

# CHAPTER 1. INTRODUCTION TO WATERSHED ASSESSMENT BRANCH SAMPLING ACTIVITIES

## *Function of the Watershed Assessment Branch*

The purpose of the Watershed Assessment Branch (WAB) is to collect waterbody (e.g., streams, rivers, and lakes) data to determine their quality in West Virginia per the Federal Clean Water Act (CWA). This is accomplished by visiting hundreds of streams and lakes throughout the state collecting water and biological samples (e.g., fish, benthic macroinvertebrates, and periphyton) and assessing the quality of the instream and streamside habitat. The data collected is used to determine which streams and lakes are in violation of water quality standards or impaired biologically.

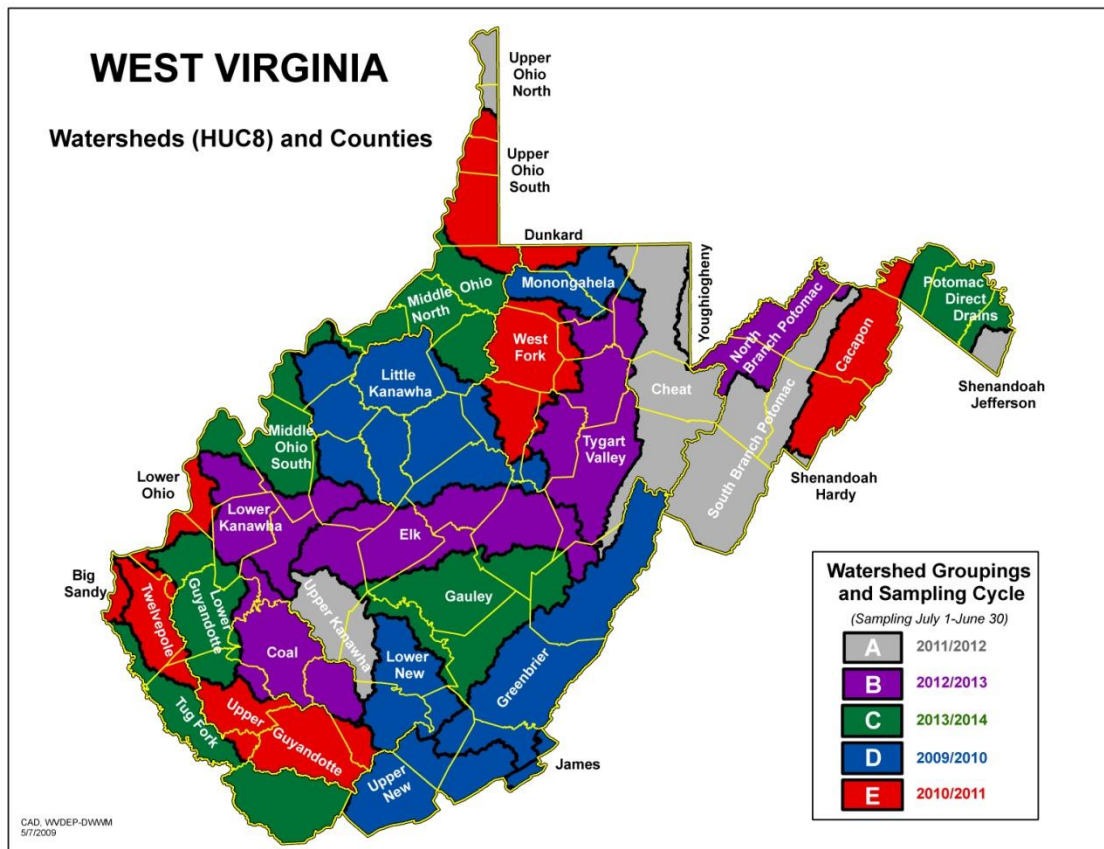


Figure 1-1. Example of WV rotating Watershed Basin Schedule.

All waterbodies (i.e., streams, rivers, lakes, reservoirs, ponds, navigable waters, wetlands, etc.) in the state are grouped into 32 watersheds (see Figure 1-1 above) based on the USGS 8-digit HUCs (Hydrologic Unit Codes). These watersheds are sampled on a five-year rotation (aka the rotating Watershed Basin Schedule) so that any given year approximately one-fifth of the watersheds are being intensively sampled and assessed. The data produced by the sampling efforts of WAB provides information regarding the

severity of pollution, the potential for cleanup, and supports the implementation of management and control measures.

The following document further describes the Watershed Assessment Branch's duties and functions:

WVDEP (West Virginia Department of Environmental Protection). December 2007. West Virginia's Water Quality Monitoring Strategy. Division of Water and Waste Management, Watershed Assessment Branch, Charleston, WV. Available online at:  
[http://www.dep.wv.gov/WWE/watershed/wqmonitoring/Documents/2007\\_WV\\_Monitoring\\_Strategy.pdf](http://www.dep.wv.gov/WWE/watershed/wqmonitoring/Documents/2007_WV_Monitoring_Strategy.pdf)

## ***Sampling Programs of the Watershed Assessment Branch***

WAB consists of many different sampling programs that are each unique in their sampling methods, protocols, and intensities of habitat assessment. The sampling programs include:

**Wadeable Streams Monitoring** occurs on streams that are wadeable (*i.e.*, easily traversed without having to use a boat). This applies to almost all 1<sup>st</sup>-4<sup>th</sup> order streams but may include some smaller 5<sup>th</sup> and 6<sup>th</sup> order streams. The components of sampling include water quality and biological assemblage samples (mainly benthic macroinvertebrates and periphyton, but sometimes fish) as well as an intensive habitat assessment. Two differing strategies of wadeable stream monitoring are as follows:

*Random (Probabilistic) Sampling* is a sampling subset within the Watershed Assessment Branch designed to allow unbiased, statistical interpretations of water quality using water chemistry, biological, and habitat data. The state is further subdivided into Level III Ecoregions statewide and examined on a 100k scale. The sample stations include 1-4<sup>th</sup> order streams (based on the NHD Plus stream coverage-100k scale) and are weighted based on the relative abundance of those orders in WV. Sampling does not coincide with the rotating Watershed Basin Schedule and occurs primarily in the Spring/Early Summer (April-Early June). Fish surveys to monitor populations & communities will be conducted on stations that are target and have watershed drainages greater than 2000 acres (+/- 10%). The fish surveys will occur later in the summer during a fish index period.

*Targeted Sampling* is designed to investigate:

1. Streams that have no previous data collected,
2. Streams that have only outdated data collected,
3. Streams with data previously collected that rendered inconclusive results (*e.g.*, streams with MMI (Multi-Metric Index) or IBI (Index of Biotic Integrity) scores that are uncertain or "gray" or streams with prior collections),
4. Streams that have known impairments (*e.g.*, 303(d) listed streams, AMD or Acid Mine Drainage, Biological impairments),
5. Streams of public or unique interest (*e.g.*, high-quality streams, trout streams, streams undergoing restoration projects).

This targeted sampling is driven by the rotating Watershed Basin Schedule and sampling is a one-time event that occurs mainly in the Summer/early fall (June-October). Fish surveys occur on a limited number of select larger streams.

**TMDL** stands for Total Maximum Daily Load. A targeted sampling strategy is used to gather information about the full extent of pollution impairments (*i.e.*, which streams are problem areas or not and what are the sources of pollution). The resultant data is used to develop and calibrate TMDL models for streams listed on the CWA Section 303(d) list. Candidate streams for TMDL development coincide with the rotating Watershed Basin Schedule and sampling occurs monthly for one year. The components of sampling include water quality samples and a limited habitat assessment. At streams with biological impairments sampling includes a one-time biological sample and intensive habitat assessment.

**Ambient Water Quality Network (AWQN)** is a bimonthly statewide trend monitoring program at 26 targeted stations on major rivers and streams (both wadeable and non-wadeable) for water quality constituents. The ambient network is perhaps the oldest program within the Watershed Assessment Branch with data existing as far back as the mid-1940s. The bimonthly components of sampling include water quality samples and limited habitat observations. These sampling activities are covered mainly in **CHAPTER 11. AMBIENT WATER QUALITY NETWORK PROTOCOLS starting on page 11-1.**

**Long Term Monitoring Stations, or LTMS**, are sampled to develop long-term biological trend data at targeted wadeable streams scattered throughout the state. Stations are selected to represent a wide array of unique and varying impairments (*e.g.*, Acid Mine Drainage, Acid Rain, Sediment, Nutrient Enrichment, *etc.*) as well as represent best attainable or reference conditions. Ambient Network stations (or nearby proxy stations) that are wadeable in the summer months are also included in this monitoring effort. Sampling occurs once per year for approximately five years to establish a baseline and then once every two to three years to monitor for changes. Sampling includes biological, intensive habitat, and water quality components. Some selected stations may also be surveyed for fish.

**Lake Monitoring** uses the rotating Watershed Basin Schedule much like TMDL sampling and the targeted Wadeable Stream Monitoring. Sampling occurs on targeted lakes (within the watershed group for that year) four times during the summer months (June - September or May - August). The number of stations per lake varies and is generally proportional to the size of the lake. The components of sampling include a vertical water chemistry profile (including the physiochemical properties, nutrients, and turbidity measurements), chlorophyll-a fecal coliform sampling, Secchi depth, and some limited habitat and disturbance observations. These sampling activities are covered mainly in **CHAPTER 12. LAKE SAMPLING PROTOCOL starting on page 12-1.**

**Continuous (Time-Series) Monitoring** is often used to provide more detailed and frequent water quality data in support of other sampling programs (*e.g.*, TMDL, Special Projects). Deployment and retrieval of the deployable sondes may be accompanied by a

water quality sample and habitat observations at targeted locations. These sampling activities are covered mainly in **CHAPTER 13. CONTINUOUS WATER QUALITY MONITORING PROCEDURES** starting on page 13-1.

**Fish Tissue Monitoring and Consumption Advisories** are conducted and published thru a cooperative effort between WVDEP and WV Division of Natural Resources (WVDNR) and WV Bureau of Public Health (a section of the WV Department of Health and Human Resources or WV DHHR). Information about fish contamination in West Virginia has been collected since the late 1970s. Beginning in September 2000, an Executive Order formalized the cooperative effort between the agencies. More information on fish consumption advisories can be found at:

<http://www.wvdhhr.org/fish/>

and information on specific contaminant values can be found in the WV Sport Fish Consumption Advisory Guide at:

[http://www.wvdhhr.org/fish/Current\\_Advisories.asp](http://www.wvdhhr.org/fish/Current_Advisories.asp)

**Special Surveys or Projects** are temporary targeted sampling designs conducted on request from internal West Virginia Department of Environmental Protection (WVDEP) programs, external agencies, private industries, or public groups/individuals that are concerned about the water quality of specific streams or segments of streams and require additional data to supplement their own data. These surveys or projects are often done in association with land transactions, spills, pending legal actions/litigation, permit applications/renewals, water quality improvement projects (e.g., mitigation projects, infrastructure improvements), emerging pollution issues, or as a part of larger studies. Special Surveys are more limited in scope in that they concentrate on a very specific area and the stations are only visited once or twice. Special Projects are more long term and widespread. They may involve monthly sampling at many sites over the course of a year or two. The components of sampling vary greatly depending on the survey or project needs and may include any combination of the following: simple habitat observations, water quality samples, continuous (time-series) monitoring, biological samples, limited habitat assessments, or intensive habitat assessments.

Sections to be added or under development:

**Lake Biological (Benthic) and Habitat Sampling**

**Lake Bathymetric Surveys**

**Continuous (Time-Series Monitoring) Data Analysis and QC**

Monitoring Programs in development:

**Wetlands Monitoring**

**Non-Wadeable Streams and Large Rivers**

**Harmful Algal Bloom Monitoring**

## ***Scope of SOP for Watershed Assessment Branch Sampling Programs***

The following Standard Operating Procedure (SOP) chapters and sections are designed primarily for use with the **Wadeable Streams Monitoring (Random and Targeted), TMDL, AWQN, LTMS, Lake Monitoring** and **Continuous Monitoring** programs which cover the bulk of sampling activities by WAB. Since these sampling programs may share aspects/components with the other sampling programs (e.g., Coordinate data collection, Sonde Calibration and Use, Flow Measurement, Photography) their individual sections in this document may refer to other sections for further reference.

In some cases, a **Special Survey** or **Project** may be unique enough that it may require the development of its own SOP document. However, most special surveys or projects can adequately rely on this document to cover its sampling components.

### ***Other Documents to Consider***

At its inception in 1996, the Watershed Assessment Branch adapted methodologies already commonly in use by USEPA and other surrounding states. Specifically, WVDEP WAB staff members who participated in USEPA's EMAP sampling for the MAHA and MAIA pilot projects in 1993-1997 in West Virginia were instrumental in setting up the WAB sampling methodologies. For more insight into these other methodologies consult the following documents (listed in chronological order):

- Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1997. Revision to Rapid Bioassessment Protocols for Use in Streams and Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Draft. EPA 841-D-97-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.
- Barbour, M.T., J. Gerritsen, B.D. Snyder, J.B. Stribling. 1999. Rapid bioassessment protocols for use in wadeable streams and rivers: Periphyton, benthic macroinvertebrates, and fish. Second Edition. United States Environmental Protection Agency. EPA/841/B-99-002.
- Davis, W, and J. Scott (editors). 2000. Mid-Atlantic Highlands Streams Assessment: Technical Support Document. EPA 903-B-00-004. U.S. Environmental Protection Agency Region 3; Philadelphia, PA.
- Klemm, D.J., P.A. Lewis, F. Fulk, and J.M. Lazorchak. 1990. Macroinvertebrate Field and Laboratory Methods for Evaluating the Biological Integrity of Surface Waters. EPA 600-4-90-030. U.S. Environmental Protection Agency; Office of Research and Development; Washington, D.C.
- Lazorchak, J.M., Klemm, D.J., and D.V. Peck (editors) 1998. Environmental Monitoring and Assessment Program – Surface Waters: Field Operations and Methods for Measuring the Ecological Condition of Wadeable Streams. EPA/620/R-94/004F. U.S. Environmental Protection Agency, Washington, D.C.
- Plafkin, J.L., M.T. Barbour, K.D. Porter, S.K. Gross and R.M. Hughes. 1989. Rapid bioassessment protocols for use in streams and rivers: Benthic macroinvertebrates and fish. United States Environmental Protection Agency. EPA/444/4-89-00.

These documents are available for download at:

<http://www.epa.gov/ncepihom/index.html>

## **General Quality Assurance/Quality Control**

### **Quality Assurance Project Plan**

The Watershed Assessment Branch Quality Assurance Project Plan (QAPP), which is submitted and approved by EPA on a regular basis, can be viewed and downloaded at:

[http://www.dep.wv.gov/WWE/watershed/Documents/2005\\_06\\_SOP\\_All.pdf](http://www.dep.wv.gov/WWE/watershed/Documents/2005_06_SOP_All.pdf)

### **Training**

Once a year, all field participants in the WAB attend mandatory training sessions. The purpose of these sessions is to ensure that all field personnel are familiar with sampling protocols presented in this SOP document and calibrated to sampling standards. These sessions occur at a field location to provide real examples and situations. Any persons unable to attend the annual training session will be instructed and evaluated on the job in the following month by one of the WAB training instructors.

Individuals who are more experienced in using these sampling protocols will be teamed up with the less experienced to ensure reinforcement of training and accurate results before they can work solo or lead a sampling team.

Several staff meetings occur throughout the year to update field personnel (those collecting the data) and office personnel (those using, analyzing, and distributing the data) with any running changes to protocol and address reoccurring problems and issues in front of the two groups. These staff meetings also serve as communication forums between field and office personnel to help each group better understand where and how the data is collected, how the data is used in fulfilling WVDEP's Clean Water Act requirements, and the specific needs of each group.

Specialized training sessions (e.g., WVDNR Boating Safety, Red Cross First Aid & CPR/AED training) as well as thematic training seminars (e.g., AMD/Acid Rain Training, Fish Taxonomy) are also scheduled as needed.

In supplement, WAB personnel may undergo additional education in the form of Workshops, Seminars, and Societal Meetings (e.g., Association of Mid-Atlantic Aquatic Biologists, American Fisheries Society, or Society for Freshwater Science) and often trained and participate in other projects with similar methodologies to those in this



document (e.g., USEPA's National Aquatic Resource Surveys for Streams and Rivers, Lakes, and Wetlands).

## Standard Operating Procedures Document

This SOP document is annually reviewed for completeness and accuracy coinciding with the mandatory training sessions and printed hard copies are provided to all program personnel for review and use in the field. In addition, any changes that occur between annual reviews of the SOP document are updated in the SOP document's electronic format and marked with a revision number. The revised SOPs are announced via email and made available internally via the WVDEP computer network at:

[Q:\WATER\\_RESOURCES\WAB\SOP'S\SOP2018.zip](Q:\WATER_RESOURCES\WAB\SOP'S\SOP2018.zip)

and externally via the web at:

<http://www.dep.wv.gov/WWE/watershed/Pages/WBSOPs.aspx>

The field personnel are to print copies of the revised SOP pages and insert them into their existing hard copy for use until a new annual hard copy is provided.

## Data Retention & Storage

All data generated by WAB are stored in a networked Oracle-platform database (Back-end) and accessed by users with multiple Microsoft Access databases (Front-ends). Combined, these are referred to as WABbase (**see Figure 1-2 on next page**). The major exception to this is any Fish Tissue Data generated for Health Consumption Advisories, which is stored in an independent Microsoft Access database.

All paper field forms, COCs, and laboratory analytical results and bench sheets are scanned into an electronic format (.pdf) and stored on the network server which is backed up nightly. The original paper forms (if available) are filed and stored in a file room for future reference.

Any electronic deliverables from contract laboratories (e.g., water quality analysis, bench sheets), raw files generated by a device (e.g., deployable or flow meter), or photographs are also stored for future reference on the network server.

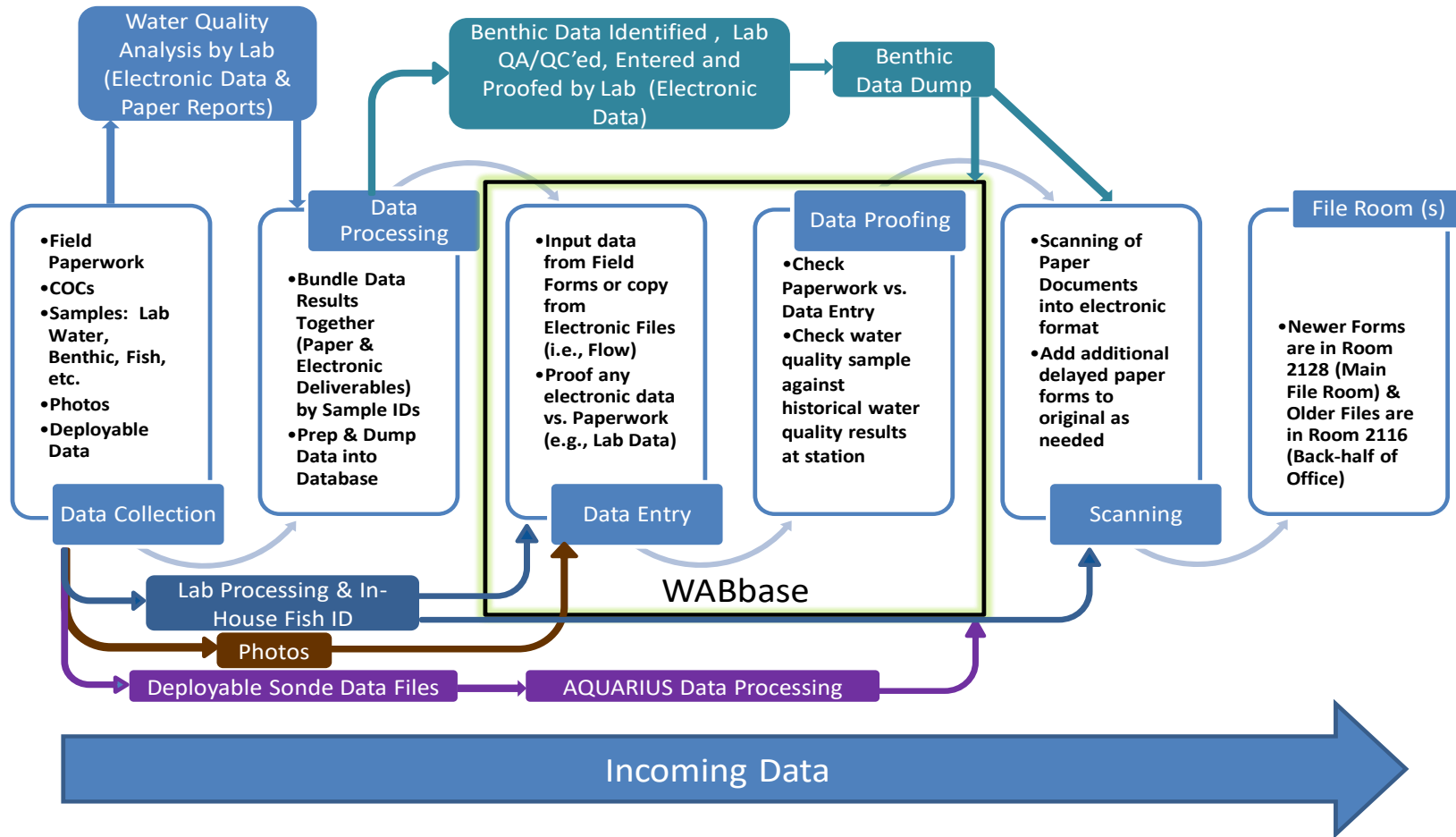


Figure 1-2. WAB Data Flow