

Updated 12/2003

**Watershed Restoration Action Strategy (WRAS)
State Water Plan Subbasin 03D
French Creek and Manatawny Creek Watersheds
(Schuylkill River)
Chester, Berks and Montgomery Counties**

Introduction

The 330-square mile subbasin 03D consists of French Creek, Mantawny Creek, and the Schuylkill River and its tributaries from Sixpenny Creek near Birdsboro to above the confluence of the Perkiomen Creek. Manatawny Creek drains a 91.2-square mile area north of the Schuylkill River and French Creek drains a 70.2-square mile area south of the river. A total of 272 streams flow for 505 miles through the subbasin. The subbasin is included in **HUC Area 2040203**, Schuylkill River, a Category I, FY99/2000 Priority watershed in the Unified Watershed Assessment.

Geology/Soils

The geology of the subbasin is complex. The majority of the subbasin lies within the Northern Piedmont Ecoregion. Smaller portions are in the Ridge and Valley and the Northeastern Highlands Ecoregions.

The southern edge of French Creek and Pickering Creek watersheds is in the Piedmont Uplands section (64c), an area of ancient metamorphic and igneous rocks, mainly gneiss and schist. The terrain consists of a series of hills. Soils derived from this section are deep and fertile and have a moderate rate of water infiltration; slopes range from 15 to 20 percent.

The middle portion of the subbasin, including the Pigeon Creek watershed, the western edge of Manatawny Creek watershed, and Monocacy Creek are within the Triassic Lowlands section (64a), which consists of broad valleys with low rounded hills. Rocks are red and brown sandstone, shale, and siltstone. The soils are comprised of sandy red and gray shaley soils with slow infiltration rates. Streams in this section exhibit the highest variability in stream flow. This area of the subbasin is interrupted by numerous outcroppings of diabase of the Diabase and Conglomerate Uplands section (64b). Boulder fields dominate much of this land, which makes it unsuitable for building or farming. The PA Game Commission owns much of this forested, boulder-strewn area. Upper French Creek passes through a high gradient diabase boulder-based area in the village of Saint Peters.

Part of the upper Manatawny Creek watershed is located within the Ridge and Valley Ecoregion. Most of this is Beekmantown Group limestone in the Northern Limestone/Dolomite Valleys section (67a). The limestone soils of 67a are the most productive soils in the subbasin for agricultural use. The soils have relatively high infiltration rates where there are sinkholes and secondary faults. The limestone valley maintains good stream base flow during droughts.

A small portion of Upper Manatawny Creek watershed is in the Northern Shale Valleys section (67b) of the Ridge and Valley Ecoregion, which is comprised of shale interbedded with limestone and dolomite of the Martinsburg Formation. This is an area of rolling hills and many small streams. Soils formed from the Martinsburg Formation have a slow rate of infiltration and relatively high runoff potential. Streams are generally flashy in nature, with low, low flows and high, high flows. Groundwater in this region is high in minerals (hardness) and may contain elevated concentrations of iron.

The eastern part of main stem Manatawny Creek and its tributary Trout Run contain igneous and metamorphic gneiss, diabase and grandorite of the Reading Prong section (58h), part of the Northeastern Highlands Ecoregion. This portion of the subbasin consists of loosely connected hills and short ridges; slopes are moderately steep. Forest cover predominates because the terrain is generally too steep and

rocky for crop production. Soils are sandy or silty clays that are slightly acidic, moderately fertile and well drained.

Land Use

The subbasin has a combination of urban, rural, forested, and agricultural land uses. Urban areas include the City of Pottstown and the Boroughs of Spring City and Phoenixville. The population of the subbasin was 144,200 in 1990 and is projected to increase to 168,500 by the year 2040. The Chester County Comprehensive Plan and the Draft regional Land Use Plan of the Northern Federation, titled “Landscapes”, serves as the guideline for regional land development.

The subbasin includes several of the more densely populated boroughs and townships along the Schuylkill River that were formerly centers of industrial activity during the Industrial Revolution. Many of the former industries are no longer operating, and these former areas represent a significant source of “brownfields” land. There are still several thriving industries in the subbasin. The majority of the subbasin can be described as growing suburbs in the portions adjacent to the existing boroughs, with the remaining areas still rural and supporting some active farming. Some of these farms, however, are struggling and pressures to sell land for development are increasing.

The subbasin has experienced population and job growth and land development since the 1980s, particularly since the opening of the Pottstown Expressway, U.S. 422, which bisects the watershed on its way from King of Prussia to the City of Reading. Areas along Route 422 are experiencing the greatest pressure from sprawl, demands for expanded municipal services, increased traffic congestion and loss of open space. The regional transportation authorities’ planned Schuylkill Valley Metro rail line from Philadelphia to Reading can be a catalyst for redevelopment in the older communities. These communities already have the other needed infrastructure in place and much underutilized and abandoned property.

The 70-square mile French Creek watershed originates in French Creek State Park and flows 22 miles to its confluence with the Schuylkill River. Land in the basin is mainly rural, consisting of crop farmland, horse farms, large estates, scattered villages, and smaller residential tracts. The most urbanized portion is in the lower end of the watershed, especially around Phoenixville Borough. Public lands total 11,000 acres. The largest forested tracts are publicly owned by the Pennsylvania Game Commission, DCNR Bureau of State Parks, and Chester County. The upper two-thirds of the Pickering Creek watershed is rural; the lower third southeast of the Borough of Phoenixville is more developed.

The 90.7-square mile Manatawny Creek watershed originates in hilly, forested terrain, which soon becomes open agricultural land used for crops and grazing. Many of the tributaries are forested at least in their upper reaches. The major land use categories are forest and open water 56%, agriculture 41%, and urban development 3%. Trout Run, a tributary of Manatawny Creek, has a water supply reservoir for the Borough of Boyertown. The lower portion of the watershed is more urbanized, especially around the city of Pottstown, the major urban center in the watershed. The heavily used US Route 422, which has experienced increased recent commercial development, passes through the watershed.

Much of the Berks County portion of the subbasin, especially the Oley Valley, has soils that were derived from carbonate rock and are of excellent quality for agriculture. Farming in Berks County is mainly for cash crops; in Montgomery and Chester County, the farmland is used for dairy farms and cash crops, predominately corn, alfalfa, and hay.

Natural/Recreational Resources

DEP Chapter 93 Exceptional Value (EV) and High-Quality (HQ) Stream Listings:

- EV streams:
 - Pine Creek
 - Bieber Creek
 - Trout Run
 - French Creek, from headwaters downstream to Beaver Run
 - Birch Run
- HQ streams:
 - Sixpenny Creek, source downstream to and including unnamed tributary at RM 1.28
 - Unnamed tributaries to Schuylkill River, from Berks-Chester-Montgomery County lines to Valley Creek, except those in Spring City and Phoenixville
 - Pigeon Creek
 - Stony Run
 - French Creek, basin Beaver Run to junction of East Vincent and East Pikeland Townships, except for Birch Run, which is EV
 - Beaver Run
 - Pickering Creek source to Philadelphia Suburban Water Company Dam

Streams in subbasin with naturally reproducing trout populations:

- Manatawny Creek tributaries: Furnace Creek, Furnace Run, Trout Run, Oysterville Creek, West Branch Pine Creek, and Ironstone Creek.
- French Creek tributaries: Pine Creek
- Headwaters of Pickering Creek
- Unnamed tributary to the Schuylkill River

PA Fish & Boat Commission Class A Wild Trout Waters (highest biomass classification): (All sections are in Berks County.)

- Bieber Creek, brown trout, from SR2026 down 2.2 miles to dam at SR1021 & T-593
- Pine Creek, tributary to Manatawny Creek, brown trout (6.0 miles)
- Sixpenny Creek, brook trout (3.7 miles,)
- Unnamed tributary to Sixpenny Creek near Monocacy, brook trout (1.7 miles)

Resources in French Creek basin:

- French Creek State Park, over 7,000 acres, includes Hopewell Lake and the smaller Scotts Run Lake.
- Hopewell Furnace National Historical Site, 848 acres.
- State Game Lands #43, 2,788 acres
- Warwick Park (Chester County owned), 455 acres.
- French Creek and its six major tributaries (a total of 42.75 stream miles) are designated a “Scenic River” in the PA Scenic Rivers System.
- The 90-acre Pine Swamp Natural Area, in French Creek State Park, is an acidic, broad-leafed swamp containing several rare plant species.
- Trythall Woods (16 acres) also contains threatened or endangered species.

Water Supplies:

- Pickering Creek Reservoir, owned by Philadelphia Suburban Water Company, is on Pickering Creek near the confluence with the Schuylkill River, just upstream of PA Route 23.

Water Quality Impairment

Subbasin 03D has little documented impairment but has potential threats to water quality from increasing residential and commercial development and agricultural practices. Ironstone Creek shows signs of streambank erosion. Several other tributaries to Manatawny Creek are stressed due to on-lot septic system discharges, riparian habitat loss, and sediment and nutrient loading. Development pressures are high in the Manatawny Creek watershed, especially around the US 422 corridor.

Monitoring/Evaluation

Manatawny Creek and Pickering Creek watersheds were evaluated under the Department's Unassessed Waters Program in 1999. The French Creek portion of the subbasin was assessed in 1998. Monocacy Creek watershed was assessed in 2000.

The percent impairment for subbasin 03D is the lowest of the southeastern PA region, only 11 percent. Out of 486.8 miles assessed so far, only 51.2 miles were determined to be impaired. The entire French Creek watershed attains water quality standards and could serve as a water quality and aquatic life reference watershed for the Pennsylvania portion of Northern Piedmont Ecoregion. Portions of only 3 named streams are impaired: Limekiln Creek by surface mining, Manatawny Creek by habitat modification and urban runoff, and Pine Creek at Chester Springs by urban runoff.

Probable Sources of Impairment in Subbasin 03D		
Source	Miles Impaired	Percentage of Impairment
Pesticides, Priority Organics (Main stem Schuylkill - PCBs, Chlordane)	29.95	58.8%
Urban Runoff/Storm Sewers	4.08	7.8%
Residential Runoff	2.85	5.6%
Agriculture	8.12	15.9%
Surface Mining (Quarrying)	6.0	11.7%

DEP biologists use a modification of U.S. Environmental Protection Agency's (U.S. EPA) Rapid Bioassessment Protocol II (RBP-II) as the primary mechanism to assess Pennsylvania's unassessed waters. This method requires selecting stream sites that would reflect impacts from surrounding land uses that are representative of the stream segment being assessed. The biologist selects as many sites as necessary to establish an accurate assessment for a stream segment. The length of the stream segment assessed can vary between sites. Several factors are used to determine site location and how long a segment can be, including distinct changes in stream characteristics, surface geology, riparian land use, and the pollutant causing impairment. A biological assessment is conducted at each site, using the modified RBP II method. Biological surveys include kick screen sampling of benthic macroinvertebrates, which are identified to family in the field, and habitat evaluations. Benthic macroinvertebrates are the organisms, mainly aquatic insects, that live on the stream bottom. Since they are short-lived (most have a one-year life cycle) and relatively immobile, they reflect the chemical and physical characteristics of a stream and chronic pollution sources or stresses.

The main stem Manatawny Creek was determined to be unimpaired after the 1999 assessment. Previously, 20.66 miles of Manatawny Creek had been on the Department's 1998 303d List of Impaired Waters as impaired by nutrients, organic enrichment/low dissolved oxygen (DO) from agricultural sources. The 303d listing had been based on a 1980's nutrient survey that stated a potential for diurnal DO violations. Manatawny Creek was removed from the 303d list in 2000 after the 1999 assessment

showed no impairment. Five unnamed tributaries to Manatawny Creek were determined to be impaired; one due to habitat modification and flow alterations and the others from crop related agricultural activities. Due to the high percentage of agricultural land use in the watershed, the increasing development along major highways, and several impaired tributaries, Manatawny Creek is vulnerable to nonpoint source pollution and should be protected.

The entire watershed of Pickering Creek except for its tributary Pine Creek was unimpaired. Water flow variability from urban runoff from the extensive commercial development around the Pennsylvania Turnpike exit #23 and along PA Routes 113, 100, and 401 have resulted in impairment of the upper portion of Pine Creek. Sixpenny Creek and its 4 unnamed tributaries were determined to be unimpaired.

The Monocacy Creek watershed is unimpaired except for about 2.5 miles of the Limekiln Creek watershed which is impaired by siltation and flow alterations from surface mining.

The main stem Schuylkill River is on the 303d list for fish consumption advisories from pesticides and priority organics. Almost 30 miles of 21 unnamed tributaries (UNTs) to the Schuylkill River are unimpaired. One UNT was impaired by nutrients and pathogens from agricultural runoff and 5.43 miles of another UNT were impaired by water and flow variability from small residential development.

Scientists from the Patrick Center for Environmental Research at the Academy of Natural Science in Philadelphia are evaluating the effects of removal of an orphan dam on Manatawny Creek near the city of Pottstown. Research areas will include geomorphology, stream chemistry, sediment chemistry, food webs, bacteria, algae, freshwater mussels, macroinvertebrates, fish, and riparian vegetation.

Point Source Discharges:

There are 44 NPDES point source discharges in the subbasin: 23 treated industrial waste discharges; 21 treated sewage discharges. Six permitted discharges of treated sewage to groundwater are also in the subbasin.

Groundwater:

The improper handling and disposal of waste solvents at metal fabricating shops and dry cleaning operations has resulted in the contamination of groundwater. Four groundwater contaminant plumes where the principal groundwater contaminant is trichloroethene (TCE) and tetrachloroethylene (PCE) are found in the subbasin. The Hazardous Sites Cleanup Program has identified all four sites for further investigation. Carbon filtration units and bottled water have been provided to approximately 45 residences in total for the four sites. One municipal water line project was completed in 1998 for the Seven Stars Road Site in East Pikeland Township. Construction of a water line for 10 residences within the Forge PCE site in Schuylkill Township is scheduled to be completed in Fall 2001. The groundwater and soil investigation for the Forge PCE site has been completed. The Camp Council Road Site in East Pikeland Township consists of a groundwater contaminant plume of dissolved tetrachloroethene that has affected the well water supplies of 15 residences. Dissolved tetrachloroethene concentrations range from 5 parts per billion to 50 parts per billion. Groundwater monitoring wells are to be installed to determine the origin of the groundwater contamination. The Dawson Road PCE site involves two residences.

Future threats to water quality

With the high projected population growth, water impairments associated with increased urbanization and pavement are expected to increase. These would include: erosion and sedimentation from construction, runoff from many small urban and suburban areas and commercial development, and point source discharges from municipal sewage treatment plants

Restoration Initiatives

Pennsylvania Growing Greener:

- \$68,325 (FY2003) to Green Valleys Association for design and implementation of agricultural best management practices on two farms in the French Creek Watershed.
- \$75,000 (FY2001) to Montgomery County Parks Department for restoration of river banks at their Upper Schuylkill River Park.
- \$242,00 (FY2001) to Phoenixville Borough phase 2 of the French Creek Corridor Restoration Project that will include streambank stabilization.
- \$30,000 (FY2001) to the Green Valley Association of Southeastern Pennsylvania for phase 2 of the French Creek Scenic Restoration Project.
- \$220,000 (FY2000) to Phoenixville Borough for streambank restoration and stabilization of French Creek.
- \$3,500 (FY2000) to Camphill Village Kimberton Hills for streambank fencing and riparian restoration.
- \$22,000 (FY2000) to the Berks County Conservancy streambank fencing and cattle crossings on Stoltzfus farm coupled with riparian buffer planting on 2700 ft of Limekiln Creek in Exeter Township.
- \$52,000 (FY2000) to the Schuylkill Canal Association for reconstruction of a weir, sidewalls, timber and towpath to maintain the integrity and continue operation and function of the 2.6-mile Schuylkill River Canal System in Upper Providence Township, a registered historic place.
- \$20,000 (FY1999) to the Pine Creek Valley Watershed Association to develop a detailed conservation plan for Pine Creek. The needs, priorities, and strategies for cooperative watershed protection initiatives will be determined. Local volunteers will assist in the planning process.
- \$30,000 (FY1999) to Green Valleys Association of Southeastern PA to reclaim an abandoned commercial site in East Vincent Township and 400 feet of streambank along French Creek. Completion of the project will allow better public access of the creek for recreational use.
- \$369,000 (FY1999) to the Academy of Natural Sciences of Philadelphia to conduct a detailed ecological study of the scope and magnitude of ecological changes due to removal of a dam on Manatawny Creek. The study will examine and document downstream transport of sediment, changes in number of fish species, and other physical, chemical and biological changes. The Greater Pottstown Watershed Alliance and the Berks County Conservancy will provide public outreach and education expertise and the Delaware Riverkeeper Network will provide stream corridor restoration and landscape design expertise.

US EPA Clean Water Act Section 319 Grants:

- \$55,600 (FY1999) to the Berks County Conservancy for an assessment of the Manatawny/Hay Creek watersheds to determine nutrient loads and collect data necessary to develop a TMDL and a management plan to restore and protect these watersheds.
- Nutrient management technicians have been funded in Berks and Chester Counties CD's from the FY94 through FY97 grants.

Pennsylvania Watershed Restoration Assistance Program (WRAP):

- \$30,000 (FY1999) to the Greater Pottstown Watershed Alliance to remove an orphan dam on the Manatawny Creek
- \$10,660 (FY1999) to Green Valley Association of Southeastern PA for streambank fencing and riparian restoration of Rock Run, French Creek watershed, on Ryers's Farm for Aged Equines.
- \$9,900 (FY1998) to the Schuylkill Riverkeeper for riparian restoration of Pigeon Creek. Native vegetation will be used to restore a 35-foot wide buffer zone and fiber mats and logs were used to stabilize stream banks.
- \$9,400 (FY1998) to Camphill Village Kimberton Hills, Inc. for riparian forest buffer restoration and watershed protection program in French Creek. Goals were to restore habitat, control stream bank erosion, reduce nutrients, and educate the village's neighbors.

- \$14,400 (FY1998) to the Berks County Conservancy for stream bank fencing and riparian buffer restoration in Limekiln Creek. One mile of stream bank was fenced and 1200 willow shrubs will be planted to restore the riparian buffer.

US EPA 205(j)(5) Program:

- 1993: Water quality assessments of agricultural impacts were completed for French Creek, Pickering Creek, and Manatawny Creek watersheds. The Berks County Chester County Conservation Districts hired nutrient management technicians to help with financial and technical assistance in these watersheds. Funding for these two technicians was provided through the Section 319 FY94 through FY97 grants.

DCNR PA Rivers Conservation Program Grants:

- \$26,000 (2000) to the Berks County Conservancy to prepare a comprehensive rivers conservation plan for Hay Creek watershed.
- \$44,500 (2000) to the Green Valleys Association to reclaim streambank property along French Creek.
- \$100,000 (1999) to Chester County to develop a rivers conservation plan for the county's watersheds. A countywide assessment and comprehensive management plan will address both quality and quantity of surface and groundwater resources in the county's 73 municipalities. These watersheds serve as public water supplies for over 500,000 people in southeastern Pennsylvania and northern Delaware. A 25-member citizen Water Resources Task Force will guide the plan, which will incorporate significant public input. The county received an additional \$170,00 for completion of this study through a FY2000 319 grant.
- \$123,000 (1997) to the Green Valleys Association of Southeastern Pennsylvania to implement sustainable watershed strategies in Northern Chester County watersheds.
- \$42,300 (1996) to the Green Valleys Association to prepare a Pigeon Creek/Stony Run watershed and sustainability plan.
- \$41,000 (1996) to District Township to develop a watershed plan for Manatawny Creek, including Sanatoga Creek, Hartenstine Creek, and Sprogels Run watersheds.
- \$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 groups in developing detailed plans at the subwatershed level.
- \$49,900 (1995) to the Green Valleys Association to develop a model program to balance water resources and land development in the French and Pickering Creek watersheds.
- \$24,200 (1995) to the Schuylkill River Greenway Association to update the zoning and land use patterns along the Schuylkill River to assess opportunities for greenway development and river access.

Water Supply Planning/Wellhead Protection Program:

- \$61,875 (1996) grant to Berks County to conduct feasibility study of regionalization of all community drinking water systems in the county.

Sewage/Stormwater Programs:

- \$84,824 (1995-6) to Berks County for preparation of a watershed stormwater management plan to address excess stormwater runoff from new development sites. Recommendations in the plan will be implemented by the county's ordinances.

PENNVEST:

- \$1,311,910 loan to Manatawny Township Municipal Authority to construct a sewage collection and conveyance system to serve the village of Bowers, eliminating contamination of groundwater and nearby Sacony Creek.
- \$2,159,000 (1997) loan to construct a sewage collection system to serve the village of Douglassville by transmitting wastewater to the Amity Township treatment facility. The project will eliminate contamination of local drinking water wells used by residents and businesses.

League of Women Voters (WREN) Mini-grants:

- \$3,000 to Camphill Village, Kimberton Hills, Inc. to educate residents living along French Creek about nonpoint source pollution and to restore a small stream on the property that feeds into French Creek.

Citizen/Conservation groups:

- Water Resources Task Force: a 25-member citizen's advisory board formed to help implement the comprehensive countywide River Conservation Plan.
- Green Valleys Association is a regional watershed organization with a long history of protection of northern Chester County resources and support and guidance to local government. They have developed the Sustainable Watershed Management program as a tool for local municipalities to incorporate regulation of water use in their zoning ordinances. They have organized meetings on water resources, streamside plantings, effective land use planning, wildlife resources and local participation in stream watches. More information is available on their web site at <http://www.greenvalleys.org/>.
- Berks County Conservancy was established to preserve Berks County's unique cultural and environmental heritage including efforts to preserve agricultural land and open space, and protect stream and groundwater quality.
- Delaware Riverkeeper Network. The goals of the Riverkeeper are to ensure that local residents actively protect streams. They also encourage residents to get involved with municipal land use decision-making and assist with local stream protection projects. Their website can be found at <http://www.delawariverkeeper.org/>
- Greater Pottstown Watershed Alliance (Manatawny Creek)
- French and Pickering Creeks Conservation Trust have lead efforts to preserve open space and historical sites in French and Pickering Creek watersheds. They have set aside creek lands in several townships, preserved over 7000 acres of open space, and conveyed lands to state parks and the PA Game Commission. More information is available on their web site at <http://www.frenchandpickering.org/>.
- The Dame Juliana League is a 100 member group of fly fishers and conservationists who have sponsored stream improvement projects in French Creek and other watersheds. They have partnered with other local and regional groups in conservation efforts. Their web site is at <http://www.djflyfishers.org/>.
- Pine Creek Valley Watershed Association

Public Participation/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. 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.

Funding Needs

The total dollars needed for addressing all nonpoint source problems in the watershed is undetermined. Stream assessments have been conducted and TMDLs will be developed 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 newer 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/Protection Needs

An assessment of nonpoint source pollution from agriculture in subbasin 03D completed in 1992 divided the study area into 23 subwatersheds and indicated that 5 of these were in need of remediation. Restoration costs were estimated at just over \$2 million; over half was needed in the Berks County portion of the subbasin. The subwatersheds most in need of restoration were Beiber Creek, Furnace Run, Little Manatawny Creek, and the Brook Evans Run area, Pigeon Creek and South Branch French Creek. Even though these streams are not on the 303d list, some individual stream segments are in need of streambank stabilization, restoration of riparian buffers and agricultural best management practices. Restoration activities should be concentrated in these areas and in areas indicated as impaired on the 303d list.

The Chester County Water Resources Authority has developed an initiative to protect first order streams, the upstream-most perennial tributaries, in the county. First order streams are very small and have low flow volume and are, therefore, more vulnerable to pollution sources affecting water quality and quantity. The county is promoting establishment of forested riparian buffers and streambank fencing where livestock graze. Forested buffers help maintain water temperature by shading the creek and help reduce streambank erosion and nutrient runoff. Buffers also provide paths for wildlife to reach food and cover. French Creek has 64.2% of its watershed flowing in first order streams. Pickering Creek has 57.8% and Pigeon Creek has 70.5% of the watersheds in first order streams. More information is available on the Water Resources Authority activities at <http://www.chesco.org/water>.

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
- French Creek Special Protection Evaluation Report, DEP Bureau of Watershed Conservation, Water Quality Monitoring and Assessment Section, January 1996.
- Assessment of Nonpoint Source Pollution for the Manatawny Creek and French Creek Watersheds, Montgomery County, Berks County, Chester County Conservation Districts and the Green Valleys Association, 1992.
- Information from the Chester County Water Resources Authority
- Draft Baseline Assessment and Cause & Effect Analysis. 3D French/Manatawny Watershed Team. PA DEP Southeast Regional Office. June, 2001

Streams in Subbasin 03D: 303d/305b Listings

Stream	Stream Code	Drainage area square miles	Miles Impaired	Miles Attained	Causes
2-Schuylkill River	00833		2.58, 2 UNTs 5.43, 2 UNTs [30.13]	29.78, 21 UNTS	AG-Nutrients & pathogens; Small residential development- Flow alterations & siltation [Fish consumption advisory, pesticides & priority organics] <i>Many UNT's are HQ-TSF</i>
3-Sixpenny Creek & 4 UNTs	01765	4.62		6.82	<i>HQ-CWF-upper basin and UNT at River Mile 1.28; Class A brook trout-entire creek & UNTs</i>
3-Monocacy Creek & 25 UNTs	01724	25.8		36.52	
4-Limekiln Creek	01744	4.22	1.49 main stem; 0.98, 4 UNTs	2.73 main stem; 2.51, 2 UNTs	Flow alterations, siltation from Surface mining
4-Owatin Creek & 5 UNTs	01730	5.13		9.16	
5 Molasses Creek & one UNT	01731	0.72		1.86	
3-Manatawny Creek	01655	91.6	2.27, one UNT 7.81, 4 UNTs	20.29 Main stem; 11.23, 7 UNTs	Habitat modification, flow alterations, urban runoff/storm sewers; AG/crops & hydro-modification-excessive algae & siltation
4-Pine Creek at Lobachsville & 4 UNTs	01701	10.0		9.77	<i>EV, Class A brown trout</i>
5-West Branch Pine Creek & 1 UNT	01702	2.44		3.25	
4-Bieber Creek & 6 UNTs	01694	9.40		12.1	<i>EV, Class A brown trout- upper 2.2 miles</i>
4-Little Manatawny Creek & 3 UNTs	01686	12.1		11.36	
5-Furnace Creek	01688	4.93			
4-Oysterville Creek & 6 UNTs	01679	12.2		14.53	
4-Furnace Run & 2 UNTs	01678	2.62		9.91	

4-Trout Run & one UNT	01671	2.37		2.84	
4-Ironstone Creek & 9 UNTs	01658	15.5		21.24	
3-Sprogles Run & 4 UNTs	01646	7.06		9.23	
3-Sanatoga Creek & one UNT	01641	7.09		4.22	
4-Hartenstine Creek & 2 UNTs	01642	3.07		4.73	
3-Possum Hollow Run	01640	1.40			
3-Brooke Evans Creek	01638	1.53		2.71	
3-Pigeon Creek & 11 UNTs	01624	14.5		22.48	<i>HQ-TSF</i>
3-Mingo Creek & 8 UNTs	01609	7.92		13.48	
3-Stony Run & 3 UNTs	01605	5.62		8.87	<i>HQ-TSF</i>
3-French Creek & 27 UNTs	01548	70.2		78.8	<i>EV-upper basin down to Beaver Run; HQ-TSF-middle basin</i>
4-Scotts Run	01602	2.91		1.27	<i>EV</i>
4-Pine Creek at French Creek State Park & 2 UNTs	01598	5.88		7.33	<i>EV</i>
4-Rock Run & one UNT	01591	3.34		5.15	<i>EV</i>
4-South Branch French Creek & 10 UNTs	01580	13.6		20.07	<i>EV</i>
4-Beaver Run & 4 UNTs	01573	5.04		8.46	<i>EV</i>
4-Birch Run & 4 UNTs	01563	6.51		9.41	<i>EV</i>
3-Pickering Creek & 28 UNTs	01508	38.8		49.52	<i>HQ-TSF-upper basin</i>
4-Pine Creek at Chester Springs	01530	5.45	1.82 main stem	2.44 main stem; 2.92, 4 UNTs	Urban runoff/storm sewers- water flow variability & cause unknown
4-“Pigeon Run” & 3 UNTs	01521			5.75	

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

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

The subbasin assessment was completed under unassessed waters program in 1998 and 1999.
Total miles listed as impaired or attained include unnamed tributaries (UNTs) where indicated.