Updated 4/2004

Watershed Restoration Action Strategy (WRAS)
State Water Plan Subbasin 03A
Upper Schuylkill River Watershed
Schuylkill, Carbon, and Berks Counties

Introduction

The 341-square mile Subbasin 03A comprises the upper Schuylkill River from the headwaters downstream to Blue Mountain. Subwatersheds include the Little Schuylkill River at 137 square miles and the West Branch Schuylkill River at 18.7 square miles. A total of 185 streams flow for 421 miles through the subbasin. The subbasin is part of **HUC Area 2040203**, Schuylkill River, a Category I, FY99/2000 Priority watershed under the Unified Watershed Assessment.

Geology/Soils

The subbasin is entirely in the Ridge and Valley Ecoregion, an area of steep slopes and northeast-southwest trending mountains with narrow intervening valleys. The Ridge and Valley is divided into several sections within the subbasin, the Northern Shale Valleys (67b), Northern Sandstone Ridges (67c), Northern Dissected Ridges (67d), and Anthracite (67e).

The Northern Shale Valleys section is characterized by rolling valleys and low hills and is underlain by shale, sandstone, and siltstone. The soils in areas underlain by fine-grained shale are relatively impervious to rainfall. Surface streams are large, and due to high erosion rates, often turbid.

The Northern Sandstone Ridges section is characterized by high, steep, forested ridges with narrow crests. Rocks are highly folded and interbedded with sandstone and conglomerate. Soils are poorly buffered and subject to acidification from airborne deposition.

The Northern Dissected Ridges section is composed of broken dissected hummocky ridges underlain by sandstone, siltstone, and shale. Shale barrens are located on some steep south facing slopes. Streams in this section are not as poorly buffered and acidic as streams in the other noncarbonate sections of the Ridge and Valley. All the soils in the subbasin are sedimentary rock based, derived from shale, sandstone, and siltstone, with moderate to slow infiltration rates and a higher than average runoff potential.

The Anthracite section contains strata of sandstone, shale, siltstone, conglomerate and coal. The strata are steeply tilted and mines penetrate deep into the hillsides. Active and abandoned coal mines have severely altered the landscape, leaving behind numerous coal refuse piles and spoil banks, abandoned highwalls and equipment, streams that disappear into spoil banks, and widespread pollution. Tunnels bored between mountains allow water exchange between watersheds.

Land Use

Abandoned mine areas are a dominant land use in the subbasin. Where mining has not occurred, the hills and mountains in the basin are largely forested; the valleys have a mixture of agriculture and villages. Most of the 9 boroughs and many villages in the subbasin were originally established as company towns associated with underground coal mines. As the mines closed, many residents left the area; others travel to jobs outside of the subbasin. The population in 1990 was 88,800; population is projected to decline to 82,000 by 2040.

Natural Resources:

- Tuscarora and Locust Lake State Parks and scattered lands owned by the PA Game Commission.

DEP Chapter 93 High Quality (HQ) or Exceptional Value (EV) streams:
EV:

- Rattling Run, headwaters down to PA Route 61

HQ:

- Mud Run, down to Schuylkill County Municipal Dam
- Kaufman Run, down to Schuylkill County Municipal Dam
- Tar Run, down to Schuylkill County Municipal Dam
- Wolf Creek, down to Schuylkill County Municipal Dam
- Tumbling Run, down to Tumbling Run Dam
- Still Creek, down to Tamaqua Water Supply Dam
- Owl Creek, down to Lower Tamaqua Dam

PA Fish and Boat Commission Class A trout waters (highest biomass category):
(Streams are in Schuylkill County unless otherwise noted)

- Bear Creek, brook trout, headwaters down to 500 meters below T-595/T-594 (3.4 miles)
- Beaver Creek, brook trout, headwaters down to lane off SR1013 (1.5 miles)
- Cold Run, brook trout, headwaters down to T-431 (2.7 miles)
- Owl Creek, brook trout (0.25 miles)
- Rattling Run, brook trout (3.9 miles, Schuylkill and Berks Counties)
- Tumbling Run, brook trout, headwaters down to Silver Creek Reservoir
- Unnamed tributary to Little Schuylkill River, near Drehersville, brook and brown trout (1.8 miles, Schuylkill and Berks Counties)

Water Supplies:
Underground mines degrade or deplete most of the shallow groundwater that would be normally available for residential water supplies. Drinking water is supplied from water supply reservoirs on unaffected tributaries originating on the mountains or in the long, narrow valleys upstream of mined areas. Mill Creek watershed has 5 major water supply reservoirs maintained by the Schuylkill County Municipal Authority. Reservoirs near the headwaters of Big Creek and Silver Creek administered by the Silver Creek Water Authority also provide drinking water to area residents.

Water Quality Impairment
Much of the upper Schuylkill River watershed is degraded by discharges from abandoned underground and surface coal mines (AMD). Numerous unreclaimed open surface mines, coal refuse, culm banks, and mine pits divert surface water into the large underground mine pools. Tunnels connect many of the mine pools and discharge high volumes of mine drainage. The upper main stem and the West Branch have mainly alkaline discharges with elevated iron; the Little Schuylkill River watershed has mainly acidic discharges. Iron precipitate coats most stream substrates in the mined areas. A few discharges have high aluminum that precipitates after reaching the surface. Mining is still taking place in the subbasin, but on a much more limited basis than in the past.

Many small streams in the subbasin flow into abandoned surface mine pits and spoil piles and disappear into the underground mine workings. Flume diversions were installed years ago in an attempt to prevent streams from entering the underground mine workings. Most of these flumes have deteriorated allowing surface water to infiltrate and increase the volume of discharges from mine openings. Inflows of the degraded Big Creek and Silver Creek and the Mary D and Kaska mine discharge into unnamed tributaries and impact the upper Schuylkill River. Restoration of the stream channels would lessen the amount of water exiting the mine openings into the receiving and in some instances restore aquatic life to these smaller tributary streams.

The upper reaches of the West Branch are impacted by alkaline discharges from abandoned mine tunnels, including the Otto Mine discharge at 3000 gpm and the Pine Knot Tunnel at 4,000 to 15,000 gpm. The major impacts are elevated concentrations of iron, manganese, and, occasionally, aluminum. The West Branch pH is near 7.0; the middle reaches are coated with iron precipitate, which eliminates the majority of the macroinvertebrates; however, a native brook population thrives in this area. A naturally reproducing brook and brown trout fishery and a diversity of macroinvertebrates are present in the lower reaches of the West Branch.

The complicated nature of mining and the difficulties in determining the responsible parties for discharges in the Anthracite region can be illustrated by the following information on historical mining in the Panther Creek watershed, a tributary of the Little Schuylkill River near Tamaqua, provided by the DEP Pottsville District Mining Office.

Mining History of Panther Creek

The majority of the Panther Creek watershed has been affected by underground and surface mining activities dating back 200 years. The Lehigh Coal & Navigation Company currently operates a 7,596-acre anthracite mining operation known as the LC&N Mine. This surface mine permit covers much of the Panther Creek watershed and extends from Tamaqua and Coaldale Boroughs in Schuylkill County into Nesquehoning, Lansford Borough and Summit Hill Boroughs in Carbon County. The mining operation includes two major open surface mine pits, named Job #111 and Springdale, and numerous other affected areas that are described in more detail below. The LC&N Mine is contained within a remining permit issued in 1985, as required under the new regulations establishing Pennsylvania's primacy over Anthracite Surface Mining. The current surface mining permit replaced mine drainage permits originally issued to Greenwood Stripping Corporation, and then transferred to Bethlehem Mines Corporation.

The LC&N Co. was established in 1793 to mine an 8000-acre tract in Panther Valley that roughly corresponds to the present LC&N Mine. The coal was quarried in shallow, open pits, until the 1840's when underground mining began on the site. Deep mining operations were begun by the LC&N around 1840 and continued until 1957. The Tamaqua Colliery, the Greenwood/Coaldale Colliery, and the Lansford Colliery were three of the collieries operated by LC&N on the Panther Valley tract. LC&N was conducting surface mining on the LC&N site during the time that underground mining was taking place, and some surface mine pits extending as deep as 500 feet were developed during the 1940s and 1950s.

Greenwood Stripping Corporation began surface mining the LC&N site in 1960. Greenwood operated several surface pits on the LC&N site, including a very large operation located to the west of LC&N's current Job #111. The current LC&N mining operation contains many acres of abandoned mine land, including abandoned surface pits, spoil piles, and coal refuse piles, which were affected and abandoned prior to State and Federal laws and regulations requiring backfilling and reclamation of surface mines.

In accordance with provisions of the joint Federal-State Anthracite Mine Water Control Program, two pumping projects were completed in the LC&N Mine:

- Project 5: In 1959, two deep well pumps were installed in No. 10 Shaft (Greenwood Mine) of the LC&N mine to prevent mine water from overflowing into the adjacent Coaldale Mine. In 1979, the state furnished a third pump that was installed by Bethlehem Mines to drain the lower benches of the adjacent Job #111 open pit.
- Project 7: In 1960, two deep well pumps were installed in No. 14 Shaft (Tamaqua Mine) of the LC&N to control water levels in that mine. Since the pumps were installed, they have been operated by LC&N to facilitate surface mining operations at the LC&N Mine.

Deep well pumps at the No. 10 Shaft location presently keep the Job #111 pit dewatered by drawing down the mine pools and allow LC&N to operate the mine. Bethlehem Mines has been operating and maintaining the pumps pursuant to a 1957 pumping agreement which requires water levels to be pumped below the 700 foot elevation.

The pumped water from the No. 10 Shaft location has been treated since 1983 and the pumped water from the No. 14 Shaft location treated since 1979 at two mine drainage treatment plants, which Bethlehem Mines was required to build as a result of a 1979 Consent Order and Agreement with the Department and a Consent Decree with the U.S. Environmental Protection Agency (EPA).

If pumping were to cease at the No. 10 Shaft in the Greenwood/Coaldale Colliery and the No. 14 Shaft in the Tamaqua Colliery, major discharges could occur at one or more of the following locations which are presently not flowing:

- The drift opening of the Tamaqua Colliery located at the 782-foot elevation adjacent to the four-lane PA Route 309, south of the Borough of Tamaqua. A discharge through this drift opening could potentially flood Route 309, since the existing culvert may not be adequate to accommodate the flow.
- The No. 14 water level tunnel at the 820-foot elevation.

Monitoring/Evaluation

Biologists from the DEP Northeast Regional Office evaluated the subbasin under the unassessed waters program in 2000. Siltation and flow alterations were identified as the major pollution causes. Iron precipitate was noted as the major sediment in most of the watersheds. The major pollution source is the extensive abandoned mining; however, a variety of other sources including small residential development, urban runoff and storm sewers, habitat alterations, channelization, upstream impoundments, and road runoff impact the subbasin. The majority of the impairment is on the larger streams such as main stem Schuylkill River, Mill Creek, the West West Branch, Muddy Branch, Little Schuylkill River, Mannon Creek, and Panther Creek at Tamaqua. Portions of the main stem Schuylkill River and Mannon Creek also have fish consumption advisories due to PCBs. Only one stream, Beaver Run at Lewistown, was impaired by siltation from agricultural sources.

SOURCES OF IMPAIRMENT IN SUBBASIN 03A UPPER SCHUYLKILL RIVER

PROTECTED WATER USE CATEGORY (Chapter 93)	SOURCE OF IMPAIRMENT	MILES IMPAIRED (424.72 total miles in watershed)	PERCENT OF WATERSHED IMPAIRED (100% of watershed evaluated)	SOURCE OF DATA
Aquatic Life	Abandoned Mine Drainage	106.58	25.1%	2000 305(b) Report
Aquatic Life	Agriculture	2.17	0.5%	"
Aquatic Life	Bank Modification	35.47	8.35%	"
Aquatic Life	Channelization	94.42	22.23%	"
Aquatic Life	Dredging	0.94	0.22%	"
Aquatic Life	Industrial Point Sources	8.21	1.93%	"
Aquatic Life	Natural Sources	6.37	1.50%	"
Aquatic Life	On Site Wastewater	3.82	0.9%	"
Aquatic Life	Other	6.62	1.6%	"
Aquatic Life	Removal of Vegetation	5.65	1.33%	"

Aquatic Life	Road runoff	77.17	18.17%	“
Aquatic Life	Small Residential Runoff	24.07	5.67%	“
Aquatic Life	Source Unknown	15.53	3.66%	“
Aquatic Life	Surface Mining	23.22	5.47%	“
Aquatic Life	Upstream Impoundments	15.96	3.76%	“
Aquatic Life	Urban Runoff/Storm Sewers	99.25	23.37%	“

Despite the extensive mining in the subbasin, many subwatersheds are unimpaired and have naturally reproducing populations of brook trout. The lower 17.59 miles of the Little Schuylkill River and other unimpaired waters are an important recreational resource for the region. The larger unimpaired secondary watersheds include Big Creek, Tumbling Run, Dyer Run, Panther Creek and Beaver Creek near Cressona, Mahoney Creek, Locust Creek, Indian Creek at Rauschs, and Rattling Run. Other watersheds are unimpaired in their upper sections and provide drinking water for many regional residents.

The PA Fish and Boat Commission (PFBC) assessed the West Branch Schuylkill River fishery in 1998, 1999 and 2000. They discovered over 100 native brook trout at 2 locations in the West Branch and at one location on the Muddy Branch. A mixed brook and brown trout population was found at the mouth of the West Branch. Some tributaries to the West Branch had more trout than the main stem. The highest numbers of trout were captured in the West West Branch, a total of 312 trout in 302 meters of stream near the mouth, and 250 trout in 343 meters of stream just downstream of Sheaffer Run. Several brook trout were also found in the middle reaches of the West Branch near the railroad bridge upstream of Minersville Borough and in the Muddy Branch near the T-564 Bridge at the village of Steins. Seven brook trout and several brown trout were captured about one mile downstream of the near-neutral pH, high aluminum Pine Knot/Oak Hill discharge. Total lengths of fish captured throughout the watershed ranged from 2 to 15.7 inches for brook trout and from 3 to 19.6 inches for brown trout. The high numbers of trout were downstream of major deep mine discharges where the pH ranged from 6.8 to 7.1 and the alkalinity was moderate to high (32 to 56 mg/l). The cold water from the deep mine discharges provide ideal temperature conditions for trout.

Several of the above streams that contain populations of native brook trout are listed as impaired on the 303d list. Determination of impairment is based on the macroinvertebrates living in the stream and the habitat. The precipitated metals and the silt covering the substrate adversely affect the invertebrates and limit colonization, thus leading to an impaired designation. The neutral pH and the cold water from the deep mine discharges allow trout to survive and in some cases thrive. Since the brook trout are mobile and can move up into tributaries to feed or if conditions worsen. They are able to live in many of these streams as long as the water is cold.

Sewage Problems:
Few of the boroughs and villages have sewage treatment plants; leaking on-lot septic systems are widespread. An Act 537 sewage assessment is underway for the upper main stem; construction of sewage treatment plants is expected to begin in 2001. Two municipal sewage treatment plants discharge treated sewage; leaking septic systems discharge raw sewage to the West Branch. Urbanization and agriculture also impact the subbasin, but to a lesser extent than mining.

Most of the boroughs and towns in the subbasin have sewage collector pipes from residences and businesses; however, few towns have sewage treatment plants. Many of the piping systems are old and leaky and nearly all discharge raw sewage directly into the creeks and rivers. In the Borough of New Philadelphia on the main stem Schuylkill River, the sewage pipe discharges short of the river during low summer flow levels and sewage piles up on the riverbank. Cumbola, the next village downstream, also discharges raw sewage directly into the river. Brockton and Middleport, located upstream of New Philadelphia, also discharge raw sewage into the main stem. Panther Creek, a tributary to the Little

Schuylkill River, has a raw sewage problem from Tamaqua Borough. The village of Branchdale discharges raw sewage into the Muddy Branch. These discharges present a serious health problem as well as a source of stream pollution.

Some areas do have sewage treatment plants. Sewage lines from the city of Pottsville extend a mile upstream to Port Carbon and discharge treated sewage into the Schuylkill River. The Borough of Minersville and Cass Township have a sewage treatment plant which discharges into the West Branch; however, some of the pipes leak, and raw sewage is still entering the river.

Future threats to water quality

Future threats are the same as those now affecting the subbasin. Water quality should improve as coal refuse piles are removed and mine discharges are treated. Construction of sewage treatment plants to eliminate raw sewage discharges should also improve water quality.

Restoration Initiatives

Pennsylvania Growing Greener Grants:

- $457,00 (FY2002) to the City of Pottsville for phase 2 of the Sharp Mountain reclamation project.
- $16,320 (FY2000) to the Schuylkill Headwaters Association to add to existing information on AMD impacts in the upper Schuylkill River tributaries by providing consistent flow measurements for abandoned deep mine discharges. These data are needed to prioritize impacts to the watershed, determine efficient remediation strategies and estimate remediation costs.
- $18,400 (FY2000) to the Schuylkill Headwaters Association to install 6000 feet of streambank fencing, stabilize 200 feet of eroding streambank, and plant the riparian area to basket willow to protect a wild brook trout population.
- $350,000 (FY1999) to the City of Pottsville for reclamation of abandoned mine lands on Sharp Mountain. This project will look into ways to correct problems associated with subsidence from underground mines that impede development and threaten public safety.
- $64,000 (FY1999) to the Schuylkill County Headwaters Association to reduce contaminated mine flow into the West Branch Schuylkill River by redirecting the normal, non-flood stream channel flow into a culvert and natural channel, away from an abandoned surface mine pit.

U.S. Environmental Protection Agency (EPA) Clean Water Act Section 319 Grants:

FY2003: Schuylkill Headwaters Association

- $315,000 to design, implement and evaluate an toxic limestone drain and aerobic wetland treatment system; and
- $450,000 to design, implement and evaluate an anoxic limestone drain and passive aerobic wetland treatment system for the Pine Forest Discharge.
- $432,220 (FY2003) to Schuylkill Headwaters Association for design and construction of a passive treatment system for the Otto coal mine discharge. USGS will conduct before and after construction chemical and biological monitoring.
- $270,245 (FY2002) to Schuylkill County Conservation District for construction and evaluation of a passive treatment system at the Bell Colliery abandoned mine site.
- $60,000 (FY2001) to the Schuylkill County Conservation District (CD) and the Schuylkill Riverkeeper to assess mine drainage pollution and develop a restoration plan for the Little Schuylkill River. An outreach and education effort aimed at increasing the involvement of residents in environmental issues is part of this project.
- $54,550 (FY1999) to the Schuylkill County CD and the Schuylkill Riverkeeper for an assessment and development of a restoration plan to prioritize mine discharges and estimate costs for treatment of upper main stem Schuylkill River tributaries and the West Branch.

- $91,850 (FY1999) to the Eastern Schuylkill Recreation Commission for passive treatment of the Newkirk Tunnel discharge to Wabash Creek in the Little Schuylkill River portion of the subbasin. A passive treatment system will reduce acid, iron, and aluminum loading in 2.3 miles of Wabash Creek.

Department of Conservation and Natural Resources (DCNR) Rivers Conservation Grants:

- $225,000 (1996) to the Natural Lands Trust and The Conservation Fund to develop a regionally based watershed conservation plan for the Schuylkill River basin that can be used to support and assist watershed associations in developing detailed plans at the watershed level.

Eastern Pennsylvania Coalition for Abandoned Mine Reclamation (EPCAMR) Local Watershed Projects:

- $3,000 (1999) to the Schuylkill Riverkeeper to organize a task force to study AMD impacts on Big Creek and Silver Creek
- $5,000 (1999) to Schuylkill Headwaters Association to implement a streambank erosion and sedimentation project on the West Branch Schuylkill River.
- $2,200 (1999) to Eastern Schuylkill Recreation Commission to install signs at the Newkirk Tunnel AMD treatment site.

PENNVEST Wastewater:

- $350,000 loan (1999) to Cass Township to design a sewage collection system to eliminate use of malfunctioning on-lot sewage systems and provide service to the Highbridge Business Park and the Keystone Opportunity Zone.
- $250,000 loan (1998) to Orwigsburg Municipal Authority to replace existing sewer lines and construct a new interceptor to eliminate discharge of untreated into streams and backups into basements during wet weather.

Other:

- $3,000 to the Schuylkill Headwaters Watershed Association from the Schuylkill County Commissioners through the county's share of Act 101 landfill fees.

Public Outreach

Watershed Notebooks

DEP's website has a watershed notebook for each of its 104 State Water Plan watersheds. Each notebook provides a brief description of the watershed with supporting data and information on agency and citizen group activities. Each notebook is organized to allow networking by watershed groups and others by providing access to send and post information about projects and activities underway in the watershed. This WRAS will be posted in the watershed notebook to allow for public comment and update. The notebooks also link to the Department's Watershed Idea Exchange, an open forum to discuss watershed issues. The website is www.dep.state.pa.us. Choose Subjects/Water Management/Watershed Conservation/Watershed and Nonpoint Source Management/Watershed Notebooks.

Citizen/Conservation groups

- Schuylkill Riverkeeper has assisted local watershed associations in designing monitoring plans and arranged public meetings for the upper Schuylkill River assessment project.
- Schuylkill Headwaters Association is actively participating in an assessment of the discharges and water quality of streams and leading the restoration efforts in the upper main stem and West Branch Schuylkill River and the Little Schuylkill River.
- Little Schuylkill Conservation Club
- Eastern Schuylkill Recreation Commission
- Schuylkill River Greenway Association
- Eastern Pennsylvania Coalition for Abandoned Mine Reclamation (EPCAMR)
- Middle Anthracite Watershed Association

Schuylkill Action Network

The Schuylkill Action Network (SAN) was formed in March 2003 to focus on drinking water and water quality issues of the Schuylkill River watershed. The watershed includes parts of 11 counties in southeastern Pennsylvania and covers approximately 2000 square miles. The Schuylkill River has 52 drinking water intakes, provides water for thermoelectric generation, and offers fishing and recreational opportunities. Members of this collaborative Network include US EPA, Pennsylvania Department of Environmental Protection, City of Philadelphia Water Department, Conservation Districts, local officials, state and federal agencies, watershed organizations, nongovernmental organizations and other essential stakeholders assisting with the crafting of local solutions.

The purpose of SAN is to improve the water resources of the Schuylkill River Watershed by working in partnership with state agencies, local watershed organizations, water suppliers, local governments, and the federal government to transcend regulatory and jurisdictional boundaries in the implementation of protection measures.

SAN includes a Steering Committee, a Planning Workgroup and Technical Workgroups to address the complex issues in the Schuylkill River watershed. SAN will restore and protect the watershed as a regional drinking water source; promote stewardship and education; transfer the experience and lessons learned to other communities; and enhance intergovernmental communication and collaboration.

The Acid Mine Drainage (AMD) Workgroup is working to characterize and minimize flow from the abandoned Pine Knot drainage tunnel, whose discharge is the largest contributor of metals from AMD. Once the sources of inflow are identified, the workgroup will prioritize the sources and implement remedial actions. Members of the AMD workgroup include EPA, PADEP, PWD, Schuylkill Headwaters Association, Schuylkill County Conservation District, Army Corp. of Engineers, US Geological Survey, Exelon, & Reading Anthracite.

Progress: **SAN uses a mix of outcome and activity measures to track progress.**

Next steps include:

>>Develop communication plan to reach stakeholders.

>>Consolidate funding opportunities.

>>SAN Workshop to be held May 2004.

>>SAN partners will participate in National Drinking Water Week May 2004.

SAN Activity Measures	
Outcome	Improve Water Quality - Restore impaired streams to full designated uses to provide safe drinking water and to support aquatic life and recreation.
Ambient	Use biological data to determine attainment of the aquatic life use.
	Reduce ambient levels in affected streams of pH, iron, manganese, aluminum and sediment to meet applicable water quality standards.
	Fecal coliform periodic ambient monitoring levels meet fecal water quality standard in designated streams.
	Monitor bacteria and sediment loadings to show reductions toward ambient criteria.
Loadings	Determine load reduction goals for each stream.
	Reduce SSO and CSO discharges upstream of drinking water intakes.

	Reduce loadings of pH, iron, manganese, aluminum and sediment from priority mine sources.
	Identify key partners and expand workgroup.
	Identify the agricultural sources/practices impacting the watershed.
Actions	Recommend practices to reduce pathogen, sediment, and nutrient loadings from agricultural practices and runoff.
	Educate designers and developers about storm water BMPs.
	Encourage monitoring of cryptosporidium by water suppliers.
	Require dischargers experiencing overflows from separate systems to report to the early warning system (EWS).
	Develop an educational/outreach program for the agriculture community.
	Utilize GIS capabilities to educate the community on environmental issues.

Funding Needs
The total dollars needed for addressing all nonpoint source problems in the watershed is undetermined. Stream assessments have been conducted and TMDLs are under development for impaired waters in the subbasin. Watershed restoration plans developed for impaired waters will help determine what Best Management Practices (BMPs) are necessary to reduce pollution sources and provide estimates of restoration needs.

Funding sources available to support the development of site-specific implementation plans and remediation projects that address the sources of water quality impairment include the EPA Clean Water Act Section 319 grant program and the Pennsylvania funded Growing Greener program which target reductions in nonpoint source pollution. Pennsylvania has generally placed more emphasis on funding projects slated for implementation on water bodies where TMDLs have been completed or where water quality impairments have been documented.

Restoration Needs:
Discharges from abandoned mines and coal refuse piles, and huge areas of unreclaimed land are the major pollution sources in the upper Schuylkill River watershed. Restoration of many of the discharges may be difficult due to high volumes of water flowing from tunnels and boreholes and a limited amount of flat land available for installation of passive treatment systems. Active treatment is an option at all these sites; however, active treatment is expensive to install and has high operation and personnel costs. Restoration of streams that now flow into strip pits or spoil banks to their original surface channels, regrading abandoned strip pits, removing refuse piles, and revegetating the land surface should reduce upstream infiltration and the volume of some discharges. Land reclamation has been proceeding in the headwaters of Mill Run in conjunction of removal of refuse piles for use in a nearby cogeneration power plant.

Treatment of discharges alone may not be enough to restore the stream uses and aquatic habitat in the subbasin. Abandoned highwall removal in conjunction with backfilling surface pits is recommended as an additional reclamation effort. Backfilling open pits will eliminate surface water accumulations that currently exhibit characteristics of AMD and remove hazardous highwalls. Regrading, highwall removal, backfilling of impounded areas, and restoration of abandoned mined areas would reroute surface water and eliminate low areas in which surface water can impound and recharge mine discharges. Replanting of regraded mine areas will help prevent runoff of silt and sediment into receiving streams. Many streams need to be restored to their original channels and diverted out of the deep mines. Stream channel

restoration will restore aquatic habitat, reduce the flow into the mines, and should help lessen the volume of tunnel discharges.

Impairment due to urban and road runoff and storm sewers should be fixed by development of stormwater management plans, installation of stormwater best management practices (BMPs) and restoration of channelized urban streams into natural channels.

Impairment due to residential development is a temporary impairment that should be repaired after the development has been completed. Agricultural BMPs should be installed on arms in the impaired reaches of Beaver Run at Lewistown.

Schuylkill River Main Stem and West Branch:
The Clean Water Act 319-funded assessment report for the upper main stem and West Branch Schuylkill River prepared by L. Robert Kimball & Associates identified eight abandoned mine sites that have the most overall effects on water quality and priorities for future restoration. These discharge sites were identified based on available water quality data, mainly from the USGS and DEP, and information from residents. More intensive water quality and flow monitoring will need to be completed to determine the technical and economic feasibility of treatment for specific sites. The majority of the abandoned mine lands in the subbasin are in private ownership; permission of the landowners would have to be secured before treatment can proceed.

The major AMD/AML sites are as follows: All sites have iron precipitate. One site also has aluminum precipitate.

- Pine Knot/Oak Hill Mine discharge on the West Branch Schuylkill River north of Minersville Borough. This huge volume discharge flows from a complex of 9 separate seep areas, 6 boreholes, and a drainage tunnel. The pH is around 6.1; the iron concentration is less than 10 mg/l and the aluminum ranges from 1 to 10 mg/l. Aluminum precipitate covers the substrate of the channel formed by the discharge as it flows under SR4002. Average flow is 10,500 gpm; however, flows as high as 30,000 gpm have been measured. The main tunnel discharge would be difficult to treat passively due to the high flows and the small area available for treatment; active treatment may prove to be the only treatment option. Smaller discharges downstream of the road could be treated by wetlands to remove iron. This site could benefit from upstream stream and land restoration to reduce water flow into the mine. This complex provides the majority of flow to the West Branch. The cold water discharge and the near-neutral pH provide excellent conditions for a naturally reproducing brook trout population in the downstream portion of the West Branch despite the heavy iron precipitate covering the stream bottom. Treatment of the discharges should result in reduction of precipitated iron but may also cause a warming of stream water with a potential to affect the trout.
- Otto Mine discharge west of Minersville Borough is the major contributor of AMD and flow to the Muddy Branch, a tributary of the West Branch Schuylkill River. The discharge flows from an airshaft in a hollow adjacent to a surface mine that was reclaimed as a landfill. Based on 9 samples collected from 1991 to 2000, the pH was around 5.9, the iron concentration ranged from 18 to 20 mg/l, and flows ranged from 628 to 2320 gpm, and an average of 1,300 gpm. This discharge is relatively alkaline, with iron precipitate. Despite the major flow coming from mine drainage and iron precipitate, Mill Creek supports a native brook trout population. Design and construction of a passive treatment of this discharge was funded with a 319 program grant for FY2003. The treatment system will consist of an oxidation pond, two wetland cells to remove iron precipitate, and an oxic limestone drain to remove manganese and trace metals, add alkalinity, and maintain the cold water temperatures needed for trout in Muddy Branch.
- Repplier Mine Tunnel (Dark Hollow) discharge on Mill Creek, along PA Route 61 northwest of St. Clair Borough, is the largest discharge to Mill Creek. This discharge is believed to have been an entryway for a railroad into the mine. The pH averages around 6.0, but varies considerably and is net

acidic. More flow and chemical data is needed to determine potential treatment possibilities. Existing data suggests that a SAPS treatment system may be possible; however, little room exists between the discharge and the highway. More area is available across the road, but this is adjacent to a water supply treatment plant.

- Pine Forrest Mine is a pump shaft discharge to Mill Creek near St. Clair Borough. Data indicated pH ranging from 3.25 to 5.5, with flow ranging from 942 to 6,283 gpm. The discharge is likely the flow from Little Wolf Creek, which flows into refuse piles and open surface mine pits and into a borehole. The highest flows were noted in 1975; more recently measured flow rates were considerably lower. DEP samples, which may incorporate flow from the nearby culm banks, had higher pH than samples collected by USGS. The culm banks should be removed to eliminate degraded surface runoff. A large open area upstream of the road may be available for a series of treatment wetlands. Treatment proposed is a series of three parallel anoxic limestone drains, an aerobic pond and three wetlands cells.
- Silver Creek Mine discharge is a seepage/tunnel discharge that forms a turquoise ponded upwelling flowing into Silver Creek west of Middleport. The discharge pH was around 5.7 and net acidic; iron concentrations were high and the flowing discharge had iron precipitate. Flow data varied considerably but appears have a lower volume than other discharges. Open land is available on both sides of the upwelling for treatment wetlands.
- Brockton Mine discharge is a surface mine pool overflow into upper Silver Creek north of New Philadelphia. The pool was dry during some sampling events; at other times the flow was close to 1000 gpm. Recent pH measurements indicated a pH of 5.0; little iron or other metals data are available. Land reclamation at this site could help reduce recharge to other interconnected downstream mine discharges.
- Mary D Mine discharge is a seepage and air shaft discharge on the upper Schuylkill River near Brockton. This discharge appears as two small streams crossing U.S. Route 209 within ½ mile of each other. Flow is relatively low compared to the others on this list, ranging from 45 to 314 gpm. Both streams have iron precipitate; the pH of one is around 6.0 and the other is 7.0. Iron concentrations are around 3.4 for both. There is an existing swamp in the area that may be able to be modified as part of a wetlands treatment system. Streams near the watershed divide enter strip mine openings and may recharge this discharge site. A bubbler artesian discharge is located ½ mile up the road off U.S. 209, outside of the Mary D village. A smaller discharge is located down the hill, closer to U.S. 209.
- Tuscarora Mine discharge is a sinkhole/subsidence depression discharging to the upper Schuylkill River near Brockton. Upstream land reclamation may help reduce discharge flow volume. A constructed wetland may be appropriate if sufficient room is available. The sinkhole is usually dry during the summer but fills up to about 6 feet high during the winter.
- Blythe Silt Dam is the remains of an old coal silt dam that washed out during Tropical Storm Agnes in 1972. Coal refuse piles surround the silt dam. The site is unstable and washes out silt during heavy rains. Little vegetation grows on the silt piles; some volunteer gray birches are growing on the refuse piles. The silt and refuse pile may be able to removed for use at a electric cogeneration plant; however, previous testing indicated the silt and refuse was not of good quality to be used without blending. If the refuse cannot be removed off site, it would have to be stabilized, covered and seeded. An unnamed tributary that originates one mile upstream of the silt dam and flows downslope of the silt dam may need to be stabilized. The tributary has a pH of 7.0 and iron precipitate.
- Bell Colliery on the upper main stem Schuylkill River is a low pH discharge (4.0) with elevated iron. This stream sized discharge may be exiting from an old vertical mine shaft in a ravine. Treatment of this discharge was funded with a 319 program grant for FY2002. The treatment system was constructed in summer 2003.

Little Schuylkill River:

L. Robert Kimball & Associates conducted the 319-funded assessment of the Little Schuylkill River in a similar manner as the upper main stem assessment. The little Schuylkill River is in better shape overall than the portion of the upper main stem within the coal region. The lower watershed has a number of clean tributaries entering which help make the Little Schuylkill River into a excellent recreational trout fishery in the lower reaches. A PA Fish and Boat Commission special regulations fishing area is located at New Ringgold.

A field tour of the major problem areas was held in 2001. As in the main stem watershed, the Little Schuylkill River also suffers from the effects of abandoned mine drainage; however, fewer discharges are located here. The majority of the discharges and abandoned mine lands are located east and west of Tamaqua in the Panther Creek and Wabash Creek valleys. During the summer of 2001, very little flow was apparent in Panther Creek upstream of Slum Run. Below this point, a sewage treatment plant discharges into the stream and may comprise a majority of the creek flow. Some of the discharges noted on the old Scarlift Project report such as Coaldale #8 were not flowing during the summer of 2001 either.

The DEP Bureau of Abandoned Mine Reclamation (BAMR) has reclaimed several abandoned surface mine pits in the watershed. They are planning to reclaim another site in the Panther Creek valley. Reclamation of these sites helps to reduce inflow into the deep mines and reduce the discharge volume exiting the mines.

A large coal refuse pile is being removed for use at an electric cogeneration plant near the headwaters of the Little Schuylkill River. The plant operators of are disposing the fly ash from the plant into a huge 90-foot deep pit known as the Big Gorilla as a demonstration project. A professor at Penn State University regularly tests the chemical components of the fly ash to ensure that the ash is safe for disposal.

The major discharges and AMD/AML sites in the Little Schuylkill River watershed in priority order are as follows:

1. Silverbrook discharge is located near the headwaters of the Little Schuylkill River and the East Branch tributary below an electric cogeneration plant. The flow averages around 600 gpm with iron of 20 mg/l; however, flows as high as 4,000 gpm have been recorded. BAMR has installed two diversion wells to raise the pH of the discharge. The wells raise the pH of the stream one unit, from 4 to 5 pH. An additional passive treatment system will need to be installed to fully restore the upper section of the river. Additional needs are reducing infiltration into the mine and diversion of flow out of the mine through reclamation of abandoned surface mine pits. Full treatment of this discharge has the potential to restore several miles of the upper Little Schuylkill River.
2. Reevesdale #2 discharge outside the little mining town of Reevesdale near the headwaters of Wabash Creek along old U.S. 209. This discharge averages around 900 gpm, with an iron concentration around 2 mg/l. The discharge is net acidic but the pH is circumneutral. The discharge exits from a collapsed tunnel. BAMR reclaimed a large portion of the disturbed land upslope of the discharge about 10 years ago. Land may be available adjacent to the discharge, if landowner permission can be received.
3. Newkirk Tunnel north dip into Wabash Creek, west of the Little Schuylkill River. The Eastern Schuylkill Recreation Commission received a 319 grant in 1999 for construction of a passive treatment system at this discharge. Construction will take place in summer 2002. The DEP BAMR Wilkes Barre office staff designed the system. The discharge averages 800 gpm. The Tamaqua High School plans to conduct long-term monitoring of the treatment system. The area near the mine tunnel is maintained by as an historical site by local residents. Construction of a passive treatment system on this discharge was completed in summer 2002.
4. Reevesdale #1 discharge is located across the highway from #2. The pH averages close to 5 and the iron is around 12.5 mg/l. Sufficient space is available near the discharge to be used for passive treatment. In addition, existing ponds may possibly be used as part of the treatment system.

5. Foster's Tunnel located near Coaldale flows under 100 gpm into a wetland. The wetland is removing much of the iron. This is a potential site for a passive treatment system to add alkaline material to improve the pH of the discharge.
6. Newkirk South dip. The 2 discharge sources start about 1 mile up on the mountain. A wetland and pond that have formed at this site remove much of the iron from the discharge.

The U.S. Route 309 discharge in Tamaqua, is not listed above. The discharge is within the mining permit area of a coal operator. Since the company stopped mining and pumping out the deep mine, the discharge has been breaking out just above the highway. The discharge is pumped up the hill for treatment with lime addition; however, treatment chemicals are inconsistently applied. This discharge drains a portion of the large deep mine pool below the Panther Creek valley. The upper end of the pool exits from the Lausanne Tunnel and discharges into the lower end of the Nesquehoning Creek and then into the Lehigh River.

Other pollution problems that need to be addressed:
- Lofty Creek, sedimentation- Lofty Creek northeast of Delano. Streambank erosion and diversion of stormwater runoff is affecting Lofty Run.
- Locust Creek streambank erosion at Locust Lake State Park. This stream needs riparian restoration and revegetation.

Pennsylvania CREP Program
Pennsylvania's Conservation Reserve Enhancement Program (PA CREP) was initiated on June 1, 2000. The Pennsylvania CREP has resulted in overwhelming interest and support by the agricultural community. Through September 30, 2002, the FSA received 5,077 CREP applications (CRP-2's) from approximately 2,500 landowners who offered to enroll 100,400 acres in conservation cover plantings. The Pennsylvania Game Commission (PGC) funded wildlife habitat biologists and Natural Resources Conservation Service (NRCS) staff have completed conservation plans for 3,084 CRP-2's on about 60,400 acres, with 54,000 acres enrolled in the program. If current levels of participation by farmers and other rural landowners continue, an estimated 100,000 acres will be completed or under contract by September 2003. Since Pennsylvania's CREP effort began, Pennsylvania has provided direct cost-share payments totaling $3,740,304.88 to more than 1,000 landowners. Pennsylvania's Growing Greener funds are used to match federal cost-share payments for eligible conservation practices. The Pennsylvania Association of Conservation Districts, Inc. (PACD) administers the funds through a grant agreement.

PA CREP Partnerships: The intergovernmental and public/private cooperation required to develop and implement the PA CREP proposal is a success story demonstrating that government agencies and private concerns can work together to achieve a worthy goal. Actions taken under PA CREP will have significant environmental benefits. The administrative cooperation, as demonstrated by Pennsylvania's Growing Greener Program, the Pennsylvania Association of Conservation Districts, Inc. and the Farm Service Agency has been remarkable. The CREP partnership involves USDA; the Pennsylvania Association of Conservation Districts, Inc.; the Pennsylvania Game Commission; the Pennsylvania Farm Bureau; the state departments of Agriculture, Conservation and Natural Resources, and Environmental Protection; Ducks Unlimited, the Chesapeake Bay Foundation and others. The PA CREP targets enrolling 100,000 acres of farmland, which is estimated to reduce nitrogen and phosphorus runoff by more than 1.6 million pounds per year.

A CREP Success Story at Miller & Rex Dairy Inc. in Upper Schuylkill River Watershed
Dennis Rex and his brother-in-law Albert Miller operate Miller & Rex Dairy, Inc. on 200 acres in the Mahonney Creek valley of eastern Schuylkill County. Dennis is the sixth generation to draw a living from the land, which has been in the family since the early 1800s. The farm keeps a 40-head milking string of registered Holsteins, raises the bull calves for beef, and raises a mix of alfalfa and timothy hay to

sell. About 4.6 acres of the farm's land was enrolled in a 15-year CREP contract. The CREP project land was originally a pasture with a stream going through it. Through CREP, the cattle were fenced out of the creek, a cattle crossing and watering system was installed for the dairy cows, and trees and shrubs were planted. The fencing and stream crossing were installed in 2001; the trees and shrubs were planted in May 2002.

The CP22 designation of riparian buffer was what the pasture needed. Some of the pasture was very wet and threatened the hoof and udder health of the milking cows. In the very wet areas, the operation went for the maximum 180-foot setback. Dry, solid ground sections were enrolled at the minimum 50-foot setback from the stream. The farm follows a conservation plan and operates with contour strips. The hay is rotated with corn as necessary. Some alfalfa stands last three years, while others can go five years before needing to be turned under and planted to corn, depending on weather. Corn is planted only to meet the dairy herd needs. Their largest cash crop is hay.

The best management practices installed improved soil conservation and water quality. The farm and pasture looked different within a one-year after fencing the stream from the cattle and one summer after planting trees and shrubs. Mahonney Creek had bare banks and was wide as it coursed through the pasture. Now, the stream looks much smaller and native and colonizing grasses filled in the bare spots and closed in on the stream itself, helping the water to maintain its course of flow.

The 450 trees planted were species suited to wet soils, and included several types of gum, an oak species, and black willow. The 220 shrubs were varieties selected for erosion control and wildlife benefit. Mr. Rex is thrilled with the results of the CREP program. He expected the restoration process to take much longer to show results. He was amazed at how the stream's banks filled in with grass and little bare ground is visible. Others in the area also enrolled some acres into the CREP. Farms that did not have a stream or wetlands planted warm season and native grasses to reduce erosion and help conserve soil.

References/Sources of information

- State Water Plan, Subbasin 3, Lower Delaware River. Department of Environmental Protection, July 1983
- USGS Topographic Maps
- 319 project proposals and summaries
- DEP: Watershed Notebooks, Unified Assessment Document, and information from databases.
- Map of Draft Level III and IV Ecoregions of Pennsylvania and the Blue Ridge Mountains, Ridge and Valley, and Central Appalachians of EPA Regions III
- Water Quality of Large Discharges from Mines in the Anthracite Region of Eastern Pennsylvania. Charles Wood, USGS Water Resources Investigations Report 95-4243, 1996.
- Upper Schuylkill River Tributaries Assessment Report, L. Robert Kimball & associates for Schuylkill County Conservation District, Draft Report, June 2000.
- Draft Total Maximum Daily Load for Panther Creek Watershed. DEP 2000.

Streams in Subbasin 03A: 303d/305b listings

Stream	**Code Number**	**Drainage area square miles**	**Miles Attained**	**Miles Impaired**	**Causes/Sources/ *Comments***
2-**Schuylkill River**	00833	335	6.82 mi. main stem; 11.01 mi. of 10 UNTs	27.7 mi. main stem; [15.53 mi. main stem]	Metals & siltation from AMD; Habitat alterations from channelization; Water/flow variability from URB & road runoff; On-site wastewater [Fish consumption advisory, PCB]
3-Big Creek & 5 UNTs	02374	3.66	7.54 mi.		
3-Silver Creek	02367	3.55	2.74 mi.	1.92 mi.	Siltation* from AMD
3-**Mill Creek**	02353	25.4		11.16 mi. main stem; 4.56 mi. of 5 UNTs	Siltation* from AMD; Habitat alterations from channelization & bank modifications; Water/ flow variability from URB
4-Mud Run	02359	2.94		3.02 mi. main stem; 1.22 mi. of one UNT	Siltation & metals from AMD; Habitat alterations from channelization & upstream impoundment; Water/flow alterations from URB *HQ-CWF, upper basin*
5-Stony Creek at Frackville	02261	0.49		1.04 mi.	Flow alterations & Water/flow variability from URB & road runoff
4-Tar Run	02358	1.17		2.19 mi.	Siltation* from AMD; Habitat alterations from channelization & bank modifications; Water/ flow variability from URB & road runoff *HQ-CWF, upper basin*
4-Wolf Creek & 2 UNTs	02355	4.16		6.37 mi.	Cause unknown/natural causes *HQ-CWF, upper basin*
3-Tumbling Run	02351	6.11	6.63 mi.		*HQ-CWF, upper basin, Class A brook trout, upper 5.2 miles*
3-**West Branch Schuylkill River**	02329	54.2	3.97 mi. of 4 UNTs	12.9 mi. main stem	Siltation & metals from AMD; Habitat alterations from channelization & bank modifications; Water/ flow variability from URB & road runoff *Native brook trout from RR bridge downstream to the mouth, also brown trout near mouth*
4-Dyer Run	02350	4.98	3.88 mi.		
4-Wagner Run	02349	1.18	2.13 mi.		
4-Wheeler Creek & one UNT	02347	1.50	1.63 mi.		
4-West West Branch Schuylkill River	02334	18.7		3.27 mi.	Siltation* from AMD, other, & surface mining; Water/flow variability from URB *Native brook trout, from downstream of Shaeffer Run to mouth*
5-West Creek	02339	10.6	1.42 mi. of 2 UNTs	6.64 mi. main stem; 1.19 mi. of one UNT	Siltation* from AMD, surface mining, & other; Water/flow variability from URB

6-Crystal Run	02343	4.95		0.03 mi. main stem	Siltation* from surface mining
5-Muddy Branch	02336	4.32		3.3 mi. main stem; 2.32 mi. of 2 UNTs	Siltation & metals from AMD & surface mining; Flow alterations from small residential development *Native brook trout, down of T-564 to near Colliery Track*
5-Schaefer Creek	02335	1.62	1.79 mi.		
4-Indian Run near Pottsville	02333	2.47	2.58 mi.		
4-Panther Creek at Cressona	02331	2.32	3.6 mi.		
4-Beaver Creek at Cressona & 2 UNTs	02330	2.05	5.32 mi.		*Class A brook trout, upper 1.5 miles*
3-Mahannon Creek	02318	11.2	2.25 mi. main stem; 3.13 mi. of 3 UNTs	3.29 mi. main stem; 0.43 mi. one UNT [0.32 main stem]	Siltation & metals from AMD; Habitat alterations from channelization & upstream impoundment; Water/flow variability from URB & road runoff [Fish consumption advisory, PCBs]
4-Mahonney Creek & 3 UNTs	02319	4.30	5.79 mi.		
3-Red Creek	02317	5.28	5.55 mi.		
3-Plum Creek	02316	5.16	5 mi.		
3-Pine Creek at Auburn & 11 UNTs	02303	17.2	27.43 mi.		
3-Bear Creek & 6 UNTs	02295	17.0	18.89 mi.		*Class A brook trout, upper 3.4 miles*
4-"Werts Hollow"	02301	1.19	1.23 mi.		
3-Stony Creek at Stony Creek & one UNT	02291	3.73	4.76 mi.		
3-**Little Schuylkill River**	02202	137	17.59 mi. upper & lower main stem; 40.53 mi. of 32 UNTs	13.85 mi. middle main stem; 3.32 mi. of 4 UNTs	Siltation* from AMD; Habitat alterations from channelization & upstream impoundment; Water/flow alterations from URB
4-Lofty Creek & 2 UNTs	02288	3.24	6.19 mi.		
4-Still Creek & 3 UNTs	02283	7.49	8.49 mi.		*HQ-CWF, upper basin*
4-Neifert Creek & 4 UNTs	02277	3.23	4.98 mi.		
4-Pine Creek near Barnesville	02269	7.96			
5-Hosensock Creek & one UNT	02273	2.98	3.62 mi.		
4-Locust Creek & 11 UNTs	02254	13.3	17.53 mi.		

5-Codorus Creek & one UNT	02261	2.77	3.74 mi.		
4-Panther Creek at Tamaqua	02252	10.7		6.47 mi. main stem	Siltation* from surface mining; Flow alterations from small residential development; Unknown toxicity from IND
5-Slum Creek	02252	0.99		1.74 mi	Other inorganics & Unknown from IND
4-Wabash Creek	02251	4.15		2.03 mi.	Siltation & metals, Flow alterations & Water/flow variability from URB & AMD
4-Owl Creek	02250	3.39	3.16 mi.		*HQ-CWF, upper basin; Class A brook trout, entire length, except for reservoir*
4-Stump Run	02236	1.24	1.25 mi. main stem; 0.52 mi of one UNT	0.94 mi. main stem	Habitat alterations from Channelization & dredging
4-Brushy Run & one UNT	02234	1.84	2.89		
4-Cold Run	02225	10.4	4.63 mi. main stem; 2.34 mi. of 2 UNTs	0.21 mi. main stem	Siltation & metals from AMD, Habitat alterations from channelization & upstream impoundment, Water/flow variability from URB *Class A brook trout, upper 2.7 miles*
5-Beaver Creek at Lewistown	02227	5.62	3.3 mi. main stem	2.17 mi. of 2 UNTs	Siltation from AG
4-Koenigs Creek	02217	3.98		5.49 mi. main stem; 0.86 mi. one UNT	Flow alterations from Road runoff & small residential development
4-Indian Run at Rauschs & 2 UNTs	02212	8.37	9.86 mi.		
4-Rattling Run	02203	4.21	3.7 mi.		*Class A brook trout, upper 3.9 miles*

* Siltation from AMD and Surface Mining is believed to be mainly iron precipitate.

Streams are listed in order from upstream to downstream. A stream with the number 2 is a tributary to a number 1 stream, 3's are tributaries to 2's, etc. Delaware River=1.

UNTs= unnamed tributaries; AG= agriculture; AMD= abandoned mine drainage; URB=urban runoff/ storm sewers; IND= Industrial point sources; mi.= miles

Chapter 93 information: EV= Exceptional Value; HQ= High Quality; WWF= warm water fishes; CWF= coldwater fishes; TSF= trout stocked fishes