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GROUNDWATER PROGRAMS AND ACTIVITIES BIENNIAL REPORT TO THE LEGISLATURE 2018

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2018 GROUNDWATER BIENNIAL REPORT TO THE WEST VIRGINIA LEGISLATURE

I. EXECUTIVE SUMMARY

The Groundwater Protection Act requires the West Virginia Department of Environmental Protection (DEP) to submit a biennial report to the Legislature on the status of the State's groundwater and groundwater management programs, including detailed reports from each agency that has groundwater regulatory responsibility. See, W. Va. Code § 22-12-6(a)(3). This is the twelfth Groundwater Biennial Report to the Legislature since passage of the Groundwater Protection Act in 1991, and it covers the period from July 1, 2015 through June 30, 2017.

DEP's Division of Water and Waste Management (DWWM) Groundwater Program is responsible for compiling and editing the information contained in this report. In addition to DEP, the West Virginia Department of Agriculture (WVDA) and the West Virginia Department of Health and Human Resources (DHHR) have groundwater regulatory authority and have contributed to this report. The boards and standing committees that share the responsibility for developing and implementing rules, policies, and procedures for the Groundwater Protection Act are: the Groundwater Coordinating Committee, the Groundwater Protection Act Committee, the Groundwater Monitoring Well Drillers Advisory Board, the Wellhead Protection Committee, and the Non-Point Source Coordinating Committee.

The purpose of this report is to provide a concise, yet thorough, overview of the programs charged with the responsibility of protecting and ensuring the continued viability of groundwater resources in West Virginia and to express the challenges faced and the goals accomplished as the agencies, programs, and committees work together to protect and restore West Virginia's water resources.

Research regarding specific hydrogeologic information about the State's groundwater, such as regional and local potentiometric surfaces (water levels), groundwater quality, groundwater flow studies, and access to Statewide dedicated groundwater monitoring data continues. As more regulated development occurs, especially pertaining to stormwater discharge, DEP continues to compile a database of constituents found in stormwater that can be utilized to protect groundwater resources. As more stormwater discharge sites come under regulation, a clearer picture begins to emerge of potential contaminants found in stormwater.

The Ambient Groundwater Quality Monitoring Network was established by DWWM in cooperation with the United States Geological Survey (USGS) in 1992 and is an ongoing project. This network provides valuable data critical to the management of West Virginia's groundwater resources. The major objective of the study is the assessment of the ambient groundwater quality of major systems (geologic units) within the State and the characterization of the individual systems. Characterization of the quality of water from the major systems will help to (1) determine which water quality constituents are problematic, (2) determine which systems have potential water quality problems, (3) assess the severity of water quality problems in respective systems, and (4) prioritize

these concerns. Only by documenting the present ambient groundwater quality of the major systems can regulatory agencies assess where water quality degradation has occurred and where potential degradation is a result of natural processes or human activity.

The USGS West Virginia Water Science Center, in cooperation with DWWM, collects and analyzes water samples and interprets the analytical results of these samples as part of the Ambient Groundwater Program. The program alternates between long-term monitoring of a set of 25 “sentinel” wells and focused topical studies that examine factors that may influence groundwater quality.

The sentinel wells, selected to represent important environmental settings in West Virginia, are sampled every five years to evaluate trends in groundwater quality. Samples from these wells are analyzed for major ions, metals, trace elements, and nutrients. Analyses for organic compounds were performed on samples from sites susceptible to such contamination based on previous studies (Chambers, et al., 2012; <http://pubs.usgs.gov/sir/2012/5186/>). The first round of sentinel well samples was collected in 2010 with a second round scheduled for 2015. The Ambient Groundwater Program ended on September 30, 2015 with no further activities planned.

Topical studies are conducted in the four years between rounds of sentinel well sampling. In topical studies, water quality samples are collected, analyzed, and the results presented in a USGS Scientific Investigation Report. Since 2011, the USGS has collected samples to determine baseline water quality conditions in the Upper Monongahela River Basin, an area of Marcellus Shale natural gas development. Groundwater samples from 41 wells and baseflow samples from 50 surface water sites were collected and analyzed for major ions, metals, trace elements, and natural occurring radioactive materials. The results of these analyses were published in a USGS report entitled Water quality of groundwater and stream base flow in the Marcellus Shale Gas Field of the Monongahela River Basin, West Virginia, 2011-2012 (Chambers, et al., 2014; <http://dx.doi.org/10.3133/sir20145233>).

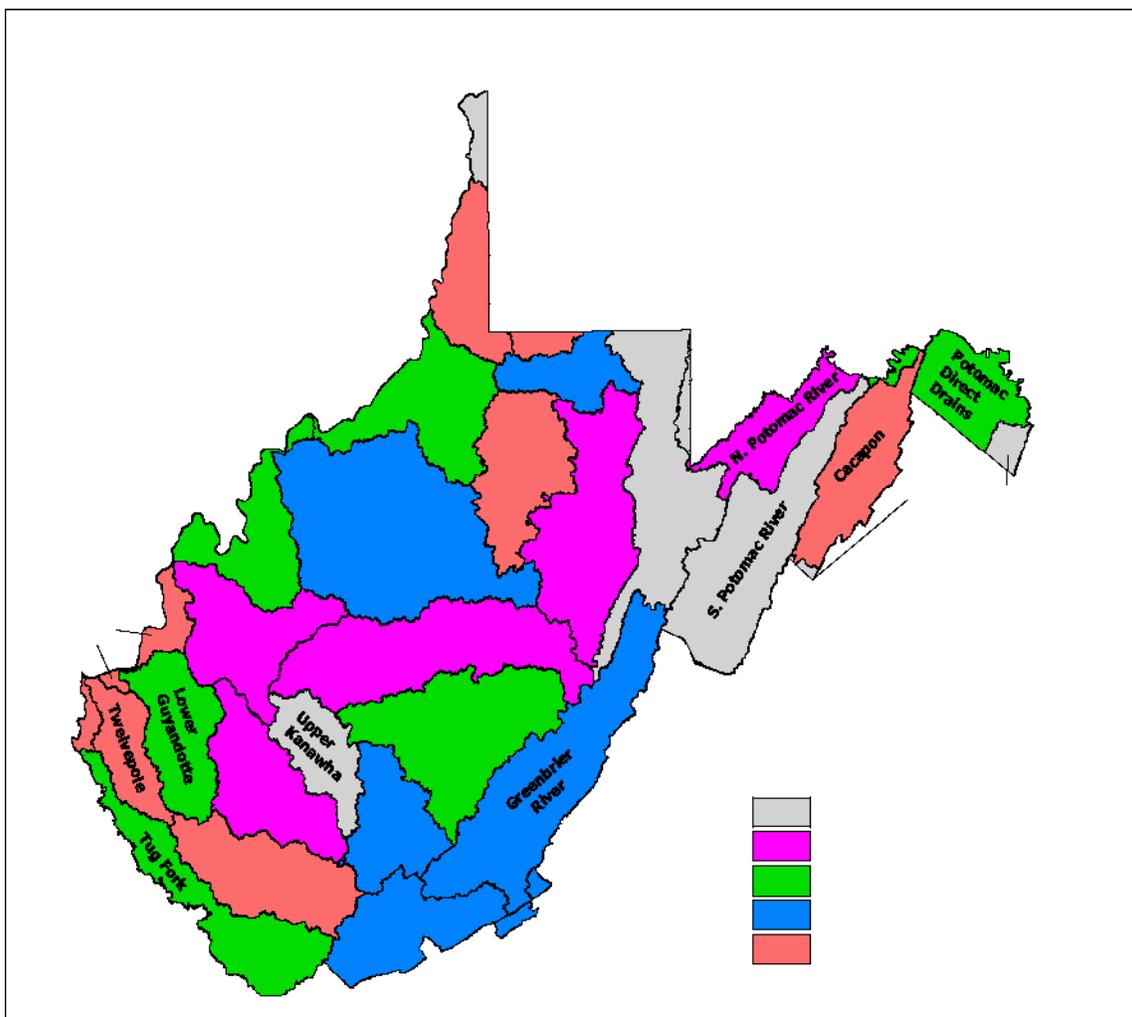
While many challenges remain, much has been done to provide protection and continued viability of West Virginia’s groundwater resources. DEP, WVDA, DHHR, and USGS continue to work closely to fulfill DEP’s mission of “Promoting a healthy environment.”

II. GROUNDWATER PROTECTION AND WATERSHED MANAGEMENT

Under the guidance of the United States Environmental Protection Agency (EPA) and with the signing of the West Virginia Watershed Management Framework Document in 1997, a new approach to management of the State’s groundwater began. Total watershed management strives to bring a holistic approach to protecting the waters of the State. The signing of this document by the agencies that chose to participate as partners indicates their understanding that, by collective agreement and cooperation, stakeholders can better achieve the goals of individual water quality programs. DEP has chosen to participate as a partner and stakeholder in watershed management in West Virginia.

Agencies having groundwater regulatory authority and responsibility provide repositories for ground and surface water data collected about those facilities under their authority. As state in this report's Executive Summary, compilation of the available groundwater data into a collective database continues as a work in progress, providing a picture of the State's groundwater protection activities and the contributions of the associated programs.

Eventually, all groundwater data that is generated by these activities and facilities will be housed in a central data repository overseen by senior scientists from each agency, under the guidance of DEP's Groundwater Coordinating Committee and Information Technology Office. The agency anticipates that population of the central database will be implemented using a watershed approach. Each watershed is comprised of smaller divisions called sub-watersheds from which data will be gathered and entered systematically until the larger picture emerges. A map depicting the 32 watersheds and hydrologic groupings is shown below in Figure 1.



West Virginia Watershed Groups

III. BOARDS AND COMMITTEES

The following boards and committees are responsible for developing and implementing policies, procedures, and rules to ensure proper application of the Groundwater Protection Act:

Groundwater Coordinating Committee

West Virginia Code § 22-12-7 establishes this committee, which is comprised of the Cabinet Secretary of DEP, the Commissioner of the Bureau of Public Health, the Commissioner of West Virginia Department of Agriculture, the Chair of the Environmental Quality Board, and the Director of the Division of Water and Waste Management. Per the statute, this Committee shall “consult, review, and make recommendations on the implementation of [the Groundwater Protection Act] by each of the groundwater regulatory agencies.”

Groundwater Monitoring Well Drillers Advisory Board

The Legislative Rule entitled *Monitoring Well Rules* (47 C.S.R. 59) authorizes the Secretary of the Department of Environmental Protection to establish an advisory board consisting of, at a minimum, three certified monitoring well drillers and one representative each from the Department of Environmental Protection, the Bureau for Public Health, and the Geologic and Economic Survey. See, 47 C.S.R. 59 § 6. The duties of the board, as prescribed by the Secretary of the Department of Environmental Protection are to advise DEP on the certification of monitoring well drillers, to assist the agency in developing groundwater monitoring well design standards, and to assist the agency in developing policies relating to monitoring well design standards, documentation, testing, and drilling-related issues. This board met on May 21, 2015 and received a report from the Department of Health and Human Resources (DHHR) that they had held four driller training sessions in 2014, at which 20 drillers were trained and subsequently passed the exam. During the first half of 2015, DHHR held one training session, certifying six new drillers. The board also discussed the issue of West Virginia being a state that does not require continuing education of its certified monitoring well drillers; the general consensus of the board was that a regulatory change would be necessary before West Virginia could impose a continuing education requirement on a certified monitoring well driller. As of the date of the 2015 meeting, there were 202 certified monitoring well drillers in the State.

Wellhead Protection and Source Water Assessment Committee

The West Virginia Wellhead Protection and Source Water Assessment Committee (aka the Wellhead Inter-Agency Coordinating Committee) meets on an as-needed basis. The committee met in the springs of 2016 and 2017, with various State and federal agency representatives and others attending. The primary task of the committee is to support and discuss West Virginia source water assessment and protection activities and opportunities to further local efforts to protect and sustain the quality and quantity of drinking water supplies within West Virginia.

IV. WEST VIRGINIA DEPARTMENT OF AGRICULTURE

Regulatory and Environmental Affairs Division Water Quality Protection

A. Pesticide Regulatory Programs

A pesticide is defined as any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any pest. Often misunderstood to refer only to insecticides, the term “pesticide” also applies to herbicides, fungicides, rodenticides, and various other substances used to control pests. Pesticides can cause harm to humans, animals or the environment, because they are designed to kill potential disease-causing organisms and control insects, weeds, and other pests. This presents a risk-benefit scenario where humans, animals, and the environment, including water, are at risk to be adversely affected. Therefore, it is deemed necessary to regulate and control pesticides by their registration, use, and application.

WVDA’s Pesticide Regulatory Programs Unit regulates and controls pesticides through the *West Virginia Pesticide Control Act*, W. Va. Code § 19-16A-1, et seq. and the following Legislative and Procedural Rules:

61 C.S.R. 12 – Fee Structure for the Pesticide Control Act of 1990

61 C.S.R. 12A – Certified Pesticide Applicator Rules and Regulations

61 C.S.R. 12B – Licensing of Pesticide Businesses

61 C.S.R. 12C – Wood Destroying Insect Treatment Standards

61 C.S.R. 12D – Aerial Application of Herbicides to Utility Rights-of-Way

61 C.S.R. 12E – Registry of Persons with Health Sensitivity to Pesticide Drift

61 C.S.R. 12F – Assessment of Civil Penalties and Procedures for Consent Agreement or Negotiated Settlement

61 C.S.R. 12G – General Groundwater Protection for Pesticides

61 C.S.R. 12H – Bulk Pesticide Operational Rules

61 C.S.R. 12I – Non-Bulk Pesticide Rules for Permanent Operational Areas

61 C.S.R. 12J – Integrated Pest Management Programs in Schools and Day Care Centers

61 C.S.R. 22 – Generic State Management Plan for Pesticides and Fertilizers in Groundwater

61 C.S.R. 22A – Best Management Practices at Temporary Operational Areas for Non Bulk Pesticide Mixing and Loading Locations



In addition to enforcing the above regulations, the Pesticide Regulatory Programs work with EPA’s Office of Pesticide Programs (OPP) and the Office of Enforcement and Compliance Assurance (OECA) through a cooperative agreement to enforce the *Federal Insecticide, Fungicide, and Rodenticide Act* (FIFRA). As outlined in guidance and written in the agreement, the Pesticide Regulatory Programs work with EPA Region 3 to establish

priorities and demonstration of progress towards the protection of water resources from pesticides. This program is known as the Pesticide in Water Program.

The goal of WVDA's Pesticides in Water Program is to ensure pesticides do not adversely affect the State's water resources. In order to manage pesticides in water, the Pesticide Regulatory Programs utilize a three-tier approach:

1. Evaluate "Pesticides of Interest" over time to identify pesticides of concern;
2. Take actions (actively manage beyond the pesticide label) to reduce or prevent contamination from Pesticides of Interest over time; and
3. Demonstrate the progress of the management strategy in reducing or maintaining concentrations below reference points.

Tier 1 Pesticides of Interest: Pesticides of Interest are those pesticides that have been identified by State Lead Agencies for pesticide enforcement through a survey conducted by the States FIFRA Issues Research and Evaluation Group (SFIREG) in 2005 (Table 1 below). Other pesticides could be added to the Pesticides of Interest list if they cause water quality impairments as defined by the federal Clean Water Act or become an interest of the WVDA.

Pesticides of Interest are those pesticides that have the potential to occur in ground or surface water at concentrations approaching or exceeding a human health or ecological reference point. It may be based on a Maximum Contaminant Level (MCL), drinking water health advisory, surface or ground water quality standard (which can address human or aquatic life toxicity), EPA reference dose, EPA drinking water level of concern or another benchmark adopted by regulation or policy. A Pesticide of Interest could be an active ingredient alone or the active ingredient collectively with degradants of toxicological concern.

Although sampling is not mandatory, it is the best measure to determine active ingredients that should be moved to the Tier 2 Pesticides of Concern category. Securing funds for monitoring pesticide residues in water has been a challenge for WVDA, but WVDA has recently entered into a financial agreement with DEP to monitor the State's groundwater for pesticides. This five-year project will test groundwater in vulnerable areas of the State. If pesticide residues are discovered in groundwater as described above, it will allow that active ingredient to be reclassified as a "Pesticide of Concern".

Table 1
State List of Pesticides of Water Quality Concern

2,4-D	Isoxaflutole
Acetochlor (+ ESA, OXA)	Lambda-cyhalothrin
Alachlor (+ ESA)	Lindane (Voluntarily cancelled, use of existing stocks permitted until October 1, 2009)
Aldicarb (+ degradants)	Malathion
Atrazine (+ DEA, DIA, DACT, Hydroxy)	Mesotrione
Azinphos-methyl	Metalaxyl
Bentazon	Metsulfuron Methyl
Bromacil	Metolachlor (+ ESA, OXA, S-Metolachlor)
Carbaryl	Metribuzin (+ DA, DADK, DK)
Carbofuran (Cancellation being prepared)	MSMA + other arsenical herbicides
Chlorothalonil	Napropamide
Chlorpyrifos (+ TCP)	Norflurazone (+ degradants)
Clopyralid	Pendimethalin
Copper Pesticides	Phenoxy herbicide group
Dacthal (+ degradants) (Cancellation being Prepared)	Phosmet
DBCP	Picloram
Diazinon	Prometon
Dicamba	Prometryn
Dimethenamid	Propazine
Diuron	Propiconazole
Endosulfan	Simazine (+ DACT, DIA)
Esfenvalerate	Sulfometuron (et. al.)
Ethoprop	Tebuthiuron
Glyphosate (+ AMPA)	Terbacil
Hexazinone (+ Metabolite B)	Thiamethoxam
Imazamethabenz	Tralkoxydim
Imazapyr	Triallate
Imidacloprid	Triclopyr
	Trifluralin

Source: State Survey for Water Resource Monitoring Programs and Analytical Parameters
October 2005 - Conducted by the SFIREG WQ/PD Working Committee
Includes chemicals of concern for both ground and surface water

Tier 2 Pesticides of Concern: Pesticides that are identified as a concern at Tier 1 must be managed. A pesticide is actively “managed” when activities are carried out to prevent or reduce contamination of water by a particular active ingredient so that it is prevented from reaching a specified reference point as mentioned above. An example of a Tier 2 Pesticide of Concern is the herbicide Atrazine. Atrazine’s widespread use on corn and high solubility in water chemistry led to detections nationwide of the parent compound and its breakdown products (also known as degradants) in both surface and groundwater.

WVDA relies heavily on public outreach and user education to manage Pesticides of Concern. The pesticide applicator certification process continuously addresses concerns of pesticides in water. This includes study material supplied for written examinations as well as initial certification training sessions. All commercial applicators using general or restricted use pesticides and all private applicators must maintain certification by attending recertification training sessions. Recertification training sessions are another opportunity to manage Pesticides of Concern.

Routine agricultural use inspections by Pesticide Regulatory Officers address existing water quality related label restrictions and State regulations. Adherence to label-specified setbacks from surface water and field drainage sites is emphasized. Under the existing enforcement process, first time violators are notified by letter. Additional violations can result in monetary fines or license revocation.

WVDA works very closely with the West Virginia Conservation Agency in the promotion of and adoption of voluntary best management practices (BMPs) shown to reduce impacts by pesticides. Examples include riparian buffer zones, filter strips, and no-till cultivation.

Tier 3 Demonstration of Progress: After a pesticide has advanced through the first two tiers, progress toward reductions in concentrations below a previously exceeded reference point should be demonstrated in Tier 3. At this stage, the steps taken to manage a Pesticide of Concern in order to keep (or return) pesticide concentrations in water to below a reference point should be outlined or the certification of widespread adoption of control measures should be demonstrated. Progress toward reduction or maintenance of concentrations below the reference point could be demonstrated by:

- Targeted monitoring of water samples from vulnerable use areas that determines that mitigation measures are preventing residue levels from approaching or exceeding a reference point;
- Downward trends in concentration levels established by monitoring data in geographic areas where the Pesticide of Concern is being used (data from WVDA, USDA, USGS, the registrant or other sources);
- The results of targeted surveys or inspections that document the wide adoption of voluntary or regulatory measures that have been proven via research to protect water quality; and/or
- Monitoring. Though not required under Tier 3, monitoring is the most representative method of showing a decrease in a particular pesticide's occurrence in water. WVDA has historically referenced studies from allied agencies such as USGS. In addition, WVDA closely observes the data provided by DEP's Ambient Water Quality Monitoring (AWQM) Network.

Cancellation of a pesticide's use in the State would be the most severe action taken under Tier 3. Historically, Tier 3 actions have involved the reclassification of a general use pesticide (as classified by EPA) to a State Restricted Use Pesticide (RUP). Use of State RUPs requires that applicators become certified under state licensing programs before the product can be purchased for use. Other conditions could be placed on the Restricted

Use License, such as product specific training program completion prior to renewal of the license.

WVDA is confident that the uniformity of the development of its environmental programs, the continued interagency cooperation, and the reliance on successfully demonstrated management practices will facilitate the accountability tier of the management program.

B. Pesticides In Water Program – Reporting Requirements

Activities related to the Pesticides in Water Program are reported under the web-based Pesticides of Interest Tracking System (POINTS). POINTS is a national reporting system funded by EPA and can be found at <http://points.wsu.edu>. From the POINTS system data, EPA – on a national level – expects to be able to:

- Determine how Pesticides of Interest were evaluated;
- Identify Pesticides of Concern (pesticides that approach or exceed reference points);
- Identify Pesticides of Concern that are being actively managed and that may need more effective management at a national level (e.g. label changes, special studies);
- Identify pesticides for which national water quality standards, aquatic life criteria or other national regulatory standards or reference points are needed;
- Demonstrate that state and tribal water quality management programs are effective at reducing pesticide risks to water quality locally; and
- Identify states in which the FIFRA lead agency is using its resources to address pesticide-impaired waters under the federal Clean Water Act.

C. Plastic Pesticide Container Recycling Program

More than 50,000 pounds of plastic pesticide containers have been collected for recycling over the last five growing seasons. WVDA maintains pesticide collection container facilities in Berkeley, Greenbrier, Hardy, Hampshire, Kanawha, Lewis, Jefferson, Mason, and Ohio Counties. Sea containers are rented to store the plastic containers for recycling. WVDA owns two of the sea containers, which has helped reduce the costs of rental units. As this program continues to grow, we hope to offer more pesticide collection facilities in areas where there is heavy pesticide usage. The continuation of this program is a legitimate protection of groundwater, in that it requires the triple rinsing or pressure rinsing of containers and, therefore, reduces the number of plastic pesticide containers that may enter the waste stream containing residues of pesticides. Containers are shredded and remanufactured into shipping pallets, drainage tile, composite lumber or other low contact nonfood containing plastic items.



Properly rinsed pesticide containers are stored in sea containers at nine locations throughout the State.

D. Pesticide Waste Disposal Program

The ongoing collection and annual disposal of waste and unwanted pesticides is another program aimed at reducing the potential of pesticides reaching water. In addition to fielding phone calls to pick up unwanted pesticides, the program specialist works with representatives of the West Virginia University Extension Service to contact private pesticide applicators or other State agencies to assist with identifying and inventorying pesticides for disposal. The program specialist has collected and prioritized inventory sheets for the next disposal program and determined what areas need this program. Due to some leadership turnover and budget restraints, the proposal for this year's program has been delayed later than anticipated, but it is currently in the process of being reviewed and finalized. WVDA is eager to get this next disposal program underway, as there have been an abundance of inventory sheets collected, and this program has proven to be very successful in the past.



Waste pesticides collected for disposal

E. Groundwater Monitoring Program

In collaboration with and with financial support from DEP's groundwater protection fees, WVDA has created a five-year groundwater monitoring program. The objective of this program is to monitor groundwater for pesticides and respond as necessary to manage concentrations that exceed reference points. When residues are found that threaten water quality standards or other reference points, WVDA will respond to pesticide water contamination events by proposing risk mitigation measures with the regulated applicator communities as outlined above. Through compliance assistance and enforcement of pesticide applicator laws and regulations and recertification training requirements, WVDA has opportunities for risk mitigation. The groundwater sampling program began in January 2018. During the months leading up to the start of the new year, the environmental programs specialist visited various locations throughout the State to determine ten sites at which to conduct these samples.

F. Bulk Pesticide Storage Facilities

Bulk pesticides storage facilities are inspected annually. In addition to the secondary containment having an adequate capacity to capture a catastrophic spill, the agency's Bulk Pesticides Operational Rules (61 C.S.R. 12H) require that pumps, transfer lines, and other appendages be inspected and maintained in good operational condition and that written emergency and discharge response plans be in place. Appropriate enforcement action is taken when facilities are found to be noncompliant.



Secondary containment at a bulk pesticide facility

**Regulatory and Environmental Affairs Division
Environmental Programs and Environmental Laborites**



WVDA's Regulatory and Environmental Affairs Division – Environmental Programs Section is headquartered at the Moorefield Agricultural Center in Moorefield, West Virginia. This program focuses on monitoring, protecting, and improving water quality. Since the program's inception in July 1998, many of the State's streams in the Eastern Panhandle have been monitored. Today, environmental technicians continue to collect approximately 2,800 water quality samples



annually in the eight counties that represent West Virginia's Potomac Watershed. Streams sampled include: Anderson Run, Bullskin Run, Cacapon River, Rockymarsh Run, Elk Run, Elks Branch, Lost River, Lunice Creek, Mill Creek (Grant County), New Creek, North Fork of the South Branch, Patterson Creek, Sleepy Creek, Opequon Creek, South Branch of the Potomac Rover, and South Fork of the South Branch.

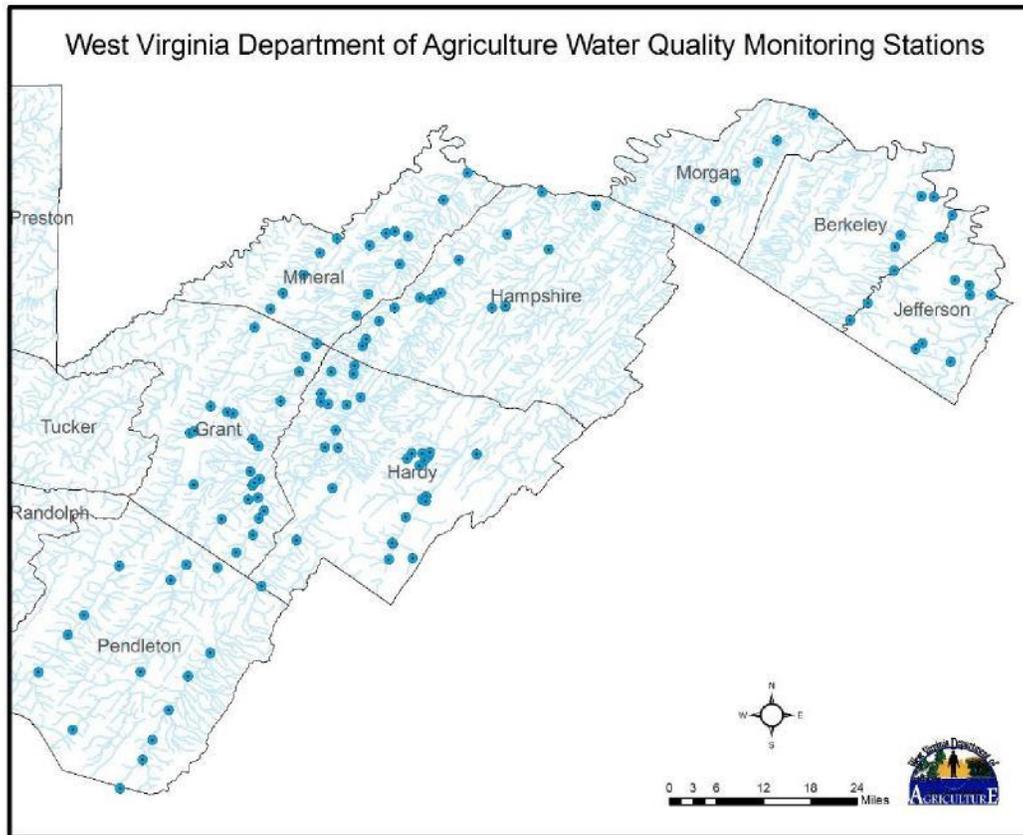
A. Monitoring and Sampling

Water samples that are collected are analyzed for pH, temperature, conductivity, and dissolved oxygen in the field and nitrate, nitrite, ammonia, orthophosphate, total phosphorous, turbidity, total suspended solids, and fecal coliform when they are received in WVDA's Environmental Laboratory in Moorefield. Since July 1998, nearly 48,000 water samples have been collected and analyzed.



Due to recent budget and financial constraints, WVDA decided to downsize the water quality slightly as of July 1, 2017. One of the biggest changes as a result was reducing the number of environmental technicians from two to one. Moreover, WVDA reduced the sampling frequency on

certain streams. While Cacapon River monitoring was added in July 2016, there have been a few sampling runs dropped for the 2017-2018 fiscal year. Despite difficult financial times, there are still positive changes taking place, such as being able to upgrade some aging field equipment in the upcoming fiscal year using Chesapeake Bay grant funds.



Water quality analysis and related maps of sampling sites are often provided to watershed organizations and state and federal agencies. WVDA utilizes Arc GIS to create these maps. This past year, a data quality assurance process was performed on existing data that will help make it more readily available to other agencies or entities. WVDA has recently shared data with groups such as Trout Unlimited and the West Virginia Conservation Agency (WVCA). In fact, WVCA has started a statistical analysis on the water quality data in the Anderson Run, Lost River, South Branch of the Potomac River, and Mill Creek (Grant County) watersheds.

One thing that hasn't changed over time is the Environmental Programs staff's ability to work with area farmers to promote best management practices designed to reduce nutrient and sediment runoff and increase farm productivity. New brochures have been created to help inform and promote producers on some of these various practices. WVDA is continuing to develop a verification program that will help to document expired cost share and non-cost share BMPs that currently exist on agricultural operations.

B. Nutrient Management Program

One of the areas in which WVDA excels is the Nutrient Management Program. WVDA strongly promotes nutrient management plans (NMPs) as a key BMP when dealing with nutrient reduction in local waterways. The NMP specifies cropping recommendations for all acreage to which commercial fertilizer, litter or animal manure is applied. Results of soil tests, coupled with specific crop yields or soil utilization, are used to develop recommendations concerning amounts of fertilizers to be applied to each field. To facilitate NMP implementation, WVDA Nutrient Management Laboratory in Moorefield routinely analyzes over 200 litter and manure samples per year. As of 2017, West Virginia proudly announced that it has met its goal of 90,000 acres under NMPs. The nutrient management staff is working diligently to maintain these NMPs for this amount of acreage as WVDA continues to expand this program.



C. Education and Outreach

Each year, the Environmental Programs Section participates in several educational and outreach events. These events include local county fairs and festivals at which the staff will educate and inform citizens about topics such as water quality or best management practices. Additionally, staff proactively takes part in Chesapeake Bay watershed meetings, conferences, and forums to understand critical issues while asserting West Virginia's water quality goals.

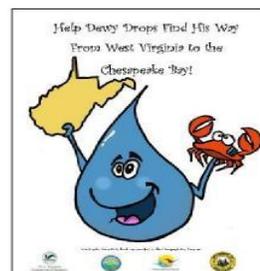
WVDA's Agricultural Outreach program has been busy with new ideas for bringing environmental education to West Virginia residents. During the past two years, this program has focused more on the importance of soil and water quality by introducing the use of WVCA's Soil Tunnel Trailer. This trailer is a handcrafted recreation of a soil profile inside an enclosed trailer that makes you feel as if you are walking into an in-ground tunnel. The purpose of this educational tool is to teach visitors the importance of good soil quality and fertility.



To help promote soil and water quality education to youngsters another way, WVDA created a water quality themed coloring-activity book that is geared toward children. This is a great way for kids to have fun and start to become familiar with water quality at home, as well as making the connection to downstream neighbors.

The Outreach Program is continually travelling to various areas of the State to promote soil and water quality education. Some of the events in which WVDA has participate include:

- Mineral County STEM Day in both 2016 and 2017. Soil Type By Feel and the Soil Tunnel Trailer were the subjects for those years, respectively.



- In May, at the Mineral County primary schools, approximately 525 students were educated on the importance of soil health, water quality, and protecting habitats.
- In June 2017, Moorefield was the host for the Summer Ag Institute for Educators. The Soil Tunnel Trailer was present, and WVDA coordinated a hands-on float trip down the South Branch of the Potomac River for teachers to learn about water quality.
- WVDA staff attends 4-H camps and the West Virginia Senior Conservation Camp and works throughout the school year to inform youth about point and non-point source pollution and how pollution affects ground and surface waters. This past summer, there were approximately 100 present at the Hardy County 4-H Camp for campers to learn about habitat protection, soil health, and water quality by means of the Soil Tunnel Trailer.
- Active participation in the West Virginia Envirothon. High school students through the State come to compete in this event to showcase their knowledge in various subjects, such as forestry, soils, aquatics, wildlife, and current environmental topics. This year, to aid with the Envirothon, a WVDA staff member submitted a fictional scenario based on Hardy County that was specific about addressing water quality issues on poultry farms.



Through the aforementioned programs, along with a dedicated, hardworking staff, WVDA is on the right track for continuing to make a difference in local streams, as well as the Chesapeake Bay Watershed. This is evidenced. By consistent excellent scores on certifications, water quality data that is being used by multiple organizations, and the continuing efforts made

to educate the public about water quality. Through unified efforts, WVDA will continue to encourage adoption of BMPs to meet the nutrient and sediment reductions required by the Chesapeake Bay Total Maximum Daily Load (TMDL). Moreover, education must continue to inform citizens of all ages on the importance of maintaining a strong agriculture industry while minimizing negative impacts to the environment.

West Virginia Conservation Agency

The West Virginia Conservation Agency (WVCA) focuses its resource conservation efforts on the maintenance and/or improvement of water quality relative to natural resource use, with a primary focus on agriculture and construction activities. The main concern is for surface water quality, but activities impacting groundwater resources are addressed through conservation programs that implement best management practices (BMPs), provide technical support, and involve educational outreach to the citizens throughout the State. The goal is to inspire and empower the people of West Virginia to value and work for clean water.

WVCA continues its “Conservation Partnerships” with State, federal, and local agencies, as well as the private sector and many non-profit organizations. This

cooperative approach provides benefits such as funding for projects and technical expertise and enables citizen input assisting the agency to pinpoint and target specific problems in specific areas. "Conservation Partnerships" continue to be an effective way to address West Virginia's concerns and provide the resources vital in the solutions and/or prevention of water quality degradation issues.

Our State has a diversity of terrain and geology that challenges natural resource conservationists with a multitude of issues that must be confronted by methods that are both effective and sensitive to the specific location and individuals affected.

WVCA undertook the following activities that either directly or indirectly protect West Virginia's groundwater resources during the reporting period of July 1, 2015 through June 30, 2017:

Agricultural Activities

- Cost share programs have been a significant contributor to encourage landowners to develop conservation practices on their property.
- Conservation Reserve Enhancement Program (CREP) reporting is completed for each federal fiscal year, October 1 through September 30.
- In FY15 (October 1, 2014 through September 30, 2015), there were 26 contracts encompassing 188 acres; of those 188 acres, 41.4 acres were established in filter strips and 146.6 acres were established in riparian forest buffers.
- In FY16 (October 1, 2015 through September 30, 2016), there were 18 contracts encompassing 133.47 acres. For this year, some acres were eligible for re-enrollment. Of the 133.47 acres, 5.43 acres were established in permanent grasses and legumes, 54.67 acres (all re-enrolled) are continuing in filter strips, 67.37 acres were established in riparian forest buffers, and six acres are continuing in riparian forest buffer.
- In FY17 (October 1, 2016 through September 30, 2017) there were 30 contracts encompassing 31.7 acres re-enrolled in permanent grasses and legumes, 52.1 acres newly enrolled in filter strips, 134.58 acres newly enrolled in riparian forest buffers, and 182.89 acres re-enrolled in riparian forest buffers, for a total of 401.27 acres.
- WVCA serves on the West Virginia Nutrient Management Committee that oversees planner certification and develops resource management practices concerning chemical fertilizer, livestock manure, and poultry litter utilization.
- WVCA assisted with 19 agriculture educational field days, reaching a total of 3,425 producers, landowners, and agency personnel.

Construction Assistance

- WVCA reviewed 20 erosion and sediment control plans for construction sites less than one acre in size, facilitating the conservation of an estimated 8,974.83 tons of soil. Plans are reviewed for the appropriate BMPs to prevent sedimentation of the State's waters and underground aquifers.
- WVCA provided technical stormwater management assistance to 20 construction projects by providing recommendations for BMPs to alleviate problem areas.

Recommended BMPs included rain gardens, overflow, plant materials, bio swales, stream restoration structures, downspouts, outlet/outfall protection, porous pavers, tree planting, subsurface basin, and detention ponds.

- WVCA provided technical and educational outreach support for sediment and construction-related issues to 21 watershed associations throughout the State, which resulted in the restoration of a total of 36,459 linear feet of severely eroding streambanks, saving 12,295.76 tons of sediment from entering the streams and underground aquifers.

Management of Organic Animal Waste and Chemical Fertilizers

WVCA serves a technical resource role on the West Virginia Concentrated Animal Feeding Operations (CAFO) Committee, which works to reduce or eliminate the nonpoint source pollution to surface and groundwater due to animal agriculture operations. The Committee works on ways to educate farmers involved in animal agriculture manage their small operations to prevent water pollution and continue to operate without having to obtain a CAFO permit. Recommendations were developed for the setback distances for the application of manures and fertilizer to prevent surface and groundwater contamination. Table 2 below shows the pounds of nitrogen and phosphorous the BMPs kept out of receiving water.

Table 2

# Nutrient Management Plans	BMPs in Plans	#N Managed	#P Managed	Acres
1	1	9,219.71	8,067.25	161.1
1	1	12,8999.33	11,286.91	155.8
1	1	6,780	900	54.7
1	1	9,200	3,660	76.5
1	1	20,132.66	16,727.49	All Exported
1	1	3,280	880	31

Agricultural Enhancement Program (AgEP)

West Virginia's Agricultural Enhancement Program's (AgEP) mission is to assist the agriculture cooperators of West Virginia Conservation Districts with the voluntary implement of BMPs on agricultural lands to conserve and improve land and water quality. AgEP offers technical and financial assistance as an incentive to implement suggested BMPs. Table 3 below shows the BMPs implemented during the reporting period.

Table 3

Practices Completed in FY16		Practices Completed in FY 17	
Practice	Unit Totals	Practice	Unit Totals
Cover Crop	218 acres	Cover Crop	150 acres
Exclusion Fence	70,479 acres	Exclusion Fence	76,658 feet
Frost Seeding	1,512 acres	Frost Seeding	1,306 acres
Heavy Use Protection Areas	44 acres	Heavy Use Protection Area	42 areas/54,420 sq. ft.
Invasive Species Management*	1,320 acres	Invasive Species Management*	1,579 acres
Lime	15,487 acres	Lime	13,286 acres / 31,620 tons
Nutrient Management	2,954 acres	Micro Irrigation	1 system
Pasture Division Fence	167,246 acres	Nutrient Management	3,198 acres
Pasture Seeding	593 acres	Pasture Division Fence	169,909 feet
Pollinator Planting	6 plots	Pasture Seeding	458 acres
Pond Clean Out	7 ponds	Pollinator Planting	3 plots
Roof Runoff Management	5 structures	Pond Clean Out	11 ponds
Urban Agriculture	35 components	Roof Runoff Management	2 structures / 7,154 sq. ft. (structures)
Watering System	100	Urban Agriculture	6 components
Winter Grazing	25 acres	Watering System	90 components /
*ISM acres include		*ISM acres include	

Spring Field Day at Mason Run Dairy

Fifty-one natural resource professionals attended a “Spring Field Day” at Mason Run Dairy in Preston County, West Virginia. The training focused on field applications of the new nutrient management planning program “Manure Management Planner” (MMP).



The workshop was graciously hosted by Greg Gibson, owner and operator of Mason Run Dairy and the West Virginia chapter of the Soil and Water Conservation Society, in partnership with the WVU Extension Service, the Natural Resources Conservation Service (NRCS), and WVCA. The day was jam-packed with sessions covering field data collection for use in RUSLE and MMP, GPS use, setback determinations, sampling, and crop rotations. Attendees received six nutrient management continuing

education units and six conservation planner continuing education units.

Educational Activities Specific to Groundwater

Conservation Specialists serve as direct service providers or help coordinate assistance from other sources to watershed organizations and landowners. WVCA supports statewide efforts to address nonpoint pollution with education and outreach, coordination and implementation of projects addressing runoff, erosion and sediment control, stormwater management, nutrient and pest management, stream cleanup, riparian demonstrations, stream bank stabilization, pre and post project monitoring, watershed assessments, agriculture BMP selection and installation, the availability and types of conservation programs, financial assistance, and water quality improvements.

WVCA held 73 educational programs attended by 4,836 students, members of the public, producers, agency personnel, and watershed association members. Fourteen stormwater workshops were held across the State, reaching a total of 391 attendees. WVCA is leading the West Virginia Save Our Streams monitoring on 89 stations on 55 streams.

Harpers Ferry Middle School Water Testing

WVCA Conservation Specialist assisted a Harpers Ferry Middle School science class with their water quality monitoring program by leading the 7th grade class through a benthic macroinvertebrate survey. HFMS science teacher, Dr. Robin Good, does water testing and biological surveying with her students on Elks Run monthly.



Aquatics Envirothon Trainings

The Eastern Panhandle Conservation District held their semi-annual Envirothon Training, at which Conservation Specialist Suzy



Campbell conducted the aquatics portion of the training. Thirty-nine students and teachers from five different schools received training in water chemistry, aquatic habitat, biological assessment, water quality laws and regulations, and other subtopics. Additionally, the conservation specialist assisted with the pre-test day aquatics training at the State Envirothon competition, which hosted a total of 25 teams with three alternates.

STEM Festival – Soil Trailer

Potomac State College hosted their annual STEM festival. WVCA Conservation Specialist attended with the Soil Tunnel Trailer, and it was open to the public. The unit has sculpted interior walls with the left 16-foot wall serving as the Soil Health Wall and the right wall serving as an agricultural Specialty Crops Wall. At eight feet wide, the back wall serves as a Water Quality Wall. The left side of the back wall depicts clean water with healthy fish, lily pads, crawdad, and a duck floating from the ceiling. The right side depicts the effects of litter and contamination, showing sickly wildlife and litter (a tire, ten-gallon drum, plastic bottles). The “pond” sculpture comes from the wall and onto the ceiling where the duck is swimming and roots from the lily pads hang down. Students and parents could pick up bookmarks, stickers, and flower seeds after they took a walk through the Soil Trailer and were given the chance to ask questions regarding the artwork. Approximately 400 people toured the Soil Trailer during the festival.

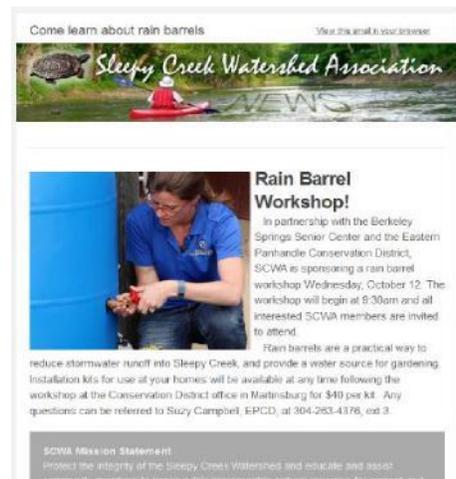


Stormwater Management

WVCA provides technical advice regarding stormwater management quality and/or quantity issues to clients through the State. The primary method to control

stormwater discharges is the use of best management practices (BMPs). WVCA provided 356 clients with a variety of BMP recommendations to control runoff. Recommended BMPs included: tree plantings, swales, rain gardens, permeable pavers, wetlands, articulated blocks, vegetation plans, bioretention structures, erosion matting, stone berm, filter strips, rainwater harvesting, streambank stabilization, diversion ditch, culvert outlet, culvert inlet protection, grading slopes, check dams, channel lining, detention pond, and increasing concentrated flows with increased stand of grass or herbaceous material on a critical area.

WVCA actively promoted the use of rainwater harvesting throughout the State by hosting 14 rain barrel workshops, which were attended by a total of approximately 391 people. Rainwater harvesting is the accumulation and deposition of rainwater for reuse on site, rather than allowing it to run off. A rain barrel is a system that collects and stores rainwater from your roof that would otherwise be lost to runoff and diverted to storm drains and streams. They also provide free irrigation for gardens and lawns and can reduce utility bills while conserving water and preventing runoff.



Nutrient Management

Nutrient management is the science and practice directed to link soil, crop, weather, and hydrologic factors with cultural, irrigation, and soil and water conservation practices to achieve optimal nutrient use efficiency, crop yields, crop quality, and economic returns, while reducing off-site transport of nutrients (fertilizer) that may impact the environment. Nutrient management plans are tailored to be farm specific and require the knowledge of local planning professionals. WVCA works in partnership with WVDA to promote the adoption of nutrient management plans (NMPs) by certifying staff to write plans, employer summer interns to assist farmers in pulling soil and manure samples, and providing educational events. During 2015, 2016, and 2017, WVCA sampled over 10,085.5 acres for NMPs.

WVCA Conservation Specialist Functions as 319 Watershed Project Managers

WVCA's Conservation Specialists (CS) support volunteer watershed associations, educate citizens on nonpoint source pollution issues, identify local stakeholders, partners, and funding sources and take the lead for project teams (PTs) consisting of community

stakeholders to place projects on the ground. Watershed Project Proposal funds are used to install specific projects designed to remedy or decrease contributions to the impairment of the priority watershed in which the projects are installed. WVCA provided programs and projects in the following areas:

Sleepy Creek II 319 Watershed Project (Morgan County)

The goal of the Sleepy Creek Phase II 319 Watershed Project is to reduce fecal coliform loads within the watershed from failing septic systems. Projects completed during the period covered by this report include installation of porous pavers, urban tree plantings, riparian buffer, installation of a rain garden.

Sleepy Creek III 319 Watershed Project (Morgan County)

The goal of the Sleepy Creek Phase III 319 Watershed Project is to reduce fecal coliform loads within the watershed from stormwater runoff from urban agricultural land uses. Projects completed during the period covered by this report include pumping 50 septic systems, repairing four septic systems, and outreach and education.

Elks Run 319 Watershed Project (Jefferson County)

The goal of the Elks Run 319 Watershed Project is to reduce fecal coliform and sediment loads within the watershed from failing septic systems and eroding streambanks. Projects completed during the period covered by this report include water quality monitoring and USGS source tracking and outreach and education.

Back Creek Protection Watershed Project (Berkeley County)

WVCA developed and obtained EPA approval for a Watershed Protection Plan to guide and prioritize conservation and restoration efforts in the Back Creek Watershed to include outreach and education.

Muddy Creek 319 Watershed Project (Greenbrier County)

The goal of the Muddy Creek 319 Watershed Project is to reduce the fecal coliform loads within the watershed from agricultural operations and failing septic systems. Best Management Practices include the installation of 5,486 feet of pipeline; ten water systems; two ponds; one well; one pumping system; 7,027 feet of exclusion fence; 1,290 feet of diversion fence; two heavy use area protections; nine septic pumpings; two septic replacements; 72 acres of nutrient management plans and 72 acres of grazing plans impacting 275 animals with a bacteria load reduction of $2.53E+12$.

Knapps Creek 319 Watershed Project (Monroe County)

Best Management Practices include the installation of 265 feet of pipeline; two watering systems; 3,518 feet of exclusion fence; 957 feet of stream restoration; two heavy use area protections; 15 septic pumpings; and ten septic replacements impacting 160 animals with a bacteria load reduction of $1.39E+12$ and a sediment load reduction of 394.74 tons.

Milligan Creek 319 Watershed Project (Greenbrier County)

Best Management Practices include the installation of 8,069 feet of pipeline; 20 watering systems; two ponds; one well; four pumping systems; 4,355 feet of exclusion fence; 28,231 feet of diversion fence; six heavy use area protections; 1,382 acres of nutrient management plans and 1,091 acres of grazing plans impacting 1,496 animals with a bacteria load reduction of $1.3E+13$.

James River 319 Watershed Project (Monroe County)

Best Management Practices include the installation of 10,506 feet of pipeline; 15 watering systems; one spring development; two ponds; one well/ one pumping system; 25,996 feet of exclusion fence; 4,845 feet of diversion fence; 900 feet of stream restoration; 15 heavy use area protections; 739 acres of nutrient management plans; 472 acres of grazing plans; and one roofed feeding area impacting 545 animals with a bacteria load reduction of $4.62E+12$.

Second Creek 319 Watershed Project (Monroe County)

Best Management Practices include the installation of 2,622 feet of pipeline; seven watering systems; one spring development; one pond; two wells; three pumping systems; 794 feet of exclusion fence; 17,011 feet of diversion fence; eight heavy use area protections; 935 acres of nutrient management plans; 707 acres of grazing plans, one roofed feeding area impacting 1,726 animals with a $1.5E+13$ bacteria load reduction.

Upper Meadow 319 Watershed Project (Greenbrier County)

Best Management Practices include the installation of 440 nutrient management plans impacting 525 animals.

Chesapeake Bay Program

WVCA is a full partner in the Chesapeake Bay Program, which is an effort by WVCA, WVDA, DEP, and several other State, federal, and local partners in the Chesapeake Bay Watershed to implement the Chesapeake Bay Total Maximum Daily Load (TMDL), released by EPA on December 29, 2010.

The Chesapeake Bay TMDL is a comprehensive “pollution diet” to restore the health of the Bay and all of its tributary streams, creeks, and rivers by setting limits for nitrogen, phosphorous, and sediment pollution. The TMDL is historic in that it is the largest clean-up ever initiated by EPA, encompassing a 63,000 square mile watershed. It is designed to ensure that all pollution control measures needed to fully restore the Bay and its tidal rivers are in place by 2025, with at least sixty percent of pollution reductions completed by 2017. West Virginia is charged with reducing nitrogen by thirty-three percent phosphorous by thirty-five percent sediment by six percent across all sectors. Each of the six Bay states and the District of Columbia have developed Watershed Implementation Plans (WIPs) that detail how and when they will meet their pollution allocations.

West Virginia released its Phase II WIP on March 30, 2012 and is already gearing up to develop its Phase III WIP in 2018, which will address reductions needed from 2018 through 2015. The WIP describes how federal, State, and local government will achieve required pollution load reductions and sets a timeline for when reductions will occur. It describes in detail how pollution reduction strategies will be undertaken in each major load sector (wastewater, developed lands, agriculture, forest, and other). Reducing nitrogen, phosphorous, and sediment in local creeks and rivers will mean healthier water resources to better sustain tourism, fishing, drinking water supplies, wildlife habitat, and other uses.

Chesapeake Bay Implementation grant funds have been allocated to assist agricultural producers with the installation of cover crops, stream bank exclusion fencing, alternative watering sources, riparian buffer development, heavy use area protection around areas such as feeding and watering troughs and walkways, and the transfer of poultry litter outside of the Bay Watershed. With the assistance of these funds, WVCA and conservation districts have helped to State reduce nutrient and sediment loads from entering the State's streams, rivers, and the Chesapeake Bay Watershed through the implementation of BMPs.

A total of 9,916.7 acres of cover crops were planted during this time. Cover crops improve water quality by reducing soil erosion and nutrient runoff. Some examples of cover crops are barley, rye, alfalfa, and triticale. Often, when farmers harvest their cash crops (corn, soy beans, etc.), the fields will lay bare in the winter. By establishing a cover crop during the winter months, the soil is held in place as opposed to being washed off of the field into streams and rivers during heavy rains. Producers are able to improve their operations while addressing environmental concerns.

Additionally, 9,514 tons of poultry litter were transferred out of the Bay Watershed. The Potomac Valley is rich with poultry production, which results in a large surplus of poultry litter. Transferring this litter out of the Watershed prevents many nutrients from running off into rivers and streams.

Water Quality Workshops – Conservation Reserve Enhancement Program (CREP)

WVCA joined with the United States Department of Agriculture Farm Service Agency and other signatories to organize a two-day comprehensive CREP training for all partnering field staff on May 3 and 4, 2016. The training targeted federal and State field employees who play a role in the program within West Virginia's Chesapeake Bay drainage. The goal of the training was to increase communication and define roles between the partners, train new staff, and provide updates on environmental challenges in the area and how West Virginia producers are obligated to meet these requirements.

West Virginia Conservation Agency's Watershed Resource Center

The Watershed Resource Center (WRC) focuses on resources on providing training, information transfer, and assistance on all aspects of water quality efforts throughout West Virginia. WRC provides specific training and education to better understand watershed and nonpoint and point source impacts and solutions.

The WRC hosts a session annually at the West Virginia Contractors Exposition. In 2015, the session was attended by more than 25 contractors and professionals, and in 2016, there were more than 125 attendees. A session of “Potential Pitfalls Associated with Construction Related to Oil and Gas in the Northwest Region of West Virginia” was presented by staff of DEP’s Division of Water and Waste Management, and the WRC presented an educational display and workshop geared toward the potential pitfalls associated with that activity. The workshop was a one-hour session with one continuing education unit/professional development hours credit.

The WRC provides annual support to the Annual Mid-Atlantic chapter of the International Erosion Control Association Environmental Conference, Workshop, and Tradeshow. The MAC/IECA disseminates information to over 200 members and public attendees in the fields of erosion and sediment control, stormwater management, wetland mitigation, and stream stabilization through technical workshops and the attendance of approximately 25 vendors at their annual conference.

The WRC provides educational outreach on nonpoint source pollution at educational field days, community events, and expositions. During this reporting period, the WRC presented water quality education for five youth camps. Educational material on water quality and nonpoint source pollution is distributed Statewide as requested



V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

DEP's Division of Water and Waste Management (DWWM) is the State's lead agency for the regulation and protection of groundwater. See, W. Va. Code § 22-12-6(a). As such, it coordinates with all the other agencies of State government charged with groundwater protection to maintain the State's groundwater management strategy and the data management system that allows these agencies to administer the State's groundwater program. Id. Several programs within DWWM are charged with aspects of groundwater protection, namely the Groundwater Program, the Office of Waste Management's Solid Waste Permitting Unit, the Office of Water Resources' Hazardous Waste Permitting Unit, and the Water Use Section. Also within DEP, both the Division of Mining and Reclamation, which includes the Office of Abandoned Mine Lands, Reclamation and Enforcement, and the Office of Oil and Gas have programs dedicated to groundwater protection. Finally, the Division of Land Restoration has programs that oversee the remediation of sites that have been impacted by past industrial practices, which remediation almost always involves the cleanup of contaminated groundwater.

Division of Water and Waste Management Groundwater and Underground Injection Control Programs

DWWM's Groundwater and Underground Injection Control (UIC) Programs coordinate the groundwater protection efforts of the Bureau for Public Health, the Department of Agriculture, and the various DEP programs that have authority under West Virginia's Groundwater Protection Act. The Groundwater and UIC Programs have seven main responsibilities:

Groundwater Remediation

Groundwater's Remediation Program is directly involved with the remediation of sites containing contaminated groundwater and soil. As of June 2017, there are nearly 136 such sites in West Virginia, which include rail yards, factories, refineries, fuel bulk terminals, aboveground fuel tanks, and spills. Contaminants range from gasoline, diesel fuel, fuel oil, and chlorinated solvents to materials such as cow manure. While the Program frequently works in conjunction with other DEP offices and State and federal agencies, often the sites that come into it do not fit squarely within the remediation box of any other agency or office, and this Program is the last recourse to obtain remediation of a contaminated site. The Remediation Program cleans up sites to the standards established in the Legislative Rule entitled *Requirements Governing Groundwater Standards*, 47 C.S.R. 12.

Groundwater Protection Plans

The *Groundwater Protection Rule*, 47 C.S.R. 58, requires Groundwater Protection Plans (GPPs) for all facilities that have the potential to affect groundwater. They are preventative maintenance documents that cover all processes and materials at a facility that may reasonably be expected to have an effect on groundwater quality. The facility must make an inventory of all potentially contaminating processes and materials and have structures and practices in place to prevent groundwater contamination from these processes and materials. Groundwater protection practices include, at a minimum,

quarterly inspections and maintenance by facility personnel and spill cleanup procedures. The *Groundwater Protection Rule* also sets out instructions for how to prepare and implement GPPs. During the reporting period, the Groundwater Program received 737 GPPs, 337 of which were for permitted facilities. Once approved, the GPPs became part of the permitted facilities' permits. GPPs for facilities not otherwise permitted by DWWM are approved by letter. Inspectors visited 139 facilities during the reporting period to check on the efficacy of the applicable GPPs.

Groundwater Variances

The Legislative Rule entitled *Requirements Governing Groundwater Standards* (47 C.S.R. 12) establishes Statewide groundwater quality standards applicable to any facility that may have an impact on groundwater. However, variances for classes of activities that, by their nature, cannot be conducted in compliance with these standards can be granted by rule if DEP's Cabinet Secretary finds that the benefits of granting a variance outweigh the benefits of complying with current standards. See, W. Va. Code § 22-12-5(f). The applicant for such variance must demonstrate that there is no technologically feasible alternative to the requested variance and that the variance is more in the public interest than adherence to existing standards. Variances that have been supported by the Secretary and approved by the Legislature can be found in the Legislative Rule entitled *Groundwater Quality Standard Variances* (47 C.S.R. 57). During the reporting period, no requests were made for variance from the standards.

There are two rules governing current variances from groundwater quality standards: *Groundwater Protection Standards at Steam Electric Generating Facilities* (47 C.S.R. 57A) and *Groundwater Protection Standards at Dominion Generation Steam Electric Generating Facility at Mount Storm, W. Va.* (47 C.S.R. 57B). The agency routinely receives and evaluates groundwater monitoring results for the facilities covered by these rules. The facility operating at Mount Storm has remained in compliance with its regulatory requirements. However, several facilities operating under 47 C.S.R. 57A have been found to exceed either their Preventative Action Levels or the groundwater protection standards set out in the rule governing their facilities. The agency's Office of Environmental Enforcement has scheduled inspections of those facilities, and the results of those inspections will be reported in next biennial report.

Underground Injection Control

The underground injection control (UIC) program, governed by the Legislative Rule entitled *Underground Injection Control* (47 C.S.R. 13), is designed to ensure that fluids injected underground will not endanger drinking water sources. DWWM regulates what are called Class 5 wells, which include agriculture drainage wells, improved sinkholes, industrial disposal wells, stormwater wells, and septic systems that have the capacity to serve 20 or more people. During the reporting period, the UIC Program issued 81 permits: 67 for on-site sewage disposal, 12 for stormwater disposed of underground from manmade conveyances, and two for groundwater remediation. During the reporting period, the UIC Program also approved 55 Injections-by-Rule: 13 in 2015, 26 in 2016, and 16 in 2017.

The Division of Mining and Reclamation regulates all UIC permits associated with mining operations, and the Office of Oil and Gas regulates all UIC permits associated with oil and natural gas production operations, which are addressed elsewhere in this report.

Septic Tank Seal Registration

Any person or company that is required to obtain a small sewage disposal installation permit must register the septic tank(s) associated with that permit with DWWM's Groundwater Program. The registration is valid for the life of the tank(s) and enables DEP to ensure that the tank is constructed and installed in such a way as to protect groundwater.

Monitoring Well Driller Certification

A monitoring well is any cased excavation or opening into the ground made by digging, boring, drilling, driving, jetting or other methods for the purpose of determining the physical, chemical, biological or radiological properties of groundwater. This definition includes piezometers and observation wells that are to be installed for purposes other than those listed above but does not include wells the primary function of which is to provide a supply of potable water. See, *Monitoring Well Rules*, 47 C.S.R. 59 § 2.7. A monitoring well driller is the individual operating the drilling rig when operating, constructing, altering or abandoning a monitoring well.

As of March 1, 1997, all monitoring well drillers are required to be certified to operate in West Virginia. To become a certified monitoring well driller, an individual must meet experience requirements and pass a written exam. The exam is free; however, individuals are charged an annual \$200 recertification fee. This one-day certification training and testing sessions are presented quarterly in Charleston and are designed to ensure that monitoring well drillers are thoroughly familiar with all requirements of applicable laws, rules, regulations, and design standards pertaining to monitoring well drilling, construction, and abandonment and the abandonment of boreholes.

Monitoring Well Construction and Abandonment

The Legislative Rule entitled *Monitoring Well Design Standards* (47 C.S.R. 60) establishes the minimum acceptable standards and documentation for the design, installation, construction, and abandonment of monitoring wells and for the abandonment of boreholes in order best to protect groundwater.

The Geochemistry of West Virginia's Water

The Groundwater Program is also studying how groundwater quality is affected by human activities and can be degraded as a result of industrial waste disposal, coal mining, oil and gas drilling, agricultural activities, domestic or municipal waste disposal, transportation, and rural development. While the overall quality of West Virginia's water resources is very good, there are many concerns to be addressed, more than the scope of this report will allow. The Groundwater Program is pursuing development of a Needs Assessment to begin a comprehensive database of groundwater quality. Two main

concerns expressed by many are pharmaceuticals and endocrine disrupting chemicals in groundwater and hydraulic fracturing in oil and gas production.

Pharmaceuticals and Endocrine Disrupting Chemicals in Groundwater

The presence of pharmaceuticals and endocrine disrupting chemicals in groundwater continues to be a major concern, as these chemicals are used in so many products consumed in everyday life. Endocrine disrupting chemicals are found in such products as antimicrobial soaps and disinfectants, flame retardants, plasticizers, linings in food containers (such as bisphenol A), food preservatives, shampoos, sunscreen, bug sprays, cosmetics, and many other personal care products. In addition to these products, pharmaceuticals and endocrine disrupting chemicals also enter drinking water supplies as they pass through septic tank and leach field systems and water treatment plants. The source comes from many over-the-counter medications, veterinary drugs, prescription drugs such as cholesterol medications, natural and synthetic estrogen compounds, heart medications, steroids, and pain medications, to name but a few.

The presence of pharmaceuticals and endocrine disrupting chemicals in groundwater has raised concerns regarding their effects on human health, including the continued viability of antibiotic medications. Endocrine disruptors can mimic or partly mimic naturally occurring hormones in the body, like estrogen, androgens, and thyroid hormones, potentially producing overstimulation. They also bind to a receptor within a cell and block the endogenous hormone from binding. The normal signal then fails to occur, and the body fails to respond properly. Examples of chemicals that block or antagonize hormones are anti-estrogens and anti-androgens. Endocrine disruptors also interfere or block the way natural hormones or their receptors are made or controlled by, for example, altering their metabolism in the liver.

Because endocrine disrupting chemicals are found in such a wide variety of products, their presence appears to be ubiquitous in the environment. Bioassays of fish in the Potomac River and other bodies of water routinely find intersex characteristics in the fish sampled. One such mutation is the presence of eggs in the testes of male fish. Another concern is the presence of certain antibiotics in ground and surface waters. As many of these compounds are known endocrine disruptors, their presence – even at low concentrations – warrant additional scrutiny.

The practice of land-applying biosolids from waste treatment facilities and livestock operations on agricultural areas must be reevaluated in light of recent research, as these biosolids have been shown to be laden with a wide variety of pharmaceuticals, endocrine disrupting chemicals, and especially antibiotics. The agriculture industry uses some 80% of the antibiotics manufactured. At this time, more study needs to be done in this area to determine the appropriate course of action needed to address this concern. Given the quantity of pharmaceuticals and endocrine disrupting chemicals entering the environment, recent exemptions for the agriculture industry regarding regulation of land-applying biosolids from waste treatment facilities and livestock operations must be perceived as a step in the wrong direction.



Pharmaceuticals and Personal Care Products in the Environment

***Division of Water and Waste Management
Office of Waste Management – Solid Waste Permitting Unit***

The proper management of waste reduces the likelihood of groundwater contamination by reducing the amount and controlling the types of contaminants in leachate. The Division of Water and Waste Management’s (DWWM’s) Solid Waste Permitting Unit (SWPU) regulates solid waste facilities under the *Solid Waste Management Act* (W. Va. Code § 22-15-1, et seq.) and the *Solid Waste Management Rule* promulgated thereunder (33 C.S.R. 1). This includes the review of applications for various permitting activities for new and existing facilities, such as permit issuance, renewal or closure. The SWPU reviews applications to accept special waste and to alter groundwater monitoring systems, and also reviews statistical groundwater monitoring reports, conducts construction quality assurance and quality control inspections, and provides compliance assistance to waste generators.

The SWPU is responsible for ensuring that facilities are properly designed by reviewing plans and granting permit modifications for expansion. During construction at these facilities, the SWPU conducts quality assurance/quality control (QA/QC) inspections to assure that facilities are build according to specifications and accepted industry practices. Table 1 below shows the type and number of facilities permitted by the SWPU:

Table 1

Description	Permitted Facilities
Active Municipal Solid Waste Landfills (Class A & B)	18
Closed Municipal Solid Waste Landfills (Class A & B)	33
Construction/Demolition Waste Facilities (Class D and D-1)	21
Yard Waste Composting Facilities	23
Transfer Stations	18
Waste Tire Facilities	3
Recycling Facilities (Class E)	9
Sewage Sludge Processing Facilities	0
Mixed Waste Processing Facilities	1

Five landfills are currently allowed to accept drill cuttings and associated drilling waste for proper disposal. Those facilities had to obtain modifications to their permits, which require that the leachate from the cells holding this waste be monitored separately from the rest of the landfills waste through dedicated monitoring wells and that the leachate emanating therefrom be treated by publicly owned treatment works (POTWs).

Oil and other chemicals, primarily from vehicles, and leachate can contaminate stormwater flowing from solid waste facilities. Plans for structures and procedures for managing stormwater are a part of the detailed plans reviewed by the SWPU. Proper design, construction, and management prevent contaminated stormwater from infiltrating into the groundwater.

In an effort to protect groundwater, the Solid Waste Management Rule requires an impermeable liner system for solid waste municipal landfills. This multiple layer liner system includes a leak detection zone that will alert the facility should there be a failure in the liner. If contamination has been detected by routine detection monitoring, the landfill may be required to begin corrective action to clean up the groundwater.

Permitted landfills must sample groundwater via monitoring wells twice each year and perform statistical tests to determine whether groundwater has been contaminated. The statistical reports are reviewed by the SWPU and DWWM's Office of Environmental Enforcement (OEE) takes any necessary enforcement action.

DWWM has a compliance section to monitor groundwater sampling, and analytical data has been verified through split sampling. The facilities are notified in writing for any improvement to sampling. As improved statistical methods are introduced, contamination caused by poor sampling techniques will become more apparent.

Groundwater monitoring wells must sometimes be replaced because they have caved in, gone dry or are located where the disposal area is expanding. The SWPU reviews well replacement plans to ensure that the new wells are properly placed to detect potential groundwater contamination as soon as possible.

Through the Landfill Closure Assistance Program (LCAP), which statutorily authorizes DEP to assist in the closure of a finite population of landfills that existed prior to the passage of the federal Resource Conservation and Recovery Act, DEP is currently monitoring 33 closed solid waste landfills in West Virginia. The emphasis of this program is on properly capping these facilities to minimize groundwater impact. LCAP utilizes consultants who follow the procedures outlined in the Solid Waste Management Rule to sample, analyze, and identify groundwater and any associated problems. The SWPU assists LCAP by providing geological assistance on program priorities.

Division of Water and Waste Management
Office of Water Resources – Hazardous Waste Permitting Unit

The *Hazardous Waste Management Act* (W. Va. Code § 22-18-1, et seq.) and its Legislative Rule entitled *Hazardous Waste Management System* (33 C.S.R. 20) provide DEP the authority to regulate the storage, treatment, and disposal of hazardous waste. One of the ways DEP regulates this is by issuing permits to facilities that store, treat, and/or dispose of hazardous waste to ensure that they are doing so in accordance with the law. The goal of the Hazardous Waste Permitting Unit (HWPU), from a groundwater protection perspective, is to identify all permitted sites with groundwater contamination or the potential for groundwater contamination due to a release, remediate the site, and return the site to its original condition. The priority objectives are to identify all sites with contaminated groundwater or the potential for groundwater contamination and to define the contaminants, source, and extent of the contamination.

The groundwater monitoring requirements for hazardous waste treatment, storage and disposal facilities (TSDFs) are just one aspect of the Resource Conservation and Recovery Act (RCRA) hazardous waste management strategy for protecting human health and the environment from accidental releases of hazardous constituents. While land disposal restrictions and unit specific standards seek to reduce the toxicity of waste and prevent releases, respectively, the groundwater monitoring requirements represent the last line of defense by ensuring that any releases are detected and remediated in a timely manner.

TSDFs that manage hazardous waste in landfills, surface impoundments, land treatment units and some waste piles (referred to as “regulated units” in the regulations) are required to implement a groundwater monitoring program to detect the release of hazardous constituents to the underlying groundwater. The regulations for permitted facilities are found at 40 CFR part 264, subpart F – *Releases from Solid Waste Management Units*, and the interim status regulations for facilities in operation before these rules came into effect are found at 40 CFR part 265, subpart F – *Groundwater Monitoring*. Both of these regulations have been incorporated by reference into the State’s *Hazardous Waste Management System* rule, referenced above, and DWWM has primacy over the implementation and enforcement of their provisions.

The overall goal of these requirements is to protect the groundwater in the uppermost aquifer from contamination by the hazardous constituents managed at the TSDF. For permitted TSDFs, a groundwater monitoring program consists of three phases: detection monitoring (40 CFR §264.98), compliance monitoring (40 CFR §264.99), and corrective action (40 CFR §264.100). The phases are sequential with a

facility able to move back and forth between phases as certain criteria are met. The regulations establish performance standards that require each facility's groundwater monitoring program to have a sufficient number of wells installed at the appropriate locations. The regulations also require groundwater monitoring wells to be located at depths that can yield representative samples of background conditions and water quality at the point of compliance in the uppermost aquifer (defined as the geological formation nearest the natural surface that is capable of yielding significant quantities of groundwater to wells or springs).

Detection monitoring is the first phase of the groundwater monitoring program. In this phase, facilities are monitoring to detect and characterize any releases of hazardous constituents into the uppermost aquifer. The purpose of a compliance monitoring program, the second phase of groundwater monitoring, is to ascertain whether the constituents released to the uppermost aquifer are exceeding acceptable concentration levels and threatening human health and the environment. A groundwater protection standard (GWPS) is established as part of the compliance monitoring program. Once an exceedance of the GWPS has been detected, the facility must take action to bring the constituent concentration levels back into compliance with the GWPS through corrective action. Corrective action is the last phase of the groundwater monitoring program. Corrective action may be achieved by the owner/operator either removing the hazardous constituents or treating them in place.

Division of Water and Waste Management Water Use Section

DWWM's Water Use Section (WUS) completed the West Virginia Water Resources Management Plan (the Plan) as required by the 2008 Water Resources Protection and Management Act (W. Va. Code § 22-26-1, et seq.). The Plan and its companion reports were adopted by the Legislature on June 6, 2014. It details past flooding and droughts in the State, examines water infrastructure needs, describes the need for continued stream gaging, and includes projections of future water use. WSU has continued to implement the Plan throughout 2016 and 2017 by making improvements to the Large Quantity Users Survey, reviewing and approving water quality management plans (WMPs) for horizontal gas wells and several ongoing projects to better define the State's water resources.

Current Projects

- West Virginia Water Resources Management Plan Implementation
- GIS Internet Based Water Information Tool
- Water Withdrawal Tool
- Large Quantity Water Users Survey
- Consumptive Water Use Study
- Golf Course Water Use Study
- Water Management Plans for Horizontal Gas Wells
- Geophysical Well Logging – Groundwater Aquifer Study
- Mine Pool Study – Location, Quantity, Quality, and Sustainability

- Data Management and Geodatabase of Zones of Critical Concern, Zones of Peripheral Concern, and Source Water Protection Plans for Implementation of the Aboveground Storage Tank Act
- Member of the West Virginia Water Gaging Council

Water Management Plans for Horizontal Well Drilling

In 2016, WUS reviewed and approved 223 unique water management plans, which included 53 new well pads and 81 modifications, relating to the withdrawal of surface and groundwater used in horizontal natural gas well drilling operations. This data is now being collected by the DEP Electronic Submission System (ESS), allowing the oil and gas operators to report their total water usage online. This new system has resulted in the collection and reporting of more consistent and accurate data.

Large Quantity Users Survey

The Water Resources Protection and Management Act identifies the need for the protection and conservation of our State's water resources. It recognizes that a comprehensive assessment of the availability and use of our State's water will benefit the citizens of West Virginia. See, W. Va. Code § 22-26-1(b). It also requires the agency to conduct an ongoing water resources survey of consumptive and non-consumptive surface and groundwater withdrawals by large quantity users, which are users who withdraw over 300,000 gallons of water in any 30-day period. See, W. Va. Code § 22-26-3(b). Therefore, WUS has continued to improve the system utilized to complete the Large Quantity Users (LQU) Survey, and the database that houses the information has been revamped to produce more useful reports. The use of ESS allows the LQUs to report their total water usage and other required information online. This system has proven to be more efficient, easier to use, and has been received by the LQU community. Table 2 below shows the amount of water used by category of LQU. The second column is the total amount of water that was withdrawn by that category for the year 2016; the third column is the percent consumption for each category, shown in decimal form; and the last column is the estimated consumptive use for the category (column two times column three).

Table 2

Water Use Category	2016 Total SW + GW in Gallons	Coefficient	Estimated Consumptive Use (GAL)
Agriculture/aquaculture	6,751,740,751	0.12	810,208,890
Chemical	141,641,497,559	0.2	28,328,299,512
Industrial	16,784,694,726	0.13	2,182,010,314
Mining	27,578,067,426	0.17	4,688,271,462
Oil & Gas	1,922,271,057	1	1,922,271,057
Petroleum	475,317,162	0.27	128,335,634
Public water supply	66,485,539,602	0.18	11,967,397,128
Recreation	1,385,776,760	0.5	692,888,380
Thermoelectric (coal)	473,483,374,238	0.025	11,837,084,356
Timber	2,252,279,297	0.25	563,069,824
TOTALS	738,760,558,578		63,119,836,558

Consumptive Use Study

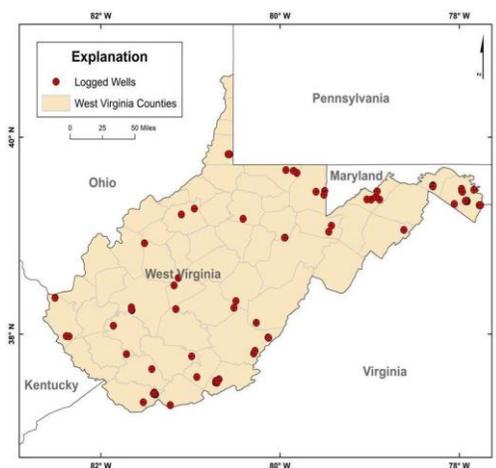
The Statewide consumptive use for 2016 has been calculated as 8.5%. Previously, USGS estimates were used, where a generalized percentage of consumptive use was applied to the estimated withdrawals by the individual use types reporting a consumptive use of 6%. If you ignore thermoelectric water use, as it does eventually precipitate back to the ground, West Virginia's consumptive use rate drops to 6.8%. The results in Table 3 below were derived by applying the accepted consumptive use percent to the actual quantity of water withdrawn by each individual user and then quantified by user category in accordance with the *Coefficient Method by SIC Code* (USGS, Scientific Investigations Report 2009) (<http://pubs.er.usgs.gov/publications/sir20095096>)

Table 3

Total Gallons Withdrawn in 2016	738,760,558,578
Total Gallons Consumed in 2016	63,119,836,558
Estimated Total Consumptive Use	8.54%

Geophysical Groundwater Well Logging

WUS and USGS have continued a collaborative five-year geophysical well logging project to assess fracture distributions in groundwater wells throughout West Virginia. The third year of this project is ending, which has produced 17 newly logged wells for a project total of 57. With the 27 wells WUS has logged as part of a previous project, 84 wells are now logged specifically for hydrological data. WUS intends on logging 43 more wells over the next two years of this project. In 2020, there should be 127 wells logged. The data from this project will be used to characterize the aquifers within the State through a better understanding of the bedding planes, joints, faults, and other fractures through which most of the State's groundwater flows or is stored. This research will increase knowledge of the depth and location of these water-bearing fractures throughout the State. With this information, WUS should be able to answer the questions about the State's groundwater aquifers posed by the Water Resources Protection and Management Act. The map below shows the locations of wells logged as part of the Statewide Borehole-Geophysics Project through August 2017.



**Division of Water and Waste Management
Non-Point Source Program**

In 2016, DWWM’s Non-Point Source (NPS) Program provided technical and financial support to 101 programs and projects ranging from general administration to outreach, planning, monitoring, and implementation. Most of the projects focus on priority areas identified within DWWM’s watershed-based plans (WBPs), but other partners and stakeholders implement projects in non-priority areas using their required matching funds or by taking advantage of additional grant opportunities.

Implementation of best management practices (BMPs) and reduction of non-point source pollutants are the major goals of the NPS Program’s watershed projects. The efforts of dedicated staff, partners, and local stakeholders have made significant impacts in restoring and protecting the State’s watersheds that are impacted and threatened by non-point source pollution. In 2016, BMP implementation was completed in 38 different Hydrologic Unit Code (HUC)12 watersheds, 53% in priority watersheds. The remaining are a result of the West Virginia Conservation Agency’s (WVCA) statewide agriculture enhancement programs. Table 4 shows total BMP implementation statewide. These reductions are a result of 21 projects in 15 priority watersheds and an additional 18 projects from WVCA’s agriculture enhancement programs in 23 other watersheds. Figure 2 provides a map of the HUC12 watersheds where pollution reductions occurred in 2016.

Table 4: 2016 BMP Implementation

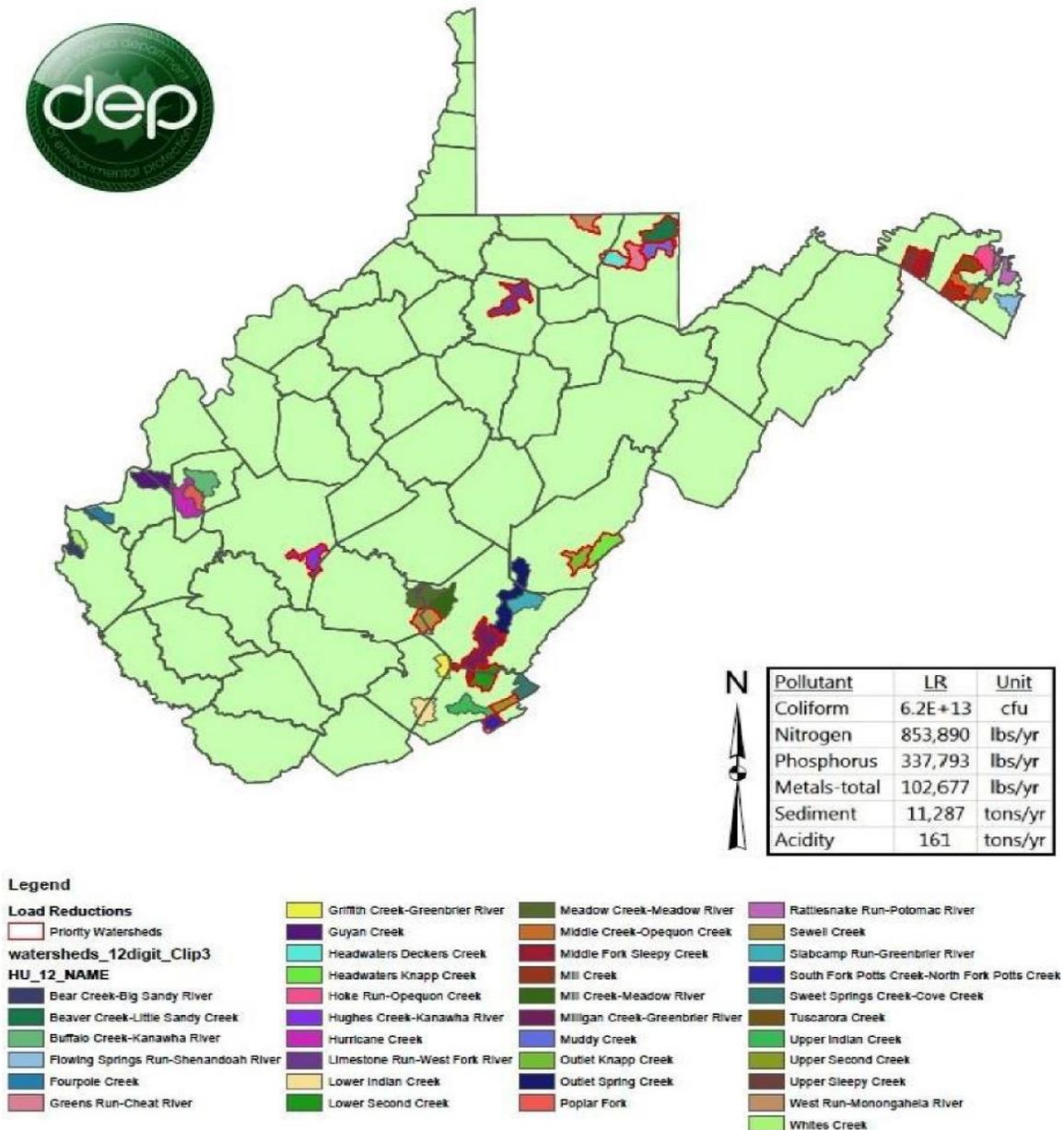
BMP	Totals	Unit
AMD ponds-wetlands	276,032	Sqft
Limestone leachbed	62,893	Sqft
Fencing	40,364	Ft
Heavy use protection	11,694	Sqft
Stream restoration	7,506	Ft
Nutrient management	6,270	Ac
Limestone channel	2,876	Ft
Grazing systems	2,542	Sqft
Water systems	1,920	Ft/IU
Watering pond	600	Sqft
Septics	89	IU
AMD systems	7	IU
Erosion control	4	Sqft

Acid mine drainage (AMD) ponds include settling and collection ponds and constructed wetlands. Fencing includes division and streamside fencing. The stream restoration category includes natural stream channel design and streambank protection BMPs. The septic category includes all repair, replacement, and pumping. AMD systems are the total number of treatment systems installed plus important components. Watering systems include individual units and feet of pipeline. Erosion control projects are associated with construction projects of less than one acre and other agriculture situations where erosion control is necessary, such as heavy use protection areas.

In West Virginia, bacteria and pollutants associated with AMD are the two largest contributors of non-point sources, accounting for approximately 70% of the impairments. Most of the bacteria loads come from agriculture and failing septic, whereas the AMD pollutants (i.e. acidity, metals, etc.) are associated with abandoned mining. In addition to the West Virginia priorities, the federal Environmental Protection Agency’s national § 319 Program promotes the reduction of nutrients and sediment, which are the leading causes of non-point source impairments nationwide. Although nutrients and sediment are not the

focus of the NPS Program, with the help of partner agencies, the NPS program has already exceeded its NPS Management Plan goals. West Virginia's NPS Management Plan was approved in 2015, one of the first in EPA Region 3. Nutrient and sediment reductions are important for restoration of the Chesapeake Bay Watershed, and West Virginia continues to meet the goals and objectives of the most recent Watershed Implementation Plan.

Figure 2: Map of HUC12 Watersheds Where Pollution Reduction Occurred in 2016



Watershed Project Highlights

In 2016, 12 watershed projects were completed. This section highlights two representative projects: AMD remediation and bacteria reductions. Project summaries and the most recent NPS Annual report are available at <https://catalog.data.gov/dataset/grants-reporting-and-tracking-system-grts>.



Sleepy Creek Phase II

The goal of this project was to reduce fecal coliform counts in the watershed and meet the Total Maximum Daily Load (TMDL) through the establishment of riparian buffers, urban tree plantings (reforestation), and stormwater management practices. Additionally, this project funded water quality monitoring to detect sources of fecal coliform impairment and public education events that included agricultural field days and stormwater management training. In addition to BMP implementation, several educational events were held, including agricultural field days and a stormwater management training. Cacapon Institute conducted water quality monitoring and measured levels of fecal coliform bacteria.

A wide variety of partners were involved in the implementation of this project, including WVCA, Eastern Panhandle Conservation District (EPCD), Cacapon Institute, the West Virginia Division of Forestry, the United States Department of Agriculture, the Natural Resource Conservation Service (NRCS), the Region 9 Planning and Development Council, the Sleepy Creek Watershed Association volunteers, landowners, local schools, and others. The riparian buffer project shown provides an example of the effort. It consisted of 393 trees and several days of hard work from 36 volunteers as well as local, State, and federal agency representatives. Other efforts in the watershed brought together diverse groups, but this riparian buffer planting provides the best example of the dedication to protecting and restoring the Sleepy Creek Watershed. The project was completed on time and within budget, using \$70,200 in § 319 funds and \$43,000 in State and local match.

Ingrand Mine Remediation

The purpose of this project was to treat water draining from the abandoned Ingrand Mine before it enters an unnamed tributary of Kanawha Creek. Friends of Deckers Creek received fiscal year 2013 funds to design and install a passive treatment system to capture and clean the AMD emanating from the mine. The completion of this project marks the sixth AMD remediation site installed by Friends of Deckers Creek within the Kanawha Creek sub-watershed.



Thus far, project performance is outstanding, significantly reducing the AMD pollutants entering the unnamed tributary to Kanawha Creek. The first round of water quality data shows a 99.6% reduction, which is 21.8% better than the project's goals. Acidity reduction is 40,540 pounds per year, and the total metals are being reduced by 7,210 pounds per year. Friends of Deckers Creek expects even better results once the wetland treatment systems mature. This project was supported by the § 319 Program (\$284,585) and the federal Office of Surface Mining, Reclamation, and Enforcement's Watershed Cooperative Agreement (\$107,000). Friends of Deckers Creek contributed \$68,415 as an in-kind match and further raised an additional \$7,000 to purchase the land for the project.

Groundwater Protection

West Virginia's NPS Program's projects do not focus specifically on our groundwater resources; however, many projects, such as septic repair/replacement, certain stormwater BMPs, source water, and acid mine drainage projects may have an indirect influence. Aside from the projects described above, the NPS Program has participated in stormwater projects associated with Piney Creek WSA, the West Virginia Conservation Agency's Back Creek porous pavers, Good News Mountaineer Garage rain gardens, and the Beckley Little League; septic projects in Tuscarora Creek, Mill Creek Opequon, Elk's Run Watershed, and Brown's Creek – Coal River; and mining projects in Morris Creek upper mainstem, Pase active treatment, Valley highwall upgrade, Summerlee, Herod's Run-Buckhannon, Beaver Creek, Sandy Run Renovation, and Swamp Run #2. To learn more, go to <http://bit.ly/2wflZcu> and download the most recent NPS and past annual reports.

Division of Water and Waste Management Office of Environmental Enforcement

Environmental Enforcement (EE) is primarily responsible for inspection and enforcement of the State and federal solid waste, hazardous waste, under- and aboveground storage tank, and water pollution control laws. EE's groundwater objective is to investigate all reports of contamination that fall within its jurisdiction and to refer all reports of contamination that are not under its jurisdiction to the appropriate authority. During the reporting period, EE investigated 1,459 spills and 1,894 complaints that had the potential to impact groundwater.

EE's Compliance Monitoring Unit (CPU) has been assigned the responsibility to conduct groundwater sampling inspections (GSIs) at various facilities throughout the State. Primarily, these facilities are active and inactive municipal and industrial landfill sites. The sites selected for sampling come from requests from DWWM's permitting staff, regional inspectors and/or inspector supervisors, and at the discretion of the CPU. Generally, all landfill sites will have a minimum of four groundwater monitoring wells. The number of monitoring wells per site will depend on the size of the landfill and could be as many as 20 or more. The parameters tested for depend on the type of landfill being sampled, and those parameters are listed in the appendices to the *Solid Waste Management Rule*, 33 C.S.R. 1.

The Landfill Pre-Closure Program continues to review industrial facilities that are in the process of ceasing operations. This review process allows EE to ensure that all known contamination is remediated. All groundwater wells present at the sites are sampled during this process. When any contaminated soil is identified at the facility, remediation is required under the Groundwater Protection Act.

Division of Mining and Reclamation

The Division of Mining and Reclamation (DMR) oversees all mining activities. This includes reviewing permit applications for surface and underground coal mines, preparation plants, coal loading facilities, haulage ways, and coal related dams. DMR also reviews permit applications for non-coal quarry operations (sand, gavel, limestone, etc.) and for National Pollutant Discharge Elimination System (NPDES) permits for coal and non-coal mining operations. DMR enforces compliance through regular inspections and oversees site reclamation to ensure the integrity of land and water resources when disturbed by mining operations and related activities.

Groundwater Protection Rule for Coal Mining Operations – 38 C.S.R. 2F

Because mineral mining, both coal and non-coal, is ubiquitous in West Virginia, protecting the quality and quantity of the groundwater from adverse impacts from these activities is imperative to both the environment and to human health and safety. Groundwater protection at mine sites was established more than 20 years ago in West Virginia with the passage of the Legislative Rule entitled *Groundwater Protection Regulations for Coal Mining Operations* (38 C.S.R. 2), and the policies and practices established by DEP's DWWM and DMR to enforce it. The resulting changes in the handling of surface activities and substances at mine sites have already protected many public and private water sources, both existing and potential, from damage due to mining.

Today, the Groundwater Protection Program is an integral part of DMR's Permitting and Inspection & Enforcement procedures for mine sites. Groundwater Protection Plans (GPPs) are incorporated in and essential to mining permits. Further, all such permits contain terms and limits that provide for protection of the subsurface environment. The operator is required to submit GPPs, where applicable, with its initial permit application, which, when approved, becomes an enforceable part of its mining permit. These GPPs must be updated, if necessary, at each permit reissuance.

Where required, Groundwater Protection Plans are included in the National Pollutant Discharge Elimination Systems (NPDES) permit application. The GPP module requires the applicant to provide specific information, such as:

- All manmade potential contaminants and at the facility;
- The areas of the site where potential contaminants are stored and the type and size of container or storage system used;
- Existing protective controls for the contaminants at each site;
- Spill Response Plan that will be followed should a leak or spill of a potential contaminant be detected at the facility;

- Training requirements with procedures and schedules for initial and refresher training for employees, contract workers, and site visitors concerning their involvement and the requirements of the Spill Response Plan for the site; and
- Inspection procedures for inspections and routine maintenance operations to insure the Groundwater Protection Plan is in place and in good working order.

West Virginia Surface Mining Reclamation Rule – 38 C.S.R. 2

Each mining permit application contains baseline groundwater information used in the determination of the proposed operation's probable hydrologic consequences (PHC). The PHC identifies currently used or significant groundwater resources that may be impacted through the mining process. If the PHC indicates that adverse impact may occur to the hydrologic balance or that acid forming or toxic forming material is present that may result in contamination of surface or groundwater supplies, then the operator shall provide additional information to evaluate such probable hydrologic consequences and to plan remedial and reclamation activities.

The location, ownership, and use of known existing wells, springs, and other groundwater resources, including discharges from other active or abandoned mines on the proposed permit area and adjacent areas, are identified in permit applications to make a reasonable approximation of the baseline groundwater conditions and use. The permit application also includes a groundwater monitoring plan consisting of parameters based on current and approved postmining land uses and all hydrologic balance protection objectives. Monitoring and analysis shall occur no less frequently than quarterly.

The PHC information is used to develop Hydrologic Reclamation Plans (HRPs), which identify remedial and reclamation activities concerning both surface and groundwater resources. The plan is specific to the local hydrologic conditions and addresses the potential adverse hydrologic consequences identified in the PHC determination. The HRP contains a description of the steps to be taken during the mining and reclamation phases to minimize disturbances to the hydrologic balance within the permit and adjacent areas, to prevent material damage outside the permit area, to meet applicable federal and State water quality laws and regulations, and to protect the rights of present water users. Components of the HRP include:

- Avoiding acid or toxic drainage;
- Preventing additional contributions of suspended solids;
- Providing for water treatment facilities when needed;
- Controlling drainage;
- Restoring, protecting or replacing water supply of present water users;
- Describing measures that will be taken to replace water supplies that are contaminated, diminished or interrupted; and
- Identifying water replacement, which includes quantity and quality descriptions including discharge rates or usage and depth to water

DMR completes a Cumulative Hydrologic Impact Assessment (CHIA) for each new mining operation. This evaluation determines whether the proposed operation has been designed to prevent material damage to the hydrologic balance outside the permit area.

“Material damage to the hydrologic balance outside the permit area” means any long term or permanent change in the hydrologic balance caused by surface mining operations, which has a significant adverse impact on the capability of the affected water resource(s) to support existing conditions and uses.

Underground Injection Control Program – 47 C.S.R. 13

The Underground Injection Control (UIC) Program, as discussed above for non-coal industries and below for the oil and gas industry, also applies to mining, primarily through the permitting of Class 5 injection wells. Type 5X13 wells are used for the disposal of coal preparation plant slurry or acid mine drainage treatment sludge into abandoned underground mine voids, and Type 5G30 wells are used for the transfer of mine water. Information about the proposed injection activity comes from the permittee via the UIC – Mining Application form. This required data includes maps, drawings, narratives and laboratory analyses, among other information. When necessary, a field inspection by DMR’s UIC personnel, accompanied by a DMR inspector and the applicant, confirms the submitted data and adds further information.

DMR has placed great emphasis on coordinated permit review across all Permitting and Inspection & Enforcement programs where underground injection control is concerned. All new proposed UIC permits as well as existing permit reissuances involve a coordinated review of the application. This involves the UIC staff located in the agency’s headquarters location, as well as staff in the regional field office(s) from both the Inspection & Enforcement section and the Permitting section.

The operator is required to include Groundwater Protection Plans with its UIC permit application. This is the same plan as submitted with the associated Mining and NPDES permits and it is reviewed concurrently by these sections during permit review. Additionally, all draft UIC – Mining permits are submitted to the West Virginia Geologic and Economic Survey (WVGES), the West Virginia University Hydrology Research Center (WVU), and the Federal Mine Safety and Health Administration (MSHA) for review and comment. Finally, input from the public via the 30-day public comment period and from the WVGES, MSHA, and WVU completes the data necessary to issue the permit. After issuance, continued monitoring as required by the permit plus observations by DMR’s inspectors assure a continuous influx of information about the site so that adjustments can be made to GPPs, if necessary.

Proposed Programs and Projects

Currently, DMR is working with the agency’s Information Technology Office to implement a central data repository, which will provide access to data across divisions within DEP. This will streamline data analysis and reporting functions for comprehensive permit review.

Division of Land Restoration **Office of Environmental Remediation**

The mission of the Office of Environmental Remediation (OER) is to provide for clean, safe, and productive West Virginia communities by assessing and remediating polluted environmental resources and restoring contaminated properties to beneficial use.

Federal Facilities Program

The Federal Facilities Program works in cooperation with EPA to oversee and assist the U.S. Department of Defense (DOD) in the investigation and cleanup of active, closing, and formerly used military installations at which hazardous substances and/or petroleum products were used, stored or disposed of during past operations. In efforts to provide equipped military forces to deter war and to protect the security of the United States, DOD constructed warfare production facilities and military training facilities throughout the country for decades. These facilities were used to store, manufacture, and test materials (including hazardous substances) without the modern and protective environmental practices established today. Operations often resulted in spilling or disposing of hazardous materials onsite or nearby. Through an established cooperative agreement, the Federal Facilities Program provides oversight and guidance to DOD to ensure that sites are properly prioritized, characterized, and remediated to safe levels in accordance with State laws. OER has coordinated with DOD on the following sites: Allegany Ballistics Laboratory, Yeager Airfield, Martinsburg Air National Guard, and Camp Dawson KD Range.

Leaking Aboveground Storage Tank Program

Like underground storage tanks discussed below, aboveground storage tanks can act as point sources for shallow groundwater contamination. Faulty installation and inadequate operating and maintenance procedures can result in tank system leaks. Depending on the amount of product released, the hydrogeologic properties of the aquifer impacted by the release, and the location of nearby public drinking water sources, public water supplies can be threatened or directly impacted. The *Aboveground Storage Tank Act* (W. Va. Code § 22-30-1, et seq.) and the *Aboveground Storage Tank Rule* (47 C.S.R. 63) authorized the agency to inventory and inspect aboveground storage tanks throughout the State. When releases from ASTs occur, the Leaking Aboveground Storage Tank Program responds and requires owners and operators to remediate impacted sites. During the reporting period, 14 confirmed releases were reported from West Virginia's approximately 43,000 registered ASTs, though only two of those had any impact to groundwater, and the agency was actively involved in seeing that those leaks were remediated in accordance with applicable environmental standards.

Leaking Underground Storage Tank Program

Unlike ASTs discussed above, the federal EPA has long had a regulatory program for the management of underground storage tanks (USTs), and West Virginia has had primacy of this regulatory program for decades through the *Underground Storage Tanks Act* (W. Va. Code § 22-17-1, et seq.) and its Legislative Rule entitled *Underground*

Storage Tanks (33 C.S.R. 30). When releases from USTs occur, the Leaking Underground Storage Tank Program responds and requires owners and operators to remediate impacted sites. During the reporting period, 83 confirmed releases were reported from West Virginia's 4,295 active USTs, though only 33 of those had any impact to groundwater, and the agency was actively involved in seeing that those leaks were remediated in accordance with applicable environmental standards.

Resource Conservation and Recovery Act Corrective Action Program

The *Resource Conservation and Recovery Act* (RCRA) Corrective Action Program is a regulatory program coordinated with EPA. Permitted RCRA facilities with environmental contamination resulting from hazardous waste treatment, storage or disposal are subject to corrective action for site remediation. Once it is established that a release has occurred, the owner/operator must institute a compliance monitoring program. The goal of the compliance monitoring program is to ensure that the quantity of hazardous constituents released into the uppermost aquifer does not exceed acceptable levels. If those levels are exceeded, the owner/operator must initiate corrective action to remediate the damage. During the reporting period, the agency with EPA to provide oversight at 42 RCRA Corrective Action sites.

Superfund Program

The Superfund Program was established by the federal *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) to provide federal authority for responding to releases or threatened releases of hazardous substances that may endanger public health or the environment. EPA is required to consider and apply state laws, standards, technical comments, and concerns during removal, pre-remedial, remedial, and enforcement response activities at sites that have been impacted by past industrial practices. West Virginia's Superfund Program is responsible for representing the State's interest and ensuring sites are remediated to safe levels in accordance with State law. Groundwater contamination has been identified at sites being remediated through removal actions and sites being assessed through Superfund pre-remedial activities. All ten West Virginia sites currently listed on the Superfund National Priorities List (NPL) for remedial action have groundwater contamination.

Voluntary Remediation Program

The Voluntary Remediation Program (VRP) was established by the *Voluntary Remediation and Redevelopment Act* (W. Va. Code § 22-22-1, et seq.), and the *Voluntary Remediation and Redevelopment Rule* (60 C.S.R. 3) outlines the program's administrative process for assessment and remediation of soil, groundwater, surface water, and sediments and sites that have been impacted by past industrial practices. The VRP encourages cleanup and redevelopment of abandoned or under-utilized contaminated properties by providing certain environmental liability protections under West Virginia law. Parties that remediate sites through the VRP use risk-based cleanup standards that consider site-specific conditions and future land use. The VRP is a structured and predictable, yet flexible, mechanism to achieve compliance with applicable State and federal environmental requirements. During the reporting period, VRP issued

17 certificates of completion and received 17 applications for new sites to come into the program.

Division of Land Restoration Rehabilitation Environmental Action Plan

The Rehabilitation Environmental Action Plan (REAP) is a coordinated effort to address litter, waste, open dump, tire cleanup, and recycling programs. These remediation programs help spare the State's groundwater from the harmful effects of litter, open dumps, and waste tires by cleaning up the pollution that would otherwise leach into and contaminate the groundwater. Specifically:

- The REAP Program eliminated 2,692 dumps from West Virginia's landscape, which led to the proper disposal of over 9,549 tons of litter and waste. REAP was also responsible for the proper disposal of over 547,533 waste tires. Many of these tires were pulled from the 635 miles of rivers and streams that REAP cleaned up during this time.
- REAP's Pollution Prevention and Open Dumps Program (PPOD) reclaimed 2,410 acres of land through the eradication of 2,692 dumps. PPOD also removed over 271 appliances from the landscape and recycled more than 62 tons of scrap metal.
- REAP's Make It Shine Program coordinated the efforts of more than 12,261 volunteers, who worked to eliminate 42 open dumps and remove 149 tons of litter and debris from 500 miles of roadways, 461 acres of parks, 263 miles of streams, and 100 miles of trails.
- REAP's Adopt-A-Highway Program had more than 21,495 volunteers in more than 2,091 active groups. They worked to remove more than 500 tons of litter from more than 5,380 miles of the State's roadways.
- REAP's Litter Control Grant Program funded 52 projects totaling \$167,333 in counties and municipalities for their litter control and cleanup program.
- REAP's Recycling Assistance Grant Program awarded 63 grants totaling \$4,056,210 to public and private entities.
- REAP's Covered Electronic Devices Grant Program, which offers grants to counties and municipalities wishing to implement electronic device recycling programs or e-recycling events, issued 37 grants totaling \$285,431.69.

Office of Oil and Gas

DEP's Office of Oil and Gas (OOG) regulates West Virginia's oil and natural gas industry. Protection of groundwater is of the utmost importance and is achieved through the permitting and inspection of the exploration, production, plugging, and underground injection activities of the industry. Over 62,000 active wells are maintained by OOG. Rules aimed at protecting groundwater have been in existence for the oil and gas industry since 1929. Additional rules have been added in subsequent years to further aid in the protection of groundwater. OOG believes that groundwater protection is maximized by conforming to these existing rules and practices. The following is a summary of selected regulatory functions and activities OOG conducts in protecting groundwater.

Underground Injection Control Program – 35 C.S.R. 4 § 7

OOG administers the Underground Injection Control (UIC) Program for Class II and Class III injection wells. Class II wells include brine disposal and secondary recovery gas and water injection wells. Class III wells include solution mining wells. The current active inventory of Class II and Class III wells consists of approximately 33 private and 12 commercial brine disposal wells, 446 secondary recovery wells, and 12 solution mining wells. The primary focus of this program is the protection of groundwater from injection operations.

During the permitting process, operators are required to sample and analyze all water wells, springs, and surface water bodies within at least a quarter-mile radius of the injection well or facility. Solution mining permits further require that groundwater be sampled, analyzed, and charted on a quarterly basis. To ensure well integrity, mechanical integrity tests (MITs) are required to be conducted on every injection well by the operator at least once during the five-year permit term to ensure that injected fluid is not migrating into any underground source drinking water. Operators are required to submit reports monthly of daily activity for each injection well.

Annual Inspection – 35 C.S.R. 4 § 11.6

Operators are required to visually inspect all their unplugged wells on an annual basis. Any significant leakage or well integrity failure is to be reported to OOG and measures must be taken to remedy the problem. Operators are required to submit certification to OOG that the inspections have been conducted.

Plugging Methodology – W. Va. Code § 22-6-24 and 35 C.S.R. 4 § 13

During plugging and abandonment operations of a well, the operator is required to separate oil, gas, and water-bearing strata with 100-foot cement plugs to completely seal the hole and prevent communication with other zones, including groundwater.

Water Supply Testing – 35 C.S.R. 4 § 19 and 35 C.S.R. 8 § 15

For conventional oil and gas wells, operators are required to notify landowners within 1,000 feet of a proposed drill site for an oil or gas well. At the request of the landowner, the operator shall sample and analyze water from any water wells or springs within this 1,000-foot radius. If no requests are made, then the operator shall choose an existing water well or spring from within the 1,000 feet to sample and analyze. Operators are required to move out to 2,000 feet if there are no wells or springs within 1,000 feet. Sampling parameters include, but are not limited to, pH, iron, chlorides, total dissolved solids, and detergents. Results are to be submitted to the landowner as well as to OOG. Results are kept on file for groundwater quality purposes should a problem ever arise.

For horizontal wells drilled in accordance with W. Va. Code § 22-6A-1, et seq., the operator shall sample and analyze water from any existing water wells or developed springs within 1,500 feet from the center of the proposed horizontal well pad. Pursuant to the Legislative Rule entitled Rules Governing Horizontal Well Development, OOG can require the operator to sample and analyze up to 2,000 feet from the center of the well

pad. Sampling parameters include, but are not limited to, total petroleum hydrocarbons, BTEX, chloride, sodium, total dissolved solids, aluminum, arsenic, barium, iron, manganese, pH, calcium, sulfate, detergents, dissolved methane, dissolved ethane, dissolved butane, dissolved propane, and bacteria (total coliform).

Miscellaneous Water Pollution Control Rules – 35 C.S.R. 1

To prevent discharged oil from reaching waters of the State, all operators are to have adequate containment or diversionary structures in place at each well or facility. Operators are also required to have a Spill Prevention Control and Countermeasures (SPCC) Plan for each of their facilities.

Abandoned Wells – 35 C.S.R. 6

Abandoned wells are the most problematic regulatory area relating to groundwater, especially for wells drilled 75 to 100 years ago, when technology and concern for groundwater protection were not as advanced as today. These wells, which are found throughout the State, now pose potential and actual threats to groundwater quality, as aquifers penetrated by these wells are typically not cased to protect them from contaminants within the borehole of the well. Some of the typical contaminants that may affect groundwater quality include hydrocarbons, chlorides, and metals. OOG works with both industry and the federal government to locate, prioritize, and plug or produce abandoned wells. OOG has a priority ranking of abandoned wells, and those that pose a significant and/or immediate threat to human health or the environment are scheduled for evaluation first.

General Water Pollution Control Permits: GP-WV-1-88 and GP-WV-1-07

The primary function of the land application general permit (GP-WV-1-88) is the prevention of pollution to the waters of the State relating to the handling and disposing of drilling wastes. Operators applying for a conventional well work permit involving the use of a pit for holding wastes generated during well work must also register this site and indicate the method for treating and disposing of the pit contents. If land application is the chosen method of disposal, the operator must file a Groundwater Protection Plan (GPP) as part of the permit packet. Generally, most pit contents (excluding those generated from a horizontal well) may be land applied after proper treatment and aeration procedures.

Another general permit (GP-WV-1-07) allows for produced water from certain coalbed methane wells to be applied directly to the ground. To qualify for coverage under this permit, candidate wells must meet strict water quality criteria. Analyses of surface water and, in some cases, groundwater must be presented to OOG on a semi-annual basis for review.

Miscellaneous

OOG investigates numerous water well contamination cases yearly. Sampling and analytical work have become routine tasks during such investigations. Parameters vary from case to case, but usually at a minimum include those which have already been

mentioned. The analyses are submitted on paper and kept in the corresponding investigation file.

VI. DEPARTMENT OF HEALTH AND HUMAN RESOURCES

Office of Environmental Health Services

Wellhead Protection Program

As of June 30, 2017, the Wellhead Protection (WHP) Program continues to work with the 556 groundwater community, non-community transient, and transient public water supply systems on developing WHP programs.

In West Virginia, the Source Water Assessment and Protection (SWAP) Program encompasses both the wellhead groundwater protection and surface water protection efforts. Implementation of the WHP Program began in the early 1990s as part of West Virginia's groundwater protection strategy. This protection strategy was extended to surface water sources with the 1996 federal Safe Drinking Water Act (SDWA) amendments. The SDWA requires states to develop and implement a SWAP Program designed to evaluate the vulnerability of public drinking water systems to possible sources of contamination and encourages states to work with these systems in developing protection and management plans. The Source Water Protection Plan (SWPP) was enacted by the West Virginia Legislature in 2014 as part of the Aboveground Storage Tank Act and subsequent revisions to the Legislative Rule entitled Public Water Supply System (64 C.S.R. 3) to include requirements for utility water systems to update existing or create new comprehensive SWPPs for surface water and surface water influenced groundwater (SWIG) systems.

The WHP Program targets groundwater water systems for protection on a county or local basis. In many communities, groundwater is the only source of drinking water. Once groundwater is contaminated, it is very expensive to treat or replace.

The WHP Program includes public participation, source delineations, the potential contaminant survey, contingency planning, and management directives complementing the SWAP Program. The WHP Program is the practice of assessing the quality of our water resources and implementing programs that reduce pollutants and chemical contaminants that could potentially negatively impact these resources. Protecting water resources from contaminants also can eliminate the need for supplementary treatment procedures and can delay the cost of new infrastructure and related increases in water rates.

The Office of Environmental Health Services (OEHS) continues to complete WHP studies for new public water supply systems and helps revise existing plans within the State by prioritizing efforts, program resources, and education and outreach efforts in developing and implementing protection measures. Implementation of the WHP builds on other environmental assessment and protection programs and requires integrated linkage and cooperation with DEP. Moving to a voluntary protection plan phase will require a multifaceted approach that will require continued financial support within West Virginia. OEHS relies on participation and involvement of federal, State, and local

agencies and industry, agriculture, environmental groups, public water supplies, and the public at many levels to protect the surface and groundwater of the State and the health of the people of West Virginia. Implementation of the WHP builds on other environmental assessment programs and requires an integrated linkage and cooperation with many associated entities. Follow up assistance and a continuing source of funding for activities will likely be required for sustainability. The WHP Program maximizes the use of existing information, requires integration with existing State and federal programs and the use of a Geographic Information System (GIS) to map delineations and assessments.

During this reporting period, the WHP Programs continued to pursue the following:

- **Building Partnerships, Interagency Cooperation, and Other Alliances**
 - Continue to participate and build voluntary protection efforts by prioritizing efforts, program resources, education and outreach efforts in developing and implementing voluntary protection measures not only to the local water systems but also to local governments, councils, planners, and other stakeholders.
 - Provide funding for DEP's Underground Injection Control Class V program to locate UIC Class V wells in source water protection and sensitive hydrological areas within the State. This work also includes an inventory of underground and aboveground storage tanks in the SWAP/WHP area.
 - Continue participation and providing funding for the Potomac Drinking Water Source Protection Partnership (DWSP). This partnership is composed of water utilities and the various governmental agencies responsible for drinking water protection in the Potomac River Basin.
 - Continue participation with the Ohio River Valley Water Sanitation Commission (ORSANCO) work group on source water protection. This work group is composed of water utilities and the various governmental agencies responsible for drinking water protection in the Ohio River basin.
 - Continue a working relationship between the federal *Safe Drinking Water Act* (SDWA) and *Clean Water Act* (CWA) programs within the State to provide the most accurate and representative assessment of source waters, based on available data that the State believes best reflects the quality of the resources.
 - Continue to work with the West Virginia Rural Water Association through a joint project with the U.S. Department of Agriculture's Farm Service Agency on local SWAP and WHP areas within the State.
 - Continue to use hydrogeologic information provided from the United States Geological Survey to help define WHP delineation areas.
- **Public Outreach and Educational Activities**
 - OEHS provides help in developing a protection program and assessing potential sources of contamination.
 - The agency's website, located at <http://www.wvdhhr.org/oehs/eed/swap/>, continues to provide information on the SWAP/WHP programs (educational materials, posters, and brochures) and guide municipalities, water suppliers, and other groups through developing local SWAP programs. In addition, a link is available to a website that provides copies of the initial SWAP/WHP susceptibility assessment reports for the community water system.
 - The agency's Source Water Protection GIS website, located at <https://oehsportal.wvdhhr.org/webportal/>, disseminates relevant source water information to public water supplies, State and federal agencies, and local governments to further source water protection.

- Installation of protection signage along the perimeter of wellhead protection areas. PWSs can use the signs for municipality and non-highway use.
- **Other Actions for Protection of Sources of Drinking Water**
 - Continue to evaluate new public water supply water wells or intakes to assure they are located in areas where contamination threats are minimal. Permits for new public water wells now require an initial survey for potential sources of contamination within 2,000 feet of the proposed well location, with site-specific information used when available.
 - Continue to use the Alternative Monitoring Strategy Program (AMSP), which determines future monitoring frequency reductions, is dependent on having a SWAP/WHP program in place, and requires consistent revisions and updates.
 - Continue to participate in the development of rules and design standards for water supply wells, private water wells, and monitoring wells for the prevention of groundwater contamination.
 - Continue to evaluate public water supply wells to determine whether groundwater sources are under the direct influence of surface water (GWUDI) and/or SWIG.
 - Continue to support the efforts of DWWM and the USGS with their groundwater ambient water quality studies. This program has strived to benchmark raw water quality data for West Virginia aquifers. West Virginia is trying to identify the impacts of various land uses on water quality. This information will help West Virginia avoid future contamination events.
 - Continue to implement the revised rules and design standards for private water wells for the protection of groundwater.

Groundwater Data Collection and Management

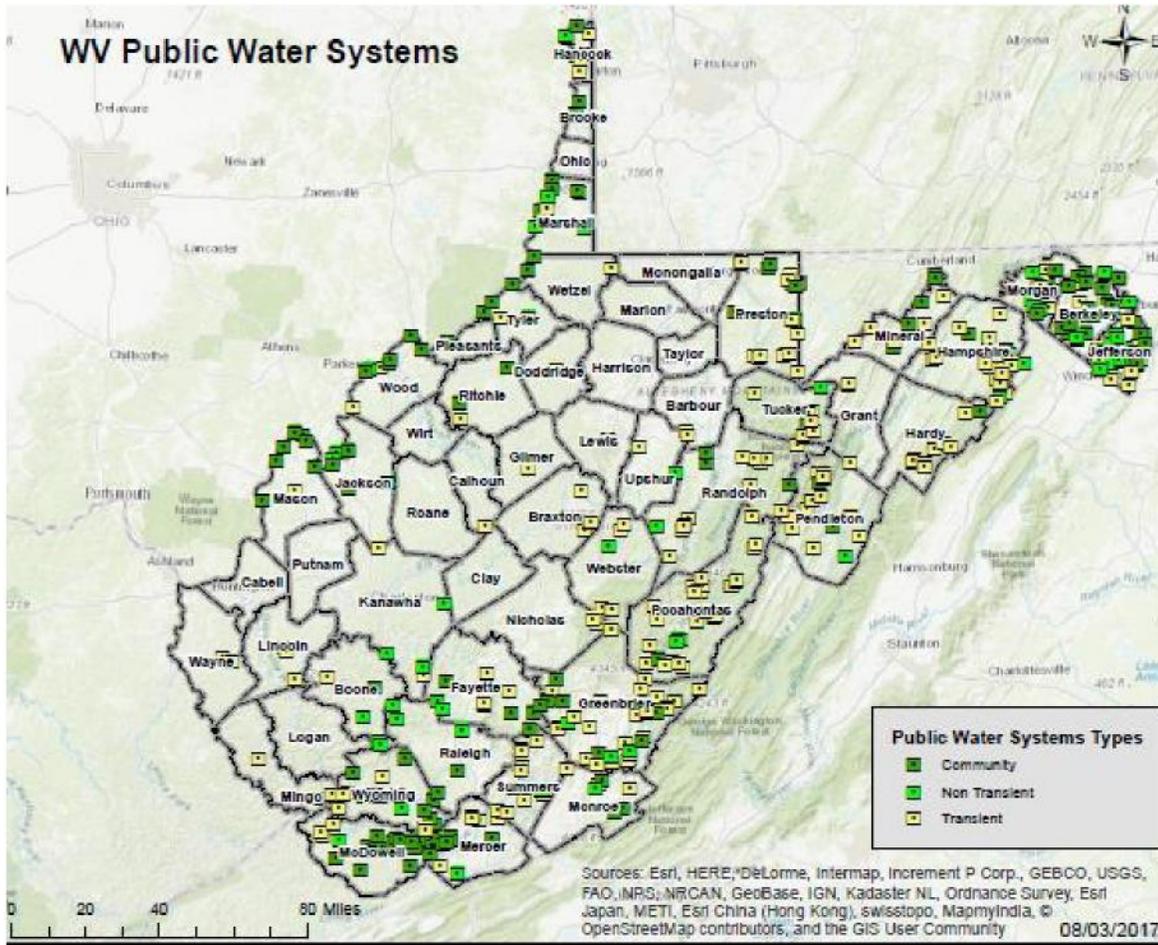
The WHP Program acquires a variety of data, including locations and characteristics of public water supply sources, point of entry, potential contaminant sources, and description of watersheds, hydrogeologic settings, and aquifer parameters. This data continues to be collected through field data collection activities and contractor services, as well as programs within federal, State, and local agencies.

Future Program Needs

OEHS to date has hired additional staff and spent a significant amount of time in developing the WHP Program, creating a GIS program for the storage and display of geologic/hydrologic, and regulatory site data, delineations, and existing significant contaminant source inventories. Potential future WHP Program needs are as follows:

- Source water education materials designed to identify, assess, prioritize, and address local needs in the area of source water protection and contamination prevention.
- Pollution prevention technical assistance to small businesses located within wellhead protection areas to balance Brownfield redevelopment with local water protection and restoration efforts.
- Continued groundwater quality monitoring to support activities mandated by the SWDA and the CWA.

- Funding to continue to sustain a grant program for public water systems that utilize groundwater to assist and focus appropriate source water protection efforts, increase resistance, and provide security to source water protection areas and new water facilities.



APPENDIX A
Regulatory Agencies with Groundwater Responsibility and Authority

Department of Agriculture

1900 Kanawha Boulevard, East
Charleston, West Virginia 25305
(304) 558-3708

Department of Environmental Protection

601 57th Street, Southeast
Charleston, West Virginia 25304

Division of Water and Waste Management
(304) 926-0495

Division of Mining and Reclamation
(304) 926-0490

Division of Land Restoration
(304) 926-0455

Office of Oil and Gas
(304) 926-0450

Office of Abandoned Mine Lands and Reclamation
(304) 926-0485

Office of Environmental Enforcement
(304) 926-0470

Department of Health and Human Resources

350 Capital Street
Charleston, West Virginia 25301

Office of Environmental Health Services
(304) 558-2981