X	X	X	X	X	X	X	X	X	X	X		

¹ 1.6 mile section of Little Lehigh Creek designated Class A Wild Trout

² Segment formerly designated Heritage Trout Angling

**TABLE 5A
FISH DATA
LITTLE LEHIGH CREEK, BERKS AND LEHIGH COUNTIES
July 8, 1996 through August 27, 2004**

Species (Common Name)	Section 3 ¹		Section 8 ²	
	RMI 17.8	RMI 17.15	RMI 4.94	RMI 4.44
	August 27, 2004	July 8, 1996	July 30, 2003	July 31, 2003
Trout (<i>Salmonidae</i>)				
Brook trout (stocked) <i>Salvelinus fontinalis</i>			X	X
Brook trout (wild) <i>S. fontinalis</i>			X	X
Brown trout (stocked) <i>Salmo trutta</i>			X	X
Brown trout (wild) <i>S. trutta</i>	89.92 kg/ha	93.03 kg/ha	112.46 kg/ha	166.58 kg/ha
Rainbow trout (stocked) <i>Oncorhynchus mykiss</i>	X		X	X
Rainbow trout (wild) <i>O. mykiss</i>			X	X

¹ 1.6 mile section of Little Lehigh Creek designated Class A Wild Trout

² Segment formerly designated Heritage Trout Angling

**TABLE 6
RBP METRIC COMPARISON
LITTLE LEHIGH CREEK
LEHIGH AND BERKS COUNTIES
APRIL 28, 2004**

METRIC	STATION						
	1LLC	2LLC	3LLC	4LLC	5LLC	6LLC	1EC ¹
1. TAXA RICHNESS	16	13	17	18	19	17	19
Cand/Ref (%)	84.21	68.42	89.47	94.74	100.00	89.47	
Biol. Cond. Score	8	3	8	8	8	8	8
2. MOD. EPT INDEX	3	3	4	5	4	4	10
Cand/Ref (%)	30.00	30.00	40.00	50.00	40.00	40.00	
Biol. Cond. Score	0	0	0	1	0	0	8
3. MOD. HBI	4.488	4.106	4.053	3.042	3.971	2.325	2.405
Cand-Ref	2.083	1.701	1.648	0.637	1.566	-0.08	
Biol. Cond. Score	0	0	0	8	0	8	8
4. % DOMINANT TAXA	56.25	57.27	24.52	49.58	22.33	18.06	57
Cand-Ref	-0.75	0.27	-32.48	-7.42	-34.67	-38.94	
Biol. Cond. Score	8	8	8	8	8	8	8
5. % MOD. MAYFLIES	2.083	9.251	25.48	51.67	23.3	9.722	64
Cand-Ref	61.917	54.749	38.52	12.33	40.7	54.278	
Biol. Cond. Score	0	0	0	7	0	0	8
TOTAL BIOLOGICAL CONDITION SCORE	16	11	16	32	16	24	40
% COMPARABILITY TO REFERENCE	40.00	27.50	40.00	80.00	40.00	60.00	
DEP IBI Score	32.4	32.8	44.8	51.8	47.1	39.1	

¹ Elk Creek, Centre County, April 21, 2004.