2014 West Virginia Integrated Water Quality Monitoring and Assessment Report

dep

west virginia department of environmental protection
Division of Water and Waste Management

WEST VIRGINIA INTEGRATED WATER QUALITY MONITORING AND ASSESSMENT REPORT 2014

Prepared to fulfill the requirements of Sections 303(d) and 305(b) of the federal Clean Water Act and Chapter 22, Article 11, Section 28 of the West Virginia Water Pollution Control Act for the period of July 2011 through June 2013.

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Introduction

The federal Clean Water Act contains several sections requiring reporting on the quality of a state's waters. Section 305(b) requires a comprehensive biennial report and Section 303(d) requires, from time to time, a list of waters for which effluent limitations or other controls are not sufficient to meet water quality standards (impaired waters). West Virginia code Chapter 22, Article 11, Section 28 also requires a biennial report of the quality of the state's waters.

UPDATE: The United States Environmental Protection Agency (EPA) partially approved and partially disapproved West Virginia's 2014 303(d) list in May 2016 by proposing to add 61 waters. The EPA took final action on November 23, 2016 by adding 28 of the 61 waters proposed for addition. A list of those added waters is included as an addendum to the list developed by the West Virginia Department of Environmental Protection (DEP). Additional information is provided in Use Assessment Procedures section on interpreting *Narrative Water Quality Criteria – Biological Impairment Data.* This paragraph, the addendum, and the portions referred to above are the only sections updated to reflect the EPA's final action. The numeric summary tables (6, 7, 8, and 9) are based on assessments made by the DEP during the 2014 assessment cycle. All necessary changes based on the additional 28 streams will be reflected in the 2016 Integrated Report.

Table 1 - Integrated Report Categories

Category 1	fully supporting all designated uses	
Category 2	fully supporting some designated uses, but no or insufficient information exists to assess the other designated uses	
Category 3	insufficient or no information exists to determine if any of the uses are being met	
Category 4	waters that are impaired or threatened but do not need a Total Maximum Daily Load	
	Category 4a	waters that already have an approved TMDL but are still not meeting standards
	Category 4b	waters that have other control mechanisms in place which are reasonably expected to return the water to meeting designated uses
	Category 4c	waters that have been determined to be impaired, but not by a pollutant
Category 5	waters that have been assessed as impaired and are expected to need a TMDL	

This document is intended to fulfill West Virginia's requirements for listing impaired waters under Section 303(d) of the Clean Water Act and the Water Quality Planning and Management Regulations, 40CFR130.7. In addition to the list of impaired waters, it explains the data evaluated in the preparation of the list and methodology used to identify impaired waterbodies. Information is provided that allows the tracking of previously listed waters that are not contained on the 2014 list. The EPA has recommended these requirements be accomplished in a single report that combines the comprehensive Section 305(b) report on water quality and the Section 303(d) list of waters that are not meeting water quality standards. The format suggested by EPA for this "Integrated Report" includes provisions for states to place their waters in one of the five categories described in Table 1. Waters that are included on the 2014 Section 303(d) List are placed in Category 5 and are located in the back of this report (West Virginia 2014 Section 303(d) List).

This Integrated Report is a combination of the 2014 Section 303(d) List and the 2014 Section 305(b) report. In general, this report includes data collected and analyzed between July 1, 2008 and June 30, 2013, from the state's 32 major watersheds by the DEP's Watershed Assessment Branch and other federal, state, private and nonprofit organizations.

Water Quality Standards

Water quality standards are the backbone of the 303(d) and 305(b) processes of the federal Clean Water Act. In West Virginia, the water quality standards are codified as 47CSR2 – Legislative Rules of the Department of Environmental Protection – Requirements Governing Water Quality Standards. Impairment assessments conducted for the 2014 cycle are based upon water quality standards that have received the EPA's approval and are currently considered effective for Clean Water Act purposes. In that regard, the EPA has recently approved several changes to the West Virginia Water Quality Standards. Information regarding the approved changes can be found on the DEP's Web page at http://www.dep.wv.gov/WWE/Programs/wqs/Pages/default.aspx.

A waterbody is considered impaired if it violates water quality standards and does not meet its designated uses. Some examples of designated uses are water contact recreation, propagation and maintenance of fish and other aquatic life, and public water supply. Designated uses

Table 2 - West Virginia Designated Uses

Category	Use Subcategory	Use Category	Description
A	Public Water	Human Health	waters, which, after conventional treatment, are used for human consumption
B1	Warm Water Fishery	Aquatic Life	propagation and maintenance of fish and other aquatic life in streams or stream segments that contain populations composed of all warm water aquatic life
B2	Trout Waters	Aquatic Life	propagation and maintenance of fish and other aquatic life in streams or stream segments that sustain year-round trout populations. Excluded are those streams or stream segments which receive annual stockings of trout but which do not support year-round trout populations
B4	Wetlands	Aquatic Life	propagation and maintenance of fish and other aquatic life in wetlands. Wetlands generally include swamps, marshes, bogs and similar areas
C	Water Contact Recreation	Human Health	swimming, fishing, water skiing and certain types of pleasure boating such as sailing in very small craft and outboard motor boats
D1	Irrigation	All Other	all stream segments used for irrigation
D2	Livestock Watering	All Other	all stream segments used for livestock watering
D3	Wildlife	All Other	all stream segments and wetlands used by wildlife
E1	Water Transport	All Other	all stream segments modified for water transport and having permanently maintained navigation aides
E2	Cooling Water	All Other	all stream segments having one or more users for industrial cooling
E3	Power Production	All Other	all stream segments extending from a point 500 feet upstream from the intake to a point one-half mile below the wastewater discharge point
E4	Industrial	All Other	all stream segments with one or more industrial users. It does not include water for cooling

are described in detail beginning in Section 6.2 of 47CSR2 and are summarized in Table 2. Each of the designated uses has associated criteria that describe specific conditions that must be met to ensure that the water can support that use. For example, the "propagation and maintenance of fish and other aquatic life" use requires the pH to remain within the range of 6.0 to 9.0 standard units at all times. This is an example of a numeric criterion. Numeric criteria are provided in Appendix E of the water quality standards.

Use attainment is determined by the comparison of available instream values of various water quality parameters to the appropriate numeric or narrative criteria specified for the designated use (see the Assessment Methodology section for more information on use attainment determination). Waterbodies that are impaired by a pollutant are placed on the 303(d) List and scheduled for TMDL development.

Numeric criteria consist of a concentration value, exposure duration and an allowable exceedance frequency. The water quality standards prescribe numeric criteria for all designated uses. For the "propagation and maintenance of fish and other aquatic life" (Aquatic Life) use, there are two forms: acute criteria that are designed to prevent lethality, and chronic criteria that prevent retardation of growth and reproduction. The numeric criteria for acute aquatic life protection are specified as one-hour average concentrations that are not to be exceeded more than once in a three-year period. The criteria for chronic aquatic life protection are specified as four-day average concentrations that are not to be exceeded more than once in a three-year period. The exposure time criterion for human health protection is unspecified, but there are no allowable exceedances.

The DEP recently received approval from the EPA for changes in several water quality standards related to total iron, nutrients and chlorophyll-a. With respect to total iron, the recent approval revises the chronic aquatic life criterion for troutwaters from 0.5 mg/l to 1.0 mg/l. The DEP and EPA concluded that the revised value is protective of the troutwater use.

The new nutrient criteria include values for total phosphorus and chlorophyll-a for both cool and warm water lakes. The criteria are applied to an average of a minimum of four samples collected throughout the sampling period from May 1 to October 31. The warm water

lakes criteria for total phosphorus and chlorophyll-a are 40 ug/l and 20 ug/l, respectively. Cool water lakes criteria for total phosphorus and chlorophyll-a are 30 ug/l and 10 ug/l respectively. It should be noted that in the 2014 Triennial Review of Water Quality Standards, DEP proposed to remove section 8.3.a.3 of 47CSR2 (the "WQS Rule"). This section stated that a lake was not in violation of nutrient water quality standards if only the phosphorus numeric criterion was exceeded. With recent EPA approval of the removal of this section the DEP assessed lakes for chlorophyll a and phosphorus criteria compliance independently during the 2014 reporting cycle.

Water quality criteria also can be written in a narrative form. For example, the water quality standards contain a provision that states that wastes, present in any waters of the state, shall not adversely alter the integrity of the waters or cause significant adverse impact to the chemical, physical, hydrologic, or biological components of aquatic ecosystems. Narrative criteria are contained in Section 3 of 47CSR2. More information regarding the use of narrative criteria is contained in the Use Assessment Procedures section.

Ohio River criteria

For the Ohio River, both the Ohio River Valley Water Sanitation Commission (ORSANCO) and West Virginia water quality criteria were considered, as agreed upon in the ORSANCO compact. Where both ORSANCO and West Virginia standards contain a criterion for a particular parameter, instream values were compared against the more stringent criterion. The DEP supports ORSANCO's efforts to promote consistent decisions by the various jurisdictions with authority to develop 305(b) reports and 303(d) lists for the Ohio River. In support of those efforts, West Virginia has and will continue to work with ORSANCO and the other member states through a workgroup charged with improving consistency of 305(b) reporting among compact states. ORSANCO standards may be reviewed at http://www.orsanco.org/standards.

Prior to West Virginia's Draft 2012 303(d) List, ORSANCO notified its member states of a change in philosophy for assessing aquatic life standards for its biennial 305(b) report. In prior years, ORSANCO has assessed water quality data along sections of the Ohio River bordering West Virginia based on the state's total iron numeric water quality standard. In 2012, ORSANCO's governing commission began using a weight of evidence approach when assessing all aquatic life standards. However, the EPA's Region III office has stated for 303(d) listing purposes, it will only accept assessments based on a philosophy of independent applicability. Therefore, West Virginia's 303(d) assessments for aquatic life will recognize violations based on either water quality or biological survey data. A review of the ORSANCO total iron water quality data revealed violation rates greater than 10 percent for several segments along the state's border and, as such, the segments have been listed as impaired on West Virginia's 2014 303(d) list.

Surface Water Monitoring and Assessment

This section describes West Virginia's strategy to monitor and assess the surface waters of the state. The DEP's Division of Water and Waste Management (DWWM) collects most of the state's water quality data. The Watershed Assessment Branch (WAB) of DWWM is responsible for general water quality monitoring and watershed assessment. The remainder of this section describes the monitoring and assessment activities conducted by the WAB. In addition, WAB water quality data is currently available at: https://apps.dep.wv.gov/dwwm/wqdata/. The data at this site is continually updated as the site is live-linked to the database. WAB biological data is available at https://apps.dep.wv.gov/dwwm/wqdatab/.

Streams and Rivers

West Virginia has a comprehensive strategy for monitoring the flowing waters of the state, by far the most prevalent surface waterbody type in the state. The Watershed Assessment Branch utilizes a tiered approach, collecting data from long-term monitoring stations, targeted sites within watersheds on a rotating basin schedule, randomly selected sites, and sites chosen to further define impaired stream segments in support of TMDL development. The following paragraphs present these approaches in further detail.

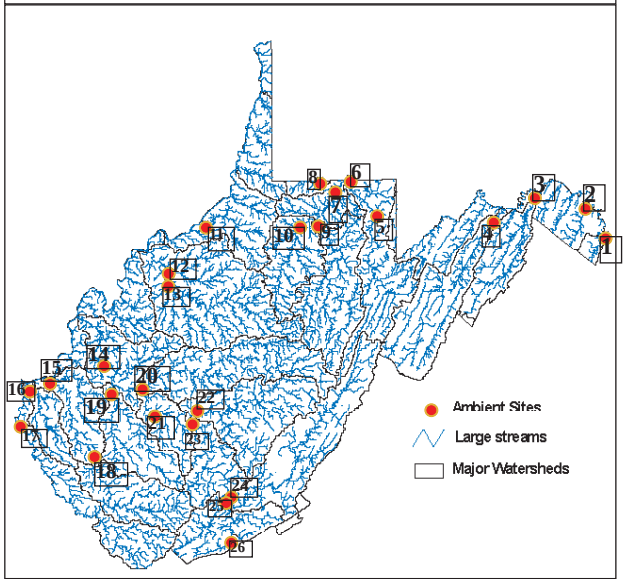
Probabilistic (random) Sampling

In 1997, the DEP's Watershed Assessment Branch began sampling sites selected through the Environmental Protection Agency's random stratified procedure in order to better assess the ecological health of watersheds and ecoregions within the state. The data generated from this random stratified (also known as probabilistic) sampling effort allows the DEP and the EPA to make statistically valid comparisons of aquatic integrity between watersheds and ecoregions. The data also assists in monitoring long-term trends in watershed and ecoregion health. Further details are provided in the section titled Probabilistic Data Summary.

Ambient Water Quality Monitoring Network

The ambient water quality monitoring network concept was established in the mid-1940s. The network currently consists of 26 fixed stations (Figure 1) that are sampled bi-monthly. Sampling stations are generally located near the mouths of the state's larger rivers and are co-located with USGS stream gages. The data provides information for trend analyses, general water quality assessments and pollutant loading calculations, and allows water resources managers to quickly gauge the health of the state's major waterways.

Figure 1 – West Virginia's Ambient Monitoring Sites



1. Shenandoah River at Harpers Ferry	14. Kanawha River at Winfield
2. Opequon Creek east of Bedington	15. Guyandotte River at Huntington
3. Cacapon River near Great Cacapon	16. Twelvepole Creek south of Ceredo
4. South Branch of the Potomac River	17. Tug Fork at Fort Gay
5. Cheat River at Albright, W.Va.	18. Guyandotte River at Pecks Mill
6. Cheat River below Cheat Lake	19. Coal River at Tornado
7. Monongahela River in Star City	20. Elk River at Coonskin Park
8. Dundard Creek east of Pentress	21. Kanawha River at Chelyan
9. Tygart Valley River at Colfax	22. Gauley River at Beech Glen
10. West Fork River at Enterprise	23. New River above Gauley Bridge
11. Middle Island Creek at Arvilla	24. Greenbrier River at Hinton
12. Hughes River west of Freeport	25. New River at Hinton
13. Little Kanawha River at Elizabeth	26. New River at Virginia state line

Targeted Monitoring

Targeted monitoring has been a component of West Virginia's assessment toolbox since the Watershed Assessment Program's inception in late 1995. Streams are sampled according to a five-year rotating basin approach. Sites are selected from the watersheds targeted for sampling each particular year. Each site is subjected to a one-time evaluation of riparian and instream habitat, basic water quality parameters, and benthic macroinvertebrate communities.

Sites are selected to meet a variety of informational needs in the following areas:

- Impaired streams
- Reference (minimally impacted) streams
- Spatial trends (multiple sites on streams exceeding 15 miles in length)
- Areas of concern as identified by the public and stakeholders
- Previously unassessed streams

Pre-Total Maximum Daily Load (TMDL) Development Monitoring

The major objective of this effort is to collect sufficient data for Total Maximum Daily Load (TMDL) modelers to develop stream restoration plans. Pre-TMDL sampling follows the framework cycle, i.e., impaired streams from watersheds in hydrologic group A will be sampled in the same year as the targeted sampling. The 303(d) List is the basis for initial site selection and additional sites are added to comprehensively assess tributary waters and to allow identification of the suspected sources of impairment. Pre-TMDL Monitoring is intensive, consisting of monthly sampling for parameters of concern. This method captures data under a variety of weather conditions and flow regimes. Pre-TMDL monitoring also includes an effort to locate the specific sources of impairment, with particular attention to identifying non-point source land use stressors as well as any permitted facilities that may not be meeting their permit requirements. For more information, see the TMDL Development Process section.

Lakes and Reservoirs

The DEP resumed a lake monitoring component in 2006. This program

focuses on water quality, collecting field parameters (dissolved oxygen, pH, temperature, and conductivity), nutrient data, clarity, and chlorophyll a. Multiple sites are sampled in larger lakes and profile data for temperature and dissolved oxygen are obtained.

The DEP added the collection of benthic macroinvertebrates to the lake monitoring program in 2011. Collections are made from near shoreline habitat using jabs and sweeps with a d-net. Plans are to eventually develop an IBI for use in lakes.

Many of West Virginia's largest reservoirs are controlled by the U.S. Army Corps of Engineers. Although The Corps' primary mission is to manage structures to provide navigation and flood control, the agency also is committed to water quality management. Data generated by the Corps has been used for assessment purposes.

Additional lake information is available from the West Virginia Division of Natural Resources. The DNR, one of the signatory agencies in the Partnership for Statewide Watershed Management, conducts fish community surveys on many of the state's reservoirs.

Wetlands

The State of West Virginia takes great interest in the management of its wetlands both large and small. The current total acreage of wetlands within the state is approximately 89,000 acres and comprises less than one percent of the State's total acreage (National Wetlands Inventory: WV 1980-86). As of this report, management efforts are currently geared toward protection of wetlands by regulatory proceedings or acquisition. Permitting authority for activities impacting wetlands (Section 404) lies with the U. S. Army Corps of Engineers. West Virginia insures protection through an active Section 401certification program.

Since the submission of the last 305(b) report; West Virginia's wetlands monitoring activities have expanded. Watershed Assessment personnel have been researching/developing assessment and monitoring strategies in conjunction with the EPA and other states. The Wildlife Resources Section of the DNR, in cooperation with West Virginia University, has evaluated aerial photography from 2003 at a 1:4800 scale to supplement the data from the original National Wetlands Inventory (NWI). The detailed information this project provides allows for the identification of man-made changes since the 1986 NWI and enables proper Cowardin classification.

The DNR updated the West Virginia Wetland Rapid Assessment Procedure (WVWRAP) for wetlands in 2011. A WVWRAP (Level II) assessment captures in excess of 100 descriptive and assessment metrics at each site which are used directly or indirectly to provide wetland integrity and functional assessments. The WVWRAP has been applied at

Table 3 - Current and Future Monitoring Activities

26 Ambient sites will continue to be monitored bi-monthly (monthly for Monongahela River Basin sites during low flow season)
A fourth round of probabilistic monitoring was conducted in 2013 and 2014. The fourth round will be completed in 2017 after 5 consecutive years of sampling.
Pre-TMDL development monitoring: Monitoring was completed in 2012 for select streams in the Coal, Dunkard, Elk, Gauley, South Branch Potomac, Shenandoah (Hardy), Upper Kanawha, Upper Ohio North, Upper Ohio South, and West Fork watersheds; monitoring was completed for the Tygart Valley River watershed in 2013; monitoring was completed in 2014 for select streams in the Potomac Direct Drains and Gauley (Meadow River) watersheds; and monitoring started in June 2014 within the Little Kanawha (Hughes River) and Monongahela (mainstem and Deckers Creek) watersheds and will be completed in July 2015.
Targeted Sampling – In Group B, approximately 24 sites were sampled during the 2012 summer sampling season from the Coal, Elk, and Tygart Valley watersheds. In Group C, approximately 211 sites were sampled on 174 streams within the Tug Fork watershed in 2013.
Lakes – Ten lakes within Group B watersheds were samples four times (May – October) in 2012; 13 lakes were sampled 4 times in 2013 within Group C watersheds; and 9 lakes were sampled 4 times in 2014 within Group D watersheds.
Water quality meters that collect continuous data were deployed at 183 sites on 141 streams in total for the years 2012, 2013, & 2014. Future years may see an increased effort in the number of deployable meters used to monitor streams. Parameters include pH, temperature, specific conductance, and dissolved oxygen.
Long Term Monitoring Sites (LTMS) – Approximately 65 sites were sampled in 2012, 2013, and 2014. A similar effort is planned for future years.

more than 680 sites to validate the technique. Calibration with intensive (Level III) assessments and GIS remote (Level I) assessments on the same wetlands/sites continues and will provide more confidence in data that will be generated in future rapid assessments. The DNR has also developed an Index of Biologic Integrity (IBI) for wetlands and applied it to approximately 90 wetlands which will contribute to the creation of reference standards for wetland integrity and wetland function. In conjunction; approximately 40 landscape metrics descriptive of wetland ecological integrity and wetland functions have been extracted and/or derived for all palustrine, emergent, shrub-scrub and forested wetlands identified in the National Wetland Inventory. These metrics will be used as input data to generate indices of function and integrity in the assessment of wetland condition and functionality across the state.

The DEP and DNR are working together towards the development of a more structured wetlands monitoring program. The current project entails the development of functional indices that will calculate the value of wetlands for their ability to attenuate floods and provide clean water, as well as for its ecological and recreational (aesthetic and educational) functions. These indices will be used to help guide wetland related development and mitigation activities of the state.

The DNR submitted in the spring of 2011 its West Virginia Wetland Program Plan, which describes a general direction for the state through 2015. The overall goal of the plan is to provide guidance and direction to the two state agencies (DEP and DNR) directly involved with conserving and regulating wetland activities in the state. The plan includes suggestions for core monitoring elements, water quality standards, and increasing education/outreach efforts.

The West Virginia field portion of the U.S. EPA's National Wetlands Condition Assessment was completed in September 2011 and the DEP plans to participate in the next national assessment in 2016.

Citizen Monitoring

West Virginia Save Our Streams is the state's volunteer water quality monitoring program. Initiated in 1989, this program encourages citizens to become involved in the improvement and protection of the state's streams. Save Our Streams has two main objectives. First, it provides the state with enhanced ability to monitor and protect its surface waters through increased water quality and aquatic life monitoring. Second, it improves water quality through educational outreach to the state's citizens. Training workshops are conducted regularly throughout the state to train, certify and provide quality assurance. A major improvement in data accessibility for the program has been the development of an online Volunteer Assessment Database (VAD): http://www.dep.wv.gov/WWE/getinvolved/sos/ Pages/VAD.aspx. Volunteer monitors can register and enter their own data online. The coordinator is the database administrator, and has tools to verify the quality of the information before it is approved and included in the VAD. The database is also available for public viewing without registration. In addition, the program periodically prepares the "State of Our Streams" report and coordinates with partners to undertake water quality studies within the state as well as other portions of the Mid-Atlantic region. To learn more visit: http://www.dep.wv.gov/sos.

DATA MANAGEMENT

Assessed Data

All readily available data was used during the evaluation process. In preparation for the development of this report, the agency sought water quality information from various state and federal agencies. Specific requests for data were made to state and federal agencies known by the DEP to be generators of water quality data. Additionally, news releases and public notices requesting data submissions were published in state newspapers and on the DEP Water and Waste Management's website. The DEP's staff reviewed data from external sources to ensure that collection and analytical methods, quality assurance and quality control and method detection levels were consistent with approved procedures. In addition, the DEP has developed guidance for those wishing to submit data. The document contained a list of requirements for submitted data along with helpful internet links and a checklist for data submitters. The guide and additional information regarding data assembly and submission, when requested by the DEP for 303(d) list development,

was found on the DEP's Web site using the following link: http://www.dep.wv.gov/WWE/watershed/IR/Documents/WV_WQ_Data_Submission_Guidelines_2010.pdf

Assessment decisions are made using the most accurate and recent data available to the agency. For stream water quality assessments, the DEP generally used water quality data with sample dates between July 2008 and June 2013 with the use of data more than five years old intentionally limited. However, in the absence of new information, previous assessments are carried forward even if the data becomes older than five years. Additionally, if a water quality criteria change is approved which affects an older assessment, the new assessment is based upon the current criteria.

Waters are not deemed impaired based upon water quality data collected when stream flow conditions are less than 7Q10 flow (the seven consecutive day average low flow that recurs at a 10 year interval) or within regulatory mixing zones. Further, waters are not deemed impaired based upon "not-detected" analytical results from methodologies that have detection limits that are not sensitive enough to confirm criteria compliance. For example, a dissolved aluminum result of "not detected" using a method with a detection limit of 0.1 mg/l would not prompt a dissolved aluminum listing for trout waters with a criterion of 0.087 mg/l.

External Data Providers

Data submitted from sources outside of the Watershed Assessment Branch were considered in the development of this report. This also includes data from other the DEP programs. Entities that provided information in response to the agency's request for data for the 2014 Section 303(d) list are shown in Table 4. External data received and qualified in the preparation of previous Section 303(d) lists were reconsidered in the 2014 review. Once data was submitted, the DEP performed the following:

- Determined quality and quantity
- Determined stream codes and mile points
- Formatted data for evaluation
- Used qualified data from external sources to make assessment decisions

Table 4 - Data providers for the 2014 303(d) List and Integrated Report

National Park Service - U.S. Department of Interior	West Virginia Department of Agriculture
Plateau Action Network	Trout Unlimited
U.S. Geological Survey	ORSANCO
West Virginia Department of Environmental Protection	Kanawha Valley Development Corporation
U.S. Army Corp of Engineers	

USE ASSESSMENT PROCEDURES

The primary focus of this report is to assess water quality information and determine if the designated uses of state waters are impaired. This section describes the various protocols used to determine use impairment.

Numeric Water Quality Criteria

The decision methodology for numeric water quality criteria used in preparation of the 2014 Section 303(d) list are consistent with those used in 2012 listing cycle.

Typically, if an ample data set exists and exceedances of chronic aquatic life protection and/or human health protection criteria occur more than 10 percent of the time, the water is considered to be impaired. If the rate of exceedance demonstrated is less than or equal to 10 percent, then the water is considered to be meeting the designated use under evaluation. Ample data sets are defined as sets with 20 or more distinct observations in the five-year period used for evaluation in this listing cycle (July 2008 to June 2013). If fewer than 20 samples per station (or representative area) exist and three or more values exceed a criterion value, then the water also is considered to be impaired. For this scenario (three observed violations), if additional non-exceeding monitoring results were available that would increase the data set size to 20 observations, a greater than 10 percent exceedance frequency would still exist.

Under West Virginia Water Quality Standards, acute aquatic life protection criteria have associated exposure durations of one hour and may be exceeded once every three years. The normal practice of "grab-sampling" ambient waters is generally consistent with the one-hour exposure duration specified in the standards. Therefore, a direct application of the allowable exceedance frequency provided in the standards is made when assessing impairment relative to acute aquatic life protection criteria. If two or more exceedances of acute criteria are observed in any three-year period, the water is considered to be impaired. If the data being evaluated is generated as part of a comprehensive network being monitored for a specific purpose, the data may be assigned a higher level of assessment quality, and the "10-percent rule" may be applied with confidence to data sets containing less than 20 observations per station. The primary example of an intensified monitoring program that generates higher assessment quality data is that which is conducted by the DEP to support TMDL development. The pre-TMDL monitoring format includes flow measurement and monthly water quality monitoring for one year at multiple locations throughout a watershed. Information is generated over a range of stream flow conditions and in all seasons. Habitat assessment and biological monitoring is performed in conjunction with water quality monitoring. The information generated under this format is among the most comprehensive available for assessing water quality. Upon conclusion of monitoring, it is then necessary for agency personnel to make a definitive judgment relative to impairment. In most instances, application of the "10-percent rule" to the pre-TMDL monitoring data sets result in the classification of waters as impaired if two or more exceedances of a criterion are demonstrated. Table 5 summarizes the criteria used to make 303(d) impairment decisions relative to numeric water quality criteria period.

Table 5 - Numeric Water Quality Decision Criteria for Listing of Impaired Waters

Water Quality Criteria	Impairment Thresholds	Additional Considerations
Acute Aquatic Life Protection (Use Category B)	**The water is impaired if two exceedances of acute aquatic life protection numeric criteria occur within any three-year period.**	**If, in the most recent three-year period, no exceedances of criteria are evidenced and at least 12 monitoring results are available, then the water may be considered "not impaired."**
Chronic Aquatic Life Protection (Use Category B) Human Health Protection (Use Categories A and C)	**The water is impaired if a greater than 10% frequency of exceedance is demonstrated in an ample dataset (20 or more available observations).** **The water is impaired if three exceedances of criteria occur with less than 20 available monitoring results.** **The water is impaired if a greater than 10% frequency of exceedance is demonstrated with less than 20 available observations, if the data being evaluated is of high assessment quality (two or more violations)**	**If, for waters with regularly scheduled monitoring, in the most recent two-year period, no exceedances of criteria are evidenced and at least eight observations are available, then the water may not be considered impaired.**

Segmentation of Streams

The majority of newly listed streams were identified as impaired for their entire length. Segmentation occurred only in limited situations involving streams with impoundments or alternative designated uses, or when knowledge of a specific pollutant source allowed clear distinction of impaired and unimpaired segments or streams with multiple monitoring locations with differing results. Multiple sample site stream segmentation, when done, is accomplished by continuing an assessed condition until samples from additional sites demonstrate a change in water quality. In other words, if water quality results from one site indicate impairment, the stream is considered impaired until downstream or upstream samples indicate compliance with the water quality criterion.

Segmentation based upon the limited amount of water quality monitoring data that is usually available may not accurately portray the extent of impairment and may contradict the ultimate findings of the TMDL that the listing mandates. The DEP believes the TMDL development process, which links extensive water quality monitoring and source tracking efforts with pollutant sources through computer modeling, provides the best assessment of criterion attainment and the most accurate identification of the watershed sources for which pollutant reductions are necessary. TMDL modeling predicts water quality over a wide range of climatic and stream flow conditions, incorporates the specific exposure duration and exceedance frequency terms of water quality criteria and prescribes pollutant/s allocations that will result in attainment of criteria in all stream segments.

Evaluation of Continuous Monitoring Data

Recently, the DEP began using deployable sondes to collect data on a continuous basis on selected streams. The sampling methodology essentially uses electronic probes designed to remain submerged and collect data continuously for a period of time ranging from several days to several months. This method is especially effective for evaluating the specific requirements of water quality criteria for parameters such as pH and dissolved oxygen. For example, the pH criterion states that water quality values should remain between 6.0 and 9.0 standard units at all times (exception for waters with high photosynthetic activity). The use of continuous monitors allows the DEP to better assess if streams are meeting the criteria. DEP is currently developing a method to assess the vast amount of data collected by continuous monitoring instruments. The methodology must address both the magnitude and frequency of violation stipulated in current water quality criteria. DEP plans to develop a continuous monitoring assessment methodology for use in the 2016 cycle.

Evaluation of Fecal Coliform Numeric Criteria

Fecal coliform assessments were based on the previously described decision criteria for numeric water quality criteria. Given the complexity of this particular criteria, most assessments are performed by comparing observations to the "maximum daily" criterion value of 400 counts/100ml. Evaluation of the monthly geometric mean fecal coliform criterion (200 counts/100ml) occurs only where five or more individual sample results are available within a calendar month.

Numeric fecal coliform water quality criteria are applicable to the Water Contact Recreation and Public Water Supply designated uses. Section 8.13 of Appendix E of the West Virginia Water Quality Standards states:

> *8.13 Maximum allowable level of fecal coliform content for Primary Contact Recreation shall not exceed 200/100ml as a monthly geometric mean based on not less than five samples per month; nor to exceed 400/100ml in more than 10 percent of all samples taken during the month.*
>
> *8.13.1 Ohio River mainstem (zone I) - During the non-recreational season (November through April only) the maximum allowable level of fecal coliform for the Ohio River (either MPN or MF) shall not exceed 2000/100 ml as a monthly geometric mean based on not less than 5 samples per month.*

A practical difficulty exists in accurate assessment of criteria compliance due to the resource commitment that would be necessary to perform monitoring at a sufficient frequency to make determinations using the geometric mean criteria, since the monthly geometric mean criterion is conditioned upon the availability of at least five distinct sample results in a month. The "maximum daily" criterion is not conditioned by a minimum sample set requirement, but practical use of the apparent 10 percent exceedance allowance would involve at least 10 samples per month.

The most frequent and regular fecal coliform water quality monitoring conducted by the Watershed Assessment Section is once per month. That monitoring frequency precludes assessment of the monthly geometric mean criterion and hampers accurate assessment of the maximum daily criterion. Due to limited resources, more frequent fecal coliform monitoring could only be accomplished by significantly reducing the number of West Virginia streams and/or stations where water quality assessments are performed. The DEP does not consider that to be a reasonable alternative.

The DEP uses the following protocols when making assessments relative to fecal coliform numeric criteria:

1. *No assessments are based upon the monthly geometric mean criterion (200 counts/100ml) unless an available data set includes monitoring at five per month or greater frequency. When data sets are available, the listing decision criteria for numeric water quality criteria are applied, considering each monthly geometric mean as an available monitoring result.*

2. *The listing decision criteria are applied to the maximum daily criterion (400 counts/100ml) and available individual monitoring results, but without the monthly prejudice. For example, if twice per month monitoring is conducted for a year and two results in two separate months are greater than 400, the stream would be assessed as fully supporting (2/24 – 8.3 percent rate of exceedance rather than basing assessments on two months out of 12 in noncompliance (2/12 – 16.7 percent rate of exceedance). If five samples per month monitoring is conducted for one year and four daily results greater than 400 are measured in four different months, the stream would be assessed as fully supporting (4/60 – 6.7 percent rate of exceedance) rather than nonsupporting (4/12 – 33.3 percent rate of exceedance), provided that the monthly geometric means were below the 200 counts/100 ml criteria.*

The decision criteria does not provide for 303(d) listing of waters with severely limited data sets and exceedance (i.e., one sample in a five-year period > 400 counts/100ml). Such waters would be classified as having insufficient data available for use assessment. The DEP will target these "fecal one-hit" waters for additional monitoring by incorporating them into the pre-TMDL monitoring plans at the next opportunity for TMDL development in their watershed. Where the intensified pre-TMDL monitoring (monthly sampling for one year) indicates impairment, TMDL development will be immediately initiated, even though the water may not be included in Category 5 of the current Integrated Report.

Narrative Water Quality Criteria – Biological Impairment Data
Updated November 2016

The narrative water quality criterion of 47CSR2 – 3.2.i. prohibits the presence of wastes in state waters that cause or contribute to significant adverse impact to the chemical, physical, hydrologic and biological components of aquatic ecosystems. Historically, DEP interpreted the criterion using the West Virginia Stream Condition Index (WVSCI). The WVSCI is a family level benthic macroinvertebrate multi-metric index for use in wadeable streams.

Passage of Senate Bill 562 in the 2012 regular legislative session required DEP to develop and secure legislative approval of new rules to interpret the narrative criterion for biological impairment found in 47 CSR 2-3.2.i. A copy of the legislation may be viewed at: http://www.legis.state.wv.us/Bill_Text_HTML/2012_SESSIONS/RS/Bills/SB562%20SUB1%20enr.htm

In its preparation of the Draft West Virginia 2012 Section 303(d) list, the DEP did not add new biological impairments. In finalizing the 2012 list, the EPA added biological listings to those proposed by the DEP. The EPA considered available benthic macroinvertebrate data and added impairments to the list based on WVSCI methodology. The EPA also determined that the uncertainty zone historically used by the DEP (WVSCI scores between 60.6 and 68) was not scientifically supported and therefore used a WVSCI score of 68 as an impairment threshold, which is equal to the 5th percentile of reference site scores.

Senate Bill 562 directs the DEP to additionally consider fish in its assessment methodology. The revised assessment methodology called for in SB 562 has not yet been finalized. The development of a multi-assemblage tool has proven to be much more difficult than originally expected and was not available for use for the 2014 Assessment Cycle.

For the 2014 303(d) list, the DEP originally proposed biological impairment listings based upon the methodology used by the EPA in their 2012 oversight actions. The DEP retained most biological impairments

identified in the Final West Virginia 2012 Section 303(d) List and added new listings using the WVSCI and a threshold of 68. On May 11, 2016 the EPA took action on West Virginia's Section 303(d) List, partially approving and partially disapproving the submission. Disapproval was because "WVDEP did not evaluate a category of existing and readily available data – specifically, genus-level macroinvertebrate data." (Responsiveness Summary – November 2016). The genus-level data referred to is the Genus Level Index of Most Probable Stream Status or GLIMPSS.
(http://www.dep.wv.gov/WWE/watershed/bio_fish/Documents/20110829GLIMPSSFinalWVDEP.pdf)
This index was developed by the DEP with assistance from the EPA in order to better utilize the genus level data being generated by the DEP. The EPA originally proposed adding 61 streams to the 2014 303(d) list. The DEP then provided information showing where existing TMDLs already addressed the pollutants that had been determined to be the primary stressors for many of these 61 streams. In November of 2016, the EPA took final action on the list, adding 28 streams to the final 2014 list. A list of streams added by the EPA in the final approved 2014 303(d) List can be found in the addendum at EPA Waters Added List Page.

Each listed stream will be revisited prior to TMDL development. Additional biological monitoring will be performed as necessary to implement the new assessment methodology. The causative stressor(s) of impairment and the contributing sources of pollution will be identified during the TMDL development process.

Biological impairments identified in the Final West Virginia 2012 Section 303(d) List are proposed to be delisted under the following scenarios:

- ⌦ Where previous listings were determined to have been made in error.
- ⌦ Where more recent biological monitoring results demonstrated WVSCI scores greater than 68. (Nov 2016 Update: Nine such streams are now being retained on the list based on their GLIMPSS Scores)
- ⌦ Where approved TMDLs have been developed pursuant to numeric water quality criteria and the Stressor Identification performed in the TMDL process demonstrated that their implementation would resolve the stress to the benthic macroinvertebrate community that caused the original listing.

Delistings under the first two scenarios are identified in Supplemental Table A. The prior listings for which surrogate TMDLs address biological impairment are identified in Supplemental Table B (Example 1).

Narrative Water Quality Criteria - Fish Tissue and Fish Consumption Advisories

The narrative water quality criterion of 47CSR2 – 3.2.e prohibits the presence of materials in concentrations that are harmful, hazardous or toxic to man, animal or aquatic life in state waters. Fish consumption advisories are used to inform the public about potential health risks associated with eating fish from West Virginia's streams. The DEP, the Division of Natural Resources, and the Bureau for Public Health have worked together on fish contamination issues since the 1980s and an executive order from the governor and subsequent Interagency Agreement signed in 2000 formalized the collaborative process for developing fish consumption advisories. Except for pollutants with specific body-burden criteria (methylmercury), the presence of contaminants in fish tissue in amounts resulting in a two meal per month or more restrictive, waterbody-specific, fish consumption advisory is evidence of impairment.

Risk-based principles are used to determine whether fish consumption advisories are necessary. These advisories are used as a public education tool to help citizens make informed decisions about eating fish caught in state streams. The risk-based approach estimates the probability of adverse health effects and provides a statement on the health risk facing the angler and high-risk groups including women of childbearing age and children. West Virginia's fish consumption advisories include guidelines on the number of meals to eat and information on proper fish preparation to further minimize risk.

Waterbody-specific fish consumption advisories exist for 12 state streams and five lakes for a variety of fish species and contaminants.

Additionally, there is a general statewide advisory that recommends limiting the consumption of certain sport-caught fish from all West Virginia waters in relation to low-level mercury and/or polychlorinated biphenyl (PCB) contamination. The statewide advisory provides species-specific recommendations ranging from one meal per week to one meal per month. The following webpage contains the 2014 West Virginia fish consumption advisories:
http://www.wvdhhr.org/fish/Current_Advisories.asp#sect2.
West Virginia water quality standards contain a numeric body-burden criterion for methylmercury in fish tissue for protection of public water supply and water contact recreation designated uses. The criterion states "The total organism body burden of any aquatic species shall not exceed 0.5 µg/g as methylmercury." Therefore, the DEP must apply the criteria to all aquatic species rather than just the commonly consumed fish species. Fish tissue methylmercury assessment is directly based upon the numeric criterion and not upon fish consumption advisories.

In the 2010 listing cycle, the DEP delisted many previous mercury impairments because they were based upon total mercury rather than methylmercury fish tissue concentrations and upon fillet rather than whole body samples. 2014 mercury listings adhere to the specific conditions of the criterion (whole-body, methylmercury, species-specific).

The DEP collected fish from selected streams and lakes in West Virginia based on past listings and waters with suspected contamination. Each fish collected was processed separately and analyzed for whole body methlymercury concentration. The analytical results assessed for 303(d) purposes include only fish with a length equal to or greater than 75% of the longest individual fish in each species at each site. This qualification is based on a general rule for compositing of fish tissue samples. The individual results of all qualified fish within each species were averaged to obtain a value for comparison to the criterion. If the average for all qualified fish of any species exceeded the 0.5 ug/g criterion, the waterbody was listed as impaired for methylmercury. The 2014 303(d) list contains six lakes listed as impaired for methylmercury.

For the mainstem Ohio River, the applicable ORSANCO body-burden criterion is 0.3 µg/g. As with previous 303(d) lists, DEP has deferred to ORSANCO's assessment results for mercury listing purposes. ORSANCO's assessment methodology is included in their Biennial Assessment of Ohio River Water Quality Conditions for 2014.

Narrative Water Quality Criteria - Algal Blooms

The narrative water quality criterion of 47CSR2 – 3.2.g prohibits algae blooms which may impair or interfere with the designated uses of the affected waters. Significant improvements have been made to the assessment methodology used for this criterion in previous cycles. The new methodology (303(d) Listing Methodology for Algae Blooms). was finalized by the DEP in June 2013 and is available at http://www.dep.wv.gov/WWE/Programs/wqs/Documents/Greenbrier%20Algae/AlgaeListingMethodology2014.pdf
The DEP commissioned research to determine river users' tolerance levels for filamentous alage growth. The report West Virginia Residents' Opinions On And Tolerance Levels Of Algae In West Virginia Waters is available at http://www.dep.wv.gov/WWE/Programs/wqs/Documents/WVAlgaeSurveReport_ResMgmt_WVDEP_2012.pdf. River users were surveyed to determine the amount of filamentous algae cover that would adversely impact recreational activities. The DEP considered the results of the survey when establishing thresholds for algae blooms that impair the Water Contact Recreation designated use. In general, a stream segment is considered impaired if filamentous algae cover greater than 20% extends for a longitudinal distance greater than three times the average stream width (3xW) OR if filamentous algae cover of greater than 40% is observed, regardless of the longitudinal extent of the bloom. The DEP also considers streams to be impaired if algae blooms cause taste or odor that interferes with the Public Water Supply designated use. The application of drinking water treatment beyond "conventional treatment" in response to algae blooms is considered direct evidence of use impairment. Additionally, the DEP considers available taste or odor complaints about finished drinking water when assessing the Public Water Supply designated use and may classify the use as impaired even though additional treatment is not implemented.

The application of the assessment methodology to observations from the 2011, 2012, 2013 growing seasons resulted in the following impairments on the 2014 Draft West Virginia 303(d) List:

- Greenbrier River - refinement of the 2012 listing to reflect impairment from Stony Creek (MP 12.1) to Howards Creek (MP 50.00)
- Cacapon River – Forks of Cacapon to Wardensville (listing remains unchanged)
- South Branch of Potomac River – Romney to Moorefield (listing remains unchanged)
- Tygart River – New Listing – Just upstream of Elkins POTW (MP 80.32) to Grassy Run

ASSESSMENT RESULTS

Streams

This section contains the results from all the data that has been assessed for West Virginia streams. Table 6 shows a summary of the classification of West Virginia waters under the five "Integrated Report" categories (see page 4). The results reveal that 22% of West Virginia's stream miles are in either Category 1 or 2 (fully supporting all or some assessed uses). Category 3, streams with insufficient data, makes up 34% of stream miles, the largest percentage of the five categories. However, that number is somewhat deceiving. The streams with limited data are typically small unnamed tributaries, which usually contribute to the larger waterbodies which have been assessed. All major rivers in the state have data and have been assessed and placed into one of the other four categories. Approximately 44% of West Virginia's streams are impaired and fall into either Category 4 or 5.

Table 6 - 2014 Category Summary Report for West Virginia

LAKES					
Type	CATEGORY	# of lakes	% lakes	acres	% acres
Lake	1	0	0	0	0
Lake	2	38	29	4239	19
Lake	3	72	55	7185	32
Lake	4a	7	5	147	1
Lake	5	15	11	10856	48
	TOTAL	132	100	22427	100
STREAMS					
Type	CATEGORY	# of stream segments	% stream segments	miles of streams	% miles
Stream	1	1170	10	4050	13
Stream	2	920	8	2752	9
Stream	3	6269	54	10366	34
Stream	4a	2155	18	8592	28
Stream	4b	1	0	2	0
Stream	4c	32	0	28	0
Stream	5	1142	10	5091	16
		11689	100	30881	100

The lists of Category 1, Category 2, and Category 3 waters are quite large; therefore, they are not published in this document. The waters included in these three categories can be viewed at http://www.dep.wv.gov/WWE/WATERSHED/IR/Pages/303d_305b.aspx.

The guidelines used by the DEP to demonstrate use-support for streams (and subsequent classification into Categories 1, 2 or 3) vary for each of the designated uses. "Supporting" assessments for individual uses are made if certain mandatory parameters have been monitored and those results demonstrate compliance with criteria. If monitoring results are available for "non-mandatory" parameters, they also must indicate compliance with any criteria prescribed for the use. To demonstrate support, aquatic life uses in wadeable streams require benthic macroinvertebrate monitoring and results showing a WVSCI score greater than or equal to 68. Public Water Supply and Water Contact Recreation uses require compliant fecal coliform monitoring and all other uses require compliant pH and dissolved oxygen monitoring.

Stream segments that support all of the designated uses are placed in Category 1. Stream segments without sufficient data to determine use support or impairment may be placed in either Category 2 or 3. Category 2 houses waters with some uses determined to be supported, but lacking sufficient information to assess other uses. Waters are placed in Category 3 if insufficient or no information exists to determine if any of the uses are being met. An "insufficient data" designation may result where some water quality data are available, but not enough to conclude that the use is supported or impaired, or where water quality data for mandatory parameters is absent.

Impaired waters are placed in Categories 4 or 5. Prior to TMDL development, waters impaired by a pollutant are placed on the Section

303(d) List and in Category 5. After TMDLs are developed and approved, those waters are relocated to Category 4A and are identified in Supplemental Table B of this report. Other impaired streams for which TMDLs need not be developed are identified in Supplemental Table D.

Category 5 includes 1,142 impaired stream segments, covering approximately 5,091 stream miles that are impaired and need TMDLs developed. This number has decreased from 6,027 miles of impaired streams identified on the 2012 list. The decrease is due, in part, to the TMDL development timeline. TMDLs always are in various stages of development, and with the additional sampling data generated, streams and stream segments may move from Categories 1, 2 or 3 to Category 5. Additionally, TMDLs that have not yet been approved by the EPA remain listed in Category 5. Once these TMDLs are approved, those streams and stream segments will move to Category 4a.

Table 7 contains a breakdown of use support specific to the use categories for state waters as set forth in the Water Quality Standards (47CSR2). The list and the summary results of Table 8 and Table 9 provide an overview of the impairment status of West Virginia waters.

The most common criteria violations in West Virginia streams in order of total stream miles are:

- Fecal coliform
- Total iron (warmwater)
- Biological impairment, as determined through application of the West Virginia Stream Condition Index
- Dissolved Aluminum
- pH
- PCBs
- Selenium

Table 7 - West Virginia Use Support Summary

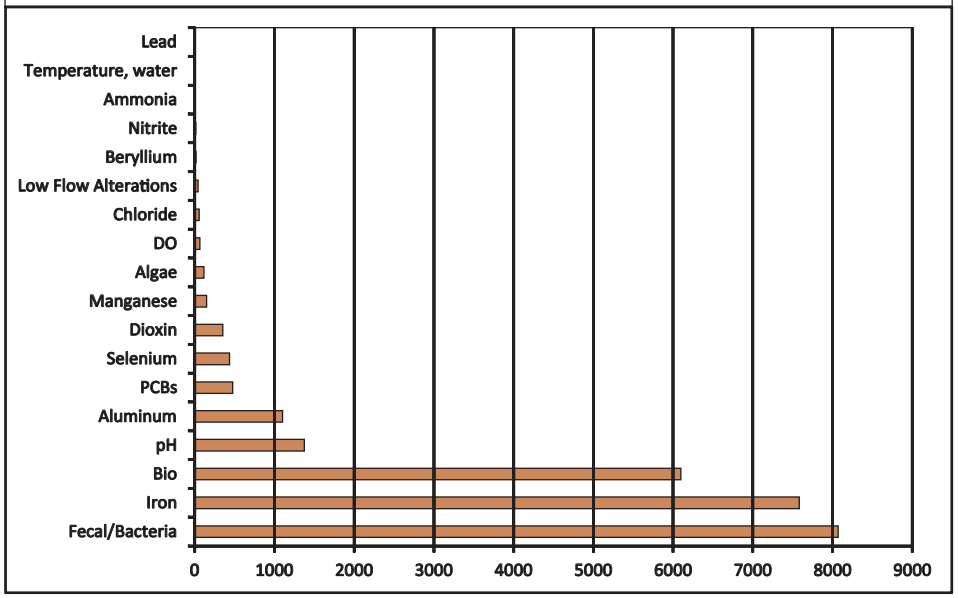
LAKES																		
Designated Use	Number of Lakes	Size (acres)	Fully Supporting				Insufficient Data				Not Assessed				Not Supporting			
			#	%	Acres	%	#	%	Acres	%	#	%	Acres	%	#	%	Acres	%
A - Public Water	132	22427	34	26	4277	19	16	12	4735	21	71	54	3531	15	11	8	9884	44
B1 - Warm Water Fishery	109	17006	0	0	0	0	38	35	10998	65	56	51	3110	18	15	14	2899	17
B2 - Troutwater	23	5421	0	0	0	0	13	57	5215	96	9	39	190	4	1	4	16	0
C - Contact Recreation	132	22427	12	9	1579	7	33	25	6546	29	65	49	3300	15	22	17	11003	49
D - Agriculture and Wildlife	132	22427	47	36	6622	30	17	13	12464	56	67	51	3338	15	1	1	4	0
E -Industrial	132	22427	47	36	6622	30	17	13	12464	56	67	51	3338	15	1	1	4	0
Total	132	22427																

STREAMS																		
Designated Use	Number of Stream Segments	Size (miles)	Fully Supporting				Insufficient Data				Not Assessed				Not Supporting			
			#	%	Miles	%	#	%	Miles	%	#	%	Miles	%	#	%	Miles	%
A - Public Water	11685	30828	2021	17	7384	24	932	8	2315	7	5961	51	9782	32	2769	24	11348	37
B1 - Warm Water Fishery	10587	25760	1992	10	3621	14	1175	11	3246	13	5678	54	9168	35	2642	25	9725	38
B2 - Troutwater	1102	5121	390	35	2102	41	200	18	1040	20	275	25	594	14	237	22	1384	27
C - Contact Recreation	11689	30881	2329	20	8265	27	1018	9	2627	9	6409	55	10562	34	1933	16	9336	30
D - Agriculture and Wildlife	11687	30879	4199	36	16885	55	369	3	1257	4	6586	56	10950	35	533	5	1807	6
E -Industrial	11687	30879	4199	36	16865	55	369	3	1257	4	6586	56	10950	35	533	5	1807	6
Total	11689	30881																

Table 8 - Summary of the Causes for Impaired Lakes and Streams

TYPE	CAUSE	SIZE (acres)
Lake	Methylmercury	9826
Lake	Chlorophyll-a	2402
Lake	PCBs	630
Lake	Phosphorus	400
Lake	Sedimention/Siltation	189
Lake	Trophic State Index	96
Lake	Iron	54
Lake	DO	4
TYPE	**CAUSE**	**SIZE (miles)**
Stream	Fecal/Bacteria	8069
Stream	Iron	7583
Stream	Bio-Impairment	6096
Stream	pH	1376
Stream	Aluminum	1102
Stream	PCBs	478
Stream	Selenium	438
Stream	Dioxin	352
Stream	Manganese	151
Stream	CNA-Algae	117
Stream	DO	65
Stream	Chloride	57
Stream	Low Flow Alterations	44
Stream	Beryllium	17
Stream	Nitrite	14
Stream	Ammonia	5
Stream	Temperature, water	2.3
Stream	Lead	1.5

Table 9 - Number of Miles for the Leading Causes of West Virginia Impaired Streams



Lakes

With the exception of listings based on fish tissue methylmercury results, past Integrated Reports have carried forward lake assessments from the previous listing cycles due to a lack of new data or full EPA approval of numeric nutrient criteria. For the 2014 listing cycle, with full EPA approval of the nutrient criteria for lakes and a data set of sufficient size and temporal spacing to meet criteria assessment requirements, the DEP has updated lake assessments. In addition to six lakes previously listed for methylymercury or PCBs, seven lakes (eight lake segments) have been added to the 303(d) List for total phosphorus and/or chlorophyll a criteria violations. One additional lake was added based on fish tissue methylmercury impairment.

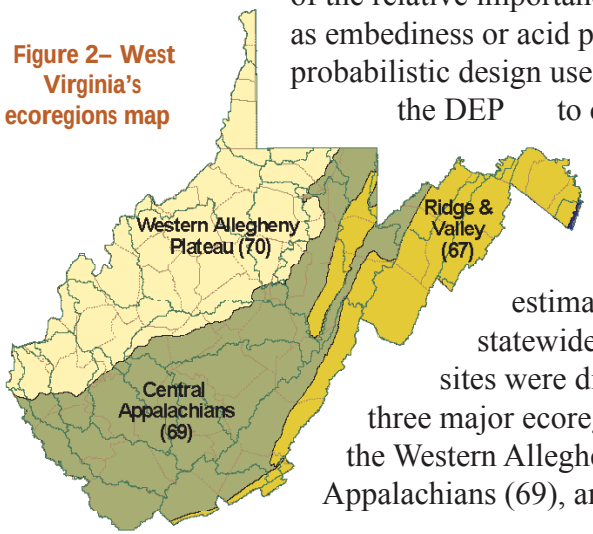
Protocols for IR categorization of lakes into Categories 1, 2 or 3 were revised in the 2014 cycle. In previous cycles, use support for lakes was based upon numeric water quality data, consistent with guidelines previously described for streams. Previous reports generally placed lakes in Category 1 if data indicating attainment was available for mandatory parameters and other parameters. In contrast to stream categorization where aquatic life use support is conditioned upon available biological monitoring that indicates integrity, the DEP lacks an ability to evaluate biological integrity in lakes. With limited tools, the DEP cannot conclude full support of the aquatic life use in lakes. As such, many of the lakes that were previously in Category 1 have been reclassified in Category 2 or 3. Such reclassification does not indicate a lowering of use support, but instead demonstrates the existing inability to effectively assess aquatic life use support in lakes.

The summary tables reflect "number of lake segments" rather than number of lakes. In lakes with multiple assessment locations and clear distinction of water quality, the lake is segmented for assessment purposes.

Probabilistic Data Summary

The goal of the DEP's probabilistic monitoring program is to provide statistically unbiased estimates of stream condition throughout a particular region (i.e., watershed, ecoregion or state) without assessing every stream mile in that region. This approach can be used to describe various aspects of stream condition including, the proportion of stream miles with biological impairment, the proportion of stream miles with specific water quality criterion violations, and the characterization of the relative importance of stressors such as embediness or acid precipitation. The probabilistic design used for this summary allows the DEP to characterize overall water quality conditions at an ecoregional (Omernik Level III) scale in addition to providing estimates of conditions statewide. Probabilistic assessment sites were distributed within the three major ecoregions in West Virginia: the Western Allegheny Plateau (70), Central Appalachians (69), and Ridge and Valley

Figure 2– West Virginia's ecoregions map



(67). Due to its small extent in West Virginia, the Blue Ridge Mountain Ecoregion (66) was combined with Ecoregion 67 for assessments and data analysis.

The probabilistically selected sites are assessed using three broad categories of aquatic integrity indicators: biological community quality; water quality; and habitat quality. From these, several individual indicators were chosen to help illustrate the condition of West Virginia's rivers and streams during the periods of interest in this report. They are presented for statewide and the three "ecoregions" in the figure 2.

Biological

- West Virginia Stream Condition Index (WVSCI)

Water Quality Indicators

- pH less than 6.0 standard units
- Sulfate greater than 50 mg/L
- fecal coliform bacteria greater than 400 colonies/100mL

Habitat Quality Indicators

- relative presence of sediment deposition
- condition of riparian vegetation zones
- a range of human-refuse intensity values

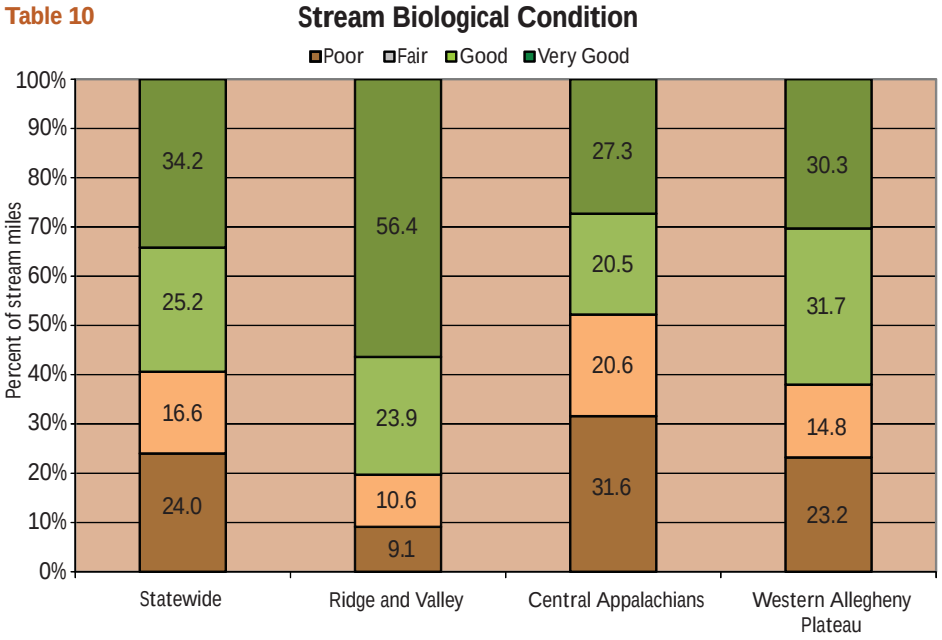
With the exception of the Designated Use Support Section, the data used to create the charts presented in this report are from the last five years of available probabilistic data (2009-2013) and are described in terms of ecoregions. It should be noted that these estimates of condition are descriptive of smaller wadeable streams where our probabilistic monitoring efforts are focused.

Biological Community

The biological communities living in West Virginia streams are exposed to many stressors, including toxic contaminants, sedimentation, nutrient enrichment, and acid precipitation. The DEP uses benthic macroinvertebrates to assess the biological condition of streams in the state. These organisms provide reliable information on water and habitat quality in streams and have been used as indicators all over the world for nearly 100 years. They are extremely diverse and exhibit a wide range of tolerances to pollutants. Further, they serve as an excellent tool for measuring overall ecological health, especially when summarized into a single index of biological integrity.

In West Virginia prior to 2012, the health of benthic macroinvertebrate communities had been rated using a statewide family-level multi-metric index developed for use in wadeable riffle/run streams, the West Virginia Stream Condition Index (WVSCI). Beginning in 1998, the DEP started identifying benthic macroinvertebrates to genus level with the intention of eventually developing a new biotic index. Development of a genus level index is now complete. The new tool, known as GLIMPSS (Genus Level Index of Most Probable Stream Status), which is stratified by season and ecoregion, has now been peer reviewed and published and is ready for use in this summary report. However, the new index is not yet ready for use in determining attainment of a stream's Aquatic Life Use (AQL) for regulatory purposes. During West Virginia's 2012 legislative session, Senate Bill 562 was passed requiring the DEP to develop a new assessment methodology that will be subject to legislative approval. The process to develop and evaluate options for assessing stream health more "holistically" is ongoing, and specifically considers the use of fish community information, along with benthic macroinvertebrate index

Table 10



scores, as part of the assessment methodology. GLIMPSS, similar to WVSCI and other indices of biotic integrity, summarizes scores of various metrics into a single index value. The metrics were selected to maximize discrimination between streams with known stressors and reference streams. Reference streams have little or no human disturbances. All identified reference streams were combined and a subsequent reference condition was established based on their benthic macroinvertebrate communities.

Based on the probabilistic data utilized in this summary and a comparison to low-end reference condition (5th percentile of all appropriate season and ecoregion reference sample GLIMPSS scores), 59.4 percent of wadeable stream miles are comparable to reference condition statewide with the remaining 40.6 percent scoring less than this threshold. Breaking this down by ecoregion, the Ridge and Valley ecoregion has the highest percentage of streams with healthy aquatic ecosystems, with 80.3 percent scoring above the 5th percentile threshold. The Western Allegheny Plateau ecoregion is estimated to have 62 percent of stream miles comparable to reference, which is a greater percentage than estimated in the past (42.5) when based on WVSCI. The percent of stream miles in the Central Appalachians scoring above the GLIMPSS threshold is estimated to be 47.8 percent which is lower than previous estimates (65.3) based on WVSCI.

Water Quality Indicators of Aquatic Integrity

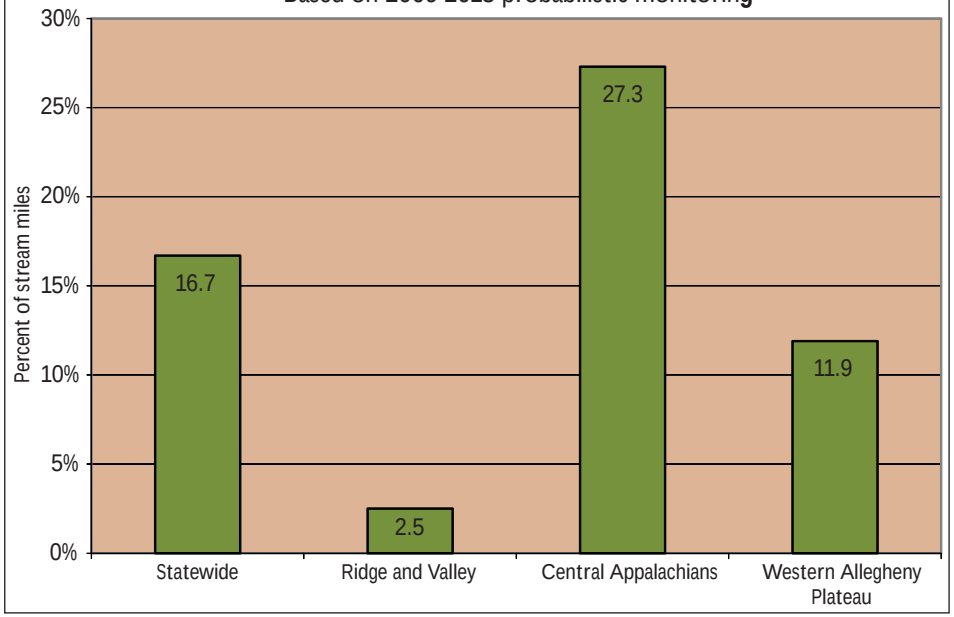
The Watershed Assessment Branch analyzes over 20 different water quality parameters at each of the sites sampled as part of the probabilistic monitoring program. Below are the results of three of these parameters.

Sulfate

Streams receiving mine drainage may be impaired by low pH and/or elevated concentrations of metals, including iron, aluminum, and manganese. Other dissolved ions such as sulfate may also be present in concentrations above background levels. A sulfate concentration greater than 50 mg/L was used to identify probabilistic sites influenced by mine drainage. Following this guideline, approximately 16.7 % of the stream miles statewide are influenced by mine drainage (Table 11). Observed

Table 11 **Percent of stream miles influenced by mine drainage - as indicated by elevated sulfate (>50 mg/L)**

Based on 2009-2013 probabilistic monitoring

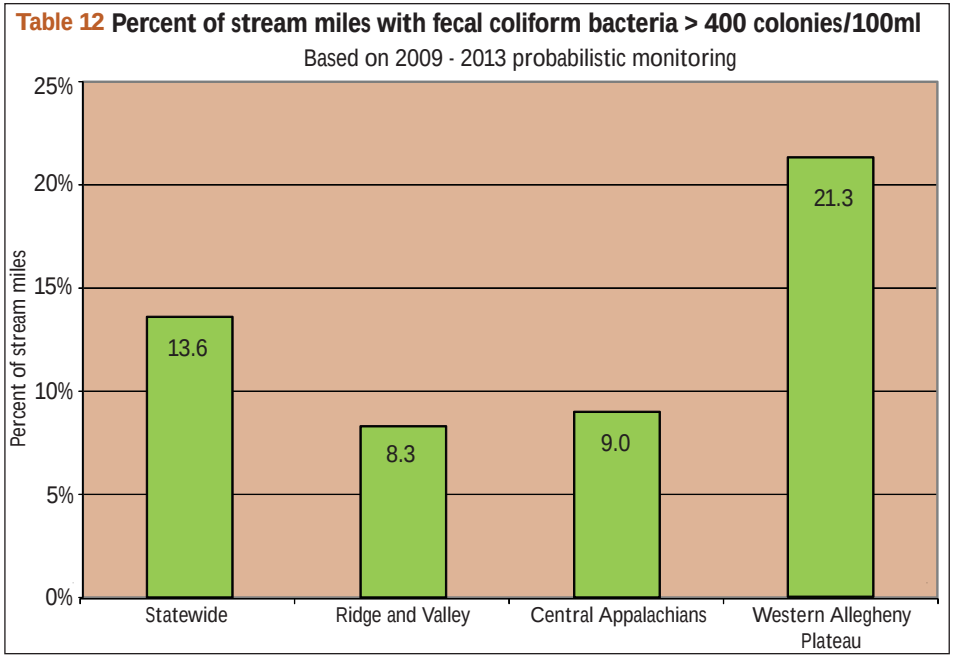


on an ecoregional basis, mine drainage influences a greater proportion of stream miles in the coal rich Central Appalachians (Ecoregion 69) than in the Ridge and Valley (Ecoregion 67) or Western Allegheny Plateau (Ecoregion 70). About 27.3 % of the stream miles in the Central Appalachians are influenced by mine drainage. Contrastingly, about 2.5% and 11.9 of stream miles are influenced by mine drainage in the Ridge and Valley and Western Allegheny Plateau, respectively.

Bacterial Contamination

Many West Virginia streams contain elevated levels of fecal coliform bacteria. Contributors to the problem include leaking or overflowing sewage collection systems, illegal homeowner sewage discharges by straight pipes or failing septic systems, and runoff from urban or residential areas and agricultural lands. Based on probabilistic data, 13.6% of stream miles in the state have fecal coliform bacteria levels that exceed the criterion of 400 colonies/100mL (Table 12). In general, watersheds in the more developed regions of the state had a greater proportion of stream miles exceeding the criterion. Among ecoregions,

Table 12 **Percent of stream miles with fecal coliform bacteria > 400 colonies/100ml**

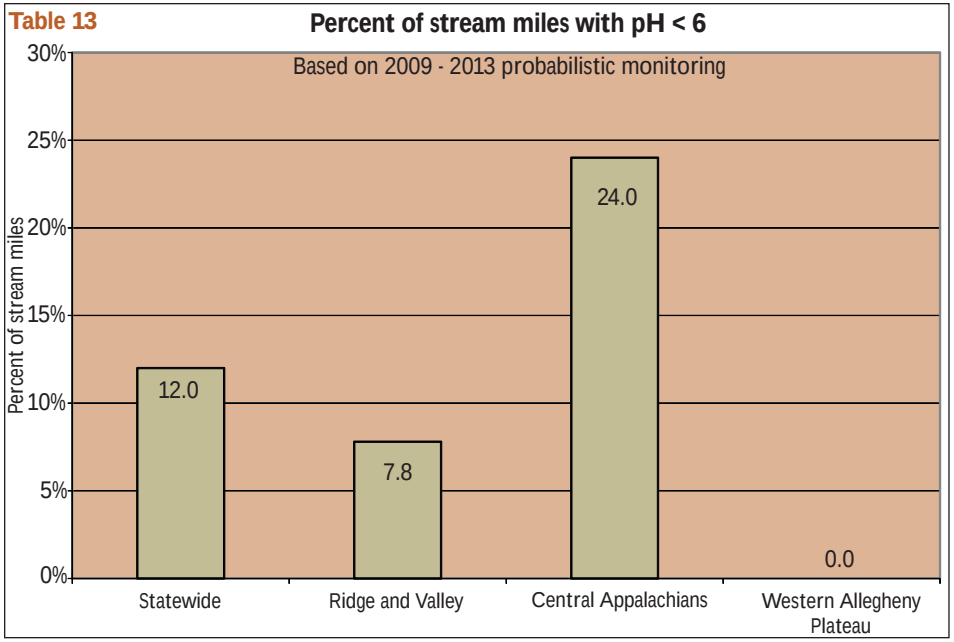


the proportion of stream miles violating the criterion was highest in the Western Allegheny Plateau with 21.3 % of stream miles exceeding the criterion. The proportions of stream miles exceeding the criterion were somewhat lower in the Central Appalachians at 9.0% and Ridge and Valley Ecoregions at 8.3%. It should be noted that DEP's probabilistic monitoring is performed at baseflow conditions. Because samples are not collected during storm runoff events, bacteria levels that may increase under these higher flow conditions are not represented in the results.

Acidity

Aquatic life communities in the headwater sections of many West Virginia streams continue to be impacted by low pH, and thus, acidic water quality. The impairment is most prevalent in watersheds with soils of low buffering capacity and most often caused by acid precipitation and less often (but potentially more severely) by acid mine drainage. An evaluation of probabilistic data indicates that approximately 12.0% of the stream miles in the state have pH values below 6.0 (Table 13). Most of the stream miles identified as impacted by acidic waters are in the Central Appalachians Ecoregion, representing 24.0% of the stream miles within this area. Specifically, the Forested Hills and Mountains section

Table 13 **Percent of stream miles with pH < 6**



of this ecoregion are largely susceptible to acid precipitation impacts due to infertile soils and resistant sandstones of the Pottsville group. The Ridge and Valley Ecoregion is less susceptible to the impacts of acid deposition with geologic materials such as limestone and shale providing more buffering capacity to neutralize acid precipitation. Nonetheless, probabilistic data indicates that approximately 7.8% of the stream miles in this ecoregion are impacted by acidic conditions. Although present, the extent of stream miles impacted by acidic waters within the Western Allegheny Plateau Ecoregion is near 0.0%. In fact, their proportion to the overall size of the total population of stream miles is insignificant enough to result in no acidic stream miles based on this cycle's probabilistic analysis. Again, this ecoregion has well buffered soils that limit the impacts of acid precipitation. Furthermore, where they do exist in this ecoregion, acidic waters are more likely the result of acid mine drainage than acid precipitation.

Habitat Quality

It is nearly impossible to accurately interpret the biological health of streams without measuring various aspects of habitat quality. During the course of probabilistic sampling, DEP personnel collected data on many

features of both riparian and instream habitat known to be important to the biological communities of streams. Habitat parameters from EPA's Rapid Bioassessment Protocol (RBP) were measured. These include measures of the amount of sediment and embeddedness in the stream channel as well as measures of the vegetation along the bank and riparian zone in the stream corridor. Specifically, ten parameters are scored (0-20) based on their quality and then combined to assess the overall physical habitat condition of the site. The overall scores (Total RBP Habitat – max score 200 pts.) were categorized as good, fair, or poor (Table 14). Based on probabilistic data, about 18.2% of stream miles statewide have good habitat quality (total RBP score of 160 or greater), 67.5% of stream miles have fair habitat quality (110–159), and 14.3% of stream miles have poor habitat quality (< 110). While these categorical thresholds are somewhat arbitrary, they do provide a good comparison of habitat conditions between two or more geographic areas.

The Ridge and Valley had the highest proportion of stream miles rated in the good category for overall habitat quality at 35.9%. Additionally, this ecoregion had the least number of stream miles rated as poor for overall habitat quality at only 3.3%. The Central Appalachians Ecoregions ranked second in the state for the proportion of stream miles rated as good for overall habitat quality with a value of 24.6.

In comparison to the other ecoregions, habitat quality scores are lower in the Western Allegheny Plateau. The presence of more widespread development and factors such as higher rates of soil erosion in this ecoregion are potential causes for only 2.0 of its stream miles being rated as good in overall habitat quality. Additionally, the proportion of stream miles with poor habitat quality 28.1% is substantially higher in this ecoregion.

It is important to consider that approximately 81.8% of stream miles in the state are in the fair or poor habitat categories. This indicates that most of the state's stream miles have at least some degree of habitat degradation.

Habitat Indicators of Aquatic Integrity

Although the DEP may gain insight into overall habitat conditions by combining the individual measures, it is useful to examine specific habitat characteristics.

Table 14 **Stream Habitat Conditions - Total RBP Habitat Scoring Categories**

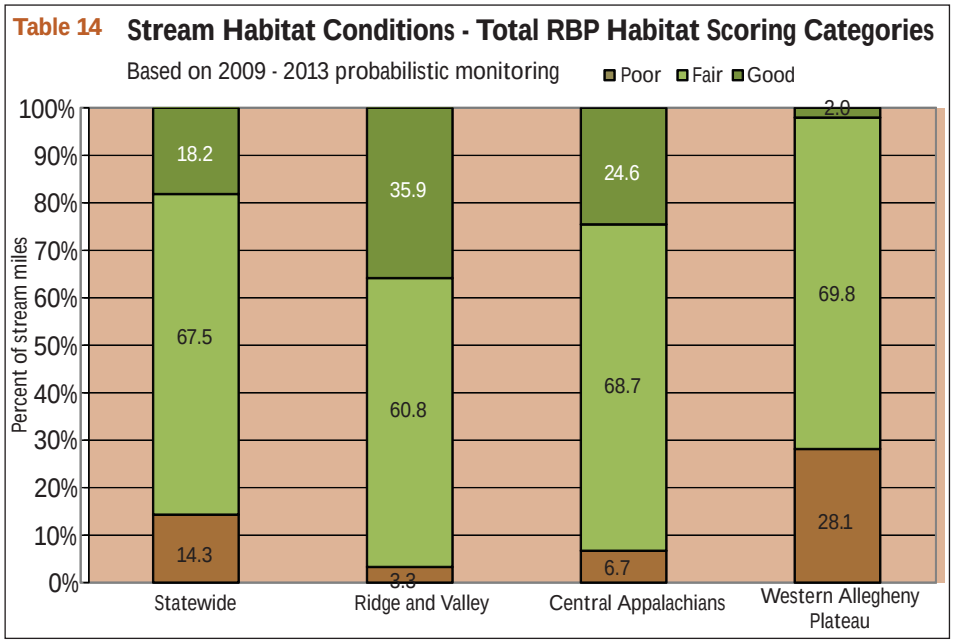
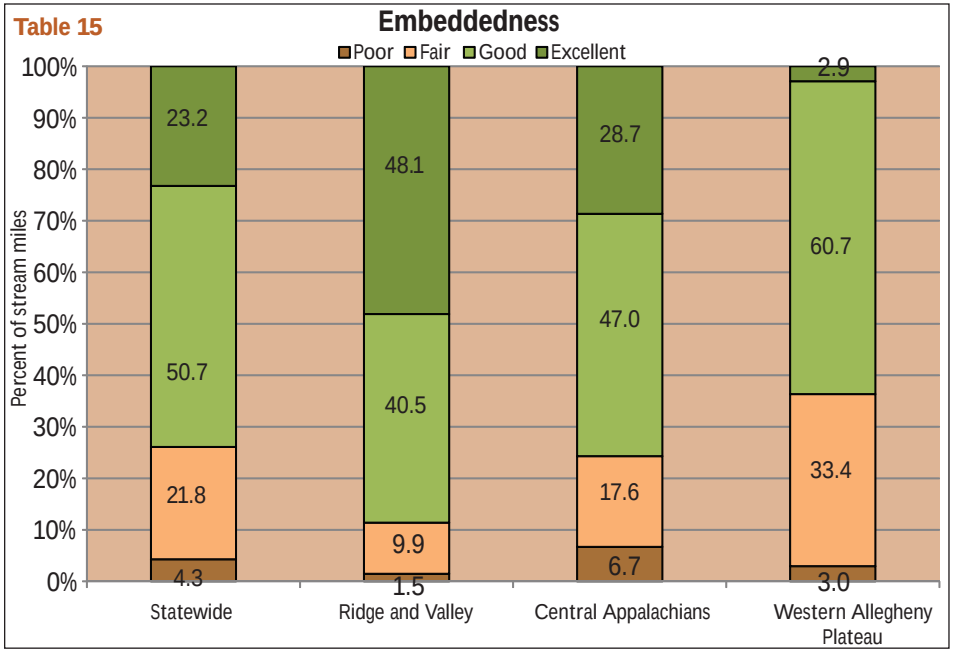


Table 15 **Embeddedness**



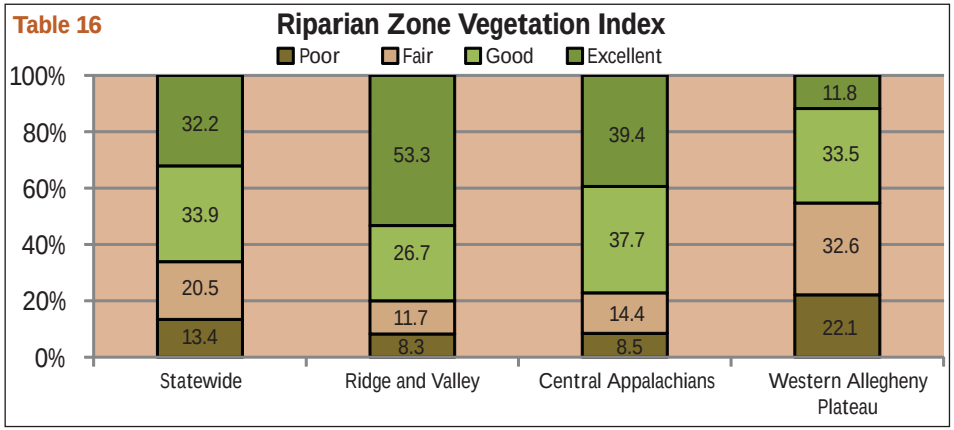
Embeddedness

Embeddedness is one of the most important problems facing West Virginia streams. The chart on page 22 titled "Embeddedness" shows the extent to which rocks (gravel, cobble, and boulders) are covered or sunken into the silt, sand, or mud of the stream bottom. Generally, as rocks become embedded, the surface area available to macroinvertebrates and fish for shelter, spawning, and egg incubation is decreased. The Western Allegheny Plateau (Ecoregion 70) had the highest percentage of streams with poor or fair ratings (36.4 percent) for embeddedness. This is likely because this region has slower, low-gradient streams, has more erodible soils, and more land-disturbing activities than in other areas. The Central Appalachians (Ecoregion 69) and Ridge and Valley (67) streams fared better with 24.3% and 11.4% combined fair and poor ratings, respectively.

Riparian Vegetation Zone

Ecoregion 67, the Ridge and Valley, had the highest percentage of wide undisturbed riparian zones at 53.3%. This indicator rates streamside zones on the amount of undisturbed vegetation present, which is desirable for providing shade, creating a more stable stream bank and minimizing the amount of sediment, excess nutrients and other pollutants entering the stream. In contrast, the Central Appalachians (Ecoregion 69) and Western Allegheny Plateau (Ecoregion 70), have a much smaller percentage of riparian zone vegetation rated as excellent 39.4% and 11.8%, respectively.

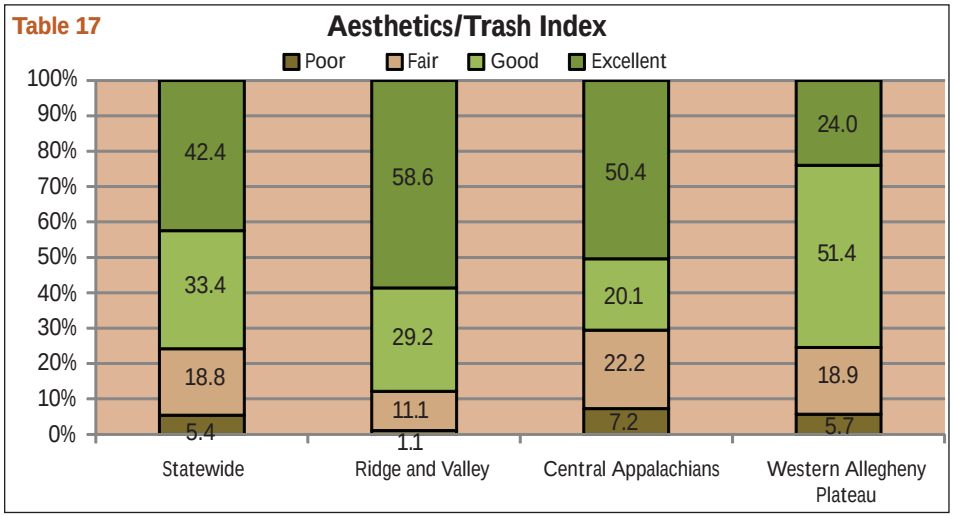
Table 16



Trash/Aesthetic Index

The "Trash/Aesthetic Index" is a measure of the amount of human refuse that is in and around the stream (including that which could be washed into the stream at high flows). Ecoregion 67, the Ridge and Valley Ecoregion, has the highest percentage of "clean" streams, with almost 60 percent of stream miles in the "very good" category. The Central Appalachians (69) and Western Allegheny Plateau (Ecoregion 70) have significantly lower percentages of "clean" streams with 50.4% and 24.0%, respectively.

Table 17



Interstate Water Coordination

PCB monitoring and TMDL development with Virginia

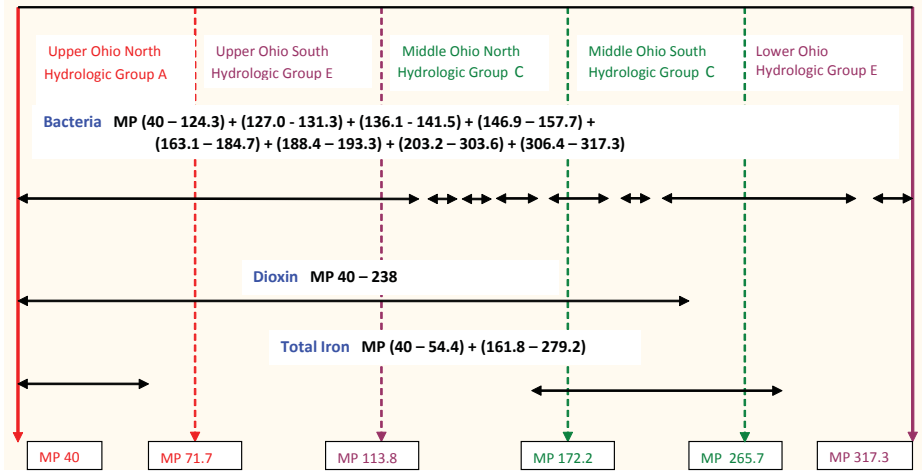
DEP has been working with the Virginia Department of Environmental Quality (VADEQ) to assess Polychlorinated Biphenyls (PCBs) impairment along the Virginia section of the Bluestone River. The product of this cooperative effort will be a TMDL for the Bluestone River and tributaries with loadings and allocated reductions for sources in both Virginia and West Virginia. The West Virginia DEP, Virginia DEQ and EPA Region III have been cooperating in an effort to locate and reduce sources of PCBs to the Bluestone River. As part of this effort, remediation of the now defunct Lyn Electric Site in Bluefield, W.Va. has been completed. Efforts included leveling and removal of the electric motor remanufacturing buildings on the site. Also, contaminated water and debris were removed from the site and clean material used to backfill

the open basement areas of the property. Within the watershed additional monitoring and source evaluation is on-going to determine what steps, if any, need to be taken in the future.

Ohio River Valley Water Sanitation Commission – ORSANCO

As with previous reports, the DEP's 2014 Integrated Report includes assessments based on data provided by ORSANCO. Throughout the development of ORSANCO's 2014 Biennial Assessment, the DEP has been involved with ORSANCO's efforts to standardize assessments among the compact states. The DEP's personnel continue to participate in several standing committees, along with representatives from other compact states, charged with helping direct ORSANCO's water quality and biological monitoring efforts.

Figure 3 - Impairments of the West Virginia Section of the Ohio River



Chesapeake Bay

The Chesapeake Bay is impaired by nutrients and sediment from multiple sources originating locally and in upstream states. This biologically diverse waterbody is an important economic and recreational resource.

The need to restore this waterbody is a high priority for many agencies, organizations and the public in general. Approximately ten percent of West Virginia's stream miles drain into the Potomac River and on into the Bay. In addition, portions of the James River Watershed in West Virginia contribute flow to the Bay.

In June 2002, Governor Bob Wise signed the Chesapeake Bay Program Water Quality Initiative Memorandum of Understanding, committing West Virginia to nutrient and sediment load reductions. In November 2005, West Virginia proposed pollutant reduction plans in the West Virginia Potomac Tributary Strategy. In December 2010, EPA finalized TMDLs for the Chesapeake Bay and other impaired tidal waters in Virginia and Maryland. In response to the TMDLs, West Virginia and the other Bay jurisdictions developed Watershed Implementation Plans (WIPs). The West Virginia WIP identifies actions and controls that the State will pursue to implement the TMDLs, and West Virginia will accomplish its TMDL responsibilities if the WIP is successfully executed. Many DEP programs are actively participating in this effort. The West Virginia WIP and supporting documents may be viewed at: http://www.wvca.us/bay/documents.cfm

Interstate Commission on Potomac River Basin

The Commission is a non-regulatory agency of basin states (Maryland, Pennsylvania, Virginia and West Virginia), Washington, D.C. and the federal government. The Commission promotes watershed-wide solutions to the pollution and water resources challenges facing the basin and its more than 6.11 million residents. Examples of current commission efforts include the Chesapeake Bay Program involvement, stream biological assessments, support of selected stream gages, the Potomac Groundwater Assessment, Potomac Basin Drinking Water Source Protection Partnership coordination and Potomac Watershed Toxic Spill Model support. In addition, the Commission's public outreach program supports and helps coordinate an annual watershed-wide clean-up effort and produces and distributes the newsletter Potomac Basin Reporter to 20,000 subscribers. The commissioners are appointed by their respective jurisdictions and provide policy guidance and oversight for a skilled staff of scientists and educators.

Ohio River Basin Water Resources Association

The Ohio River Basin Water Resources Association was dissolved in 2010. A former Association member now resides on ORSANCO's Water Resources Committee in a continuing effort to represent the issues of concern to the Association.

Total Maximum Daily Load (TMDL) Development Process

From 1997 until 2003, EPA Region III developed West Virginia TMDLs under the settlement of a 1995 lawsuit, Ohio Valley Environmental Coalition, Inc., West Virginia Highlands Conservancy, et. al. v. Browner, et. al. The lawsuit resulted in a consent decree between the plaintiffs and the EPA that specifies TMDL development requirements and compliance dates. While the EPA was working on developing TMDLs, the DEP concentrated on building its own TMDL program. With the help of the TMDL stakeholder committee, the agency secured funding from the state legislature and created the TMDL section within the Division of Water and Waste Management.

The TMDL section is committed to implementing a TMDL process that reflects the requirements of TMDL regulations, provides for the achievement of water quality standards, and ensures that ample stakeholder participation is achieved in the development and implementation of TMDLs. The DWWM's approach to TMDL development allows 48 months to develop a TMDL from start to finish. This approach enables the agency to carry out an extensive data generation and gathering effort to produce scientifically defensible TMDLs, and allows ample time for modeling, report drafting and frequent public participation opportunities.

The DEP's TMDLs are developed according to the Watershed Management Framework cycle. The framework divides the state into 32 major watersheds and operates on a five year, five-step process. The watersheds are divided into five hydrologic groups (A - E). Each group of watersheds is assessed once every five years. A map depicting the 32 watersheds and hydrologic groupings is provided as an attachment to this document before the List Key. The TMDL process begins in the first year of the cycle with pre-TMDL sampling and public meetings in the affected watersheds. The data is compiled and TMDL development begins in year two of the cycle. In the third year, TMDL development continues and the TMDL is drafted. The TMDL is finalized in the fourth year. In the fifth year of the cycle, TMDL implementation is initiated through the NPDES permitting process and efforts toward limiting nonpoint source loading. Throughout the TMDL development process, there are numerous opportunities for public participation and input.

Since its inception, the DEP's TMDL section pursued timely development of TMDLs for the waters and impairments identified in the consent decree between the EPA and the Ohio Valley Environmental Coalition, et. al. The TMDLs developed and approved in the Dunkard Creek, Upper Ohio River South, Youghiogheny, and the Camp Creek portion of the Twelvepole Creek watersheds in 2009 fulfilled the last of EPA's commitments under the consent decree.

The 303(d) list identifies and prioritizes the waters and impairments for which future TMDLs will be developed by specifying the year in the "Projected TMDL Year" column. The impaired waters intended for TMDL development in 2015, 2016 and 2017 are known and identified. For other waters and impairments, where the timing of TMDL development is less certain, the "Projected TMDL Year" is identified as the latest year where an opportunity exists per the DEP's plans to develop TMDLs in concert with the Watershed Management Framework.

At any point in time, the DEP personnel are working on TMDLs in

Table 18 - West Virginia TMDL Development Progress

Hydrologic Group	Watersheds	Progress
A3	South Branch of Potomac Upper Kanawha Upper Ohio North	Final Drafts submitted to U.S. EPA for approval-January 2015
B3	Tygart Valley	Development on-going
C3	Gauley (Meadow River) Potomac Direct Drains - (Rockymarsh Run and Warm Springs Run)	Sampling completed. TMDL development on-going
D3	Monongahela (Monongahela main-stem) Little Kanawha (Hughes River)	Pre-TMDL sampling on-going until June 2015.
E3	Upper Guyandotte	Intiial public meetings scheduled

each of the five hydrologic groups (A-E). Each set of TMDLs moves through several stages of development prior to finalization and the EPA's approval. Table 18 shows the state's TMDL development progress.

The DEP's Web site contains all approved TMDL documents and the draft TMDL documents currently out for public comment. These documents can be found at http://www.dep.wv.gov/WWE/watershed/TMDL/Pages/default.aspx.

Water Pollution Control Programs

Division of Water and Waste Management

The Division of Water and Waste Management's mission is to preserve, protect, and enhance West Virginia's watersheds for the benefit and safety of all its citizens through implementation of programs controlling hazardous waste, solid waste and surface and groundwater pollution, from any source.

The DWWM strives to meet its mission through implementation of programs controlling surface and groundwater pollution caused by industrial and municipal discharges as well as oversight of construction, operation and closure of hazardous and solid waste and underground storage tank sites. In addition, the division works to protect, restore and enhance the state's watersheds through comprehensive watershed assessments, groundwater monitoring, wetlands preservation, inspection and enforcement of hazardous and solid waste disposal and proper operation of underground storage tanks.

Environmental Enforcement (EE) is a branch of the Division of Water and Waste Management charged with assuring compliance with many of the state pollution control regulations. EE promotes compliance with the Solid Waste Management Act, Water Pollution Control Act, Groundwater Protection Act, Hazardous Waste Management Act, Underground Storage Tank Act, and Dam Safety Act by providing assistance, inspecting regulated sites, and enforcing conditions required by these acts.

National Pollution Discharge Elimination System (NPDES) Program

The DWWM's primary mechanism for controlling point sources is the West Virginia NPDES permitting program. This program, administered by the Permitting Branch, regulates activities and facilities involved in the installation, construction, modification, and operation and maintenance of wastewater treatment systems as well as their discharges. Individual and general permits are used to implement the program. Most permits include effluent limits and requirements for facility operation and maintenance, discharge monitoring and reporting. Other permits require the installation and implementation of best management practices in lieu of effluent limitations and discharge monitoring requirements. The Permitting Branch also administers a pretreatment program in conjunction with the NPDES program, which outlines procedures for regulating proposed industrial wastewater connections to publicly owned treatment works. The program imposes discharge limitations for

West Virginia Department of Environmental Protection - Division of Water and Waste Management - Report Date 11/19/2014

NPDES PERMITTING	- PERMIT ACTION REPORT (7/1/2011 - 6/30/2013)											
dep st virginia department of environmental protection	Applications Recieved This Period	Applications Denied this Period	Permits Registrations and Modifications Issued This Period	Permits Registrations and Modifications Issued Year-to-Date for Current Fiscal 2015	Withdrawn and Voided This Period	Applications Pending as of 6/30/2013					Average DEP Time To Issue Permits This Period (In Days)	Average Total Time to Issue Permits This Period (In Days)
						Greater Than 180 DEP days	Less Than 180 > 90 DEP days	Less Than Equal to 90 DEP days	Total (DEP days)	Greater Than 180 total days		
INDIVIDUAL PERMITS	247	0	184	22	24	30	14	48	92	42	164	177
GENERAL PERMITS												
Home Aeration Units	517	2	558	171	8	9	6	127	142	119	39	65
Sewage General	104	0	501	2	16	1	1	15	17	16	177	223
Storm Water Construction	1101	0	996	164	42	0	2	127	129	5	36	40
All Others	610	2	618	206	39	0	1	35	36	19	121	151
MODIFICATION PERMITS	518	1	527	93	51	26	17	51	94	39	84	94
TRANSFER PERMITS	455	0	425	25	2	16	9	43	68	50	102	107
TOTAL - PERMITS	3552	5	3809	683	182	82	50	446	578	290		

NOTE: The permits used to calculate for the "Average DEP Time" column are those that were submitted after June 30, 1999, when ERIS was deployed for the Division of Water and Waste Management

indirect discharges and requires the installation of pretreatment facilities where necessary to prevent interference with POTW operations and sludge disposal practices and to ensure that the pollutants contributed by industrial users do not pass through the POTW and violate water quality standards. The National Combined Sewer Overflow (CSO) Policy is implemented as a component of the NPDES Permits for POTWs with CSOs. The DEP has issued two Concentrated Animal Feeding Operation (CAFO) permits with a third application currently under evaluation. Activities administered by the Permitting Branch include the regulation of industrial solid waste landfills and the land application of sewage sludge, and developing wasteload allocations for new or expanding sewage treatment facilities. The previous table is a list of permit actions for the time period beginning in July 2011 and ending in June 2013.

In addition to permitting, compliance assessment and enforcement activities are coordinated between the Permitting Branch and Environmental Enforcement. Noncompliance is initially addressed by administrative actions to compel compliance. These may include warning letters, notices to comply, enforcement orders, or referrals for civil action.

Nonpoint Source Control Program

The Nonpoint Source Control Program focuses on restoration and protection of streams from nonpoint source pollution. The program assesses nonpoint source impacts, then develops and implements watershed based plans and projects designed to reduce pollutant loads from agricultural, silviculture, resource extraction, urban runoff, construction activities, and failing septic systems. Program initiatives are based upon education, technical assistance, financial incentives, demonstration projects, and enforcement, as necessary. The division's Nonpoint Source Program supports overall administration and coordination of the nonpoint source activities through these participating state agencies: the West Virginia Conservation Agency, the Office of Oil and Gas, and the Division of Health and Human Resources. Each year, specific activities are funded under the Nonpoint Source Program. Many of the streams being listed on the state's list of impaired waters are affected by nonpoint sources. The majority of the Total Maximum Daily Loads being developed involve nonpoint source water quality impacts. To more effectively respond to TMDL implementation needs, the Nonpoint Source Management Plan was updated in 2000 to incorporate watershed management principles, including integration of TMDL and Watershed Management Framework scheduling. In addition to several plans currently under development, the Nonpoint Source Program has 27 watershed based plans in various stages of implementation that address a variety of nonpoint sources of pollution. These plans are developed in cooperation with the stakeholders, including federal, state and local government agencies, within the watershed. As a result of these plans, numerous nonpoint source remediation projects for acid mine drainage, agriculture, streambank erosion, and dirt roads have been undertaken. The goal of the watershed based plans is to restore the impaired streams to meet water quality standards. The successes to date emphasize the need to focus more resources on voluntary installation of best management practices in identified priority watersheds where local stakeholders are interested in making a difference.

Groundwater Program

Under the Groundwater Protection Act, West Virginia Code Chapter 22, Article 12, Section 6.a.3, DEP's Groundwater Program is responsible for compiling and editing information for a biennial report to the Legislature on the status of the state's groundwater and groundwater management program. The DEP, the West Virginia Department of Agriculture and the West Virginia Department of Health and Human Resources all have groundwater regulatory responsibility and contribute to the report. These state boards and six standing committees currently share the responsibility of developing and implementing rules, policies and procedures for the Ground Water Protection Act (1991). The Environmental Quality Board, the Groundwater Coordinating Committee, the Groundwater Protection Act Committee, the Groundwater Monitoring Well Drillers Advisory Board, the Well Head Protection Committee, and the Nonpoint Source Coordinating Committee are the standing committees. The report provides a concise, thorough overview of those programs that are charged with the responsibility of protecting and ensuring the continued viability of groundwater resources in West Virginia. The current biennial report to the Legislature covers

the period from July 1, 2011 through June 30, 2013. Copies of the report "Groundwater Programs and Activities: Biennial Report to the West Virginia 2014 Legislature" may be obtained by contacting the Groundwater Program at the Division of Water and Waste Management, 601 57th St., S.E., Charleston, WV 25304 or by calling (304) 926-0495. The report also may be reviewed at http://www.dep.wv.gov/WWE/Programs/gw/Documents/2014/FinalReport14.pdf

The Ambient Groundwater Quality Monitoring Network was established by the DWWM in cooperation with the USGS in 1992 and is an ongoing project. The network provides critical data needed for proper management of West Virginia's groundwater resources. The major objective of this USGS study is to assess the ambient groundwater quality of major systems (geologic units) within West Virginia and to characterize the individual systems. Characterization of the quality of water from the major systems helps to:

- Determine which water quality constituents are problems within the state
- Determine which systems have potential water quality problems
- Assess the severity of water quality problems in respective systems
- Prioritize these concerns

Only by documenting present ambient groundwater quality of the state's major systems can regulatory agencies assess whether water quality degradation has occurred in certain areas and whether potential degradation is a result of natural processes or those associated with human activity. The USGS is currently working with the DEP on a 5-year groundwater assessment framework. In year 1, they collect groundwater data from a network of 27 sentinel wells to obtain current status of groundwater quality and track changes over time. In years 2 through 5, the USGS will conduct a variety of topical studies. The most recent topical study provides a baseline of current surface water and groundwater quality in the Monongahela River Basin related to shale gas development. All associated groundwater quality data for each well sampled and summaries of groundwater quality for each respective watershed are published in the USGS Water Resources Data for West Virginia annual report.

Division of Mining and Reclamation

The mission of the Division of Mining and Reclamation (DMR) is to regulate the mining industry in accordance with federal and state law. Activities include issuing both National Pollutant Discharge Elimination System and Surface Mining Control and Reclamation Act permits for mineral extraction sites and related facilities, inspecting facilities for compliance, monitoring water quality, tracking ownership and control, and issuing and assessing violations. The DMR is responsible for the computer databases that track their regulatory activities - Environmental Resources Information System (ERIS) and Applicant Violator System (AVS, the federal OSM database). The Permitting Unit is responsible for reviewing permit applications for surface and underground coal mines, preparation plants, coal loading facilities, haulage ways, and coal-related dams. This unit also reviews permit applications for non-coal quarry operations (sand, gravel, limestone, etc). Permit review teams staffed with geologists, hydrologists, engineers and others are located in each regional office throughout the state and in the headquarters office. The DMR's Inspection and Enforcement unit is responsible for inspecting all coal mining and quarry operations in the state. It enforces compliance through regular inspections and Notices of Violation, and ensures site reclamation through final release of the operation. This unit is also responsible for civil penalty assessments, show cause proceedings, bond forfeiture and collection. The DMR's Program Development unit is responsible for implementing a proactive approach to policy issues, legislation and training. This unit is designed to keep the Division staff current with technological advances and to provide clear direction through development of cogent policy and guidance to meet legal and regulatory requirements. This unit provides regulatory interpretation and support to field offices, develops and updates handbooks and forms, drafts legislation and initiates regulation changes. Other responsibilities of this unit include Small Operators Assistance Program, public relations, including responses to Freedom of Information Act requests, special projects, employee training and research of laws, regulations and policy.

Cost Benefit Analysis

A true cost/benefit analysis on the economic and social costs and benefits of water pollution control is a difficult and time consuming task. Particularly, the evaluation of industrial facilities would be a monumental task considering the various types of industry (mining, chemical, power generation, etc), each having a very different process of pollution control. However, the information contained in the following paragraphs provides an idea of the amount of money currently expended to construct and upgrade both the municipal facilities within the state as well as programs available to homeowners wanting to correct failing onsite sewage systems.

Funding for Water Quality Improvements

The DEP is responsible for administering a combination of state and federal funds expended for projects to improve water quality in state streams. The following narrative provides an overview of the programs within the DEP's Division of Water and Waste Management that provide funding for water quality improvements and a summary of the funds dispersed between July 2011 and June 2013 to improve water quality.

Clean Water State Revolving Fund Program

The Clean Water State Revolving Fund (CWSRF) program is a funding program administered by the State Revolving Fund Branch to address water quality problems through wastewater facility construction, upgrades, or expansions. The branch is charged with general oversight, fiscal management and technical and administrative compliance review of local governmental entities that receive funds and provides information and guidance on what administrative actions are needed to process a loan through the program. When a community has been recommended by the West Virginia Infrastructure and Jobs Development Council to seek CWSRF program funding for financial assistance, the community is contacted by a financial manager and project engineer. A meeting may be scheduled to advise the community leaders about the overall program requirements and specifically what they should do next to obtain a CWSRF loan. There are federal, state, and program requirements that must be met prior to scheduling a loan closing. The CWSRF currently has three financial assistance programs available. These three programs are described below:

Low Interest Loan Program

A low interest loan program for construction of municipal wastewater treatment works is available for municipalities and public service districts to build, upgrade, or expand treatment facilities and collection systems. Conventional loans with a repayment period of 20 years are available with an interest rate and annual administrative fee not exceeding 3% for certain communities. Loans with repayment periods from 21 to 40 years are available for disadvantaged communities where financial affordability is an issue. The interest rate and annual administration fee on these loans do not exceed 1/2%. From July 2011 through June 2013, 30 wastewater treatment facility loans totaling $131,052,333 were funded.

Agriculture Water Quality Loan Program

The Agriculture Water Quality Loan Program is a partnership with the West Virginia Conservation Agency developed to address pollution from nonpoint sources using Best Management Practices approved by the U.S. Environmental Protection Agency. CWSRF money is loaned to participating banks so they can offer below market rate low interest loans to qualifying applicants. For more information, contact your local Conservation District office, http://www.wvca.us/directory/cdo.cfm. From July 2011 through June 2013, 19 nonpoint source agriculture BMP loans totaling $865,576 were funded.

Onsite Systems Loan Program

In cooperation with the West Virginia Housing Development Fund and Safe Housing and Economic Development office (Welch, WV) a low interest loan program has been established to address onsite sewage disposal problems. Called the "Onsite Systems Loan Program," loans up to $10,000 are available to replace malfunctioning septic systems and to install new onsite sewage systems for homes that have direct sewage discharges to ditches and streams. Centralized treatment for these homes will not be available in the next five years. For the current reporting period of June 2011 through June 2013, a total of $350,000 pass through was provided to the two agencies.

In conclusion, although funding for maintenance and improvement of water quality is often a controversial issue, the DEP recognizes that millions of dollars are expended annually by businesses, municipalities, private and public entities (including state and federal agencies) to improve and maintain water quality in West Virginia. These expenditures address pollutants from various media including solid and hazardous waste, air and water.

Public Participation and Responsiveness Summary

The draft Section 303(d) List was advertised for public comment on June 12, 2014. Legal notices of the availability of the draft document and request for public comments were placed in newspapers statewide. The draft document was promoted via news release, e-mail and the Internet. The public comment period extended from June 12, 2014 to July 11, 2014. At the conclusion of the public comment period, the DEP considered all comments and made adjustments to the list as appropriate. Public comments were received from the Greenbrier River Watershed Association, John M. Wood and Petra B. Wood, and Appalachian Mountain Advocates (on behalf of Ohio Valley Environmental Coalition, West Virginia Rivers Coalition, West Virginia Highlands Conservancy and Sierra Club). Comments have been compiled and responded to in this summary. The DEP appreciates the efforts commenters have put forth to improve West Virginia's listing process. Comments and comment summaries are bold and italicized. Agency responses appear in plain text.

One commenter expressed support for the TMDL alternative approach that is being implemented to address the algae impairment of the Greenbrier River as described in the Greenbrier River Restoration Plan. The commenter requested continued algae assessment in the less problematic segments of the River upstream of the impaired segment and suggested that a similar point source monitoring and phosphorus reduction scheme be implemented for contributing wastewater treatment plants if additional segments are determined to be impaired. The supportive comment is noted and appreciated. The DEP will continue annual assessments of algae growth in the segment upstream of the mouth of Howards Creek. Monitoring plans are described in Table 2 of the Greenbrier River Restoration Plan. The existing WV/NPDES permits for larger contributing point sources also contain effluent nutrient monitoring requirements. If new impairments are determined, then all available information will be evaluated to determine the most prudent course of action. If point source phosphorus control is found to be the most significant necessary action, then an approach similar to that being implemented in the Plan will be pursued.

One commenter stated that the WVDEP must use genus level benthic macroinvertebrate data to assess compliance with narrative water quality criteria, citing 2010 and 2012 EPA 303(d) list review and approval documents in which the EPA articulated expectations that a genus level assessment would be performed in the subsequent listing cycles. The commenter also stated that the WVDEP has a duty under federal law to assemble and evaluate all existing and readily available data regardless of any conflicting or confounding state law and that existing data and the GLIMPSS index allow incorporation of a genus-level macroinvertebrate assessment into the 2014 Section 303(d) list. The DEP interprets SB 562 as a mandate to secure prior Legislative approval of a new assessment methodology under which the DEP will make impairment decisions pursuant to the narrative criterion at 47 CSR 2-3.2.i. The DEP was not able to accommodate the EPA's expectations for a genus level benthic macroinvertebrate assessment in the 2014 Section 303(d) list because the GLIMPSS index has not been considered by the West Virginia Legislature and the use of a new index with impairment thresholds independently developed by the DEP would be inconsistent with the Legislative mandate.

The DEP regrets the delays that it has experienced but intends to present a methodology to the 2016 Legislature. The proposed methodology will include a benthic macroinvertebrate component based upon the best available science that when combined with the fish component will best identify biological integrity impairments.

One commenter stated that the WVDEP's duty to assemble and evaluate readily available data extends to the selenium and benthic macroinvertebrate stream data required to be collected and reported in WV/NPDES permits. Compilations of instream selenium and biological data were provided with a recommendation that they be considered. The commenter incorrectly stated that the selenium data was not considered in the preparation of the draft 303(d) list, citing the lack of a selenium listing for Little Elk Creek (WVKC-39).

In the preparation of the draft Section 303(d) list, the DEP evaluated stream selenium data reported under WV/NPDES mining permits for the period July 1, 2008 thru June 30, 2013. After receipt of the comment, available selenium information for Little Elk Creek was reevaluated. No monitored location in Little Elk Creek exhibited selenium exceedances that indicate impairment under 303(d) listing protocols. Also in response to the comment, the DEP reassembled and reevaluated the entire dataset of self-reported selenium data from permittees. The reevaluation resulted in two additional selenium impairment listings.

The DEP did not evaluate biological data reported under WV/NPDES mining permits when it prepared the draft list. The additional biological data was assembled and evaluated in response to the comment. Consideration of this data resulted in 84 additional biological impairment listings, nine impaired length adjustments and one delisting.

One commenter stated the DEP failed to explain its delisting methodology and that one marginally passing biological score is insufficient evidence to delist biologically impaired streams.

The DEP will continue to base biological listing and delisting decisions on the most recent biological score. In the 2014 Draft 303(d) list, prior biological impairments were delisted if new, comparable data demonstrates a WVSCI score greater than 68. It should be noted that delisting based on one sample is commensurate with the amount of data initially used to list the majority of biologically impaired segments.

One commenter noted that the WVSCI was designed to be updated as new data from reference sites are obtained and that an impairment threshold greater than 68 is indicated by new data.

The comment is generally accurate, but because of the Senate Bill 562 mandate to present new methodologies for interpretation of 47 CSR 2-3.2.i. to the Legislature, the DEP did not pursue WVSCI recalculation.

One commenter stated that the WVDEP has a duty under federal law to prioritize TMDL development for listed waters and has failed to perform this duty for biologically impaired streams for which a specific projected TMDL year is not provided. The commenter also stated that the WVDEP's intention to address such impairments "as soon as practicable after accomplishing SB 562 requirements" is not sufficient to fulfill its priority ranking duty and that the responsibilities to prioritize and develop TMDLs are not altered by SB 562 .

The DEP reconsidered the "TBD" placeholder used in the draft list. The final draft list now includes specific TMDL years for all impairments. To accomplish this, the DEP considered available resources and balanced the TMDL development needs associated with the legacy biological impairments against those for other impairments. Water quality monitoring and source data needs were also considered. The new prioritization schedules TMDL development for the previous "TBD" biological impairments at the next practical opportunity afforded by the Watershed Management Framework. The DEP will consider special future projects that are not synchronized with the Framework to accelerate TMDL development for long duration listings if resources and data allow.

One commenter requested clarification of the surrogate label used in Tables B and B-1 related to biological impairments resolved by implementation of approved pollutant-specific TMDLs and why this label was used in the Monongahela and West Fork River watersheds and not elsewhere.

Biological TMDL development has been temporarily suspended in response to Senate Bill 562. Therefore, biological TMDLs were not developed in the Monongahela River and West Fork River watershed TMDL projects. In contrast, prior TMDL projects included development and formal approval of biological impairment TMDLs. Those TMDLs are directly identified in Table B.

In the Monongahela and West Fork River watershed TMDL projects, stressor identification (SI) to determine the significant stressor(s) to benthic macroinvertebrates was performed under the same methodology used in prior projects. The DEP performed SI for streams with available biological information demonstrating WVSCI scores less than 68 at the same time it was developing TMDLs based on numeric water quality criteria for those streams.

For a subset of the streams subjected to SI, the DEP determined that implementation of the TMDLs based upon numeric water quality criteria would resolve the impacts upon which the biological impairment listings were based. Those streams are identified with the "surrogate" label in Tables B and B-1, and the impairments are no longer included on the 303(d) list. The reason for the Table B variation is simply that formal biological impairment TMDLs were not presented or approved. The absence of formal biological TMDLs does not invalidate the underlying science associated with SI that demonstrates that implementation of approved numeric criteria TMDLs will resolve the biological stress that caused the listings.

It is important to note that biological impacts addressed in this manner represented only a subset of the SI results and that the DEP has retained many biological impairment listings where SI determined the presence of stressors that are not resolved through implementation of numeric criteria TMDLs.

The results of SI and the stream-specific numeric criteria TMDLs that are anticipated to resolve impacts are presented directly in the TMDL reports. Table 4-1 in both the Monongahela River and West Fork River TMDL reports identifies stream-specific surrogate TMDLs for biological impacts.
The reports are available at:
http://www.dep.wv.gov/WWE/watershed/TMDL/grpd/Pages/default.aspx#monongahela
http://www.dep.wv.gov/WWE/watershed/TMDL/grpe/Pages/default.aspx#west%20fork

One commenter mistakenly indicated that the DEP did not issue a public notice for the 2014 Draft Section 303(d) list and requested an extension of the comment period.
The draft Section 303(d) List was advertised for public comment on June 12, 2014. Legal notices of the availability of the draft document and request for public comments were placed in newspapers statewide. The draft document was promoted via news release, e-mail and the Internet. The public comment period extended from June 12, 2014 to July 11, 2014.

One commenter requested explanation of how "modification of the listing methodology" might be cause for delisting previous impairments without TMDL development and the presentation of specific examples.
The Supplemental Table A description includes the subject scenario as a possible cause for including a stream/impairment delisting, but this scenario did not exist in the 2014 assessment. An analogous situation did occur in the refinement of the listed length of the algae impairment in Greenbrier River. The new methodology described on page 12 of the draft report was applied to refine the listed length of the impairment. A past example involved the fish tissue based mercury methodology where assessments were previously based on fillet and total mercury results and changed in 2010 to a whole body/ methylmercury basis to improve consistency with the applicable water quality criterion.

One commenter requested additional information to be presented in the various Supplemental Tables provided with the 303(d) list.
Specific requests included:

- ***The locations and sample dates of improved biological results in Supplemental Table A***
- ***Additional columns of data for Causative Stressor(s), Source, Impaired Size, Reach Description for TMDLs referenced in Supplemental Table B and the pollutant-specific TMDLs associated with CNA-Biological (Surrogate) designations***
- ***Mean and confidence level water quality statistics before and after implementation of water quality improvements for Supplemental Table C entries***

• ***Identification of point source discharges by permit number for Supplemental Table D entries***

In many instances, the requested information is difficult to display in the format of the document but is alternatively available in TMDL reports and/or upon request. The DEP's Watershed Assessment Branch welcomes stream-specific requests for information as they are often the best mechanism for communicating details.

The latter mechanism is suggested for the information requested in Supplemental Tables A and C. Additionally, the database of water quality data generated by the Watershed Assessment Branch may be queried at the following link and biological data is intended to be made available in the near future.: https://apps.dep.wv.gov/dwwm/wqdata/

The information requested relative to Supplemental Tables B is best obtained via review of approved TMDLs that are posted on the DEP's webpage. In contrast to 303(d) listings that have impaired segments and lengths identified by simplified rules for interpreting monitoring information, West Virginia develops watershed TMDLs through detailed modeling and prescribes allocations for multiple sources and source categories that are predicted to attain water quality criteria at all delineated subwatersheds. All approved WV TMDLs can be viewed at: http://www.dep.wv.gov/WWE/watershed/TMDL/Pages/default.aspx

Descriptions of the biological stressor identification process used in the Monongahela and West Fork River watershed TMDL projects are also provided at that website. Chapter 4 of each TMDL report summarizes stressor identification results. Table 4-1 of each report identifies stream-specific surrogate TMDLs for biological impacts. Additional details are available in the Stressor Identification Technical Report Appendix associated with each project.

Supplemental Table D has been modified to include the permit numbers associated with Category 4b point source discharges.

List Supplements Overview

Six supplements are provided that contain additional information. The six supplements are entitled: "Previously Listed Waters – No TMDL Developed," "Previously Listed Waters – TMDL Developed," "Water Quality Improvements," "Impaired Waters – No TMDL Needed," "Total Aluminum TMDLs Developed," and "New Listings for 2014."

Supplemental Table A - Previously Listed Waters – No TMDL Developed

Previously listed waters from the 2012 list that are not on the 2014 list are included in this supplement if a TMDL has not been developed, and these waters have been reevaluated and determined not to be impaired. Causes for revision of the impairment status include recent water quality data demonstrating an improved water quality condition, revision to the water quality criteria associated with the previous listing, documentation that the water was previously listed in error or a modification of the listing methodology.

Supplemental Table B - Previously Listed Waters - TMDL Developed

TMDLs have been developed for many previously listed waters. TMDL development allows the removal of impairments from the 303(d) list. Waters included in Supplemental Table B have TMDLs developed for the identified impairments, but water quality improvements are not yet complete and/or documented. Waters in Supplemental Table B will have an Integrated Report Category 4A designation unless TMDLs still need to be developed for other pollutants, in which case the stream will be included in Category 5.

Supplemental Table C - Water Quality Improvements

The goal of TMDLs and stream restoration projects is to bring the stream back to the point where it meets its designated uses and the associated water quality criteria. Supplement C includes a listing of streams with improved water quality due to TMDL implementation or pre-TMDL stream restoration work resulting in delisting. In the Integrated Report, the waters in Supplement C can be included in Category 1 if all designated uses are being met.

Supplemental Table D - Impaired Waters - No TMDL Development Needed

This table lists impaired waters for which either other control mechanisms are in place to control pollutants or the water is not impaired by a pollutant (i.e., flow alterations caused by mining). These waters will be contained in Integrated Report Categories 4b and 4c unless TMDLs need to be developed for other pollutant-related impairments (Category 5).

Supplemental Table E - Total Aluminum TMDLs Developed

This table contains a list of previously listed waters for which total aluminum TMDLs were developed and established by the EPA. Due to a criteria change from total aluminum to dissolved aluminum, the state placed total aluminum TMDLs onto a separate table from Supplemental Table B. Streams are removed from this list after dissolved aluminum evaluations are made.

Supplemental Table F - New Listings for 2014

This table is a list of impaired waters that are new on the list for 2014 and were not on the 2012 Section 303(d) list.