Williams Run Watershed Assessment

Venango County, PA

Prepared for:
South Sandy Creek Watershed Association
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Coldwater Heritage Partnership

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Photos were taken by Jennifer Hedglin.

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Overview

Newly formed in 2004, the South Sandy Creek Watershed Association (SSCWA) is a citizens group concerned about the past, present, and future of the South Sandy Creek Watershed. Their mission is "*to preserve, maintain, and restore the land, air, and water through community involvement and education*." Guided by a 7-member Board of Directors, the group has grown to include 50 members.

Board of Directors
Valerie Tarkowski, President
Chuck Woods, Vice President
Scott Fleming, Secretary
Richard McClung, Treasurer
Fred Krizinsky, Director
Larry Wheeler, Director
Steve Overholt, Director

To aide in accomplishing their mission, SSCWA was awarded a Coldwater Heritage Partnership (CHP) grant in 2006 to prepare a watershed assessment for the Williams Run Watershed, a sub-watershed to South Sandy Creek.

Goals

The goals of the Williams Run Watershed Assessment are:

- ✓ To collect water quality data
- ✓ To organize & compile data from previous sampling
- ✓ To identify all impacts affecting the watershed
- ✓ To inform & include the community of the work that is/will be done in the watershed
- ✓ To form & strengthen partnerships with various agencies
- ✓ To prepare a formal assessment that documents the findings & plans for the watershed

The plan will then be used to help prioritize and organize projects within Williams Run Watershed as work continues towards protection and remediation of this resource of both Venango County and the Commonwealth of Pennsylvania. This document should be an evolving plan of action for the Williams Run Watershed by updating the included information as projects are completed and more data is collected.

Sources of Data

The following groups and agencies have provided data for this study.

- Pennsylvania Department of Environmental Protection – Bureau of Abandoned Mine Reclamation (BAMR)
- Pennsylvania Fish and Boat Commission (PFBC)
- Venango Chapter of Pennsylvania Senior Environmental Corps (PaSEC)

Watershed Description

Location & Size

Williams Run Watershed is located in Venango County, Pennsylvania (see Map 1) and includes sections of Irwin, Mineral, and Victory Townships. The headwaters of Williams Run originate in Irwin Township, near the intersection of Georgetown and Millbrook Roads, and flows northeast for approximately 5.55 miles to its confluence with South Sandy Creek in State Game Lands (SGL) #39.

Williams Run Watershed drains approximately 4,010 acres with the majority of the watershed in Irwin Township (see Table 1 below).

Table 1. Township Drainage Within Williams Run Watershed

Township	Total Acres	Acres Included In Williams Run Watershed
Irwin	19,316.5	2,981.7
Mineral	14,366.0	891.2
Victory	13,235.8	137.2

Topography

The watershed is shown on the Polk and Barkeyville quadrangles of the United States Geological Survey (USGS) maps. While located in the Allegheny Plateau, topography of the watershed ranges from gently rolling hills at the headwaters to steep forested ravines through most of SGL #39. Elevations range from 1,540 feet to 1,160 feet, for a total vertical drop of approximately 380 feet over the length of Williams Run.

Geology

Sedimentary rocks, such as sandstone, shale, and siltstone, are located beneath Venango County. A brief description of the surface rocks is provided in Table 2.

Table 2. Surface Rocks Found In Williams Run Watershed

Time Period	Group	Description
Mississippian	Pocono	Sandstone, conglomerate, some shale Lowest lying
Pennsylvanian	Pottsville	Sandstone, small amount of shale Second lowest formation
Pennsylvanian	Allegheny	Coal, shale, some clay & sandstone, and limestone in southern part of the county Highest lying (closest to surface)

Source: Churchill, Norman J., Donald P Hipes, and Franklin S. Ackerman. 1975. *Soil Survey of Venango County, Pennsylvania.* United States Department of Agriculture Soil Conservation Service, Washington, D.C. 86 pp.

Soils

The following soil information was reported by Churchill, 1975.

The majority of Williams Run Watershed lies within the Hanover-Alvira association, however, a small portion of the headwaters lies within the Canfield-Ravenna association. The Hanover Series is characterized by deep, nearly level to very steep, moderately well drained and well drained soils on uplands. In winter and spring, the water table is at an average depth of 18-36 inches, which creates the limitation of a seasonal high water table. The Alvira Series is characterized by deep, nearly level to sloping, somewhat poorly drained soils on uplands. In winter and spring, the water table is at an average depth of 6-18 inches, which creates the limitation of a seasonal high water table. The native vegetation of both the Hanover and the Alvira Series is mostly mixed oaks, maple, ash, and black cherry.

The Canfield Series is characterized by deep, gently sloping to moderately steep, moderately well drained soils on uplands. In winter and spring, the water table is at an average depth of 18-36 inches, which creates the limitation of a seasonal high water table. The Ravenna Series is characterized by deep, nearly level to sloping, somewhat poorly drained soils on uplands. In winter and spring, the water table is at an average depth of 6-18 inches, which creates the limitation of a seasonal high water table. The native vegetation of both the Canfield and the Ravenna Series is mostly mixed oaks, maple, ash, and black cherry.

Twenty soil types were mapped within the Williams Run Watershed and are listed in Table 3 along with approximate acreage and limitations.

Table 3. Soil Types Found Within Williams Run Watershed

Soil Symbol	Soil Name	Approx. Acreage	Limitations
AlA	Alvira silt loam	114.01	Restricted permeability Seasonal high water table
AlB	Alvira silt loam	1118.18	Restricted permeability Seasonal high water table Erosion hazard
ArB	Alvira and Ravenna very stony silt loams	131.64	Stoniness Slow permeability Seasonal high water table
At	Atkins silt loam	55.84	Flood hazard Seasonal high water table
Bt	Brinkerton and Frenchtown very stony silt loams	35.80	Stoniness Slow permeability Seasonal high water table
CdB	Canfield gravelly silt loam	18.99	Erosion hazard Restricted permeability Seasonal high water table
FeA	Frenchtown silt loam	270.27	Restricted permeability Seasonal high water table
FeB	Frenchtown silt loam	31.59	Restricted permeability High water table
HaA	Hanover silt loam	27.17	Restricted permeability Seasonal high water table
HaB	Hanover silt loam	344.86	Erosion hazard Restricted permeability Seasonal high water table
HaC	Hanover silt loam	92.59	Erosion hazard Restricted permeability Seasonal high water table
HdB	Hanover very stony silt loam	216.49	Stoniness Restricted permeability Seasonal high water table
HdD	Hanover very stony silt loam	1101.64	Stoniness Restricted permeability Slope Seasonal high water table
HdE	Hanover very stony silt loam	10.77	Stoniness Steep slopes
HlB	Hazleton very stony loam	2.94	Stoniness
HnF	Hazleton and Gilpin very stony soils	117.20	Stoniness Steep slopes
Ph	Philo silt loam	72.59	Flooding Seasonal high water table
Po	Pope loam	17.83	Flooding hazard
RaA	Ravenna silt loam	33.29	Restricted permeability Seasonal high water table
Sm	Strip Mines	429.94	
W	Water	8.05	

Blue shaded rows indicate major components of Hydric Soils

Source: Churchill, Norman J., Donald P Hipes, and Franklin S. Ackerman. 1975. *Soil Survey of Venango County, Pennsylvania.* United States Department of Agriculture Soil Conservation Service, Washington, D.C. 86 pp.

Wetlands

Wetlands are defined by three criteria: the presence of hydric soils, a dominance of hydrophytic vegetation (plants with adaptations for surviving in seasonally wet growing conditions), and wetland hydrology. Wetlands are important for groundwater recharge, flood prevention, and wildlife habitat. Williams Run Watershed has 8.11 acres of wetlands (Table 4) identified on the National Wetlands Inventory (NWI) maps produced by the U.S. Fish and Wildlife Service. Although these identified wetlands are accurately depicted on the maps, the NWI maps are created by interpretation of satellite imagery and therefore are not a complete inventory of all wetlands. Since hydric soil must be present for a wetland, it can be assumed that the potential for at least an additional 349 acres of wetlands exist within the watershed.

In addition, there are man-made wetlands near Woods Corners that were created to treat abandoned mine drainage. The wetlands on the east side of Hells Kitchen Road have been drained while the wetland on the west side of Hells Kitchen Road is still in existence.

Table 4. Wetland Acreage and Description Based on National Wetlands Inventory Codes

National Wetlands Inventory Code	Acres Within Williams Run Watershed	Description
PUBZ	6.41	Palustrine, Unconsolidated bottom, Intermittently exposed/permanent
PFO1/SS1Y	0.30	Palustrine, Forested, Broad-leaved deciduous/Scrub-scrub, Broad-leaved deciduous, Saturated/semipermanent/seasonal
PSS1Y	1.40	Palustrine, Scrub-scrub, Broad-leaved deciduous, Saturated/semipermanent/seasonal

Biology

Vegetation

Williams Run Watershed lies in a temperate forest region (Molles, Jr. 1999) where one can find various tree species such as maples, oaks, cherries, and eastern hemlocks. In addition to the canopy level, various types of shrubs and herbaceous vegetation can be found (see Photo 1).

The mined lands generally contain pioneer species, such as bigtooth aspen (*Populus grandidentata*) and red pine (*Pinus resinosa*)

Photo 1. Fiddleheads, Indian pipes, and violets are just a few examples of the various herbaceous vegetation that can be found in Williams Run Watershed.

Wildlife

Numerous species of small mammals, songbirds, fish, waterfowl, and game birds, such as ruffed grouse (*Bonasa umbellus*) reside in the watershed. In addition, larger mammals such as fisher (Martes pennanti), mink (*Mustela vison*), porcupine (*Erethizon dorsatum*), coyote (*Canis latrans*), white-tailed deer (*Odocoileus virginianus*) (see Photo 2), and black bear (*Euarctos americanus*) can be found within the watershed boundaries.

A recent sighting of 13 timber rattlesnakes (*Crotalus horridus*) in the summer of 2007 by the Pennsylvania Game Commission is an exciting and noteworthy find due to the current decline in their population. These rattlesnakes are listed as a candidate species in Pennsylvania, meaning that they may reach the threatened or endangered status.

Photo 2. White-tailed deer fawn seeking refuge near the confluence of Williams Run & South Sandy Creek.

Species of Special Concern

Results from DCNR's Pennsylvania Natural Diversity Index (PNDI) indicated no species of special concern within the Williams Run Watershed. However, results from PFBC and DCNR have shown that species of special concern are found within the South Sandy Creek Watershed (see Table 5 below).

Table 5. Species of Special Concern Found Within South Sandy Creek Watershed

Common Name	Scientific Name	Status
Eastern Massasauga	*Sistrurus catenatus catenatus*	PA Endangered
Spotted darter	*Etheostoma maculatum*	PA Threatened
Ohio lamprey	*Ichthyomyzon bdelloim*	PA Candidate
Longhead darter	*Percina Macrocephela*	PA Threatened
Small Wood Flower	Helianthus microcephalus	PA Tentatively Undetermined

Land Use

With 1,615 acres of Williams Run Watershed located in SGL #39, the majority (76.8%) of the watershed is forested, open land used for wildlife habitat and recreation (see Map 2). Agriculture is present in the watershed and accounts for 12.6% of the land use. Abandoned mine lands accounts for 11.6% and are largely found at Woods Corners and along Allen Road.

The major industries for Venango County are manufacturing with 3,865 paid employees and health care/social assistance with 3,215 paid employees. (Please note that mining, utilities, and construction data is not published by counties.)

Climate

Located in a humid, continental type climate, Venango County has an average summer temperature of 68°F and an average winter temperature of 26°F. The average precipitation for the area is 42 inches annually.

Demographics & Population Centers

By using the 2000 United States Census Data, the following statistics have been noted in Table 6.

Table 6. Demographics

Location	2000 Population	Square Miles	Population Density Per Square Mile
Pennsylvania	12,281,054	44,816.61	274.0
Venango County	57,656	675	85.3
Irwin Township	1309	30.2	43.4
Mineral Township	533	22.5	23.7
Victory Township	408	19.9	20.5

Currently, there are no population centers in existence within Williams Run Watershed. The small village of Pearl is located near the intersection of Slatertown Road and Old Route 8.

Existing & Potential Uses of Watershed

With 40% of the land being classified as public lands, recreational activities are nearly endless. SGL #39 provides excellent hunting and fishing opportunities, along with hiking, horseback riding, cross-country skiing, bird watching, and other wildlife observing.

However, it is the potential that this watershed has that keeps SSCWA and its partners pushing forward. In September 2005, a fisheries survey of Williams Run Watershed by the Pennsylvania Fish and Boat Commission (PFBC), found wild brook trout *(Salvelinus fontinalis)* in a tributary to Williams Run. By restoring Williams Run Watershed, the wild brook trout will be able to expand their range throughout the watershed and ultimately form one large, genetically diverse

population within the South Sandy Creek Watershed instead of several isolated populations scattered throughout (see Map 3).

In addition, other wildlife species, the community, and area visitors would benefit from a cleaner watershed.

Unique and/or Outstanding Features

- Remoteness – As stated earlier, SGL #39 provide 1,615 acres of remote wilderness open to the public.
- Sound Land Management – Those same 1,615 acres are under the management of the Pennsylvania Game Commission so they are being managed & protected as wildlife habitat.
- Impact – In addition to improving the Williams Run Watershed with remediation efforts, a significant improvement will also be made in the South Sandy Creek Watershed (SSCW) because Williams Run is a major polluter of SSCW.
- Native Wild Brook Trout –Tributary #51365 (locally known as the East Branch) to Williams Run is listed on the PFBC's Pennsylvania Stream Sections that Support Native Reproduction of Trout (revised 2007). The data collected in 2005 show native brook trout is the species that placed the tributary on the list.

Data & Recommendations

Water Sampling

Six points were sampled monthly in Williams Run Watershed over the course of the CHP grant. The points were already established by Jon Smoyer of BAMR and were part of his routine sampling for the area (see Map 4). The assessor (Jennifer Hedglin) partnered with Smoyer to adopt the sites for quarterly sampling and then to share all data collected by both parties. The samples collected by Hedglin were analyzed at Analytical Testing Services, Inc. of Franklin, PA.

Additional data was included on both the 6 sites sampled by Hedglin and on other sites in the watershed to try to get a complete picture.

The results from the water quality sampling confirm Williams Run Watershed is not achieving its designated use as a coldwater fishery. Low alkalinity and high metals are the main threats, which stem from pollution from abandoned mine drainage.

However, the headwaters of Williams Run (WRHW) are meeting the requirements for a coldwater fishery, so the degradation of this watershed begins below the headwaters.

A summary table is included on the next page of the averages of each sampling point. A complete data table for each sampling point is included in Appendix 1. Table 8 includes the location and description of each sampling point.

Recommendations: Continue following a water sampling schedule to collect data and keep a water quality database up-to-date. It may be beneficial to include Tributary #51365 (East Branch) in a routine sampling schedule to detect any decline in the water quality.

Conducting a visual assessment of both the stream and riparian zone would be beneficial to develop a greater understanding of what is affecting the watershed.

Table 7. Summary Table of Water Quality Data for Williams Run Watershed

Location	**# of Samples**	**Source of Data**	**Flow** (gpm) or **SWL** (inches)	**pH** (Lab)	**Cond.** (Lab)	**Alk** (Lab)	**Acidity**	**Iron**	**Mn**	**Al**	**SO4**	**TSS**	**TDS**	**Hardness**
					uohms/cm	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ppm)	(mg/L)
WRHW	9	BAMR	x	6.9	0.00	44.56	-6.13	0.97	0.34	0.55	27.14	8.60	x	x
WRR5	13	CHP, BAMR	x	4.2	445.75	8.15	106.02	15.29	6.94	7.40	565.54	5.13	294.25	421.43
WRL7	16	CHP, BAMR	77.72	4.4	104.23	5.24	46.18	1.64	1.78	1.93	86.19	4.23	52.77	51.23
WR2	16	CHP, BAMR	83.93	4.0	241.33	3.65	48.71	2.70	3.25	1.85	217.48	4.54	159.10	152.07
WRR4	7	BAMR	x	3.8	x	0.54	54.46	1.537	3.24	3.80	168.31	3.1	x	x
WRL6	1	BAMR	x	5.9	x	7.80	9.80	0.111	0.09	0.20	20.00	2.0	x	x
WRR3	7	BAMR	x	3.3	x	0	133.03	6.94	8.12	10.71	597.50	4.29	x	x
WRR2	1	BAMR	x	5.0	x	6.80	12.20	0.05	0.24	0.45	20.00	12.00	x	x
WRR1	1	BAMR	x	4.0	x	1.00	49.80	2.07	2.21	3.23	152.80	8.00	x	x
WRL5	1	BAMR	x	6.6	x	11.40	24.20	0.16	0.06	0.20	20.00	4.00	x	x
WRL4	1	BAMR	x	6.7	x	23	25.8	2.33	0.11	0.2	20	14	x	x
WRL3	1	BAMR	x	5.8	x	7.80	8.80	0.06	0.03	0.20	20.00	6.00	x	x
WRL2	1	BAMR	x	6.4	x	9.00	6.40	0.06	0.01	0.20	20.00	6.00	x	x
WRL1	1	BAMR	x	5.9	x	7.60	7.60	0.02	0.06	0.20	20.00	4.00	x	x
WR1	19	CHP, BAMR, TAG	x	5.4	290.48	8.44	39.41	0.38	1.00	0.90	113.36	3.41	56.50	x
AARS	10	BAMR	x	7.4	x	117.36	-82.38	0.51	0.32	0.83	57.29	5.3	x	x
ARS	19	CHP, BAMR	x	3.1	796.76	65.41	769.98	139.28	4.37	36.63	864.71	17.25	422.45	259.95
Woods	12	CHP, BAMR	x	3.3	603.5	9.83	287.19	11.85	12.70	29.53	607.47	x	398.00	388.7

Water Quality Criteria for a Coldwater Fishery:

pH = 6.0 to 9.0
Alkalinity = minimum of 20 mg/l, except where natural conditions are less
Iron = 1.5 mg/l as 30-day average
Manganese = maximum of 1.0 mg/l
Sulfate = maximum of 250 mg/l
Total Dissolved Solids (TDS) = 500 mg/l as monthly average; maximum of 750 mg/l

Sources of Data:

CHP = Coldwater Heritage Partnership (grant to fund sample analysis)
BAMR = Bureau of Abandoned Mine Reclamation
TAG = Technical Assistance Grant from PA DEP

Table 8. Location & Description of Water Sampling Points

Location	Type	Latitude	Longitude	Description
WRHW	stream	41-15-02	079-58-14	Headwaters of Williams Run at Hells Kitchen Road
WRR5	discharge	41-15-15	079-57-53	**W**illiams **R**un **5**th tributary on **R**ight Discharge from Gadsby Pond
WRL7	stream	41-15-35	079-57-33	**W**illiams **R**un **7**th tributary on **L**eft
WR2	stream	41-15-37	079-57-36	**W**illiams **R**un
WRR4	stream	41-15-41	079-57-37	**W**illiams **R**un **4**th tributary on **R**ight
WRL6	stream	41-15-45	079-57-36	**W**illiams **R**un **6**th tributary on **L**eft
WRR3	discharge	41-15-54	079-57-41	**W**illiams **R**un **3**rd tributary on **R**ight
WRR2	stream	41-16-15	079-57-31	**W**illiams **R**un **2**nd tributary on **R**ight
WRR1	stream	41-16-32	079-56-50	**W**illiams **R**un **1**st tributary on **R**ight
WRL5	stream	41-16-32	079-56-52	**W**illiams **R**un **5**th tributary on **L**eft
WRL4	discharge	41-16-34	079-56-46	**W**illiams **R**un **4**th tributary on **L**eft
WRL3	stream	41-16-59	079-56-49	**W**illiams **R**un **3**rd tributary on **L**eft
WRL2	stream	41-17-12	079-56-41	**W**illiams **R**un **2**nd tributary on **L**eft
WRL1	stream	41-17-17	079-56-41	**W**illiams **R**un **1**st tributary on **L**eft
WR1	stream	41-17-45	079-57-04	**W**illiams **R**un
AARS	stream	41-14-56	079-58-11	**A**bove **A**llen **R**oad **S**ite
ARS	stream	41-14-56	079-59-04	**A**llen **R**oad **S**ite
Woods	discharge	41-15-55	079-58-10	Discharge to Chuck Woods' Upper Pond

Table 9. Summary Table of Major Impacts to Water Quality within Williams Run Watershed

Site	Major Impacts Affecting Water Quality	Cause	Recommendation
WRR5	Low pH & Alkalinity High iron, manganese, sulfate	Abandoned Mine Drainage (AMD)	Also known as the Gadsby pasture site. This is the discharge with the highest iron and second highest acidity loading in the Williams Run watershed with 22 pounds per day (PPD) and 137 ppd respectively. The source of AMD is not fully known. It is most likely pyretic spoil or buried coal refuse upgradient of the seep area. Exploratory drilling could help determine the source of the AMD as well as the source of the groundwater recharge generating the AMD. Land reclamation to remove of abate the source of the problem is recommended. The chemistry, flow variations and site constraints do not easily accomodate passive treatment of this discharge. The pond located upslope of the seep area, from which there is no visible discharge is suspected of being a constant source of recharge to the problem.
WRL7	Low pH & Alkalinity High iron, manganese	AMD	This discharge is the lowest ranked source of AMD pollution to Williams Run. The mild AMD chemistry originates in the abandoned surface mine pits on SGL. No. 39 and property owned by John Clark. Mr. Clark has already stated to BAMR his desire not to have the pit reclaimed. Water remediation in the pit without reclamation may be possible, but may also interfere with future reclamation of the physical hazard of the highwall and pit. Given that this discharge is the smallest in terms of AMD loading to the watershed, it is recommended that it should be the last to be addressed unless Mr. Clark consents to land reclamation at which time the highwall and AMD can be addressed in a single mine reclamation project.
WR2	Low pH & Alkalinity High iron, manganese	AMD	This is Williams Run at its midpoint. It is located downstream of ARS, WRR5 and WRL7. Reclamation or treatment of the AMD problems upstream should be addressed to restore this point in the stream.
WR1	Low pH & Alkalinity	AMD	This is Williams Run at the confluence with South Sandy Creek. As such it is located downstream of all AMD problems. Reclamation or treatment of the AMD problems upstream should be addressed to restore this stream.

ARS	Low pH High iron, manganese, sulfate	AMD	Known as the Allen Road Site.This is the 3rd highest source of AMD loading to the watershed. It is located in the very headwaters. The source of the AMD is coal refuse and acidic spoil on abandoned mine lands parallel to Allen Road. Testing of the coal refuse shows it to be of little to no fuel value in terms of BTU and is highly pyretic. Removal of the acid forming materials would be the best reclamation option. However, removal may be cost prohibitive. Another possible reclamation option is to blend the acid forming materials with an alkaline product in order to both neutralize and encapsulate them. And prevent contact with air and water. This may still be a very costly venture, The contour of the site would have to be adjusted to accommodate the large volume of material needed to offset the volume of acid forming materials. These seeps are low in flow and as such give the site a moderate rank in terms of loading. The site does exhibit the worst AMD chemistry in the watershed. Passive treatment of this chemistry is not technically feasible for any sustainable period of time. Active chemical treatment of the seeps would result in sludge that must be handled. Land reclamation is clearly the best option to remedy this site.
Woods	Low pH & Alkalinity High iron, manganese, sulfate	AMD	This site is the source of the highest acidity loading (142ppd) and aluminum loading (15.ppd) in the Willaims Run watershed. The South Sandy Watershed Association currently has plans to convert the abandoned surface mine pond owned by Charles Woods into a passive treatment system. The group should move forward with the design and construction of the system. Long term operation and maintenance of the system should be considered prior to construction.

Macro-invertebrate Sampling

The Venango Chapter of the PaSEC partnered with SSCWA and agreed to do macro-invertebrate sampling at two of the sampling points. By using the PA DEP Citizens' Volunteer Monitoring Protocol, they concluded that WR1 (near mouth of Williams Run) and WR2 (~3.4 river miles upstream) are classified as "poor" water quality due to the lack of sensitive species being present. Their completed data sheets are included in Appendix 2.

Recommendations: Continue monitoring macro-invertebrate populations in Williams Run Watershed.

Fish Sampling

PFBC sampled the main branch of Williams Run at several locations using electro-fishing gear (see Photo 3). One point (river mile 1.62) was sampled in 1998 and again in 2005 to determine any changes (see Table 9). While there was a change, it was for the worse with 2 species of fish found in 1998 and then 0 in 2005.

Photo 3. PFBC & SSCWA sampling Unknown Tributary to Williams Run

However, the water quality of Tributary #51365 (East Branch) to Williams Run was stable due to the presence of wild brook trout in 1998 and in 2005 (see Photo 4 & Table 10), demonstrating that this watershed has the potential to house a healthy population of wild brook trout. By taking a look at the whole South Sandy watershed (see Map 3), one can see the various isolated populations of wild brook trout that could eventually become one large population.

Recommendations: Continue monitoring the brook trout populations in the Williams Run & South Sandy Creek Watersheds.

Photo 4. Wild brook trout sampled from Tributary #51365 (East Branch) to Williams Run.

Abandoned Mine Drainage (AMD) & Abandoned Mine Lands (AML)

The combination of these two issues is the primary threat to Williams Run Watershed. With 1,956 acres of AML in Venango County, nearly one quarter (~463 acres) of those are within the Williams Run Watershed. Various portions of the streams in this watershed are considered "dead" due to the impact that AMD has had on the streams (see Photo 5), consequently, Williams Run and 4 of its tributaries are listed as a Category 5: Impaired Streams Requiring TMDLs (PA DEP 2006). In addition, dangerous highwalls can be found in the watershed as well.

At the time of this assessment, several projects are getting started to help make the community safer by eliminating dangerous highwalls and alleviating some of the stress on the aquatic ecosystems. The projects include filling & sloping the highwalls along Hells Kitchen Road and directing the flow of AMD to an inclined limestone bed for treatment.

Recommendations: Continue working on remediation projects & educating the public about the significance of these projects to continue building local support.

Photo 5. Confluence of Unknown Tributary & Williams Run. Note the aluminum (silver or whitish color) in Williams Run.

Table 10. Fish Sampling Data on Williams Run

		February 23, 1982	June 23, 1998	June 28, 2004	Sept. 12, 2005
		Site 05	rm 1.62	rm 0.03	rm 1.62
Rhinichthys atratulus	Blacknose Dace	NO FISH COLLECTED	✓	NO FISH COLLECTED	NO FISH COLLECTED
Salvelinus fontinalis	Brook Trout				
Salvelinus fontinalis	Brook Trout - hatchery				
Salmo trutta	Brown Trout				
Campostoma anomalum	Central Stoneroller				
Luxilus cornutus	Common Shiner				
Semotilus atromaculatus	Creek Chub		✓		
Etheostoma flabellare	Fantail Darter				
Etheostoma blennioides	Greensided Darter				
Etheostoma nigrum	Johnny Darter				
Rhinichthys cataractae	Longnose Dace				
Cottus bairdi	Mottled Sculpin				
Hypentelium nigricans	Northern Hog Sucker				
Lepomis gibbosus	Pumpkinseed				
Clinostomus elongatus	Redside Dace				
Catostomus commersoni	White Sucker				
	Total # of species	0	2	0	0

Table 11. Fish Sampling Data on Tributary #51365 (East Branch) to Williams Run
At Latitude 41° 16’ 32” Longitude 079° 56’ 53”

		June 23, 1998	Sept. 12, 2005
		rm 0.00	rm 0.00
Rhinichthys atratulus	Blacknose Dace	✓	✓
Salvelinus fontinalis	Brook Trout	✓	✓
Salvelinus fontinalis	Brook Trout - hatchery		
Salmo trutta	Brown Trout		
Campostoma anomalum	Central Stoneroller		
Luxilus cornutus	Common Shiner		
Semotilus atromaculatus	Creek Chub	✓	✓
Etheostoma flabellare	Fantail Darter		
Etheostoma blennioides	Greensided Darter		
Lepomis cyanellus	Green Sunfish		✓
Etheostoma nigrum	Johnny Darter		
Rhinichthys cataractae	Longnose Dace		
Cottus bairdi	Mottled Sculpin	✓	✓
Hypentelium nigricans	Northern Hog Sucker		
Lepomis gibbosus	Pumpkinseed		
Clinostomus elongatus	Redside Dace		
Catostomus commersoni	White Sucker		✓
	Total # of species	4	6

Riparian Vegetation

The upper portions of Williams Run lack riparian vegetation in various spots. One example would be the stretch of stream that flows across a cow pasture along Hells Kitchen Road.

With the lower portions of Williams Run lying in SGLs, there is adequate riparian vegetation in existence.

> Recommendations: Check into various grants (Partners for Fish and Wildlife Program, National Fish and Wildlife Foundation General Matching Grants, etc.) to help fund streambank fencing projects to keep livestock out of streams and to also plant native species. Educate the community on the importance of riparian vegetation and overall water quality.

Illegal Dumps

During surveys of the watershed, illegal dumps were not located within Williams Run Watershed. After consulting several other agencies that frequently work in the area, no illegal dumps were identified.

One issue that was identified was littering. On several occasions, a bag of trash was left along side the road.

> Recommendations: To prevent illegal dumps from becoming a problem, set up neighborhood patrols, educate the community, and host another trash day where the community can get rid of large items responsibly.

Invasive Species

The presence of invasive species does not seem to be a primary threat currently in the watershed. It was not the purpose of this assessment to do a complete vegetative survey, however, Knotweed (*Polygonum* sp.) was located along Alan road.

> Recommendations: While removal of the presently occurring invasive species may not be feasible, preventing them from moving onto another site is highly recommended. When the vegetation is disturbed on any remediation project, plant native species whenever possible. Also, educate the community on the importance of landscaping with native species.

Public Participation

The first public meeting was held on April 6, 2006 to announce the grant & also to get any public input on the project. The public meetings were advertised in local newspapers. The SSCWA Board reviewed the plan on September 6, 2007 and the second public meeting was held on October 4, 2007 at the Mineral Township building.

Conclusion

Williams Run Watershed provides a unique wilderness experience and has the potential to increase wildlife habitat and recreational activities for its visitors. Protecting and improving this watershed will also result in improved wildlife habitat in the South Sandy Creek Watershed.

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tree_id=4001&-redoLog=true&-geo_id=04000US42&-format=ST-2|ST-2S&-_lang=en

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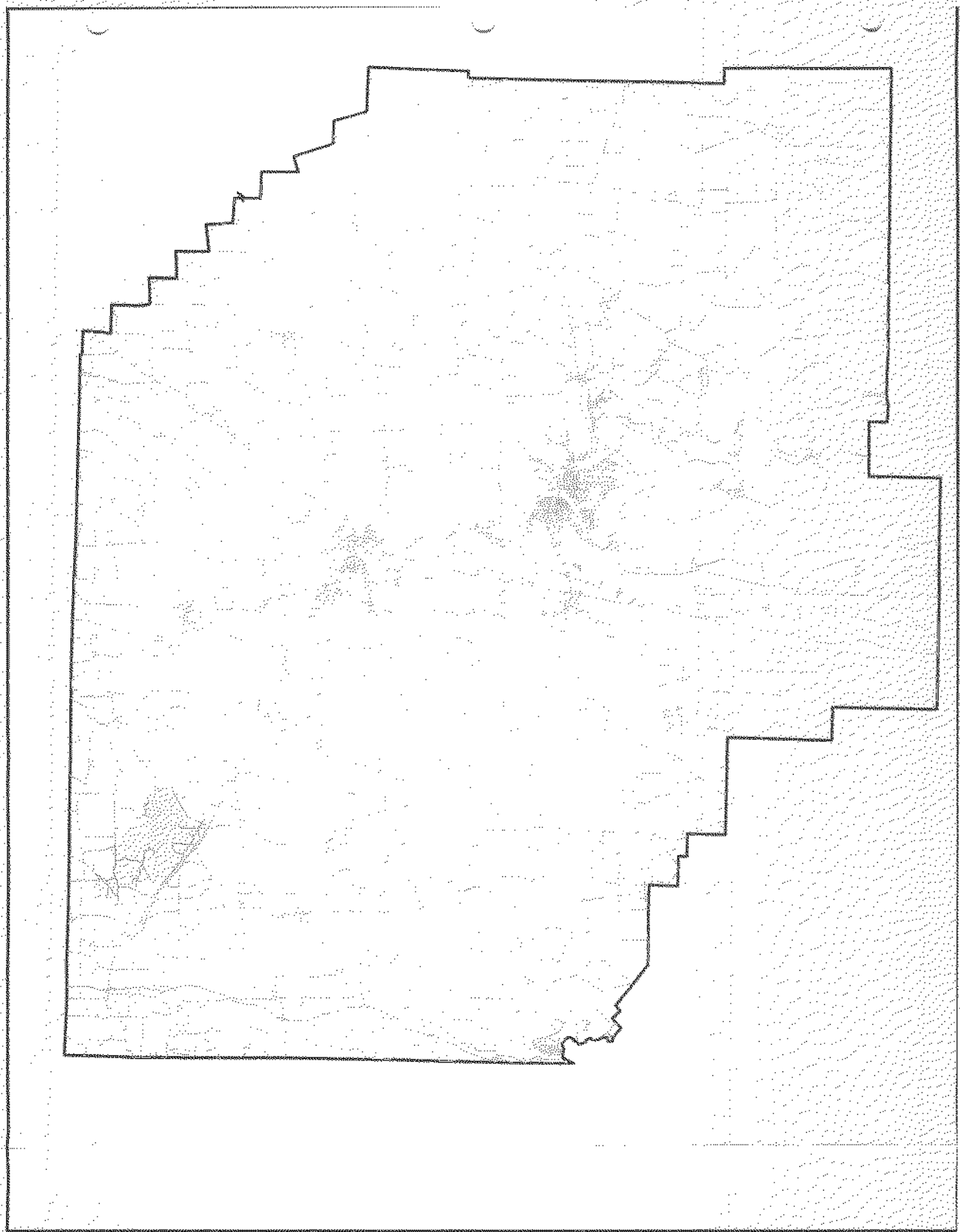
MAPS



Roads
Williams Run
Venango

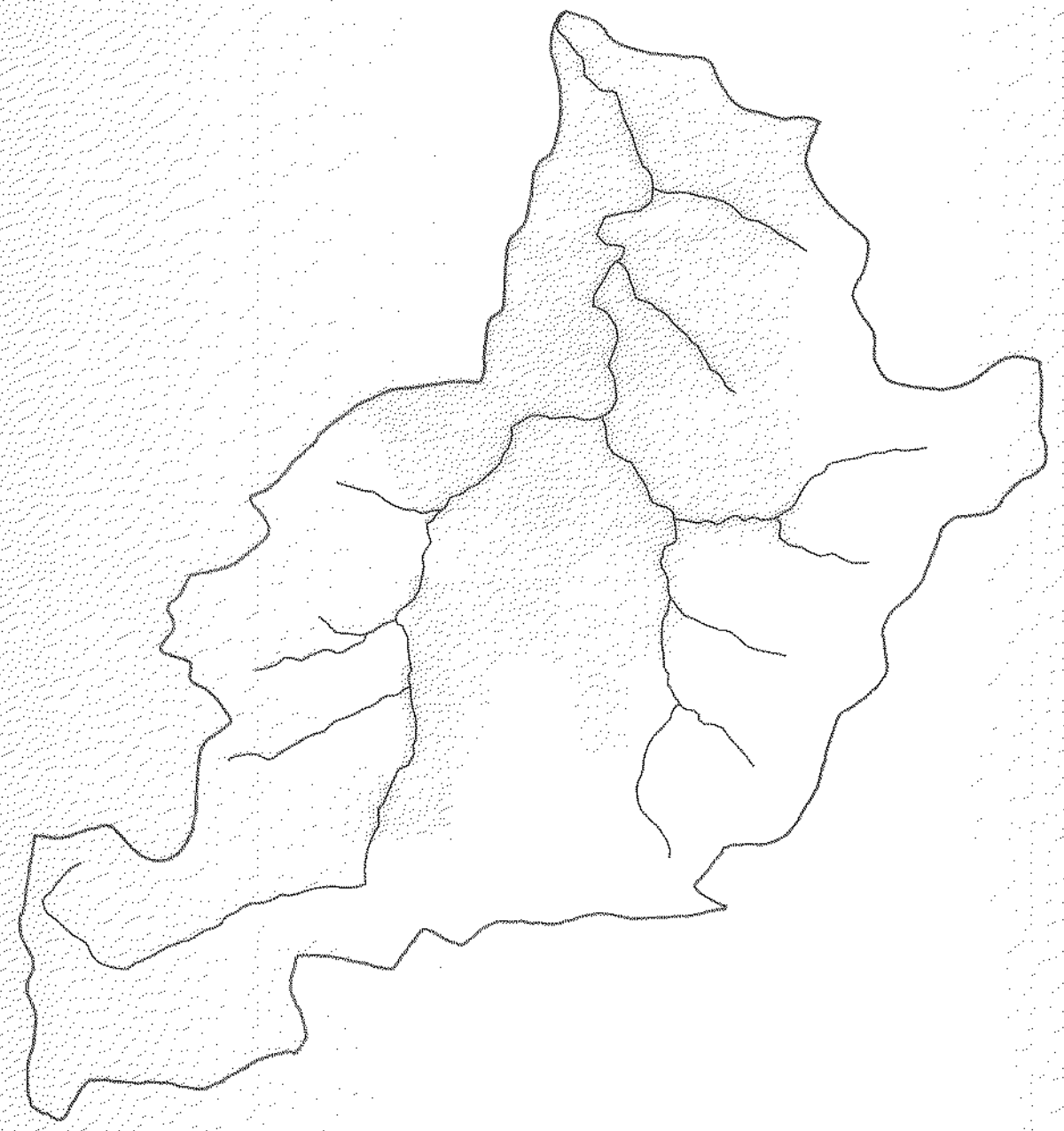
N

Williams Run Watershed
Venango County, PA

SCALE
1:180000

8000 0 8000 16000 24000 32000 Feet

Map 1. Location of Williams Run Watershed in Venango County



Williams Run
Williams Run Watershed
Gamelands

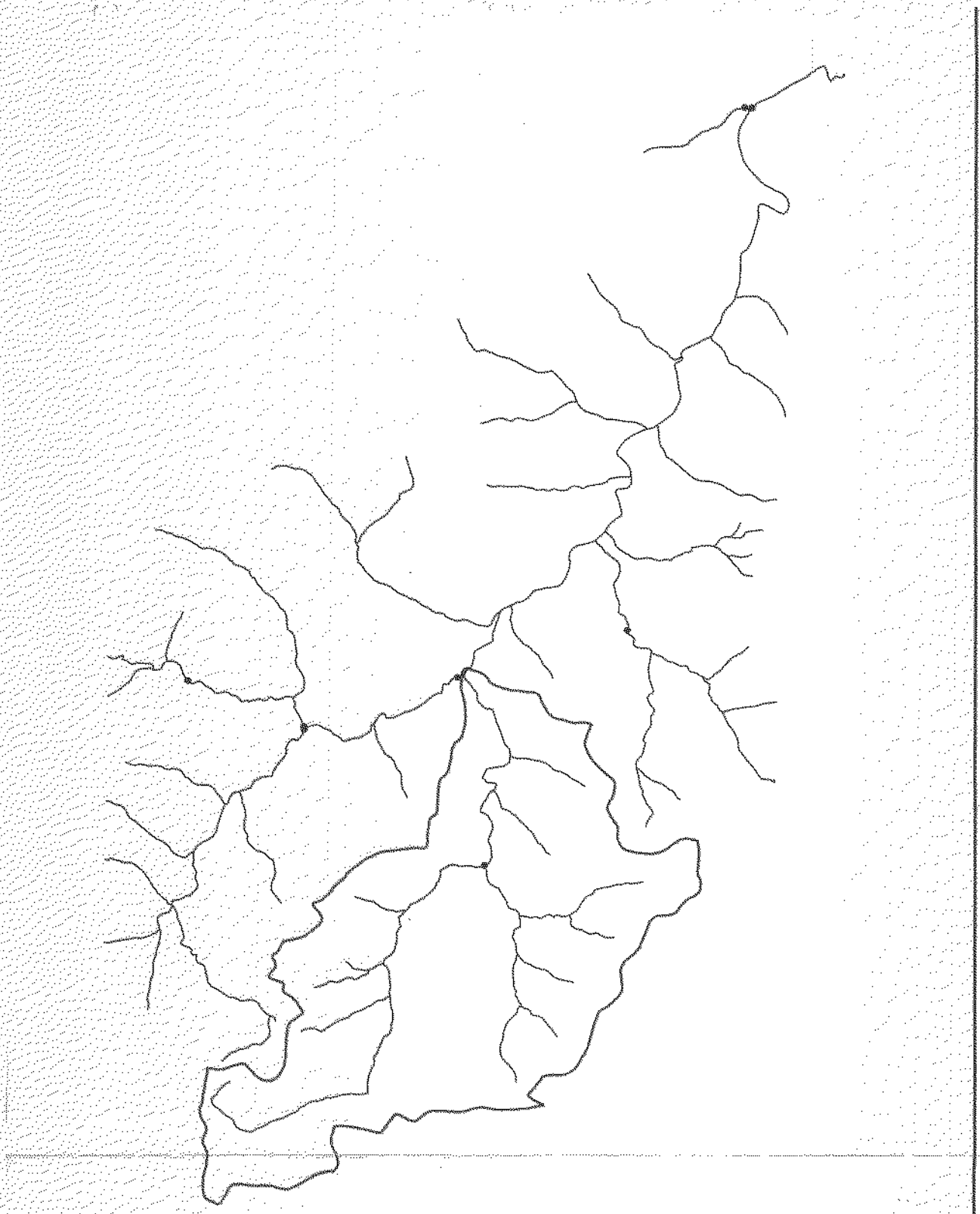
N

Williams Run Watershed
Venango County, PA

SCALE
1:24000

2000 0 2000 4000 Feet

Map 2. Location of State Game Lands in Williams Run Watershed



Brook trout
Williams Run
South Sandy Creek
Williams Run Watershed

N

Williams Run Watershed
Venango County, PA

SCALE
1:42000

4000 0 4000 8000 Feet

Map 3. Confirmed Location of Brook Trout in South Sandy Creek Watershed

- Water Quality sampling Points.
- Williams Run.
- Williams Run.

N

Williams Run Watershed
Venango County, PA

SCALE
1:36000

2000 0 2000 4000 Feet

Map 4. Location of Water Sampling Points in Williams Run Watershed

Appendix 1

Water Sampling Data

Williams Run Watershed
Williams Run Headwaters - along Hells Kitchen Road

Source	Date	Station	Flow (gpm) or SWL (inches)	pH (Field)	pH (Lab)	Cond. (Lab)	Temp.	Alk (Lab)	Acidity	Iron	Mn	Al	SO4	TSS	TDS	Hardness
						uohms/cm	°C	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ppm)	(mg/L)
BAMR	5/18/04	WRHW			7			33.20	35.20	1.520	0.38	0.699	21.00	32.0		
BAMR	7/7/04	WRHW			7			40.80	9.80		0.05		37.40			
BAMR	6/15/05	WRHW			6.9			62.00	-13.60	2.070	0.91	0.77		12.0		

BAMR = Bureau of Abandoned Mine Reclamation
CHP = Coldwater Heritage Partnership Grant
TAG = Technical Assistance Grant from DEP

Values in shaded cells indicate amounts less than that of the lowest detectable limit.

Williams Run Watershed
Tributary to Williams Run - on Gadsby's property

Source	Date	Station	Flow (gpm) or SWL (inches)	pH (Field)	pH (Lab)	Cond. (Lab)	Temp.	Alk (Lab)	Acidity	Iron	Mn	Al	SO4	TSS	TDS	Hardness
						uohms/cm	°C	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ppm)	(mg/L)
BAMR	8/19/05	WRR5			4.5			16.40	50.00	9.50	6.90	2.36	823.80	12.0		
BAMR	12/22/05	WRR5			4.8			11.40	100.00	20.50	7.74	7.19	722.10			
BAMR	3/20/06	WRR5			4.4			7.80	88.00	16.40	6.71	7.39	587.20			
BAMR	4/20/06	WRR5			4.6			9.60	84.40	15.10	6.60	6.41	646.30	6.0		
CHP	5/25/06	WRR5			3.2	202		28.00	121.00	2.59	4.61	6.61	100.00		133.0	47
BAMR	6/15/06	WRR5			4.0			2.80	105.40	17.90	6.12	9.40	633.00			
BAMR	7/26/06	WRR5			4.0			1.60	108.60	17.80	5.82	7.82	630.90	4.0		
CHP	8/17/06	WRR5			4.5	589		2.00	63.50	3.40	3.45	2.27	110.00		389.0	671.1
BAMR	9/15/06	WRR5			3.7			0.00	89.80	15.50	5.54	6.86	556.50	4.0		
BAMR	10/16/06	WRR5			4.4			9.40	113.00	20.60	6.57	9.61	647.20			
CHP	11/18/06	WRR5			4.1	435		5.00	207.00	19.60	10.15	9.76	550.00		287.0	339.7
BAMR	12/12/06	WRR5			4.4			8.00	118.00	20.10	6.73	11.00	605.00	6.0		
CHP	2/26/07	WRR5			4.5	557		4.00	129.50	19.77	13.29	9.56	740.00		368.0	627.9

BAMR = Bureau of Abandoned Mine Reclamation
CHP = Coldwater Heritage Partnership Grant
TAG = Technical Assistance Grant from DEP

Values in shaded cells indicate amounts less than that of the lowest detectable limit.

Williams Run Watershed
Tributary to Williams Run - on SGL #39

Source	Date	Station	Flow (gpm) or SWL (inches)	pH (Field)	pH (Lab)	Cond. (Lab)	Temp.	Alk (Lab)	Acidity	Iron	Mn	Al	SO4	TSS	TDS	Hardness
						uohms/cm	°C	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ppm)	(mg/L)
BAMR	3/31/04	WRL7			4.5			6.40	58.60	0.675	1.55	3.16	77.00	6.0		
BAMR	8/19/05	WRL7			4.0			2.40	45.20	3.800	2.75	2.98	120.20	4.0		
BAMR	9/12/05	WRL7			4.0			2.60	77.40	1.890	2.50	2.73	112.60	10.0		
BAMR	11/9/05	WRL7	21.70		4.1			3.40	70.20	0.460	2.17	1.97	107.00			
BAMR	12/22/05	WRL7	27.50		4.4			6.20	64.80	0.895	2.10	2.35	90.70			
BAMR	1/24/05	WRL7	103.00		4.7			6.60	47.00	0.736	1.02	1.25	59.50			
BAMR	3/20/06	WRL7	110.00		4.7			6.80	31.40	0.823	0.95	1.33	71.70			
BAMR	4/20/06	WRL7	29.00		4.6			7.40	59.00	1.550	1.66	1.80	93.60	8.0		
CHP	5/25/06	WRL7			4.35	98.8		2.00	45.50	0.640	1.45	1.55	70.00		15.3	61.1
BAMR	6/15/06	WRL7	15.00		4.3			4.80	21.20	2.330	1.89	2.26	85.70			
BAMR	7/26/06	WRL7	84.00		4.4			5.60	13.80	1.600	1.00	0.73	66.70			
CHP	8/17/06	WRL7			4.48	133		2.00	63.50	3.400	3.45	2.27	110.00		89.6	92.6
BAMR	9/15/06	WRL7	243.00		4.7			7.60	16.60	1.560	1.27		90.70			
BAMR	10/16/06	WRL7	72.00		4.6			8.40	19.20	2.210	1.50	2.43	79.20			
CHP	11/18/06	WRL7			4.22	80.9		3.00	66.00	1.330	1.75	1.59	70.00		53.4	0
BAMR	12/12/06	WRL7	72.00		4.9			8.60	39.40	2.310	1.45	2.02	74.50			

BAMR = Bureau of Abandoned Mine Reclamation
CHP = Coldwater Heritage Partnership Grant
TAG = Technical Assistance Grant from DEP

Values in shaded cells indicate amounts less than that of the lowest detectable limit.

Williams Run Watershed
Williams Run - on SGL #39

Source	Date	Station	Flow (gpm) or SWL (inches)	pH (Field)	pH (Lab)	Cond. (Lab)	Temp.	Alk (Lab)	Acidity	Iron	Mn	Al	SO4	TSS	TDS	Hardness
						uohms/cm	°C	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ppm)	(mg/L)
BAMR	6/15/05	WR2	83.93		3.6			0.00	49.80	2.840	3.97	2.27	286.40			
BAMR	7/20/05	WR2			3.6			0.00	56.00	2.290	3.60	0.89	280.20			
BAMR	8/19/05	WR2			3.6			0.00	47.80	3.060	5.28	1.21	272.60	4.0		
BAMR	9/12/05	WR2			3.7			0.00	70.00	2.230	4.34	1.13	297.30	14.0		
BAMR	12/22/05	WR2			4.5			7.00	50.40	7.280	3.62	1.73	222.70			
BAMR	1/24/06	WR2			4.6			6.20	46.00	2.870	1.36	1.30	119.80	6.0		
BAMR	3/20/06	WR2			4.3			5.20	36.60	3.930	2.22	2.09	171.40	4.0		
BAMR	4/20/06	WR2			4.0			1.40	38.00	2.120	3.02	1.61	234.00	6.0		
CHP	5/25/06	WR2			3.9	229		5.00	70.50	1.450	3.38	2.31	175.00		151.0	174.60
BAMR	6/5/06	WR2			3.7			0.00	44.40	1.700	3.94	3.68	337.20			
BAMR	7/26/06	WR2			4.1			3.00	21.60	1.390	2.08	1.09	169.20			
CHP	8/17/06	WR2			3.5	358		13.00	77.50	0.720	6.11	2.36	315.00		236.0	277.70
BAMR	9/15/06	WR2			4.4			6.80	20.40	2.510	1.28	1.48	61.30			
BAMR	10/16/06	WR2			4.0			2.20	33.80	2.930	3.14	2.61	239.20			
CHP	11/18/06	WR2			4.6	137		1.00	70.00	2.090	2.15	1.24	130.00		90.3	3.90
BAMR	12/12/06	WR2			4.6			7.60	46.60	3.750	2.58	2.63	168.40	4.0		

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CHP = Coldwater Heritage Partnership Grant
TAG = Technical Assistance Grant from DEP

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Williams Run Watershed
Tributary to Williams Run

Source	Date	Station	Flow (gpm) or SWL (inches)	pH (Field)	pH (Lab)	Cond. (Lab)	Temp.	Alk (Lab)	Acidity	Iron	Mn	Al	SO4	TSS	TDS	Hardness
						uohms/cm	°C	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ppm)	(mg/L)
BAMR	3/24/04	WRR4			4			1.40	52.20	1.070	1.94	2.99	84.10	4.0		
BAMR	7/7/04	WRR4			3.5			0.00	69.60	2.420	4.97	5.52	313.90			
BAMR	12/22/05	WRR4			3.8			0.00	49.20	1.280	3.06	2.96	151.70			
BAMR	4/20/06	WRR4			3.8			0.00	70.00	0.781	3.16	3.58	150.70			
BAMR	6/15/06	WRR4			3.6			0.00	56.20	0.979	4.27	5.44	258.70			
BAMR	10/16/06	WRR4			3.7			0.00	46.20	2.450	3.01	3.29	140.20			
BAMR	12/12/06	WRR4			4.0			2.40	37.80	1.780	2.30	2.81	78.90			

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CHP = Coldwater Heritage Partnership Grant
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Williams Run Watershed
Tributary to Williams Run

Source	Date	Station	Flow (gpm) or SWL (inches)	pH (Field)	pH (Lab)	Cond. (Lab)	Temp.	Alk (Lab)	Acidity	Iron	Mn	Al	SO4	TSS	TDS	Hardness
						uohms/cm	°C	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ppm)	(mg/L)
BAMR	3/24/04	WRL6			5.9			7.80	9.80	0.111	0.09					

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Williams Run Watershed
Tributary to Williams Run

Source	Date	Station	Flow (gpm) or SWL (inches)	pH (Field)	pH (Lab)	Cond. (Lab)	Temp.	Alk (Lab)	Acidity	Iron	Mn	Al	SO4	TSS	TDS	Hardness
						uohms/cm	°C	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ppm)	(mg/L)
BAMR	3/24/04	WRR3			3.4			0.00	141.20	9.930	7.33	12.30	543.70	4.0		
BAMR	7/7/04	WRR3			3.1			0.00	164.60	5.180	9.75	12.80	782.10			
BAMR	12/22/05	WRR3			3.8			0.00	73.40	4.430	7.38	6.28	543.40			
BAMR	4/20/06	WRR3			3.3			0.00	126.00	5.450	8.36	10.00	538.00	10.0		
BAMR	6/15/06	WRR3			3.1			0.00	161.40	6.150	8.45	12.40	727.70			
BAMR	10/16/06	WRR3			3.2			0.00	143.20	8.890	8.06	11.00	542.00	3.0		
BAMR	12/12/06	WRR3			3.4			0.00	121.40	8.530	7.51	10.20	505.60	4.0		

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TAG = Technical Assistance Grant from DEP

Values in shaded cells indicate amounts less than that of the lowest detectable limit.

Williams Run Watershed
Tributary to Williams Run

Source	Date	Station	Flow (gpm) or SWL (inches)	pH (Field)	pH (Lab)	Cond. (Lab)	Temp.	Alk (Lab)	Acidity	Iron	Mn	Al	SO4	TSS	TDS	Hardness
						uohms/cm	°C	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ppm)	(mg/L)
BAMR	3/24/04	WRR2			5			6.80	12.20	0.046	0.24	0.45		12.0		

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CHP = Coldwater Heritage Partnership Grant
TAG = Technical Assistance Grant from DEP

Values in shaded cells indicate amounts less than that of the lowest detectable limit.

Williams Run Watershed
Tributary to Williams Run

Source	Date	Station	Flow (gpm) or SWL (inches)	pH (Field)	pH (Lab)	Cond. (Lab)	Temp.	Alk (Lab)	Acidity	Iron	Mn	Al	SO4	TSS	TDS	Hardness
						uohms/cm	°C	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ppm)	(mg/L)
BAMR	3/24/04	WRR1			4.0			1.00	49.80	2.070	2.21	3.23	152.80	8.0		

BAMR = Bureau of Abandoned Mine Reclamation
CHP = Coldwater Heritage Partnership Grant
TAG = Technical Assistance Grant from DEP

Values in shaded cells indicate amounts less than that of the lowest detectable limit.

Williams Run Watershed
Tributary to Williams Run

Source	Date	Station	Flow (gpm) or SWL (inches)	pH (Field)	pH (Lab)	Cond. (Lab)	Temp.	Alk (Lab)	Acidity	Iron	Mn	Al	SO4	TSS	TDS	Hardness
						uohms/cm	°C	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ppm)	(mg/L)
BAMR	3/24/04	WRL5			6.6			11.40	24.20	0.162	0.06			4.0		

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CHP = Coldwater Heritage Partnership Grant
TAG = Technical Assistance Grant from DEP

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Williams Run Watershed
Tributary to Williams Run

Source	Date	Station	Flow (gpm) or SWL (inches)	pH (Field)	pH (Lab)	Cond. (Lab)	Temp.	Alk (Lab)	Acidity	Iron	Mn	Al	SO4	TSS	TDS	Hardness
						uohms/cm	°C	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ppm)	(mg/L)
BAMR	3/24/04	WRL4			6.7			23.00	25.80	2.330	0.11			14.0		

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CHP = Coldwater Heritage Partnership Grant
TAG = Technical Assistance Grant from DEP

Values in shaded cells indicate amounts less than that of the lowest detectable limit.

Williams Run Watershed
Tributary to Williams Run

Source	Date	Station	Flow (gpm) or SWL (inches)	pH (Field)	pH (Lab)	Cond. (Lab)	Temp.	Alk (Lab)	Acidity	Iron	Mn	Al	SO4	TSS	TDS	Hardness
						uohms/cm	°C	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ppm)	(mg/L)
BAMR	3/24/04	WRL3			5.8			7.80	8.80	0.064	0.03			6.0		

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CHP = Coldwater Heritage Partnership Grant
TAG = Technical Assistance Grant from DEP

Values in shaded cells indicate amounts less than that of the lowest detectable limit.

Williams Run Watershed
Tributary to Williams Run

Source	Date	Station	Flow (gpm) or SWL (inches)	pH (Field)	pH (Lab)	Cond. (Lab)	Temp.	Alk (Lab)	Acidity	Iron	Mn	Al	SO4	TSS	TDS	Hardness
						uohms/cm	°C	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ppm)	(mg/L)
BAMR	3/24/04	WRL2			6.4			9.00	6.40	0.056				6.0		

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CHP = Coldwater Heritage Partnership Grant
TAG = Technical Assistance Grant from DEP

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Williams Run Watershed
Tributary to Williams Run

Source	Date	Station	Flow (gpm) or SWL (inches)	pH (Field)	pH (Lab)	Cond. (Lab)	Temp.	Alk (Lab)	Acidity	Iron	Mn	Al	SO4	TSS	TDS	Hardness
						uohms/cm	°C	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ppm)	(mg/L)
BAMR	3/24/04	WRL1			6.4			9.00	6.40	0.056				6.0		

BAMR = Bureau of Abandoned Mine Reclamation
CHP = Coldwater Heritage Partnership Grant
TAG = Technical Assistance Grant from DEP

Values in shaded cells indicate amounts less than that of the lowest detectable limit.

Williams Run Watershed
WR 1 - Near mouth of Williams Run

Source	Date	Station	Flow (gpm) or SWL (inches)	pH (Field)	pH (Lab)	Cond. (Lab)	Temp.	Alk (Lab)	Acidity	Iron	Mn	Al	SO4	TSS	TDS	Hardness
						uohms/cm	°C	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ppm)	(mg/L)
TAG	10/22/01	WR01		7	6.6	354		14	0	0.2	0.1	0.1	220	1		
TAG	11/10/01	WR01		7.5	7.1	514		15	0	0.2	0.2	0	242	3		
TAG	12/15/01	WR01		6.6	6.2	362		8	0	0.3	0.7	0.3	160	1		
?	1/19/02	WR01	6"	5.4	6.86	332	-0.2	12.97	N.D.	0.62	0.45	0.4	152.3	4		
BAMR	3/24/04	WR1			4.7			6.80	47.00	0.727	1.05	1.55	80.60			
BAMR	5/18/04	WR1			4.1			3.80	80.60	1.050	2.57	2.76	170.30	6.0		
BAMR	7/7/04	WR1			4.8			10.60	43.80		1.84	1.54	139.60			
BAMR	6/15/05	WR1	230.50		4.8			7.60	33.80		1.49	0.98	114.70			
BAMR	12/22/05	WR1			5.7			8.40	49.40		0.80		100.00			
BAMR	1/24/06	WR1			5.2			7.20	44.00	0.332	0.62	0.65	58.50	6.0		
BAMR	3/20/06	WR1			4.9			7.40	27.20	0.430	0.95	1.00	65.60			
BAMR	4/20/06	WR1			5.0			7.40	28.00		1.00	0.76	79.90	8.0		
CHP	5/25/06	WR1			5.9	95.2		8.00	59.00	0.190	0.71	0.29	52.00			
BAMR	6/15/06	WR1			4.7			7.00	13.60		1.46	1.74	149.00			
BAMR	7/26/06	WR1			5.2			7.60	6.40		0.83		64.10			
BAMR	9/15/06	WR1			5.8			10.60	7.00	0.409	0.56		44.70			
BAMR	10/16/06	WR1			4.9			9.40	13.20		1.38	1.41	103.70			
CHP	11/18/06	WR1			4.5	85.7		1.00	83.50	0.220	0.96	0.59	60.00		56.5	0
BAMR	12/12/06	WR1			4.7			7.60	64.60	0.488	1.35	1.62	96.80			

BAMR = Bureau of Abandoned Mine Reclamation
CHP = Coldwater Heritage Partnership Grant
TAG = Technical Assistance Grant from DEP

Values in shaded cells indicate amounts less than that of the lowest detectable limit.

Williams Run Watershed
Discharge to Williams Run - along Alan Road

Source	Date	Station	Flow (gpm) or SWL (inches)	pH (Field)	pH (Lab)	Cond. (Lab)	Temp.	Alk (Lab)	Acidity	Iron	Mn	Al	SO4	TSS	TDS	Hardness
						uohms/cm	°C	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ppm)	(mg/L)
BAMR	5/18/04	AARS			7.4			128.2	-94.8	0.797	0.37	0.44	70.6	14.0		
BAMR	7/7/04	AARS			7.6			101.6	-61.4				31.2			
BAMR	6/15/05	AARS		2.00	7.5			154.60	-101.20	0.635	0.88		40.10			
BAMR	7/20/05	AARS		2.00	7.7			149.00	-113.60		0.62		60.00			
BAMR	12/22/05	AARS		5.00	7.0			72.60	-26.80	0.471	0.37	2.09	84.80	6.0		
BAMR	1/24/06	AARS		5.00	7.3			83.20	-37.40	0.651	0.15	1.07	59.50	6.0		
BAMR	3/20/06	AARS			6.8			86.60	-61.00	0.454	0.21	1.74	86.40	8.0		
BAMR	4/20/06	AARS			7.7			131.00	-90.80		0.09		65.70	4.0		
BAMR	6/15/06	AARS			7.2			131.60	-120.20	0.871	0.30		48.30			
BAMR	9/15/06	AARS			7.6			135.20	-116.60		0.15		26.30			

BAMR = Bureau of Abandoned Mine Reclamation
CHP = Coldwater Heritage Partnership Grant
TAG = Technical Assistance Grant from DEP

Values in shaded cells indicate amounts less than that of the lowest detectable limit.

Williams Run Watershed
Discharge to Williams Run - along Alan Road

Source	Date	Station	Flow (gpm) or SWL (inches)	pH (Field)	pH (Lab)	Cond. (Lab)	Temp.	Alk (Lab)	Acidity	Iron	Mn	Al	SO4	TSS	TDS	Hardness
						uohms/cm	°C	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ppm)	(mg/L)
BAMR	3/31/04	ARS			3.6			0.00	186.4	77.600	1.13	11.0	289.5	50.0		
BAMR	5/18/04	ARS			3.0			0.00	172.6	14.100	3.72	11.0	193.1	12.0		
BAMR	7/7/04	ARS			2.5			0.00	632.2	61.200	4.92	39.6	840.2			
BAMR	6/15/05	ARS	5.00		2.6			0.00	645.00	63.900	6.85	34.30	1024.60	4.0		
BAMR	7/20/05	ARS			2.6			0.00	499.20	49.400	5.76	30.00	719.70			
BAMR	11/9/05	ARS			2.9			0.00	352.00	67.100	1.99	14.70	494.30			
BAMR	12/22/05	ARS			2.9			0.00	579.20	156.000	4.13	31.20	734.00			
BAMR	1/24/06	ARS			3.0			0.00	470.00	142.000	1.45	20.70	583.10			
BAMR	3/20/06	ARS			2.6			0.00	1310.00	300.000	4.33	53.20	1.36			
BAMR	4/20/06	ARS			2.7			0.00	972.80	214.000	5.41	44.90	1090.30			
CHP	5/25/06	ARS			2.4	1.49		436.00	1853.00	205.200	6.72	46.88	2050.00		9.8	
BAMR	6/15/06	ARS			2.4			0.00	2425.80	300.000	8.83	106.00	1677.40			
BAMR	7/26/06	ARS			2.7			0.00	872.00	188.000	4.22	35.10	1152.10			
CHP	8/17/06	ARS			2.4	1.55		775.00	2526.00	502.300	15.71	165.02	3875.00		1030.0	
BAMR	9/15/06	ARS			3.5			0.00	92.00	38.800	0.93	5.58	218.00			
BAMR	10/16/06	ARS			2.9			0.00	560.20	146.000	3.87	29.00	789.30			
CHP	11/18/06	ARS			3.8	2479		9.00	262.00	51.850	1.10	8.02	300.00		184.0	
BAMR	12/12/06	ARS			4.2			5.80	158.20	56.400	1.40	9.82	257.60			
CHP	2/26/07	ARS			6.0	705		17.00	61.00	12.460	0.62	0.00	140.00		466.0	

BAMR = Bureau of Abandoned Mine Reclamation
CHP = Coldwater Heritage Partnership Grant
TAG = Technical Assistance Grant from DEP

Values in shaded cells indicate amounts less than that of the lowest detectable limit.

Williams Run Watershed
Discharge to Williams Run - Woods' Ponds

Source	Date	Station	Flow (gpm) or SWL (inches)	pH (Field)	pH (Lab)	Cond. (Lab)	Temp.	Alk (Lab)	Acidity	Iron	Mn	Al	SO4	TSS	TDS	Hardness
						uohms/cm	°C	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ppm)	(mg/L)
BAMR	1/24/06	Woods			3.4			0.00	235.40	9.870	10.00	28.70	618.30			
BAMR	3/20/06	Woods			3.3			0.00	226.40	8.520	10.00	28.30	565.00			
BAMR	4/20/06	Woods			3.3			0.00	243.80	6.940	10.10	27.90	604.30			
CHP	5/25/06	Woods			3.5	625		17.00	398.00	21.110	26.63	35.59	625.00		412.0	
BAMR	6/15/06	Woods			3.3			0.00	246.00	10.100	9.17	30.40	295.50			
BAMR	7/26/06	Woods			3.4			0.00	279.40	14.000	9.82	29.90	656.60			
CHP	8/17/06	Woods			3.4	632		22.00	431.00	31.070	20.14	35.12	960.00		416.0	
BAMR	9/15/06	Woods			3.3			0.00	268.60	14.400	10.50	29.40	631.00			
BAMR	10/16/06	Woods			3.3			0.00	231.60	10.400	9.83	28.10	586.30			
CHP	11/18/06	Woods			3.0	591		55.00	398.00	2.280	12.88	26.09	550.00		390.0	
BAMR	12/12/06	Woods			3.2			0.00	215.60	5.470	9.14	24.80	487.60			
CHP	2/26/07	Woods			3.4	566		24.00	272.50	7.980	14.20	30.04	710.00		374.0	

BAMR = Bureau of Abandoned Mine Reclamation
CHP = Coldwater Heritage Partnership Grant
TAG = Technical Assistance Grant from DEP

Values in shaded cells indicate amounts less than that of the lowest detectable limit.

Appendix 2

Macro-Invertebrate Data Sheets

Biosurvey Data Sheet (page 2) Macro-invertebrate Survey Rocky bottom stream

Site name: Williams Run - Near mouth of stream Date: _____5/15/06_____
Location: 41° 17' 45.3" 79° 57' 3.2"
Monitor ID#s: __iep1275 , efk6435, jak6435, lb2832

Weather in last 24 hrs. Showers Weather today: ___Rain_____

Identify the macro-invertebrates (to order) in your sample using the identification card. We are only concerned with organisms that appear on the tally sheet. Record the number of organisms below and then assign them letter codes based on their abundance as listed below.

R(rare) = 1-9 organisms C(common) = 10-99 organisms D(dominant) = 100 plus organisms

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Group I – Sensative

__0___ ( ) Gilled snails
__0___ ( ) Hellgrammites
__0___ ( ) Mayfly nymph
__0___ ( ) Non net-spinning caddisfly larva (case builders)
__0____ ( ) Riffle beetle adults
_6___ (R) Stonefly nymph
_0____ ( ) Water Penny larva

Group II – Somewhat sensitive

_0____ ( ) Alderfly larvae
__3__ (R) Beetle larvae
__0___ ( ) Clam
__0___ ( ) Cranefly larvae
__0___ ( ) Crayfish
__0___ ( ) Damselfly nymph
___0___ ( ) Dragonfly nymph
__0___ ( ) Fishfly larvae
__0___ ( ) Net-spinning caddisfly larvae (non case builders)
__0___ ( ) Scuds
___0___ ( ) Sowbugs

Group III – Tolerant

__0___ ( ) Aquatic worms
__0___ ( ) Blackfly larvae
__0___ ( ) Leeches
__5__ (R) Midge larvae
__0__ ( ) Snails (other)

Continue on to page 3

Biosurvey: Data Sheet (Page 3)

Site ID: Williams Run – Near mouth of stream __Date: ____5/15/06_____

41° 17' 45.3" 79° 57' 3.2"

Water Quality Rating

To calculate the index value, add the number of letters found in the three groups on the previous page and multiply by the indicated weighing factor.

Group I . Sensitive

# of R's, C's, and D's

___1____ (# of R's) x 5.0 = ___5.0_

___0____(# of C's) x 5.6 = _____

___0____(# of D's) x 5.3 = _____

Sum of the Index Value for Group I= _5.0___

Group II . Somewhat Sensitive

# of R's, C's, and D's

____1___ (# of R's) x 3.2 = __3.2__

____0___(# of C's) x 3.4 = _____

____0___(# of D's) x 3.0 = _____

Sum of the Index Value for Group II= __3.2_____

Group III. Tolerant

# of R's, C's, and D's

____1___ (# of R's) x 1.2 = __1.2__

____0___(# of C's) x 1.1 = _____

____0___(# of D's) x 1.0 = _____

Sum of the Index Value for Group III= __1.2___

To calculate the water quality score for the stream site, add together the index values for each group.

The sum of these *values* equals the water quality score.

Water Quality Score = ___9.4_____

Compare this score to the following number ranges to determine the quality of your stream site.

____Good > 40 ____Fair 20-40 _X_ Poor < 20

Note: The tolerance groupings (Group I, II, III) and the water quality rating categories were developed for streams in the Mid-Atlantic states.

Comments: Stream contained few attachment sites for macro-invertebrates. Sand and gravel were abundant

Biosurvey Data Sheet (page 2) Macro-invertebrate Survey Rocky bottom stream

Site name: Williams Run - off of Game Land Road Date: 5/15/06

JR2 ***Location:*** ***41° 15' 37.5" 79° 57' 36.1"***

Monitor ID#s: iep1275 , efk6435, jak6435, lb2832

Weather in last 24 hrs. Showers Weather today: Rain

Identify the macro-invertebrates (to order) in your sample using the identification card. We are only concerned with organisms that appear on the tally sheet. Record the number of organisms below and then assign them letter codes based on their abundance as listed below.

R(rare) = 1-9 organisms C(common) = 10-99 organisms D(dominant) = 100 plus organisms

---

Group I – Sensative

0 ( ) Gilled snails
0 ( ) Hellgrammites
0 ( ) Mayfly nymph
0 ( ) Non net-spinning caddisfly larva (case builders)
0 ( ) Riffle beetle adults
2 (R) Stonefly nymph
0 ( ) Water Penny larvae

Group II – Somewhat sensitive

0 ( ) Alderfly larvae
0 ( ) Beetle larvae
0 ( ) Clam
0 ( ) Cranefly larvae
0 ( ) Crayfish
1 (R) Damselfly nymph
0 ( ) Dragonfly nymph
0 ( ) Fishfly larvae
0 ( ) Net-spinning caddisfly larvae (non case builders)
0 ( ) Scuds
0 ( ) Sowbugs

Group III – Tolerant

0 ( ) Aquatic worms
0 ( ) Blackfly larvae
0 ( ) Leeches
1 (R) Midge larvae
0 ( ) Snails (other)

Continue on to page 3

Biosurvey: Data Sheet (Page 3)
Site ID: Williams Run – ~~Near mouth of stream~~ Date: 5/15/06
Location: ***41° 15' 37.5" 79° 57' 36.1"***
Water Quality Rating

To calculate the index value, add the number of letters found in the three groups on the previous page and multiply by the indicated weighing factor.

Group I . Sensitive

# of R's, C's, and D's

1 (# of R's) x 5.0 = 5.0

0 (# of C's) x 5.6 =

0 (# of D's) x 5.3 =

Sum of the Index Value for Group I= 5.0

Group II . Somewhat Sensitive

# of R's, C's, and D's

1 (# of R's) x 3.2 = 3.2

0 (# of C's) x 3.4 =

0 (# of D's) x 3.0 =

Sum of the Index Value for Group II= 3.2

Group III. Tolerant

# of R's, C's, and D's

1 (# of R's) x 1.2 = 1.2

0 (# of C's) x 1.1 =

0 (# of D's) x 1.0 =

Sum of the Index Value for Group III= 1.2

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

Water Quality Score = 9.4

Compare this score to the following number ranges to determine the quality of your stream site.

____Good > 40 ____Fair 20-40 __X__ Poor < 20

Note: The tolerance groupings (Group I, II, III) and the water quality rating categories were developed for streams in the Mid-Atlantic states.

Comments: There was abundant flow from an upstream impoundment due to heavy rain in previous days which may explain the presence of the Damselfly nymph. Stream bottom showed abundant deposits of Iron Oxide.