

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

**BIG BROOK  
WAYNE COUNTY**

**Segment: Basin  
Stream Code: 05992  
Drainage List B**

WATER QUALITY MONITORING SECTION (APF)  
DIVISION OF WATER QUALITY STANDARDS  
BUREAU OF WATER STANDARDS AND FACILITY REGULATION  
DEPARTMENT OF ENVIRONMENTAL PROTECTION  
OCTOBER 2006

## **INTRODUCTION**

The Big Brook basin is currently designated High Quality – Cold Water Fishes (HQ-CWF) and was evaluated for redesignation as Exceptional Value (EV) Waters based on a petition submitted by the Lebanon Township (Wayne County) Board of Supervisors. The petitioner requested redesignation of the stream reach from the headwaters to the T477 (Gridline Road) crossing in Lebanon Township on the basis of exceptional water quality, aquatic life, habitat and land use. The Environmental Quality Board (EQB) accepted the petition for further study on January 16, 2001. The Department evaluated the entire basin. One component of the evaluation was a field survey conducted by Department staff on April 24-25, 2002.

## **GENERAL WATERSHED DESCRIPTION**

Big Brook is a tributary to Dyberry Creek in the Delaware River drainage (Figure 1). The basin is located in Dyberry, Oregon, Lebanon and Damascus townships in Wayne County. Big Brook is a freestone creek containing 28.9 miles of streams that drains 14.5mi<sup>2</sup> and flows in a southerly direction. The surrounding area is characterized by relatively hilly topography, which is portrayed on the Aldenville and Galilee 7.5-minute series USGS quadrangles.

Much of the watershed has a relatively low population density and land ownership is entirely private with forested or agricultural land uses. The watershed is entirely within the North-East Plateau ecoregion. The National Wetlands Inventory maps indicate the presence of forested and shrub-scrub swamp.

## **WATER QUALITY AND USES**

### **Surface Water**

No long-term water chemistry data were available to allow a direct comparison to water quality criteria. The Department collected grab samples at station 3BB (Table 1) on April 24, 2002 (Table 2). These samples indicated generally good water quality but since the instantaneous nature of grab samples precludes comparison to applicable water quality criteria, the indigenous aquatic community is a better indicator of long-term water quality conditions. There are no National Pollution Discharge Elimination System (NPDES) permitted discharges and one water withdrawal permitted to Wayne County Ready Mix, within the Big Brook basin. There is the potential of water quality impacts from non-point sources due to the presence of agriculture, roadways, and private on-lot sewage disposal in the basin.

## **Aquatic Biota**

The indigenous aquatic community is an excellent indicator of long-term water quality conditions and is used as a measure of both water quality and ecological significance. Department staff collected habitat and benthic macroinvertebrate data at three sampling locations on April 24-25, 2002 (Figure 1).

**Habitat.** Instream habitat conditions were evaluated at each of the three stations where benthic macroinvertebrates were sampled (Figure 1, Table 3). The habitat evaluation consists of rating twelve habitat parameters to derive a station habitat score. The habitat scores for Big Brook ranged from 177 to 195; reflecting sub-optimal to optimal habitat conditions.

**Benthos.** Benthic macroinvertebrate collection efforts employed the Department's PA-DEP RBP benthic sampling methodology using the Department's antidegradation sampling protocol adapted from EPA's 1989 and 1999 Rapid Bioassessment Protocols manuals. The results of the benthic macroinvertebrate sampling efforts are presented in Table 4. Taxonomic diversity was good with a mean of 22.7 total taxa per station. A large number of taxa intolerant of pollution were present at all stations.

## **BIOLOGICAL USE QUALIFICATIONS**

The qualifying criterion applied to Big Brook was the DEP antidegradation integrated benthic macroinvertebrate scoring test described at §93.4b(a)(2)(i)(A) and §93.4b(b)(1)(v). Selected benthic macroinvertebrate community metrics were compared to a reference station (Table 5). The reference station was located on Sawkill Creek, Pike County. Sawkill Creek was used because of its close proximity, similar drainage area, and similar geologic setting. Sawkill Creek is currently designated Exceptional Value (EV) in Chapter 93 and has served as an EV reference stream in other Departmental surveys. All sampling was done over a two-day period to minimize the effects of seasonal variation. This comparison was done using the following metrics that were selected to assess aquatic community health: taxa richness; modified EPT index (total number of intolerant Ephemeroptera, Plecoptera, and Trichoptera taxa); modified Hilsenhoff Biotic Index; percent dominant taxon; and percent modified mayflies.

Based on these five metrics, all stations on Big Brook had biological condition scores greater than 92% of the reference station on Sawkill Creek. This indicates that Big Brook qualifies for an EV designation under the Department's regulatory criterion (§ 93.4b(b)(1)(v)).

## **PUBLIC RESPONSE AND PARTICIPATION SUMMARY**

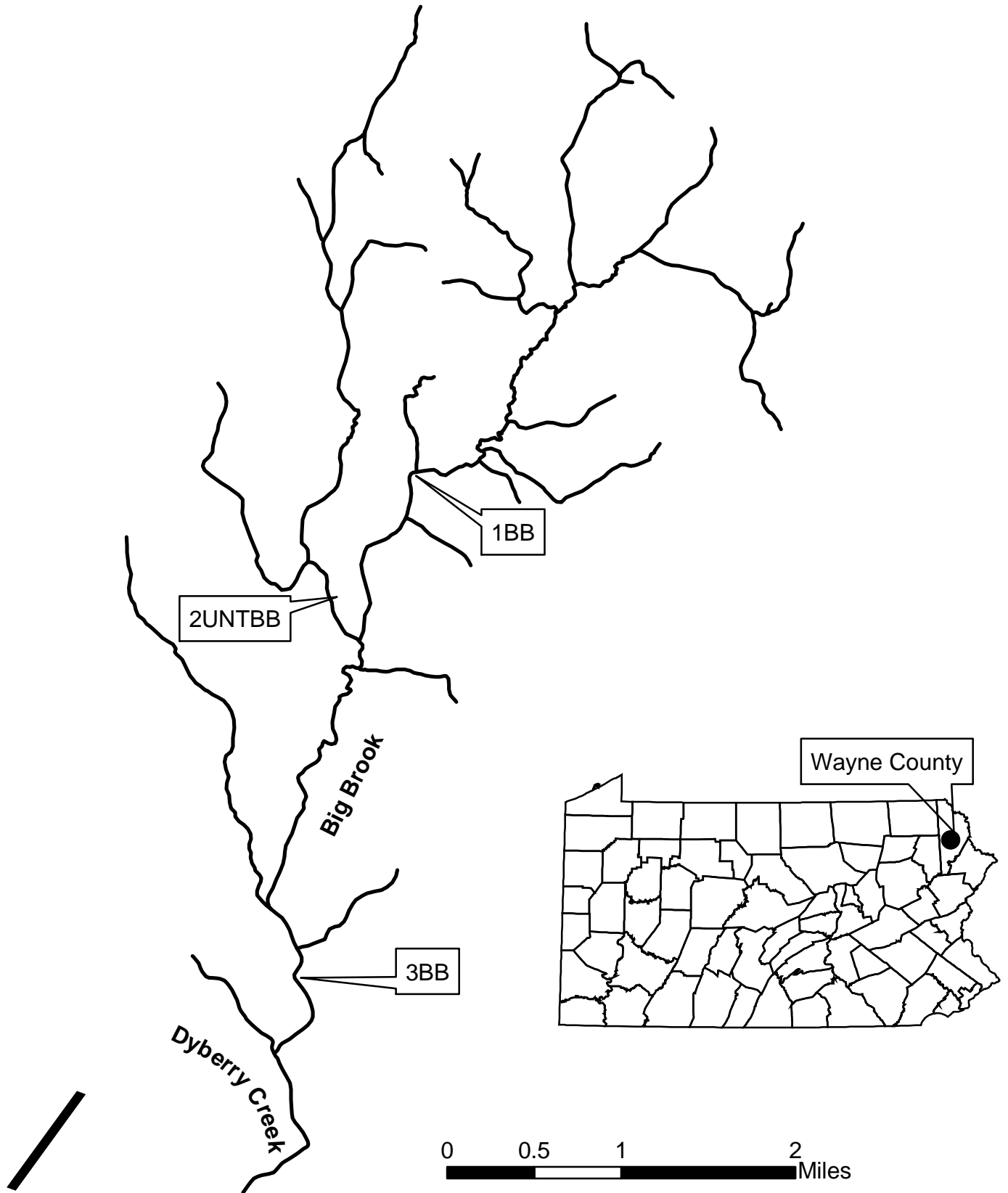
The Department provided public notice of this aquatic life use evaluation and requested any technical data from the general public through publication in the Pennsylvania Bulletin on April 27, 2002 (32 Pa.B 2162). A similar notice was also published in the Scranton Times on April 26, 2002. In addition, the Lebanon Township Board of Supervisors were notified of the redesignation evaluation in a letter dated November 19, 2001 and March 12, 2002. No additional data was received in response to these requests.

## **RECOMMENDATIONS**

Based on applicable regulatory definitions and requirements of § 93.4(b), the Department recommends that the protected use of Exceptional Value (EV) be applied to the Big Brook basin, including all its tributaries, from its source to mouth. This recommendation is consistent with the petitioner's request and affects approximately 29 stream miles.



**Figure 1**  
**Big Brook**  
**Wayne County**



**TABLE 1**  
**STATION LOCATIONS**  
**BIG BROOK, WAYNE COUNTY**

<b><u>STATION</u></b>	<b><u>LOCATION</u></b>
1BB	Big Brook at T477 (Gridline Road) bridge crossing in Lebanon Township. Lat: 41.6386 Long: -75.2606 RMI: 4.1
2UNTBB	Unnamed tributary Big Brook (5995) SR191 bridge crossing in Oregon Township. Lat: 41.6683 Long: -75.2550 RMI: 0.1
3BB	Big Brook at T550 bridge crossing in Dyberry Township. Lat: 41.6803 Long: -75.2469 RMI: 0.42
Ref1	Sawkill Creek along T524 in Milford Township, Pike County. Lat: 41.3511 Long: -74.8453 RMI: 4.5

**TABLE 2**  
**WATER CHEMISTRY<sup>1</sup>**  
**BIG BROOK, WAYNE COUNTY**  
**April 24, 2002**

STATION	3 BB
Field Parameters	
Temp (°C)	11.46
pH	8.62
Cond (umhos)	116
Diss. O <sub>2</sub>	10.67
Laboratory Parameters	
pH	8.2
Alkalinity	22
Acidity	0
Hardness	28
T Diss. Sol.	30
Susp. Sol.	<2
NH <sub>3</sub> -N	<0.02
NO <sub>2</sub> -N	<0.01
NO <sub>3</sub> -N	0.14
Total P	0.01
Ca	9.52
Mg	1.12
Cl	7
SO <sub>4</sub>	<20.0
As*	<4.0
As Diss*	<4.0
Cd*	<0.2
Cd Diss*	<0.2
hex Cr*	<10.0
Cr*	<50
Cu*	<4
Cu Diss*	<4
Fe*	138
Pb*	<1
Pb Diss.*	<1
Mn*	<10.0
Ni*	<4.0
Ni Diss.*	<4.0
Zn*	<5.0
Zn Diss*	<5.0
Al*	38.599
fecal coliforms	<10

<sup>1</sup>- Except for pH, conductance and indicated otherwise, all values are total concentrations in mg/l

\*-Total concentration in ug/l



**TABLE 3**  
**HABITAT ASSESSMENT SUMMARY**  
**BIG BROOK, WAYNE COUNTY**  
**APRIL 2002**

HABITAT PARAMETER	scoring range	Candidate Stations			Reference Station
		1BB	2UNTBB	3BB	Ref <sup>1</sup>
1 . instream cover	0 - 20	17	16	16	18
2 . epifaunal substrate	0 - 20	18	16	18	19
3 . embeddedness	0 - 20	17	16	16	18
4 . velocity/depth	0 - 20	15	16	14	16
5 . channel alterations	0 - 20	17	14	16	17
6 . sediment deposition	0 - 20	17	16	17	18
7 . riffle frequency	0 - 20	18	17	18	18
8 . channel flow status	0 - 20	17	18	17	17
9 . bank condition	0 - 20	16	13	15	16
10 . bank vegetation protection	0 - 20	16	16	16	17
11 . grazing/disruptive pressures	0 - 20	15	12	17	19
12 . riparian vegetation zone width	0 - 20	13	7	13	16
Total Score	0 - 240	196	177	193	209
Rating		Optimal	Suboptimal	Optimal	Optimal

Ref<sup>1</sup> - Sawkill Creek, Pike County

**TABLE 4**  
**SEMI-QUANTITATIVE BENTHIC MACROINVERTEBRATE DATA**  
**BIG BROOK, WAYNE COUNTY**  
**April 24, 2002**

	Candidate Stations			Reference Station
	1BB	2UNTBB	3BB	Ref <sup>1</sup>
<u>MAYFLIES</u>				
Baetidae	<i>Acentrella</i>	-	3	1
	<i>Baetis</i>	-	-	4
Ephemerellidae	<i>Drunella</i>	8	16	23
	<i>Ephemerella</i>	30	21	14
	<i>Eurylophella</i>	-	1	-
	<i>Serratella</i>	13	6	2
Heptageniidae	<i>Cinygmula</i>	-	1	-
	<i>Epeorus</i>	14	8	5
	<i>Stenonema</i>	-	2	2
Isonychidae	<i>Isonychia</i>	5	1	2
Leptophlebiidae	<i>Paraleptophlebia</i>	1	9	7
<u>STONEFLIES</u>				
Leuctridae	<i>Leuctra</i>	-	3	2
Perlidae	<i>Acroneuria</i>	1	-	2
	<i>Agnatina</i>	-	4	1
	<i>Paragnetina</i>	3	-	2
Perlodidae	<i>Isoperla</i>	4	-	1
Pteronarcyidae	<i>Pteronarcys</i>	-	1	-
<u>CADDISFLIES</u>				
Helicopsychidae	<i>Helicopsyche</i>	1	-	-
Hydropsychidae	<i>Cheumatopsyche</i>	-	-	1
	<i>Diplectrona</i>	-	-	1
	<i>Hydropsyche</i>	2	2	1
Philopotamidae	<i>Dolophilodes</i>	5	-	2
Rhyacophilidae	<i>Rhyacophila</i>	4	2	1
Uenoidae	<i>Neophylax</i>	-	4	-
<u>TRUE FLIES</u>				
Chironomidae		10	13	24
Empididae	<i>Chelifera</i>	-	1	-
	<i>Hemerodromia</i>	-	1	-
Simuliidae	<i>Simulium</i>	-	-	1
	<i>Prosimulium</i>	-	-	1
Tipulidae	<i>Antocha</i>	-	1	-
	<i>Cryptolabis</i>	-	-	5
	<i>Dicranota</i>	-	1	-
	<i>Hexatoma</i>	-	-	6
	<i>Pseudolimnophila</i>	-	-	1
<u>MISC. INSECT TAXA</u>				
Corydalidae	<i>Nigronia</i>	-	-	2
Sialidae	<i>Sialis</i>	1	-	-
Elmidae	<i>Optioservus</i>	1	-	2
	<i>Oulimnius</i>	-	-	-
	<i>Promoresia</i>	4	-	-
	<i>Stenelmis</i>	-	4	-
Psephenidae	<i>Ectopria</i>	1	-	-
	<i>Psephenus</i>	3	10	5
Gomphidae	<i>Boyeria</i>	-	1	-
	<b>Total Taxa</b>	<b>19</b>	<b>23</b>	<b>26</b>

Ref<sup>1</sup> - Sawkill Creek, Pike County

**TABLE 5**  
**RBP METRIC COMPARISON**  
**BIG BROOK**

METRIC	STATION			
	1 BB	2 UNTBB	3 BB	Ref <sup>1</sup>
1. TAXA RICHNESS	19	23	26	26
Candidate/Reference (%)	73%	88%	100%	--
Biological Condition Score	6	8	8	--
2. MOD. EPT INDEX	12	14	16	14
Candidate/Reference (%)	86%	100%	114%	--
Biological Condition Score	8	8	8	--
3. MOD. HBI	1.83	2.32	2.59	2.41
Candidate - Reference	-0.58	-0.09	0.18	--
Biological Condition Score	8	8	8	--
4. % DOMINANT TAXA	27	18.6	20.3	16.4
Candidate - Reference	10.6	2.2	3.9	--
Biological Condition Score	8	8	8	--
5. % MODIFIED MAYFLIES	64	57.5	49.2	36.4
Reference - Candidate	-27.6	-21.1	-12.8	--
Biological Condition Score	8	8	8	--
TOTAL BIOLOGICAL CONDITION SCORE	38	40	40	--
% COMPARABILITY TO REFERENCE	95%	100%	100%	--

Ref<sup>1</sup> - Sawkill Creek, Pike County