SOBERS RUN

NORTHAMPTON COUNTY

WATER QUALITY STANDARDS REVIEW

STREAM REDESIGNATION EVALUATION REPORT

Segment: Basin
Stream Code: 04646
Drainage List: C

WATER QUALITY MONITORING SECTION (MJL)
DIVISION OF WATER QUALITY STANDARDS
BUREAU OF CLEAN WATER
DEPARTMENT OF ENVIRONMENTAL PROTECTION

February 2016

INTRODUCTION

The Department conducted an evaluation of Sobers Run in 2005 as part of ongoing statewide monitoring efforts and again in 2009 in response to a petition submitted by Bushkill Township, which was accepted by the Environmental Quality Board (EQB) on April 21, 2009. The petitioner requested that the basin be redesignated to Exceptional Value (EV) from the source to its mouth. The Sobers Run basin is currently designated High Quality - Cold Water Fishes, Migratory Fishes (HQ-CWF, MF). Components of this evaluation include field surveys conducted April 2005 and May 2009 as well as water quality protective measures implemented within the Sobers Run basin.

GENERAL WATERSHED DESCRIPTION

Sobers Run is a freestone tributary to Bushkill Creek. The candidate basin is located in Bushkill Township, Northampton County (Figure 1). The Sobers Run basin has a drainage area of approximately 10.19 square miles, the mainstem consists of 10.67 stream miles, and the basin consists of approximately 16.18 stream miles. The surrounding area is characterized by relatively flat topography with some gently rolling hills of low relief. The current land use consists of forested land (63.2%), agriculture (33.1%), urban/developed (2.1%), and wetlands (1.6%). There are a total of four NPDES permitted discharges in the Sobers Run basin, including one industrial stormwater and three small flow or single residence sewer treatment discharges.

WATER QUALITY AND USES

Surface Water

Long-term chemistry data were not available from the Department's Water Quality Network. Water quality monitoring was conducted by the Retired and Senior Volunteer Program, January 2007 through December 2009, at two locations in the Sobers Run basin. Department staff collected in-situ water chemistry at three locations in 2009 (Table 6).

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 five locations in the Sobers Run basin on April 19, 2005 and at three additional stations on May 5, 2009. For these two separate sampling efforts, an EV reference station was collected from Wild Creek (Carbon County) on April 19, 2005 and again on May 5, 2009 (Table 1). Wild Creek

was chosen as an EV reference due to similar drainage area and stream type as Sobers Run.

Habitat. Instream habitat was assessed at each station. Total habitat scores ranged from a suboptimal 179 (1UNT) to an optimal 207 (3SR) compared to optimal scores found at the reference station 1WC on April 19, 2005 (229) and May 5, 2009 (227). Suboptimal stream bank condition scores at all seven candidate stations indicate instability often due to historical impacts such as mill dams. Low suboptimal riparian zone width scores at 1UNT and 2UNT indicates reduced riparian buffer, while the remaining candidate station scores indicate optimal riparian buffer (Table 2).

Benthos. Benthic macroinvertebrate samples were collected at seven stations (Table 1) 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). A total of four stations (1SR, 1UNT, 2UNT, 3UNT, and 3SR) were sampled on April 19, 2005 and three stations (2SR, 4UNT, and 3SR) were sampled on May 5, 2009 as two separate surveys. Overall candidate stations exhibited a mix of sensitive and tolerant taxa. All candidate stations were represented by moderately to highly sensitive mayfly, stonefly, and caddisfly communities. Some candidate stations (1UNT, 2UNT) and the 2009 sample at 3SR also had elevated numbers of tolerant taxa such as Chironomidae, Simuliidae, and Elmidae. Chironomidae was the dominant taxon at 1UNT comprising approximately 39% of the subsample.

BIOLOGICAL USE QUALIFICATIONS

The qualifying criteria applied to Sobers Run were the DEP integrated benthic macroinvertebrate scoring test described at § 93.4b(b)(1)(v). Selected benthic macroinvertebrate community metrics from Sobers Run basin (Tables 4 & 5) were compared to a reference station with comparable drainage area.

In April 2005, Sobers Run stations 1SR, 1UNT, 2UNT, 3UNT, and 3SR were compared to a reference station (1WC) on Wild Creek in Carbon County (Table 4). In May 2009, Sobers Run stations 4UNT, 2SR, and 3SR were again compared to a reference station (1WC) on Wild Creek in Carbon County (Table 5). The Wild Creek station location has similar Ridge and Valley Province characteristics as Sobers Run; and Wild Creek and Sobers Run are located in close proximity (east-southeast area of the state), where temporally similar aquatic community dynamics offer standardized candidate/reference comparisions. In order to minimize seasonal variation, candidate and reference stations were sampled within a temporally narrow window for each of the 2005 and 2009 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, stations 1UNT, 2UNT, and 3SR sampled in 2005, had Biological Condition Scores (BCS) that were below the 92% EV qualifying criterion when compared to reference station 1WC, while 1SR and 3UNT scored above the 92% EV qualifying criterion. In 2009, two additional stations (4UNT and 2SR) were sampled in addition to 3SR, which was previously sampled in 2005. Based on the five metrics identified above, 2SR and 3SR had BCS that were below the 92% EV qualifying criterion when compared to the reference station 1WC, while 4UNT scored above the 92% EV qualifying criterion (Tables 4 & 5).

A total of 7.43 stream miles qualify as EV Waters under this criterion.

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 A[1]];

B. The water is a surface water of exceptional ecological significance [§ 93.4b(b)(2) – see Appendix A[2]].

Areas of Sobers Run that satisfy these EV qualifying criteria are depicted in Figure 1 and are discussed below:

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

The outstanding resource waters EV criterion may be applied to the petitioned waters since they already have the prerequisite HQ designation. The definition of “Outstanding National, State, regional or local resource waters” in § 93.1 requires adoption of “water quality protective measures” by National or State government agencies. “Coordinated water quality protective measures” along a watershed corridor, also defined at § 93.1, are required for regional or local governments. (See Appendix A for the definitions). Such water quality protective measures have been applied through management

activities implemented on lands draining to the Sobers Run basin in Northampton County as described below:

Outstanding State Resource Waters

A review of the Department of Conservation and Natural Resources' (DCNR's) Bureau of State Parks management plan for Jacobsburg State Park found that there are no water quality protection measures identified for streams that run through the park.

Outstanding Local Resource Waters

The Department evaluated approximately 88 local conservation easements described as "coordinated water quality protective measures" owned or co-owned by Bushkill Township or Northampton County along the Sobers Run watershed corridor. Two easements, one located just upstream of Baron Road and station 3UNT, and one located downstream, provide protective measures to approximately 2.1 stream miles of West Branch Sobers Run from the northern most boundary of the Eschenbach property to a point approximately 0.5 miles downstream of Baron Road. In addition, approximately 37 easements, located north of Jacobsburg State Park, provide protective measures to approximately 3.2 stream miles from a point north of SR-512 and station 1SR to Jacobsburg State Park (Figure 1). Protective measures include restrictions on intensive agriculture, industrial animal production and commercial kennels. Protective measures also seek to protect natural resources so as to keep them in an undisturbed state except as required to promote and maintain a diverse community of predominately native species. The protective measures provided by these easements will enhance water quality protection over the long-term, are situated along the watershed corridor in a manner that provides protection to substantial reaches of the corridor, and meet regulations that require that such measures be "coupled with" an interest in real estate, as described at § 93.1. Definitions - "*Coordinated water quality protective measures*".

A total of 5.3 stream miles qualify as EV Waters under this criterion due to these conservation easements.

In addition, Bushkill Township requested that the Department review its comprehensive approach to plan for long-term protection of the Sober Run watershed, which is almost entirely located within the township boundaries. The Township implemented a rarely used planning mechanism to identify watercourses and their riparian corridors in an Official Map. The watercourses, as greenways, are planned to be reserved as open space. In general, under Article IV of the Pennsylvania Municipalities Planning Code

(Code), a municipality is authorized to adopt an "official map," by ordinance. Once adopted, the official map must be recorded in the office of the county recorder of deeds. Such recording serves as notice that the municipality has reserved certain property it might acquire for future use. Once an owner of such property has submitted a written notice to the municipality of its intentions to build or otherwise develop property included in the reservation, the municipality has one year to exercise its right to acquire the property.

Bushkill Township exercised its authority to adopt an Official Map pursuant to the Code. On April 21, 2005, the Township adopted Ordinance No. 2005.01 which identified proposed greenways to be reserved for open space. Such greenways include the following:

1. "Existing woodlands as shown on the "Woodlands" Geographic Information Systems layer found on the Lehigh and Northampton Counties Digital Geographic Data Disk Release 3.1, published by the Lehigh Valley Planning Commission in October 2004, except for those woodlands which are not connected to water courses in any manner."

2. "A 150-foot buffer zone measured from the top bank of both sides of any stream which appears on U.S. Geological Survey 7.5-minute quadrangle maps, resulting in a 300-foot minimum total buffer zone width. Where land development plans and permits are required and indicate necessary impacts to mapped greenway areas, the Township requires applicants to restore woodland conditions within the 300-foot zone where existing woodlands are not mapped (e.g., previously impacted riparian area)."

An additional feature of the Official Map ordinance is a requirement that any Subdivision or Land Development Plan submitted to the Township must incorporate the identified features and classifications of the Official Map. Therefore, any greenways identified on the Map must be incorporated into the plans.

Bushkill Township also adopted a Zoning Ordinance in 2012 that protects watercourses. In particular, the ordinance establishes what is considered to be an acceptable riparian buffer and limits uses and activities within the riparian buffer of streams, ponds, wetlands, and vernal pools.

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

Information gathered for the Pennsylvania Natural Heritage Program and reported in County Natural Areas Inventories for Lehigh and Northampton Counties (2005) identified a total of two specific areas with statewide or local ecological significance that is based upon the rarity and uniqueness of the areas' endemic ecological community types. The two areas, Jacobsburg Environmental Education Center and Rismiller Woods, are both Ephemeral/Fluctuating Pool Natural Communities, which are rare and endemic communities. Rismiller Woods also supports a good quality population of Swamp Dog-Hobble, a Pennsylvania Rare shrub. Both areas are wetlands hydrologically connected to riverine surface waters and therefore, are water quality dependent. The presence of endemic plant communities dependent on water quality or hydrology and their rarity in Pennsylvania satisfies the exceptional ecological significance criterion at § 93.4b(b)(2).

Rismiller Woods is located in the very upper reaches of Sobers Run basin, while the Jacobsburg Environmental Education Center is located within the lower reaches near the confluence with Bushkill Creek. The Sobers Run basin can be characterized as a headwater subbasin within the Bushkill Creek watershed. Disturbances to otherwise intact hydrological and biogeochemical processes in headwaters will directly affect water quality in downstream reaches of the basin. Degradation of upstream reaches like headwaters has been demonstrated to impact downstream reaches (Alexander et al. 2007, Nadeau et al. 2007, Wipfli et al. 2007). The comprehensive water quality protective measures throughout the entire Sobers Run basin, the co-occurrence of the two Ephemeral/Fluctuating Pool Natural Communities, and the interconnection between the rare and endemic communities with the upstream headwater reaches represent important and unique surface waters. Because of the distribution of the ecologically significant rare and unique endemic natural communities and the protection afforded to headwater and interstitial watercourse segments, the reaches of Sobers Run basin within these areas as well as those reaches that flow to them are recommended for EV designation as surface waters of exceptional ecological significance.

A total of 16.18 stream miles qualify as EV Waters under this criterion.

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 July 11, 2009 (39 Pa.B 3536). A similar notice was also published in The Express Times newspaper on June 30, 2009. In addition, Bushkill Township and Northampton County Conservation District were notified of the redesignation evaluation in a letter dated June 24, 2009. In response to this redesignation evaluation and public notices, the latest (2009) Coldwater Conservation Plan completed for the Upper Bushkill Creek Watershed was received from Hanover Engineering Associates. In addition, water chemistry results collected by the Retired Senior Volunteer Program, were received from the Northampton County Conservation District. The data provided was used as documentation and support for the Sobers Run special protection assessment.

Final Draft Notice, Comments and Response. Once the final draft report was completed, it was made available to all municipalities, County Planning Commissions, County Conservation Districts and other State Agencies on December 15, 2015 with a public comment period ending 30-days later. Nine stakeholders offered comments in support of the recommendation.

RECOMMENDATION

Based on applicable regulatory definitions and requirements of § 93.4b, the Department recommends that the entire Sobers Run basin be redesignated EV based on § 93.4b (b)(2) (exceptional ecological significance) (Figure 1). This redesignation recommendation includes the surface waters that additionally meet other qualifiers for outstanding local resource waters and the DEP integrated benthic macroinvertebrate scoring test. This recommendation adds approximately 16.18 stream miles of EV waters to Chapter 93.

APPENDIX A

[1]Definition 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 measures[3] 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 provide 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

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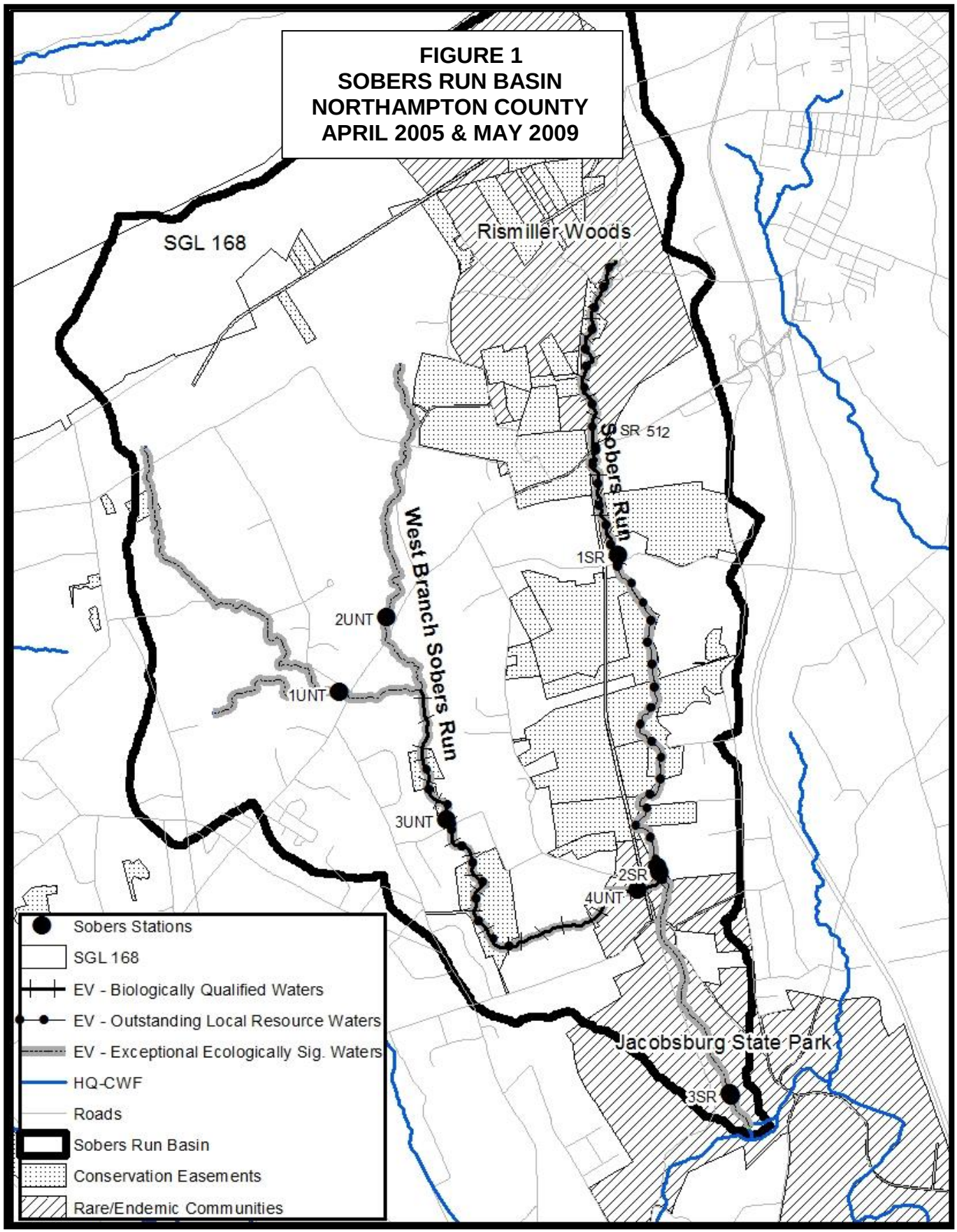
FIGURE 1
SOBERS RUN BASIN
NORTHAMPTON COUNTY
APRIL 2005 & MAY 2009
SGL 168
Rismiller Woods
SR 512
Sobers Run
West Branch Sobers Run
1SR
2UNT
1UNT
3UNT
2SR
4UNT
Jacobsburg State Park
3SR
Sobers Stations
SGL 168
EV - Biologically Qualified Waters
EV - Outstanding Local Resource Waters
EV - Exceptional Ecologically Sig. Waters
HQ-CWF
Roads
Sobers Run Basin
Conservation Easements
Rare/Endemic Communities

TABLE 1
STATION LOCATIONS
SOBERS RUN BASIN
NORTHAMPTON COUNTY
APRIL 2005 & MAY 2009

STATION	LOCATION
1SR	Sobers Run (04646) approximately 40 meters upstream of TR-615. Bushkill Township, Northampton County Lat: 40º 49' 16.37" Long: 75º 18' 41.96"
2SR	Sobers Run (04646) just upstream of West Branch Sobers Run. Bushkill Township, Northampton County Lat: 40º 48' 05.12" Long: 75º 18' 32.56
1UNT	Unnamed Tributary (04648) approximately 25 meters upstream of SR-512. Bushkill Township, Northampton County Lat: 40º 48' 47.57" Long: 75º 20' 04.93"
2UNT	West Branch Sobers Run (04647) approximately 250 meters upstream of SR-512. Bushkill Township, Northampton County Lat: 40º 49' 04.08" Long: 75º 19' 50.67
3UNT	West Branch Sobers Run (04647) approximately 15 meters upstream of TR-611. Bushkill Township, Northampton County Lat: 40º 48' 18.30" Long: 75º 19' 34.65"
4UNT	West Branch Sobers Run (04647) approximately 190 meters upstream of Sobers Run confluence. Bushkill Township, Northampton County Lat: 40º 48' 01.38" Long: 75º 18' 39.35"
3SR	Sobers Run (04646) approximately 25 meters upstream of footbridge near mouth. Bushkill Township, Northampton County Lat: 40º 47' 14.70" Long: 75º 18' 13.59"
1WC	Wild Creek (03959) approximately 75 meters upstream of SR-1001. Penn Forest Township, Carbon County Lat: 40º 56' 24.62" Long: 75º 35' 04.09"

TABLE 2
HABITAT ASSESSMENT RESULTS
SOBERS RUN BASIN
NORTHAMPTON COUNTY
APRIL 2005 & MAY 2009

PARAMETER	STATION[1]								
	1SR	2SR	1UNT	2UNT	3UNT	4UNT	3SR	1WC[3]	1WC[4]
1. instream cover	15	14	15	16	15	16	16	19	18
2. epifaunal substrate	17	15	15	16	14	17	18	19	19
3. embeddedness	18	15	18	18	15	16	17	18	18
4. velocity/depth regimes	14	15	13	16	15	16	17	18	17
5. channel alteration	18	19	18	20	15	15	19	20	20
6. sediment deposition	18	14	14	18	15	16	16	18	19
7. frequency of riffles	18	15	16	16	15	17	18	19	19
8. channel flow status	16	16	15	16	17	17	15	19	18
9. condition of banks	15	14	14	13	12	15	13	19	19
10. bank vegetative protection	18	17	15	16	17	16	18	20	20
11. disruptive pressure	19	20	14	15	18	15	20	20	20
12. riparian zone width	18	20	12	13	17	16	20	20	20
Total Score	**204**	**194**	**179**	**193**	**185**	**192**	**207**	**229**	**227**
Rating[2]	**OPT**	**OPT**	**SUB**	**OPT**	**SUB**	**OPT**	**OPT**	**OPT**	**OPT**

[1] Refer to Figure 1 and Table 1 for station locations
[2] OPT=Optimal(≥192); SUB=Suboptimal(132-191)
[3] Wild Creek, Carbon County, April 19, 2005
[4] Wild Creek, Carbon County, May 5, 2009

TABLE 3
SEMI-QUANTITATIVE BENTHIC MACROINVERTEBRATE DATA
SOBERS RUN BASIN
NORTHAMPTON COUNTY
APRIL 2005 & MAY 2009

		CANDIDATE STATIONS					REF	CANDIDATE STATIONS			REF
		1SR	1UNT	2UNT	3UNT	3SR	1WC[1]	2SR	4UNT	3SR	1WC[2]
MAYFLIES											
Ameletidae	***Ameletus***										1
Baetidae	***Acentrella***							12	10	7	1
	Acerpenna										1
	Baetis	14	14	4	12	12	15	2	3		12
Ephemerelidae	***Drunella***	2	1	5	8	35		1		15	
	Ephemerella	43	35	20	15	49	24	4	16	15	54
	Eurylophella									5	
	Serratella						2	1	1	2	6
Heptageniidae	***Cinygmula***										
	Epeorus	26	4	3	3	9	11		1	2	4
	Maccaffertium							5	1	2	
	Rhithrogena										
	Stenonema	1	1	6	8	9	5				
Isonychidae	***Isonychia***					1					
Leptophlebiidae	***Habrophlebiodes***										2
	Paraleptophlebia	2	8		1		6	1			1

[1] Wild Creek, Carbon County, April 19, 2005
[2] Wild Creek, Carbon County, May 5, 2009

TABLE 3 CONT.
SEMI-QUANTITATIVE BENTHIC MACROINVERTEBRATE DATA
SOBERS RUN BASIN
NORTHAMPTON COUNTY
APRIL 2005 & MAY 2009

		CANDIDATE STATIONS					REF	CANDIDATE STATIONS			REF
		1SR	1UNT	2UNT	3UNT	3SR	1WC[1]	2SR	4UNT	3SR	1WC[2]
STONFLIES											
Chloroperlidae	***Alloperla***								1		
	Sweltsa						1				
Leuctridae	***Leuctra***	2	1	1	1		6	10	6	6	5
Nemouridae	***Amphinemura***	3	32	22	20	6	10	26	14	3	14
Peltoperlidae	***Tallaperla***										1
Pteronarcyidae	***Pteronarcys***	1					3	1			1
Taeniopterygidae	***Taeniopteryx***							4			
Perlidae	***Acroneuria***		1	1	1	6	3	6	1		1
Perlodidae	***Isoperla***	1	9		6	4	12		3	1	5
	Remenus			1							

[1] Wild Creek, Carbon County, April 19, 2005
[2] Wild Creek, Carbon County, May 5, 2009

TABLE 3 CONT.
SEMI-QUANTITATIVE BENTHIC MACROINVERTEBRATE DATA
SOBERS RUN BASIN
NORTHAMPTON COUNTY
APRIL 2005 & MAY 2009

		CANDIDATE STATIONS					REF	CANDIDATE STATIONS			REF
		1SR	1UNT	2UNT	3UNT	3SR	1WC[1]	2SR	4UNT	3SR	1WC[2]
CADDISFLIES											
Brachycentridae	***Micrasema***				4		1				
Glossosomatidae	***Agapetus***			2				2	2		1
Hydropsychidae	***Ceratopsyche***							1	2	5	1
	Cheumatopsyche			4	7		6	5	4		
	Hydropsyche	3	1	8	14	7	9				
	Diplectrona	6			1		1				
Hydroptilidae	***Orthotrichia***									1	
	Stactobiella				2						
Lepidostomatidae	***Lepidostoma***										4
Philopotamidae	***Chimarra***			4	3			12	2	1	
	Dolophilodes			1	1		12	6	44	7	11
	Wormaldia							1		2	
Polycentropidae	***Polycentropus***						1	3	1	4	
Rhyacophilidae	***Rhyacophila***	6	5	3	5	6	6	1	2		5

[1] Wild Creek, Carbon County, April 19, 2005
[2] Wild Creek, Carbon County, May 5, 2009

TABLE 3 CONT.
SEMI-QUANTITATIVE BENTHIC MACROINVERTEBRATE DATA
SOBERS RUN BASIN
NORTHAMPTON COUNTY
APRIL 2005 & MAY 2009

		CANDIDATE STATIONS					REF	CANDIDATE STATIONS			REF
		1SR	1UNT	2UNT	3UNT	3SR	1WC[1]	2SR	4UNT	3SR	1WC[2]
TRUE FLIES											
Blephariceridae	***Blepharicera***										
Ceratopogonidae	***Probezzia***	1			1						
Empididae	***Chelifera***	1	1	1	1						
	Clinocera				1	1			1	5	
	Hemerodromia		1	3	1	3			1	1	
	Neoplasta										
Tipulidae	***Antocha***		1		1				1	2	2
	Dicranota	1	1				4				1
	Hexatoma	1				1	4	1	1		1
	Limonia				1						
	Tipula	1									
Simuliidae	***Prosimulium***	3	3	26	7	2	1			1	
	Simulium	35	3	36	12	16	3	5	14	10	9
	Stegopterna		2	1							
Chironomidae		69	92	60	54	34	41	39	55	74	22

[1] Wild Creek, Carbon County, April 19, 2005
[2] Wild Creek, Carbon County, May 5, 2009

TABLE 3 CONT.
SEMI-QUANTITATIVE BENTHIC MACROINVERTEBRATE DATA
SOBERS RUN BASIN
NORTHAMPTON COUNTY
APRIL 2005 & MAY 2009

		CANDIDATE STATIONS					REF	CANDIDATE STATIONS			REF
		1SR	1UNT	2UNT	3UNT	3SR	1WC[1]	2SR	4UNT	3SR	1WC[2]
MISC. INSECT TAXA											
Cordulegastridae	***Cordulegaster***						1				
Corydalidae	***Nigronia***	1					5	1	1		3
Drypidae	***Helichus***				1						
Elmidae	***Dubiraphia***		1		1						
	Microcylloepus					1					
	Optioservus	1			4			4	6	1	6
	Oulimnius		14	1	6	2	6	12		7	4
	Promoresia	1		1	9	1	6	1	6	1	13
	Stenelmis				1			6			
Gomphidae	***Lanthus***	3	2		2	2	1	3	2		
	Ophiogomphus									1	
	Stylogomphus							1			
Psephenidae	***Ectopria***		1			1					
	Psephenus	2				5		20	7	5	
Ptilodactylidae	***Anchytarsus***						4				
NON-INSECT TAXA											
Oligochaeta											1
	Richness	26	24	23	34	23	30	31	29	27	30
	Total # Organisms	230	234	214	215	213	210	197	209	186	193

[1] Wild Creek, Carbon County, April 19, 2005
[2] Wild Creek, Carbon County, May 5, 2009

TABLE 4
RBP METRIC COMPARISON
SOBERS RUN BASIN
NORTHAMPTON COUNTY
APRIL 2005

METRIC	CANDIDATE STATIONS					REF.
	1SR	1UNT	2UNT	3UNT	3SR	1WC[1]
1. TAXA RICHNESS	26	24	23	34	23	30
Cand/Ref (%)	87	80	77	113	77	xxx
Biol. Cond. Score	8	7	6	8	6	8
2. MOD. EPT INDEX	11	10	12	15	9	15
Cand/Ref (%)	73	67	80	100	60	xxx
Biol. Cond. Score	6	4	7	8	3	8
3. MOD. HBI	3.69	4.07	4.13	4.03	2.97	3.11
Cand-Ref	0.58	0.96	1.02	0.92	-0.14	xxx
Biol. Cond. Score	8	5	4	5	8	8
4. % DOMINANT TAXA	30	39	28	25	23	20
Cand-Ref	10	19	8	5	3	xxx
Biol. Cond. Score	8	2	8	8	8	8
5. % MOD. MAYFLIES	32	21	16	16	48	23
Ref-Cand	-9	2	7	7	-25	xxx
Biol. Cond. Score	8	8	8	8	8	8
TOTAL BIOLOGICAL CONDITION SCORE	38	26	33	37	33	40
% COMPARABILITY TO REFERENCE	**95**	**65**	**83**	**93**	**83**	

[1] Wild Creek, Carbon County, April 19, 2005

TABLE 5
RBP METRIC COMPARISON
SOBERS RUN BASIN
NORTHAMPTON COUNTY
MAY 2009

METRIC	CANDIDATE STATIONS			REF
	4UNT	2SR	3SR	1WC[1]
1. TAXA RICHNESS	29	31	27	30
Cand/Ref (%)	97	103	90	xxx
Biol. Cond. Score	8	8	8	8
2. MOD. EPT INDEX	14	16	13	16
Cand/Ref (%)	88	100	81	xxx
Biol. Cond. Score	8	8	8	8
3. MOD. HBI	3.27	3.79	4.13	2.64
Cand-Ref	0.63	1.15	1.49	xxx
Biol. Cond. Score	8	2	0	8
4. % DOMINANT TAXA	26	20	40	28
Cand-Ref	-2	-8	12	xxx
Biol. Cond. Score	8	8	7	8
5. % MOD. MAYFLIES	14	12	26	35
Ref-Cand	21	23	9	xxx
Biol. Cond. Score	5	5	8	8
TOTAL BIOLOGICAL CONDITION SCORE	37	31	31	40
% COMPARABILITY TO REFERENCE	**93**	**78**	**78**	

[1] Wild Creek, Carbon County, May 5, 2009

TABLE 6
IN-SITU WATER CHEMISTRY
SOBERS RUN BASIN
NORTHAMPTON COUNTY
MAY 2009

PARAMETER	UNITS	STATIONS		
		2SR	3SR	4UNT
ALKALINITY T	MG/L	26.6	25.2	22.8
ALUMINUM T	UG/L	84.5	131	62.9
AMMONIA T	MG/L	< 0.02	< 0.02	< 0.02
ARSENIC D	UG/L	< 3	< 3	< 3
ARSENIC T	UG/L	< 3	< 3	< 3
CADMIUM D	UG/L	< 0.2	< 0.2	< 0.2
CADMIUM T	UG/L	< 0.2	< 0.2	< 0.2
CALCIUM T	MG/L	14.8	12.6	10.9
CHROMIUM T	UG/L	< 50	< 50	< 50
COPPER D	UG/L	< 4	< 4	< 4
COPPER T	UG/L	< 4	16.1	< 4
HARDNESS T	MG/L	51	44	38
IRON T	UG/L	200	175	204
LEAD D	UG/L	< 1	< 1	< 1
LEAD T	UG/L	< 1	< 1	< 1
MAGNESIUM T	MG/L	3.4	3.09	2.68
MANGANESE T	UG/L	< 10	< 10	< 10
NICKEL D	UG/L	< 4	< 4	< 4
NICKEL T	UG/L	< 4	< 4	< 4
pH	pH units	7.4	7.4	7.4
TDS	MG/L	110	98	88
SPECIFIC CONDUCTANCE	umhos/cm	141.3	125.3	110.7
ACIDITY T	MG/L	-19.2	-17.6	-14.4
CHLORIDE T	MG/L	12.8	12.2	11.5
NITRATE T	MG/L	0.54	0.6	0.6
NITRITE T	MG/L	< 0.01	< 0.01	< 0.01
PHOSPHORUS T	MG/L	0.013	0.012	0.011
SULFATE T	MG/L	20.1	17.4	< 15
TSS	MG/L	< 5	< 5	< 5
ZINC D	UG/L	5.7	< 5	< 5
ZINC T	UG/L	6.3	11.8	5.2

Measurements with "<" indicate concentrations below the reporting limit.