

**2010 Pennsylvania Integrated Water Quality
Monitoring and Assessment Report**

**Clean Water Act
Section 305(b) Report and 303(d) List**

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EXECUTIVE SUMMARY

Pennsylvania has a population of 12,448,279 and area of 45,333 square miles. There are six major river basins - Delaware, Susquehanna, Genesee, Potomac, Ohio, and Lake Erie - with an estimated 86,000 stream and river miles and 161,455 lake acres. Seventeen square miles of Delaware Estuary and 512 acres of tidal wetlands exist in the southeast corner. In the northwest corner are 63 miles of Lake Erie shoreline. Scattered throughout the state are 403,924 freshwater wetlands. These numbers illustrate the magnitude and complexity the Pennsylvania Department of Environmental Protection (DEP) faces in assessing, protecting, and managing its water resources.

There are several goals of the 2010 Integrated Water Quality Monitoring and Assessment Report (Integrated Report). Foremost is to report on the condition of the waters in the Commonwealth. Other goals include describing the water pollution control and assessment/monitoring programs. Pollution control programs are discussed in detail in Part B, and Assessment and Monitoring in Part C. The report concludes with a discussion of groundwater in Part D.

Part A summarizes and discusses stream and lake assessments. The introduction describes the five-part list. These lists of individual waterbodies are separate from the narrative because of their size and are available on DEP's website.

In April 2007 DEP completed a ten year program to assess all wadeable streams. The census utilized a biological assessment of the aquatic life use. Other designated uses and non-wadeable waters were assessed to a lesser extent as resources and time permitted. As of this report 84,867 miles of streams and rivers are assessed for aquatic life use with 68,320 miles listed as attaining that water use. Of the impaired miles, 9,413 require development of a Total Maximum Daily Load (TMDL) to reduce pollutant inputs and 6,105 have an approved TMDL. An additional 65 miles are under compliance agreements and expected to improve within a reasonable amount of time. The two largest problems are agriculture and abandoned mine drainage. The largest stressors are siltation and metals. However, other problems should not be minimized because in local areas they may impact a relatively large percentage of waters. For example, urban runoff/stormsewers is a minor problem in rural areas but major in metropolitan regions.

There are 76,484 acres of lakes assessed for aquatic life use and 39,301 acres are attaining that use. Of the impaired acres, 4,990 require a TMDL, 11,650 have an approved TMDL, and 20,543 acres are impaired but do not require a TMDL because they are not affected by pollutants. The largest problem source is agriculture and largest stressors are nutrients, suspended solids, and organic enrichment/low D.O. As discussed above, smaller problems should not be minimized because they still have regional importance.

To protect the health of those who consume fish caught in the Commonwealth, DEP monitors fish flesh for possible contaminants. When concentrations of substances known to be harmful to humans reach action levels, fish consumption advisories are issued to inform people of the possible dangers and the actions they can take to protect themselves. Currently there are

approximately 1,195 miles of fish consumption advisories in need of TMDLs and 712 with approved TMDLs. Lake listings include 28,870 acres requiring TMDLs and an additional 5,483 with approved TMDLs. There is a statewide fish consumption advisory of no more than one meal per week for all waters to protect against the ingestion of unconfirmed contaminants. The fish consumption listings in this report have triggered action levels more restrictive than the one meal per week. It should be noted that DEP directs much of its fish tissue sampling to areas where there is a greater chance of problems. As a result, it is not surprising to see a higher number of stream miles and lake acres impaired for this use compared to the stream miles (2,430) and lake acres (13,942) attaining this use.

Aquatic life use was the original focus of the statewide surveys because with a rapid and efficient biological assessment of aquatic macroinvertebrates (insects, snails, clams, etc.) it was possible to canvas the state over a ten year period. In addition, aquatic life use is a good measure because it is reliable as an indicator of long term pollution problems. Since completing the statewide census for aquatic life use, DEP is emphasizing developing assessment methodologies, programs, and partnerships to increase recreational and potable water supply use assessments.

Of the 1,397 stream miles assessed for recreational use, 701 were attaining. There are 688 impaired miles requiring a TMDL and 8 with an approved TMDL. Lake recreational use was assessed for 75,322 acres with 73,928 attaining, and 1,394 impaired requiring a TMDL. The potable water supply use was assessed for 2,883 stream miles with 2,762 attaining, 107 impaired requiring a TMDL, and 14 with approved TMDLs. Lake potable water supply use was assessed for 44,933 acres with 44,921 attaining, and 12 impaired requiring a TMDL.

Part B is the narrative describing the Commonwealth's water pollution control programs. The section begins with a description of progressive efforts to prevent pollution before it becomes a problem. The Alternate Energy Portfolio Standard (AEPS) was adopted to shift energy dependence from polluting non-renewable energy sources to clean renewable sources. With the success of AEPS, other energy legislative initiatives such as, The Alternative Energy Investment Fund Act and House Bill 1202, were also passed in 2008. On other fronts, DEP has programs to encourage reduction in pollution that also provide cost savings to the treatment facilities. Examples of these successes are provided.

As evident in the Part B narrative, the Commonwealth's permitting and NPDES program is complex and deals with a large number of inspections and permits including regulating and permitting 4,548 industrial and sewage treatment facilities. Pennsylvania is a large producer of coal and natural gas and all mining and extraction activities require permits and inspection. It is DEP's responsibility to issue permits that assure stormwater from earthmoving and construction activities is managed properly so as not to cause damage to streams or adversely affect their hydrology. County conservation districts work with DEP on stormwater protection. DEP also regulates combined sewer overflows (CSO) and manages and protects wetlands.

Part B also includes a discussion of non-point source programs. Pennsylvania's Non-point Source (NPS) Program was developed in response to Section 319 of the federal Clean Water Act to address problems caused by pollution from non-point sources. Unlike point source pollution,

which comes from pipes, the causes of non-point source pollution can be difficult to define or quantify. Sometimes referred to as “polluted runoff,” non-point source pollution is generally caused by stormwater runoff across the land or infiltration of pollutants into the groundwater.

Non-point source problems require treating and controlling runoff from large areas. Treatment and control is accomplished through what are known as best management practices (BMP). BMPs are often specifically adapted to a particular location and problem. Examples include improving farming practices, reclamation of abandoned mines, installation of sediment ponds, and planting riparian buffers. A major function of the non-point source program is to identify the need for and initiate funding of BMP projects. Some examples of successful projects are described in the narrative.

The non-point program works with the TMDL program. A TMDL model outputs a load reduction of, for example, sediment. That sediment load reduction must be achieved to meet water quality goals and the reductions are achieved through the use of non-point BMPs. The non-point program provides technical assistance, education, and funding necessary to put the BMPs in place. Education is an important facet of the non-point program. It often takes a consortium of interested and active people concerned about their watershed to achieve non-point source controls. The purpose and goals of the TMDL program are outlined following the section on the non-point program.

In 2005 Commonwealth voters approved Growing Greener II (Act 45 of 2005). This bond issue made \$230 million available to DEP over the next five years to clean up rivers and streams, take on serious environmental problems at abandoned mines and contaminated industrial sites, and finance the development and deployment of advanced energy projects. Growing Greener funds are important to the success of non-point source controls and programs as illustrated in the Part B narrative.

The combined efforts of the NPDES and non-point programs to identify and correct problems have resulted in many water quality improvements. In 2007, DEP began an ongoing process of identifying areas where restoration efforts were underway and targeting them for monitoring. When monitoring indicates the waters are restored, Department biologists document the improvements and remove the problem from Category 5 of the List (impaired waters requiring a TMDL) and place it in Category 2 (waters attaining at least one use). Seventeen such sites were identified and sampled in 2008/2009.

Part C is the Surface Water Quality Monitoring and Assessment discussion. It begins with a discussion of the Water Quality Standards Program which includes water uses, water quality criteria, and Pennsylvania’s Antidegradation Program.

The next three sections discuss monitoring programs including intensive surveys, ambient fixed station monitoring at Water Quality Network (WQN) sites, and lake monitoring.

Citizen Volunteer Monitoring Program (CVMP) is an important program with the goal of working with interested groups in projects that generate quality assured data related to DEP's highest priorities. Ongoing projects include: bacteria sampling with the intent of assessing streams for recreational use; monitoring the effects of restoration efforts with the intent of tracking the improving water quality of streams and lakes; protecting our most valuable watersheds by implementing an early warning system for Exceptional Value (EV) and High Quality (HQ) streams and lakes that are vulnerable to degradation because of changing land use.

EPA's Integrated Listing guidance requires states to gather and use all existing and readily available data generated by sources outside DEP. This data must meet quality assurance and procedural guidelines outlined by DEP. Data solicitations were sent to over 500 outside sources in an effort to satisfy this requirement.

The Assessment and Listing Methodology is a collection of protocols used to conduct field surveys and evaluate information for assessments. These protocols are the basis for the streams and lakes information contained in the Integrated Report narrative and the five part list. These protocols were subjected to peer review. Before being adopted, the entire methodology was made available for public review during the summer of 2007 and spring 2009. The methodology is lengthy and as a result is reported separately from this narrative and is available on DEP's website along with the responses to public comment.

The next several sections present detailed tables summarizing stream and lake use support. These tables formed the basis for the discussions presented at the beginning of the Executive Summary. The lakes section also contains discussions on restoration and control efforts. Some funding is available from DEP to restore and/or protect lakes. Control measures are codified in DEP's Rules and Regulations at Section 96.5 - Discharges to Lakes, Ponds, and Impoundments, which sets forth treatment requirements for point source discharges necessary to control eutrophication. Both efforts are important in protecting and restoring the Commonwealth's lakes. Section C ends with an overview of wetlands. It describes the types of wetlands found, DEP's jurisdiction and responsibility to protect wetlands, and other wetland related activities.

Finally, Part D provides an overview of the groundwater program including assessment activities and wellhead and source water protection.

PART A: INTRODUCTION

This report is the twentieth in a series of reports prepared in response to Section 305(b) of the federal Clean Water Act that requires states to provide an assessment of water quality. These reports are prepared on a biennial basis.

DEP uses an integrated format for Clean Water Act Section 305(b) reporting and Section 303(d) listing. The “2010 Pennsylvania Integrated Water Quality Monitoring and Assessment Report” satisfies the requirements of both Sections 305(b) and 303(d). The narrative that follows contains summaries of various water quality management programs including water quality standards, point source control, and nonpoint source control. It also includes descriptions of programs to protect lakes, wetlands, and groundwater quality. A summary of the use support status of streams and lakes is also presented in the narrative report.

In addition to this 305(b) narrative, the water quality status of Pennsylvania’s waters is presented using a five-part characterization of use attainment status. The listing categories are:

Category 1: Waters attaining all designated uses.

Category 2: Waters where some, but not all, designated uses are met. Attainment status of the remaining designated uses is unknown because data are insufficient to categorize the water.

Category 3: Waters for which there are insufficient or no data and information to determine if designated uses are met.

Category 4: Waters impaired for one or more designated uses but not needing a total maximum daily load (TMDL). These waters are placed in one of the following three subcategories:

- *Category 4A*: TMDL has been completed.
- *Category 4B*: Expected to meet all designated uses within a reasonable timeframe.
- *Category 4C*: Not impaired by a pollutant and not requiring a TMDL.

Category 5: Waters impaired for one or more designated uses by any pollutant. Category 5 includes waters shown to be impaired as the result of biological assessments used to evaluate aquatic life use. Category 5 constitutes the Section 303(d) list EPA will approve or disapprove under the Clean Water Act.

Each waterbody must be assessed for four different uses as defined in DEP 's rules and regulations at 25 Pennsylvania Code Chapter 93 (Water Quality Standards) in Section 93.3 Protected Water Uses. The four include Aquatic Life, Water Supply, Fish Consumption, and Recreation. Generally, Aquatic Life pertains to maintaining flora and fauna indigenous to aquatic habitats; Water Supply relates to the protection of ambient water quality for possible use as a potable water supply; Fish Consumption protects the public from consuming tainted fish; and Recreation relates to water contact and boating. Each use may have different water quality criteria for individual chemical constituents and each use requires a different type of stream or lake assessment.

DEP encourages use of the Internet to view the Integrated Report documents electronically on its website at <http://www.depweb.state.pa.us>, search keyword “Water Quality List”. Full address is: http://www.portal.state.pa.us/portal/server.pt/community/water_quality_standards/10556
Because of the size of the five-part list, it will only be available electronically.

PART B: BACKGROUND

Part B1 Total Waters

Table 1
Atlas of Surface Waters in Pennsylvania

The following information is presented to provide a perspective on Pennsylvania’s water resources:

State Population	12,448,279 [†]
State Surface Area (square miles)	45,333
Number of Water Basins (major basins)	6
Total Miles of Rivers and Streams	86,000*
Number of Lakes/Reservoirs/Ponds**	3,956
-Number of Significant, Publicly Owned Lakes (subset)	219
Acres of Lakes/Reservoirs/Ponds**	161,445 ^{††}
-Acres of Significant, Publicly Owned Lakes (subset)	98,942
Square Miles of Estuaries/Harbors/Bays	
-Delaware Estuary	17
-Presque Isle Bay	6
Miles of Great Lakes Shore	63 ^{†††}
Acres of Freshwater Wetlands	403,924
Acres of Tidal Wetlands	512

[†] US Census estimate 2008

^{††} Lakes and ponds greater than two acres

^{†††} Lake Erie - Fourteen miles comprise the Presque Isle Peninsula.

*DEP estimate based on 1:24,000 scale National Hydrography Data (NHD) GIS stream coverage. This 86,000 may change as the NHD is quality assured and corrected.

** “Total Water Estimates for United States Streams and Lakes”, EPA, August 1993

Part B2.1 Pollution Prevention and Energy Efficiency Program

DEP recognizes the value of multi-media pollution prevention in providing environmental protection. Not only does preventing pollution create a healthy, sustainable environment, it also saves money, contributing to a stronger economy. Programs throughout DEP are built upon the premise that not generating waste is preferable to dealing with waste after it is generated. Since energy usage and generation has major impacts economically and environmentally to businesses, industry, and state and local governments, the Rendell Administration recognized the need to direct efforts related to energy and alternative fuel issues and was integral in passing the

Alternative Energy Portfolio Standard (AEPS) legislation and developing the Energy Independence Strategy. The AEPS law is a two-tiered standard ensuring that in 15 years, 18 percent of all the electricity sold in Pennsylvania will come from clean sources. Tier I requires 8 percent of electricity sold at retail in the state to come from traditional renewable resources such as solar, photovoltaic energy, wind power, and low-impact hydro; and Tier II requires 10 percent of Pennsylvania retail electricity to be generated from resources such as waste coal, distributed generation systems, and demand-side management. At least 0.5 percent of Tier I must be met by electricity from solar photovoltaic cells. The Alternative Energy Investment Fund Act was passed in a special legislative session in 2008, and includes funding for green buildings, energy efficiency, and demand-side response programs designed to reduce Pennsylvania's energy consumption. As a result of the same session, Gov. Rendell signed into law House Bill 1202, which requires that certain percentages of biodiesel and ethanol be included in each gallon of gasoline or diesel sold in the commonwealth as in-state production of biodiesel or cellulosic ethanol reaches certain levels.

The Rendell Administration is currently launching additional programs as a result of the American Recovery and Reinvestment Act (ARRA) in order to help create jobs and further the development of the alternative energy and energy efficiency sectors. These programs provide funding for alternative energy and energy efficiency projects for local governments, businesses, colleges and universities, conservation districts, etc. The eligible technologies included in these programs are combined heat and power, biogas, solar, wind, and other technologies.

DEP's pollution prevention programs help government and businesses move beyond compliance-based, end-of-pipe thinking to preventing pollution before it is created, effectively reducing adverse impacts to the environment. The Office of Energy and Technology Development (OETD) has programs for helping small businesses, industry, government, and schools to better manage their environmental impacts, reduce energy usage, and save money. Some major focus areas of OETD are economic development, indigenous energy, hydrogen economy, market barriers, distributed power, and green buildings.

The Small Business Pollution Prevention Assistance Account (PPAA) loan program has funded a variety of pollution prevention/energy efficiency projects. Reported results for some of these projects are as follows:

Custom Castings Northeast, Inc. has reported saving 497,000 pounds of cement, 75,000 pounds of gypsum, and 76,000 pounds of wood. In addition, the company has reported a reduction of 379,000 pounds of waste as well as reduced labor costs. The company has realized a savings of \$355,000 in addition to an increase in production in the six years since implementing their project.

Gautier Steel, Ltd. has reported saving 13,807 MWH (megawatt hours) of electricity, 70,117 MCF (thousand cubic feet) of natural gas and 192,202 MGALS (megagallons) of water. Combined, these savings have given the company \$1,891,482 in the four years since implementing their project.

Reynoldsville Casket has reported saving 7,745 gallons of paints and thinners as well as 2,540 gallons of waste paint. In addition, Reynoldsville has reduced their air emissions and waste disposal costs. The company has realized a savings of \$92,226 in addition to an increase in production in the seven years since implementing their project.

The loan program has also provided \$2,126,930 in funding to 38 healthcare professionals to help them purchase/install new digital x-ray systems in their offices. The new digital systems replaced their film-based x-ray systems and have helped the businesses save water and electricity and reduce the amount of radiation emitted. In addition, the businesses realized a reduction in their hazardous waste stream, wastewater, waste disposal costs, lab and maintenance costs, and x-ray supplies. These 38 projects have saved the businesses \$446,257 since implementation.

DEP works with The Pennsylvania Technical Assistance Program (PENNTAP) and other groups to support technology-based economic development. As a means to improving competitiveness, Pennsylvania companies receive a limited amount of free assistance to help resolve specific technical needs. Technical assistance was provided for 218 businesses during the past year resulting in an estimated economic benefit exceeding \$18.5 million. Waste and energy use-reduction assessments were performed at 67 businesses. Environmental benefits included conserving 75,000 gallons of water and a reduction in air emissions approaching 2,000 tons per year or 1,420 metric tons of carbon equivalence. Energy savings were estimated at nearly 0.3 megawatts. \$232,000 in savings were reported by businesses receiving PennTAP's assistance.

Government is leading by example, integrating pollution prevention and energy efficiency measures throughout the Commonwealth. Examples of this include the work of the Governor's Green Government Council (GGGC) to implement green planning throughout the state to go towards purchases of environmentally friendly green buildings and electricity from renewable sources like wind and solar power. DEP is building strategic partnerships with businesses and organizations throughout the Commonwealth, promoting pollution prevention and energy efficiency, fostering environmental and energy technologies, and providing compliance assistance to help organizations protect the environment while saving money. To lead the way, the Governor issued executive order 12-04 requiring all state agencies to reduce energy usage. Building energy usage was reduced by 18% from calendar year 2005 to 2009, using 2004 as the base year. In addition, the Guaranteed Energy Savings program has been streamlined. Twenty-nine major building retrofits will return major energy savings to seven agencies and cover the capital costs out of the savings. The first nine projects to be completed will save taxpayers over \$89.5 million on a capital outlay of \$51.7 million. Future energy bills will be reduced by specifying stringent performance goals for new construction. Out of the 162 high performance green buildings in Pennsylvania certified under the US Green Building Council's LEED® rating system, twelve are occupied by state agencies, an increase of three from 2006.

The Commonwealth now ranks 10th on the U.S. Environmental Protection Agency's Top 50 Green Power Partnership List. By modifying its existing contract, the Commonwealth will purchase 400,000 megawatt hours a year, or 40 percent of state government's electricity, from

renewable wind and biomass sources. The contract calls for electricity that is generated 10 percent from wind power and 90 percent from biomass sources.

Part B2.2 (a) NPDES

Pennsylvania implements the EPA delegated point source National Pollutant Discharge Elimination System (NPDES) permitting program through DEP's six regional field offices and six district mining operations offices. While program development and evaluation occurs in DEP's central office, the field offices and district mining offices conduct site-specific permitting, monitoring, compliance, and enforcement activities. The central office also provides specialized assistance in the areas of policy, regulatory development, complex permitting, laboratory audits, safety training, treatment plant operations, enforcement, and data management.

The Toxics Management Strategy provides for a consistent statewide approach for addressing EPA priority pollutants and other toxic substances in the NPDES permit program. The strategy, parts of which are codified in a Statement of Policy, Chapter 16, is a support document to DEP's toxic regulation, Section 93.8a of the rules and regulations.

In state fiscal years 2008 and 2009 (July 1, 2007 – June 30, 2009), field office staff issued 476 new, 1,712 renewals, and 189 amendments for NPDES permits for municipal or private sewage treatment plants, industrial discharges and solid or hazardous waste facilities, as well as 128 new, 359 renewals, and 7 amendments for coverage under stormwater general permits.

Water Quality Management (WQM) permits authorize construction and operation of sewage collection and conveyance systems and sewage and industrial wastewater treatment facilities. The field offices issued 955 WQM permits and permit amendments for sewage and industrial waste treatment plants in state fiscal years 2008 and 2009.

Permitting summaries for other programs follow later in the document.

Part B2.2 (b) Compliance and Enforcement

The DEP point source control program regulates approximately 9,050 sewage and industrial dischargers in Pennsylvania. Approximately 385 of these are considered major dischargers based on EPA criteria. DEP field offices maintain a staff of field inspectors, hydrogeologists, biologists, compliance specialists, supervisors, and managers to conduct activities including inspections of both NPDES and non-NPDES wastewater treatment facilities, emergency response, investigation of pollution incidents and complaints, and routine stream monitoring.

Approximately 7,490 facilities inspections were conducted during state fiscal years 2008 and 2009. Generally, if environmental damage or willfulness is not involved in violations, an

attempt is made to obtain voluntary compliance. In more serious situations, criminal, civil, or administrative actions may be used. DEP field offices completed 383 such actions in state FYs 08 and 09, resulting in approximately \$10.96 million in penalties.

The Water and Wastewater Operator Outreach program is continuing to have a positive impact on effluent quality by providing on-site training for wastewater treatment plant operators. This program has expanded to the point where training was conducted at an average of 40 sites per federal fiscal year from 2001-2009. As a result of this training, most sites show substantial improvement in compliance with permit requirements.

Tracking of data on effluent quality for major dischargers is accomplished through EPA's Integrated Compliance Information System (ICIS). There has been an ongoing effort to enhance the compliance monitoring program by automating the input of effluent limits data and discharge monitoring data to ICIS. In 2007, DEP implemented an electronic DMR system to store monitoring data as well as a data system called the NPDES Management System to store permit information. These systems have significantly reduced the number of data elements that were electronically unavailable. In 2008, with the intention of acquiring information through data transfers from the States, EPA released a "schema" (database requirements) for a subset of data elements. Approximately 20 fields were associated with DMRs. Pennsylvania is now transferring DMR data electronically to ICIS, thus reducing the manual data entry burden for DEP staff.

There are several checks and balances in place to ensure the quality of self-monitoring data. Since 2006, DEP's Bureau of Labs (BOL) has been responsible for oversight of all environmental labs. BOL provides a year end report to EPA with details and accreditation information. In addition, field inspectors review information and self-monitoring data during surveillance activities, and follow-up as appropriate.

Part B2.2(c) Mining

District mining operations offices, under the direction of DEP's Bureau of Mining and Reclamation (BMR), issue NPDES discharge permits for active mining operations. During federal FY 08 and FY 09, the following new permits were issued: 105 coal surface, 11 coal underground, 13 coal refuse reprocessing, one coal refuse disposal, and 41 industrial mineral surface permits.

Part B2.2 (d) Oil and Gas

During the two year period from October 1, 2007 to October 1, 2009, the Bureau of Oil and Gas Management (BOGM) issued three new NPDES discharge permits and one new NPDES permit for coalbed methane wastewater treatment facilities. There are 12 active NPDES permits for coalbed methane treatment facilities and 12 active NPDES permits for brine treatment facilities in Pennsylvania.

Currently within the BOGM, nine NPDES permit applications for new facilities are pending and there are five pending renewals. In addition, five stripper oil well discharges are covered by the general permit, with two receiving Water Quality Management Part II permits and two pending a Water Quality Management Part II permit.

In response to the increasing need for treatment facilities to reduce the environmental impacts of the exploitation of natural gas resources associated with the Marcellus Shale formation, the Department of Environmental Protection issued in, April 2009, a Total Dissolved Solids Strategy. In addition, the Department moved to develop a more standardized permitting process coordinating well drilling approvals from BOGM, approvals for water withdrawals issued by River Basin Commissions, correction of site development issues at well pads through the management and treatment of wastes from drilling operations, and addressing production activities. Department regional offices received inquiries about new wastewater treatment facilities from at least 29 parties. Of these, approximately 25 applications were submitted and are now under review by the regional staff. Lastly, the Department is currently revising 25 Pa Code Chapter 93 Water Quality Standards and Chapter 95 Wastewater Treatment Requirements regulations to address in-stream, treatment, and effluent discharge criteria for specific contaminants of concern.

Part B2.2 (e) Stormwater Discharge Permits

The 1990 federal stormwater regulations require NPDES permits for discharges of stormwater from certain industrial activities and municipalities. Initially, there were four Pennsylvania cities (Philadelphia, Pittsburgh, Allentown, and Erie) on the EPA list of municipalities needing stormwater permits. Later, Pittsburgh and Erie were exempted from the stormwater permitting requirements because of large areas of combined sewers in these cities. Permits have been issued to Philadelphia and Allentown.

DEP began implementing the Phase II stormwater regulations on December 8, 2002. These regulations require construction activities consisting of earth disturbance activities between one and five acres with point sources and all construction activities consisting of earth disturbance activities greater than five acres to obtain permits. In addition approximately 940 small municipalities (including those that were initially exempted), must obtain NPDES permits to operate their municipal separate storm sewer systems (MS4s).

DEP administers a reimbursement and grant program under the Storm Water Management Act (Act 167) for counties to prepare comprehensive stormwater management watershed plans to regulate activities and development that may cause accelerated stormwater runoff. Municipalities implement the plans through the enactment or amendment of local ordinances. One hundred and sixty-seven (167) stormwater management plans have been approved by DEP across Pennsylvania (as of November 2007). All plans approved since 2001 include specific components to enhance protection of water quality, groundwater recharge, and groundwater recharge areas. Sixty-seven (67) watersheds have plans that include water quality components.

Forty-six (46) new plans are currently underway, with the emphasis on stormwater management plans that address planning for all watersheds within the county boundary.

On September 28, 2002, DEP released a stormwater policy that addresses the need to improve water quality, sustain water quantity (including groundwater recharge and stream base flow), and integrate upcoming federal stormwater management regulatory obligations. DEP proposes a best management practices (BMP) approach to stormwater management that generally encourages the minimization of runoff by allowing stormwater to infiltrate into the ground whenever possible and requires the management of any net increase in quantity of runoff. This approach will reduce pollution to streams, provide for groundwater recharge, enhance stream flow during times of drought, and reduce the threat of flooding and stream bank erosion resulting from accelerated runoff.

Final policies were published on June 3, 2006 for compliance and enforcement of both Act 167 and the MS4 permitting program (DEP documents 363-4000-003 and 363-4000-004, respectively).

Part B2.2 (f) Construction and Urban Runoff

This category includes two major subcategories: highway construction and new land development including residential, industrial, commercial, institutional, and recreational construction. Uncontrolled runoff from these sites has the potential to cause significant soil erosion and localized sediment pollution in streams.

Standards and criteria for minimizing erosion and preventing sediment pollution are contained in Chapter 102 rules and regulations. These regulations apply to any earth disturbance activity, including land development and road, highway or bridge construction. Requirements for control measures and facilities are written to utilize best management practices, primarily by establishing design and performance standards.

Pennsylvania's program is administered by DEP and county conservation districts through a delegation of DEP authorities to the conservation districts. Joint responsibilities for program implementation include the processing and issuance of permits, complaint investigations, site inspection, compliance, and enforcement. BMPs are reviewed for design and performance effectiveness through permit plan reviews and periodic monitoring at the construction site. Both DEP and the county conservation districts facilitate implementation of BMPs by conducting numerous training seminars and workshops for individuals, municipalities, and other parties engaged in undertaking earth disturbance activities.

DEP's comprehensive stormwater management policy uses existing authority to provide a framework for the integration of all Department stormwater management programs and promotes a comprehensive watershed approach to stormwater management in the Commonwealth. Fundamentally, the policy emphasizes the reduction of stormwater runoff generated by

development and other activities by encouraging minimization of impervious cover, use of low impact development designs, and use of innovative stormwater BMPs that provide infiltration, water quality treatment, and otherwise more effectively manage the volume and rate of stormwater discharges. These stormwater BMPs and planning practices will be advanced through increased emphasis on DEP 's Act 167 stormwater management planning program and implementation of the new (Phase II) and existing (Phase I) NPDES Stormwater Discharge Associated with Construction Activity Permit programs, and the new NPDES MS4 permits.

Because of increased need and emphasis on improving water quality and protecting water resources through improved stormwater runoff management, DEP developed the Pennsylvania Stormwater Management Best Management Practices (BMP) Manual to support the implementation of stormwater management requirements and water quality antidegradation requirements. The BMP Manual provides the design standards and planning concepts to guide local authorities, planners, land developers, contractors, and others involved with planning, designing, reviewing, approving, and constructing land development projects. The BMP Manual also advances the most recent innovations in stormwater management, focusing on preserving on-site and off-site pre-construction hydraulic conditions. Volume and rate management through ground water infiltration, porous surfaces, and other onsite management are emphasized. Water quality components such as oil separators, passive wetland treatment, and other advanced technologies are also being emphasized and integrated into the BMP Manual.

Existing Erosion and Sediment Control (E&S) regulations found at Title 25, Chapter 102 describe the requirements for controlling accelerated erosion and preventing sediment pollution from various earth disturbance activities. The purpose of Chapter 102 is to protect surface waters of the Commonwealth from sediment and stormwater pollution by requiring the use of best management practices (BMPs) that minimize accelerated erosion and sedimentation and manage post construction stormwater runoff, both during and after earth disturbance activities.

Since 1972, earth disturbance activities related to agricultural plowing and tilling, as well as, non-agricultural earth disturbance activities have been regulated under this Chapter by requiring persons to develop, implement, and maintain BMPs.

The Department is currently proposing amendments to Chapter 102 that incorporate provisions which: enhance requirements related to agriculture; clarify existing requirements for accelerated E&S control; incorporate updated federal requirements; update permit fees; codify Post-Construction Stormwater Management (PCSM) requirements; and add requirements related to riparian forest buffers.

Part B2.2 (g) Stormwater Permits Conservation Districts

DEP and county conservation districts jointly administer issuance of NPDES permits for stormwater discharges associated with construction activities. During calendar years 2007 and 2008, conservation districts received, reviewed and acknowledged 3,863 Notices of Intent (NOI) for coverage under the statewide general permit. DEP issued 718 individual NPDES permits

authorizing stormwater discharges from construction activities. In addition, conservation districts conducted 32,324 compliance-monitoring inspections at permitted and non-permitted sites. Conservation districts also conducted 5,181 complaint investigations, in addition to routine compliance inspections.

Part B2.2 (h) Combined Sewer Overflows

Combined sewer overflows (CSOs) to waters of the Commonwealth are considered point sources subject to NPDES permitting, compliance, and enforcement requirements. EPA has been regulating CSOs through the 1989 and 1994 national CSO policies that require each state to develop and implement a state CSO control strategy. DEP revised its policy in September 2007. The revised policy reiterates the need for permittees to have Nine Minimum Controls (NMC) in place and to implement a Long-Term Control Plan (LTCP). LTCP milestones are placed in NPDES permits with dates for completing them. The revised policy also made clearer the need for a post-construction monitoring plan.

DEP has continued to place a high priority on the permitting and inspection program to deal with requirements for implementation of nine minimum controls and long-term control plans.

Part B2.3 (a) Non-point Source Control Program

Pennsylvania's Non-point Source (NPS) Program was developed in response to Section 319 of the federal Clean Water Act to address problems caused by non-point sources, such as the overland flow of stormwater or infiltration of pollutants into the groundwater. The three main sources of non-point runoff resulting in degraded water quality in Pennsylvania are agriculture, abandoned mine drainage, and urban runoff. Other sources include abandoned oil and gas wells, construction activities, land disposal, habitat modification, hydromodification, and silviculture (logging practices).

The Clean Water Act requires each state to prepare a Management Plan for its non-point source program. This Management Plan outlines the program components to be used to address non-point source problems including a variety of non-regulatory, financial, and technical assistance programs needed to improve and maintain surface and groundwater quality. Pennsylvania last updated its NPS Management Plan in 2008.

Pennsylvania has received more than \$83 million from the federal Section 319 Grant Program (FY 1990 - 2009). This money has been used to institutionalize a non-point source program, implement various innovative technologies to treat non-point source pollution problems, develop an educational program, and begin several comprehensive watershed initiatives. Other funding sources for non-point source pollution management include: Pennsylvania's Chesapeake Bay Program, the Nutrient Management Act, the County Conservation District Assistance Funding Program, the Stormwater Management Act Fund, the Coastal Zone Resources Program, USDA's

Environmental Quality Incentives and Conservation Reserve Enhancement Programs, and the Environmental Stewardship and Watershed Protection Grant, also known as Growing Greener.

Growing Greener has provided \$280.1 million in watershed grants since 1999. Local partners have added another \$511 million from their own resources. The tremendous value of the program became clear to legislators and Growing Greener funding was initially extended through 2012. This increased total funding to \$547.7 million from the original \$241.5 million allocated to DEP. The funding is being made possible through a \$4.25-per ton tipping fee on solid waste disposed in Pennsylvania's municipal waste landfills. In July 2005, Growing Greener II was passed which removed the 2012 sunset date on the tipping fee and increased funding for projects through 2010. An additional \$74.3 million has been allocated for watershed grants.

Monitoring of both land treatment and water quality for a five- to ten-year period is the best way to document the effectiveness of non-point source pollution control efforts. Pennsylvania has hosted 4 of the 24 EPA Section 319 National Monitoring Projects (NMP) across the country. Pennsylvania NMPs include: the Swatara Creek NMP, monitoring the effect of passive treatment on abandoned mine drainage; the Stroud Water Research Center NMP, monitoring a riparian buffer project in an agricultural watershed; the Pequea and Mill Creek NMP, using a paired watershed approach to monitor the effectiveness of agricultural best management practices (BMPs); and the Villanova Urban Stormwater BMP demonstration site, monitoring a suite of innovative stormwater management practices.

Four watersheds in Pennsylvania have been awarded EPA Targeted Watershed Grants: the Dunkard Creek Watershed, Christina River Basin Initiative, Upper Susquehanna River Basin Restoration, and Schuylkill River Watershed Initiative. The Targeted Watershed Grant is an EPA program designed to encourage successful community-based approaches and management techniques to protect and restore the nation's waters.

Part B2.3 (b) Highlights of Pennsylvania's Current NPS Program

Education and Outreach

Some of the Section 319 Grant Program involves projects fully or partially directed towards NPS education and outreach. Two initiatives funded through the Section 319 Grant Program that are directed entirely at education and outreach at the grassroots level include the Pennsylvania League of Women Voters (LWV) and the Pennsylvania Association of Conservation Districts (PACD). Using funds from the Section 319 Grant Program, The LWV Water Resources Education Network (WREN) supported eleven grants of up to \$5,000 in 2009 to enable groups of local citizens and officials to build community support for water resource protection. PACD's NPS Pollution Prevention Educational Mini-Grant program provided funding of up to \$2,500 each for 29 projects. These projects included the development of audio-visual products, exhibits or models, production of special events, marketing tools, publications, actual stream reclamation projects, hands-on water studies, and educational workshops.

Since 1999, the Growing Greener Program has funded 175 education/outreach projects for a total of \$10.2 million.

Building Capacity

DEP is working to establish a network of technical assistance providers to help watershed organizations effectively and efficiently achieve their watershed protection goals. These providers offer technical services to groups embarking on projects aimed at protecting and enhancing their local watersheds. Growing Greener currently supports seven technical providers.

Conservation district watershed specialists help local groups protect and improve their watersheds, provide expert advice to farmers and landowners for conservation practices, work with DEP regional staff, and help support local grant-funded restoration projects. There are now 67 Growing Greener - funded watershed specialists working in 66 of the state's 67 counties.

Pennsylvania's Watershed Approach

Pennsylvania is committed to a watershed approach for water resource management. Locally managed and monitored watershed improvement projects are essential to enhancing, maintaining, and reclaiming the Commonwealth's water resources.

More and more people are working to improve and protect Pennsylvania's watersheds by learning about their watersheds and sharing that information with their neighbors, restoring water quality through hands-on projects, and planning for the future through water resources management.

DEP provides assistance to local groups planning to implement restoration measures in watersheds where one or more TMDLs have been identified. The goal is to help such groups develop implementation plans more expeditiously and in a manner that fully complies with EPA requirements for additional funding under the Section 319 Grant program.

Thirty-four watersheds across the state containing water bodies with water quality impairments caused by non-point source pollution have been targeted to have watershed based implementation plans developed with funding from the Section 319 Grant program. The watershed based plans identify the type, number, and an estimated cost of best management practices needed to eliminate water quality impairments. This work, in turn, qualifies local sponsors to receive Section 319 Grant program construction funds for restoration projects that implement the TMDLs.

Abandoned Mine Reclamation

Eliminating drainage from abandoned mines and restoring rivers and streams to a healthy state represent significant challenges. The vast majority of impacts result from mines and mining practices of the past, predating the 1977 federal Surface Mining Control and Reclamation Act (SMCRA).

It's estimated that in Pennsylvania alone, the cost of addressing all of the environmental impacts of mining activities prior to the passage of SMCRA will exceed several billion dollars. Therefore, it's unlikely that public funds alone will ever be sufficient to tackle this monumental set of problems. Considering the scope of the challenge and the resources required to mount a successful clean-up program, it is widely recognized that an active, cooperative partnership between involved citizens, academia, industry, and public agencies is essential to properly address acid mine drainage or abandon mine drainage (AMD).

Growing Greener has contributed significantly toward addressing AMD issues. The projected accomplishments of these grants include over 5,600 acres of abandoned mine reclamation and over 600 miles of stream improvements. In the past two years alone, Growing Greener funds have been used to treat over 17 MGD of AMD affected water by plugging 10 oil and gas wells and constructing 16 treatment systems. Additionally, the Bureau of Abandoned Mine Reclamation awarded reclamation contracts using Growing Greener and Abandon Mine Land (AML) Program funds aimed at improving 1,572 acres of abandoned mine lands and installing 13 projects to reduce or treat Acid Mine Drainage (AMD).

The State's Section 319 Grant Program has also made a significant contribution toward correcting AMD problems using passive treatment systems. A total of 14 projects costing more than \$2.0 million to treat AMD through passive treatment were funded through this Program in the past two years.

The Western Pennsylvania Coalition for Abandoned Mine Reclamation (WPCAMR) was formed in 1982 by six western Pennsylvania conservation districts. Today 24 county conservation districts make up WPCAMR. In 1996, the Eastern Pennsylvania Coalition for Abandoned Mine Reclamation (EPCAMR) was formed covering 16 counties in the anthracite coal region and the northern bituminous region. Today EPCAMR represents a coalition of watershed organizations, reclamation partners, co-generation plants, the active anthracite mining industry, and regional non-profit organizations.

The goal of the coalitions is to provide leadership for building local watershed-based support and partnerships with grassroots organizations whose primary focus is abandoned mine drainage abatement and abandoned mine land reclamation.

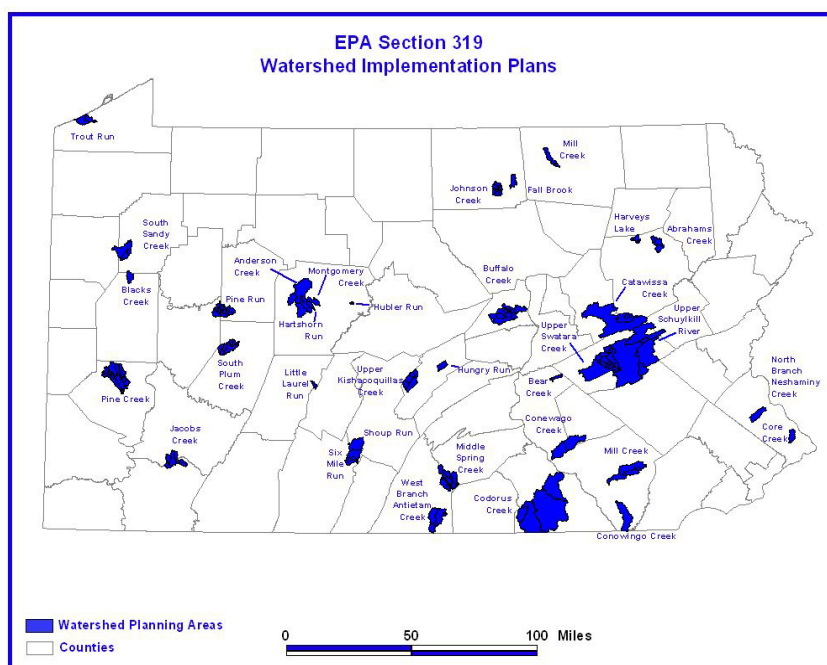
An important event in the battle to address AMD occurred in December 2006 when the Abandon Mine Lands (AML) Program was reauthorized in the final hours before Congress adjourned. The AML Reauthorization, which amends the 1977 Surface Mining Control and Reclamation Act (SMCRA), extends the AML Program for at least 15 years and will triple the AML funding Pennsylvania receives from reclamation fees collected on every ton of coal produced. In the next 15 years Pennsylvania should receive at least \$1.5 billion to clean up Priority 1 and 2 AML sites. States can also set aside up to 30% of this funding to address AMD problems not associated with Priority 1 and 2 sites. This extra funding will increase the number of AML problems that can be remediate; however, it will not be enough money to address all of the problems in Pennsylvania.

Agriculture and Nutrient Management

PA's Section 319 Non-point Source (NPS) Management Program provides significant financial and technical assistance resources toward reduction of agricultural sources of sediment and nutrients to surface waters. Section 319 grants have provided funding for substantial agricultural project implementation in the FFY2005 through FFY2009 grants:

FFY Grant Cycle	Dollars Awarded	# Projects
2005	\$462,192	5
2006	120,000	1
2007	114,000	1
2008	999,328	4
2009	153,687	2
Totals	\$1,848,207.	13

The FFY2005 through FFY2009, 319 grants were all in some stage of implementation during the 2007 through 2009 period. Section 319 Program agricultural projects are targeted to TMDL-approved watersheds with an approved Watershed Implementation Plan (WIP) or watersheds with 303(d) listed streams. Projects are being implemented in WIPs for agricultural NPS-impaired watersheds include Core Creek/Lake Luxembourg (Bucks County); Upper Kishacoquillas Creek (Mifflin); Conewago Creek (Dauphin); Mill Creek (Lancaster); Codorus Creek (York); Conowingo Creek (Lancaster); Mill Creek/ Stephen Foster Lake (Bradford); Hungry Run (Mifflin); and Buffalo Creek (Union). The figure below illustrates these agricultural WIP locations.



The PA NPS Program website provides detailed information on WIPs and the Pa NPS Program at <http://www.depweb.state.pa.us/watershedmgmt/>. Projects are being implemented in these watersheds to reduce impacts from nutrients, sedimentation/siltation, organic enrichment/low dissolved oxygen, and other causes of agricultural impairment. Program funds are used to develop and implement nutrient management and farm conservation plans and best management practices (BMPs) identified in these plans. Partnerships with the USDA-Natural Resources Conservation Service (NRCS) and county conservation districts assist with both plan and BMP implementation.

Agriculture, Communities and Rural Environment (ACRE), Act 38 of 2005, provides funds for agricultural project implementation. Over \$800,000 in funding through ACRE was provided for twenty-one grants that were completed as of September 2008. There was much less activity with ACRE grants during 2009. Grants were provided to local organizations, such as county conservation districts, to help agricultural operations come into baseline voluntary compliance with the PA Clean Streams Law and Chapter 91 and 92 Regulations. ACRE grants have facilitated conservation and nutrient management plan development for over 200,000 acres. Odor Management Plan regulations, also required under ACRE, became effective in February 2009. Certified planners develop an odor management plan when a Concentrated Animal Operation (CAO) or Concentrated Animal Feeding Operation (CAFO) is building or expanding a barn or manure storage structure.

The PA Nutrient Management Program, revised under Act 38 of 2005, addresses all farms that need to implement nutrient management planning. The Pennsylvania Nutrient Management Program (NMP) and CAFO programs have continued to coordinate efforts to maximize program results and to minimize duplication. The success of these and other related programs depends upon a partnership between the State Conservation Commission (SCC), DEP, Pennsylvania Department of Agriculture, conservation districts, private sector planners, and farm operators. In June of 2006, the SCC published major revisions to the NMP regulations with an effective date of October 1, 2006. For NMP plans, these revisions include application of the manure export requirements originally implemented in the CAFO program along with additional phosphorus management, manure and soil testing, minimum ground cover, and streamside buffer requirements. These revisions to the regulations were to be phased-in on existing farms over a three-year period ending on October 1, 2009. They are implemented immediately on new or expanding operations. For 2009, a total of 932 CAFOs were required to have NMPs, and an additional 1575 volunteer NMPs were developed.

In October 2005, revision of the Pennsylvania CAFO program regulations became final, so that Pennsylvania's program would be consistent with the federal Environmental Protection Agency's (EPA) CAFO rule. A major change under the revised program is the extensions of CAFO permit coverage to a large portion of the state's poultry operations. With the requirements for dry poultry and newly covered operations, total accepted applications rose from 170 CAFOs in March of 2006 to 341 as of March 31, 2009. DEP has the lead for implementation of the CAFO program and in 2008 completed its update to permits and forms, including gaining final approval for its NPDES General Permit. It has also updated its CAFO and nutrient management website, including development of a CAFO application review guidance document titled "Implementation Guidance for NPDES CAFO Permits and Water

Quality Management Permits for Manure Storage Facilities”. DEP maintains an annual inspection requirement in coordination with county conservation districts, and has worked through available information to assure all CAFOs are covered.

The Resources Enhancement and Protection Program (REAP) was created through Act 55 of 2007. REAP allows farmers and businesses to earn tax credits in exchange for approved BMP implementation on agricultural operations that will enhance farm production and protect natural resources. The program is administered by the SCC and the tax credits will be granted by the PA Department of Revenue. Farmers receive tax credits of up to \$150,000 per agricultural operation for 50% or 75% of the total cost of a conservation project, depending on the BMP implemented. Farmers also qualify for a 50% tax credit to purchase No-till planting equipment. In the first round of REAP funding in 2007-2008, approximately 650 BMPs were funded at a total cost of \$23.6 million (\$3.4 million public funds). Nearly \$10 million in tax credits were approved, and approximately \$5 million in credits were awarded as of November 30, 2008. Almost half of credits approved for eligible projects were for no till planting equipment. Waste storage facilities and animal heavy use area improvements were two other big ticket BMPs in FY 2007-2008. FY2008-FY2009 REAP applications were received in late 2008. Another \$10 million in credits were made available for 942 BMPs during the FY2008-FY2009 period, which ended June 30, 2009. The 942 BMPs had a total cost of \$23 million, of which \$2.67 million were public funds. No-till equipment and other BMPs were approved for tax credits on an approximately 50:50 funding split. For the FY2009-FY2010 REAP application period another \$5 million in tax credits was made available based on state budget funding levels.

PA’s Conservation Reserve Enhancement Program (CREP) continues to be implemented in the Susquehanna and Ohio River basins. Total enrollment in the Chesapeake Bay (Susquehanna River) CREP counties has increased to 176,222 acres of which there are 21,604 acres of forested riparian buffers. During the last year, enrollment has increased in this area by 4,200 acres, which includes 1,200 acres of riparian buffers. In the Ohio River CREP counties, total enrollment increased to 26,051 acres; an increase in 1,600 acres, including an increase of 117 acres of forested riparian buffers. The 2008 Farm Bill reauthorized CREP through December 2012. Enrollment can continue up to an acreage cap of 200,000 acres in the Chesapeake Bay CREP counties and the 65,000 acre goal in the Ohio River basin CREP. CREP expansion into PA’s portion of the Delaware River basin is being evaluated.

The 2008 Federal Farm Bill provides significant funding increases in the FFY2008 and FFY2009 funding cycles for USDA-NRCS agricultural conservation program implementation. PA’s mandatory program allocations for FFY2008 totaled \$19.04 million. FFY2008 USDA-NRCS Conservation Program accomplishments are available on the PA NRCS website at www.pa.nrcs.usda.gov/programs/accomplishments.html. Highlights include: FY2008: Conservation Security Program (CSP) 103 contracts, \$571,000; Environmental Quality Incentives Program (EQIP) 616 contracts, \$14.8 million. FY2009: Chesapeake Bay Watershed Initiative (CBWI) 323 contracts, \$5.4 million (first year for this program); EQIP - 344 contracts, \$12.8 million. There were no new CSP contracts in FY2009. These are the PA NRCS primary funding programs for environmental improvement with farmers for nutrients, erosion and sedimentation control. FY2010 CBWI criteria are currently being evaluated. CBWI funding is

expected to double in 2010. CBWI priority watersheds for FY2009 and a list of priority practices are available on the PA NRCS website at www.pa.nrcs.usda.gov/.

The Environmental Stewardship and Watershed Protection Act of 1999 and the Watershed Stewardship Act 45 of 2005, also known as Growing Greener II, provided significant monies for agriculture projects from 2007 through 2009. Growing Greener (GG) II funding was exhausted and unavailable for the 2009 Growing Greener grant round. Growing Greener I and Growing Greener II funded many watershed restoration projects addressing agricultural NPS issues through county conservation districts and local watershed groups. The program has also invested millions of dollars to implement agricultural BMPs through statewide initiatives including the Susquehanna and Ohio River basin CREP, Chesapeake Bay Foundation Farm Stewardship, and PA Association of Conservation District Technical Assistance grants. Statewide and local GG-funded projects combine resources with Section 319 NPS agricultural projects, USDA-NRCS Farm Bill conservation programs, the ACRE program, and local agricultural watershed restoration initiatives. Agricultural NPS project funding through the GG Initiative’s 2007 and 2008 grant rounds are shown in the following table:

	GG I \$ awarded	GG II \$ awarded	Total # projects
2007	\$ 966,598.	\$680,126.	13
2008	\$ 747,958.	\$2,116,479.	24
Totals	\$1,714,556	\$2,796,605.	37

Stream Corridor Protection and Restoration

Natural stream channel design addresses the entire stream system. It is based on fluvial geomorphology, or FGM, which is the study of a stream’s interactions with the local climate, geology, topography, vegetation, and land use - how a river carves its channel within its landscape. All successful natural stream channel designs address sediment transport, habitat enhancement, and bank and channel stabilization. Natural stream channel design (NSCD) is relatively new to Pennsylvania. Our understanding of what works best to restore a channel’s natural stability is still evolving, particularly across a state as diverse in geography and land use as Pennsylvania. The Guidelines for Natural Stream Channel Design for Pennsylvania Waterways were developed with funding through a Section 319 grant by the Keystone Stream Team, an informal group comprised of government and environmental resource agencies, university researchers, sportsmen, citizen-based watershed groups, and private companies. These guidelines are aimed at watershed organizations and professionals involved in stream restoration design, construction, and permitting. The guidelines can be found at http://www.canaanvi.org/canaanvi_web/community.aspx

The Keystone Stream Team used a Section 319 grant to develop a web-based database for reference reach information collected on NSCD projects. A Section 319 grant also enabled the U.S. Geological Survey to develop Regional Curves. More information on both projects is available on the Keystone Stream Team’s website at: www.keystonestreamteam.org.

In addition, the 319 Grant Program has provided over \$2.15 million in the past five years to fund nineteen projects on selected streams using NSCD techniques.

Since 1999 Growing Greener has funded 40 FGM implementation projects for a total of \$5.2 million.

Documenting Restored Waterbodies

Significant funding has been provided over the past several years from non-point source funding programs such as Growing Greener and Section 319 Grant programs supporting stream and lake assessment, planning, and restoration activities. Hundreds of projects have been successfully completed. Those activities are beginning to show water quality improvements, but efforts to document them have generally been localized and inconsistent.

During 2007, DEP launched a coordinated effort to identify waterbodies across the state in which significant improvements to water quality have been observed. Stream names and locations were solicited from DEP watershed managers, conservation district watershed specialists, and citizen volunteer monitoring groups. DEP biologists then surveyed these waterbodies to determine the extent of their recovery and their potential to be removed from the State's impaired list. A total of 25 streams were surveyed in 2008 and 2009. Analysis of the survey results is on-going and changes to the Integrated Report will be made as they become available. The Department has petitioned EPA to remove four additional streams from Category 5 of the Integrated Report as the designated uses are now attaining as the result of abandon mine drainage remediation projects in these watersheds. The streams are Babb Creek, Gum Boot Run, Lloydville Run (an Unnamed Tributary to Bells Gap Run), and Sterling Run.

Many other waterbodies have shown improved water quality, but have not improved enough to be removed from the impaired lists. As more non-point source funding is applied in these watersheds, it is anticipated that water quality will continue to improve and additional stream segments will be removed from impaired status.

Part B2.3(c) Total Maximum Daily Load Development (TMDL)

Impaired waters are those waterbodies that do not or will not meet water quality standards even after the application of all required technology-based treatment and other pollutant control requirements. DEP assesses Commonwealth waters and places impaired waters in Category 5 of the Integrated Report. Impaired waters require the development of a TMDL. A TMDL is the amount of pollutant loading that a waterbody can assimilate and still meet water quality standards. A TMDL is the sum of individual wasteload allocations (WLAs) for point sources, load allocations (LAs) for nonpoint sources, and a margin of safety. DEP uses mathematical models to develop the TMDLs.

TMDLs are planning tools that set water quality objectives for impaired waters. Meeting the water quality objectives of the TMDL will result in the attainment of water quality standards. If,

however, a waterbody is found to still be impaired after meeting the TMDL objective, the TMDL is reconsidered and new objectives set.

TMDLs are developed for the sources and causes of impairment that are identified in Category 5 of the Integrated Report. In the years 2008 and 2009, DEP completed 110 TMDLs establishing allocations to the appropriate sources of pollutant loading. Individual WLAs are the amounts of the load allocated to point sources. WLAs are the basis for setting limits in National Pollutant Discharge Elimination System (NPDES) permits, which are the implementation procedures used to correct pollution problems attributed to point source discharges. The LA portion of the TMDL is the amount of the load that is allocated to categories of non-point sources. The LAs are the basis of future watershed restoration plans, which are the first part of correcting non-point source pollution problems.

The development of an implementation (or restoration) plan begins with a more detailed assessment of a watershed. The detailed assessment includes an analysis of the known water quality, identification of quantities and locations of pollution sources, and selection of priorities for corrective action. It concludes with a description of the management measures needed to restore and maintain water quality, and it provides for public input concerning water quality problems and the restoration measures needed. The result of these activities is a management plan that includes the goals and objectives for improving water quality, an estimate of the technical and financial resources needed to implement the plan, an education program, and monitoring to demonstrate the success of the plan. The document also includes a budget and a timetable for implementation that identifies interim milestones. DEP will encourage local groups, watershed associations, or county conservation districts to take the lead and/or play an active role in completing detailed assessments and developing the implementation plan. Grant monies from the CWA Section 319 Non-point Source Program and the Commonwealth's Growing Greener program can be used to complete these assessments. The final plan should meet the objective set in the TMDL.

Part C: Surface Water Quality Monitoring and Assessment

Part C1.1 Water Quality Standards Program

Water Quality Standards (WQS) are the combination of water uses to be protected, the criteria (i.e. levels of substances) that need to be maintained or attained to support the uses, and an antidegradation policy. WQS are important elements of Pennsylvania's water quality management program because they set the general and specific goals for the quality of our waters. WQS are instream water quality goals that are achieved by imposing specific regulatory standards, such as treatment requirements and effluent limitations on point sources of pollution and best management practices on non-point sources.

Pennsylvania's WQS are found in DEP's rules and regulations at 25 Pennsylvania Code Chapter 93 (Water Quality Standards). General or narrative criteria applicable to all waters are designed to control those substances not identified by specific criteria but which may be harmful to protected water uses or to human, animal, plant or aquatic life if present in excessive amounts. Specific water quality criteria are contained in Chapter 93, including criteria for toxic substances identified as EPA priority pollutants, as well as other substances (available electronically at www.pacode.com).

Water quality standards implement the provisions of Pennsylvania's Clean Streams Law (35 P.S. Section 691.1 et seq.) and Section 303 of the federal Clean Water Act (33 U.S.C.A. § 1313). The authority of the Environmental Quality Board to promulgate and amend water quality standards is found in Sections 5 and 402, of the Clean Streams Law and in Section 1920-A of the Administrative Code of 1929 (71 P.S. Section 510-20).

Section 303(c) of the Federal Clean Water Act requires that "... the state shall from time to time (but at least once every three year period) hold public hearings for the purpose of reviewing applicable water quality standards and, as appropriate, modifying and adopting standards..." The review and revisions to WQS are part of Pennsylvania's continued planning process and water quality management program. The development and review of WQS and the complementary water quality assessment program consider the fundamental policies that are set forth in state and federal law which includes the national goal to achieve "fishable/swimmable" waters.

Pennsylvania's recently concluded triennial review includes amendments to Chapter 93 to incorporate updated and revised criteria for toxic substances that were previously contained in Chapter 16 Water Quality Toxics Management Strategy – Statement of Policy. Other amendments include clarifications of terms and definitions, drainage list corrections, a review of waterbody segments that do not meet the fishable or swimmable uses, and other corrections of typographic, format, and grammatical errors. In addition, DEP adopted revisions to Chapter 16 for updates to the human health criteria methodologies and updates or corrections to the approved analytical methods. This triennial review of Pennsylvania's WQS was submitted to the US EPA Region 3 Administrator on July 9, 2009 for review and approval following adoption as final rulemaking at the January 20, 2009 Environmental Quality Board (EQB) meeting, and

publication in the Pennsylvania Bulletin on May 16, 2009 (39 Pa.B. 2523). These amendments are based on proposed rulemaking, with some modification, that were approved by the EQB at its October 16, 2007 meeting, which were published in the Pennsylvania Bulletin on January 12, 2008 (38 Pa.B. 236, 248) with provision for a 45-day public comment period, including public meetings and hearings that were held at the Department's Southcentral Regional Office in Harrisburg, PA on February 14, 2008. A correction was published in the Pennsylvania Bulletin on February 2, 2008 (38 Pa.B. 612) to correct the criteria for two chemicals found in the proposed Table 5, § 93.8c (relating to criteria for toxic substances). Based on a request received, the public comment period was extended an additional 30 days and closed on March 27, 2008, as published in the Pennsylvania Bulletin on February 23, 2008 (38 Pa.B. 976).

Although EPA approval is still pending on the current triennial review that was submitted on July 9, 2009, the Department is in the preliminary stages of initiating the next triennial review of Pennsylvania's WQS. The scope of the next triennial review is being developed, but at a minimum will include consideration of updates to aquatic life and human health criteria that have been issued by EPA, and that were not considered during previous triennials. Exclusion of the water contact (swimmable) use in a portion of the Delaware Estuary (RM 108.4 to RM 81.8), and from the outer Erie Harbor/Presque Isle Bay harbor basin and central shipping channel will be evaluated to determine whether conditions still prevail that warrant these exclusions from Pennsylvania's WQS. The Department is also reevaluating the existing dissolved oxygen and temperature criteria, as well as considering the development of new water quality criteria for pollutants not currently regulated, or where water uses may not be adequately protected through existing criteria. The latter is mostly related to concerns about emerging contaminants associated with pharmaceuticals and personal care products, and wastewater issues related to Marcellus shale drilling and other resource extraction activities within the Commonwealth. Rulemaking associated with the next triennial review is expected to be initiated during summer 2010, for completion as final rulemaking during 2011. Development of the proposed rulemaking phase will be shared with other affected agencies, EPA and appropriate advisory committees. Once proposed, the triennial review will include provision for public participation, with a period (minimum of 45 days) to allow for public review and comments for consider in the development of final rulemaking.

The Antidegradation Implementation Guidance, completed in 2003, is designed to apply DEP's antidegradation regulation, partially approved by EPA in 2000 and finally approved in 2007. With the completion of the guidance, U.S. Environmental Protection Agency (EPA) is in the process of removing its promulgation of an antidegradation regulation for Pennsylvania. The antidegradation policy, which applies to all waters, mandates that existing uses are maintained and protected, and that the existing quality of High Quality and Exceptional Value waters are also maintained and protected.

In Pennsylvania, water uses that are protected statewide include Warm-Water Fishes; Potable, Industrial, Livestock, Wildlife, and Irrigation Water Supply; and Boating, Fishing, Water Contact Sports, and Esthetics. Other uses, such as Cold-Water Fishes, Trout Stocking, High Quality or Exceptional Value waters, navigation, and others, are protected as applicable on a waterbody by waterbody basis.

Portions of only two waterbodies in the Commonwealth have been shown to not fully support the federal “fishable/swimmable” goal. The water contact (swimmable) use is excluded from RM 108.4 to RM 81.8 in the Delaware Estuary because of significant impacts from combined sewer overflows, and from the outer Erie Harbor/Presque Isle Bay harbor basin and central shipping channel due to the hazards to recreational users posed by commercial shipping traffic.

Part C1.2 Plan for Achieving Comprehensive Assessments

In 1996, DEP developed a strategy for the statewide assessment of wadeable free-flowing streams involving a basic field-level biological screening assessment. After completing the first-ever statewide assessment of the state’s wadeable surface waters in April 2007, DEP replaced the original protocol with a new, more intensive assessment protocol for the second statewide assessment. DEP’s new plan for achieving comprehensive, statewide assessment of its surface waters is based on the implementation of the Instream Comprehensive Evaluation (ICE) program.

The ICE program is designed to assess the water quality of previously assessed streams with a more rigorous methodology. It is based on a survey design that includes both probability based and targeted sampling within one major sub-basin in each of six DEP regions. Initial fieldwork began in 2005 in the Delaware drainage and was expanded to include the first set of six regional sub-basins in the rest of the state. A new set of six sub-basins will be surveyed upon completion of the previous six basins and repeated on a rotating-basin schedule thereafter. This is a cooperative effort led by Office of Water Management, with assessments being conducted by Department field and central office staff.

The ICE program uses an intensive biological assessment protocol that is a modification of EPA’s Rapid Bioassessment Protocol (RBP) III method, which includes laboratory identification of benthic macroinvertebrates to genus level and an RBP habitat assessment. Each biological assessment results in an Assessment Summary for input to the 305(b) assessment database and GIS that identifies waters with obvious aquatic life use impairment and those with no obvious impairment. In addition to these stream assessment projects, a lake assessment element is also being implemented. Lake sampling efforts are described in the Lakes Water Quality Assessment section.

Part C1.3 Intensive Surveys

Intensive surveys have been a key element of DEP’s water quality assessment program since their inception in 1965. These chemical and biological stream and lake investigations are conducted to gather background or baseline data on specific streams or lakes to determine the effects of point and/or non-point source discharges on receiving water quality, provide data in support of administrative or enforcement actions, determine the source of spills of pollution materials and evaluate their effect on water quality, and assess the distribution and accumulation of trace metals and selected organics in fish tissue or sediments. These surveys can include any combination of chemical sampling of water, effluent, sediment, or fish tissue; flow measurement;

qualitative, quantitative, or semi-quantitative EPA RBP macroinvertebrate sampling; qualitative or quantitative (RBP) habitat assessment; or qualitative (and sometimes quantitative) fish sampling. While the current emphasis is on evaluation of waters previously assessed as attaining designated uses (discussed in the previous section), other types of intensive surveys remain important to the Commonwealth's water quality management program.

An important element of DEP's water quality assessment program is the evaluation of candidate waters for Special Protection designation as High Quality (HQ) or Exceptional Value (EV) Waters. These targeted, intensive surveys involve field studies of habitat and the aquatic community, observation of land use, and field and other known information to determine if a basin or stream segment qualifies for Special Protection in the Antidegradation program. Streams receiving HQ or EV designation are protected to maintain their existing quality.

Part C1.4 Ambient Fixed Station Monitoring

The Pennsylvania Water Quality Network (WQN) is a statewide, fixed station water quality sampling program operated by Bureau of Water Standards and Facility Regulation. It is designed to assess both the quality of the Commonwealth's surface waters and the effectiveness of the water quality management program by accomplishing four basic objectives:

1. Monitor current status and temporal water quality trends in major surface streams (routine stations)
2. Monitor current status and temporal water quality trends in selected reference waters (reference stations)
3. Monitor current status and temporal water quality trends in major tributaries entering the Chesapeake Bay
4. Monitor current status and temporal water quality trends in selected lakes

Major streams are considered to be interstate and intrastate waters with drainage areas of roughly 200 square miles or greater. These waters receive both point and non-point source pollutants and are sampled at or near their mouths to measure overall quality before flows enter the next higher order stream. In this way, current water quality status and trends can be established and the effectiveness of water quality management programs can be assessed by watershed. In addition, reference stations are selected to represent: 1) "ambient" waters of natural quality minimally affected by human activities; and 2) "typical" waters with quality representative of that normally found in the region of the state being sampled.

The WQN consists of 105 routine stations generally sampled bi-monthly for stream discharge measurements and physical/chemical analysis, and every other year for biological evaluation. Twenty-five reference stations are generally sampled monthly for stream discharge and physical/chemical analysis and annually for biological evaluation. Also, 27 Chesapeake Bay loading stations are sampled monthly for stream discharge and physical/chemical analysis and

every other year for biological evaluation. In addition, these bay loading stations are targeted for sampling 8 times per year during storm events.

Single mid-channel or spatially composite, depth-integrated samples are collected at each site depending on stream size. Stream discharge (flow volume) is measured or calculated each time a water sample is collected. United States Geological Survey (USGS) stream gauging facilities and/or extrapolation equations are utilized whenever possible. Where no USGS facilities/equations exist, stream discharge is measured by U.S. Army Corps of Engineers and private facilities, or calculated according to methods outlined by USGS. At a minimum, macroinvertebrate samples are collected every other year at both routine and Chesapeake Bay load monitoring stations between August 1 and October 31 and annually at reference stations during fall (November 1 – December 30) or spring (March 1 – April 30) utilizing DEP benthic sampling methodology adapted from EPA Rapid Bioassessment Protocols.

Fish tissue is sampled periodically at the rate of about 100 WQN samples per year. Sampling locations are determined annually. Sampling is rotated through the network to provide periodic complete coverage and to maintain surveillance on problem waters. Fillets are sampled for appropriate pollutants in order to assess suitability for human consumption.

Lakes included in the WQN (except for Lake Erie and Presque Isle Bay that are part of the base network) are selected after consideration of size, public access, intensity of use, and availability of existing data. Large lakes with heavy public use and/or historical data are favored for inclusion because changing trends in the water quality of these resources have the potential for serious impacts on water uses.

In the past, lakes have been scheduled for annual sampling in groups of 15 to 20. Lake groups are sampled once a year for five consecutive years before initiating a new group. The five-year data blocks were then used to assess lake water quality trends. Sixteen lakes are currently being sampled in addition to Lake Erie and Presque Isle Bay. Lake levels for Lake Erie and Presque Isle Bay stations are measured at the U.S. Coast Guard station at the entrance to Erie Harbor.

Lake Erie and Presque Isle Bay samples are collected at mid-depth. Two samples are collected from one site on each of the other lake monitoring sites during mid-summer stratification. These sites correspond to the deepest point in each lake, with one sample collected one meter below the surface and the second sample one meter above the lake bottom. A temperature/dissolved oxygen profile is recorded through the vertical water column and an aliquot from the shallow sample is filtered for chlorophyll a analysis.

Qualitative plankton samples and chlorophyll a are collected annually from Lake Erie and Presque Isle Bay. Quantitative invertebrate or plankton sampling and qualitative or quantitative fish sampling is optional at other lakes and may be conducted at the discretion of the collector.

Part C1.5 Lake Water Quality Assessments (LWQA)

Lake assessments include data from the Lake Water Quality network sampling, which is conducted on a 5-year rotating basis using summer samples. Additional data is collected from Lake Trophic Status studies on a 3-time per year sampling regime to determine lake status and to evaluate the need for phosphorus point source controls. Trophic State Index (TSI) sampling has been completed by DEP, a cooperative DEP/DCNR program, and the DEP Citizen Volunteer Monitoring Program (CVMP). Citizen volunteer monitors have been trained to collect data on both public and private lakes to contribute to the lake assessment databases.

Lake watershed assessments since 1995 have been funded under EPA Section 319 grants and under Pennsylvania's Growing Greener grant program, as well as through EPA's special 106 appropriation funds. Several statewide LWQA (Lake Water Quality Assessment) projects have been funded to assess the status of some important Pennsylvania lakes and to help refine the state's lake database. The most recent statewide survey was the assessment of 18 randomly chosen PA lakes, as part of EPA's National Lake Survey conducted in 2007. Currently, data are available in a draft report and will be finalized by EPA in 2010.

Lake impairment screening to determine the TSI, identify water quality violations and determine impacts on recreational uses and aquatic life is ongoing statewide. TSI lake survey results, along with fish and aquatic macrophyte survey data are used to determine lake use attainment status. These studies identify waterbodies in need of more in-depth (Clean Lakes Phase I type) studies. Phase I assessment studies evaluate existing water quality conditions in the lake and watershed, identify sources and magnitude of pollutants, and recommend lake and watershed management plans to restore or protect water quality. Phase II projects continue documentation of water quality conditions and also implement lake and watershed BMPs as recommended in the Phase I management plan.

Institutional BMPs, (environmental education efforts, such as workshops and outreach), are integral components of successful projects and can be as important as structural BMPs. Continued water quality studies are recommended to monitor the success of control efforts. Also, TMDL lakes are targeted for monitoring on a continuing basis, post BMP installation, so that water quality improvements may be detected and reported. Several of the TMDL lakes are improving and have been subjects of "Success Stories" (DEP website: http://www.portal.state.pa.us/portal/server.pt/community/nonpoint_source_management/10615/success_stories/554277 and EPA's "Success Stories" featured on their website: <http://www.epa.gov/reg3wapd/nps/success/index.htm#pa>).

Pennsylvania's definition of a "significant lake" is a waterbody with public access and a hydraulic residence time of 14 days or more. Pennsylvania has 219 verified significant lakes totaling 98,942 acres. Another 156 public waterways are used as lakes but may not have a 14-day residence time. Additionally, PA has at least 171 verified natural lakes (16,389 acres, some enhanced by a dam). Lake assessments are done on "significant lakes" as well as other lakes by DEP and various partners including USGS, EPA, citizen volunteers, Department of Conservation and Natural Resources (DCNR), Morris Arboretum, Conservation Districts, ACOE, the Lake

Wallenpaupack Watershed Management District and consultants. Since the 1997 TMDL Lawsuit, 311 lakes have been assessed for water quality; and since 1999 (10-yr span), 292 lakes have been assessed using DEP's lake water quality protocol. In the past 6 years, other data on lakes such as, aquatic macrophyte coverage, fishery data, and Department of Health beach bacteria data have been incorporated into the lake assessments for the Integrated Report. In 2009, DEP acquired microcystin analytic capability, and Regional field offices collected limited data during the 2009 summer recreational period. Residents in the vicinity of one lake in the northeast Region were issued a warning for dangerous microcystin levels in June 2009. DEP will be working with the Department of Health to outline warning levels and protocols as guidelines for Regional offices. Lakes assessed through the 2009 field season are included in this report. Continued monitoring specific to each Use category is ongoing in an effort to achieve a comprehensive statewide lake assessment.

Basic water quality assessments are done on lakes under three main programs in Pennsylvania:

- LWQN – a statewide set of lakes sampled by field office biologists once per summer for 5 years. A set of 16 lakes were selected in 2006 for a five-year sampling round in the WQN program. These lakes will be included in the 2012 Integrated Report. Data from these lakes are available in the STORET database.
- Lake TSI studies – As of 2007, all six DEP field offices have incorporated TSI studies in their survey protocol to determine if phosphorus controls are needed for point source discharges in the lake watershed or to determine current trophic status on a lake with older or no data. Samples are collected three times in 1 year (spring, summer and fall), at a minimum of two stations at surface and bottom locations. Each Regional field office samples at least two lakes per year under this program.
- Lake Citizen Volunteer Monitoring Program - Citizen volunteer monitors have been recruited and trained to collect lake data for assessment purposes; and since 2001, volunteer monitoring data has been collected for 49 lakes. Due to State budgetary cuts the CVMP Lake Program was suspended at the end of the 2009 field season.

Lake data from the above efforts are reviewed to evaluate support of designated uses and compliance with water quality criteria. Updated Lake assessment methodologies have been publicly reviewed and are posted on DEP's Water Quality webpage at http://www.portal.state.pa.us/portal/server.pt/community/water_quality_standards/10556/2009_assessment_methodology/666876. The results of these assessments are presented in the Integrated Report and are summarized in this section.

Lake acreages are standardized to the acres reported in the National Hydrography Data set (NHD) where possible. Some differences in reported acreages will remain until all data are extracted from only the NHD layer and errors in the NHD layer are corrected. Until all the lake data can be entered and retrieved from the ICE computer application, lake numbers reported for various statistics and tables will be variable.

Part C1.6 Citizens' Volunteer Monitoring

In 1996 DEP initiated the Citizens' Volunteer Monitoring Program (CVMP) to provide support and technical assistance to volunteer monitoring efforts. Involvement of individuals and organizations in monitoring water quality of streams, rivers, and lakes creates an informed constituency that understands the powers and limitations of scientific information. Numerous groups are involved statewide in monitoring activities.

CVMP goals included:

1. Helping citizens know their water resources better.
2. Demonstrating that volunteers collect quality data that is credible.
3. Acting as a liaison between volunteers, service providers, and other DEP programs.
4. Enabling volunteer monitors to collect quality assured data that can be used by DEP.

The CVMP provided workshops, training, and quality assurance sessions for volunteer monitors throughout the state. It created a technical handbook that includes specific guidance for volunteers in designing their monitoring plan, numerous protocols for monitoring at differing levels of expertise, and a volunteer monitoring code of ethics. The handbook includes useful information to help volunteers determine how the data they collect might be used to meet their monitoring goals.

To help meet DEP needs, the CVMP has worked in partnership with various groups to collect data. A bacteria-monitoring partnership resulted in data that can be used to determine recreational use attainment of streams for the Integrated Water Quality and Monitoring Assessment Report. A volunteer lake monitoring project also provides data for use in this process. Working both internally and with volunteers, the program is taking part in monitoring to gauge the effectiveness of restoration projects including Conservation Reserve Enhancement Projects.

The CVMP provided guidance and technical assistance to the Senior Environment Corps throughout the state. The Corps uses standardized protocols to assess physical, chemical, and biological indicators in streams. These data can be used as screening tools to determine where further study is needed and to check on the success or failure of restoration efforts. Under the guidance of program staff, most Corps member groups have developed or are developing study designs to guide and broaden their monitoring efforts.

Due to serious budget deficits, all departments within state government were asked to reduce spending and maximize efficiencies to meet their highest priorities. As a result, DEP made operational changes that affect the CVMP. In July 2009 DEP began limiting its direct technical and financial support for volunteer monitors to specific projects that result in the generation of quality assured data related to DEP's highest priorities and staff previously dedicated to the CVMP were reassigned duties directly related to meeting those priorities. Certain CVMP

projects directly related to DEP's priorities that are already underway will continue. These include working with 319 program staff and volunteers to monitor sections of streams to assess impacts from natural stream channel design structures, which are supported by 319 monies and monitoring Conservation Reserve Enhancement Program (CREP) activities to assess the effectiveness of these practices.

Requests from volunteer monitors for services previously provided by the CVMP such as routine technical assistance and training on preparation and implementation of a locally driven monitoring plan are being directed to DEP's partner agencies in the Consortium for Scientific Assistance to Watersheds. The Consortium is funded through a Growing Greener grant administered by DEP.

Part C1.7 Existing and Readily Available Information

In an effort to utilize all existing and readily available data, DEP contacted about 500 potential outside data sources (federal, state, and local governments; universities; advisory groups; citizen monitoring groups; watershed associations; public interest groups; and sportsmen's groups) to request information regarding water quality. Each group on the mailing list received materials that briefly explained the reasons why DEP was soliciting information from them. Minimum quality assurance standards for the data were made available on DEP's website. Those groups with data and/or information regarding water quality limited segments were requested to fill out a data submission form and return it, along with any pertinent supporting documentation, to DEP.

For any given listing cycle, DEP determines the accuracy and validity of existing and readily available data and information provided by outside groups based on a set of minimum quality assurance requirements. These requirements include the specific location of the reported impairment, identification of the particular water quality standards violation(s), data to substantiate the conclusion of impairment, identification of the source(s) and cause(s) of impairment, and the presence of a quality assurance/quality control plan. Acceptable data from these sources are then included in the assessment database to prepare the use support summary in this narrative report and the five-part list of waterbody-specific use support decisions. More detail on this process is provided in the assessment and listing methodology document associated with the five-part list.

Two macroinvertebrate stream surveys were submitted to DEP for inclusion in the 2010 Integrated Report. The Lititz Run Watershed Alliance submitted a macroinvertebrate survey for Lititz Run, tributary to Conestoga River, in Lancaster County. Macroinvertebrate identification was completed to family level instead of genus level as specified in DEP protocol, which is the basis for excluding this survey from the report.

Muhlenberg College Professor Dr. Patricia Bradt submitted a macroinvertebrate survey for Bushkill Creek, tributary to Delaware River, in Northampton County. Data was collected using Surber and Hess samplers in 1972-1977 and 1994-2006. DEP sampling method utilizes a 6D

kick net in order to cover a 1 m² area compared to the 0.03 m² obtained by the Surber and Hess samplers. The report describes a decrease in number of Trichoptera over time but Empheroptera and Plecoptera numbers remain constant. DEP surveyed Bushkill Creek in April 2009 and determined the stream was attaining for aquatic life despite the report showing decreases in the amount of Trichoptera over the years.

DEP works with Dept of Conservation and Natural Resources (DCNR) and the state Dept. of Health (DOH) to obtain Escherichia coli results for beach monitoring at state park and private beaches, respectively. Information obtained from the agencies is utilized to target sampling efforts by DEP for fecal coliforms the following bathing season. Beaches monitored by DEP for fecal coliforms are then assessed for recreational use attainment. No beaches monitored by DCNR in 2008 were target by DEP to be included in the 2010 Integrated Report.

The Citizen Volunteer Monitoring Program and the Division of Water Quality Standards solicited volunteers across the state for bacteria sampling. Volunteers from Senior Environmental Corps (SEC), Watershed Associations, County Conservation Districts and Delaware River Basin Commission (DRBC) staff were trained by DEP in adherence to sampling protocol and quality/assurance plans to ensure data collected would be usable for recreational use assessments. Twenty-seven SECs and Watershed Associations, and six County Conservation Districts participated in the collection of fecal coliform samples at eighty-three sites on forty-nine streams. DRBC sampled an additional twenty sites on eleven streams. Data submitted from the various groups resulted in twenty-three stream attainments and thirty-nine stream impairments for recreation.

Part C2.1: Assessment and Methodology

Because of its length, the 2009 Assessment Methodology is not included with this report but rather is posted separately on DEP's website. It is available electronically at www.depweb.state.pa.us. Use the following keywords: Water, Water Quality, and, finally, 2009 Assessment Methodology.

The Methodology describes the collection and analytical methods used to evaluate stream assessment information. The resulting assessments comprise the stream miles, lake acreages, and attained/impaired status reported in the 2010 Integrated Report.

The 2009 Assessment Methodology contains the following protocols:

Watershed Assessments
Instream Comprehensive Evaluations (ICE)

Macroinvertebrate Stream Protocols
Limestone Streams
Multi-Habitat (Pool/Glide Streams)
Riffle/Run Freestone Streams

Lake Protocols
Lake Assessment
Aquatic Macrophyte Coverage Procedures for Lake Assessments
Lake Fisheries
Evaluation of Phosphorous Discharges to Lakes, Ponds, and Impoundments
Plankton Sampling
Chlorophyll A Sampling

Chemistry and Bacteria
Chemistry Evaluations
Fish Tissue Sampling
Bacterial Sampling

Natural Sources
Natural Pollutant Sources

Outside Agency
Outside Agency Data

Appendices
Appendix A – Source and Cause Definitions
Appendix B – Taxa Tolerance Values

Part C3.1 Stream Use Support

Table 2 is a summary of the four use support categories used in listing. Miles “supporting” are the number of miles not impaired for an assessed water use; “impaired” are not supporting the assessed use and requiring a TMDL; “approved TMDL” refers to impaired segments for which an approved TMDL is in place to address the problem(s), and “compliance” lists stream miles impaired but expected to improve in a reasonable amount of time because formal agreements are in place obligating responsible parties to take corrective action. “Pollution” is a special category of impairment listing problems that cannot be addressed through a TMDL because they are not caused by pollutant loading. “Assessed” represents the total miles surveyed for that use.

Table 3 summarizes the sources of impairment problems and Table 4 the causes. Note that totaling the sources or causes will not equal the miles summarized in Table 2 because a given waterbody may have multiple sources and/or causes. The tables are statewide summaries. The individual source/cause pairs for each waterbody are found on Categories 5, 4b, and 4c. The lists are large and, as a result, are provided separately in electronic format.

Table 2
Statewide Assessment Summary
A statewide summary of use support status for four water uses in assessed streams

	Aquatic Life Use	Fish Consumption Use	Recreational Use	Potable Water Supply Use
Streams (miles)				
Assessed	84,867	4,337	1,397	2,883
Supporting	68,320	2,430	701	2,762
Impaired	9,413	1,195	688	107
*Approved TMDL	6,105	712	8	14
Compliance	65	---	---	---
**Pollution	2,580	---	---	---

* TMDL miles reported here are only those overlapping impaired segments. A TMDL allocation may include an entire watershed, including streams listed as attained.

** 1,616 miles have both pollution and pollutant problems

Table 3
Statewide Assessment Summary
Sources of Impairment: Streams
Totals Include List 4a, 4b, 4c, and 5
(Mile totals will not equal Table 2 because a waterbody can have multiple impairments)

Source	Designated Use (Miles)				Total
	Aquatic Life	Fish Consumption	Recreation	Water Supply	
Abandoned Mine Drainage	5,475			35	5,510
Agriculture	5,380		65	39	5,484
Source Unknown	403	1664	617	39	2,723
Urban Runoff/Storm Sewers	2,299		14		2,313

Road Runoff	871				871
Small Residential Runoff	711				711
Habitat Modification	615				615
Municipal Point Source	394		6	5	405
Removal of Vegetation	394				394
Atmospheric Deposition	383				383
Channelization	322				322
Other	309		1	9	319
Bank Modifications	272				272
Land Development	226				226
On site Wastewater	200		5		205
Erosion from Derelict Land	200				200
Industrial Point Source	120	29		23	172
Construction	164				164
Natural Sources	162				162
Upstream Impoundment	155				155
Hydromodification	142				142
Subsurface Mining	106			23	129
Flow Regulation/Modification	117				117
Surface Mining	113				113
Combined Sewer Overflow	110				110
Petroleum Activities	52			23	75
Golf Courses	53				53
Package Plants	20				20
Silvaculture	19				19
Land Disposal	14				14
Highway, Road, Bridge Const.	12				12
Draining or Filling	10				10
Recreation and Tourism	3				3
Logging Roads	2				2
Dredging	1				1

Table 4

Statewide Assessment Summary
Causes of Impairment: Streams
Totals Include List 4a, 4b, 4c, and 5

(Mile totals will not equal Table 2 because a waterbody can have multiple impairments)

Cause	Use Designation (Miles)				
	Aquatic Life	Fish Consumption	Recreation	Water Supply	Total
Siltation	8,270			3	8,273
Metals	5,057			12	5,069
pH	2,728				2,728
Nutrients	2,596			35	2,631
Water/Flow Variability	1,476				1,476
Organic Enrichment/Low D.O.	1,342				1,342
Other Habitat Alterations	963				963
PCB		940			940
Mercury		922			922
Cause Unknown	873				873
Pathogens	7		697	39	743
Flow Alterations	697				697
Suspended Solids	567				567
Turbidity	224				224
Salinity/TDS/Chlorides	190			30	220
Excessive Algal Growth	128				128
Chlordane		119			119
Unknown Toxicity	83				83
Thermal Modifications	75				75
Other Inorganics	44			21	65
Dioxins		46			46
Oil and Grease	39				39
DO/BOD temp	28			4	32
Exotic Species	26				26
Pesticides	25				25
Nonpriority Organics	23				23

Unionized Ammonia	18				18
Priority Organics	17				17
Color	10				10
Osmotic Pressure	9				9
Chlorine	9				9
Taste and Odor	7				7
Filling and Draining	5				5
Noxious Aquatic Plants	5				5

Monitoring information indicates that 68,320 miles support designated aquatic life use. A total of 9,413 miles are reported as impaired and still requiring a TMDL and 6,105 miles are impaired but already have an approved TMDL. There are 2,580 miles with pollution problems not requiring a TMDL and 65 miles are impaired but expected to improve in a reasonable time pending agreed upon corrective action.

The three largest sources of reported impairment for aquatic life are abandoned mine drainage, agriculture, and urban runoff/storm sewers. The leading causes are siltation, metals, pH, nutrients, water/flow variability, and organic/enrichment. While direct source/cause linkages cannot be made at the level of detail presented in Tables 3 and 4, causes other than water/flow variability are known to be associated with the three leading sources abandoned mine drainage, agriculture, and urban runoff/storm sewers. Agricultural impairments are generally caused by nutrients and siltation associated with surface runoff, groundwater input and unrestricted access of livestock to streams. Low pH, elevated concentrations of metals, and siltation are the result of abandoned mine drainage runoff from mine lands and refuse piles. Increased levels of nutrients and siltation, along with flow variability, are associated with urban runoff. The sources associated with water/flow variability are varied, including hydromodification, road runoff, urban runoff/storm sewers, and several others. Any source that alters runoff or stream flow can effect water/flow variability. Water/flow variability is considered pollution not requiring a TMDL but the problem still requires remediation.

There are 4,337 assessed miles supporting the fish consumption use and 1,195 miles impaired and still requiring a TMDL. There are approved TMDLs for 712 miles. The 2,430 miles supporting this use is a conservative estimate. As a rule, when fish tissue samples are clean the results are only extrapolated to represent two miles on small streams and ten on larger waterbodies. To protect the public, larger extrapolations are made when the fish tissue samples are tainted.

The major source of contamination resulting in fish consumption advisories is listed as unknown because it is difficult to trace the sources. The contamination can be in the soil, groundwater, stream sediment, or point sources. The contaminants do not readily break down and can linger for decades. In addition, fish can move considerable distances. Only with careful study can the source of contamination be determined with certainty. The contaminants documented are PCB,

mercury, chlordane, and dioxin in decreasing order. Atmospheric deposition is the most likely source of the mercury. There is a statewide advisory limiting consumption of recreationally caught fish to one meal per week. If fish tissue mercury concentrations are greater than the one meal per week level (higher concentrations), they are placed on Category 5 of waters. Conversely, if subsequent samples indicate the concentrations are now less than the one meal per week level they are removed from Category 5.

Recreational use is assessed primarily by measuring bacteria levels. High bacteria densities indicate conditions that might cause sickness from contact with or ingestion of the water. Many of the waters targeted for sampling were suspected of having bacteria problems so the 688 miles of impaired miles versus the 701 miles attaining is not unexpected. There are 8 miles with an approved pathogen TMDL. The major source of pathogens is listed as source unknown followed by agriculture. If there are several potential sources of bacteria in the watershed the assessor lists the source as unknown until better information becomes available.

Potable water supply use was supported in 2,762 miles of streams assessed, not supported in 107, and 14 had approved TMDLs. This potable water supply use is measured before the water is treated for consumption. The primary assessment measures are nitrate+nitrite levels and bacteria but additional parameters, both organic and inorganic, are considered.

Part C3.2 Record of changes to the 2008 Integrated List 5 made in the 2010 Integrated List

The Integrated List is part of a biennial report. The previous list included data gathered through 2008. In the two year period leading up to this report, a number of waterbodies listed as impaired on the 2008 Integrated Report were resurveyed. Impaired waters may be resurveyed for a number of reasons including the need for additional data to support TMDL development, or changes in land use, or point source discharge characteristics. Waters are reevaluated on a rotating basis as per the ICE sampling protocol outlined in the 2009 Assessment Methodology. Areas where watershed improvement projects are in place are also targeted to document improvements that may results.

Appendix E tracks changes in the status of waters impaired in 2008 but attaining uses in 2010. Each of these delistings is the result of a detailed chemical or biological survey and subsequent data evaluation. Appendix F tracks changes in the pollutant causes. Entries for waters that were reported as impaired in 2008, but a subsequent survey found them to be impaired but by different pollutants are edited to better reflect the problems. The comments associated with each record describe the changes. Lastly, Appendix G describes records with errors. Some are mapping errors discovered because the GIS coverage has undergone several revisions over the past 12 years and occasionally some legacy mapping errors are uncovered. Other errors relate to an impairment being incorrectly mapped to a pollutant source. Comments in these records describe the error.

Part C3.3 Lakes Use Support

Table 5 is a summary of the four use support categories for lakes. Acres “supporting” is the number of acres not impaired for the assessed use. “Impaired” acres (List 5) do not support the assessed use and still require a TMDL. “Approved TMDL” includes impaired lake waters where a TMDL has been completed and approved by EPA. ”Impaired (List 4c)” is a special category of use impairment where a problem is documented but it will not be addressed through a TMDL. Pollution is a special category of impairment where there is a problem but it will not be addressed through a TMDL because it does not involve pollutant loadings. “Assessed” refers to the total acres surveyed for that use.

Table 6 summarizes the sources of impairment problems and Table 7 the causes. Note that totaling the sources or causes will not equal the acres summarized in Table 5. This is because a waterbody may have multiple sources and causes. The individual source/cause pairs for each waterbody are found on List 5, 4b, and 4c. The lists are large and as a result are presented only in electronic format separate from this narrative.

Table 5

Statewide Lake Assessment Summary

A statewide summary of use support status for four water uses in assessed lakes

	Aquatic Life Use	Fish Consumption Use	Recreational Use	Potable Water Supply Use
Lakes (acres)				
Assessed	76,484*	58,295	75,322	44,933
Supporting (List 2)	39,301	13,942	73,928	44,921
Impaired (List 5)	5,349	38,870	1,394	12
Impaired (List 4c)	20,543	---	---	---
Approved TMDL List 4a	11,650*	5,483	---	---

*Lake Jean pH TMDL (248 acres) now attaining, so no longer included in TMDL total.

* Lake Galena (359 acres) appears both on List 4a and List 5.

Table 6
 Statewide Assessment Summary
 Sources of Impairment: Lakes
 Totals Include List 4a, 4b, 4c, and 5
 (Acre totals will not equal Table 5 because a waterbody can have multiple impairments)

Source	Use Designation (Acres)			Water Supply	Total
	Aquatic Life	Fish Consumption	Recreation		
Atmospheric Deposition	219	38,870			39,089
Other	19,859				19,859
Agriculture	12,846		1,307		14,153
Source Unknown	2,935	5,588			8,523
Urban Runoff/Storm Sewers	3,641		82		3,723
On site Wastewater	3,223		87		3,310
Municipal Point Source	2,439				2,439
Natural Sources	1,222				1,222
Small Residential Runoff	531				531
Habitat Modification	486			57	543
Removal of Vegetation	445				445
Abandoned Mine Drainage	365			12	377
Golf Courses	210				210
Road Runoff	185		5		190
Recreation and Tourism	185				185
Hydromodification	121				121
Construction	89				89
Bank Modification	31				31
Land Development	5		5		10

Table 7
 Statewide Assessment Summary
 Causes of Impairment: Lakes
 Totals Include List 4a, 4b, 4c, and 5
 (Acre totals will not equal Table 5 because a waterbody can have multiple impairments)

Cause	Use Designation (Acres)			Total
	Aquatic Life	Fish Consumption	Recreation Water Supply	
Mercury (Lakes)		44,331		44,331
pH	15,852			15,852
Nutrients	13,447		137	13,584
Suspended Solids	10,989		57	11,046
Organic Enrichment/Low D.O.	8,603			8,603
DO/BOD	1,280			1,280
Pathogens			1,179	1,179
Excessive Algal Growth	471		31	502
Turbidity	445			445
Metals	365		12	377
Noxious Aquatic Plants	291		5	296
Exotic Species	226		66	292
Siltation	95		46	141
Other Habitat Alterations	31			31
Unionized Ammonia	25			25
PCB		22		22

A total of 76,484 acres of Commonwealth lakes have been assessed for aquatic life use. Of these, 39,301 acres support that use. There are 4,990 assessed lake acres that are impaired and still require a TMDL. Approved TMDLs are in place for 11,650 acres. Pollution problems that do not require TMDLs impair 20,543 acres. The major sources of aquatic life use impairment in lakes are “other”, and agriculture. “Other” is the source used for lakes on List 4c which are impaired but not requiring a TMDL. These lakes show short term fluctuations in DO or pH but support a healthy fish community. The primary stressors are nutrients, suspended solids, organic enrichment/low DO, and pH. Low DO and high pH problems are associated with summer lake stratification.

Fish consumption assessments covered 58,295 lake acres (excluding Lake Erie but not Presque Isle Bay). Of these, 13,942 acres are assessed as supporting this use, 38,870 acres are reported as requiring a TMDL, and 5,483 acres have approved TMDLs. The reason for the large proportion of impaired acres is the implementation of Pennsylvania's risk-based mercury fish consumption advisory methodology in 2001. Nearly all of the lake advisories are due to mercury with atmospheric deposition listed as the source.

In addition, fish consumption advisories are in place for a number of species in the Pennsylvania portion of Lake Erie. These advisories are due to PCB and mercury. There are 63 miles of Lake Erie shoreline in Pennsylvania fourteen of which comprise the Presque Isle Peninsula.

A total of 75,322 lake acres have been assessed for recreation use support and only 1,394 of those acres require TMDLs. Pathogens and nutrients from agriculture and on site wastewater are responsible for the impairments.

All but 12 acres of 44,933 acres assessed for potable water supply use were found to be attaining that use.

Part C3.4 Excluding the Fishable and Swimmable Uses

DEP routinely re-evaluates, as part of its triennial review of water quality standards, the two water bodies where the fishable or swimmable uses specified in Section 101(a) (2) of the federal Clean Water Act are not being met: (1) the Harbor Basin and entrance channel to Outer Erie Harbor/ Presque Isle Bay and (2) several zones in the Delaware Estuary.

The swimmable use designation was deleted from the Harbor Basin and entrance channel demarcated by U.S. Coast Guard buoys and channel markers on Outer Erie Harbor/ Presque Isle Bay because boat and commercial shipping traffic pose a serious safety hazard in this area. This decision was based on a Use Attainability study completed in 1985. Because the same conditions and hazards exist today, no change to the designated use for Outer Erie Harbor/ Presque Isle Bay is proposed.

DEP cooperated with the Delaware River Basin Commission (DRBC), EPA and other DRBC signatory states on a comprehensive Use Attainability study in the lower Delaware River and Delaware Estuary. This study resulted in appropriate restrictions relating to the swimmable use, which DRBC included in water use classifications and water quality criteria for portions of the tidal Delaware River in May 1991. These changes were incorporated into Sections 93.9e and 93.9g (Drainage Lists E and G) of Pennsylvania's Water Quality Standards in 1994. The primary water contact use remains excluded from the designated uses for river miles 108.4 to 81.8 because of continuing significant impacts from combined sewer overflows and other hazards, such as commercial shipping traffic.

Part C3.5 Lakes Trophic Status

Lake trophic status, based on Carlson's Trophic State Index (TSI), is used as a tool to monitor lake status in Pennsylvania. Lakes with a TSI of less than 40 are oligotrophic (nutrient poor); 40-50 is mesotrophic; 50-65 is eutrophic (nutrient rich); and greater than 65 TSI is considered hypereutrophic. TSIs for Pennsylvania lakes are based on seasonal mean values of phosphorus, secchi depth and chlorophyll a. Trophic category is based on the Total Phosphorus (TP) TSI. Table 8 summarizes lake trophic status. Sums do not include Lake Erie, but do include Presque Isle Bay for pertinent data.

Table 8
Lake Trophic Status: Summary of Lakes Assessed

	Number of Lakes	Acreage of Lakes
Total Assessed (all types)	311	
Assessed for TSI	293	90024.9*
Oligotrophic	18	11878
Mesotrophic	118	28275.9
Eutrophic	106	42602.5
Hypereutrophic	23	3560.6
Unassigned (data not assembled or current)	28	3707.9

* Excel summary table calculation, not NHD coverage.

Part C3.6 Lake Restoration Efforts

The Commonwealth's lake protection and restoration program is mainly supported by EPA's Nonpoint Source Program (Section 319 of the Clean Water Act) and the state's Environmental Stewardship Program, through Growing Greener grants. Other funding sources include EPA Section 104(b)3 grants, the Natural Resources Conservation Service (NRCS) PL566 program, and other programs such as the Chesapeake Bay Program and PENNVEST (Clean Water State Revolving Funds). DCNR also funds in-lake restoration practices for State Park lakes. Various partners are engaged in lake and lake watershed restorations, and are not limited to the lake owners. Watershed partners include county Conservation Districts which implement many DEP program initiatives and also serve as grant and project managers. Program goals to restore and/or protect lake water quality are based on studies that identify impairments, pollution sources and the course of remediation. Public use and benefit of the lake, and watershed priority based on impairment are important criteria in prioritizing lakes to be funded.

Restoration techniques implemented through Phase II or restoration grants include various watershed and in-lake best management practices (BMPs) such as agricultural BMPs, riparian corridor protection and restoration (buffers and in-stream structures), lake shoreline protection, dredging, stormwater management and control techniques, point source controls, aquatic macrophyte controls, lake and watershed liming, alum treatments, biomanipulation to benefit fisheries, lake drawdowns, septic management, wildlife control, and institutional BMPs such as public education efforts and enacting protective municipal ordinances. Sewage treatment plant upgrades are also an important control technique to improve lake water quality.

Table 9 provides information on current Phase I (assessments) and Phase II (restoration/implementation) lake work being conducted in the Commonwealth. Expenditures on active lake projects or lake watershed projects in Pennsylvania currently amounts to approximately \$1.5 million for 2007-2009. Table 10 summarizes known techniques used in lake restoration projects in Pennsylvania's public lakes.

Part C3.7 Lake Control Methods

Pennsylvania's lake management regulation is codified in DEP's Rules and Regulations at Section 96.5 - Discharges to Lakes, Ponds and Impoundments, which sets forth treatment requirements for point source discharges necessary to control eutrophication. It is a technology-based approach that results in increasingly stringent effluent requirements based on an assessment of the water quality benefits of such controls. The need for and extent of point source controls for a specific lake are determined by field studies conducted during spring overturn, summer stratification and fall overturn. Appropriate nutrient limitations and monitoring requirements are included in NPDES permits based on the trophic conditions found during these studies. In most cases, follow-up monitoring is conducted to evaluate the adequacy of the effluent limitations.

Nonpoint source pollution can also impact lake water quality. Phase I diagnostic studies on Pennsylvania lakes have identified nonpoint source impacts from acid deposition, agricultural runoff, streambank erosion, malfunctioning septic systems, construction, stormwater runoff, and pathogens. Mitigation of these sources is highlighted in the previous section. Acidity problems, resulting mostly from acid deposition, but also in a few cases mining runoff, may be mitigated with lime treatments, although funding for these types of projects is very limited. Lakes with naturally low pH (swamps and bogs) are not considered for treatment, but may be listed on part 4C of the Integrated List. Liming is the current method to mitigate low pH in lakes, and is used in PA on both public and private lakes. Some lakes (reservoirs) have been identified as impaired by metals from mine drainage, or more commonly by mercury (mainly via fish tissue) and none have been identified as impacted by "high acidity," based on high concentrations of dissolved metals. Restoration efforts and BMPs in the watershed are the best way to reduce mining effects in waterbodies (i.e. treating the source of the problem). In-lake mitigation could be explored by using alum treatments to bind metals into the lake sediments. Some "toxics" can be removed by dredging but again, funding for dredging is limited. Most efforts have focused on source control (mining BMPs or AMD BMPs) and natural recovery rather than in-lake mitigation.

Table 9. Current Lake Projects in Pennsylvania as of 2008. Does not include assessments done by DEP. Final reports available from the Bureau of Watershed Management.

Lake or Study Name	County	Study Type	Study Period	Federal Funds	Fund Source	GG totals	319 totals	Match	Sponsor
Lake Jean	Luzerne, Sullivan	Phase II	1995 - yearly		DCNR	\$1,500			Bureau of State Parks
Harveys Lake	Luzerne	Phase II and III	2007-2009	\$85,000	319		\$85,000		Harveys Lake Borough
		Phase II and III	2009 - 2011	\$262,534	319		\$262,534	\$48,315	Harveys Lake Borough
Stephen Foster Lake	Bradford	Phase II	2007-2009	\$99,070	319		\$99,070		Bradford CCD
		Phase III	2004 - 2009	\$4,000	319		\$4,000		\$2,000/yr for monitoring
Frances Slocum Lake	Luzerne	Phase I	2007-2009	\$48,900	319				Luzerne CCD
Shawnee Lake	Bedford	Phase I	2007-2009	\$30,000	319		\$30,000	\$30,000	DCNR
Lake Galena	Bucks	Phase I	2008 - 2009	\$45,000	319		\$45,000		Bucks CCD
Lake Carey	Woming	Phase II	2008 - 2009		GG	\$308,939	\$67,490	\$67,490	Lake Carey Welfare Association
Glendale Lake	Cambria	Phase II	2008 - 2009		GG	\$43,500		\$13,106	Cambria Co. Cons. District
Lake Wallenpaupack	Pike, Wayne	Phase II	2008 - 2009		GG	\$40,530			Lake Wallenpaupack Wtrshd Mngmt

									Dst.
	Pike	Phase II	2008 - 2009		GG	\$26,240		\$6,560	Paupack Township
Conneaut Lake	Crawford	Phase II	2008 - 2009		GG	\$35,000		\$25,000	Crawford Co. Cons. District
		Phase II	2008 - 2009		GG	\$30,000		\$12,500	
Lake Sinoquipe	Fulton	Phase II	2008 - 2009		GG	\$106,960		\$19,040	Fulton Co. Cons. District
Various Small Lake Projects	multi	mostly Phase 1	2008 - 2009		GG	\$350,000		\$252,520	C-SAW
Total Funds				\$574,504		\$942,669	\$593,094	\$474,531	
Total 319 + GG									\$1,535,763

319 = Nonpoint Source Program

DCNR = PA Dept. Conservation & Natural Resources

GG = Growing Greener Program, PA Environmental Stewardship Funds

CCD = County Conservation District

Not included are funds for dam repairs

Phase I = lake & watershed assessment/monitoring & management plan

Phase II = restoration BMPs, including Educational

Phase III = monitoring for efficacy, post-TMDL

Table 10
Lake Rehabilitation Techniques Used in Public Lakes

Technique	Number of Lakes Where Technique Used	Acres of Lakes Where Technique Used
In-Lake Treatment		
Aeration	2	50
Aquatic herbicide treatment	38	435
Aquatic macrophyte harvesting	3	50
Lake drawdowns	21	7,085
Liming	1	100

Watershed Treatments		
Sediment traps/detention basins	6	8,128
Shoreline erosion controls/bank stabilization	11	13,907
Conservation tillage	4	7,633
Animal waste management practices installed	7	9,787
Riprap installed	4	7,334
Road or skid trail management	4	14,654
Stream restoration (natural channel design)	3	1665
Created wetlands	4	1719

Other Lake Protection/Restoration Controls		
Local lake management program in place	55	63,019
Public information/education program/activities	45	46,645
Local ordinances/regulations to protect lake	2	6,350
Point source controls	14	13,834

Part C4 Wetlands Protection Program

Pennsylvania has 403,924 acres of wetlands and 412,905 acres of deep-water habitats such as ponds and lakes. About 1.4 percent of the Commonwealth's land surface is represented by wetlands, with 97 percent classified as palustrine. Approximately 76 percent of the palustrine wetlands are further classified as forested and scrub/shrub wetlands. Lacustrine wetlands, mainly composed of the shallow zone (less than 6.6 feet deep) of Lake Erie, represent about two percent of the total, while riverine wetlands make up the remaining one percent. Pennsylvania has 512 acres of tidal wetlands in the Delaware Estuary.

Wetlands are most abundant in the glaciated portions of northeastern and northwestern Pennsylvania. Crawford, Mercer, Erie, Monroe, Pike, Wayne and Luzerne counties contain 40

percent of the Commonwealth's wetlands. Pike and Monroe counties have the highest percentages of land covered by wetlands with 6.7 percent and 6.4 percent, respectively.

DEP's jurisdiction for the protection of wetlands is primarily established by the Dam Safety and Encroachments Act of 1978. The Environmental Quality Board adopted Chapter 105, Dam Safety and Waterway Management rules and regulations effective September 27, 1980. Amended regulations became effective October 12, 1991. Since March 1, 1995, DEP has been given authority to attach federal Section 404 authorization along with state permit approvals for most projects through the Pennsylvania State Programmatic General Permit (PASPGP-3). This provides "one-stop shopping" for approximately 80 percent of the state and federal permit applications received. PASPGP-3 will expire on June 30, 2011.

Thirty (30) of Pennsylvania's 66 county conservation districts have Chapter 105 Delegation Agreements with DEP to register Bureau of Watershed Management General Permits within their counties. The basic duties of each district are to provide information and written materials to the general public on the Dam Safety and Encroachments Act and Chapter 105 regulations, register general permits, and perform on-site investigations as the first step to gain voluntary compliance. The Office of Water Management coordinates this program.

An Environmental Review Committee, consisting of representatives of the U.S. Fish and Wildlife Service (USFWS), Pennsylvania Game Commission (PGC), Pennsylvania Fish and Boat Commission (PFBC), EPA, U.S. Army Corps of Engineers (ACOE) and DEP, meets monthly to review selected applications submitted to DEP. A similar committee has been established that meets semi-annually to review ongoing enforcement actions. Through these committees, lead agencies are designated for taking action or providing field support to resolve violations or to provide data for permit reviews. This coordination economically utilizes limited staff of both state and federal agencies.

DEP, in cooperation with the Penn State Cooperative Wetlands Center completed a pilot wetland condition assessment in an area of south central Pennsylvania in 2006. The pilot was to test a wetland condition assessment methodology that could be expanded to the entire Commonwealth. Evaluation of the results could lead to a standardized wetlands condition assessment methodology. Results from the pilot assessment will be evaluated in 2010 with the assistance of EPA's Office of Research and Development. The same wetland assessment methodology is being utilized to evaluate the wetland replacement efforts conducted from 2000-2004. The results of this evaluation will be completed in 2010 as well.

DEP staff participated in the Mid-Atlantic Wetland Workgroup efforts to provide assistance in the 2008-09 probabilistic wetlands assessment of all EPA Region III states and foster coordination between wetland programs and existing water quality monitoring and reporting activities. DEP staff are participating in the National Wetland Assessment Workgroup to plan the 2011 national wetland assessment.

Part C5 Trend Analysis for Surface Waters

Introduction

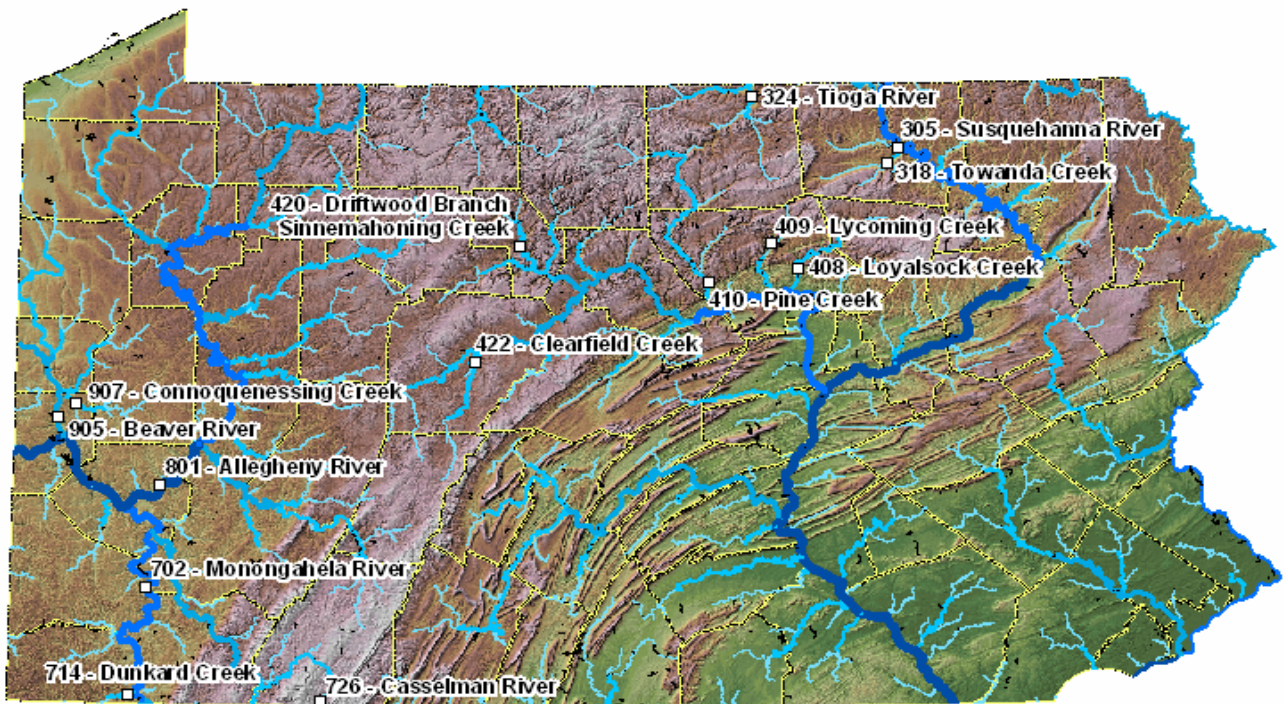
Periodically, the Department analyzes long-term trends of chemical water quality based on data collected at a network of fixed surface water monitoring sites located throughout the Commonwealth.

Trend analysis is a statistical technique used to determine if values of a random variable collected over some time period generally increase or decrease. The results of any trend analysis should be interpreted with caution. Simply because no trend is detected, does not prove that a trend does not exist. Rather, this result may mean that there either really is no trend or that insufficient evidence exists to conclude that there is a trend.

Methods

The present analyses utilized a parametric trend test developed and performed by staff with the United States Geologic Survey. This approach adjusts observed variation in water quality parameters for variation in flow because most water quality parameters exhibit substantial co-variation with stream flow.

The tests were performed on a sub-set of the Department's fixed-site water quality network (WQN) stations located in areas of the state underlain by the Marcellus shale geologic formation. The following map shows the 14 site locations.



At each of the sites, 19 different water quality parameters were tested for trends. The period of data considered in these analyses was from October 1991 through September 2009 for most parameters, with total nitrogen and dissolved inorganic phosphorous data from October 2002 through September 2009. Samples were mostly collected on a monthly or bi-monthly basis. The following parameters were tested for trends at the selected stations:

Alkalinity, total (ALK)	Phosphorous, total (TP)
Hardness (HARD)	Phosphorus, dissolved inorganic (DIP)
Calcium (Ca)	Nitrogen, total (TN)
Magnesium (Mg)	Nitrite (NO ₂)
Aluminum, total (Al)	Nitrate (NO ₃)
Copper, total (Cu)	Ammonia, total (NH ₄)
Iron, Total (Fe)	Sulfate (SO ₄)
Lead, total (Pb)	Total Dissolved Solids (TDS)
Zinc, total (Zn)	Total Suspended Solids (TSS)
Oxygen, dissolved (DO)	

Results

Trend test results are presented in the table below. Dissolved oxygen results are not reported because samples were collected at different times of the day and diurnal fluctuations likely confound any trend observations. Nitrite results are not reported because concentrations were consistently reported at or below laboratory detection limits and slight changes in values had disproportionate effects on nitrite trend tests.

WQN Station	ALK	HARD	Ca	Mg	Al	Cu	Fe	Pb	Zn	TP	DIP	TN	NO3	NH4	SO4	TDS	TSS
305 - Susquehanna River	10	28	22	28	-8	-49	-2	-83	22	29	30	-19	-27	-34	-60	15	15
318 - Towanda Creek	17	11	-8	-20	12	-50	-23	-96	-43	-57	-39	-58	-75	---	-52	22	54
324 - Tioga River	42	5	-21	-24	-29	-50	-19	-93	-66	-22	-34	-20	-34	-38	-34	-2	13
408 - Loyalsock Creek	10	15	-3	-8	-25	---	-36	---	-79	-50	---	-16	-65	---	-20	58	-41
409 - Lycoming Creek	7	7	-11	-15	-11	---	-8	---	-56	-48	---	-38	-58	---	-27	46	-19
410 - Pine Creek	25	37	5	12	104	---	7	-93	-15	-62	---	-30	-64	---	-15	24	69
420 - Driftwood Branch Sinnemahoning Creek	10	26	2	1	-3	---	0	---	---	-54	---	-18	-47	116	-13	54	17
422 - Clearfield Creek	430	13	35	51	-65	-53	-45	-90	-73	-66	---	-24	-42	-69	8	10	2
702 - Monongahela River	46	10	-39	-41	-7	-53	-15	-90	-51	-69	-69	2	-6	-30	-2	12	14
714 - Dunkard Creek	83	92	175	89	-40	-42	-52	-93	-45	-41	-32	97	163	240	144	118	29
726 - Casselman River	36	28	13	1	-28	-79	-19	-80	-40	-50	1	-15	-54	26	-23	44	98
801 - Allegheny River	30	2	20	19	-36	-53	-38	-95	-45	-69	-10	-28	-29	-35	-29	-7	6
905 - Beaver River	11	13	-28	-40	-13	-58	47	-84	-44	-2	-33	-18	-45	5	-29	7	41
907 - Connoquenessing Creek	24	-3	-90	-36	-45	-60	-29	-97	-36	-37	41	-26	-92	-71	-24	-6	-28

values indicate approximate % change in flow-adjusted trend over the tested time period

highlighted values indicate statistically significant trends (p-value < 0.05)

--- indicate datasets without enough data to run the trend test

Of the 14 stations tested, 13 showed significant increasing trends in total alkalinity, and 8 showed significantly increasing trends in hardness. The alkalinity trend at WQN 422 on Clearfield Creek was especially pronounced. Only 3 stations exhibited significant trends in calcium concentration, with decreasing trends observed at WQN 409 on Lycoming Creek and WQN 907 on Connoquenessing Creek, and an increasing calcium trend observed at WQN 726 on Casselman River. Three stations also showed significant trends in magnesium concentrations over the tested period of record, with WQN 408 on Loyalsock Creek and WQN 409 on Lycoming Creek displaying decreasing magnesium trends, and WQN 410 on Pine Creek showing an increasing trend in magnesium concentration. The only station that did not show a significant increasing trend in alkalinity – WQN 409 on Lycoming Creek – showed decreasing trends in calcium and magnesium.

The only station showing a significant increasing trend in total aluminum was WQN 410 on Pine Creek; five other stations showed significant decreasing trends in total aluminum. Out of the 11 stations with sufficient total copper data to run the trend test, 10 stations showed significant decreasing trends. Three stations showed significant decreasing trends in total iron, with one station – WQN 905 on Beaver River – showing a significant increasing trend in total iron concentration. All 11 stations with sufficient data for total lead showed significant decreasing trends, as did 11 of the 13 stations with sufficient total zinc data. Twelve of the 14 stations showed significant decreasing trends in total phosphorus, with WQN 305 being the only station exhibiting a significant increasing total phosphorus trend. Only two stations – WQN 318 on Towanda Creek and WQN 702 on Monongahela River – showed significant trends in dissolved inorganic phosphorous, both decreasing. Six stations showed significant decreasing trends in total nitrogen, with WQN 714 on Dunkard Creek being the only station tested to show a significant increasing trend in total nitrogen. Similarly, WQN 714 on Dunkard Creek was the only station displaying a significant increasing trend in nitrate concentration, with significant decreasing trends observed at 11 other stations. All stations that displayed significant decreasing trends in total nitrogen also showed significant decreasing trends in nitrate, with the exception of WQN 305 on Susquehanna River where the nitrate trend was not significant. Five stations showed significant decreasing trends for total ammonia with WQN 714 on Dunkard Creek again being the only station to show a significant increasing trend for this nitrogen parameter.

Eleven tested stations showed significant decreasing trends in sulfate concentrations, with WQN 714 on Dunkard Creek being the only tested station where a significant increasing sulfate trend was observed. Four stations showed significant increasing trends in total dissolved solids; none of the tested stations showed significantly decreasing total dissolved solids trends. None of the trends for total suspended solids were statistically significant.

Discussion

Overall, these results suggest water quality has significantly improved – as evidenced by decreasing trends in potentially toxic metals, decreasing trends in phosphorus and nitrogen species and decreasing sulfate concentrations – at most of these 14 stations based on the sampling conducted during the tested time period. A few significant exceptions to these observations were seen at some stations – like the increasing aluminum trend observed at WQN 410 on Pine Creek, the increasing iron trend at WQN 905 on Beaver River, increasing total phosphorus at WQN 305 on Susquehanna River, as well as increasing nitrogen and sulfate levels at WQN 714 on Dunkard Creek. Also, four stations did show significant increasing trends in total dissolved solids. Almost all of these stations showed significant increasing trends in total alkalinity, which usually can be considered a water quality improvement because increased alkalinity means increased acid neutralizing capacity, but elevation of alkalinity much beyond natural levels can have detrimental consequences to water quality, so assessment of these trends depends on the specific context of conditions at each station.

Part D Groundwater

Part D1 Groundwater Assessment

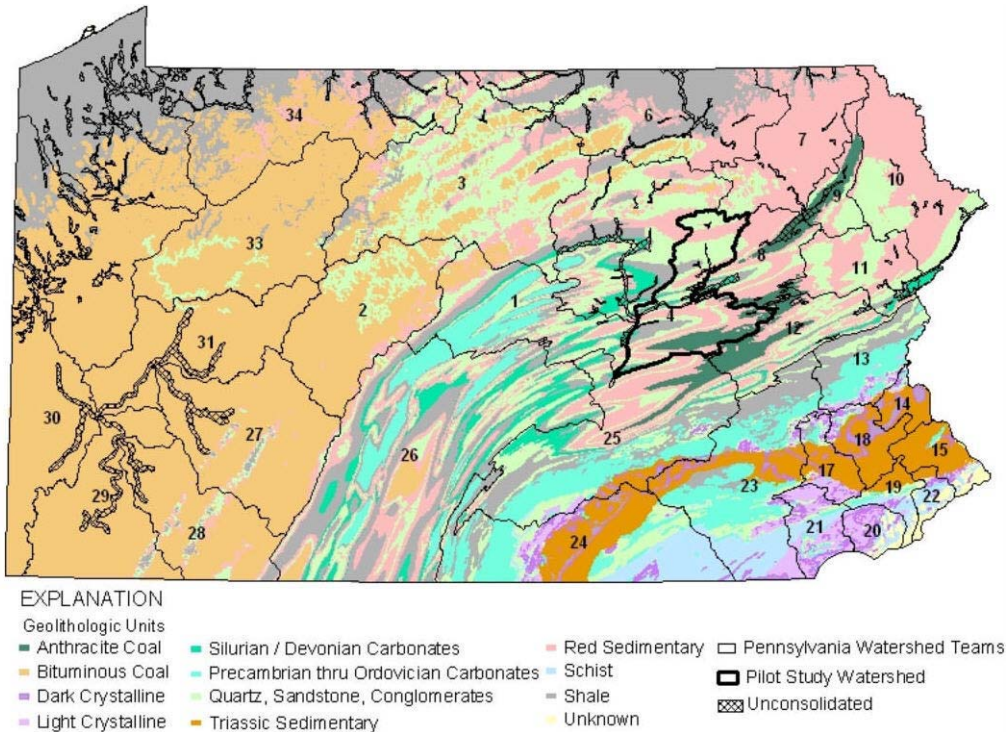
Ambient/Fixed Station Ground Water Quality Monitoring Network (GWMN):

Resources available to operate the Ambient Fixed Ground Water Monitoring Program continue to be limited. Ground water quality monitoring has been active from 2005 to 2008 in four GWMN basins: Lancaster basin (191), Kirkwood Basin (196), Pottstown Basin (58), and Telford Basin (61). A total maximum daily load is under development for the Upper Octoraro Creek (Kirkwood Basin). The Ground water quality monitoring data for the Kirkwood Basin has been made available for this effort.

Statewide Monitoring Networks:

To address the need for increased groundwater quality monitoring coverage of the state to meet program goals, DEP has worked with the USGS to design a statewide, watershed-based groundwater quality network using the stratified approach applied in the USGS National Water Quality Assessment project for the lower Susquehanna River. There have been 13 major aquifer categories identified for the network based on dominant rock type or geolithologies. The distribution of these geolithologic units (except for the glacial outwash) are shown on Figure D-1.

Figure D-1



To develop the groundwater network, 30 groundwater monitoring points are selected within each geolithic unit. This network can be reconfigured to be analyzed based upon the planning watersheds previously used by DEP for watershed management.

Part D2 USGS Releases Groundwater Quality Data Compilation for Pennsylvania

Under a joint funding agreement with the Bureau of Watershed Management, the U.S. Geological Survey has updated a digital Data Series report that provides a compilation of ambient groundwater quality data for a 28-year period based on water samples from wells throughout Pennsylvania. The updated report has tripled the amount of wells used in the original compilation completed in 2006. Twelve data sources from local, state, and federal agencies were used in the updated compilation, which covers 11 different analyte groups. The data are presented both in terms of the 35 water planning watersheds used by DEP as well as 13 major geolithologic units representing the major aquifers in the state. Over 24,000 wells were included in the project and the number of analyses ranged from several thousands for nutrients and other inorganic compounds to two dozen for antibiotics. The number of wells sampled varies considerably across the state with most being concentrated near major urban centers. Minimal data exists for about a fourth of the state. When compared to maximum contaminant levels (MCL), the analyte group with the highest MCL exceedance was microorganisms (50% of 4,674 samples), followed by volatile organic compounds (24% of 4,528 samples). The lowest MCL exceedances were for insecticides (<1% of 1,424 samples) and wastewater compounds (<1% of 328 samples). With limited monitoring of ambient groundwater underway in only a handful of basins in the Ambient/Fixed Station Monitoring Networks, this compilation will help fill in data gaps and shed light on how to establish a more complete statewide groundwater monitoring network. Alternatively, analytical and interpretive tools may be developed and applied to the database to help predict ambient groundwater quality in areas lacking data. The report (Low, D.J., Chichester, D.C. and Zarr, L.F. 2008. Selected groundwater quality data in Pennsylvania – 1979-2006: USGS Data Series 314, 22 p.) is available on-line at <http://pubs.usgs.gov/ds/314/>

Part D3 Sources of Groundwater Contamination

Each DEP regional office defined its highest priority sources of groundwater contamination. These concerns are consistent from the 2008 report and are shown below in Table D-1. The priorities include industrial facilities, underground storage tanks, hazardous waste sites, abandoned landfills, aboveground storage tanks, manure/fertilizer applications, chemical facilities, and septic systems. The contaminants associated with these sources are also shown. Multiple regional studies have indicated 30% to 90% of private water wells have total coliform contamination. In addition, one study showed up to 30% E. coli contamination. The USGS study Relation Between Selected Well Construction Characteristics And Occurrence Of Bacteria In Private Household Supply Wells, South-Central And Southeastern Pennsylvania, WRIR 01-4206, stated that either

or both well construction and aquifer contamination could be responsible for the results but problems were more likely to occur where the well was poorly constructed.

Table D-1

Major Sources of Groundwater Contamination

Contaminant Source	Highest-Priority Sources (√)	Factors Considered in Selecting Contaminant Sources (1)	Contaminants
Agricultural Activities			
Animal feedlots			
Chemical facilities	√	ADCEFG	ABCDE
Drainage wells			
Manure/fertilizer applications	√	ABCDEFGH	DEIK
On site pesticide mixing/loading			
Pesticide applications			
Storage/Treatment Activities			
Land application of biosolids			
Lawn maintenance/pest treatment			
Material stockpiles			
Storage tanks (above ground)	√	ABCDEFGG	ABC
Storage tanks (underground)	√	ABCDEFGH	ABCDEGIJK
Surface impoundments			
Waste piles or tailings			
Disposal Activities			

Abandoned landfills	√	ABCDE	ADGJ
Landfills (current)			
Septic systems	√	ABCDEFGH	EIK
Underground injections wells			
Resource Extraction			
Abandoned/existing oil/gas wells			
Abandoned/poorly built water wells			
Coal mining/acid mine drainage			
Quarries (non coal)/borrow pits			
Other			
Atmospheric deposition			
Industrial facilities	√	ABCDEFG	ABCG
Hazardous waste generators			
Hazardous waste sites	√	ABCDEFG	ABCDEFGHIJK
Natural groundwater conditions (3)			
Petroleum/fuel pipelines			
Sewer lines			
Salt storage and road deicing			
Spills/transportation of materials			
Urban runoff			

(1) Factors in Selecting a Contaminant Source Contaminants

(2)

- | | | |
|--------------------------------------------------------------------------------------------------------|----|----------------------------|
| A. Human health and/or environmental risk (toxicity) | A. | Volatile organic chemicals |
| B. Size of the population at risk | B. | Petroleum compounds |
| C. Location of the source relative to drinking water | C. | MTBE/TBA |
| D. Number and/or size of contaminant sources | D. | Pesticides |
| E. Hydrogeologic sensitivity | E. | Nitrates |
| F. State findings, other findings | F. | Salinity/brine |
| G. Documented from mandatory reporting | G. | Metals |
| H. Geographic distribution/occurrence | H. | Radionuclides |
| I. Other criteria (please describe) | I. | Microbiological |
| | J. | Sulfates, manganese and/or |
| (3) This could include natural occurring contaminants such as radium, radon, sulfate, iron, manganese, | K. | Total dissolved solids |
| | L. | Other contaminant (please |

Part D4 Statewide Groundwater Protection Programs

A summary of state groundwater protection programs is presented in Table D-2. Important groundwater protection programs are summarized following the table. Pennsylvania does not have statewide, private water well construction standards.

Table D-2

Summary of State Groundwater Protection Programs

Programs or Activities	Check (√)	Implementation Status	Responsible State Agency
Active SARA Title III Program	√	Fully established	BLRWM
Ambient groundwater monitoring system	√	Continuing efforts	BWM
Aquifer vulnerability assessment (pesticides)	√	Continuing efforts	PDA
Aquifer mapping	√	Continuing efforts	BTGS
Aquifer characterization	√	Continuing efforts	BTGS
Comprehensive data management system	√	Under development	BWM*
EPA-endorsed Core Comprehensive State Groundwater Protection Program (CSGWPP)	√	Partially established	BWM*
Groundwater discharge permits	√	Continuing efforts	RWM
Groundwater Best Management Practices	√	Continuing efforts	BWM*
Groundwater legislation (remediation)	√	Fully established	BLRWM
Groundwater classification (remediation)	√	Continuing efforts	BLRWM
Groundwater quality standards (remediation)	√	Fully established	BLRWM
Interagency coordination for groundwater protection initiatives	√	Continuing efforts	BWM*
Non-point source controls	√	Continuing efforts	BWM*
Pesticide State Management Plan	√	Continuing efforts	PDA
Pollution Prevention Plan	√	Continuing efforts	OPPCA
Resource Conservation and Recovery Act (RCRA) Primacy	√	Fully established	BLRWM
Source Water Assessment Program (EPA approved 2000)	√	Fully established	BWM
State Superfund	√	Fully established	BLRWM
State RCRA Program incorporating more stringent requirements than RCRA primacy		Not applicable	
State septic system regulations	√	Fully established	BWSFR

Underground storage tank installation requirements	√	Fully established	BLRWM
Underground storage tank remediation fund	√	Fully established	BLRWM
Underground storage tank permit program	√	Fully established	BLRWM
Underground injection control program		Not applicable; EPA direct implementation	
Vulnerability assessment for drinking water/wellhead protection	√	Partially established	BWM*
Well abandonment guidelines	√	Fully established	BTGS*
Wellhead Protection Program (EPA approved 1999)	√	Continuing effort	BWM
Well installation regulations (Public Water Supplies)	√	Fully established	BWSFR
Others:			
Monitoring well installation guidance	√	Fully established	BWM*
Nutrient management program	√	Continuing efforts	BWM
Private well installation guidance	√	Continuing efforts	BWM
Voluntary site remediation program	√	Fully established	BLRWM

BLRWM DEP Bureau of Land Recycling and Waste Management

BTGS Bureau of Topographic and Geologic Survey, Department of Conservation and Natural Resources

BWM DEP Bureau of Watershed Management

BWSFR DEP Bureau of Water Standards and Facility Regulation

OPPCA DEP Office of Pollution Prevention and Compliance Assistance

PDA Bureau of Plant Industry, Department of Agriculture

RWM DEP Regional Water Management Program

* Indicates lead agency

Part D5 Groundwater Protection Program

DEP's Principles for Groundwater Pollution Prevention and Remediation (DEP ID: 383-0800-001), is available on DEP's website at www.depweb.state.pa.us, and has been in place since 1996. This document sets forth the principles for a consistent statewide program for prevention of groundwater pollution and remediation of contaminated

groundwater. The ultimate goal for groundwater protection, as set forth in the Principles, is prevention of groundwater contamination whenever possible.

Part D6 Wellhead Protection and Source Water Protection Programs

Pennsylvania's Wellhead Protection Program (WHP) is the cornerstone of the Source Water Assessment and Protection (SWAP) Program for groundwater resources serving public water systems. Pennsylvania's Wellhead Protection Program (WHP) was developed in 1989 and subsequently approved by EPA in 1999. The Pennsylvania safe drinking water regulations direct public water suppliers to find and utilize the best sources available and take measures necessary to protect those sources. These regulations define wellhead protection, set permitting requirements for groundwater resources, and set forth requirements for state approval of local WHP programs.

More than 450 municipalities or water suppliers are developing or implementing local WHP programs and/or watershed protection programs. DEP has awarded 97 Source Water Protection Grants worth 4.3 million dollars, provided direct technical assistance, and supported partnerships to assist communities and water systems to protect community drinking water sources from contamination. These grants funded the voluntary development of local Source Water Protection (SWP) programs that meet DEP's minimum requirements. Since 2007, direct technical assistance has been provided to community water systems and municipalities through the Source Water Protection Technical Assistance Program. Over 50 Community Water Systems (CWS) are participating in the program at this time. In addition to protecting public health and infrastructure investment by avoiding costly contamination, local SWP efforts complement watershed protection and management through sound land-use planning and pollution prevention activities. Source water protection is an integral part of a sustainable infrastructure for public water supply.

Part D7 Source Water Assessment and Protection (SWAP) Program

The 1996 Safe Drinking Water Act reauthorization requires that states develop a Source Water Assessment and Protection (SWAP) Program. The SWAP program assesses the drinking water sources that serve public water systems for their susceptibility to pollution. This information is used as a basis for building voluntary, community-based barriers to drinking water contamination. States are required to assess all sources (both groundwater and surface water) serving public water systems. In Pennsylvania, this represents about 14,000 permanent drinking water sources. EPA approved Pennsylvania's SWAP program in March 2000. Pennsylvania has completed the source water assessments for 98% of systems in the state. Under the plan, Pennsylvania will continue to conduct assessments for new sources and update completed assessments as needed.

For the assessments that have been completed, the SWAP program has delineated the boundaries of the areas providing source waters for all public water systems and has identified (to the extent practicable) the origins of regulated and certain unregulated contaminants in the delineated area to determine the susceptibility of the water sources to such contaminants.

The SWAP program provides prioritized information on the potential sources of contamination that will be the basis for coordination of restoration efforts and development of local source water protection programs. These efforts will lead to improvements in raw water quality and may also result in reduced treatment costs for the public water system. The following table provides a summary of the results of the source water assessments for the most common and the most threatening potential sources of contamination to sources of public drinking water conducted under the EPA Program. More detail on how the source water assessments were conducted can be found in the Source Water Assessment and Protection Program guidance.

GW RANK	EPA Most Threatening	EPA Most Prevalent
1	Underground Storage Tanks	Transportation Corridors
2	Transportation Corridors	Agriculture
3	Agriculture	Underground Storage Tanks
4	Automobile Related Activities	Septic
5	Mining	Mining
SW RANK	EPA Most Threatening	EPA Most Prevalent
1	Transportation Corridors	Transportation Corridors
2	Agriculture	Municipal Sanitary Waste Disposal
3	Fertilizer and Pesticide Applications	Septic Systems
4	Storm water	Mining
5	Mining	Animal Feeding Operations

Source water assessments support emergency response, improved land use planning and municipal decisions. They also prioritize and help coordinate actions by federal and state agencies to better protect public health and safety. Spill detection and emergency response networks for public water systems in Pennsylvania have been established on the Allegheny, Monongahela, Susquehanna, Schuylkill, and Delaware Rivers. They include a variety of on-line detectors to alert operators to imminent changes in raw water quality at surface water intakes. Long-term trends in raw water conditions based on data provided by these monitors may be the basis for restoration and protection efforts or changes in water treatment schedules. The core of these programs is the Internet based

communication network that shares raw water data, incident information, and response efforts in real-time.