# Wet Waders and Beyond

# The Condition of Our State's Waters

# A Citizen's Perspective

dep

west virginia department of environmental protection


WV Department of Environmental Protection
Division of Water and Waste Management, Nonpoint Section
601 57th Street, SE
Charleston, WV 25304

The document was prepared by Tim Craddock, WV DEP's Citizens' Monitoring Coordinator and is available electronically in Portable Document Format (PDF). To request your copy send e-mail to Tim Craddock at: tcraddock@wvdep.org.

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WV Save Our Streams would like to recognize all the volunteer monitors, not only those directly associated with the program, but any others who have given their time and energy in an effort to protect our state's streams and rivers. WV Save Our Streams would also like to recognize all of the agency and other partners who have provided assistance of any kind, to help guide volunteers through the myriad of processes involved with water quality issues.

"*Perception is not acquired by formal education, nor is it reserved for persons learned in the arts or sciences. Perception is a recognition of the values found in natural things, and it is something that grows through our experiences at various stages of development*."

Adapted from Round River: From the Journals of Aldo Leopold, preface by Luna Leopold.

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## PROGRAM OVERVIEW

The West Virginia Save Our Streams Program's major goal is to improve and protect the water quality of the rivers and streams of our state. Two primary and equal objectives are used to accomplish this goal.

The first objective is to provide the state with enhanced ability to monitor and protect its surface waters through increased water quality data collection. Currently the state is only able to monitor a small percentage of its surface waters. Monitoring stations historically have been located around point source discharges, leaving vast stretches of rivers unmonitored because they traverse rural or urban areas for which there are few or no permitted discharges. Without adequate information on these rivers, the state is unable to discern current impacts from nonpoint source pollution or to determine areas that may improve due to installation of Best Management Practices (BMP's).

The second objective is to improve water quality through educational outreach to West Virginia's citizens. Once citizens are actively involved in stream monitoring and restoration activities, they can begin to initiate projects in their own watersheds to improve stream quality. For example, as a result of mapping land uses in their watershed and conducting regular water quality monitoring using the program biological monitoring technique, participants can spot trouble areas in need of restoration or pristine areas in need of continuing protection. Activities can be implemented to improve water quality, such as using BMP's on farms, installing wooded buffer zones in riparian areas, cleaning up trash and debris through stream cleanups and other projects. Participants are given how-to fact sheets for these activities as well as information on appropriate state documents and regulations.

The program provides a unique mechanism to instruct West Virginia citizens on the need to monitor and restore the state's waterways. It is West Virginia's Department of Environmental Protection (DEP), Division of Water and Waste Managements goal to implement through the program, with the help of a coordinator, a combined effort of local, state and federal government agencies, local organizations and volunteers to improve water quality and natural habitat by various projects that help protect our water resources.

### The Workshops

The program coordinator oversees workshop sessions. Each workshop is designed to educate citizens on pollution problem recognition, state regulations and programs pertaining to pollution abatement, such as West Virginia's Nonpoint Source Pollution Management Plan. Workshop sessions include a slide show, discussion, video, practice scenarios or other learning tools and activities to demonstrate stream pollution problems, monitoring techniques and restoration practices. The major focus of the workshop is the streamside, hands-on demonstrations of the program's stream monitoring techniques.

Once a monitor has been trained in accordance with the program's guidelines and is certified, he/she will receive the equipment and can begin to conduct surveys. After each survey, the monitor sends the data collected to the program coordinator to review for accuracy. The

coordinator reviews the field survey sheets for any water quality problems and for corrections, if any are needed. Then, if any corrections are needed the sheets are returned to the monitor with the necessary comments. After the results have been analyzed, the program coordinator will summarizes the information and later stores it into a computer database. Any severe pollution problems may be investigated further after the appropriate regulatory agencies are notified.

Regional coordinators, local program monitors and others may be called upon to assist new monitors in specific technique difficulties and solving pollution problems. All of these individuals have been trained to use the programs method and are active participants in the program. In addition to the initial workshop volunteer monitors are required to maintain their certification through annual refresher trainings and testing. The WV Save Our Streams Program offers several types and levels of training:

- **Level 1** (**Beginning Level**): Introduces the concepts of biological/physical stream monitoring and follows methods similar to the Izaak Walton League of America (IWLA) Save Our Streams protocols. Groups participating at this level receive a certificate, resource materials and basic biological monitoring equipment. These workshops are approximately 6-8 hours in length with both in-class and hands-on demonstrations along a stream or river reach.
- **Level 2** (**Intermediate Level**): Expands upon the stream assessment protocols by introducing invertebrate counts, simple biotic indices and a more thorough habitat assessment. Participants receive resources similar to the above. The level two workshops last one to two days depending upon the requirements of the group. Prerequisites are a level one workshop or some familiarity and experience with biomonitoring methods.
- **Level 3** (**Advanced Level**): Closely follows US EPA Rapid Bioassessment Protocols for stream assessment. The resources provided are similar to the above levels, but are often more advanced and somewhat specific based upon the goals of the volunteer group. The level three workshops last two to three days with a variety of demonstrations and exercises both inside and along a stream or river reach. Prerequisites are a level one or level two workshop and experience using WV Save Our Streams or other similar biomonitoring methods.
- **Trainers Certification**: This is a two-day workshop for those interested in becoming official training designees of WV Save Our Streams. The course is offered to those who have been monitoring using the WV Save Our Streams methods for at least one year and are comfortable teaching the methods to others. Previous monitoring experience can be substituted under certain circumstances; however, the trainer must be WV Save Our Streams Certified to the level at which they plan to teach. The program coordinator reserves the right to approve participants based upon level of experience and commitment to the WV Save Our Streams Program.
- **Specialized Training**: Additional specialized training workshops can also be scheduled. These types of trainings are designed to fit more specific needs of a group. Examples include assistance with study designs, sedimentation and channel measurements (i.e. pebble counts and cross sections), watershed surveys and monitoring nutrient impacts through physical characterizations.

Workshops are scheduled around the state in areas where either the state has requested additional monitoring or where there is a high level of public interest. These workshops are open to the public and are often advertised in West Virginia magazines, newspapers, and other state agency publications.

## ASSESSMENT METHODS

The method of assessment depends largely upon the level of training provided and the volunteer's time and attention to detail. Most experienced groups use a more advanced assessment approach for data collection and a simpler level as an outreach tool in their watershed. However, all groups begin with level one and move to more advanced levels as their expertise and familiarity with the methods improve.

### Biological Integrity

Biological integrity is commonly defined as "the ability to support and maintain a balanced, integrated, and adaptive community with a biological diversity, composition, and functional organization comparable to those of natural aquatic ecosystems in the region" (Karr and Dudley 1981, and Karr et al. 1999). The U.S. Environmental Protection Agency has endorsed the use of biological integrity as an indicator of environmental condition and, more specifically, ecological health. It is unique among currently used indicators in that it uses information gathered directly from the aquatic organisms and the biological community of which they are a part. Over time, aquatic organisms are often exposed to a variety of factors that cause stress to the community. If collected and analyzed properly, the condition of the community can help to characterize many types of cumulative environmental impacts.

The groups of animals found in leaf packs, rocks, woody debris and other areas of streams, rivers, ponds and wetlands are collectively called benthic macroinvertebrates (Table 1). Benthic refers to the bottom, in this case the bottom of a stream. Macroinvertebrates are animals without a backbone that can be seen with the naked eye. These bottom-dwelling animals include crustaceans and worms but most are larvae of aquatic insects. Macroinvertebrates are an important link in the food web between the producers (leaves, algae) and higher consumers such as fish. West Virginia Save Our Streams uses macroinvertebrates as the primary indicators of biological integrity. Algal growth conditions and other aquatic animals and plants are also used on a limited basis.

All insects go through a series of changes (metamorphoses) during their life cycle. Insect life cycles can be grouped as either complete or incomplete metamorphoses. Incomplete metamorphosis lacks the pupae stage and the nymph and adult are more similar in appearance. A complete metamorphosis includes a pupae stage, and often the adult and larva tend to look very different from each other. The insect groups of the macroinvertebrate communities show both kinds of metamorphosis. Most aquatic insects remain underwater in the immature stages and leave the stream only as adults. The life cycles of the insect groups of macroinvertebrates can range from a few months to several years.

**Table 1.** Orders and Classes of Commonly Collected Macroinvertebrates

| **Aquatic Insects** | **Crayfish, Scuds and Sowbugs** | **Worms, Leeches and Flatworms** | **Snails, Clams and Mussels** |
|---|---|---|---|
| *Ephemeroptera*<br>*Plecoptera*<br>*Trichoptera*<br>*Odonata*<br>*Coleoptera*<br>*Megaloptera*<br>*Diptera* | *Decapoda*<br>*Isopoda*<br>*Amphipoda* | *Oligochaeta*<br>*Hirudinea*<br>*Turbellaria* | *Gastropoda*<br>*Bivalvia* |

Macroinvertebrates are often divided into categories based upon their tolerance to stress. This stress is caused by various kinds of human induced and natural disturbances that may occur in stream and river environments. These categories are often described in both qualitative and quantitative terms. The narratives and the scale below more precisely describe the stress tolerance rating categories commonly used for most kinds of macroinvertebrates.

- **Very Sensitive**: Invertebrates that occur mostly in pristine environments with little or no disturbances. They usually do not occur in high numbers, nor does one kind dominate the entire population.
- **Sensitive**: Invertebrates that occur in a range of environments from little or no disturbance to moderately disturbed conditions. They may occur in slightly elevated numbers under certain conditions.
- **Somewhat Tolerant**: Invertebrates that occur in a range of environments from moderately to highly disturbed conditions but can also occur in less disturbed conditions. Their high numbers are often good indications of disturbance.
- **Tolerant**: Invertebrates that occur most often disturbed conditions. In very disturbed environments only one or two kinds may dominate the entire population. They are also found in good conditions, but usually in very low numbers.
- **Very Tolerant**: Invertebrates that occur most often in highly to very disturbed conditions and their numbers may be extremely high or they may dominate the community. They are also occasionally found in less disturbed conditions.

| Very Sensitive | | Sensitive | | Somewhat Tolerant | | | Tolerant | | Very Tolerant | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

**The Analyses of Biological Integrity**

The program uses a standardized approach to collection (500-micron kick seine) focusing on the riffle and run habitats. The program's methods are generally field based, with a variety of unique modifications to make sorting, counting and identification somewhat easier. A minimum of two and a maximum of four kicks are performed throughout the 100-meter reach in a variety of riffle or run habitats. The volunteers will count, sort and identify 200 or more invertebrates from these combined samples. If a minimum of 200 is collected after two kicks, than no more collection is necessary, if however the 200-target is not reached after two kicks, collection is continued until 200 are collected or until four kicks have been performed.

The metrics (mathematical formulas) used to analyze the samples were chosen based upon invertebrate samples collected by Downstream Alliance (DA), Jefferson County Watershed Coalition (JCWC), Guardians of the West Fork (GWF), WV Department of Highways (DOH), DEP's Watershed Assessment Section (WAS) and WV Save Our Streams. Approximately 300 stations with family-level identification and/or counts to the order level from DA, JCWC, GWF, and DOH and an additional 300 random collections from WAS and WV Save Our Streams from basins throughout the state were used to develop the metrics.

The metrics that make up the IBI (Index of Biological Integrity) were chosen based largely upon the standard metrics that make up the WV Stream Condition Index (WVSCI) with slight modifications for the field and ease of use by volunteers (Table 2). The final score, called the Stream Condition Index, is an average based upon all metrics or a select few depending upon the conditions of the assessment. This final score is given a rating of optimal, sub optimal, marginal or poor based upon the scale below.

| Optimal | Sub Optimal | Marginal | Poor |
|---|---|---|---|
| > 80 | 80 - 65 | 64.9 - 50 | < 50 |

**Table 2.** The WV Save Our Streams Index of Biological Integrity

| **Metrics That Decrease With Stress** | | |
|---|---|---|
| | Value $^{X}$ | Reference Formula |
| Total Taxa | 21 | = 100 × (X ÷ 21) |
| EPT Taxa | 13 | = 100 × (X ÷ 13) |
| % EPT Abundance | 90 | = 100 × (X ÷ 90) |
| **Metrics That Increase With Stress** | | |
| | Value $^{X}$ | Reference Formula |
| % Chironomidae | 2 | = 100 × [(100 - X) ÷ 98] |
| % Dominant Taxa | 30 | = 100 × [(100 - X) ÷ 70] |
| Modified Hilsenhoff Biotic Index (HBI) | 3.0 | = 100 × [(10 - X) ÷ 7.0] |

The above metrics are part of the advanced program method. At the beginning and intermediate levels, volunteers use simpler formulas and are taught the use of the more advanced mathematical derivations as they advance through the levels. WV Save Our Streams also provides a spreadsheet that will automatically calculate the metric scores. The above metrics are described in more detail in the appendix section of this report.

## Habitat Assessment

The volunteer monitors complete a visual assessment at each monitoring station. A 100-meter section of stream and the land in its immediate vicinity are qualitatively evaluated for in-stream and streamside habitat conditions. The volunteer's also record physical measurements, potential for erosion, surrounding land uses that may be impacting the site, focusing mostly on non point sources of pollution and other anthropogenic disturbances. They also record information about substrate composition, water conditions and the riparian buffer.

An important part of the assessment is the scoring of habitat conditions most likely to affect the aquatic life in the stream. At the advanced level, ten parameters are evaluated using a scale of 0-20. Habitat conditions are also evaluated at the beginning and intermediate levels.

- **Optimal** (excellent) conditions describe habitat quality that meets natural expectations
- **Sub-optimal** (good) conditions describe habitat quality that is slightly less than expected but still adequate
- **Marginal** conditions describe habitat quality with moderate to high levels of degradation
- **Poor** conditions describe a habitat that is substantially altered

| Optimal | | | | | Sub Optimal | | | | | | Marginal | | | | | Poor | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

The habitat conditions used by the program are as follows:

1. **Attachment sites for macroinvertebrates** refer to the amount of living space or hard substrates (i.e. rocks, woody debris, vegetation etc.) available for macroinvertebrates.
2. **Stream velocity and depth combinations** are important to the maintenance of healthy aquatic communities. Fast water increases the amount of dissolved oxygen in the water; keeps pools from being filled with sediment; and helps food items like leaves, twigs, and algae move more quickly through the aquatic system. Slow water provides spawning areas for fish and shelters macroinvertebrates that might be washed downstream in higher stream velocities. Similarly, shallow water tends to be more easily aerated (i.e., it holds more oxygen), but deeper water stays cooler longer. Thus the best stream habitat includes all of the velocity/depth combinations and can maintain a wide variety of organisms.
3. **Channel flow status** is the percent of the existing channel that is filled with water. The flow status changes as the channel enlarges or as flow decreases as a result of dams and other obstructions, diversions for irrigation, or drought. When water does not cover much of the streambed, the living area for aquatic organisms is limited.
4. **Sediment deposition** is a measure of the amount of sediment that has been deposited in the stream channel and the changes to the stream bottom that have occurred as a result of the deposition. High levels of sediment deposition create an unstable and continually changing environment that is unsuitable for many aquatic organisms.
5. **Embeddedness** refers to the extent to which rocks (gravel, cobble, and boulders) are surrounded by, covered by, or sunken into the silt and sand of the stream bottom. As rocks become embedded, fewer living spaces are available to macroinvertebrates and fish for shelter, spawning and egg incubation. To estimate the percent of embeddedness, observe the amount of silt or finer sediments overlying and surrounding the rocks. If kicking does not dislodge the rocks or cobbles, they are probably greatly embedded.
6. **Frequency of Riffles** refers to the measure of the riffle sequence found within the stream reach. Riffles are a high quality habitat. Therefore, an increased frequency of occurrence enhances the diversity of the stream community.
7. **Channel alteration** is basically a measure of large-scale changes in the shape of the stream channel. Many streams in urban and agricultural areas have been straightened, deepened (e.g., dredged), or diverted into concrete channels, often for flood control purposes. Such streams have far fewer natural habitats for fish, macroinvertebrates, and plants than do naturally meandering streams.

The next three parameters are scored from both sides of the bank:

8. **Condition of banks** measures erosion potential and whether the stream banks are eroded. Steep banks are more likely to collapse and suffer from erosion than are gently sloping banks and are therefore considered to have high erosion potential. Signs of erosion include crumbling, unvegetated banks, exposed tree roots, and exposed soil.
9. **Riparian vegetative zone width** is defined here as the width of natural vegetation from the edge of the stream bank. The riparian vegetative zone is a buffer zone to pollutants entering a stream from runoff. It also controls erosion and provides stream habitat and nutrient input into the stream. A wide, relatively undisturbed riparian vegetative zone reflects a healthy stream system.
10. **Bank vegetative protection** measures the amount of the stream bank that is covered by natural (i.e., growing wild and not obviously planted) vegetation. The root systems of plants growing on stream banks help hold soil in place, reducing erosion. Vegetation on banks provides shade for fish and macroinvertebrates and serves as a food source by dropping leaves and other organic matter into the stream.

An overall integrity score and rating is determined by simply dividing the score received by the total points possible. This result is multiplied by 100 and compared to an integrity rating scale.

## Physiochemical Monitoring

Volunteer monitors often collect select physiochemical data, especially temperature, pH, dissolved oxygen, and on occasions, conductivity. These types of measurements are helpful for providing clues about sources of stressors. Other more advanced groups may collect a suite of chemical information related to the specific impairments in their watershed. For example, several groups in the northern part of the state monitoring parameters related to polluted coalmine drainage and a few groups also incorporate fecal coliform analysis. WV Save Our Streams provides training for water quality collection and analysis, and assistance with study design, but does not provide any type of equipment to carry out the procedures, except for temperature and pH. Those groups that collect this information do so at their own expense or through grants that subsidize the cost of this analysis.

Water quality analysis is an important part of the determination of the overall quality of our streams and rivers, and in most cases this component of volunteer monitoring programs has been dramatically under funded. It is my hope that in the near future additional funding may become available so that a sustainable chemical water quality analysis component can be added to the program.

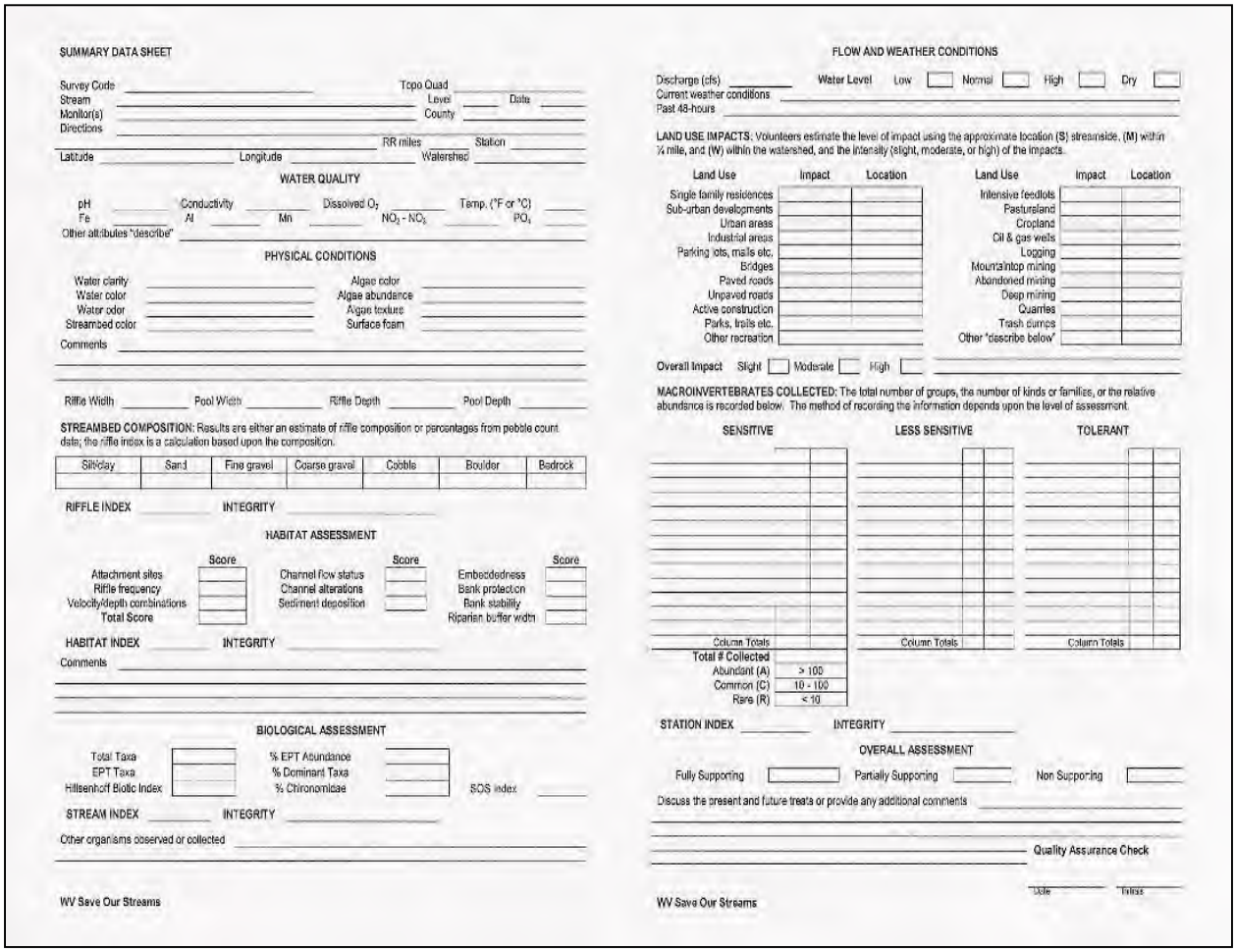
## PROGRAM ASSESSMENT METHODS

Quality assurance is maintained through regular training, random field checks, consistent data assessment and summary techniques and constant updates and communication. The coordinator maintains the bulk of the survey information, but the volunteer groups are encouraged to keep their own files so that they can easily communicate necessary information to the local communities.

The program coordinator assesses each survey that is submitted, summarizes the information using a standard summary sheet (Figure 1) and sends a response, when necessary to the volunteers. The summary information is filed electronically, made available as requested and shared with other sections within WV DEP, as well as other state and federal agencies and variety of partners. This information is not yet posted on the web, nor is it in a Graphic Information Systems (GIS) format.

Simple statistical analyses are used to compare the information whenever possible, and various graphical formats are used to show trends over time. Both the biological and habitat integrity scales are in a consistent format so that they can easily be compared and understood.

**Figure 1.** Program Summary Sheet



SUMMARY DATA SHEET

Survey Code _____ Topo Quad _____
Stream _____ Level _____ Date _____
Monitor(s) _____ County _____
Directions _____
_____ RR miles _____ Station _____
Latitude _____ Longitude _____ Watershed _____

WATER QUALITY

pH _____ Conductivity _____ Dissolved $O_2$ _____ Temp. (°F or °C) _____
Fe _____ Al _____ Mn _____ $NO_2$ - $NO_3$ _____ $PO_4$ _____
Other attributes "describe" _____

PHYSICAL CONDITIONS

Water clarity _____ Algae color _____
Water color _____ Algae abundance _____
Water odor _____ Algae texture _____
Streambed color _____ Surface foam _____
Comments _____

Riffle Width _____ Pool Width _____ Riffle Depth _____ Pool Depth _____

STREAMBED COMPOSITION: Results are either an estimate of riffle composition or percentages from pebble count data; the riffle index is a calculation based upon the composition.

| Silt/clay | Sand | Fine gravel | Coarse gravel | Cobble | Boulder | Bedrock |
|---|---|---|---|---|---|---|
| | | | | | | |

RIFFLE INDEX _____ INTEGRITY _____

HABITAT ASSESSMENT

| | Score | | Score | | Score |
|---|---|---|---|---|---|
| Attachment sites | | Channel flow status | | Embeddedness | |
| Riffle frequency | | Channel alterations | | Bank protection | |
| Velocity/depth combinations | | Sediment deposition | | Bank stability | |
| Total Score | | | | Riparian buffer width | |

HABITAT INDEX _____ INTEGRITY _____
Comments _____

BIOLOGICAL ASSESSMENT

| | | | | | |
|---|---|---|---|---|---|
| Total Taxa | | % EPT Abundance | | | |
| EPT Taxa | | % Dominant Taxa | | | |
| Hilsenhoff Biotic Index | | % Chironomidae | | SOS Index | |

STREAM INDEX _____ INTEGRITY _____
Other organisms observed or collected _____

WV Save Our Streams

FLOW AND WEATHER CONDITIONS

Discharge (cfs) _____ Water Level Low ☐ Normal ☐ High ☐ Dry ☐
Current weather conditions _____
Past 48-hours _____

LAND USE IMPACTS: Volunteers estimate the level of impact using the approximate location (S) streamside, (M) within ¼ mile, and (W) within the watershed, and the intensity (slight, moderate, or high) of the impacts.

| Land Use | Impact | Location | Land Use | Impact | Location |
|---|---|---|---|---|---|
| Single family residences | | | Intensive feedlots | | |
| Sub-urban developments | | | Pastureland | | |
| Urban areas | | | Cropland | | |
| Industrial areas | | | Oil & gas wells | | |
| Parking lots, malls etc. | | | Logging | | |
| Bridges | | | Mountaintop mining | | |
| Paved roads | | | Abandoned mining | | |
| Unpaved roads | | | Deep mining | | |
| Active construction | | | Quarries | | |
| Parks, trails etc. | | | Trash dumps | | |
| Other recreation | | | Other "describe below" | | |

Overall Impact Slight ☐ Moderate ☐ High ☐ _____

MACROINVERTEBRATES COLLECTED: The total number of groups, the number of kinds or families, or the relative abundance is recorded below. The method of recording the information depends upon the level of assessment.

| SENSITIVE | | LESS SENSITIVE | | TOLERANT | |
|---|---|---|---|---|---|
| | | | | | |
| Column Totals | | Column Totals | | Column Totals | |

Total # Collected
Abundant (A) > 100
Common (C) 10 - 100
Rare (R) < 10

STATION INDEX _____ INTEGRITY _____

OVERALL ASSESSMENT

Fully Supporting ☐ Partially Supporting ☐ Non Supporting ☐

Discuss the present and future treats or provide any additional comments _____

Quality Assurance Check

Date _____ Initials _____

WV Save Our Streams

## VOLUNTEER DATA SUMMARIES

Students from Pendleton County Middle School collect and analyze water samples from the North Fork.

The remainder of this report contains information about activities and summary data collected by the volunteers. The bulk of the data is provided in the appendices. However, overall assessment tables are included in the body of this report as well as additional tables and graphical representations depicting certain aspects of the information. Additional information on projects and other reported information involving volunteers is also included. The reporting period for this report includes data collected and submitted from January 2003 through January 2004. In addition, 2002 information may be included if it was not included in previous reports.

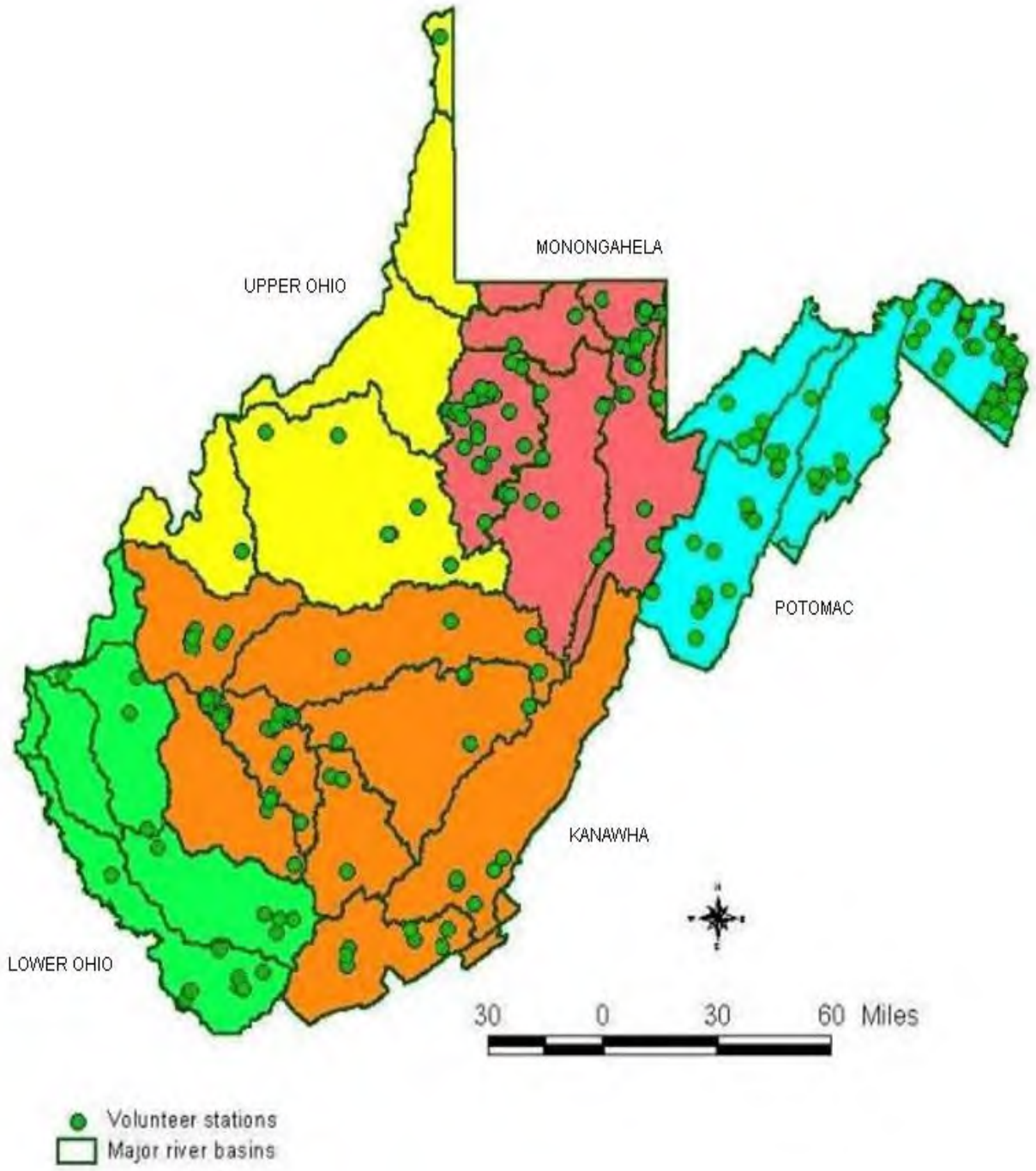
The data collected by volunteers is grouped into the U.S. Geological Survey (USGS) scheme of hydrologic units, which divides the state into 32 major drainage basins. Some of these are entire stream basins with a natural hydrologic boundary, while others are divided for manageability. For the purposes of this report these basins are organized into larger basins, shown on the map (Figure 2) on the next page. The basin groupings and names are based mostly upon their natural hydrologic connections or their proximity to one another.

The information presented in this report is summarized at the beginning of each section and an overall assessment table is provided at the end of the section. All other tables appear in the appendix sections. The integrity rating of optimal, sub-optimal, marginal and poor, and a category rating of fully supporting, partially supporting and non-supporting are provided.

- **Fully supporting**: All attributes are adequate to support healthy stream conditions
- **Partially supporting**: One or more attributes show signs of disturbance, and overall do not fully support healthy stream conditions
- **Non-supporting**: All attributes show signs of disturbance and do not support healthy stream conditions

In some cases the category rating of **threatened** may be used to describe the stream reach. Threatened refers to a condition(s) that may be impaired but does not effect the overall quality of the stream. For example, the overall habitat conditions may be assessed as sub-optimal, but a single attribute, such as sediment deposition may be assessed as marginal. The biological integrity, overall habitat integrity and water quality are used to determine the category ratings.

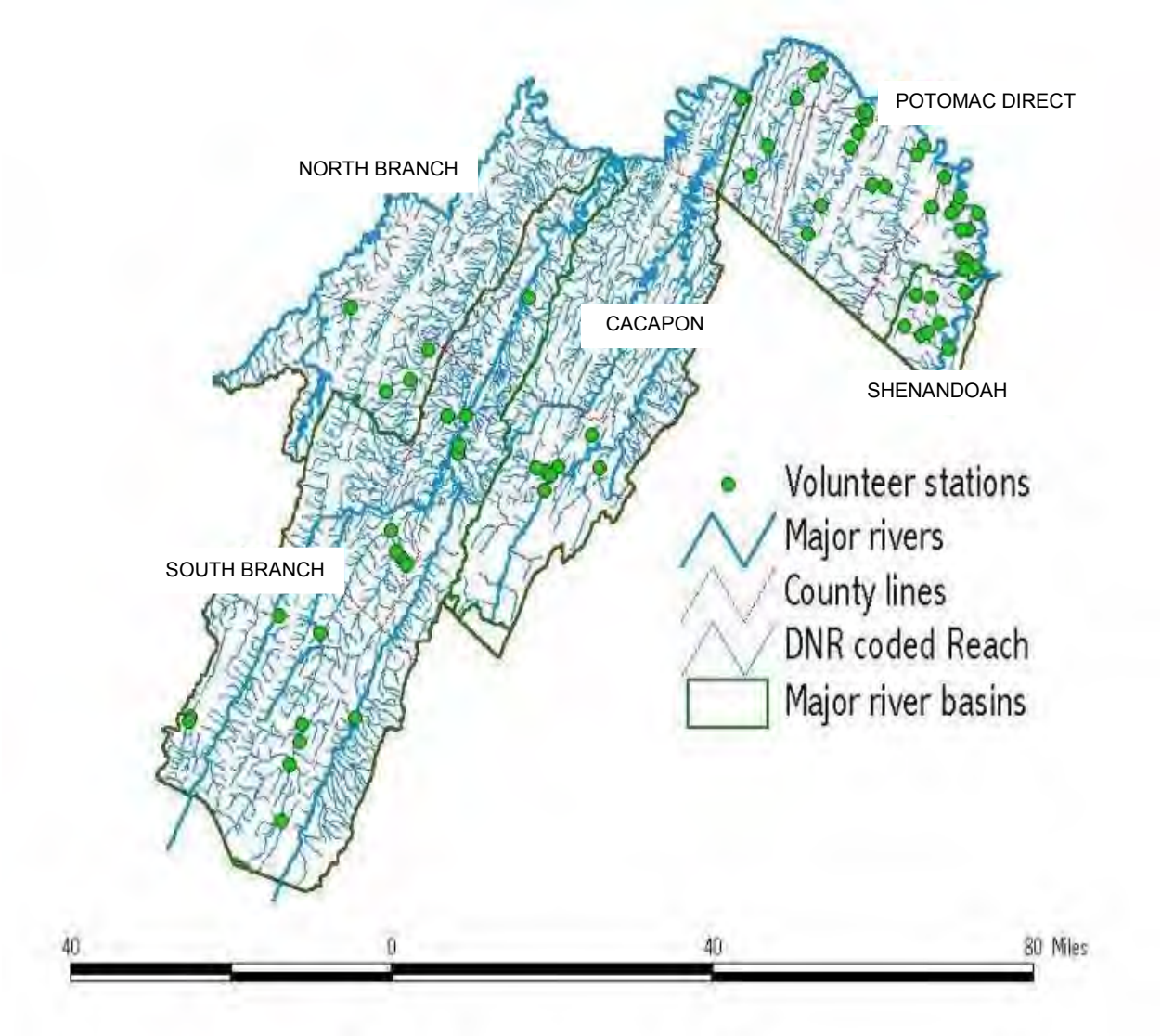
**Figure 2.** Basin Divisions for This Report



## THE POTOMAC BASIN

This region of West Virginia has shown the most consistent and sustained volunteer monitoring over the past several years. In 2002–2004 volunteers monitored 75 stations at least once (Figure 3), and about 50% of these stations were monitored on multiple occasions. Most of the long term monitoring has taken place in the Potomac Direct Drains and Shenandoah basins. The habitat and biological integrity rated in the low sub-optimal range and overall 45% of the stations were fully supporting, 27% were partially supporting and 28% were non-supporting. Impacts associated with development and agriculture seem to be the most significant contributors to stream disturbances in this region. Table 3 at the end of this section provides a look at the overall assessment within the basin.

**Figure 3.** Volunteer Stations in the Potomac



Volunteer monitoring groups from this region that sent information during this reporting period include Blue Heron Environmental Network, Sleepy Creek Watershed Association, Department of Highways, Marshall University, Cacapon Institute, Bakers Run Conservation Society, Friends of Spring Run, Jefferson County Watershed Coalition, The Mountain Institute, Berkeley County Chapter of the IWLA and Pendleton County Middle School.

**Potomac Direct Drain**

**Back Creek Watershed**

The guardian of this basin is the Blue Heron Environmental Network (BHEN). This group is one of the most active groups in the state and has been successful with many of their outreach campaigns in support of clean and healthy streams. The Back Creek Water Quality Initiative is one example of their efforts.

This effort involves working with landowners to help them understand and protect the resource by encouraging water monitoring and protection of buffers throughout the Back Creek Valley. Another part of the initiative is the effort to become part of the Wild and Scenic Rivers Program. BHEN began the process several years ago as a way to further the protection and preservation of their stream. Progress has slowed somewhat due to the local political climate, but a majority of the local residents support the effort.

The focus of the group the past few years has been to learn more about the effects of sediment; with the help of WV Save Our Streams, they have begun research into methods that can be used by volunteers to establish baseline conditions. A few workshops have occurred and thus far the focus has been on monitoring surface sediment and channel stability through a variety of pebble count methods and cross section measurements. In addition, BHEN helps to educate landowners and developers, and to encourage the use of the appropriate BMP's. Usually, the right procedure involves a combination of techniques such as silt fences, buffers, quick re-vegetation and the careful planning for drainage and water storage.

BHEN host the first stream workshop dedicated specifically to sediment monitoring. Several watershed groups in the Potomac Basin participated in the training.

The group has focused their monitoring efforts on the tributaries of Kate's Run, sections of Tilhance Creek and a small headwater stream named Harper Run. Many consider Harper Run to be an intermittent stream, however the group is well aware of its existence and its unique wetland environment. Harper Run has also been an area of contention for the group due to activities associated with the Tomahawk Race Track. There has been no good faith effort on the part of the track owners and operators to protect the resource, and the results have had dramatic impacts on this small

headwater stream. Landowners in the area have requested assistance from Blue Heron on several occasions, and thus far at least two surveys have been completed. The pictures on the next page dramatically illustrate the impacts to this small stream. Ask yourself the question; if you were an aquatic organism would you be able survive here?

Kate's Run is a small stream that drains from the northwestern corner of the watershed below the Berkeley County Landfill. The Run flows through some relatively old bottomland hardwood forest and has supported a wide variety of aquatic organisms. However, the landfill has had a dramatic impact on this stream in the past and there are still problems today. Since the early 1990's the stream has scored in the optimal range for biological integrity, but surveys indicate a decline in abundance and diversity.

Problems associated with the landfill's lining may be a possible cause of the decline as well as new housing developments in parts of the drainage. An unexplained white/gray fungus has been observed during low flow conditions on several occasions.

The 1st photo is Harper Run above the track; the second photo, silt fences placed directly into the stream creating a sediment dam; in the 3rd photo it is difficult to distinguish between land and water, in this case dirt was piled into the stream during trail construction.

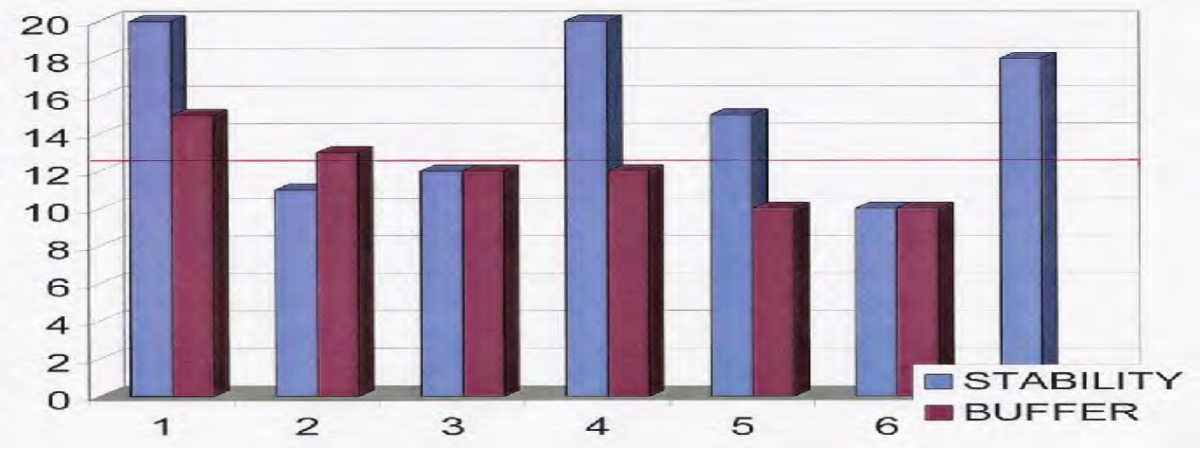
## Sleepy Creek Watershed

The Sleepy Creek Watershed is a sister and neighbor basin to Back Creek with many similarities. The guardian of this basin is the Sleepy Creek Watershed Association (SCWA). SCWA are active monitors of their stream, and they are closely monitoring the development that is rapidly approaching. The group has been able to maintain good relationships with landowners that live along the stream, mostly through their monitoring and non-confrontational outreach efforts. They have formed partnerships with Shepherd University and Canaan Valley Institute, and using a summer intern have compiled information, which they hope to use to show the value of their water resources.

The stream thus far has fairly good overall integrity with 57% of the stations fully supporting and 43% partially supporting mostly due to habitat conditions. Recent surveys focusing on the habitat have indicated deterioration, especially in the condition of the banks and the width of the

riparian buffers (Figure 5). Several property owners have encroached upon the buffer zone through their landscaping and gardening activities.

**Figure 5.** Buffer and bank stability conditions along Sleepy Creek




Subdivision development and construction activities are on the rise in much of the watershed with development occurring on or near the ridge-tops and adjacent to tributaries of Sleepy Creek. This is a concern to some of the SCWA members, and they are beginning to closely monitor the headwater and smaller tributaries that feed into the Sleepy Creek. No specific procedures are in place by the state to target these smaller very important water resources, so the group is looking into alternate methods, such as protocols used by the Ohio EPA for monitoring headwater streams.

**Cacapon**

Several groups are active in the Cacapon; these include the Friends of the Cacapon River, Bakers Run Conservation Society, and the Cacapon Institute. However, monitoring reports in 2003 and 2004 were sparse. This report contains information in the watershed from Bakers Run, contractors for the WV Department of Highways (DOH) and Marshall University (MU). The surveys reviewed from DOH and MU is part of the characterization of the streams that may be impacted during on-going construction of Corridor H through the area (Figure 5).

Stream Scholars study macroinvertebrates collected from Skaggs Run.

Even though actual surveys were somewhat limited, outreach activities were ongoing. The Cacapon Institute (CI) is one of the most active organizations. One example of CI's programs is **Stream Scholars**, a hands-on exploration of stream ecology for 7th through 9th grades that takes place in the summer months. CI also recently unveiled its virtual stream classroom for elementary

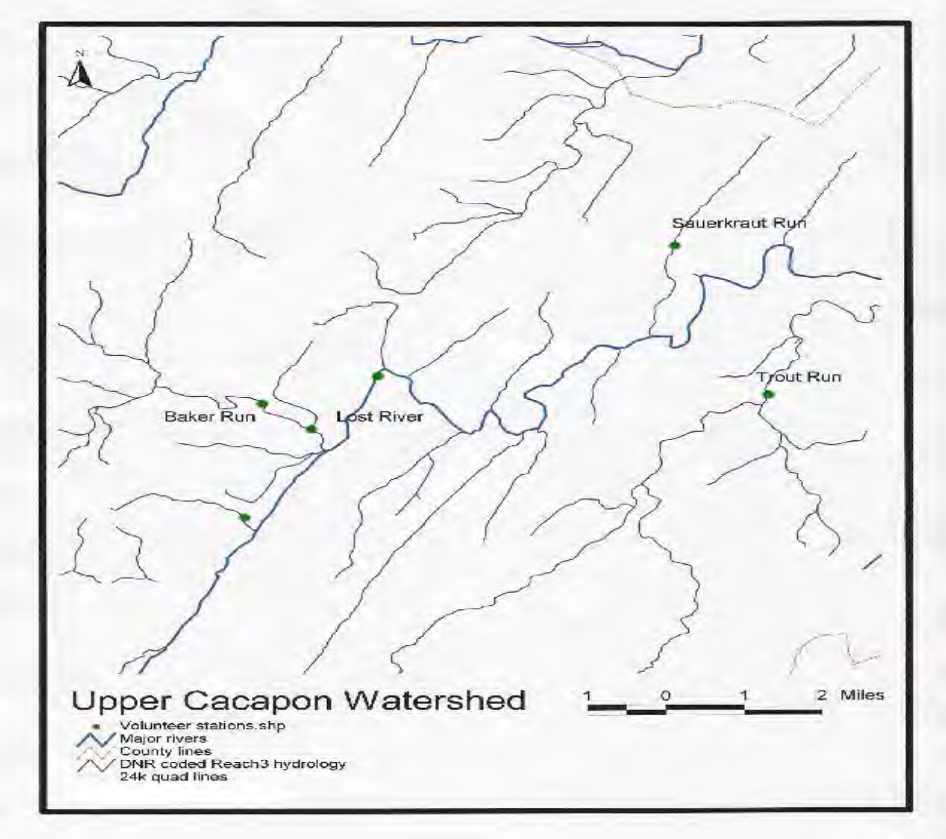
through high school students. More information about the CI's outreach activities, research projects and publications is on their web page at: **http://www.cacaponinstitute.org/**.

The Bakers Run Conservation Society hosts a **Watershed Awareness Day** at Hardy Middle School in the fall, which highlights many different types of water related activities including biomonitoring, habitat assessment, and fly fishing just to name a few. Carla Hardy of the WV Conservation Agency (WVCA) is an active partner and does a great deal of work to help organize this and other local events that highlight water quality and awareness.

The stations monitored within the Cacapon showed very healthy conditions overall, with 83% of the sites fully supporting. Most of the stations had optimal or sub-optimal biological and habitat integrity, and good water quality. Long Lick Run and sections of Sauerkraut Run scored slightly less than expected with only marginal habitat conditions.

An observed increase in algae growth was noted along some sections of Bakers Run and within certain reaches of the Cacapon and Lost Rivers. There is a great deal of agricultural activities along many of these waters, but no specific cause has been indicated. Members of the Friends of the Cacapon, WV River Network, Cacapon Institute and others are working with the Nutrient Criteria Committee to research the impacts to our waterways from nutrients such as nitrates and phosphates. West Virginia does not yet have a specific criterion to indicate nutrient enriched conditions.

**Figure 5.** Volunteer Monitoring Stations in the Upper Cacapon




Although not indicated on the map, Corridor H travels throughout most of the Baker Run watershed.

The road also travels along many sections of the Lost River, and crosses Trout Run and Sauerkraut Run at several locations.

**North and South Branch of the Potomac**

Multiple stream surveys from DOH and MU were reviewed from this basin related to Corridor H construction activity. There are several active volunteer groups in the area in the upper reaches of the South Branch in Pendleton and Hardy Counties, and in the lower reaches of Hampshire County. Groups submitting information for this report include Pendleton County Middle School, Friends of Spring Run Wild Trout, The Mountain Institute and scattered surveys from area high schools. Conditions were variable with only 44% of the stations rating as fully supporting, the majority of these located in the South Branch Basin. North Branch information is limited, however no stations rated as fully supporting. Much of the disturbances to the stream environments are related to past mining activity in the North Branch and agricultural activity in the South Branch.

Several very interesting projects have come about in this region over the last several years. WV Save Our Streams has formed some unique partnerships with state agencies, watershed groups and education and outreach specialists. One example is the program's cooperation with The Mountain Institute (TMI). TMI is an outdoor learning retreat located near the summit of Spruce Knob, West Virginia's highest peak. WV Save Our Streams is a volunteer member of the staff and works with TMI staff to train teachers and students about stream ecology. The partnership has resulted in the Potomac Stream Samplers Project, which targets middle and high school students and teachers of the region.

Initially, teachers meet for a three-day summer workshop to learn stream and watershed assessment skills. Following in-school sessions, students and teachers travel to the Potomac headwaters on Spruce Knob for a two-day outdoor watershed study. TMI staff then assists students back in their own school environment, as they work in teams to carry out an investigation of their local watershed including threats analysis (based on local land uses) and water quality sampling.

Potomac basin teachers learn an easy invertebrate field-sorting method during a summer workshop on Big Run located south of Spruce Knob.

Data will be shared with other schools via an on-line interactive "stream status" map interface that will give students a context for their local measurements. Liaison with local watershed groups will provide discussion opportunities, reinforcement of concepts, and community connections. A final watershed remediation activity will be suggested and carried out by each class. The three-day development workshop that inaugurates these projects includes:

- Overview of upstream-downstream linkages
- Watershed assessment and land use mapping techniques
- Water quality sampling and river stage
- Data analysis techniques
- Curriculum integration brainstorming session

In 2003, West Virginia Save Our Streams was the first to complete an ecological assessment of Spring Run. These assessments were completed due to concerns raised by Friends of Spring Run (FSR), a small watershed association that cooperates with the owners to operate a catch-and-release fly-fishing for a 1-¾ mile length of the stream. The property owners offer visitors, residents and others the chance to experience fly-fishing for wild trout through a no fee permit process. This permit, issued by FSR, provides access to the stream and specific guidelines to insure its protection. FSR also provides education and outreach to a local high school and other groups through fly-fishing and other stream related activities, has dramatically improved the stream by installing a variety of habitat improvement and streambank stabilization structures, and has enhanced the riparian zone with plantings of native grasses and trees.

FSR has noticed a declining mayfly hatch, and a decline in the size and numbers of trout, and a change in distribution of trout in the stream. Spring Run has produced wild rainbow trout for more than 50 years due to its cold alkaline waters, continually fed by a large spring in the headwaters. FSR feels that the practices of the upstream hatchery and possibly other land uses are having a negative impact on the rainbow trout fishery, the water quality and the diversity of the benthic macroinvertebrate communities.

These initial assessments provided baseline data and a better understanding of this rather unique stream's ecology. This initial effort has resulted in plans for additional studies on the Run starting in 2005 and continuing for the next several years. These studies will monitor the effects of a new treatment system that the hatchery plans to implement within the next year. The study will monitor invertebrate communities, habitat conditions focusing on sediment, and chemical constituents related to nutrients.

Partners involved thus far include Cacapon Institute, WV Division of Natural Resources, WV Conservation Agency, WV Save Our Streams, WV DEP's Watershed Assessment Branch, WV Department of Agriculture and Friends of Spring Run. The project will be funded in part by a grant from the Stream Partners Program, Chesapeake Bay Program funding and a variety of in-kind services provided by the partners.

**Shenandoah**

### Jefferson County Streams

For the past eight years the Jefferson County Watershed Coalition (JCWC) with training support from Blue Heron Environmental Network has been monitoring the streams of Jefferson County which drain to the Potomac and Shenandoah Rivers. The coalition uses teams of students from Shepherd University and long-time volunteers to monitor 20 stations (Figure 6). JCWC uses a unique sorting device to capture and count all macroinvertebrates that they collect, and sometimes the numbers range in the thousands!

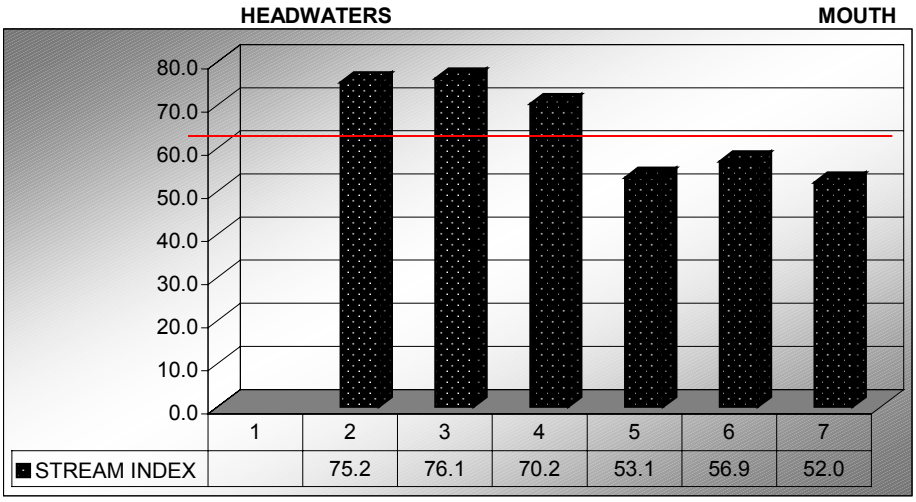
This process along with access to university labs adds a level of quality to the information not often duplicated by other volunteer monitors. Recently, WV Save Our Streams submitted portions of their biological data from Elk Run and Elk Branch to Tetra Tech, Inc. Tetra Tech is DEP's and EPA's contractor assisting with Total Maximum Daily Load (TMDL) development

throughout West Virginia. Tetra Tech plans to examine the information and use it to possibly enhance their model, thus better describing the ecological conditions of the region. Many streams in this area have been dramatically impacted by rampant development, inadequate sewage treatment and changes to the channel dynamics.


**Figure 6.** Jefferson County Watershed Coalition monitoring stations

Figure 7 provides an example of biological conditions from headwaters to mouth along Evitt's Run. The stream index score steadily declines as the stream flows towards the Shenandoah River. Many of the streams in the county seem to show a similar pattern, but even though the trends are clear, the county planners and developers show no signs of slowing progress. JCWC plans to enhance their monitoring effort by adding fecal coliform analysis (in order to gain more attention) and specific water chemistry, cutting back slightly on the analysis of the benthic macroinvertebrate communities.

**Figure 7.** Evitt's Run stream index scores




Scores below the red line indicate marginal biological integrity.

**Table 3**. Potomac Overall Assessment

| STREAM | BASIN | STATION | DATE | HABITAT | BIOLOGICAL | OVERALL | | | STATION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | FULLY | PARTIALLY | NON | |
| BAKERS RUN | CACAPON | 1 | | 67.0 | 87.5 | X | | | 77.3 |
| BAKERS RUN | CACAPON | 2 | | 60.0 | 78.5 | X | | | 69.3 |
| BAKERS RUN | CACAPON | 3 | | 65.0 | 84.1 | X | | | 74.6 |
| BAKERS RUN | CACAPON | 4 | May-04 | 78.3 | 77.4 | X | | | 77.9 |
| LONG LICK RUN | CACAPON | | | 58.0 | 83.7 | | X | | 70.9 |
| LOST RIVER | CACAPON | 1 | | 82.0 | 83.9 | X | | | 83.0 |
| LOST RIVER | CACAPON | 2 | | 82.0 | 86.3 | X | | | 84.2 |
| SAUERKRAUT RUN | CACAPON | 1 | | 66.0 | 50.8 | | X | | 58.4 |
| SAUERKRAUT RUN | CACAPON | 2 | | 68.0 | 87.0 | X | | | 77.5 |
| TROUT RUN | CACAPON | 1 | | 65.0 | 75.9 | X | | | 70.5 |
| TROUT RUN | CACAPON | 2 | | 65.0 | 76.5 | X | | | 70.8 |
| WAITES RUN | CACAPON | | | 80.0 | 87.0 | X | | | 83.5 |
| ABRAMS CREEK | NORTH BRANCH | | | 41.0 | 28.1 | | | X | 34.6 |
| ELKLICK RUN | NORTH BRANCH | | | 52.0 | 72.9 | | X | | 62.5 |
| NF PATTERSON CREEK | NORTH BRANCH | 1 | | 75.0 | 55.3 | | X | | 65.2 |
| NF PATTERSON CREEK | NORTH BRANCH | 2 | | 55.0 | 76.4 | | X | | 65.7 |
| PATTERSON CREEK | NORTH BRANCH | | | 79.0 | 67.0 | | X | | 73.0 |
| BACK CREEK | POTOMAC DIRECT | 3 | Jul-04 | 63.3 | 73.8 | | X | | 68.6 |
| ELK BRANCH | POTOMAC DIRECT | | Oct-03 | | 69.4 | X | | | 69.4 |
| ELK RUN | POTOMAC DIRECT | 1 | May-03 | | 63.4 | | | X | 63.4 |
| ELK RUN | POTOMAC DIRECT | 2 | Oct-03 | | 67.3 | X | | | 67.3 |
| ELK RUN | POTOMAC DIRECT | 1 | Oct-03 | | 70.8 | X | | | 70.8 |
| HARPER RUN | POTOMAC DIRECT | | Jul-03 | 71.5 | 7.7 | | X | | 39.6 |
| HALF MILE RUN | POTOMAC DIRECT | | Mar-04 | 81.7 | 84.7 | X | | | 83.2 |
| KATES RUN | POTOMAC DIRECT | | Jun-04 | 82.5 | 72.1 | X | | | 77.3 |
| OPEQUON CREEK | POTOMAC DIRECT | 2 | Jul-04 | 32.5 | 52.9 | | | X | 42.7 |
| OPEQUON CREEK | POTOMAC DIRECT | 1 | Oct-03 | 35.0 | 41.4 | | | X | 38.2 |
| RATTLESNAKE RUN | POTOMAC DIRECT | 3 | Sep-03 | | 43.9 | | | X | 43.9 |
| RATTLESNAKE RUN | POTOMAC DIRECT | 2 | Sep-03 | 66.0 | 32.5 | | X | | 49.3 |

| STREAM | BASIN | STATION | DATE | HABITAT | BIOLOGICAL | OVERALL | | | STATION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | FULLY | PARTIALLY | NON | |
| RATTLESNAKE RUN | POTOMAC DIRECT | 1 | Apr-03 | 66.0 | 75.4 | X | | | 70.7 |
| RATTLESNAKE RUN | POTOMAC DIRECT | 3 | Apr-03 | 58.3 | 42.7 | | | X | 50.5 |
| RATTLESNAKE RUN | POTOMAC DIRECT | 1 | Apr-03 | | 33.8 | | | X | 33.8 |
| ROCKY MARSH RUN | POTOMAC DIRECT | 1 | Oct-03 | | 48.8 | | X | | 48.8 |
| ROCKY MARSH RUN | POTOMAC DIRECT | 2 | Apr-03 | | 50.1 | | | X | 50.1 |
| SLEEPY CREEK | POTOMAC DIRECT | 1 | May-04 | 83.3 | 73.1 | X | | | 78.2 |
| SLEEPY CREEK | POTOMAC DIRECT | 2 | Jun-04 | 53.3 | 76.4 | | X | | 64.9 |
| SLEEPY CREEK | POTOMAC DIRECT | 3 | Jul-04 | 58.3 | 72.7 | | X | | 65.5 |
| SLEEPY CREEK | POTOMAC DIRECT | 3 | Nov-03 | 78.3 | 76.5 | X | | | 77.4 |
| SLEEPY CREEK | POTOMAC DIRECT | 2 | Aug-03 | 66.7 | 77.3 | X | | | 72.0 |
| SLEEPY CREEK | POTOMAC DIRECT | 1 | Jul-03 | 58.3 | 60.0 | | | X | 59.2 |
| SLEEPY CREEK | POTOMAC DIRECT | | Sep-04 | 96.7 | 72.4 | X | | | 84.6 |
| TOWN RUN | POTOMAC DIRECT | | Oct-03 | | 36.1 | | | X | 36.1 |
| TUSCARORA CREEK | POTOMAC DIRECT | 1 | Jul-04 | 75.0 | 60.0 | | X | | 67.5 |
| TUSCARORA CREEK | POTOMAC DIRECT | 2 | May-03 | 40.0 | 64.9 | | | X | 52.5 |
| ANDERSON RUN | SOUTH BRANCH | | | 54.0 | 55.1 | | X | | 54.6 |
| BIG RUN | SOUTH BRANCH | 1 | Apr-04 | 71.7 | 69.7 | X | | | 70.7 |
| BIG RUN | SOUTH BRANCH | 2 | Aug-04 | 64.5 | 94.3 | | X | | 79.4 |
| CLIFFORD HOLLOW | SOUTH BRANCH | | | 76.0 | 85.3 | X | | | 80.7 |
| DUMPLING RUN | SOUTH BRANCH | | | 57.0 | 69.7 | | X | | 63.4 |
| FORT RUN | SOUTH BRANCH | | | 68.0 | 71.4 | X | | | 69.7 |
| NORTH FORK | SOUTH BRANCH | | Oct-04 | 88.3 | 83.2 | X | | | 85.8 |
| SOUTH BRANCH | SOUTH BRANCH | | Oct-04 | 53.3 | 61.6 | | | X | 57.5 |
| SOUTH BRANCH | SOUTH BRANCH | | Oct-04 | 66.7 | 80.5 | X | | | 73.6 |
| SOUTH BRANCH | SOUTH BRANCH | | Oct-04 | 83.3 | 72.5 | X | | | 77.9 |
| SOUTH MILL CREEK | SOUTH BRANCH | | Jul-03 | 72.5 | 86.7 | X | | | 79.6 |
| SPRING RUN | SOUTH BRANCH | 1 | Jul-03 | 81.0 | 57.3 | | X | | 69.2 |
| SPRING RUN | SOUTH BRANCH | 2 | Jul-03 | 78.0 | 63.5 | | X | | 70.8 |
| SPRING RUN | SOUTH BRANCH | 3 | Jul-03 | 84.0 | 68.0 | X | | | 76.0 |
| SPRING RUN | SOUTH BRANCH | 4 | Jul-03 | 72.0 | 72.0 | X | | | 72.0 |
| SOUTH FORK | SOUTH BRANCH | | Oct-04 | 51.7 | 74.6 | | X | | 63.2 |
| TOMBS HOLLOW RUN | SOUTH BRANCH | | | 59.0 | 41.9 | | | X | 50.5 |
| WALNUT BOTTOM | SOUTH BRANCH | 1 | | 50.0 | 51.7 | | | X | 50.9 |
| WALNUT BOTTOM | SOUTH BRANCH | 2 | | 58.0 | 71.2 | X | | | 64.6 |
| BULLSKIN RUN | SHENANDOAH | 1 | Nov-03 | | 60.6 | | | X | 60.6 |
| BULLSKIN RUN | SHENANDOAH | 2 | Oct-03 | | 61.4 | | | X | 61.4 |
| BULLSKIN RUN | SHENANDOAH | 3 | Nov-03 | | 68.0 | X | | | 68.0 |
| EVITTS RUN | SHENANDOAH | 1 | May-03 | | 53.1 | | | X | 53.1 |
| EVITTS RUN | SHENANDOAH | 1 | Oct-03 | | 75.2 | X | | | 75.2 |
| EVITTS RUN | SHENANDOAH | 2 | Oct-03 | | 56.9 | | | x | 56.9 |
| EVITTS RUN | SHENANDOAH | 3 | Oct-03 | | 76.1 | X | | | 76.1 |
| EVITTS RUN | SHENANDOAH | 4 | Apr-03 | 65.0 | 52.0 | | x | | 58.5 |
| EVITTS RUN | SHENANDOAH | 4 | Oct-03 | | 70.2 | X | | | 70.2 |
| HUBBARDS RUN | SHENANDOAH | 1 | Nov-03 | | 38.8 | | | X | 38.8 |
| HUBBARDS RUN | SHENANDOAH | 2 | Apr-03 | 48.0 | 29.4 | | | x | 38.7 |
| **TOTALS AND AVERAGES** | | | | **65.9** | **65.2** | **34** | **20** | **21** | **65.6** |

**MARGINAL** AND **POOR** SCORES ARE HIGHLIGHTED

## THE MONONGAHELA BASIN

This region of West Virginia has been extensively characterized by volunteer monitors prior to 2002, especially in Monongalia and Preston counties by Downstream Alliance and Friends of Deckers Creek (see the reference section for more information), and has seen sustained volunteer efforts in the West Fork and Tygart Valley over the past several years. In 2003–2004 volunteers monitored 75 stations on a fairly regular basis (Figure 8). Long term and educational monitoring has been going on for many years on Files Creek and the Forks of Sandy Creek. Volunteer data collected from Watkins Run were a major factor for its addition to the presumptive Tier 2.5 list of high quality streams. The habitat and biological integrity rated in the high marginal range and overall 31% of the stations were fully supporting, 36% were partially supporting and 33% were non-supporting. Impacts associated with mining, especially abandoned mines, development and agriculture seem to be the most significant contributors to stream disturbances in this region. Table 5 at the end of this section provides a look at the overall assessment within the basin.

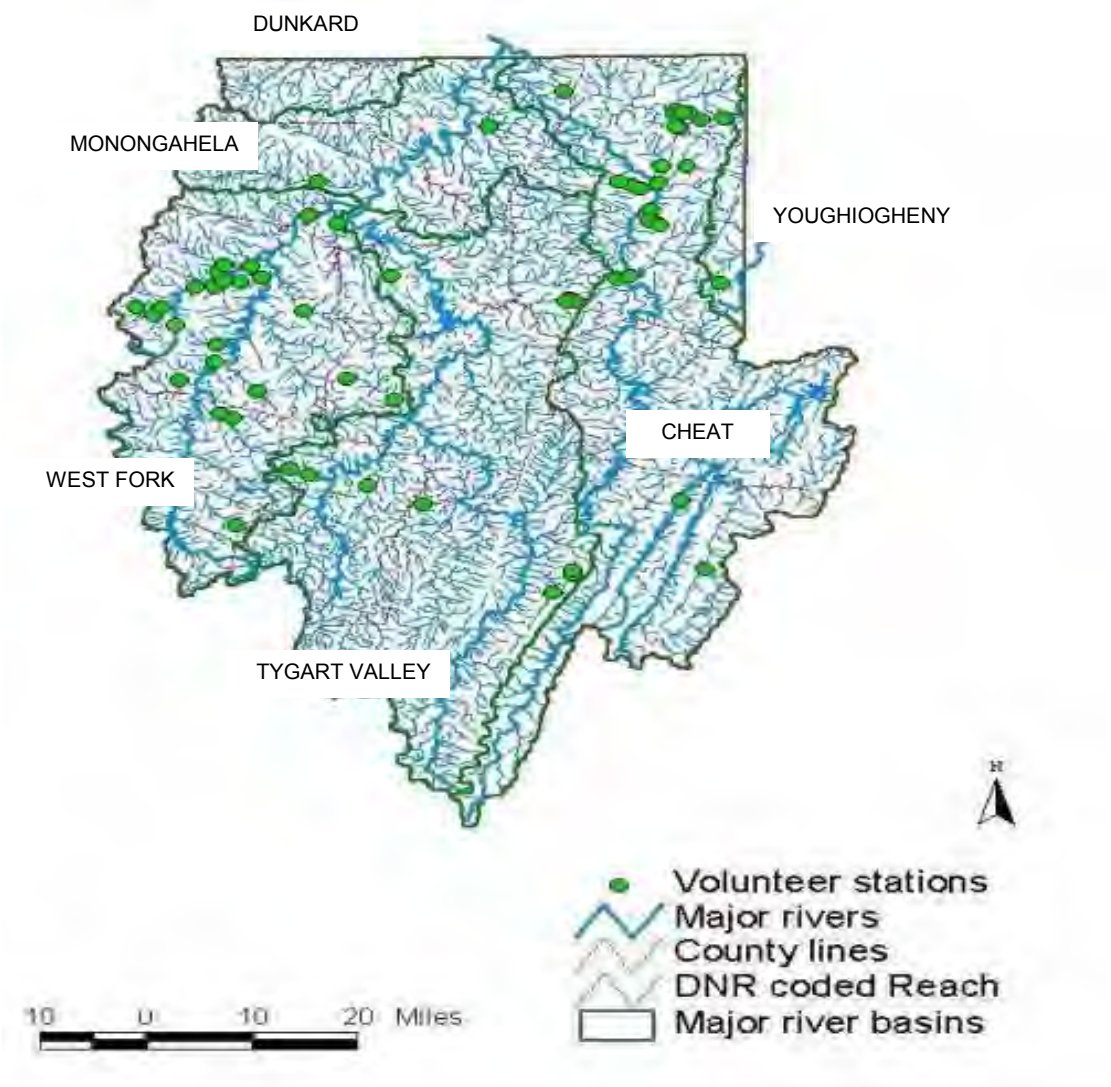



**Figure 8.** Volunteer Stations in the Monongahela Basin

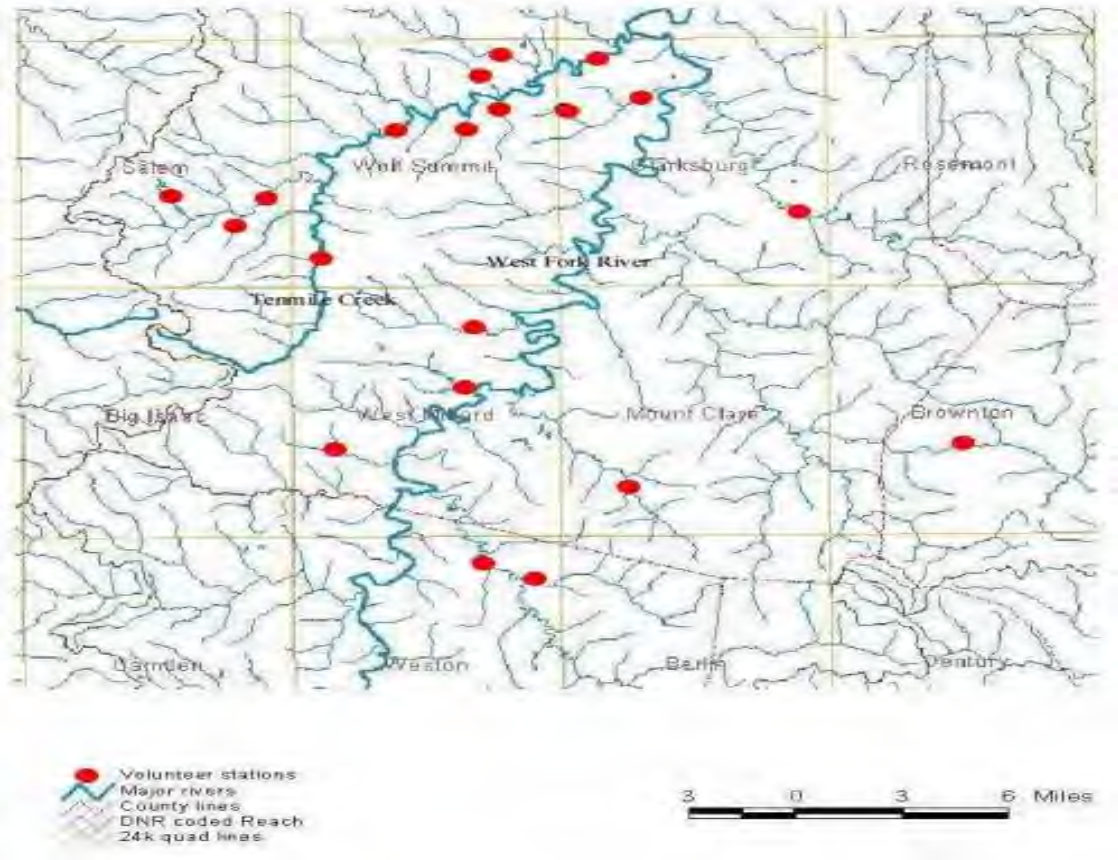
Volunteer monitoring groups from this region that sent information during this reporting period include Friends of the Cheat, Friends of Deckers Creek, Guardians of the West Fork, Lower West Fork Watershed Association, Aurora Elementary School, Elkins Middle and High School, Trout Unlimited, Buckhannon River Watershed Association, Alderson Broaddus College, Friends of Laurel Mountain and Sandy Pals 4-H Club.

**West Fork**

The activity in this basin centers largely on the reclamation of impacts associated with polluted coalmine drainage from abandoned mines. Watershed groups active in the basin are the Guardians of the West Fork and the Lower West Fork Watershed Association. The focus of the groups has been slightly different, but their efforts have generated interest from the local communities and resulted in several local projects or project proposals. One of their major partners is the Office of Surface Mining (OSM), which provides funding through the Appalachian Clean Streams Program and interns to watershed groups through the VISTA program. There is more about OSM later in this report.

The Guardians of the West Fork use monitoring as its major tool to show conditions of area streams and rivers. The group has been using advanced techniques for the past several years and has been able to characterize many of the regions waters (Figure 9).

**Figure 9.** Guardians of the West Fork monitoring stations



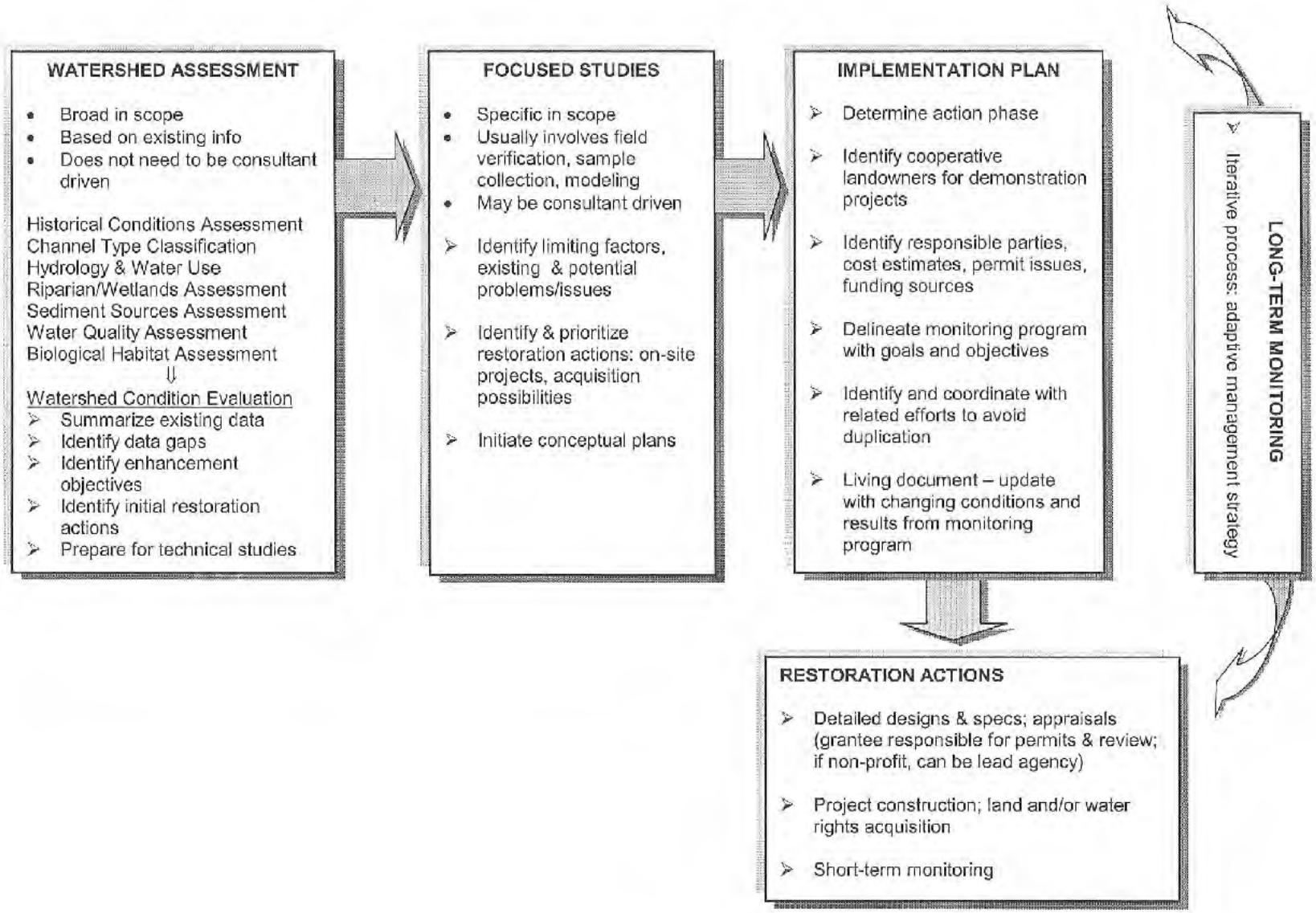
This high quality monitoring data has provided the group with focus and drawn in funding from OSM and WV DEP's Nonpoint Source Program. The Guardians, with assistance from Nonpoint field staff have written one of the state's first **watershed based plan** for Lambert's Run. A watershed based plan is probably the most important planning and implementation mechanism available to watershed groups and others interested in the protection and restoration of our water resources. The watershed based plan is specific to each watershed, however certain steps should be considered to help develop your plan. Figure 10 on the next page provides an example of a more technical approach, however the Nonpoint Program can work with you and your partners to help develop your plan.

Members from the Lower West Fork Watershed Association sort macroinvertebrates during a summer workshop on Helen's Run.

The Lower West Fork Watershed Association's strategy has been less technical, but still successful for initiating change and developing watershed based projects. Outreach and education have been their major focus, which includes working with local schools through demonstrations and by hosting the West Fork River Festival. A festival is a unique tool to improve community awareness and have fun. For many groups is a major fund raising mechanism that sustains group activities throughout the year.

Nearly all of the streams monitored by volunteers in this basin exhibited disturbed conditions. Overall average ratings were only marginal for both biological and habitat conditions and only two stations were assessed as fully supporting.

**Figure 10.** Watershed Planning Flowchart



## Cheat

The Friends of the Cheat (FOC) is one of the most successful groups in the state over the past several years. Their ability to engage partners and produce high quality information is key to their success. The **River of Promise** is a memorandum of agreement that the partners will work towards the preservation and restoration of the Lower Cheat River Watershed. FOC uses this mechanism to focus on restoration, preservation and education.

FOC have adopted the WV Save Our Streams intermediate and advanced monitoring techniques, and through the assistance of partners at WVU and Downstream Alliance are able to collect water quality information that is analyzed by a certified laboratory and macroinvertebrate samples that are identified to family level. Monitoring efforts are focused on marginal and sub optimal tributaries and are part of the effort to reintroduce native brook trout. Specific project monitoring to record the effects of acid mine drainage remediation on both water quality and biological integrity are also part of their monitoring efforts. A total of 22 stations (Figure 11), including reference sites, are monitored as part of this effort. At each station discharge is measured, invertebrates samples are collected, a visual habitat assessment is performed and water samples are collected for a suite of chemical analysis focusing primarily on parameters associated with mining (Table 4).

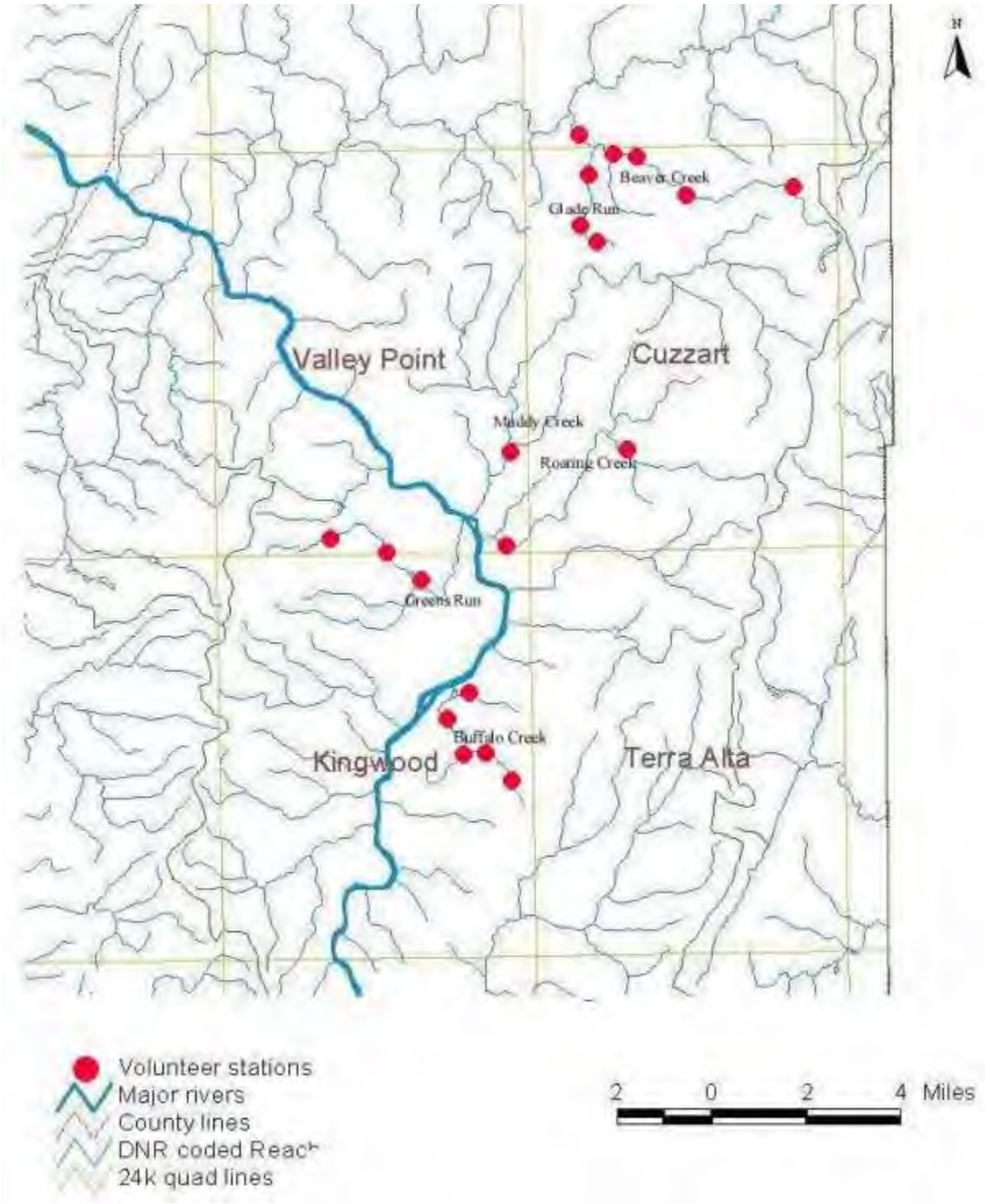
Thus far FOC has seen some improvements in conditions along portions of Beaver Creek, which once held substantial populations of brook trout, and Buffalo Run, which harbors excellent macroinvertebrate populations in some sections but still has certain water quality and habitat issues. Project monitoring on North Fork of Greens Run has shown slight improvements. Through monitoring FOC has been able to locate additional sites in the watershed that may be eligible for project funds. Read more about FOC's activities at **http://www.cheat.org/**.

**Table 4.** Results from samples collected at the North Fork of Greens Run project site

| STREAM | STATION | DATE | DISCHARGE | pH | ACIDITY | ALKALINITY | MG | CA | FE | AL | MN | $SO_4$ | DO | COND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NF GREENS RUN | 2-1 | 19-Jul-2003 | 2279.0 | 7.6 | 1.0 | 16.0 | 5.73 | 19.40 | 0.18 | 1.03 | 0.40 | 57.0 | | 164 |
| NF GREENS RUN | 2-2 | 19-Jul-2003 | 1988.0 | 4.6 | 24.0 | 1.0 | 2.16 | 8.28 | 0.53 | 2.41 | 0.66 | 36.0 | | 90 |
| NF GREENS RUN | 2-3 | 19-Jul-2003 | 1077.0 | 4.3 | 28.0 | 1.0 | 1.85 | 7.12 | 0.33 | 2.25 | 0.75 | 32.0 | | 100 |
| NF GREENS RUN | 2-1 | 4-Oct-2003 | NA | 6.6 | 1.0 | 9.0 | 3.32 | 13.70 | 0.41 | 1.39 | 0.40 | 48.0 | NA | 108 |
| NF GREENS RUN | 2-2 | 4-Oct-2003 | NA | 4.6 | 14.0 | 1.0 | 1.91 | 8.45 | 0.34 | 1.94 | 0.58 | 40.0 | NA | 89 |
| NF GREENS RUN | 2-3 | 4-Oct-2003 | NA | 6.7 | 1.0 | 12.0 | 1.40 | 6.15 | 0.34 | 1.69 | 0.61 | 37.0 | NA | 93 |
| NF GREENS RUN | 2-1 | 18-May-2004 | 5690.0 | 7.4 | 1.0 | 15.0 | 3.97 | 17.40 | 1.34 | 1.79 | 0.42 | 39.0 | 8.0 | 145 |
| NF GREENS RUN | 2-2 | 18-May-2004 | 3469.0 | 5.3 | 10.0 | 1.0 | 2.15 | 10.60 | 3.33 | 3.04 | 0.50 | 33.0 | 9.0 | 104 |
| NF GREENS RUN | 2-1 | 9-Sep-2004 | 3143.4 | 6.6 | 0.0 | 9.5 | 2.84 | 13.41 | <0.1 | <0.1 | 0.32 | 22.7 | 9.0 | 130 |
| NF GREENS RUN | 2-2 | 9-Sep-2004 | 2429.4 | 5.3 | 0.0 | 1.8 | 1.78 | 10.06 | 0.12 | 0.55 | 0.46 | 20.6 | 8.0 | 104 |

DISCHARGE = GALLONS/MINUTE; CHEIMCAL ATTRIBUTES EXCEPT FOR CONDUCTIVITY AND PH ARE MEASURED IN MG/LITER

**Figure 11.** Friends of the Cheat monitoring stations



## Tygart Valley

A wide variety of activities associated with volunteer monitoring are occurring in the Tygart Valley Basin. They include using monitoring as part of a science curriculum at middle and high schools, developing and implementing watershed based plans, and targeting select streams as high quality waters that deserve protection. Active groups in this basin include the Buckhannon River Watershed Association, Friends of Laurel Mountain, Sandy Pals 4-H Club and Elkins area high schools and middle schools. In 2004, this basin hosted the National Cannon Envirothon Competition, a high school level competition that focuses on four major areas (soil, aquatics, forestry and wildlife) of our natural resources. The WV Save Our Streams Coordinator has been the aquatics team leader for the past four years. Read more about West Virginia's Envirothon competition at: **http://www.wvca.us/envirothon/index.php**.

Many high quality waters occur in parts of this basin and remain so due primarily to the protection offered by the resource management practices within the Monongahela National Forest and because much of the region remains heavily forested. However, past mining activity, increased development, acid precipitation, and no buffer protection ordinances have resulted in disturbances to many sub watersheds within this basin.

Overall biological integrity fell in the high marginal range and overall habitat integrity rated sub-optimal. When habitat deterioration is not a plausible cause for disturbance to the macro-invertebrate communities, water quality is often a likely candidate.

## Sandy Creek and Watkins Run

A Watkins Run native Brook Trout rises for a drifting mayfly.

An excellent example of successful outreach occurred on Sandy Creek, which is located in the southwestern corner of Preston County. Sandy Creek was mined many years ago and although some reclamation took place such as the revegetation of old slag piles and filling in openings, much of the watershed was left untouched. For many years very little life existed in the lower portions of the stream and no one seemed to care until a small watershed group and 4-H club (Friends of Laurel Mountain (FLM) and Sandy Pals 4-H) began to monitor the stream. At first just a few signs of life were encountered, but over the years abundance and diversity has improved and the stream's poor biological integrity rating climbed to marginal and even sub-optimal in certain sections. The focus of this effort has always been on educating the young and showing them the importance of a living stream. Several local school projects have resulted and many county state essay winners have written about the stream. The last school project won recognition at the 2003 WV DNR Youth Conservation Day.

Monitoring information collected by FLM from Watkins Run, a small undisturbed tributary draining to the Cheat River from Laurel Mountain, was key to its addition to the presumptive Tier 2.5 list for high quality waters. Watkins Run is a beautiful cold-water steam protected by mountains and forests on all sides. The stream, however, is 80-90% privately and company owned so there are still threats of logging and quarry operations. Others who supported the protection of Watkins Run and attended Environmental Quality Board (EQB) public meetings include Trout Unlimited, WV Rivers Network, WV Save Our Streams and a majority of the local residents.

## The Buckhannon Watershed

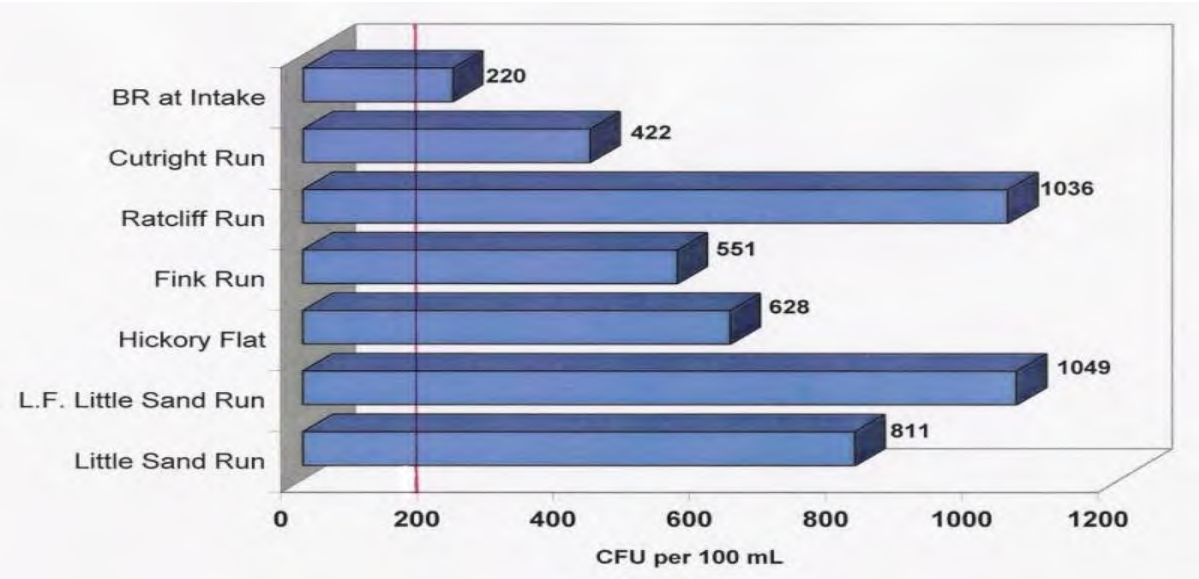
Often, partnerships and volunteer groups form around education institutions. These types of partnerships offer many types of benefits and in many cases adds credibility to the volunteer efforts. The Buckhannon River Watershed Association (BRWA) is an excellent example of this type of relationship. The association membership includes college students and professors, retired faculty members, agency representatives and members of the local business and professional community. BRWA has written several watershed based plans for restoring streams impaired by polluted coalmine drainage and other forms of acidity (Finks Run, Pecks Run and the Upper Buckhannon Basins). Resources of West Virginia Wesleyan College and the Highlands Institute for Environmental Research are used to assist in the group's efforts to restore, preserve and educate local citizens about the water quality within the basin.

Fecal coliform contamination has been a concern in the Buckhannon River watershed for several years. In 1998 a student and professor at West Virginia Wesleyan College conducted a watershed-wide survey of over 30 locations along the mainstem of the river and many of its tributaries (Long and Simmons, 1998). The most severely contaminated tributaries were located in and around the city of Buckhannon. Since 2001 the Buckhannon Sewer Department has been monitoring fecal coliform levels in the river mainstem in and around Buckhannon and has found that higher flows lead to dramatic increases in coliform concentrations.

In 2003 the BRWA was awarded a Stream Partners Grant to pursue additional coliform testing. The main goal of this sampling was to perform an intensive sampling of a few tributaries to determine whether or not the streams should be categorized as "Impaired" according to state water quality criteria.

The geometric mean of coliform concentrations at each site is shown in Figure 12. West Virginia's water quality regulations state that if the mean coliform concentration (the geometric mean of no less than 5 samples taken during a one-month period) is greater than 200 CFU per 100 ml, then the water body should be considered "Impaired" for recreation and drinking water uses. All seven sampling sites violated state water quality criteria during April 2004.

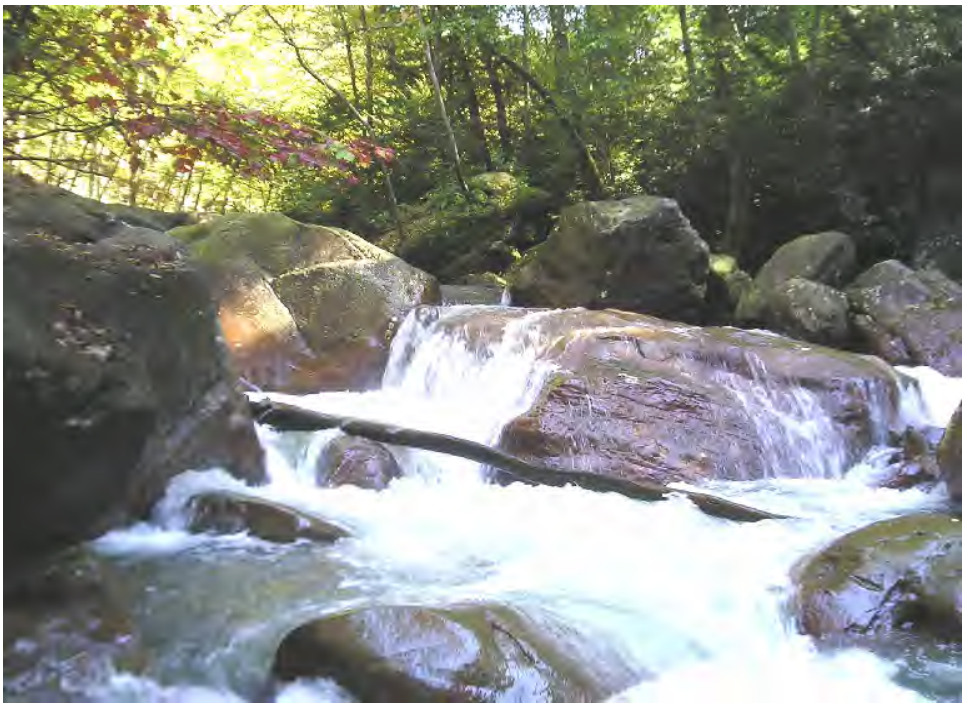
**Figure 12.** Fecal Coliform concentrations from the Buckhannon River




## Monongahela

### Deckers Creek

Friends of Deckers Creek (FODC) started out as a sibling association about four years ago encouraged and mentored by the Friends of the Cheat, but they are now a credible organization of their own with a wide variety of partners and successful endeavors. Deckers Creek has some scenic canyons and waterfalls along much of the stream, but the orange stain of past mining has distracted from the scenic beauty of this stream. The orange color can be seen on more than 50% of the stream, all the way to the Monongahela River through Morgantown. The group, however, has not been distracted; they have forged ahead and made progress, mostly through monitoring and outreach, to secure funds for reclamation projects throughout the watershed. FODC has done much of the monitoring themselves but other partners such as West Virginia University, Downstream Alliance (DA), WV Division of Natural Resources, Office of Surface Mining, DEP's Abandoned Mine and Reclamation Sections and others have contributed. The results can be seen in the "*AMD in Deckers Creek: What We Know So Far*" published by DA in 2002.



Deckers Creek gorge in the upper reaches of the watershed

**Table 5**. Monongahela Overall Assessment

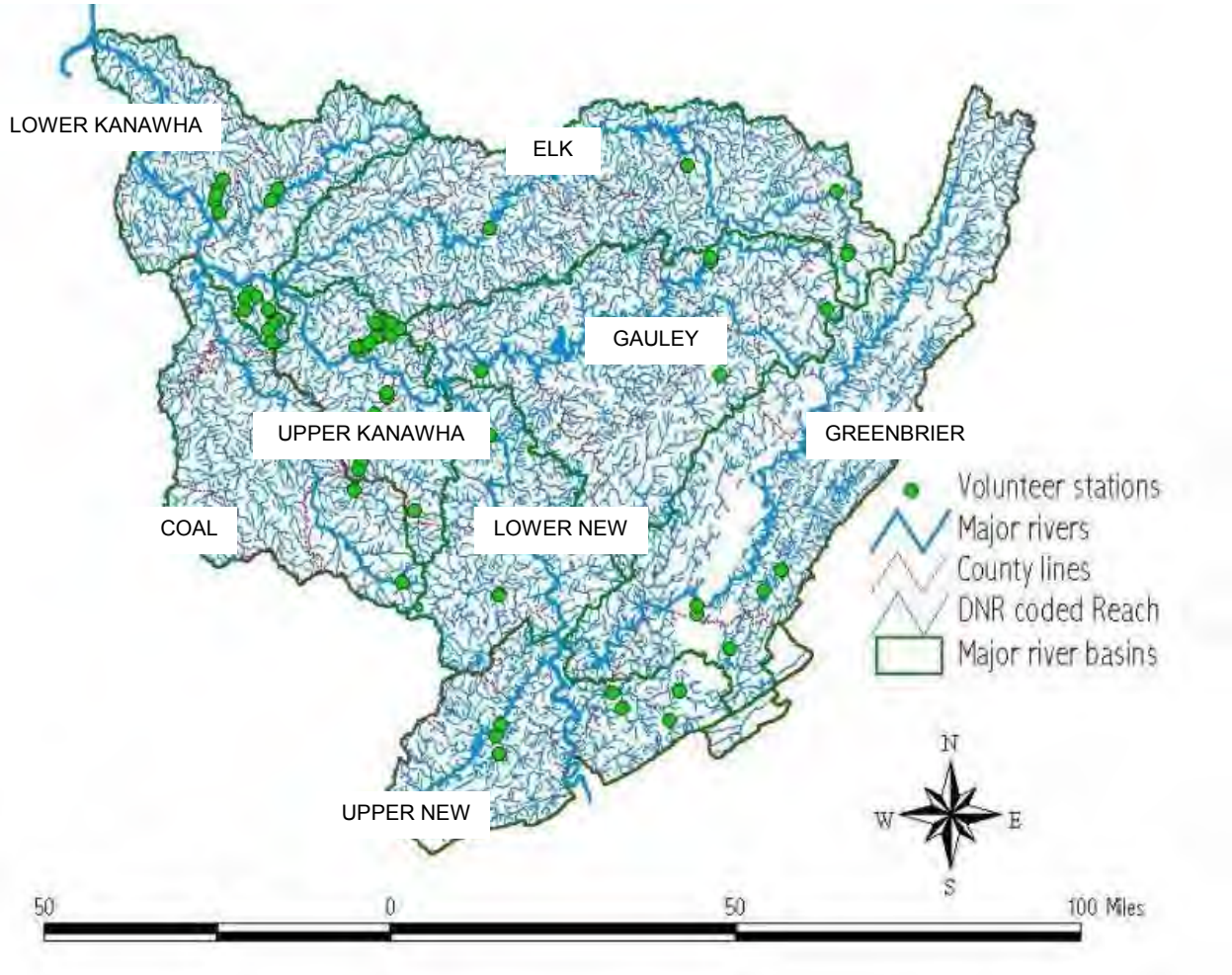
| STREAM | BASIN | STATION | DATE | HABITAT | BIOLOGICAL | OVERALL | | | STATION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | FULLY | PARTIALLY | NON | |
| BEAVER CREEK | CHEAT | 3-1 | Aug-03 | 67.0 | 57.3 | | x | | 62.2 |
| BEAVER CREEK | CHEAT | 3-2 | Jul-03 | 73.0 | 83.4 | x | | | 78.2 |
| BEAVER CREEK | CHEAT | 3-3 | Jul-03 | 81.0 | 71.3 | x | | | 76.2 |
| BEAVER CREEK | CHEAT | 3-4 | Aug-03 | 35.0 | 44.4 | | | x | 39.7 |
| BEAVER CREEK | CHEAT | 3-5 | Aug-03 | 68.0 | 50.3 | | x | | 59.2 |
| BEAVER CREEK | CHEAT | 3-6 | Aug-03 | 64.0 | 44.9 | | | x | 54.5 |
| BEAVER CREEK | CHEAT | 3-7 | Aug-03 | 66.0 | 77.3 | x | | | 71.7 |
| BEAVER CREEK | CHEAT | 3-1 | May-04 | 74.0 | 63.2 | | x | | 68.6 |
| BEAVER CREEK | CHEAT | 3-5 | May-04 | 72.0 | 82.8 | x | | | 77.4 |
| BEAVER CREEK | CHEAT | 3-8 | May-04 | 56.0 | 22.6 | | | x | 39.3 |
| BUFFALO RUN | CHEAT | 1-2 | Apr-04 | 54.0 | 93.8 | | x | | 73.9 |
| BUFFALO RUN | CHEAT | 1-1 | Aug-03 | 64.0 | 70.4 | | x | | 67.2 |
| BUFFALO RUN | CHEAT | 1-2 | Aug-03 | 70.0 | 89.7 | x | | | 79.9 |
| BUFFALO RUN | CHEAT | 1-3 | Aug-03 | 64.0 | 68.7 | | x | | 66.4 |
| BUFFALO RUN | CHEAT | 1-4 | Aug-03 | 73.0 | 67.4 | x | | | 70.2 |
| BUFFALO RUN | CHEAT | 1-5 | Aug-03 | 58.0 | 61.7 | | | x | 59.9 |
| BUFFALO RUN | CHEAT | 1-6 | Aug-03 | 68.0 | 84.9 | x | | | 76.5 |
| BUFFALO RUN | CHEAT | 1-7 | Jul-03 | 61.0 | 73.7 | | x | | 67.4 |
| BUFFALO RUN | CHEAT | | Oct-04 | | 61.4 | | | x | 61.4 |
| BUFFALO RUN | CHEAT | 1-1 | May-04 | 55.0 | 73.0 | | x | | 64.0 |
| BUFFALO RUN | CHEAT | 1-3 | May-04 | 54.0 | 64.6 | | | x | 59.3 |
| BUFFALO RUN | CHEAT | 1-5 | May-04 | 42.0 | 78.3 | | x | | 60.2 |
| BUFFALO RUN | CHEAT | 1-6 | May-04 | 66.0 | 83.0 | x | | | 74.5 |

| STREAM | BASIN | STATION | DATE | HABITAT | BIOLOGICAL | OVERALL | | | STATION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | FULLY | PARTIALLY | NON | |
| BUFFALO RUN | CHEAT | 1-7 | May-04 | 72.0 | 50.0 | | x | | 61.0 |
| GLADY FORK | CHEAT | | Aug-04 | 73.0 | 86.1 | x | | | 79.6 |
| GLADE RUN | CHEAT | 4-1 | Jul-03 | 43.0 | 31.3 | | | x | 37.2 |
| GLADE RUN | CHEAT | 4-2 | Jul-03 | 29.0 | 33.0 | | | x | 31.0 |
| GLADE RUN | CHEAT | 4-3 | Jul-03 | 34.0 | 43.9 | | | x | 39.0 |
| GLADE RUN | CHEAT | 4-2 | May-04 | 42.5 | 48.2 | | | x | 45.4 |
| GLADE RUN | CHEAT | 4-3 | May-04 | 36.0 | 42.5 | | | x | 39.3 |
| MUDDY CREEK | CHEAT | 1 | Jun-03 | 75.0 | 81.3 | x | | | 78.2 |
| NF GREENS RUN | CHEAT | 2-1 | Jul-03 | 73.0 | 47.4 | x | | | 60.2 |
| NF GREENS RUN | CHEAT | 2-2 | Jul-03 | 79.0 | 68.4 | x | | | 73.7 |
| NF GREENS RUN | CHEAT | 2-3 | Jul-03 | 83.0 | 51.4 | | x | | 67.2 |
| NF GREENS RUN | CHEAT | 2-1 | May-04 | 50.0 | 43.8 | | | x | 46.9 |
| NF GREENS RUN | CHEAT | 2-2 | May-04 | 36.0 | 51.1 | | | x | 43.6 |
| ROARING CREEK | CHEAT | 1 | Jun-03 | 41.3 | 78.2 | | x | | 59.8 |
| ROARING CREEK | CHEAT | 2 | Jul-03 | 68.0 | 82.6 | | | | 75.3 |
| WATKINS RUN | CHEAT | 1 | May-03 | 87.0 | 80.7 | x | | | 83.9 |
| WATKINS RUN | CHEAT | 2 | Aug-03 | 81.0 | 75.3 | x | | | 78.2 |
| WATKINS RUN | CHEAT | 2 | Aug-04 | 96.0 | 76.0 | x | | | 86.0 |
| LEADING CREEK | TYGART VALLEY | | | 57.0 | 71.5 | | x | | 64.3 |
| LF FILES CREEK | TYGART VALLEY | | Jun-04 | 68.8 | 77.7 | x | | | 73.3 |
| LF FILES CREEK | TYGART VALLEY | | May-04 | 66.7 | 66.0 | x | | | 66.4 |
| LF FILES CREEK | TYGART VALLEY | | May-03 | 66.7 | 68.6 | x | | | 67.7 |
| LB/LF SANDY CREEK | TYGART VALLEY | 1 | Jun-04 | 52.5 | 73.2 | | x | | 62.9 |
| LB/LF SANDY CREEK | TYGART VALLEY | 1 | Jul-03 | 56.7 | 57.1 | | | x | 56.9 |
| LB/LF SANDY CREEK | TYGART VALLEY | 2 | Aug-04 | 52.5 | 78.9 | | x | | 65.7 |
| LF SANDY CREEK | TYGART VALLEY | | Jul-03 | 33.3 | 54.1 | | | x | 43.7 |
| LF SANDY CREEK | TYGART VALLEY | | May-03 | 45.0 | 53.4 | | | x | 49.2 |
| MILLSTONE CREEK | TYGART VALLEY | | May-04 | 91.7 | 63.6 | | x | | 77.7 |
| MILLSTONE CREEK | TYGART VALLEY | | May-03 | 91.7 | 80.0 | x | | | 85.9 |
| RB/LK SANDY CREEK | TYGART VALLEY | 2 | Jun-04 | 72.5 | 53.3 | | x | | 62.9 |
| RB/LF SANDY CREEK | TYGART VALLEY | 2 | May-03 | 50.0 | 62.1 | | | x | 56.1 |
| RB/LF SANDY CREEK | TYGART VALLEY | 2 | Jul-03 | 74.0 | 51.1 | | X | | 62.6 |
| RB/LF SANDY CREEK | TYGART VALLEY | 1 | Aug-04 | 72.5 | 45.5 | | X | | 59.0 |
| UNT MIDDLE FORK RIVER | TYGART VALLEY | | Jul-04 | 71.0 | 45.0 | | X | | 58.0 |
| BOOTH CREEK | WEST FORK | | Jul-03 | 48.0 | 75.9 | | X | | 62.0 |
| BRUSHY FORK | WEST FORK | | Jul-03 | 74.5 | 55.5 | | X | | 65.0 |
| ELK CREEK | WEST FORK | | Mar-04 | 62.0 | 67.0 | | x | | 64.5 |
| HELENS RUN | WEST FORK | | Aug-04 | 41.7 | 62.1 | | | X | 51.9 |
| ISAACS CREEK | WEST FORK | | Jul-03 | 63.0 | 57.9 | | | x | 60.5 |
| KINCHELOE CREEK | WEST FORK | | Jul-03 | 55.5 | 70.3 | | X | | 62.9 |
| LAMBERTS RUN | WEST FORK | | Jun-03 | 83.0 | 27.7 | | x | | 55.4 |
| SALEM FORK | WEST FORK | | May-03 | 64.0 | 53.3 | | | X | 58.7 |
| SKIN CREEK | WEST FORK | | Apr-03 | 54.0 | 59.7 | | | x | 56.9 |
| TENMILE CREEK | WEST FORK | | Sep-03 | 56.5 | 65.4 | | X | | 61.0 |
| TWO LICK CREEK | WEST FORK | | Jul-03 | 69.5 | 70.7 | X | | | 70.1 |
| UNT LAMBERTS RUN | WEST FORK | | May-03 | | 0.0 | | | x | 0.0 |
| RHINE CREEK | YOUGHIOGHENY | | Apr-03 | 80.0 | 72.0 | x | | | 76.0 |

**MARGINAL** AND **POOR** SCORES ARE HIGHLIGHTED

## THE KANAWHA BASIN

**Figure 13.** Volunteer stations in the Kanawha Basin




This region of West Virginia also has had consistent and sustained volunteer monitoring over the past several years. In 2003–2004 volunteers monitored 53 stations at least once (Figure 13), and about 30% of these stations were monitored on multiple occasions, usually in the spring and fall. Most of the monitoring took place in the Upper and Lower Kanawha Basins. The habitat and biological integrity rated marginal and overall 30% of the stations were fully supporting, 42% were partially supporting and 28% were non-supporting. However, several very high quality streams are located in this region. Table 8 at the end of this section provides a look at the overall assessment within the basin.

Impacts associated with major resource extraction activities such as mining, logging and oil and gas well development were major contributors to stream impacts. Additionally there were many impacts associated with development such as impervious surfaces (parking lots, roads etc.), channel modifications, urban and sub urban sprawl and inadequate sewage in some parts of the basin. Agricultural impacts were somewhat limited in this region, except for the Upper New River and Greenbrier Basins.

HMWO collects macroinvertebrates from their reference stations above the mine drainage impacts.

Volunteer monitoring groups from this region that sent information during this reporting period include the Heizer-Manila Watershed Organization, Lower Paint Creek Watershed Association, Lower Greenbrier Watershed Association, Indian Creek Watershed Association, Pikeview High School, Oak Hill Catholic Center, Kelly's Creek Community Association, Morris Creek Watershed Association, Trout Unlimited and the Elk Headwaters Association.

**Upper and Lower Kanawha**

Several groups have been monitoring streams in this basin for extended periods with some success and frustration. We often measure success in water quality by our ability to show improvements. Many of the streams in this region have not dramatically improved but have either remained the same, or in some cases degraded even further. Possibly, an alternate measure of success could be based upon the level of effort and commitment towards our goals, even though these goals are often not met in what some feel is a timely manner. This section briefly highlights several active groups from this basin.

**Heizer Creek**

Heizer and Manila Creeks have resided on the 303(d) list for many years and other than maintenance checks on a few portals due to safety risks, no water quality implementation plans have been attempted by the state agencies. However, TMDL monitoring has occurred over the past year for metals (aluminum, iron and manganese) and pH by the Watershed Assessment Section. This information is complimented by the efforts of the Heizer-Manila Watershed Organization (HMWO) who in 2004 submitted data that was accepted as credible enough to be included for 303(d) purposes. TMDL development, which includes data analysis, modeling and reporting for Heizer Creek is scheduled for 2005. HMWO has not waited on the state to act but have been experimenting with pilot wetlands in an attempt to reduce the metal loads on select small tributaries. There have been some successes but due to intense precipitation over the past several years; these small wetlands have not been able to maintain enough storage time for load reductions.

In addition to being involved in intense monitoring, HMWO is also one of the few groups certified to teach level one WV Save Our Streams classes and is able to use this certification as a mechanism to encourage schools and local 4-H groups to participate in stream related activities. Other than monitoring, HMWO completes regular trash collections and has recently completed an extensive willow planting effort to help restore eroded streambanks.

The efforts of HMWO have not gone unnoticed. They have been awarded for several accomplishments at Watershed Celebration Day and through the local Conservation Districts.

## Davis Creek

The Davis Creek Watershed Association (DCWA) has had some setbacks in 2003 and 2004 due mainly to devastating flooding within the watershed. Extreme rains resulted in some of the highest water levels in more than 20 years. Much of the group's equipment and survey data was damaged so the information recorded was lost. However, like most of the volunteer groups in West Virginia, Davis Creek did not give up, and with assistance from DEP a major clean up was undertaken. Volunteers from Charleston area DEP offices, local residents and volunteers from the watershed association participated.

Even though recent monitoring information was lost, from 1996-2002 the group has successfully documented the increased erosion, increased sedimentation and changes to the macroinvertebrate communities that have occurred. Parts of the stream's headwaters are relatively well protected due to its beginnings in Kanawha State Forest, but even increased use of this facility has had impacts on the upper stream reaches. The most dramatic impacts are from the development of the shopping centers of Southridge and Shops at Trace Fork along Corridor G. Development of these large shopping, restaurant and entertainment complexes continues to proceed. High levels of embeddedness, or in some cases complete burial of riffle habitat in Trace Fork, is just one example of the impacts.

## Paint Creek

Volunteer monitoring on Paint Creek's stream has been very site specific, focusing on bank and structure repair projects. WV Save Our Streams provided assistance with the planning, permit requirements and monitoring of two projects on the stream. The project on Ash Branch, a small cold-water tributary located about midway within the watershed is discussed here.

Early in 1994-1995 Trout Unlimited (TU) placed K-dams, also called splash-dams, in Ash Branch. The structures were designed to create pools to improve the habitat of the stream for trout. In addition to the structures, fingerling brown, brook and rainbow trout were introduced to the stream.

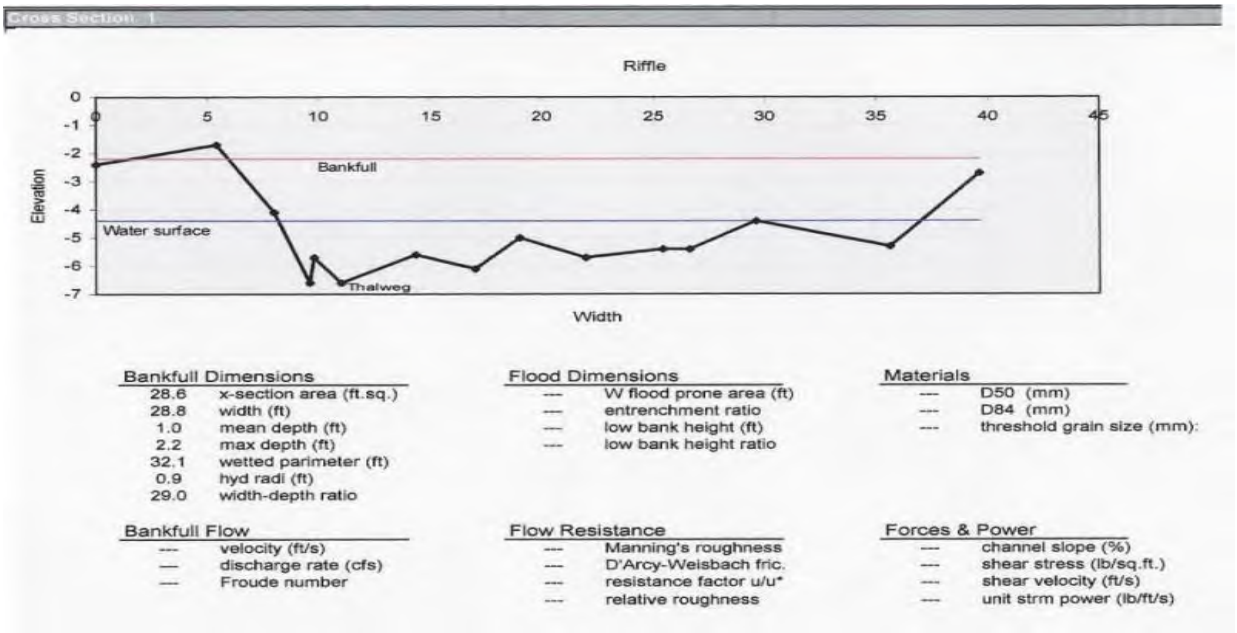
The arm of the K-Dam has collapsed resulting in bank erosion adjacent to the structure as well as further downstream.

The integrity of these structures survived for many years, however, the consistent storm flows over the last several years (rainfall was 22% above normal in 2002-2004) compromised structures in the lower reaches causing extensive erosion and channel widening. Mitigation money became available to the Lower Paint Creek Watershed Association (LPCWA) through its association with TU. Together, the groups decided to use the money to repair the structures. WV Save Our Streams encouraged TU and LPCWA to design a monitoring plan so that changes to the channel, sedimentation and biological integrity could be tracked.

The monitoring plan incorporates the use of certain channel classification measurements (Rosgen, 1998), such as cross-section and longitudinal profiles in reference areas and in the project areas and pebble counts to capture changes to the surface sediment. In addition, the standard stream assessment methods from the WV Save Our Streams program will be part of the monitoring scheme.

The project has proceeded somewhat slowly, but some initial channel data (Figure 14) has been collected and permits have been approved. Repair and construction as well as additional monitoring should begin in the spring or summer of 2005.

**Figure 14.** Ash Branch cross-section profile



## Morris Creek

Morris Creek is located on the Fayette/Kanawha County lines and is another stream that has been dramatically impacted by polluted coalmine drainage from abandoned mines. The Morris Creek Watershed Association (MCWA) is the local guardian and they have had great success with outreach in the local community and in developing partnerships with DEP's Stream Restoration Group, Abandoned Mine and Reclamation Section, Nonpoint Program, Office of Surface Mining, National Hummer Club, WV Tech and Marshall University just to name a few.

Morris Creek community members demonstrate kick-net washing 101 during a summer stream-monitoring workshop in the headwaters of Morris Creek.

MCWA is currently working on a watershed based plan that will remediate much of the mine drainage. They are also working on establishing an education center and continuing outreach through stream-monitoring using Hummers to gain access to headwater areas and to offer tours within the watershed. John King, an environmental science major at Marshall University is a member of the association and is currently working on his masters using the WV Save Our Streams protocols as his guide.

In addition to the mine drainage treatment the MCWA will also include a **sediment monitoring program** as part of its watershed based plan, using methods designed for volunteers by WV Save Our Streams. The methods are similar to those described previously for the Ash Branch project.

## Upper Elk River

The **Kanawha Valley Chapter of Trout Unlimited** has adopted the WV Save Our Streams protocols and has begun to incorporate a long-term monitoring program with their regular trout stocking and outreach programs. Its mission to "***conserve, protect and restore North America's trout and salmon fisheries and their watersheds***" makes TU an excellent partner for WV Save Our Streams and many other organizations. Their members bring a great deal of knowledge and expertise about natural stream conditions and are committed to their mission.

In West Virginia, several chapters have had training, but thus far the Kanawha Valley Chapter is the only one who has a specific monitoring plan. TU's focus is the Upper Elk Watershed, one of the most pristine watersheds in our state. The area is nationally recognized for its trout fishing opportunities, abundance of outdoor recreation and its scenic beauty. The local residents feel that protection and preservation seems to be

secondary, even though the quality of the land and water is the reason for the interest in the first place.

Members of TU and EHA participate in a Level three stream-monitoring workshop on a "very warm" spring Saturday.

Using the advanced WV Save Our Streams techniques, TU has an ambitious schedule targeting the mouths of select tributaries and sections of the main stream on the Upper Elk River. Figure 15 depicts monitoring results over the last several years. Its partner in the region is the **Elk Headwaters Association** (EHA). EHA helps to organize monitoring related and other watershed outreach activities in the region. In addition to the procedures adopted, TU also incorporates a unique sediment monitoring procedure designed by the US Forest Service (USFS).

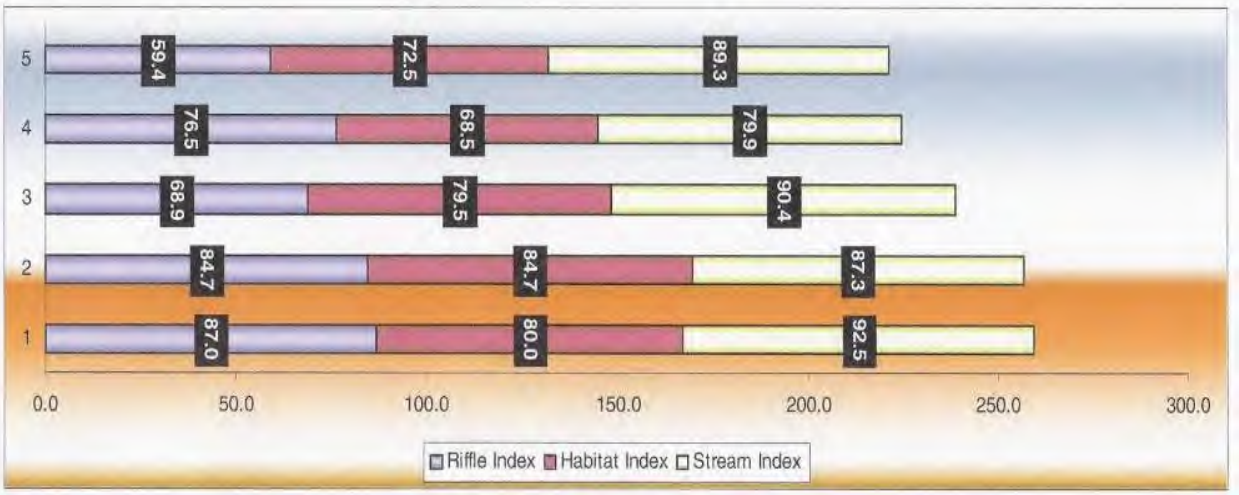
Studies on western mountain streams suggest that interstitial sediments finer than 4 mm reduce the permeability of the gravel and can impair the inter-gravel water flow needed to provide oxygen and remove metabolic wastes from trout embryos. The embryos can successfully hatch into alevins (fry), but they are unable to migrate upwards through the gravel to emerge because the inter-gravel pores are blocked. Mortality increases as the percentage of materials less than 4 mm increase. The USFS estimates that percentages of ≥ 30% impact the success of trout spawning in eastern streams. Thus far data has been collected by TU and the USFS since 1997. This type of monitoring may help focus attention on the area's unique resources and could be a valuable component of a monitoring plan, if the appropriate quality assurance and quality control (QAQC) procedures are written. Table 6 provides a summary of select stations.

**Table 6.** Interstitial sediment analysis on Upper Elk tributaries

| **Stations** | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | Overall Average |
|---|---|---|---|---|---|---|---|
| Big Run (below Slaty Fork) | 26.0 | 24.0 | **31.5** | 29.8 | No data | 25.6 | 27.4 |
| Big Run (below Whittaker Falls) | **37.0** | 27.0 | **34.8** | 26.7 | No data | 21.4 | 29.4 |
| Chimney Rock Run | 27.0 | 26.0 | **34.4** | **31.2** | No data | **30.2** | 29.8 |
| Laurel Run | 20.0 | 29.0 | **30.8** | **35.5** | **32.3** | **45.7** | **32.2** |
| Props Run | 30.0 | 29.0 | **40.4** | **36.9** | **35.0** | **38.3** | **34.9** |
| Rose Run | 29.0 | **38.0** | **41.3** | **39.8** | No data | **39.2** | **37.5** |

TU has also been collecting water quality data that includes pH, temperature, a visual estimation of turbidity and iron and an estimation of water level (flow). They have an extensive database with more than 900 entries since 1979. The portion from 2003-2004 is included in appendix 10.

**Figure 15.** Results from the TU monitoring stations




Station one-two is located on the upper Elk River mainstem in the catch-and-release area, station three is at the mouth of Big Spring Fork and station four is near the mouth of Old Field Fork. The Elk River begins at the confluence of Old Field and Big Spring. Station five is much further downstream on Camp Creek.

## Lower Coal River

The Coal River Group formed in late 2003 focusing on the lower sections of the Coal River from Tornado to its confluence with the Kanawha River. The group's mission is to encourage use of the river and promote its history and recreational opportunities. During meetings with state officials the group asked if the river was safe for swimming. Representatives from DEP and the Department of Health and Human Resources (DHHR) could not answer with 100% certainty, so the group decided to try and find out for themselves.

Money was raised to pay a private contractor and with volunteer effort and public service district cooperation, coliform samples were collected during the 2004 summer season. A majority of these samples did not show levels exceeding standards. The group plans to collect samples in the future as part of their monitoring plan.

## New River

### Laurel and Wolf Creeks

Plateau Action Network is continuing its assessment of these watersheds using a unique approach. Essentially, a consultant is completing the work, but in this case the consultant is a middle school science class from Oak Hill Catholic Center. The students collect water quality samples from three locations in the headwaters of Wolf Creek near outfalls from abandoned mines. The students also perform an intermediate level stream assessment at the mouth of Wolf Creek and the same assessment at a station on Laurel Creek. Laurel Creek was chosen as the reference (control) site for this study. The watershed boundaries border each other and both have similar characteristics (Figure 16).

Students prepare to measure a cross-section and discharge during an early fall workshop near the mouth of Wolf Creek.

Wolf Creek is impaired in the upper reaches for pH and metals and there is biological impairment throughout most of its length. Laurel Creek has similar impacts, but strong liming treatment has been successful. Much of the stream has optimal or sub-optimal biological integrity and water quality that overall, does not violate standards. There are some habitat impacts from erosion and sedimentation. Table 7 provides the most recent water quality data collected from Wolf Creek and the remaining information can be found on the overall assessment table and in the appendices.

**Figure 16.** Laurel and Wolf Creek sub watersheds

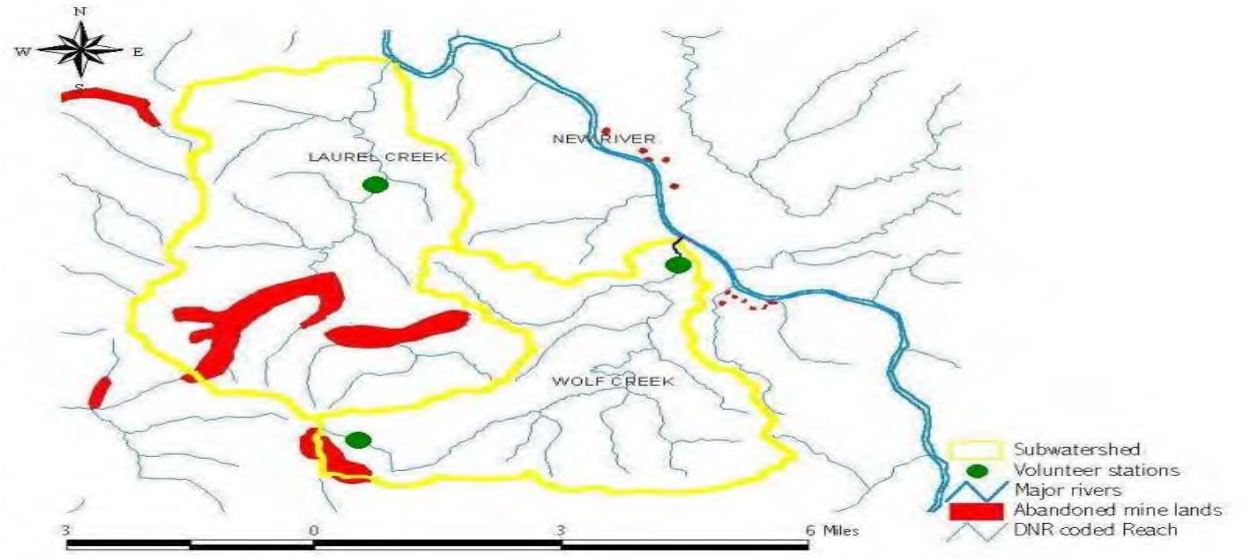


**Table 7.** Water quality results from Wolf Creek mine drainage

| **SSPP WOLF CREEK 1** | | | | | |
|---|---|---|---|---|---|
| **ANALYSES** | RESULTS | UNITS | MDL | DATE | ANALYST |
| PH | 6.12 | | E150.1 | 30-Oct-03 | JLM |
| **TOTAL METALS** | | | E200.7 | 23-Oct-03 | JD |
| ALUMINUM | 0.99 | MG/L | | | |
| IRON | 0.82 | MG/L | | | |
| MANGANESE | 1.45 | MG/L | | | |
| **DISSOLVED METALS** | | | E200.7 | 23-Oct-03 | JD |
| ALUMINUM | 0.06 | MG/L | | | |
| IRON | 0.62 | MG/L | | | |
| MANGANESE | 1.47 | MG/L | | | |
| SULFATE | 115 | MG/L | E300.0 | 23-Oct-03 | LK |
| **ANALYSES** | RESULTS | UNITS | MDL | DATE | ANALYST |
| TURBIDITY | 2.21 | NTU | SM2130B | 23-Oct-03 | TS |
| TOTAL ACIDITY | 15.8 | MG/L | SM2310B | 30-Oct-03 | JLM |
| ALKALINITY | 5.4 | MG/L | SM2320B | 30-Oct-03 | JLM |
| **SSPP WOLF CREEK 2** | | | | | |
| **ANALYSES** | RESULTS | UNITS | MDL | DATE | ANALYST |
| PH | 4.05 | | E150.1 | 30-Oct-03 | JLM |
| **TOTAL METALS** | | | E200.7 | 23-Oct-03 | JD |
| ALUMINUM | 5.42 | MG/L | | | |
| IRON | 9.92 | MG/L | | | |
| MANGANESE | 2.53 | MG/L | | | |
| **DISSOLVED METALS** | | | E200.7 | 23-Oct-03 | JD |
| ALUMINUM | 5.27 | MG/L | | | |
| IRON | 2.77 | MG/L | | | |
| MANGANESE | 2.58 | MG/L | | | |
| SULFATE | 203 | MG/L | E300.0 | 23-Oct-03 | LK |
| TURBIDITY | 40.6 | NTU | SM2130B | 23-Oct-03 | TS |
| TOTAL ACIDITY | 75.9 | MG/L | SM2310B | 30-Oct-03 | JLM |
| ALKALINITY | ND | MG/L | SM2320B | 30-Oct-03 | JLM |
| **SSPP WOLF CREEK 3** | | | | | |
| **ANALYSES** | RESULTS | UNITS | MDL | DATE | ANALYST |
| PH | 2.91 | | E150.1 | 30-Oct-03 | JLM |
| **TOTAL METALS** | | | E200.7 | 23-Oct-03 | JD |
| ALUMINUM | 46.4 | MG/L | | | |
| IRON | 304 | MG/L | | | |
| MANGANESE | 16.9 | MG/L | | | |
| **DISSOLVED METALS** | | | E200.7 | 14-Nov-03 | JD |
| ALUMINUM | 45.8 | MG/L | | | |
| IRON | 316 | MG/L | | | |
| MANGANESE | 16.8 | MG/L | | | |
| SULFATE | 1960 | MG/L | E300.0 | 22-Oct-03 | JD |
| TURBIDITY | 10.9 | NTU | SM2130B | 22-Oct-03 | KS |
| TOTAL ACIDITY | 305 | MG/L | SM2310B | 30-Oct-03 | JLM |
| ALKALINITY | ND | MG/L | SM2320B | 23-Oct-03 | JLM |

Analyses completed by REI Consultants Inc.
Lab Order #: 0310823 Collection Date: 10/21/03

**Table 8.** Kanawha Overall Assessment

| STREAM | BASIN | STATION | DATE | HABITAT | BIOLOGICAL | OVERALL | | | STATION | INTEGRITY |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | FULLY | PARTIALLY | NON | | |
| CLEAR FORK | COAL | | Apr-04 | 36.7 | 70.0 | | X | | 53.4 | MARGINAL |
| BIG SPRING FORK | ELK | 1 | Jul-04 | 68.5 | 78.6 | X | | | 73.6 | SUB OPTIMAL |
| CAMP CREEK | ELK | 1 | Jun-04 | 72.5 | 72.5 | X | | | 72.5 | SUB OPTIMAL |
| OLD FIELD FORK | ELK | 1 | Apr-04 | 79.5 | 91.2 | X | | | 85.4 | OPTIMAL |
| ELK RIVER | ELK | 1 | Oct-03 | 80.0 | 90.4 | X | | | 85.2 | OPTIMAL |
| ELK RIVER | ELK | 1 | Oct-04 | 84.7 | 88.8 | X | | | 86.8 | OPTIMAL |
| ELK RIVER | ELK | 2 | Aug-04 | 63.3 | 78.4 | | X | | 70.9 | SUB OPTIMAL |
| ELKLICK RUN | GAULEY | | Oct-04 | 66.0 | 86.2 | X | | | 76.1 | SUB OPTIMAL |
| RICH CREEK | GAULEY | | Mar-03 | 66.7 | 72.7 | X | | | 69.7 | SUB OPTIMAL |
| UPPER GLADE RUN | GAULEY | 1 | Apr-04 | 57.5 | 75.3 | | X | | 66.4 | SUB OPTIMAL |
| UPPER GLADE RUN | GAULEY | 2 | Jun-04 | 43.8 | 66.2 | | X | | 55.0 | MARGINAL |
| UPPER GLADE RUN | GAULEY | 3 | Jun-03 | 49.0 | 65.5 | | X | | 57.3 | MARGINAL |
| HARTS RUN | GREENBRIER | | Feb-04 | 61.0 | 78.9 | X | | | 70.0 | SUB OPTIMAL |
| GREENBRIER RIVER | GREENBRIER | | Jul-04 | 58.3 | 66.0 | X | | | 62.2 | MARGINAL |
| SECOND CREEK | GREENBRIER | 1 | Jul-04 | 75.0 | 66.4 | X | | | 70.7 | SUB OPTIMAL |
| SECOND CREEK | GREENBRIER | 2 | Jul-03 | 76.7 | 77.1 | X | | | 76.9 | SUB OPTIMAL |
| MANILA CREEK | KANAWHA | 7 | Jul-03 | 68.0 | 49.8 | | X | | 58.9 | MARGINAL |
| MANILA CREEK | KANAWHA | 6 | Apr-03 | 59.0 | 0.0 | | | X | 29.5 | POOR |
| MANILA CREEK | KANAWHA | 5 | Apr-03 | 52.0 | 0.0 | | | X | 26.0 | POOR |
| MANILA CREEK | KANAWHA | 4 | Jul-03 | 53.0 | 0.0 | | | X | 26.5 | POOR |
| MANILA CREEK | KANAWHA | 3 | Jul-03 | 54.0 | 0.0 | | | X | 27.0 | POOR |
| MANILA CREEK | KANAWHA | 2 | Jul-03 | 62.0 | 0.0 | | | X | 31.0 | POOR |
| MANILA CREEK | KANAWHA | 1 | Jul-03 | 48.0 | 0.0 | | | X | 24.0 | POOR |
| MANILA CREEK | KANAWHA | 7 | Apr-03 | 67.0 | 50.9 | | X | | 59.0 | MARGINAL |
| MANILA CREEK | KANAWHA | | Oct-03 | 58.3 | 67.9 | | X | | 63.1 | MARGINAL |
| POCATALICO RIVER | KANAWHA | | May-03 | 56.7 | 56.9 | | | X | 56.8 | MARGINAL |
| TRACE FORK | KANAWHA | | Aug-03 | 57.0 | 58.1 | | | X | 57.6 | MARGINAL |
| ASH BRANCH | KANAWHA | | Apr-03 | 58.0 | 88.9 | | X | | 73.5 | SUB OPTIMAL |
| FIVEMILE FORK | KANAWHA | 1 | Jul-03 | 51.0 | 60.6 | | | X | 55.8 | MARGINAL |
| FIVEMILE FORK | KANAWHA | 2 | Jul-03 | 56.0 | 64.4 | | | X | 60.2 | MARGINAL |
| FROZEN BRANCH | KANAWHA | | Jul-03 | 68.0 | 67.2 | X | | | 67.6 | SUB OPTIMAL |
| GOOSE HOLLOW | KANAWHA | 1 | Jul-03 | 74.0 | 67.1 | X | | | 70.6 | SUB OPTIMAL |
| GOOSE HOLLOW | KANAWHA | 2 | Jun-03 | 34.0 | 60.0 | | | X | 47.0 | POOR |
| HICKS HOLLOW | KANAWHA | | Jun-03 | 41.0 | 68.5 | | X | | 54.8 | MARGINAL |
| HORSEMILL BRANCH | KANAWHA | | Jul-03 | 49.0 | 45.1 | | | X | 47.1 | POOR |
| HURRICANE FORK | KANAWHA | | Jun-03 | 48.0 | 32.5 | | | X | 40.3 | POOR |
| KELLYS CREEK | KANAWHA | 1 | Jul-03 | 58.0 | 71.2 | | X | | 64.6 | MARGINAL |
| KELLYS CREEK | KANAWHA | 2 | Jul-03 | 45.0 | 56.8 | | | X | 50.9 | MARGINAL |
| KELLYS CREEK | KANAWHA | 3 | Jul-03 | 67.0 | 55.7 | | X | | 61.4 | MARGINAL |
| KELLYS CREEK | KANAWHA | 4 | Jun-03 | 59.0 | 65.4 | | X | | 62.2 | MARGINAL |
| KELLYS CREEK | KANAWHA | | Jun-03 | 66.0 | 54.1 | | X | | 60.1 | MARGINAL |
| MORRIS CREEK | KANAWHA | | Sep-04 | 48.8 | 74.5 | X | | | 61.7 | MARGINAL |
| MORRIS CREEK | KANAWHA | 15 | Nov-04 | 68.3 | 61.7 | | X | | 65.0 | SUB OPTIMAL |
| MORRIS CREEK | KANAWHA | 7 | Nov-04 | 83.5 | 59.8 | | X | | 71.7 | SUB OPTIMAL |
| UNT LEFT FORK | KANAWHA | | Jul-03 | 79.5 | 51.3 | | X | | 65.4 | SUB OPTIMAL |
| WILLIS BRANCH | KANAWHA | | Jul-03 | 64.0 | 76.2 | | X | | 70.1 | SUB OPTIMAL |
| LAUREL CREEK | NEW RIVER | | Oct-03 | 83.3 | 68.5 | | X | | 75.9 | SUB OPTIMAL |
| WOLF CREEK | NEW RIVER | | May-04 | 37.0 | 71.7 | | | X | 54.4 | MARGINAL |

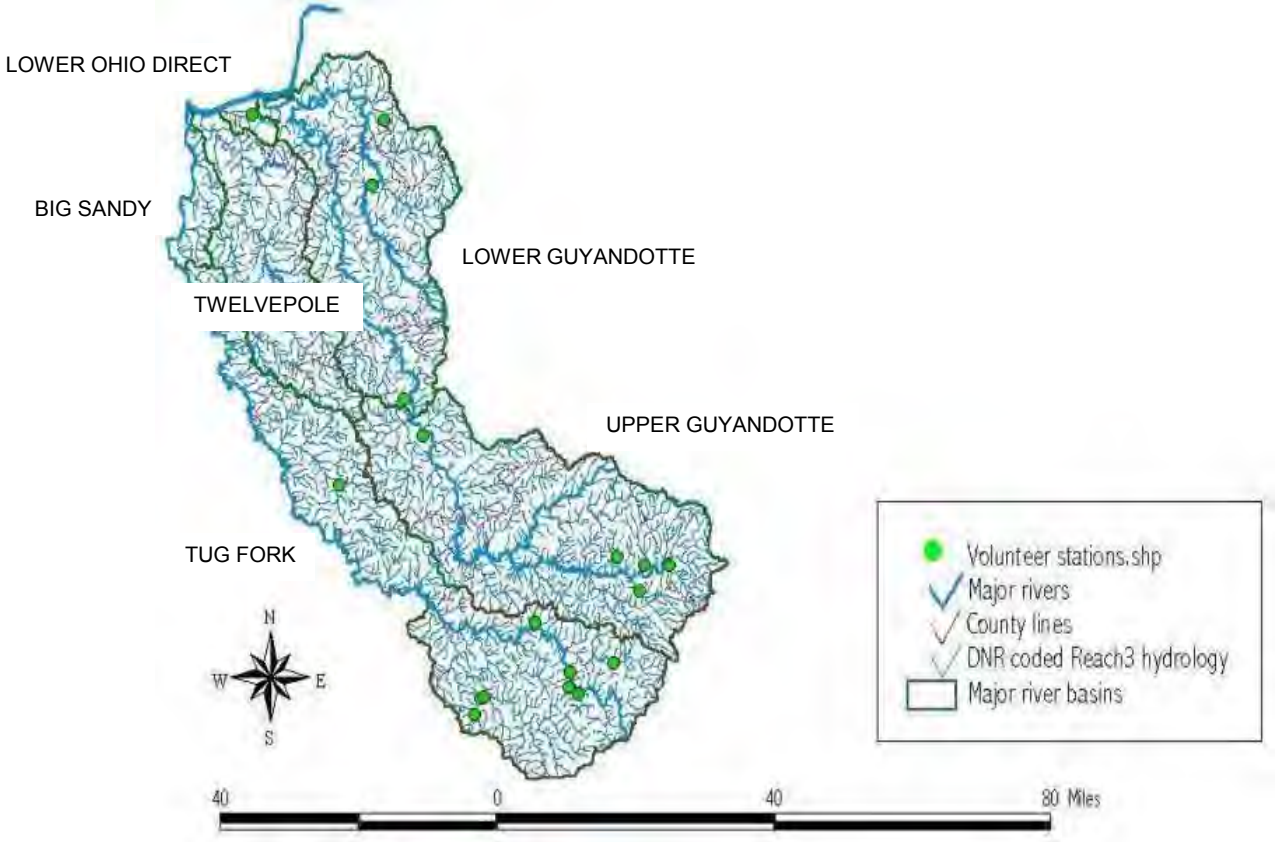
| STREAM | BASIN | STATION | DATE | HABITAT | BIOLOGICAL | OVERALL | | | STATION | INTEGRITY |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | FULLY | PARTIALLY | NON | | |
| BRUSH CREEK | NEW RIVER | 2 | Oct-04 | 41.0 | 28.1 | | X | | 34.6 | POOR |
| BRUSH CREEK | NEW RIVER | 1 | Apr-03 | 52.0 | 72.9 | X | | | 62.5 | SUB OPTIMAL |
| DROOPING LICK CREEK | NEW RIVER | | May-04 | 75.0 | 55.3 | | X | | 65.2 | SUB OPTIMAL |
| HANS CREEK | NEW RIVER | | Oct-03 | 55.0 | 76.4 | | X | | 65.7 | MARGINAL |
| INDIAN CREEK | NEW RIVER | | Sep-03 | 79.0 | 67.0 | X | | | 73.0 | SUB OPTIMAL |
| **OVERALL AVERAGES AND TOTALS** | | | | **60.7** | **59.0** | **16** | **22** | **15** | **59.8** | |

**MARGINAL** AND **POOR** SCORES ARE HIGHLIGHTED

## THE OHIO BASINS

This section will discuss volunteer activities within the Upper and Lower Ohio Basins. Many of the streams that empty directly into the Ohio have not been monitored by volunteers due to the difficulties associated with the biological assessment of their low gradients (lack of riffle/run habitats). At times WV Save Our Streams has provided equipment and training to help volunteer monitoring groups adapt to these stream types, but there has been a limited acceptance except at certain middle and high schools. However, not all the streams lack riffles and run habitats (especially many streams within the Lower Ohio Basin), so many can still be assessed using the primary program methods. Figure 17 shows the stations within the Lower Ohio Basin.

**Figure 17.** Volunteer stations in the Lower Ohio




Volunteer monitoring groups from the Upper and Lower Ohio region that sent information during this reporting period include the Upper Guyandotte Watershed Association, Elkhorn Creek Watershed Association, Cabell Midland High School, Trout Unlimited, Shady Springs High School, Gilmer County Watershed Coalition, Marshall University, Glenville State College, Ralph R. Willis Technical Center, Roane-Jackson Technical Center and Cumberland High School. There are also several schools that have active programs but did not send any information during this reporting period.

## Lower Ohio

This region is characterized primarily by impacts associated with major resource extraction activities, namely mining, logging and oil and gas well roads. These activities have left many of the steep mountainsides with scars. The abandoned roads and sliding hillsides are contributors to the habitat deterioration (73% of the streams assessed had marginal habitat scores).

Often, even short storm events result in fast run-off and high stream turbidity.

Biological conditions were slightly better; due mostly to relatively cool water and high dissolved oxygen associated with the steep mountain terrain. Much of the coal mined in this region is low in sulphur content, so when exposed to water and oxygen the resulting acidity is low. However, biological impairments due to high concentrations of dissolved metals, sedimentation and contamination from sewage are common throughout much of the region. The methods used by the volunteer monitoring groups in this region are not stringent enough to distinguish the changes in the benthic invertebrate communities; however, the biological integrity conditions are well documented by WAS.

Table 9 on the next page provides a look at the overall assessment results from streams surveyed within the region. Volunteer activities are making a difference in the region and the community is beginning to recognize the importance of good water quality for healthy lives, a healthier environment and for providing financial benefits (i.e. tourism from trout fishing). OSM and the VISTA Program have provided funding for internships for both the Elkhorn Creek Watershed Association and the Upper Guyandotte Watershed Association for the past several years. Also a new chapter of Trout Unlimited has formed and is beginning to bring attention to the area's fisheries, focusing on the Upper Guyandotte and Tug Fork basins.

**Table 9.** Lower Ohio Overall Assessment

| STREAM | BASIN | STATION | DATE | HABITAT | BIOLOGICAL | OVERALL | | | STATION | INTEGRITY |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | FULLY | PARTIALLY | NON | | |
| BARKERS CREEK | GUYANDOTTE | | May-03 | 52.0 | 56.9 | | | X | 54.5 | MARGINAL |
| CABIN CREEK | GUYANDOTTE | | Jul-03 | 73.3 | 74.3 | X | | | 73.8 | SUB OPTIMAL |
| DEVILS FORK | GUYANDOTTE | | Jul-03 | 66.7 | 75.7 | X | | | 71.2 | SUB OPTIMAL |
| GUYANDOTTE RIVER | GUYANDOTTE | | Sep-03 | 63.0 | 70.5 | | X | | 66.8 | SUB OPTIMAL |
| SLAB FORK | GUYANDOTTE | 1 | Jul-03 | 65.0 | 72.9 | X | | | 69.0 | SUB OPTIMAL |
| SLAB FORK | GUYANDOTTE | 1 | Oct-04 | 60.0 | 70.4 | | X | | 65.2 | SUB OPTIMAL |

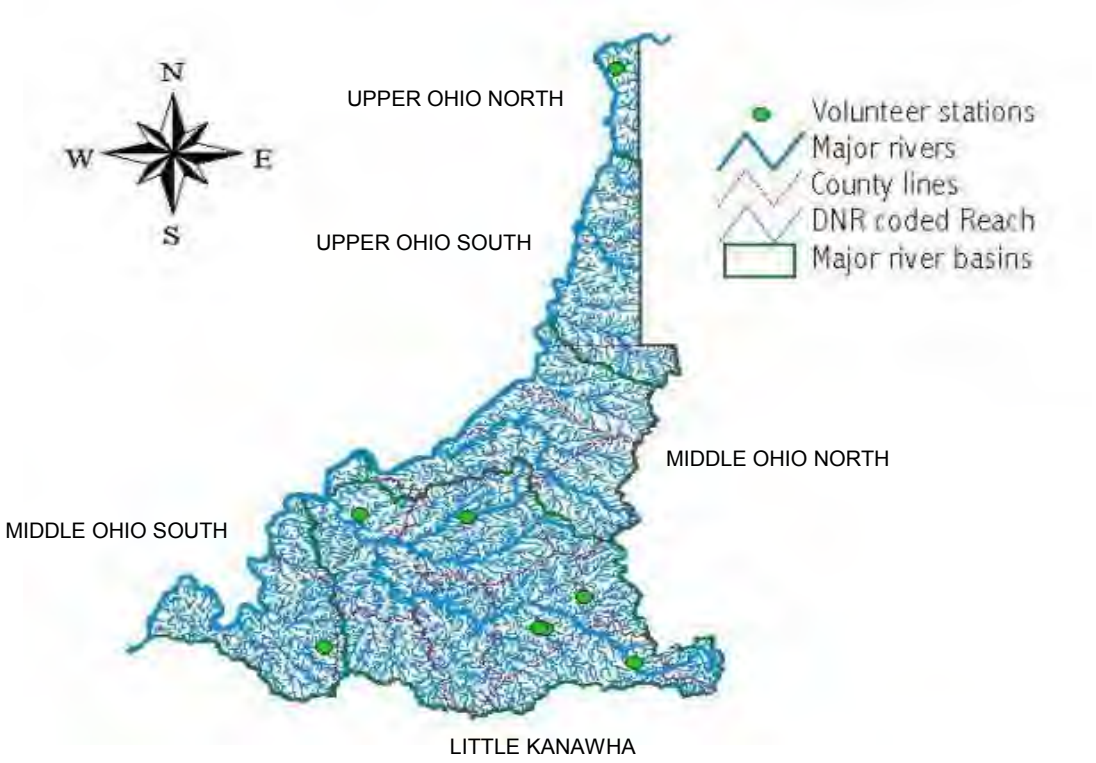
| STREAM | BASIN | STATION | DATE | HABITAT | BIOLOGICAL | OVERALL | | | STATION | INTEGRITY |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | FULLY | PARTIALLY | NON | | |
| BRADSHAW CREEK | TUG FORK | 2 | Mar-03 | 50.0 | 62.9 | | | X | 56.5 | MARGINAL |
| BRADSHAW CREEK | TUG FORK | 1 | Mar-03 | 50.0 | 68.6 | | X | | 59.3 | MARGINAL |
| DRY FORK | TUG FORK | | Apr-03 | 66.7 | 62.9 | | X | | 64.8 | MARGINAL |
| ELKHORN CREEK | TUG FORK | | Mar-03 | 58.3 | 62.9 | | | X | 60.6 | MARGINAL |
| TWIN BRANCH | TUG FORK | | Oct-03 | 50.0 | 70.0 | | X | | 60.0 | MARGINAL |
| | | | | **59.5** | **68.0** | **3** | **5** | **3** | **63.8** | MARGINAL |

**MARGINAL** AND **POOR** SCORES ARE HIGHLIGHTED

## Upper Ohio

Historically, volunteer monitoring activity has been limited in this region due mostly to the nature of the streams as explained earlier (Figure 18). However, with a targeted, very focused approach using hands-on education and outreach and pilot or demonstration projects, an increase in interest and participation could be accomplished.

**Figure 18.** Volunteer stations in the Upper Ohio



A good example of a focused effort is the formation of the Sand Fork Technical Committee (SFTC). SFTC is working towards characterizing the streams within the Sand Fork sub watershed in the hopes to better understand the sources of the metal contamination, and to implement future projects that will address the needs of the community and implement the recommendations of the TMDL. Members of SFTC include DEP's Nonpoint and Watershed Assessment Section, WV Conservation Agency, U.S. Army Corps of Engineers, Canaan Valley Institute, Glenville State College, Gilmer County Watershed Coalition, and the Cedar Creek Community Association. Future partners are anticipated and may include of the Office of Emergency Services and U.S. Geological Service.

The Sand Fork proposed project site "Rocky Run."

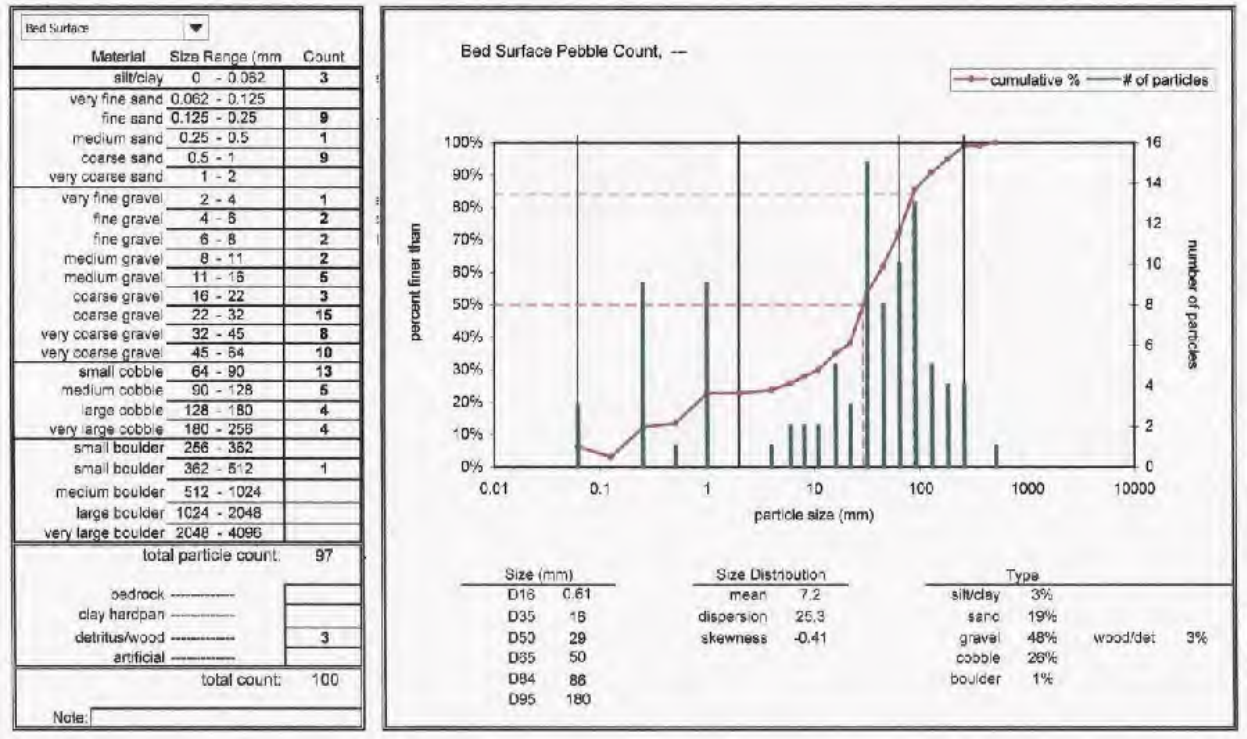
The committee has been using very sophisticated GIS and satellite imagery to interpret the conditions of the landscape to help target possible project and reference locations. Public meetings have been held on several occasions within the watershed to explain the group's intensions and to solicit information and landowner support. Finally, select members of the committee have been participating in the fieldwork associated with channel characterization.

Rocky Fork has been selected as a probable project location. The upper portion of this small watershed is forested but there are impacts from logging, pasturelands and general encroachment upon the stream. The lower portion of the stream flows through pasturelands with very little buffer protection, as well as downstream channel restrictions from a local road and bridge. The stream has widened and incised dramatically and the banks are high and extremely eroded. The site was chosen due primarily to landowner cooperation and its location within the watershed.

The project will improve the stability of the channel and slow erosion, thereby reducing the sediment load, and possibly the metal load, entering the stream. The group believes that the nature of the soils in the watershed and their metal content are a major contributor to the elevated metal concentrations found throughout the watershed. Figure 19 shows the results of pebble count date collected from Rocky Run.

The group is also investigating the cost and logistics of installing a stream gage near the mouth of Sand Fork to further characterize bankfull flows and act as a possible warning system for high water events.

**Figure 19.** Pebble count data collected from Rocky Fork, Gilmer County



Bed Surface

| Material | Size Range (mm | Count |
|---|---|---|
| silt/clay | 0 - 0.062 | 3 |
| very fine sand | 0.062 - 0.125 | |
| fine sand | 0.125 - 0.25 | 9 |
| medium sand | 0.25 - 0.5 | 1 |
| coarse sand | 0.5 - 1 | 9 |
| very coarse sand | 1 - 2 | |
| very fine gravel | 2 - 4 | 1 |
| fine gravel | 4 - 5 | 2 |
| fine gravel | 6 - 8 | 2 |
| medium gravel | 8 - 11 | 2 |
| medium gravel | 11 - 16 | 5 |
| coarse gravel | 16 - 22 | 3 |
| coarse gravel | 22 - 32 | 15 |
| very coarse gravel | 32 - 45 | 8 |
| very coarse gravel | 45 - 64 | 10 |
| small cobble | 64 - 90 | 13 |
| medium cobble | 90 - 128 | 5 |
| large cobble | 128 - 180 | 4 |
| very large cobble | 180 - 256 | 4 |
| small boulder | 256 - 362 | |
| small boulder | 362 - 512 | 1 |
| medium boulder | 512 - 1024 | |
| large boulder | 1024 - 2048 | |
| very large boulder | 2048 - 4096 | |
| total particle count: | | 97 |
| bedrock | | |
| clay hardpan | | |
| detritus/wood | | 3 |
| artificial | | |
| total count: | | 100 |

Note:



| Size (mm) | |
|---|---|
| D16 | 0.61 |
| D35 | 16 |
| D50 | 29 |
| D65 | 50 |
| D84 | 86 |
| D95 | 180 |

| Size Distribution | |
|---|---|
| mean | 7.2 |
| dispersion | 25.3 |
| skewness | -0.41 |

| Type | | | |
|---|---|---|---|
| silt/clay | 3% | | |
| sand | 19% | | |
| gravel | 48% | wood/det | 3% |
| cobble | 26% | | |
| boulder | 1% | | |

Very few stream surveys were received from this region (Table 10), but overall a majority of the streams were fully supporting (57%). Biological impairments were common, and many of these are believed to be associated with sedimentation and high percentages of embeddedness.

**Table 10.** Upper Ohio Overall Assessment

| STREAM | BASIN | STATION | DATE | HABITAT | BIOLOGICAL | OVERAL | | | STATION | INTEGRITY |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | FULLY | PARTIALLY | NON | | |
| CEDAR CREEK | LITTLE KANAWHA | | Sep-03 | 76.0 | 65.1 | X | | | 70.6 | SUB OPTIMAL |
| CEDAR CREEK | LITTLE KANAWHA | | Apr-03 | 70.0 | 72.1 | X | | | 71.1 | SUB OPTIMAL |
| ELLIS CREEK | LITTLE KANAWHA | | Sep-03 | 63.0 | 63.5 | | | X | 63.3 | MARGINAL |
| LITTLE MILL CREEK | OHIO (MIDDLE) | | May-04 | 71.7 | 73.8 | X | | | 72.8 | SUB OPTIMAL |
| STEWARTS RUN | OHIO (MIDDLE) | | Jul-04 | 73.3 | 62.9 | | X | | 68.1 | SUB OPTIMAL |
| UNT HUGHES RIVER | OHIO (MIDDLE) | | Apr-03 | 76.7 | 67.2 | X | | | 72.0 | SUB OPTIMAL |
| TOMLINSON RUN | OHIO (UPPER) | | Mar-03 | 55.0 | 35.5 | | | X | 45.3 | POOR |
| **TOTALS AND AVERAGES** | | | | **69.4** | **62.9** | **4** | **1** | **2** | **66.1** | |

**MARGINAL** AND **POOR** SCORES ARE HIGHLIGHTED

## Appalachian Clean Streams Program

The Office of Surface Mining's (OSM) Clean Streams Program is a broad-based program that works toward the elimination of acid mine drainage from abandoned coalmines. Using a combination of private and governmental resources, the program facilitates and coordinates citizen groups, university researchers, the coal industry, corporations, the environmental community, and local, state, and federal government agencies that are involved in cleaning up streams polluted by acid drainage. Begun as an initiative in 1994, this successful program has funded 77 projects in ten states.

A major part of the Clean Streams Program is OSM's Watershed Internship Program. This program provides grants and training to organizations that support college students work on watersheds affected by acid mine drainage. It is a commitment to provide financial assistance that fosters development and implementation of watershed based planning. Internships are available for college students who are currently studying in the fields of environmental and civil engineering, biological studies or other environmental related fields and reclamation activities.

Internships are available in Ohio, West Virginia, Tennessee, Pennsylvania, Kentucky, Alabama, Maryland, Virginia, Indiana, Oklahoma, Illinois, Iowa, and Missouri. Table 11 lists the watersheds that received intern funding from the program in 2003-2004.

**Table 11.** WV Watershed groups with OSM interns

| | |
|---|---|
| Friends of the Cheat | Friends of Deckers Creek |
| Guardians of the West Fork | Lower West Fork Watershed Association |
| Gilmer County Watershed Coalition | North Fork Watershed Project |
| Plateau Action Network | Lower Greenbrier Watershed Association |
| Coal River Watershed Association | Elkhorn Creek Watershed Association |

Another part of the Appalachian Clean Streams Program is the Watershed Cooperative Agreement Project (WCAP) funds. These monies are available to award cooperative agreements to not-for-profit organizations, especially small watershed groups, that undertake local acid mine drainage (AMD) reclamation projects. The maximum award amount for each cooperative agreement are normally $100,000, in order to assist as many groups as possible to undertake actual construction projects to clean streams impacted by acid mine drainage. Projects must meet eligibility criteria for coal projects outlined in the Surface Mining Law (Public Law 95-87).

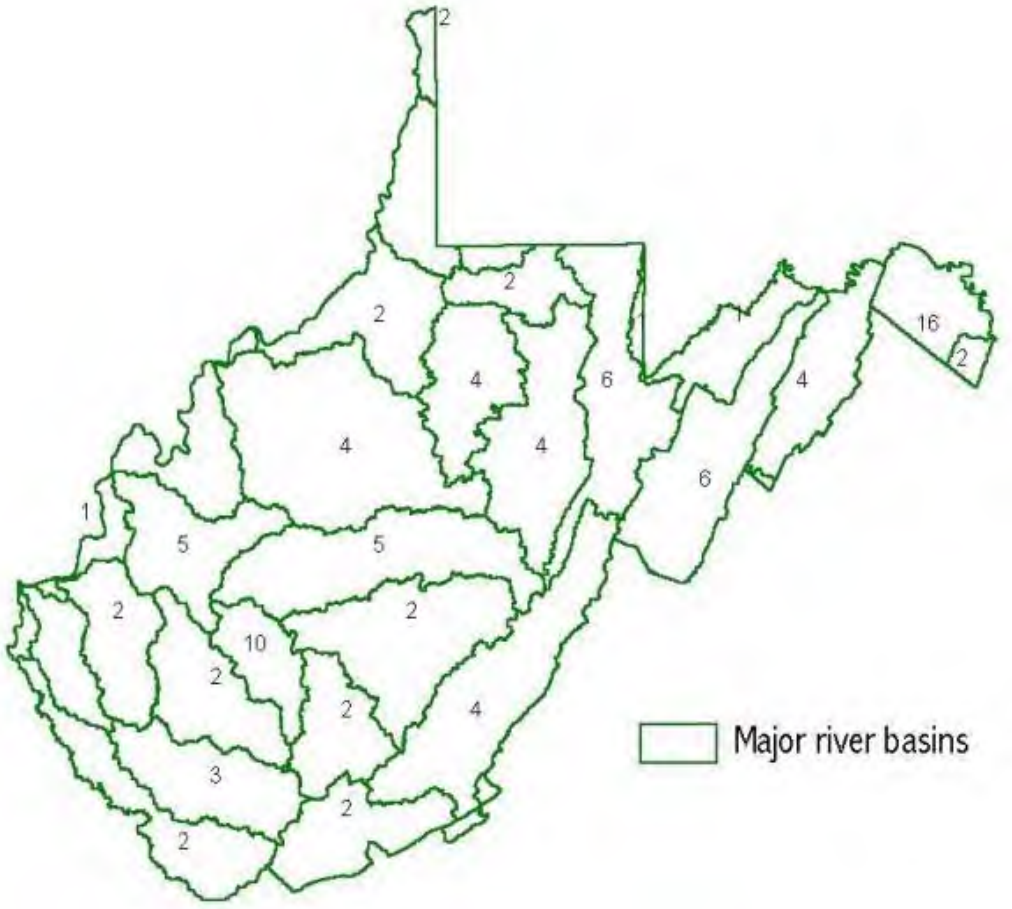
Read more about the Appalachian Clean Streams Program on the Office of Surface Mines web page at: **http://www.osmre.gov/osm.htm**.

## WV SAVE OUR STREAMS WORKSHOPS

The primary goal of the WV Save Our Streams Program is to follow its mission to "***promote the preservation and restoration of our state waters by providing a better understanding of their ecological integrity***" through outreach and education. The stream monitoring workshops and various other kinds of related trainings offered by the program are the major ways this outreach is accomplished. We often measure whether we accomplish our goals and mission in terms of numbers. These numbers are used to compare our progress over time and to increase our productivity. Since 2000 the program has not set specific numeric criteria for workshops (these are taught as needed), however a minimum program goal is roughly a dozen each year scattered throughout the state.

In 2003-2004 the program coordinator and his certified designees taught 91 workshops and demonstrations resulting in a total of 204 certified volunteer monitors. An average of 12 persons attended each workshop with many more witnessing the demonstrations. Figure 20 shows the distribution of workshops by watershed.

**Figure 20.** Workshop distribution by watershed




**Breakdown** - 41% of the workshops were level one, 32% were level two, and 26% were level three. In addition, 3% were other types of training, which in 2003-2004 focused on the impacts and measurement of sedimentation.

## THE FINAL ASSESSMENT

In this section we compare each basin's overall average score to a theoretical reference score that represents optimal conditions. The comparison is made using a simple percent difference statistic. Percent difference is applied when comparing two experimental quantities, neither of which can be considered the "correct" value. The comparison categories are as follows:

- **Riparian buffer and bank conditions**: This is an index based upon the conditions of the riparian buffer, stability of the banks and the vegetative cover on the banks.
- **Sedimentation**: This index is based upon the conditions of the channels sediment deposition (i.e. sand/gravel bars) impacts, embeddedness and riffle composition.
- **Habitat integrity**: This index is based upon the overall habitat conditions. A minimum of five habitat attributes is used.
- **Biological integrity**: This index is based upon the condition of the macroinvertebrate communities (i.e. stream index scores).

The table provides the average scores.

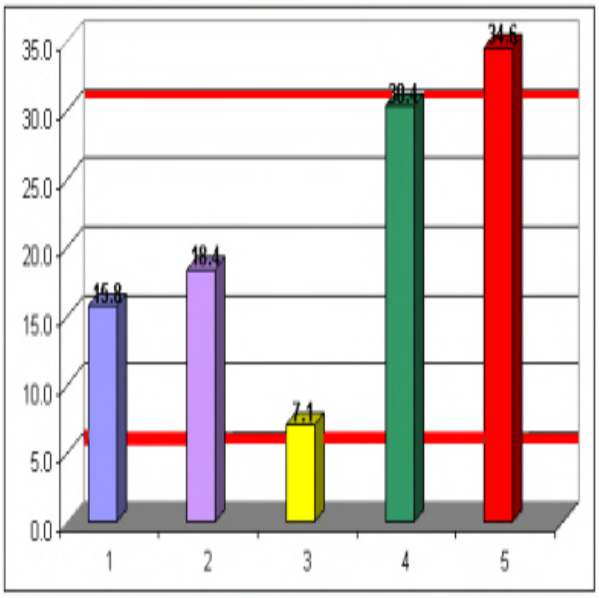
| | SEDIMENTATION | BANK-BUFFER | HABITAT | BIOLOGICAL | AVERAGE | INTEGRITY RATING |
|---|---|---|---|---|---|---|
| POTOMAC | 64.4 | 68.3 | 64.8 | 65.2 | 65.7 | SUB-OPTIMAL |
| MONONGAHELA | 65.1 | 66.5 | 61.9 | 63.9 | 64.4 | MARGINAL |
| UPPER OHIO | 54.8 | 74.5 | 65.3 | 64.0 | 64.7 | MARGINAL |
| KANAWHA | 65.6 | 58.9 | 60.7 | 58.5 | 60.9 | MARGINAL |
| LOWER OHIO | 65.7 | 56.4 | 59.5 | 68.0 | 62.4 | MARGINAL |
| OVERALL AVERAGE | 63.1 | 64.9 | 62.4 | 63.9 | 63.6 | MARGINAL |

PERCENT DIFFERENCE

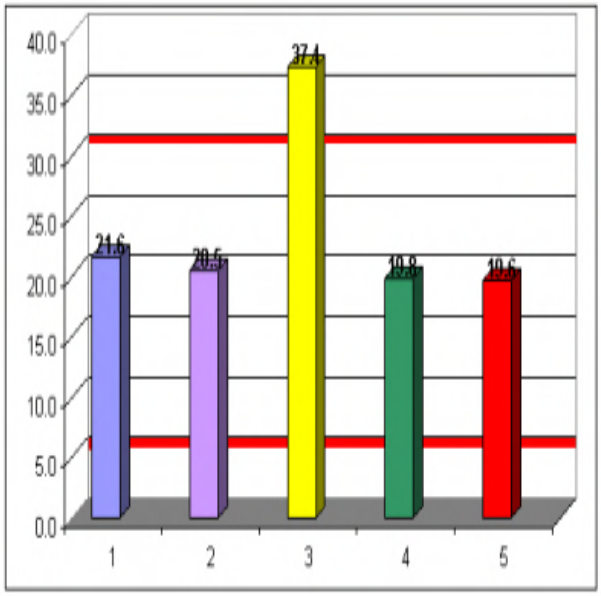
| | | | | | | |
|---|---|---|---|---|---|---|
| 1. POTOMAC | 21.6 | 15.8 | 21.0 | 20.4 | 19.7 | 19.7 |
| 2. MONONGAHELA | 20.5 | 18.4 | 25.5 | 22.4 | 21.7 | 21.7 |
| 3. UPPER OHIO | 37.4 | 7.1 | 20.2 | 22.2 | 21.2 | 21.6 |
| 4. KANAWHA | 19.8 | 30.4 | 27.4 | 31.0 | 27.1 | 27.1 |
| 5. LOWER OHIO | 19.6 | 34.6 | 29.4 | 16.2 | 24.7 | 24.9 |

REFERENCE SCORE = 80.0

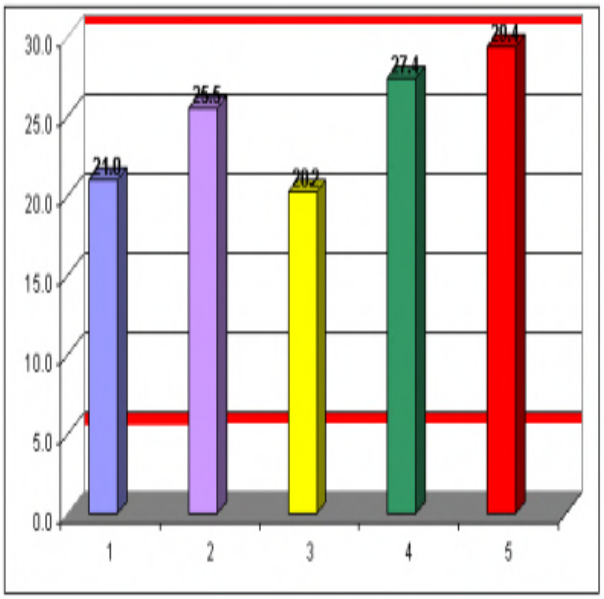
The bar graphs on the next page depict the results from the table. The red line at the 5 and 30 marks indicate the best and worst conditions. In other words, if a bar height is below the 5-mark, overall conditions would be given an optimal rating; if the height of is above the 30-mark, overall conditions would be given a poor rating. The 20-mark delineates between sub-optimal and marginal ranges.



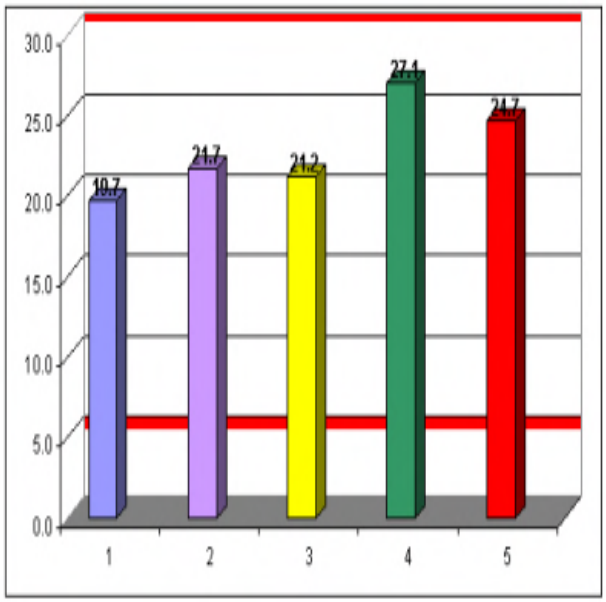

**Buffer and bank**




**Sedimentation**




**Habitat integrity**




**Biological integrity**

Most of the basins fall between the 5 and 30-mark, however, the Kanawha and the Upper Ohio exceeds the 30-mark in the buffer and bank category and the Upper Ohio exceeds the 30-mark in the sedimentation category.

It is important to keep in mind that these graphs are based upon a limited number of stations (less than 100 in most cases), especially the upper and lower Ohio basins.

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**Appendix 1**. Stream monitors and station locations

| STREAM | STATION | DATE | LEVEL | MONITORS | COUNTY | BASIN | LATITUDE | | | LONGITUDE | | | TOPO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | DGREES | MINUTES | SECONDS | DEGREES | MINUTES | SECONDS | |
| BAKERS RUN | 1 | | 2 | DOH | HARDY | CACAPON | 39 | 2 | 27 | 78 | 44 | 45 | NEEDMORE |
| BAKERS RUN | 2 | | 2 | DOH | HARDY | CACAPON | | | | | | | NEEDMORE |
| BAKERS RUN | 3 | | 2 | DOH | HARDY | CACAPON | | | | | | | BAKER |
| BAKERS RUN | 4 | May-04 | 1 | EHMS | HARDY | CACAPON | 39 | 2 | 51 | 78 | 45 | 27 | BAKER |
| LONG LICK RUN | | | 2 | DOH | HARDY | CACAPON | | | | | | | NEEDMORE |
| LOST RIVER | 1 | | 2 | DOH | HARDY | CACAPON | 39 | 3 | 15 | 78 | 43 | 47 | BAKER |
| LOST RIVER | 2 | | 2 | DOH | HARDY | CACAPON | 39 | 1 | 1 | 78 | 45 | 45 | BAKER |
| SAUERKRAUT RUN | 1 | | 2 | DOH | HARDY | CACAPON | 39 | 6 | 28 | 78 | 39 | 37 | BAKER |
| SAUERKRAUT RUN | 2 | | 2 | DOH | HARDY | CACAPON | | | | | | | BAKER |
| TROUT RUN | 1 | | 2 | DOH | HARDY | CACAPON | 39 | 2 | 59 | 78 | 38 | 8 | BAKER |
| TROUT RUN | 2 | | 2 | DOH | HARDY | CACAPON | | | | | | | BAKER |
| WAITES RUN | | | 2 | DOH | HARDY | CACAPON | | | | | | | WARDENVILLE |
| BEAVER CREEK | 3-1 | Aug-03 | 2 | FOC | PRESTON | CHEAT | | | | | | | CUZZART |
| BEAVER CREEK | 3-2 | Jul-03 | 2 | FOC | PRESTON | CHEAT | 39 | 36 | 34 | 79 | 33 | 36 | CUZZART |
| BEAVER CREEK | 3-3 | Jul-03 | 2 | FOC | PRESTON | CHEAT | 39 | 36 | 41 | 79 | 31 | 04 | CUZZART |
| BEAVER CREEK | 3-4 | Aug-03 | 2 | FOC | PRESTON | CHEAT | 39 | 37 | 36 | 79 | 35 | 38 | CUZZART |
| BEAVER CREEK | 3-5 | Aug-03 | 2 | FOC | PRESTON | CHEAT | 39 | 35 | 4 | 79 | 37 | 2 | CUZZART |
| BEAVER CREEK | 3-6 | Aug-03 | 2 | FOC | PRESTON | CHEAT | 39 | 35 | 4 | 79 | 37 | 4 | BRANDONVILLE |
| BEAVER CREEK | 3-7 | Aug-03 | 2 | FOC | PRESTON | CHEAT | | | | | | | BRANDONVILLE |
| BEAVER CREEK | 3-1 | May-04 | 2 | FOC | PRESTON | CHEAT | 39 | 37 | 37 | 79 | 35 | 58 | BRANDONVILLE |
| BEAVER CREEK | 3-5 | May-04 | 2 | FOC | PRESTON | CHEAT | 39 | 36 | 34 | 79 | 33 | 36 | CUZZART |
| BEAVER CREEK | 3-10 | May-04 | 2 | FOC | PRESTON | CHEAT | 39 | 37 | 20 | 79 | 35 | 23 | CUZZART |
| BEAVER CREEK | 3-9 | May-04 | 2 | FOC | PRESTON | CHEAT | 39 | 37 | 36 | 79 | 35 | 38 | CUZZART |
| BEAVER CREEK | 3-8 | May-04 | 2 | FOC | PRESTON | CHEAT | 39 | 37 | 20 | 79 | 35 | 23 | CUZZART |
| BUFFALO RUN | 1-2 | Apr-04 | 2 | FOC | PRESTON | CHEAT | 39 | 27 | 4 | 79 | 39 | 2 | KINGWOOD |
| BUFFALO RUN | 1-1 | Aug-03 | 2 | FOC | PRESTON | CHEAT | 39 | 27 | 30 | 79 | 39 | 20 | KINGWOOD |
| BUFFALO RUN | 1-2 | Aug-03 | 2 | FOC | PRESTON | CHEAT | 39 | 27 | 25 | 79 | 39 | 1 | KINGWOOD |
| BUFFALO RUN | 1-3 | Aug-03 | 2 | FOC | PRESTON | CHEAT | 39 | 26 | 50 | 79 | 39 | 29 | KINGWOOD |
| BUFFALO RUN | 1-4 | Aug-03 | 2 | FOC | PRESTON | CHEAT | 39 | 26 | 25 | 79 | 39 | 3 | KINGWOOD |
| BUFFALO RUN | 1-5 | Aug-03 | 2 | FOC | PRESTON | CHEAT | 39 | 26 | 15 | 79 | 39 | 11 | KINGWOOD |
| BUFFALO RUN | 1-6 | Aug-03 | 2 | FOC | PRESTON | CHEAT | 39 | 26 | 15 | 79 | 39 | 11 | KINGWOOD |
| BUFFALO RUN | 1-7 | Jul-03 | 2 | FOC | PRESTON | CHEAT | 39 | 25 | 55 | 79 | 35 | 21 | KINGWOOD |
| BUFFALO RUN | | Oct-04 | 1 | PCHS | PRESTON | CHEAT | 39 | 26 | 7 | 79 | 31 | 3 | KINGWOOD |
| BUFFALO RUN | 1-1 | May-04 | 2 | FOC | PRESTON | CHEAT | 39 | 27 | 30 | 79 | 39 | 20 | KINGWOOD |
| BUFFALO RUN | 1-3 | May-04 | 2 | FOC | PRESTON | CHEAT | | | | | | | KINGWOOD |
| BUFFALO RUN | 1-5 | May-04 | 2 | FOC | PRESTON | CHEAT | | | | | | | KINGWOOD |
| BUFFALO RUN | 1-6 | May-04 | 2 | FOC | PRESTON | CHEAT | 39 | 26 | 15 | 79 | 39 | 11 | KINGWOOD |
| BUFFALO RUN | 1-7 | May-04 | 2 | FOC | PRESTON | CHEAT | 39 | 25 | 55 | 79 | 39 | 21 | KINGWOOD |
| GLADY FORK | | Aug-04 | 2 | TU | RANDOLPH | CHEAT | 38 | 57 | 9 | 79 | 36 | 4 | GLADY |
| GLADE RUN | 4-1 | Jul-03 | 2 | FOC | PRESTON | CHEAT | 39 | 35 | 57 | 79 | 36 | 4 | CUZZART |
| GLADE RUN | 4-2 | Jul-03 | 2 | FOC | PRESTON | CHEAT | 39 | 35 | 39 | 79 | 36 | 8 | CUZZART |

| STREAM | STATION | DATE | LEVEL | MONITORS | COUNTY | BASIN | LATITUDE | | | LONGITUDE | | | TOPO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | DGREES | MINUTES | SECONDS | DEGREES | MINUTES | SECONDS | |
| GLADE RUN | 4-3 | Jul-03 | 2 | FOC | PRESTON | CHEAT | 39 | 35 | 57 | 79 | 36 | 8 | CUZZART |
| GLADE RUN | 4-2 | May-04 | 2 | FOC | PRESTON | CHEAT | 39 | 35 | 37 | 79 | 36 | 9 | CUZZART |
| GLADE RUN | 4-3 | May-04 | 2 | FOC | PRESTON | CHEAT | | | | | | | CUZZART |
| GLADE RUN | 4-4 | May-04 | 2 | FOC | PRESTON | CHEAT | 39 | 35 | 59 | 79 | 36 | 8 | CUZZART |
| MUDDY CREEK | 1 | Jun-03 | 2 | AURELEM | PRESTON | CHEAT | | | | | | | VALLEY POINT |
| MUDDY CREEK | 1 | Jul-03 | 2 | FOC | PRESTON | CHEAT | 39 | 33 | 7 | 79 | 37 | 3 | VALLEY POINT |
| NF GREENS RUN | 2-1 | Jul-03 | 2 | FOC | PRESTON | CHEAT | 39 | 29 | 5 | 79 | 4 | 27 | KINGWOOD |
| NF GREENS RUN | 2-2 | Jul-03 | 2 | FOC | PRESTON | CHEAT | 39 | 30 | 17 | 79 | 40 | 4 | KINGWOOD |
| NF GREENS RUN | 2-3 | Jul-03 | 2 | FOC | PRESTON | CHEAT | 39 | 30 | 35 | 79 | 42 | 13 | VALLEY POINT |
| NF GREENS RUN | 2-4 | Jul-03 | 2 | FOC | PRESTON | CHEAT | 39 | 29 | 37 | 79 | 40 | 9 | VALLEY POINT |
| NF GREENS RUN | 2-1 | May-04 | 2 | FOC | PRESTON | CHEAT | 39 | 37 | 20 | 79 | 35 | 23 | KINGWOOD |
| NF GREENS RUN | 2-2 | May-04 | 2 | FOC | PRESTON | CHEAT | 39 | 29 | 39 | 79 | 40 | 17 | KINGWOOD |
| NF GREENS RUN | 2-4 | May-04 | 2 | FOC | PRESTON | CHEAT | 39 | 29 | 39 | 79 | 40 | 17 | VALLEY POINT |
| ROARING CREEK | 1 | Jun-03 | 2 | FOC | PRESTON | CHEAT | 39 | 30 | 3 | 79 | 38 | 6 | VALLEY POINT |
| ROARING CREEK | 2 | Jul-03 | 2 | FOC | PRESTON | CHEAT | 39 | 31 | 50 | 79 | 35 | 7 | CUZZART |
| WATKINS RUN | 1 | May-03 | 2 | FLM | PRESTON | CHEAT | 39 | 20 | 1 | 79 | 43 | 3 | ROWLESBURG |
| WATKINS RUN | 2 | Aug-03 | 2 | FLM | PRESTON | CHEAT | 39 | 20 | 3 | 79 | 43 | 14 | ROWLESBURG |
| WATKINS RUN | 2 | Aug-04 | 2 | FLM | PRESTON | CHEAT | 39 | 20 | 03 | 79 | 43 | 14 | FELLOWSVILLE |
| CLEAR FORK | | Apr-04 | 1 | CFWA | RALEIGH | COAL | 37 | 57 | 2 | 81 | 26 | 6 | DOROTHY |
| BIG SPRING FORK | 1 | Jul-04 | 3 | TH-EHWA | POCAHONTAS | ELK | 38 | 25 | 1 | 80 | 7 | 8 | SHARP KNOB |
| CAMP CREEK | 1 | Jun-04 | 3 | TU | BRAXTON | ELK | 38 | 36 | | 80 | 37 | | ERBACON |
| OLD FIELD FORK | 1 | Apr-04 | 3 | TU-EHWA | POCAHONTAS | ELK | 38 | 25 | 49 | 80 | 7 | 8 | SHARP KNOB |
| ELK RIVER | 1 | Oct-03 | 3 | TU-EHWA | RANDOLPH | ELK | 38 | 32 | 3 | 80 | 9 | 4 | SAMP |
| ELK RIVER | 1 | Oct-04 | 3 | TU-EHWA | RANDOLPH | ELK | 38 | 32 | 3 | 80 | 9 | 4 | MINGO |
| ELK RIVER | 2 | Aug-04 | 1 | BREATH | CLAY | ELK | 38 | 29 | 57 | 81 | 4 | 32 | CLAY |
| ELKLICK RUN | | Oct-04 | 2 | GPAC | NICHOLAS | GAULEY | 38 | 10 | 32 | 80 | 27 | 49 | FORK MOUNTAIN |
| RICH CREEK | | Mar-03 | 1 | TU | FAYETTE | GAULEY | 38 | 11 | 9 | 81 | 6 | 1 | ANSTED |
| UPPER GLADE RUN | 1 | Apr-04 | 3 | SHDSPRHS | WEBSTER | GAULEY | 38 | 24 | 1 | 80 | 29 | 13 | WEBSTER SPRINGS |
| UPPER GLADE RUN | 2 | Jun-04 | 2 | CAMP | WEBSTER | GAULEY | 38 | 24 | 12 | 80 | 29 | 15 | WEBSTER SPRINGS |
| UPPER GLADE RUN | 3 | Jun-03 | 2 | CAMP | WEBSTER | GAULEY | | | | | | | WEBSTER SPRINGS |
| HARTS RUN | | Feb-04 | 2 | LGWA | GREENBRIER | GREENBRIER | 37 | 45 | 2 | 80 | 21 | 2.6 | WHITE SULPHUR SPRINGS |
| GREENBRIER RIVER | | Jul-04 | 1 | ICWA | SUMMERS | GREENBRIER | 37 | 43 | 26 | 80 | 31 | 39 | ALDERSON |
| SECOND CREEK | 1 | Jul-04 | 1 | ICWA | MONROE | GREENBRIER | 37 | 42 | 26 | 80 | 31 | 42 | RONCEVERTE |
| SECOND CREEK | 2 | Jul-03 | 1 | ICWA | MONROE | GREENBRIER | 37 | 38 | 14 | 80 | 26 | 30 | FORT SPRING |
| BARKERS CREEK | | May-03 | 2 | UGWA | WYOMING | GUYANDOTTE | 37 | 32 | 36 | 81 | 23 | 21 | MULLENS |
| CABIN CREEK | | Jul-03 | 1 | UGWA | WYOMING | GUYANDOTTE | 37 | 36 | 17 | 81 | 26 | 51 | MULLENS |
| DEVILS FORK | | Jul-03 | 1 | UGWA | WYOMING | GUYANDOTTE | 37 | 35 | 26 | 81 | 18 | 38 | MULLENS |
| GUYANDOTTE RIVER | | Sep-03 | 2 | RWTC | LOGAN | GUYANDOTTE | 37 | 49 | 20 | 81 | 57 | 43 | LOGAN |
| SLAB FORK | 1 | Jul-03 | 1 | UGWA | WYOMING | GUYANDOTTE | 37 | 35 | 26 | 81 | 22 | 35 | MULLENS |
| SLAB FORK | 1 | Oct-04 | 1 | UGWA | WYOMING | GUYANDOTTE | | | | | | | MULLENS |
| ASH BRANCH | | Apr-03 | 2 | TU | KANAWHA | KANAWHA | 38 | 06 | 1 | 81 | 22 | 5 | ESKDALE |
| FIVEMILE FORK | 1 | Jul-03 | 2 | KCCA | KANAWHA | KANAWHA | 38 | 15 | 26 | 81 | 21 | 3.6 | MAMMOTH |

| STREAM | STATION | DATE | LEVEL | MONITORS | COUNTY | BASIN | LATITUDE | | | LONGITUDE | | | TOPO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | DGREES | MINUTES | SECONDS | DEGREES | MINUTES | SECONDS | |
| FIVEMILE FORK | 2 | Jul-03 | 2 | KCCA | KANAWHA | KANAWHA | 38 | 15 | 1.2 | 81 | 22 | 4.1 | MAMMOTH |
| FROZEN BRANCH | | Jul-03 | 2 | KCCA | KANAWHA | KANAWHA | 38 | 13 | 4 | 81 | 25 | 1 | CEDAR GROVE |
| GOOSE HOLLOW | 1 | Jul-03 | 2 | KCCA | KANAWHA | KANAWHA | 38 | 15 | 6 | 81 | 21 | 2 | MAMMOTH |
| GOOSE HOLLOW | 2 | Jun-03 | 2 | KCCA | KANAWHA | KANAWHA | 38 | 16 | 2 | 81 | 20 | 5 | MAMMOTH |
| HICKS HOLLOW | | Jun-03 | 2 | KCCA | KANAWHA | KANAWHA | 38 | 14 | 7 | 81 | 25 | 1 | CEDAR GROVE |
| HORSEMILL BRANCH | | Jul-03 | 2 | KCCA | KANAWHA | KANAWHA | 38 | 13 | 2 | 81 | 25 | 4 | CEDAR GROVE |
| HURRICANE FORK | | Jun-03 | 2 | KCCA | KANAWHA | KANAWHA | 38 | 16 | 3 | 81 | 19 | 3 | MAMMOTH |
| KELLYS CREEK | 1 | Jul-03 | 2 | KCCA | KANAWHA | KANAWHA | 38 | 13 | 0 | 81 | 25 | 4 | MAMMOTH |
| KELLYS CREEK | 2 | Jul-03 | 2 | KCCA | KANAWHA | KANAWHA | | | | | | | CEDAR GROVE |
| KELLYS CREEK | 3 | Jul-03 | 2 | KCCA | KANAWHA | KANAWHA | 38 | 17 | 1 | 81 | 21 | 3 | CEDAR GROVE |
| KELLYS CREEK | 4 | Jun-03 | 2 | KCCA | KANAWHA | KANAWHA | 38 | 14 | 3 | 81 | 24 | 3 | CEDAR GROVE |
| KELLYS CREEK | | Jun-03 | 2 | KCCA | KANAWHA | KANAWHA | 38 | 15 | 6 | 81 | 22 | 44 | QUICK |
| MORRIS CREEK | | Sep-04 | 1 | MCWA | KANAWHA | KANAWHA | 38 | 8 | 29 | 81 | 20 | 52 | MONTGOMERY |
| MORRIS CREEK | 15 | Nov-04 | 3 | MCWA | FAYETTE | KANAWHA | 38 | 8 | 0 | 81 | 21 | 6 | MONTGOMERY |
| MORRIS CREEK | 7 | Nov-04 | 3 | MCWA | KANAWHA | KANAWHA | 39 | 9 | 7 | 81 | 20 | 0 | MONTGOMERY |
| MANILA CREEK | 7 | Jul-03 | 2 | HMWO | PUTNAM | KANAWHA | | | | | | | BANCROFT |
| MANILA CREEK | 6 | Apr-03 | 2 | HMWO | PUTNAM | KANAWHA | | | | | | | BANCROFT |
| MANILA CREEK | 5 | Apr-03 | 2 | HMWO | PUTNAM | KANAWHA | 38 | 32 | 27 | 81 | 48 | 13 | BANCROFT |
| MANILA CREEK | 4 | Jul-03 | 2 | HMWO | PUTNAM | KANAWHA | | | | | | | BANCROFT |
| MANILA CREEK | 3 | Jul-03 | 2 | HMWO | PUTNAM | KANAWHA | 38 | 31 | 2 | 81 | 48 | 31 | BANCROFT |
| MANILA CREEK | 2 | Jul-03 | 2 | HMWO | PUTNAM | KANAWHA | | | | | | | BANCROFT |
| MANILA CREEK | 1 | Jul-03 | 2 | HMWO | PUTNAM | KANAWHA | 38 | 29 | 39 | 81 | 47 | 60 | BANCROFT |
| MANILA CREEK | 7 | Apr-03 | 2 | HMWO | PUTNAM | KANAWHA | 38 | 33 | 32 | 81 | 47 | 16 | BANCROFT |
| MANILA CREEK | | Oct-03 | 2 | HMWO | PUTNAM | KANAWHA | 38 | 32 | 08 | 81 | 48 | 0 | BANCROFT |
| POCATALICO RIVER | | May-03 | 1 | PTHELEM | KANAWHA | KANAWHA | 38 | 31 | 11 | 81 | 39 | 43 | SISSONVILLE |
| TRACE FORK | | Aug-03 | 1 | DCWA | KANAWHA | KANAWHA | 38 | 19 | 56 | 81 | 42 | 50 | CHARLESTON WEST |
| UNT LEFT FORK | | Jul-03 | 2 | KCCA | KANAWHA | KANAWHA | 38 | 16 | 4 | 81 | 21 | 5.2 | MAMMOTH |
| WILLIS BRANCH | | Jul-03 | 2 | UPCWA | FAYETTE | KANAWHA | 37 | 54 | 43 | 81 | 16 | 32 | PAX |
| CEDAR CREEK | | Sep-03 | 2 | GSC | GILMER | LITTLE KANAWHA | 38 | 52 | 39 | 80 | 50 | 28 | GLENVILLE |
| CEDAR CREEK | | Apr-03 | 2 | GSC | GILMER | LITTLE KANAWHA | | | | | | | GLENVILLE |
| ELLIS CREEK | | Sep-03 | 3 | GCWC | GILMER | LITTLE KANAWHA | 38 | 58 | 4 | 80 | 43 | 2 | GILMER |
| LITTLE KANAWHA RIVER | | Aug-03 | 2 | CGTC | CALHOUN | LITTLE KANAWHA | | | | | | | GRANTSVILLE |
| ABRAMS CREEK | | | 2 | DOH | GRANT | NORTH BRANCH | 39 | 18 | 22 | 79 | 11 | 33 | GREENLAND GAP |
| ELKLICK RUN | | | 2 | DOH | GRANT | NORTH BRANCH | | | | | | | GREENLAND GAP |
| NF PATTERSON CREEK | 1 | | 2 | DOH | GRANT | NORTH BRANCH | 39 | 11 | 29 | 79 | 3 | 47 | MEDLEY |
| NF PATTERSON CREEK | 2 | | 2 | DOH | GRANT | NORTH BRANCH | 39 | 10 | 32 | 79 | 7 | 1 | MEDLEY |
| PATTERSON CREEK | | | 2 | DOH | GRANT | NORTH BRANCH | 39 | 14 | 13 | 79 | 1 | 8 | MEDLEY |
| BRUSH CREEK | 2 | Oct-04 | 1 | PKVHS | MERCER | NEW | 37 | 26 | 1 | 81 | 3 | 7 | ATHENS |
| BRUSH CREEK | 1 | Apr-05 | 3 | WVGC | MERCER | NEW | 37 | 27 | 35 | 81 | 03 | 34 | ATHENS |
| DROOPING LICK CREEK | | May-04 | 1 | ICWA | MONROE | NEW | 37 | 29 | 54 | 80 | 36 | 4 | UNION |
| HANS CREEK | | Oct-03 | 1 | ICWA | MONROE | NEW | 37 | 3 | 14 | 80 | 43 | 38 | LINDSIDE |
| INDIAN CREEK | | Sep-03 | 1 | ICWA | MONROE | NEW | 37 | 33 | 17 | 80 | 34 | 35 | UNION |

| STREAM | STATION | DATE | LEVEL | MONITORS | COUNTY | BASIN | LATITUDE | | | LONGITUDE | | | TOPO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | DGREES | MINUTES | SECONDS | DEGREES | MINUTES | SECONDS | |
| LAUREL CREEK | | Oct-03 | 2 | OHCC | FAYETTE | NEW | 38 | 04 | 5 | 81 | 8 | 5 | BECKWITH |
| WOLF CREEK | | May-03 | 2 | OHCC | FAYETTE | NEW | 38 | 3 | 36 | 81 | 4 | 24 | FAYETTEVILLE |
| LITTLE MILL CREEK | | May-04 | 2 | RJTCS | ROAN | MIDDLE OHIO | 38 | 49 | 18 | 81 | 33 | 50 | GAY |
| STEWARTS RUN | | Jul-04 | 1 | BREATH | RITCHIE | MIDDLE OHIO | | | | | | | HARRISVILLE |
| UNT HUGHES RIVER | | Apr-03 | 1 | TU | DODRIDGE | MIDDLE OHIO | 39 | 12 | 10 | 81 | 6 | 1 | HARRISVILLE |
| TOMLINSON RUN | | Mar-03 | 2 | NCUMHS | HANCOCK | UPPER OHIO | 40 | 32 | 50 | 80 | 35 | 40 | EAST LIVERPOOL SOUTH |
| BACK CREEK | 3 | Jul-04 | 1 | BHEN | HANCOCK | POTOMAC DIRECT | 39 | 23 | 49 | 78 | 8 | 54 | TABLERS STATION |
| ELK BRANCH | | Oct-03 | 2 | JCWC | JEFFERSON | POTOMAC DIRECT | 39 | 20 | 32 | 77 | 46 | 42 | CHARLES TOWN |
| ELK RUN | 1 | May-03 | 2 | JCWC | JEFFERSON | POTOMAC DIRECT | 39 | 20 | 10 | 77 | 46 | 7 | CHARLES TOWN |
| ELK RUN | 2 | Oct-03 | 2 | JCWC | JEFFERSON | POTOMAC DIRECT | 39 | 20 | 10 | 77 | 46 | 7 | CHARLES TOWN |
| ELK RUN | 1 | Oct-03 | 2 | JCWC | JEFFERSON | POTOMAC DIRECT | 39 | 20 | 07 | 77 | 45 | 45 | CHARLES TOWN |
| HARPER RUN | | Jul-03 | 3 | BHEN/FOCA | BERKELEY | POTOMAC DIRECT | 39 | 33 | 6 | 78 | 1 | 15 | BIG POOL |
| HALF MILE RUN | | Mar-04 | 2 | BHEN | BERKELEY | POTOMAC DIRECT | 39 | 31 | 38 | 78 | 2 | 40 | BIG POOL |
| KATES RUN | | Jun-04 | 3 | BHEN | BERKELEY | POTOMAC DIRECT | 39 | 34 | 6 | 78 | 0 | 25 | BIG POOL |
| OPEQUON CREEK | 2 | Jul-04 | 1 | IWLA | BERKELEY | POTOMAC DIRECT | | | | | | | MIDDLEWAY |
| OPEQUON CREEK | 1 | Oct-03 | 1 | IWLA | BERKELEY | POTOMAC DIRECT | 39 | 31 | 0 | 77 | 53 | 4 | HEDGESVILLE |
| RATTLESNAKE RUN | 3 | Sep-03 | 2 | JCWC | JEFFERSON | POTOMAC DIRECT | 39 | 35 | 5 | 77 | 45 | 34 | SHEPHERDSTOWN |
| RATTLESNAKE RUN | 2 | Sep-03 | 2 | JCWC | JEFFERSON | POTOMAC DIRECT | 39 | 23 | 42 | 77 | 47 | 57 | SHEPHERDSTOWN |
| RATTLESNAKE RUN | 1 | Apr-03 | 2 | JCWC | JEFFERSON | POTOMAC DIRECT | 39 | 25 | 5 | 77 | 45 | 34 | SHEPHERDSTOWN |
| RATTLESNAKE RUN | 3 | Apr-03 | 2 | JCWC | JEFFERSON | POTOMAC DIRECT | 39 | 23 | 42 | 77 | 47 | 57 | SHEPHERDSTOWN |
| RATTLESNAKE RUN | 1 | Apr-03 | 2 | JCWC | JEFFERSON | POTOMAC DIRECT | | | | | | | SHEPHERDSTOWN |
| ROCKY MARSH RUN | 1 | Oct-03 | 2 | JCWC | JEFFERSON | POTOMAC DIRECT | 39 | 25 | 51 | 77 | 51 | 46 | SHEPHERDSTOWN |
| ROCKY MARSH RUN | 2 | Apr-03 | 2 | JCWC | JEFFERSON | POTOMAC DIRECT | 39 | 29 | 20 | 77 | 39 | 39 | SHEPHERDSTOWN |
| SLEEPY CREEK | 1 | May-04 | 1 | SCWA | MORGAN | POTOMAC DIRECT | 39 | 36 | 18 | 78 | 9 | 58 | STOTLERS CROSSROADS |
| SLEEPY CREEK | 2 | Jun-04 | 1 | SCWA | MORGAN | POTOMAC DIRECT | 39 | 38 | 25 | 78 | 7 | 15 | STOTLERS CROSSROADS |
| SLEEPY CREEK | 3 | Jul-04 | 1 | SCWA | MORGAN | POTOMAC DIRECT | | | | | | | HANCOCK |
| SLEEPY CREEK | 3 | Nov-03 | 2 | SCWA | MORGAN | POTOMAC DIRECT | 39 | 28 | 28 | 78 | 16 | 24 | HANCOCK |
| SLEEPY CREEK | 2 | Aug-03 | 2 | SCWA | MORGAN | POTOMAC DIRECT | | | | | | | STOTLERS CROSSROADS |
| SLEEPY CREEK | 1 | Jul-03 | 1 | SCWA | MORGAN | POTOMAC DIRECT | 39 | 37 | 22 | 78 | 05 | 58 | STOTLERS CROSSROADS |
| SLEEPY CREEK | | Sep-04 | 1 | SCWA | MORGAN | POTOMAC DIRECT | | | | | | | STOTLERS CROSSROADS |
| TOWN RUN | | Oct-03 | 2 | JCWC | JEFFERSON | POTOMAC DIRECT | 39 | 25 | 15 | 77 | 49 | 14 | SHEPHERDSTOWN |
| TUSCARORA CREEK | 1 | Jul-04 | 1 | CA-BHEN | BERKELEY | POTOMAC DIRECT | 39 | 28 | 6 | 77 | 59 | 53 | MARTINSBURG |
| TUSCARORA CREEK | 2 | Apr-04 | 2 | EAGELEM | BERKELEY | POTOMAC DIRECT | 39 | 27 | 58 | 77 | 58 | 4 | MARTINSBURG |
| ANDERSON RUN | | | 2 | DOH | HARDY | SOUTH BRANCH | 39 | 8 | 9 | 78 | 56 | 10 | OLD FIELD |
| BIG RUN | 1 | Jun-04 | 1 | TMI | PENDLETON | SOUTH BRANCH | | | | | | | SPRUCE KNOB |
| BIG RUN | 2 | Aug-04 | 3 | TMI | PENDLETON | SOUTH BRANCH | 38 | 41 | 4 | 79 | 34 | 20 | SPRUCE KNOB |
| BIG RUN | 1 | Apr-04 | 1 | TMI | PENDLETON | SOUTH BRANCH | 38 | 40 | 34 | 79 | 34 | 30 | SPRUCE KNOB |
| CLIFFORD HOLLOW | | | 2 | DOH | HARDY | SOUTH BRANCH | | | | | | | MOOREFIELD |
| DUMPLING RUN | | | 2 | DOH | HARDY | SOUTH BRANCH | 39 | 4 | 38 | 78 | 57 | 27 | MOOREFIELD |
| FORT RUN | | | 2 | DOH | HARDY | SOUTH BRANCH | 39 | 5 | 24 | 78 | 57 | 10 | MOOREFIELD |
| NORTH FORK | | Oct-04 | 1 | PMS | PENDLETON | SOUTH BRANCH | 38 | 23 | 26 | 79 | 36 | 30 | ONEGO |
| SOUTH BRANCH | | Oct-04 | 1 | PMS | PENDLETON | SOUTH BRANCH | 38 | 60 | 23 | 79 | 35 | 38 | SUGAR GROVE |

| STREAM | STATION | DATE | LEVEL | MONITORS | COUNTY | BASIN | LATITUDE | | | LONGITUDE | | | TOPO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | DGREES | MINUTES | SECONDS | DEGREES | MINUTES | SECONDS | |
| SOUTH BRANCH | | Oct-04 | 1 | PMS | PENDLETON | SOUTH BRANCH | 38 | 20 | 18 | 79 | 27 | 57 | UPPER TRACT |
| SOUTH BRANCH | | Oct-04 | 1 | PMS | PENDLETON | SOUTH BRANCH | 38 | 06 | 10 | 79 | 32 | 37 | FRANKLIN |
| SOUTH MILL CREEK | | Jul-03 | 3 | PHS | GRANT | SOUTH BRANCH | 38 | 57 | 40 | 79 | 6 | 45 | PERTESBURG EAST |
| SPRING RUN | 1 | Jul-03 | 2 | FSRWT | GRANT | SOUTH BRANCH | 38 | 55 | 9 | 79 | 5 | 10 | PERTESBURG EAST |
| SPRING RUN | 2 | Jul-03 | 2 | FSRWT | GRANT | SOUTH BRANCH | 38 | 55 | 7 | 79 | 5 | 9 | PERTESBURG EAST |
| SPRING RUN | 3 | Jul-03 | 2 | FSRWT | GRANT | SOUTH BRANCH | 38 | 55 | 5 | 79 | 5 | 5 | PERTESBURG EAST |
| SPRING RUN | 4 | Jul-03 | 2 | FSRWT | GR | SOUTH BRANCH | 38 | 55 | 0 | 79 | 4 | 9 | PERTESBURG EAST |
| SOUTH FORK | | Oct-04 | 1 | PMS | PENDLETON | SOUTH BRANCH | 38 | 07 | 37 | 79 | 20 | 28 | FORT SEYBERT |
| TOMBS HOLLOW RUN | | | 2 | DOH | HARDY | SOUTH BRANCH | | | | | | | MEDLEY |
| WALNUT BOTTOM | 1 | | 2 | DOH | HARDY | SOUTH BRANCH | 39 | 8 | 7 | 78 | 58 | 38 | OLD FIELD |
| WALNUT BOTTOM | 2 | | 2 | DOH | HARDY | SOUTH BRANCH | | | | | | | OLD FIELD |
| BULLSKIN RUN | 1 | Nov-03 | 2 | JCWC | JEFFERSON | SHENANDOAH | 39 | 12 | 43 | 77 | 50 | 5 | CHARLES TOWN |
| BULLSKIN RUN | 2 | Oct-03 | 2 | JCWC | JEFFERSON | SHENANDOAH | 39 | 14 | 4 | 77 | 53 | 49 | CHARLES TOWN |
| BULLSKIN RUN | 3 | Nov-03 | 2 | JCWC | JEFFERSON | SHENANDOAH | 39 | 14 | 56 | 77 | 56 | 1 | CHARLES TOWN |
| EVITTS RUN | 1 | May-03 | 2 | JCWC | JEFFERSON | SHENANDOAH | 39 | 17 | 30 | 77 | 52 | 9 | CHARLES TOWN |
| EVITTS RUN | 1 | Oct-03 | 2 | JCWC | JEFFERSON | SHENANDOAH | 39 | 17 | 30 | 77 | 52 | 9 | CHARLES TOWN |
| EVITTS RUN | 2 | Oct-03 | 2 | JCWC | JEFFERSON | SHENANDOAH | 39 | 15 | 09 | 77 | 51 | 17 | CHARLES TOWN |
| EVITTS RUN | 3 | Oct-03 | 2 | JCWC | JEFFERSON | SHENANDOAH | | | | | | | CHARLES TOWN |
| EVITTS RUN | 4 | Apr-03 | 2 | JCWC | JEFFERSON | SHENANDOAH | 39 | 17 | 50 | 77 | 54 | 22 | CHARLES TOWN |
| EVITTS RUN | 4 | Oct-03 | 2 | JCWC | JEFFERSON | SHENANDOAH | 39 | 17 | 50 | 77 | 54 | 22 | CHARLES TOWN |
| HUBBARDS RUN | 1 | Nov-03 | 2 | JCWC | JEFFERSON | SHENANDOAH | | | | | | | CHARLES TOWN |
| HUBBARDS RUN | 2 | Apr-03 | 2 | JCWC | JEFFERSON | SHENANDOAH | | | | | | | CHARLES TOWN |
| BRADSHAW CREEK | 2 | Mar-03 | 1 | ECWA | MCDOWELL | TUG FORK | 37 | 18 | 60 | 81 | 49 | 11 | BRADSHAW |
| BRADSHAW CREEK | 1 | Mar-03 | 1 | ECWA | MCDOWELL | TUG FORK | 37 | 20 | 51 | 81 | 48 | 16 | BRADSHAW |
| DRY FORK | | Apr-03 | 1 | ECWA | MCDOWELL | TUG FORK | 37 | 20 | 55 | 81 | 47 | 48 | BRADSHAW |
| ELKHORN CREEK | | Mar-03 | 1 | ECWA | MCDOWELL | TUG FORK | 37 | 24 | 41 | 81 | 27 | 21 | KEYSTONE |
| TWIN BRANCH | | Oct-03 | 1 | ECWA | MCDOWELL | TUG FORK | 37 | 29 | 8 | 81 | 39 | 44 | DAVY |
| LEADING CREEK | | | 2 | DOH | RANDOLPH | TYGART VALLEY | | | | | | | MONTROSE |
| LF FILES CREEK | | Jun-04 | 2 | NPS-WVCA | RANDOLPH | TYGART VALLEY | 38 | 49 | 41 | 79 | 47 | 53 | BEVERLY EAST |
| LF FILES CREEK | | May-04 | 1 | ELMS | RANDOLPH | TYGART VALLEY | 38 | 49 | 41 | 79 | 47 | 53 | BEVERLY EAST |
| LF FILES CREEK | | May-03 | 1 | ELMS | RANDOLPH | TYGART VALLEY | | | | | | | BEVERLY EAST |
| LB/LF SANDY CREEJ | 1 | Jun-04 | 2 | FLM | PRESTON | TYGART VALLEY | 39 | 18 | 6 | 79 | 47 | 52 | FELLOWSVILLE |
| LB/LF SANDY CREEJ | 1 | Jul-03 | 2 | FLM | PRESTON | TYGART VALLEY | 39 | 18 | 6 | 79 | 47 | 52 | FELLOWSVILLE |
| LB/LF SANDY CREEJ | 2 | Aug-04 | 2 | FLM | PRESTON | TYGART VALLEY | 39 | 18 | 06 | 79 | 47 | 53 | FELLOWSVILLE |
| LF SANDY CREEK | | Jul-03 | 2 | FLM | PRESTON | TYGART VALLEY | 39 | 18 | 0 | 79 | 47 | 60 | FELLOWSVILLE |
| LF SANDY CREEK | | May-03 | 2 | FLM | PRESTON | TYGART VALLEY | 39 | 18 | 0 | 79 | 41 | 6 | FELLOWSVILLE |
| MILLSTONE CREEK | | May-04 | 1 | ELMS | RANDOLPH | TYGART VALLEY | 38 | 50 | 6 | 79 | 47 | 50 | BEVERLY EAST |
| MILLSTONE CREEK | | May-03 | 1 | ELMS | RANDOLPH | TYGART VALLEY | | | | | | | BEVERLY EAST |
| RB/LF SANDY CREEK | 2 | Jun-04 | 2 | FLM | PRESTON | TYGART VALLEY | 39 | 18 | 3 | 79 | 47 | 43 | FELLOWSVILLE |
| RB/LF SANDY CREEK | 2 | May-03 | 2 | FLM | PRESTON | TYGART VALLEY | 39 | 18 | 0 | 79 | 47 | 5 | FELLOWSVILLE |
| RB/LF SANDY CREEK | 2 | Jul-03 | 2 | FLM | PRESTON | TYGART VALLEY | 39 | 18 | 3 | 79 | 47 | 43 | FELLOWSVILLE |
| RB/LF SANDY CREEK | 1 | Aug-04 | 2 | FLM | PRESTON | TYGART VALLEY | 39 | 18 | 03 | 79 | 44 | 43 | FELLOWSVILLE |

| STREAM | STATION | DATE | LEVEL | MONITORS | COUNTY | BASIN | LATITUDE | | | LONGITUDE | | | TOPO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | DGREES | MINUTES | SECONDS | DEGREES | MINUTES | SECONDS | |
| UNT MIDDLE FORK RIVER | | Jul-04 | 3 | CAMP | LEWIS | TYGART VALLEY | 38 | 57 | 2 | 80 | 4 | 5 | CASSITY |
| BOOTH CREEK | | Jul-03 | 2 | LWFWA | MARION | WEST FORK | 39 | 26 | 10 | 80 | 12 | 5 | FAIRMONT WEST |
| BRUSHY FORK | | Jul-03 | 3 | GUARD | HARRISON | WEST FORK | 39 | 13 | 54 | 80 | 17 | 19 | MOUNT CLARE |
| ELK CREEK | | Mar-04 | 2 | ABC | BARBOUR | WEST FORK | 39 | 8 | 1 | 80 | 6 | 12 | PHILLIPI |
| HELENS RUN | | Aug-04 | 1 | LWFWA | MARION | WEST FORK | 39 | 27 | 7 | 80 | 15 | 2 | SHINSTON |
| ISAACS CREEK | | Jul-03 | 3 | GUARD | HARRISON | WEST FORK | 39 | 21 | 21 | 80 | 24 | 41 | WOLF SUMMIT |
| KINCHELOE CREEK | | Jul-03 | 3 | GUARD | HARRISON | WEST FORK | 39 | 81 | 57 | 80 | 30 | 31 | WEST MILFORD |
| LAMBERTS RUN | | Jun-03 | 3 | GUARD | HARRISON | WEST FORK | 39 | 20 | 35 | 80 | 20 | 60 | CLARKSBURG |
| SALEM FORK | | May-03 | 3 | GUARD | HARRISON | WEST FORK | 39 | 17 | 51 | 80 | 33 | 53 | SALEM |
| SKIN CREEK | | Apr-03 | 2 | ENV | LEWIS | WEST FORK | 38 | 55 | 10 | 80 | 23 | 8 | ROANOKE |
| TENMILE CREEK | | Sep-03 | 3 | GUARD | HARRISON | WEST FORK | 39 | 19 | 20 | 80 | 23 | 07 | WOLF SUMMIT |
| TWO LICK CREEK | | Jul-03 | 3 | GUARD | HARRISON | WEST FORK | 39 | 10 | 7 | 80 | 28 | 52 | WEST MILFORD |
| UNT LAMBERTS RUN | | May-03 | 3 | GUARD | HARRISON | WEST FORK | 39 | 20 | 19 | 80 | 22 | 22 | CLARKSBURG |
| RHINE CREEK | | Apr-03 | 2 | AURELEM | PRESTON | YOUGHIOGHENY | | | | | | | AURORA |

**Appendix 2**. Water chemistry

| STREAM | BASIN | STATION | DATE | WATER CHEMISTRY | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | PH | COND | DO | IRON | AL | MN | PHOSPHATE | NITRATE | ACID | FECAL | HARDNESS | ALKALINE |
| BAKERS RUN | CACAPON | 1 | | 7.5 | | | | | | | | | | | |
| BAKERS RUN | CACAPON | 2 | | 7.5 | | 8.5 | | | | | | | | | |
| BAKERS RUN | CACAPON | 3 | | 7.5 | | 9.6 | | | | | | | | | |
| LONG LICK RUN | CACAPON | | | 7.7 | | 8.5 | | | | | | | | | |
| LOST RIVER | CACAPON | 1 | | 7.5 | | 7.6 | | | | | | | | | |
| LOST RIVER | CACAPON | 2 | | 7.5 | | | | | | | 2.0 | | | | |
| SAUERKRAUT RUN | CACAPON | 1 | | 7.8 | | 9.2 | | | | | | | | | |
| SAUERKRAUT RUN | CACAPON | 2 | | 7.8 | | 10.2 | | | | | | | | | |
| TROUT RUN | CACAPON | 1 | | 7.6 | | 10.5 | | | | | | | | | |
| TROUT RUN | CACAPON | 2 | | 7.6 | | 10.5 | | | | | | | | | |
| WAITES RUN | CHEAT | | | 7.3 | | 10.0 | | | | | | | | | |
| BEAVER CREEK | CHEAT | 3-1 | Aug-03 | 7.8 | 181 | 8.0 | 1.2 | 0.1 | 0.4 | | | | | | |
| BEAVER CREEK | CHEAT | 3-2 | Jul-03 | 7.1 | 36 | 10.0 | 0.5 | 0.5 | 0.1 | | | | | | |
| BEAVER CREEK | CHEAT | 3-3 | Jul-03 | 5.1 | 25 | 9.0 | 0.4 | 0.4 | 0.1 | | | | | | |
| BEAVER CREEK | CHEAT | 3-4 | Aug-03 | 7.3 | 164 | 8.0 | 0.4 | 0.4 | 0.5 | | | | | | |
| BEAVER CREEK | CHEAT | 3-5 | Aug-03 | 4.0 | 376 | 8.0 | 0.6 | 4.0 | 2.7 | | | | | | |
| BEAVER CREEK | CHEAT | 3-6 | Aug-03 | 7.2 | 98 | 11.0 | 0.4 | 0.5 | 0.5 | | | | | | |
| BEAVER CREEK | CHEAT | 3-7 | Aug-03 | 7.6 | 164 | 8.0 | 0.3 | 0.3 | 0.3 | | | | | | |
| BEAVER CREEK | CHEAT | 3-1 | May-04 | 6.2 | 136 | | 0.3 | 0.3 | 0.3 | | | 8.0 | | | 340.0 |
| BEAVER CREEK | CHEAT | 3-5 | May-04 | 6.9 | 43 | 10.0 | 0.6 | 0.6 | 0.1 | | | 7.0 | | | 3.0 |
| BEAVER CREEK | CHEAT | 3-10 | May-04 | 6.5 | 81 | | 0.6 | 0.5 | 0.2 | | | 2.0 | | | 5.0 |
| BEAVER CREEK | CHEAT | 3-9 | May-04 | 6.3 | 100 | | 0.3 | 0.6 | 0.4 | | | | | | |
| BEAVER CREEK | CHEAT | 3-8 | May-04 | 4.4 | 296 | | 0.7 | 2.4 | 2.0 | | | 20.0 | | | 1.0 |
| BUFFALO RUN | CHEAT | 1-2 | Apr-04 | 8.1 | 223 | | | | | | | | | | |
| BUFFALO RUN | CHEAT | 1-1 | Aug-03 | 8.1 | 279 | 8.0 | 0.5 | 0.2 | 0.8 | | | | | | |
| BUFFALO RUN | CHEAT | 1-2 | Aug-03 | 7.6 | 108 | 66.0 | 0.2 | 0.2 | 0.0 | | | | | | |
| BUFFALO RUN | CHEAT | 1-3 | Aug-03 | 7.7 | 359 | 8.0 | 0.1 | 0.1 | 1.0 | | | | | | |
| BUFFALO RUN | CHEAT | 1-4 | Aug-03 | 4.6 | 398 | | 0.5 | 0.6 | 3.4 | | | | | | |
| BUFFALO RUN | CHEAT | 1-5 | Aug-03 | 7.1 | 381 | | 0.1 | 0.1 | 0.2 | | | | | | |
| BUFFALO RUN | CHEAT | 1-6 | Aug-03 | 7.9 | 314 | 9.0 | 0.2 | 0.1 | 0.0 | | | | | | |
| BUFFALO RUN | CHEAT | 1-7 | Jul-03 | 8.0 | | 9.0 | 0.1 | 0.1 | 1.2 | | | | | | |
| BUFFALO RUN | CHEAT | | Oct-04 | 6.2 | 468 | 8.0 | | | | | | | | | |
| BUFFALO RUN | CHEAT | 1-1 | May-04 | 6.5 | 110 | 9.4 | 0.4 | 0.3 | 0.3 | | | 1.0 | | | 12.0 |
| BUFFALO RUN | CHEAT | 1-3 | May-04 | 6.6 | 101 | 9.4 | | | | | | | | | |
| BUFFALO RUN | CHEAT | 1-5 | May-04 | 6.9 | 172 | 9.2 | 0.8 | 0.4 | 0.5 | | | 1.0 | | | 6.0 |
| BUFFALO RUN | CHEAT | 1-6 | May-04 | 7.4 | 190 | 9.4 | 1.1 | 0.6 | 0.2 | | | 1.0 | | | 31.0 |
| GLADY FORK | CHEAT | | Aug-04 | 7.2 | 70 | 9.6 | | | | | | | | | |
| GLADE RUN | CHEAT | 4-1 | Jul-03 | 8.0 | 720 | 8.0 | | | | | | | | | |
| GLADE RUN | CHEAT | 4-2 | Jul-03 | 7.6 | 518 | 10.0 | | | | | | | | | |
| GLADE RUN | CHEAT | 4-3 | Jul-03 | 6.4 | 219 | 7.0 | | | | | | | | | |
| GLADE RUN | CHEAT | 4-2 | May-04 | 7.6 | 233 | 8.0 | | | | | | | | | |

| STREAM | BASIN | STATION | DATE | WATER CHEMISTRY | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | PH | COND | DO | IRON | AL | MN | PHOSPHATE | NITRATE | ACID | FECAL | HARDNESS | ALKALINE | |
| GLADE RUN | CHEAT | 4-3 | May-04 | 6.4 | 142 | 8.0 | | | | | | | | | | |
| GLADE RUN | CHEAT | 4-4 | May-04 | 6.8 | 168 | 8.0 | | | | | | | | | | |
| MUDDY CREEK | CHEAT | 1 | Jun-03 | 7.3 | 290 | | | | | | | | | | | |
| MUDDY CREEK | CHEAT | 1 | Jul-03 | 8.0 | 310 | 12.0 | | | | | | | | | | |
| NORTH FK GREENS RUN | CHEAT | 2-1 | Jul-03 | 7.6 | | | 0.2 | 1.0 | 0.4 | | | | | | | |
| NORTH FK GREENS RUN | CHEAT | 2-2 | Jul-03 | 4.6 | 90 | | 0.5 | 2.4 | 0.7 | | | | | | | |
| NORTH FK GREENS RUN | CHEAT | 2-3 | Jul-03 | 4.3 | 100 | | 0.3 | 2.3 | 0.8 | | | | | | | |
| NORTH FK GREENS RUN | CHEAT | 2-4 | Jul-03 | 6.4 | 50 | | 0.2 | 0.2 | 0.1 | | | | | | | |
| NORTH FK GREENS RUN | CHEAT | 2-1 | May-04 | 7.4 | 145 | 8.0 | 1.3 | 1.8 | 0.4 | | | | | | | |
| NORTH FK GREENS RUN | CHEAT | 2-2 | May-04 | 6.5 | 104 | 9.0 | 3.3 | 3.0 | 0.5 | | | 10.0 | | | 1.0 | |
| NORTH FK GREENS RUN | CHEAT | 2-4 | May-04 | 6.4 | 64 | 10.0 | 0.0 | 0.0 | 0.0 | | | 0.0 | | | 6.2 | |
| ROARING CREEK | CHEAT | 1 | Jun-03 | 7.0 | 150 | | | | | | | | | | | |
| ROARING CREEK | CHEAT | 2 | Jul-03 | 7.6 | 140 | | | | | | | | | | | |
| WATKINS RUN | CHEAT | 1 | May-03 | 8.4 | 48 | 12.2 | | | | | | | | | | |
| CLEAR FORK | COAL | | Apr-04 | 8.1 | 300 | | | | | | | | | | | |
| BIG SPRING FORK | ELK | 1 | Jul-04 | 8.0 | 240 | 11.5 | | | | | | | | | | |
| CAMP CREEK | ELK | 1 | Jun-04 | 7.5 | 278 | 11.6 | | | | | | | | | | |
| OLD FIELD FORK | ELK | 1 | Apr-04 | 8.4 | 70 | 10.1 | | | | | | | | | | |
| ELK RIVER | ELK | 1 | Oct-03 | 7.7 | 110 | 10.2 | | | | | | | | | | |
| ELK RIVER | ELK | 1 | Oct-04 | 8.1 | 132 | 11.5 | | | | | | | | | | |
| ELK RIVER | ELK | 2 | Aug-04 | 7.7 | 240 | 8.6 | | | | | | | | | | |
| ELKLICK RUN | GAULEY | | Oct-04 | 6.5 | 30 | | | | | | | | | | | |
| UPPER GLADE RUN | GAULEY | 1 | Apr-04 | 7.8 | 193 | 9.7 | | | | | | | | | | |
| UPPER GLADE RUN | GAULEY | 2 | Jun-04 | 7.1 | 40 | | | | | | | | | | | |
| UPPER GLADE RUN | GAULEY | 3 | Jun-03 | 8.2 | 48 | 10.0 | | | | | | | | | | |
| HARTS RUN | GREENBRIER | | Feb-04 | 9.1 | 50 | | | | | | | | | | 20.0 | |
| BARKERS CREEK | GUYANDOTTE | | May-03 | 7.8 | | | | | | | | | | | | |
| SLAB FORK | GUYANDOTTE | 1 | Oct-04 | 8.4 | 247 | | | | | | | | | | | |
| MANILA CREEK | KANAWHA | 2 | Jul-03 | 4.5 | | | 16.0 | | | | | | | | | |
| MANILA CREEK | KANAWHA | | Oct-03 | 7.9 | 260 | | | | | | | | | | | |
| POCATALICO RIVER | KANAWHA | | May-03 | 8.1 | 301 | 7.5 | | | | | | | | | | |
| ASH BRANCH | KANAWHA | | Apr-03 | 7.8 | 420 | | | | | | | | | | | |
| FIVEMILE FORK | KANAWHA | 1 | Jul-03 | 8.0 | 550 | | | | | | | | | | | |
| FIVEMILE FORK | KANAWHA | 2 | Jul-03 | 8.2 | 620 | | | | | | | | | | | |
| FROZEN BRANCH | KANAWHA | | Jul-03 | 8.0 | 220 | | | | | | | | | | | |
| GOOSE HOLLOW | KANAWHA | 1 | Jul-03 | 8.0 | 570 | | | | | | | | | | | |
| GOOSE HOLLOW | KANAWHA | 2 | Jun-03 | 8.0 | 290 | | | | | | | | | | | |
| HICKS HOLLOW | KANAWHA | | Jun-03 | 8.5 | 1120 | | | | | | | | | | | |
| HORSEMILL BRANCH | KANAWHA | | Jul-03 | 3.5 | 630 | | | | | | | | | | | |
| HURRICANE FORK | KANAWHA | | Jun-03 | 8.3 | 890 | | | | | | | | | | | |
| KELLYS CREEK | KANAWHA | 2 | Jul-03 | 3.8 | 590 | | | | | | | | | | | |
| KELLYS CREEK | KANAWHA | 3 | Jul-03 | 6.9 | 400 | | | | | | | | | | | |

| STREAM | BASIN | STATION | DATE | WATER CHEMISTRY | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | PH | COND | DO | IRON | AL | MN | PHOSPHATE | NITRATE | ACID | FECAL | HARDNESS | ALKALINE |
| KELLYS CREEK | KANAWHA | | Jun-03 | 7.3 | 410 | | | | | | | | | | |
| MORRIS CREEK | KANAWHA | | Sep-04 | 7.6 | 190 | | | | | | | | | | |
| MORRIS CREEK | KANAWHA | 15 | Nov-04 | 7.3 | | | | | | | | | | | |
| MORRIS CREEK | KANAWHA | 7 | Nov-04 | 6.9 | | | | | | | | | | | |
| WILLIS BRANCH | KANAWHA | | Jul-03 | 8.0 | 400 | | | | | | | | | | |
| CEDAR CREEK | LITTLE KANAWHA | | Sep-03 | 6.9 | | | | | | | | | | | |
| CEDAR CREEK | LITTLE KANAWHA | | Apr-03 | 7.3 | 170 | 9.0 | | | | | | | | | |
| ELLIS CREEK | LITTLE KANAWHA | | Sep-03 | 7.3 | 280 | 10.0 | | | | | | | | | |
| LAUREL CREEK | NEW RIVER | | Oct-03 | 8.2 | 240 | 9.6 | | | | | | | | | |
| WOLF CREEK | NEW RIVER | | May-03 | 7.4 | 270 | 13.0 | | | | 5.0 | | | | | |
| BRUSH CREEK | NEW RIVER | 2 | Oct-04 | 8.2 | 240 | | | | | 15.0 | 2.0 | | | | 80.0 |
| BRUSH CREEK | NEW RIVER | 1 | Apr-03 | 9.8 | 160 | | | | | | | | | | |
| ABRAMS CREEK | NORTH BRANCH | | | 7.0 | | 7.6 | 4.0 | | | | | | | | |
| ELKLICK RUN | NORTH BRANCH | | | 8.0 | | 8.0 | | | | | | | | | |
| NORTH FK PATTERSON CREEK | NORTH BRANCH | 1 | | 8.0 | | 11.0 | | | | | | | | | |
| NORTH FK PATTERSON CREEK | NORTH BRANCH | 2 | | 8.0 | | 9.8 | | | | | | | | | |
| PATTERSON CREEK | NORTH BRANCH | | | 8.0 | | 13.0 | | | | | | | | | |
| LITTLE MILL CREEK | OHIO (MIDDLE) | | May-04 | 8.3 | 123 | | | | | 0.0 | | | | | |
| STEWARTS RUN | OHIO (MIDDLE) | | Jul-04 | 8.3 | 412 | | | | | | | | | | |
| UNT HUGHES RIVER | OHIO (MIDDLE) | | Apr-03 | 8.2 | 140 | 9.6 | | | | | | | | | |
| TOMLINSON RUN | OHIO (UPPER) | | Mar-03 | 8.2 | 380 | 9.0 | | | | | | | | | |
| BACK CREEK | POTOMAC DIRECT | 3 | Jul-04 | 7.0 | | | | | | | | | | | |
| KATES RUN | POTOMAC DIRECT | | Jun-04 | 9.0 | | | | | | | | | | | |
| OPEQUON CREEK | POTOMAC DIRECT | 2 | Jul-04 | 8.5 | 512 | | | | | | | | | | |
| OPEQUON CREEK | POTOMAC DIRECT | 1 | Oct-03 | 9.4 | 620 | 13.0 | | | | | | | | | |
| RATTLESNAKE RUN | POTOMAC DIRECT | 2 | Sep-03 | 7.7 | | 6.4 | | | | | | | | | |
| RATTLESNAKE RUN | POTOMAC DIRECT | 1 | Apr-03 | 8.4 | 483 | 10.6 | | | | | | | | | |
| SLEEPY CREEK | POTOMAC DIRECT | 2 | Jun-04 | 5.5 | | | | | | | | | | | |
| TUSCARORA CREEK | POTOMAC DIRECT | 1 | Jul-04 | 6.0 | | | | | | | | | | | |
| TUSCARORA CREEK | POTOMAC DIRECT | 2 | Apr-04 | 7.4 | 680 | | | | | | | | | | |
| SOUTH BRANCH POTOMAC | SOUTH BRANCH | | Oct-04 | 8.0 | | 9.0 | | | | | | | 73 | 100.0 | |
| SOUTH BRANCH POTOMAC | SOUTH BRANCH | | Oct-04 | 8.0 | | 12.1 | | | | | | | 42 | 118.0 | |
| SOUTH BRANCH POTOMAC | SOUTH BRANCH | | Oct-04 | 8.0 | | 10.0 | | | | | | | 33 | 100.0 | |
| ANDERSON RUN | SOUTH BRANCH | | | 8.0 | | 12.0 | | | | | 1.0 | | | | |
| BIG RUN | SOUTH BRANCH | 1 | Jun-04 | 8.5 | 130 | | | | | | | | | | |
| BIG RUN | SOUTH BRANCH | 2 | Aug-04 | 8.0 | 130 | 9.6 | | | | | | | | | |
| BIG RUN | SOUTH BRANCH | 1 | Apr-04 | 8.1 | 161 | | | | | | | | | | |
| CLIFFORD HOLLOW | SOUTH BRANCH | | | 7.0 | | 10.1 | | | | | | | | | |
| DUMPLING RUN | SOUTH BRANCH | | | 7.0 | | 10.0 | | | | | | | | | |
| FORT RUN | SOUTH BRANCH | | | 7.0 | | 12.0 | | | | | | | | | |
| NORTH FORK | SOUTH BRANCH | | Oct-04 | 8.0 | | 9.2 | | | | | | | 145 | | |
| SOUTH MILL CREEK | SOUTH BRANCH | | Jul-03 | 7.6 | 270 | 9.1 | | | | | | | | | |

| STREAM | BASIN | STATION | DATE | WATER CHEMISTRY | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | PH | COND | DO | IRON | AL | MN | PHOSPHATE | NITRATE | ACID | FECAL | HARDNESS | ALKALINE |
| SPRING RUN | SOUTH BRANCH | 1 | Jul-03 | 8.4 | 241 | 10.1 | | | | 0.0 | | | | | |
| SPRING RUN | SOUTH BRANCH | 2 | Jul-03 | 8.4 | 283 | 9.7 | | | | 0.0 | | | | | |
| SPRING RUN | SOUTH BRANCH | 3 | Jul-03 | 8.4 | 280 | 10.0 | | | | | | | | | |
| SPRING RUN | SOUTH BRANCH | 4 | Jul-03 | 7.9 | 292 | 10.1 | | | | | | | | | |
| SOUTH FORK | SOUTH BRANCH | | Oct-04 | 7.0 | | 8.3 | | | | | | | 145 | 100.0 | |
| TOMBS HOLLOW RUN | SOUTH BRANCH | | | 8.0 | 201 | 11.5 | | | | | | | | | |
| WALNUT BOTTOM | SOUTH BRANCH | 1 | | 8.0 | | 7.2 | 1 mg/L | | | | | | | | |
| WALNUT BOTTOM | SOUTH BRANCH | 2 | | 8.3 | 207 | 11.0 | | | | | | | | | |
| BRADSHAW CREEK | TUG FORK | 2 | Mar-03 | 8.5 | | 8.0 | | | | | | | | | |
| BRADSHAW CREEK | TUG FORK | 1 | Mar-03 | 8.5 | | 8.0 | | | | | | | | | |
| DRY FORK | TUG FORK | | Apr-03 | 8.0 | | 6.0 | | | | | | | | | |
| ELKHORN CREEK | TUG FORK | | Mar-03 | 8.5 | | 6.0 | | | | | | | | | |
| TWIN BRANCH | TUG FORK | | Oct-03 | 8.0 | | 10.0 | | | | | | | | | |
| LEADING CREEK | TYGART VALLEY | | | 6.0 | | 10.4 | | | | | | | | | |
| LEFT FK FILES CREEK | TYGART VALLEY | | Jun-04 | 6.4 | 70 | | | | | | | | | | |
| LEFT FK FILES CREEK | TYGART VALLEY | | May-04 | 7.2 | | | | | | | | | | | |
| LB/LF SANDY CREEK | TYGART VALLEY | 1 | Jun-04 | 7.0 | | | | | | | | | | | |
| LB/LF SANDY CREEK | TYGART VALLEY | 1 | Jul-03 | 7.0 | | | | | | | | | | | |
| UNT MIDDLE FORK RIVER | TYGART VALLEY | | Jul-04 | 6.9 | 44 | | | | | | | | | | |
| BOOTH CREEK | WEST FORK | | Jul-03 | 6.2 | 440 | | | | | | | | | | |
| BRUSHY FORK | WEST FORK | | Jul-03 | 8.2 | 774 | 7.8 | | | | | | | | | |
| ELK CREEK | WEST FORK | | Mar-04 | 7.4 | 640 | | 0.5 | | | 4.0 | | | | | |
| HELENS RUN | WEST FORK | | Aug-04 | 8.3 | 670 | 9.2 | | | | | | | | | 150.0 |
| ISAACS CREEK | WEST FORK | | Jul-03 | 8.0 | 745 | 7.8 | | | | | | | | | |
| KINCHELOE CREEK | WEST FORK | | Jul-03 | 7.8 | 104 | 8.6 | | | | | | | | | |
| LAMBERTS RUN | WEST FORK | | Jun-03 | 7.4 | 560 | 9.8 | | | | | | | | | |
| SALEM FORK | WEST FORK | | May-03 | 7.6 | 80 | 9.2 | | | | | | | | | |
| SKIN CREEK | WEST FORK | | Apr-03 | 6.5 | 380 | | | | | | | | | | |
| TENMILE CREEK | WEST FORK | | Sep-03 | 7.4 | 490 | | | | | | | | | | |
| TWO LICK CREEK | WEST FORK | | Jul-03 | 7.9 | 171 | 8.6 | | | | | | | | | |
| UNT LAMBERTS RUN | WEST FORK | | May-03 | 6.0 | 810 | 9.1 | | | | | | | | | |

**Appendix 3**. Physical conditions

| STREAM | BASIN | STATION | DATE | | WATER | | | ALGAE | | | STREAMBED | FOAM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TEMP | CLARITY | COLOR | ODOR | COLOR | TEXTURE | ABUNDANCE | | |
| BAKERS RUN | CACAPON | 1 | | 42.8 | | | | | | | | |
| BAKERS RUN | CACAPON | 2 | | 63.1 | | | | | | | | |
| BAKERS RUN | CACAPON | 3 | | 63.1 | | | | | | | | |
| BAKERS RUN | CACAPON | 4 | May-04 | | MURKY | BROWN | MUSKY | DARK GREEN | EVEN COATING | IN SPOTS | BROWN | NONE |
| LONG LICK RUN | CACAPON | | | 64.0 | | | | | | | | |
| LOST RIVER | CACAPON | 1 | | 77.0 | | | | | | | | |
| LOST RIVER | CACAPON | 2 | | 77.0 | | | | BROWN | EVEN COATING | IN SPOTS | | |
| SAUERKRAUT RUN | CACAPON | 1 | | 60.8 | | | | | | | | |
| SAUERKRAUT RUN | CACAPON | 2 | | 61.0 | | | | | | | | |
| TROUT RUN | CACAPON | 1 | | 55.0 | | | | | | | | |
| TROUT RUN | CACAPON | 2 | | 55.0 | | | | | | | | |
| WAITES RUN | CHEAT | | | 52.0 | | | | | | | | |
| BEAVER CREEK | CHEAT | 3-1 | Aug-03 | 65.0 | CLEAR | NONE | NONE | DARK GREEN | MATTED | IN SPOTS | BROWN | SLIGHT |
| BEAVER CREEK | CHEAT | 3-2 | Jul-03 | 62.0 | CLEAR | NONE | NONE | DARK GREEN | HAIRY | IN SPOTS | BROWN/BLACK | |
| BEAVER CREEK | CHEAT | 3-3 | Jul-03 | 63.0 | CLEAR | NONE | | DARK GREEN | HAIRY | IN SPOTS | BROWN/GRAY | MODERATE |
| BEAVER CREEK | CHEAT | 3-4 | Aug-03 | 65.0 | CLEAR | NONE | NONE | BROWN | HAIRY | IN SPOTS | BROWN/ORANGE | |
| BEAVER CREEK | CHEAT | 3-5 | Aug-03 | 74.0 | CLEAR | NONE | NONE | BROWN | HAIRY | IN SPOTS | ORANGE | |
| BEAVER CREEK | CHEAT | 3-6 | Aug-03 | 67.0 | CLEAR | NONE | NONE | BROWN | HAIRY | IN SPOTS | BROWN | SLIGHT |
| BEAVER CREEK | CHEAT | 3-7 | Aug-03 | 64.0 | MURKY | GRAY/WHITE | MUSKY | BROWN | HAIRY | IN SPOTS | BROWN | SLIGHT |
| BEAVER CREEK | CHEAT | 3-1 | May-04 | 63.0 | CLEAR | NONE | SEWAGE | BROWN | EVEN COAT | IN SPOTS | BROWN | NONE |
| BEAVER CREEK | CHEAT | 3-5 | May-04 | 58.0 | CLEAR | NONE | SEWAGE | DARK GREEN | HAIRY | IN SPOTS | BROWN | SLIGHT |
| BEAVER CREEK | CHEAT | 3-10 | May-04 | 60.0 | CLEAR | NONE | NONE | BROWN | MATTED | IN SPOTS | BROWN | NONE |
| BEAVER CREEK | CHEAT | 3-9 | May-04 | 60.0 | CLEAR | NONE | NONE | BROWN | MATTED | IN SPOTS | BROWN | NONE |
| BEAVER CREEK | CHEAT | 3-8 | May-04 | 66.0 | MURKY | ORANGE | NONE | BROWN | EVEN COATING | IN SPOTS | Orange | NONE |
| BUFFALO RUN | CHEAT | 1-2 | Apr-04 | 59.5 | CLEAR | NONE | NONE | BROWN | EVEN COATING | IN SPOTS | BROWN | NONE |
| BUFFALO RUN | CHEAT | 1-1 | Aug-03 | 70.0 | CLEAR | NONE | NONE | DARK GREEN | EVEN COATING | IN SPOTS | BROWN | |
| BUFFALO RUN | CHEAT | 1-2 | Aug-03 | 8.0 | MURKY | NONE | NONE | LIGHT GREEN | HAIRY | IN SPOTS | BROWN | |
| BUFFALO RUN | CHEAT | 1-3 | Aug-03 | 66.0 | CLEAR | NONE | NONE | DARK GREEN | MATTED | IN SPOTS | BROWN | |
| BUFFALO RUN | CHEAT | 1-4 | Aug-03 | 66.0 | CLEAR | NONE | NONE | DARK GREEN | EVEN COATING | IN SPOTS | BROWN | |
| BUFFALO RUN | CHEAT | 1-5 | Aug-03 | 72.0 | CLEAR | NONE | NONE | DARK GREEN | EVEN COATING | IN SPOTS | BROWN/BLACK | |
| BUFFALO RUN | CHEAT | 1-6 | Aug-03 | 68.0 | CLEAR | NONE | NONE | | | NONE | BROWN/BLACK | |
| BUFFALO RUN | CHEAT | 1-7 | Jul-03 | | | | SEWAGE | DARK GREEN | EVEN COATING | IN SPOTS | BROWN/BLACK | |
| BUFFALO RUN | CHEAT | | Oct-04 | 46.0 | CLEAR | NONE | NONE | BROWN | EVEN COATING | IN SPOTS | BROWN | NONE |
| BUFFALO RUN | CHEAT | 1-1 | May-04 | 59.5 | MURKY | Brown | NONE | DARK GREEN | EVEN COATING | IN SPOTS | | NONE |
| BUFFALO RUN | CHEAT | 1-3 | May-04 | 59.4 | MURKY | GRAY/WHITE | NONE | | | | GRAY/WHITE | NONE |
| BUFFALO RUN | CHEAT | 1-5 | May-04 | 61.9 | MURKY | GREEN | NONE | | | | BROWN/ORANGE | NONE |
| BUFFALO RUN | CHEAT | 1-6 | May-04 | 64.0 | MURKY | BROWN | MUSKY | | | | BROWN | NONE |
| BUFFALO RUN | CHEAT | 1-7 | May-04 | | MURKY | NONE | NONE | | | | BROWN | NONE |
| GLADY FORK | CHEAT | | Aug-04 | 63.0 | CLEAR | NONE | NONE | DARK GREEN | EVEN COATING | IN SPOTS | BROWN | SLIGHT |
| GLADE RUN | CHEAT | 4-1 | Jul-03 | 65.0 | MURKY | BROWN | NONE | BROWN | EVEN COATING | EVERYWHERE | BROWN/ORANGE | |
| GLADE RUN | CHEAT | 4-2 | Jul-03 | 64.0 | MURKY | BROWN | NONE | BROWN | EVEN COATING | EVERYWHERE | BROWN/ORANGE | |

| STREAM | BASIN | STATION | DATE | | WATER | | | ALGAE | | | STREAMBED | FOAM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TEMP | CLARITY | COLOR | ODOR | COLOR | TEXTURE | ABUNDANCE | | |
| GLADE RUN | CHEAT | 4-3 | Jul-03 | 68.0 | MURKY | BROWN | NONE | BROWN | EVEN COATING | EVERYWHERE | BROWN/ORANGE | |
| GLADE RUN | CHEAT | 4-2 | May-04 | 52.0 | CLEAR | NONE | MUSKY | DARK GREEN | HAIRY | IN SPOTS | BROWN/ORANGE | SLIGHT |
| GLADE RUN | CHEAT | 4-3 | May-04 | 59.0 | CLEAR | NONE | MUSKY | DARK GREEN | HAIRY | EVERYWHERE | BROWN/BLACK | SLIGHT |
| GLADE RUN | CHEAT | 4-4 | May-04 | 62.0 | CLEAR | NONE | SEWAGE | DARK/LIGHT GREEN | EVEN COATING | IN SPOTS | BROWN/ORANGE | SLIGHT |
| MUDDY CREEK | CHEAT | 1 | Jun-03 | 62.0 | CLEAR | NONE | NONE | DARK/LIGHT GREEN | MATTED | EVERYWHERE | BROWN | |
| MUDDY CREEK | CHEAT | 1 | Jul-03 | 62.0 | CLEAR | NONE | NONE | DARK GREEN/BROWN | MATTED | EVERYWHERE | BROWN/BLACK | SLIGHT |
| NORTH FK GREENS RUN | CHEAT | 2-1 | Jul-03 | | MURKY | NONE | | DARK GREEN | MATTED | IN SPOTS | BROWN/BLACK | |
| NORTH FK GREENS RUN | CHEAT | 2-2 | Jul-03 | 62.0 | CLEAR | NONE | NONE | | | NONE | BROWN/ORANGE | SLIGHT |
| NORTH FK GREENS RUN | CHEAT | 2-3 | Jul-03 | 64.0 | CLEAR | NONE | NONE | | | NONE | BROWN/ORANGE | SLIGHT |
| NORTH FK GREENS RUN | CHEAT | 2-4 | Jul-03 | | CLEAR | NONE | NONE | DARK GREEN | EVEN COATING | IN SPOTS | BROWN | NONE |
| NORTH FK GREENS RUN | CHEAT | 2-1 | May-04 | | MURKY | BROWN | NONE | DARK GREEN | EVEN COATING | IN SPOTS | BROWN | NONE |
| NORTH FK GREENS RUN | CHEAT | 2-2 | May-04 | 60.0 | MURKY | CLEAR/ORANGE | NONE | DARK GREEN | MATTED | IN SPOTS | BROWN/ORANGE | NONE |
| NORTH FK GREENS RUN | CHEAT | 2-4 | May-04 | 60.0 | MURKY | GRAY/WHITE | MUSKY | DARK GREEN | EVEN COATING | IN SPOTS | BROWN/GRAY | NONE |
| ROARING CREEK | CHEAT | 1 | Jun-03 | 59.0 | CLEAR | NONE | NONE | LIGHT GREEN/BROWN | EVEN COATING | EVERYWHERE | BROWN | |
| ROARING CREEK | CHEAT | 2 | Jul-03 | 55.0 | CLEAR | NONE | NONE | LIGHT GREEN | EVEN COATING | IN SPOTS | BROWN | |
| WATKINS RUN | CHEAT | 1 | May-04 | 52.4 | CLEAR | NONE | NONE | LIGHT GREEN | EVEN COATING | IN SPOTS | BROWN | |
| WATKINS RUN | CHEAT | 2 | Aug-04 | 62.6 | CLEAR | NONE | NONE | LIGHT GREEN | EVEN COATING | IN SPOTS | BROWN | NONE |
| WATKINS RUN | CHEAT | 2 | Aug-04 | 60.8 | CLEAR | NONE | NONE | | | | BROWN | NONE |
| CLEAR FORK | COAL | | Apr-04 | 51.2 | CLEAR | NONE | NONE | LIGHT GREEN | EVEN COATING | IN SPOTS | BROWN/BLACK | NONE |
| BIG SPRING FORK | ELK | 1 | Jul-04 | 64.0 | CLEAR | NONE | NONE | LIGHT/DARK GREEN | HAIRY | EVERYWHERE | BROWN | |
| CAMP CREEK | ELK | 1 | Jun-04 | 71.0 | CLEAR | NONE | NONE | | | NONE | BROWN/GRAY | |
| OLD FIELD FORK | ELK | 1 | Apr-04 | 56.0 | CLEAR | NONE | NONE | LIGHT/DARK GREEN | EVEN COATING | IN SPOTS | BROWN | NONE |
| ELK RIVER | ELK | 1 | Oct-03 | 50.0 | CLEAR | NONE | NONE | LIGHT/DARK GREEN | EVEN COATING | EVERYWHERE | BROWN | NONE |
| ELK RIVER | ELK | 1 | Oct-04 | 56.7 | CLEAR | NONE | NONE | LIGHT/DARK GREEN | HAIRY | EVERYWHERE | BROWN | NONE |
| ELK RIVER | ELK | 2 | Aug-04 | 80.1 | CLEAR | NONE | NONE | DARK GREEN | EVEN COATING | IN SPOTS | BROWN | SLIGHT |
| ELKLICK RUN | GAULEY | | Oct-04 | 58.5 | CLEAR | NONE | NONE | LIGHT GREEN | EVEN COATING | IN SPOTS | BROWN | NONE |
| RICH CREEK | GAULEY | | Mar-03 | 52.0 | | | | | | | | |
| UPPER GLADE RUN | GAULEY | 1 | Apr-04 | 50.0 | CLEAR | NONE | NONE | DARK GREEN | EVEN COATING | IN SPOTS | BROWN | NONE |
| UPPER GLADE RUN | GAULEY | 2 | Jun-04 | 69.0 | CLEAR | NONE | NONE | DARK GREEN | HAIRY | IN SPOTS | BROWN | SLIGHT |
| UPPER GLADE RUN | GAULEY | 3 | Jun-03 | 68.4 | CLEAR | NONE | NONE | DARK GREEN | HAIRY | IN SPOTS | BROWN/BLACK | |
| HARTS RUN | GREENBRIER | | Feb-04 | 37.4 | CLEAR | NONE | NONE | DARK GREEN | EVEN COATING | IN SPOTS | BROWN | NONE |
| GREENBRIER RIVER | GREENBRIER | | Jul-04 | | MURKY | GREEN/BROWN | NONE | BROWN | EVEN COATING | IN SPOTS | BROWN | SLIGHT |
| SECOND CREEK | GREENBRIER | 1 | Jul-04 | | CLEAR | NONE | NONE | DARK GREEN | EVEN COATING | EVERYWHERE | BROWN | SLIGHT |
| SECOND CREEK | GREENBRIER | 2 | Jul-03 | 69.0 | CLEAR | NONE | NONE | DARK GREEN/BROWN | EVEN COATING | IN SPOTS | BROWN | SLIGHT |
| BARKERS CREEK | GUYANDOTTE | | May-03 | 55.0 | CLEAR | NONE | NONE | | | | BROWN/BLACK | |
| CABIN CREEK | GUYANDOTTE | | Jul-03 | 65.0 | CLEAR | NONE | NONE | | | | BROWN/BLACK | |
| DEVILS FORK | GUYANDOTTE | | Jul-03 | | CLEAR | NONE | NONE | LIGHT GREEN | MATTED | IN SPOTS | BROWN/BLACK | |
| GUYANDOTTE RIVER | GUYANDOTTE | | Sep-03 | 53.0 | CLEAR | | NONE | DARK GREEN | EVEN COATING | EVERYWHERE | BROWN | |
| SLAB FORK | GUYANDOTTE | 1 | Jul-03 | 64.0 | CLEAR | NONE | NONE | | | | BROWN/BLACK | |
| SLAB FORK | GUYANDOTTE | 1 | Oct-04 | 63.5 | CLEAR | NONE | NONE | DARK GREEN/BROWN | EVEN COATING | EVERYWHERE | BROWN/BLACK | NONE |
| MANILA CREEK | KANAWHA | 7 | Jul-03 | | CLEAR | NONE | NONE | | | | BROWN | |
| MANILA CREEK | KANAWHA | 6 | Apr-03 | | MURKY | ORANGE | ROTTEN EGG | | | | ORANGE | NONE |

| STREAM | BASIN | STATION | DATE | | WATER | | | ALGAE | | | STREAMBED | FOAM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TEMP | CLARITY | COLOR | ODOR | COLOR | TEXTURE | ABUNDANCE | | |
| MANILA CREEK | KANAWHA | 5 | Apr-03 | 62.0 | CLEAR | NONE | ROTTEN EGG | | | | ORANGE | |
| MANILA CREEK | KANAWHA | 4 | Jul-03 | | MURKY | ORANGE | ROTTEN EGG | | | | ORANGE | SLIGHT |
| MANILA CREEK | KANAWHA | 3 | Jul-03 | | CLEAR | NONE | ROTTEN EGG | | | | | SLIGHT |
| MANILA CREEK | KANAWHA | 2 | Jul-03 | | MURKY | NONE | ROTTEN EGG | | | | ORANGE | SLIGHT |
| MANILA CREEK | KANAWHA | 1 | Jul-03 | | MURKY | NONE | ROTTEN EGG | | | | ORANGE | |
| MANILA CREEK | KANAWHA | 7 | Apr-03 | | CLEAR | NONE | NONE | | | | BROWN | |
| MANILA CREEK | KANAWHA | | Oct-03 | 53.0 | CLEAR | NONE | NONE | LIGHT/DARK GREEN | EVEN COATING | IN SPOTS | BROWN | NONE |
| POCATALICO RIVER | KANAWHA | | May-03 | 61.4 | CLEAR | NONE | NONE | DARK GREEN | HAIRY | EVERYWHERE | BROWN/GRAY | SLIGHT |
| TRACE FORK | KANAWHA | | Aug-03 | 74.0 | MILKY | BROWN | NONE | BROWN | EVEN COATING | IN SPOTS | BROWN | NONE |
| ASH BRANCH | KANAWHA | | Apr-03 | 55.0 | CLEAR | NONE | NONE | DARK GREEN | HAIRY | EVERYWHERE | BROWN | NONE |
| FIVEMILE FORK | KANAWHA | 1 | Jul-03 | 68.0 | CLEAR | NONE | NONE | | | NONE | BROWN/BLACK | SLIGHT |
| FIVEMILE FORK | KANAWHA | 2 | Jul-03 | 66.0 | CLEAR | NONE | NONE | LIGHT GREEN | HAIRY | IN SPOTS | BROWN | NONE |
| FROZEN BRANCH | KANAWHA | | Jul-03 | 68.0 | CLEAR | NONE | | | | NONE | BROWN/BLACK | |
| GOOSE HOLLOW | KANAWHA | 1 | Jul-03 | 74.0 | CLEAR | NONE | SEWAGE | BROWN | EVEN COATING | IN SPOTS | BROWN/BLACK | SLIGHT |
| GOOSE HOLLOW | KANAWHA | 2 | Jun-03 | 70.0 | CLEAR | NONE | | LIGHT GREEN | EVEN COATING | IN SPOTS | BROWN/BLACK | |
| HICKS HOLLOW | KANAWHA | | Jun-03 | 68.0 | CLEAR | GRAY/WHITE | SEWAGE | | | NONE | BROWN | SLIGHT |
| HORSEMILL BRANCH | KANAWHA | | Jul-03 | 75.0 | CLEAR | | ROTTEN EGG | DARK GREEN | HAIRY | EVERYWHERE | ORANGE/GRAY | |
| HURRICANE FORK | KANAWHA | | Jun-03 | 68.0 | | | | | | | | |
| KELLYS CREEK | KANAWHA | 1 | Jul-03 | 70.0 | CLEAR | | NONE | BROWN | EVEN COATING | IN SPOTS | BROWN/ORANGE | |
| KELLYS CREEK | KANAWHA | 2 | Jul-03 | 65.0 | CLEAR | | NONE | LIGHT GREEN | EVEN COATING | IN SPOTS | BROWN/ORANGE | |
| KELLYS CREEK | KANAWHA | 3 | Jul-03 | 65.0 | CLEAR | | NONE | Dark green/brown | EVEN COATING | IN SPOTS | BROWN/GRAY | |
| KELLYS CREEK | KANAWHA | 4 | Jun-03 | 69.0 | CLEAR | | MUSKY | LIGHT GREEN | EVEN COATING | IN SPOTS | BROWN/BLACK | |
| KELLYS CREEK | KANAWHA | | Jun-03 | 65.0 | CLEAR | NONE | NONE | LIGHT GREEN | EVEN COATING | IN SPOTS | BROWN | NONE |
| MORRIS CREEK | KANAWHA | | Sep-04 | 68.5 | CLEAR | NONE | NONE | LIGHT GREEN/BROWN | EVEN COATING | IN SPOTS | BROWN | NONE |
| MORRIS CREEK | KANAWHA | 15 | Nov-04 | 49.1 | CLEAR | NONE | NONE | LIGHT/DARK GREEN | HAIRY | IN SPOTS | BROWN | NONE |
| MORRIS CREEK | KANAWHA | 7 | Nov-04 | 48.7 | CLEAR | GRAY/WHITE | NONE | LIGHT GREEN | HAIRY | IN SPOTS | ORANGE | NONE |
| UNT LEFT FORK | KANAWHA | | Jul-03 | | CLEAR | NONE | NONE | LIGHT GREEN | EVEN COATING | IN SPOTS | BROWN/ORANGE | |
| WILLIS BRANCH | KANAWHA | | Jul-03 | 69.8 | CLEAR | NONE | NONE | LIGHT GREEN/BROWN | EVEN COATING | IN SPOTS | BROWN | |
| CEDAR CREEK | LITTLE KANAWHA | | Sep-03 | | MURKY | NONE | NONE | DARK GREEN | HAIRY | IN SPOTS | BROWN | SLIGHT |
| CEDAR CREEK | LITTLE KANAWHA | | Apr-03 | 59.0 | MURKY | NONE | NONE | DAK GREEN/BROWN | HAIRY | IN SPOTS | BROWN | |
| ELLIS CREEK | LITTLE KANAWHA | | Sep-03 | 63.5 | CLEAR | NONE | MUSKY | DARK GREEN | EVEN COATING | IN SPOTS | BROWN/ORANGE | NONE |
| LAUREL CREEK | NEW RIVER | | Oct-03 | 51.8 | CLEAR | NONE | MUSKY | DARK GREEN | EVEN COATING | IN SPOTS | BROWN/BLACK | |
| WOLF CREEK | NEW RIVER | | May-03 | 54.0 | CLEAR | NONE | MUSKY | DARK GREEN/BROWN | HAIRY | IN SPOTS | BROWN/BLACK | SLIGHT |
| BRUSH CREEK | NEW RIVER | 2 | Oct-04 | 60.3 | MURKY | NONE | MUSKY | DARK GREEN | HAIRY | EVERYWHERE | BROWN | SLIGHT |
| BRUSH CREEK | NEW RIVER | 1 | Apr-03 | 48.0 | MURKY | GREEN | MUSKY | DARK GREEN/BROWN | HAIRY | EVERYWHERE | BROWN/BLACK | NONE |
| DROOPING LICK CREEK | NEW RIVER | | May-04 | 70.0 | CLEAR | NONE | NONE | BROWN | EVEN COATING | EVERYWHERE | BROWN | NONE |
| HANS CREEK | NEW RIVER | | Oct-03 | | CLEAR | NONE | NONE | | | | BROWN | |
| INDIAN CREEK | NEW RIVER | | Sep-03 | 72.0 | CLEAR | NONE | NONE | | | | BROWN | |
| LITTLE KANAWHA RIVER | NORTH BRANCH | | Aug-03 | 77.0 | MURKY | | MUSKY | DARK GREEN | HAIRY | IN SPOTS | BROWN | SLIGHT |
| ABRAMS CREEK | NORTH BRANCH | | | 57.2 | | | | | | | | |
| ELKLICK RUN | NORTH BRANCH | | | 66.2 | | | | | | | | |
| NORTH FK PATTERSON CREEK | NORTH BRANCH | 1 | | 43.7 | | | | | | | | |

| STREAM | BASIN | STATION | DATE | | WATER | | | ALGAE | | | STREAMBED | FOAM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TEMP | CLARITY | COLOR | ODOR | COLOR | TEXTURE | ABUNDANCE | | |
| NORTH FK PATTERSON CREEK | NORTH BRANCH | 2 | | 37.4 | | | | | | | | |
| PATTERSON CREEK | NORTH BRANCH | | | 41.9 | | | | | | | | |
| LITTLE MILL CREEK | OHIO (MIDDLE) | | May-04 | 70.5 | CLEAR | NONE | MUSKY | DARK GREEN/BROWN | EVEN COATING | EVERYWHERE | BROWN/BLACK | MODERATE |
| STEWARTS RUN | OHIO (MIDDLE) | | Jul-04 | 79.5 | CLEAR | NONE | NONE | DARK GREEN/BROWN | HAIRY | EVERYWHERE | BROWN | NONE |
| UNT HUGHES RIVER | OHIO (MIDDLE) | | Apr-03 | 53.0 | CLEAR | NONE | NONE | LIGHT GREEN/BROWN | HAIRY | IN SPOTS | BROWN/GRAY | |
| TOMLINSON RUN | OHIO (UPPER) | | Mar-03 | 46.4 | CLEAR | NONE | MUSKY | DARK GREEN | MATTED | EVERYWHERE | BROWN/GRAY | MODERATE |
| BACK CREEK | POTOMAC DIRECT | 3 | Jul-04 | 78.0 | CLEAR | NONE | NONE | | | NONE | BROWN/GRAY | NONE |
| HARPER RUN | POTOMAC DIRECT | | Jul-03 | 60.0 | MUDDY | BROWN | MUSKY | BROWN | EVEN COATING | IN SPOTS | BROWN/BLACK | SLIGHT |
| HALF MILE RUN | POTOMAC DIRECT | | Mar-04 | 56.0 | CLEAR | NONE | NONE | LIGHT GREEN | HAIRY | IN SPOTS | BROWN | SLIGHT |
| KATES RUN | POTOMAC DIRECT | | Jun-04 | 64.4 | CLEAR | NONE | MUSKY | BROWN/RED | HIARY | EVERYWHERE | BROWN/GRAY | NONE |
| OPEQUON CREEK | POTOMAC DIRECT | 2 | Jul-04 | 76.5 | CLEAR | NONE | NONE | LIGHT/DARK GREEN | HAIRY | IN SPOTS | BROWN | NONE |
| OPEQUON CREEK | POTOMAC DIRECT | 1 | Oct-03 | 60.0 | CLEAR | NONE | ROTTEN EGG | LIGHT GREEN/BROWN | HAIRY | IN SPOTS | BROWN/GRAY | MODERATE |
| RATTLESNAKE RUN | POTOMAC DIRECT | 3 | Sep-03 | | MUDDY | BROWN | NONE | LIGHT/DARK GREEN | MATTED | IN SPOTS | BROWN | NONE |
| RATTLESNAKE RUN | POTOMAC DIRECT | 2 | Sep-03 | 59.0 | CLEAR | BROWN/GREEN | NONE | DARK GREEN | MATTED | EVERYWHERE | BROWN | SLIGHT |
| RATTLESNAKE RUN | POTOMAC DIRECT | 1 | Apr-03 | 57.6 | CLEAR | NONE | NONE | LIGHT GREEN | HAIRY | EVERYWHERE | BROWN | NONE |
| RATTLESNAKE RUN | POTOMAC DIRECT | 3 | Apr-03 | | CLEAR | NONE | NONE | LIGHT GREEN | HAIRY | IN SPOTS | BROWN | NONE |
| RATTLESNAKE RUN | POTOMAC DIRECT | 1 | Apr-03 | 56.0 | CLEAR | NONE | NONE | LIGHT GREEN | HAIRY | IN SPOTS | BROWN | NONE |
| ROCKY MARSH RUN | POTOMAC DIRECT | 1 | Oct-03 | | MURKY | BROWN | NONE | BROWN | HAIRY | IN SPOTS | BROWN | NONE |
| ROCKY MARSH RUN | POTOMAC DIRECT | 2 | Apr-03 | | CLEAR | NONE | NONE | LIGHT/DARK GREEN | HAIRY | IN SPOTS | BROWN | NONE |
| SLEEPY CREEK | POTOMAC DIRECT | 1 | May-04 | 64.0 | CLEAR | NONE | NONE | | | | BROWN | |
| SLEEPY CREEK | POTOMAC DIRECT | 2 | Jun-04 | 73.4 | MURKY | BROWN | MUSKY | | | NONE | BROWN | SLIGHT |
| SLEEPY CREEK | POTOMAC DIRECT | 3 | Jul-04 | | CLEAR | BROWN | NONE | BROWN | EVEN COATING | IN SPOTS | BROWN | NONE |
| SLEEPY CREEK | POTOMAC DIRECT | 3 | Nov-03 | 48.0 | CLEAR | NONE | NONE | | | | BROWN | NONE |
| SLEEPY CREEK | POTOMAC DIRECT | 2 | Aug-03 | | CLEAR | | | DARK GREEN/BROWN | HAIRY | IN SPOTS | | SLIGHT |
| SLEEPY CREEK | POTOMAC DIRECT | 1 | Jul-03 | 74.0 | CLEAR | NONE | NONE | | | | | |
| SLEEPY CREEK | POTOMAC DIRECT | | Sep-04 | 74.0 | CLEAR | NONE | NONE | | | | GRAY/WHITE | NONE |
| TOWN RUN | POTOMAC DIRECT | | Oct-03 | | CLEAR | NONE | NONE | | | | BROWN/BLACK | NONE |
| TUSCARORA CREEK | POTOMAC DIRECT | 1 | Jul-04 | 62.0 | MURKY | GRAY/WHITE | NONE | LIGHT/DARK GREEN | HAIRY | EVERYWHERE | BROWN/GREEN | SLIGHT |
| TUSCARORA CREEK | POTOMAC DIRECT | 2 | Apr-04 | 55.0 | CLEAR | NONE | MUSKY | DARK GREEN/BROWN | MATTED | EVERYWHERE | BROWN | MODERATE |
| BULLSKIN RUN | SHENANDOAH | 1 | Nov-03 | | CLEAR | NONE | NONE | LIGHT/DARK GREEN | MATTED | IN SPOTS | BROWN | SLIGHT |
| BULLSKIN RUN | SHENANDOAH | 2 | Oct-03 | | CLEAR | NONE | NONE | LIGHT GREEN | HAIRY | IN SPOTS | BROWN | NONE |
| BULLSKIN RUN | SHENANDOAH | 3 | Nov-03 | | MURKY | BROWN | NONE | LIGHT GREEN | HAIRY | IN SPOTS | BROWN | NONE |
| ELK BRANCH | SHENANDOAH | | Oct-03 | | MURKY | WHITE/GRAY | NONE | Dark green | MATTED | IN SPOTS | BROWN | NONE |
| ELK RUN | SHENANDOAH | 1 | May-03 | 63.0 | CLEAR | NONE | NONE | LIGHT GREEN | MATTED | IN SPOTS | | NONE |
| ELK RUN | SHENANDOAH | 2 | Oct-03 | | MURKY | WHITE/GRAY | MUSKY | LIGHT GREEN/GRAY | HAIRY | IN SPOTS | BROWN | SLIGHT |
| ELK RUN | SHENANDOAH | 1 | Oct-03 | | MURKY | WHITE/GRAY | NONE | DARK GREEN | MATTED | IN SPOTS | BROWN | NONE |
| EVITTS RUN | SHENANDOAH | 1 | May-03 | | CLEAR | NONE | NONE | DARK GREEN | HAIRY | IN SPOTS | BROWN | NONE |
| EVITTS RUN | SHENANDOAH | 1 | Oct-03 | | MURKY | BROWN | NONE | LIGHT GREEN | HAIRY | IN SPOTS | BROWN | NONE |
| EVITTS RUN | SHENANDOAH | 2 | Oct-03 | | | | | | | | | |
| EVITTS RUN | SHENANDOAH | 3 | Oct-03 | | MURKY | WHITE/GRAY | MUSKY | LIGHT GREEN | MATTED | IN SPOTS | BROWN | SLIGHT |
| EVITTS RUN | SHENANDOAH | 4 | Apr-03 | 71.0 | CLEAR | None | NONE | LIGHT GREEN/GRAY | FLOATING | IN SPOTS | BROWN | MODERATE |
| EVITTS RUN | SHENANDOAH | 4 | Oct-03 | | MURKY | WHITE/GRAY | NONE | LIGHT GREEN | HAIRY | IN SPOTS | BROWN | MODERATE |

| STREAM | BASIN | STATION | DATE | | WATER | | | ALGAE | | | STREAMBED | FOAM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TEMP | CLARITY | COLOR | ODOR | COLOR | TEXTURE | ABUNDANCE | | |
| HUBBARDS RUN | SHENANDOAH | 1 | Nov-03 | | MURKY | NONE | NONE | LIGHT GREEN | HAIRY | IN SPOTS | BROWN | SLIGHT |
| HUBBARDS RUN | SHENANDOAH | 2 | Apr-03 | 57.0 | CLEAR | NONE | NONE | DARK GREEN | HAIRY | IN SPOTS | BROWN | NONE |
| SOUTH BRANCH POTOMAC | SOUTH BRANCH | | Oct-04 | 56.0 | CLEAR | NONE | MUSKY | LIGHT GREEN/BROWN | HAIRY/MATTED | EVERYWHERE | BROWN | NONE |
| SOUTH BRANCH POTOMAC | SOUTH BRANCH | | Oct-04 | 56.0 | CLEAR | NONE | NONE | LIGHT GREEN/BROWN | MATTED | EVERYWHERE | BROWN | SLIGHT |
| SOUTH BRANCH POTOMAC | SOUTH BRANCH | | Oct-04 | 54.0 | CLEAR | NONE | NONE | DARK GREEN/BROWN | EVEN COATING | EVERYWHERE | BROWN | SLIGHT |
| ANDERSON RUN | SOUTH BRANCH | | | 44.6 | | | | | | | | |
| BIG RUN | SOUTH BRANCH | 1 | Jun-04 | 65.3 | CLEAR | NONE | NONE | LIGHT/DARK GREEN | HAIRY | IN SPOTS | BROWN | NONE |
| BIG RUN | SOUTH BRANCH | 2 | Aug-04 | 63.9 | CLEAR | NONE | NONE | DARK GREEN | HAIRY | EVERYWHERE | BROWN | NONE |
| BIG RUN | SOUTH BRANCH | 1 | Apr-04 | 59.9 | CLEAR | NONE | NONE | LIGHT/DARK GREEN | HAIRY | EVERYWHERE | BROWN | SLIGHT |
| CLIFFORD HOLLOW | SOUTH BRANCH | | | 55.9 | | | | | | | | |
| DUMPLING RUN | SOUTH BRANCH | | | | | | | | | | | |
| FORT RUN | SOUTH BRANCH | | | 41.0 | | | | | | | | |
| NORTH FORK | SOUTH BRANCH | | Oct-04 | 54.0 | CLEAR | NONE | MUSKY | BROWN | EVEN COATING | EVERYWHERE | BROWN | NONE |
| SOUTH MILL CREEK | SOUTH BRANCH | | Jul-03 | 75.0 | CLEAR | NONE | MUSKY | DARK GREEN | EVEN COATING | EVERYWHERE | BROWN/GRAY | NONE |
| SPRING RUN | SOUTH BRANCH | 1 | Jul-03 | 57.9 | CLEAR | NONE | NONE | LIGHT/DARK GREEN | HAIRY | IN SPOTS | BROWN/GRAY | NONE |
| SPRING RUN | SOUTH BRANCH | 2 | Jul-03 | 59.4 | CLEAR | NONE | NONE | LIGHT/DARK GREEN | HAIRY | IN SPOTS | BROWN/GRAY | SLIGHT |
| SPRING RUN | SOUTH BRANCH | 3 | Jul-03 | 60.2 | CLEAR | NONE | NONE | LIGHT/DARK GREEN | EVEN COATING | IN SPOTS | BROWN/GRAY | SLIGHT |
| SPRING RUN | SOUTH BRANCH | 4 | Jul-03 | 59.5 | CLEAR | NONE | NONE | LIGHT/DARK GREEN | EVEN COATING | IN SPOTS | BROWN/GRAY | SLIGHT |
| SOUTH FORK | SOUTH BRANCH | | Oct-04 | 56.0 | CLEAR | NONE | NONE | BROWN | MATTED | IN SPOTS | BROWN | SLIGHT |
| TOMBS HOLLOW RUN | SOUTH BRANCH | | | 54.1 | | | | | | | | |
| WALNUT BOTTOM | SOUTH BRANCH | 1 | | 82.4 | | | | | | | | |
| WALNUT BOTTOM | SOUTH BRANCH | 2 | | 64.2 | | | | | | | | |
| BRADSHAW CREEK | TUG FORK | 2 | Mar-03 | 53.6 | CLEAR | NONE | MUSKY | BROWN | EVEN COATING | EVERYWHERE | BROWN | NONE |
| BRADSHAW CREEK | TUG FORK | 1 | Mar-03 | | CLEAR | NONE | NONE | BROWN | EVEN COATING | IN SPOTS | BROWN | NONE |
| DRY FORK | TUG FORK | | Apr-03 | 59.0 | CLEAR | NONE | MUSKY | BROWN | EVEN COATING | EVERYWHERE | BROWN | NONE |
| ELKHORN CREEK | TUG FORK | | Mar-03 | 51.6 | CLEAR | GREEN/BROWN | NONE | | | | BROWN | NONE |
| TWIN BRANCH | TUG FORK | | Oct-03 | 60.8 | CLEAR | NONE | NONE | BROWN | EVEN COATING | IN SPOTS | BROWN | NONE |
| LEADING CREEK | TYGART VALLEY | | | 40.1 | | | | | | | | |
| LEFT FK FILES CREEK | TYGART VALLEY | | Jun-04 | 61.0 | CLEAR | NONE | NONE | DARK GREEN | HAIRY | IN SPOTS | BROWN | NONE |
| LEFT FK FILES CREEK | TYGART VALLEY | | May-04 | 51.8 | CLEAR | NONE | NONE | LIGHT GREEN | EVEN COATING | IN SPOTS | BROWN | NONE |
| LEFT FK FILES CREEK | TYGART VALLEY | | May-03 | 55.0 | CLEAR | NONE | NONE | LIGHT GREEN | EVEN COATING | IN SPOTS | BROWN | None |
| LB/LF SANDY CREEK | TYGART VALLEY | 1 | Jun-04 | 64.4 | CLEAR | NONE | NONE | BROWN | EVEN COATING | IN SPOTS | | None |
| LB/LF SANDY CREEK | TYGART VALLEY | 1 | Jul-03 | 68.0 | CLEAR | NONE | NONE | BROWN | EVEN COATING | EVERYWHERE | | |
| LB/LF SANDY CREEK | TYGART VALLEY | 2 | Aug-04 | 60.8 | CLEAR | NONE | NONE | BROWN | EVEN COATING | IN SPOTS | BROWN | NONE |
| LEFT FK SANDY CREEK | TYGART VALLEY | | Jul-03 | 68.0 | CLEAR | NONE | NONE | BROWN | EVEN COATING | EVERYWHERE | BROWN | |
| LEFT FK SANDY CREEK | TYGART VALLEY | | May-03 | 62.6 | CLEAR | NONE | NONE | BROWN | EVEN COATING | EVERYWHERE | BROWN/ORANGE | |
| MILLSTONE CREEK | TYGART VALLEY | | May-04 | 48.2 | CLEAR | NONE | NONE | LIGHT GREEN | EVEN COATING | IN SPOTS | BROWN | NONE |
| MILLSTONE CREEK | TYGART VALLEY | | May-03 | 53.0 | CLEAR | | | LIGHT GREEN | EVEN COATING | IN SPOTS | BROWN | |
| RB/LF SANDY CREEK | TYGART VALLEY | 2 | Jun-04 | 65.3 | CLEAR | NONE | NONE | BROWN | EVEN COATING | EVERYWHERE | BROWN | NONE |
| RB/LF SANDY CREEK | TYGART VALLEY | 2 | May-03 | 62.0 | CLEAR | NONE | NONE | BROWN | EVEN COATING | EVERYWHERE | | |
| RB/LF SANDY CREEK | TYGART VALLEY | 2 | Jul-03 | 68.0 | CLEAR | NONE | NONE | BROWN | EVEN COATING | EVERYWHERE | BROWN | |
| RB/LF SANDY CREEK | TYGART VALLEY | 1 | Aug-04 | 66.2 | CLEAR | NONE | NONE | BROWN | EVEN COATING | EVERYWHERE | BROWN | NONE |

| STREAM | BASIN | STATION | DATE | | WATER | | | ALGAE | | | STREAMBED | FOAM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TEMP | CLARITY | COLOR | ODOR | COLOR | TEXTURE | ABUNDANCE | | |
| UNT MIDDLE FORK RIVER | TYGART VALLEY | | Jul-04 | 68.7 | CLEAR | NONE | NONE | | | NONE | BROWN/WHITE | SLIGHT |
| BOOTH CREEK | WEST FORK | | Jul-03 | 73.4 | CLEAR | NONE | NONE | LIGHT/DARK GREEN | HAIRY | EVERYWHERE | BROWN/BLACK | SLIGHT |
| BRUSHY FORK | WEST FORK | | Jul-03 | 69.4 | MURKY | NONE | NONE | DARK GREEN | EVEN COATING | IN SPOTS | BROWN | NONE |
| ELK CREEK | WEST FORK | | Mar-04 | 42.8 | CLEAR | NONE | MUSKY | DARK GREEN/BROWN | EVEN COATING | EVERYWHERE | BROWN | SLIGHT |
| HELENS RUN | WEST FORK | | Aug-04 | 67.4 | CLEAR | NONE | MUSKY | DARK GREEN | HAIRY | EVERYWHERE | BROWN/GRAY | SLIGHT |
| ISAACS CREEK | WEST FORK | | Jul-03 | 71.4 | MURKY | NONE | NONE | | | | ORANGE | NONE |
| KINCHELOE CREEK | WEST FORK | | Jul-03 | 73.0 | MURKY | NONE | NONE | DARK GREEN | HAIRY | IN SPOTS | BROWN | SLIGHT |
| LAMBERTS RUN | WEST FORK | | Jun-03 | 59.2 | MURKY | ORANGE | ROTTEN EGG | | | | | |
| SALEM FORK | WEST FORK | | May-03 | 57.2 | MURKY | | NONE | DARK GREEN | EVEN COATING | IN SPOTS | BROWN | |
| SKIN CREEK | WEST FORK | | Apr-03 | 59.0 | CLEAR | NONE | NONE | DARK GREEN | | IN SPOTS | BROWN | NONE |
| TENMILE CREEK | WEST FORK | | Sep-03 | 72.0 | CLEAR | NONE | NONE | DARK GREEN | HAIRY | EVERYWHERE | BROWN/ORANGE | |
| TWO LICK CREEK | WEST FORK | | Jul-03 | 69.4 | CLEAR | NONE | NONE | LIGHT/DARK GREEN | HAIRY | IN SPOTS | BROWN | NONE |
| UNT LAMBERTS RUN | WEST FORK | | May-03 | 58.6 | CLEAR | NONE | NONE | DARK GREEN | EVEN COATING | IN SPOTS | ORANGE | SLIGHT |
| RHINE CREEK | YOUGHIOGHENY | | Apr-03 | | CLEAR | NONE | NONE | LIGHT/DARK GREEN | EVEN COATING | IN SPOTS | BROWN | |

**Appendix 4**. Habitat integrity

| STREAM | BASIN | STATION | DATE | CHANNEL | | | | | SEDIMENTATION | | | BANKS & BUFFER | | | | INDEX | INTEGRITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ATTACHMENT | RIFFLE | VELOCITY/DEPTH | FLOW | ALTERATION | SEDIMENT DEP | EMBEDDED | INDEX | COVER | STABILITY | BUFFER | INDEX | | |
| BAKERS RUN | CACAPON | 1 | | | | 12 | | | 10 | 17 | 68 | | 14 | 14 | 70 | 67.0 | SUB OPTIMAL |
| BAKERS RUN | CACAPON | 2 | | | | 9 | | | 8 | 11 | 48 | | 16 | 16 | 80 | 60.0 | MARGINAL |
| BAKERS RUN | CACAPON | 3 | | | | 12 | | | 11 | 14 | 63 | | 16 | 12 | 70 | 65.0 | SUB OPTIMAL |
| BAKERS RUN | CACAPON | 4 | May-04 | | | | | | 18 | | 90 | | 15 | 14 | 73 | 78.3 | SUB OPTIMAL |
| LONG LICK RUN | CACAPON | | | | | 8 | | | 10 | 12 | 55 | | 16 | 12 | 70 | 58.0 | MARGINAL |
| LOST RIVER | CACAPON | 1 | | | | 11 | | | 15 | 18 | 83 | | 20 | 18 | 95 | 82.0 | OPTIMAL |
| LOST RIVER | CACAPON | 2 | | | | 11 | | | 15 | 18 | 83 | | 20 | 18 | 95 | 82.0 | OPTIMAL |
| SAUERKRAUT RUN | CACAPON | 1 | | | | 12 | | | 8 | 14 | 55 | | 16 | 16 | 80 | 66.0 | SUB OPTIMAL |
| SAUERKRAUT RUN | CACAPON | 2 | | | | 12 | | | 10 | 14 | 60 | | 16 | 16 | 80 | 68.0 | SUB OPTIMAL |
| TROUT RUN | CACAPON | 1 | | | | 12 | | | 11 | 12 | 58 | | 16 | 14 | 75 | 65.0 | SUB OPTIMAL |
| TROUT RUN | CACAPON | 2 | | | | 12 | | | 11 | 12 | 58 | | 16 | 14 | 75 | 65.0 | SUB OPTIMAL |
| WAITES RUN | CACAPON | | | | | 13 | | | 13 | 18 | 78 | | 20 | 16 | 90 | 80.0 | OPTIMAL |
| BEAVER CREEK | CHEAT | 3-1 | Aug-03 | | | | | | 9 | 10 | 48 | 14 | 16 | 18 | 80 | 67.0 | SUB OPTIMAL |
| BEAVER CREEK | CHEAT | 3-2 | Jul-03 | | | | | | 10 | 13 | 58 | 18 | 17 | 15 | 83 | 73.0 | SUB OPTIMAL |
| BEAVER CREEK | CHEAT | 3-3 | Jul-03 | | | | | | 13 | 12 | 63 | 18 | 20 | 18 | 93 | 81.0 | OPTIMAL |
| BEAVER CREEK | CHEAT | 3-4 | Aug-03 | | | | | | 1 | 5 | 15 | 10 | 10 | 9 | 48 | 35.0 | POOR |
| BEAVER CREEK | CHEAT | 3-5 | Aug-03 | | | | | | 16 | 12 | 70 | 13 | 15 | 12 | 67 | 68.0 | SUB OPTIMAL |
| BEAVER CREEK | CHEAT | 3-6 | Aug-03 | | | | | | 16 | 12 | 70 | 12 | 6 | 18 | 60 | 64.0 | MARGINAL |
| BEAVER CREEK | CHEAT | 3-7 | Aug-03 | | | | | | 11 | 13 | 60 | 15 | 7 | 20 | 70 | 66.0 | SUB OPTIMAL |
| BEAVER CREEK | CHEAT | 3-1 | May-04 | | | | | | 15 | 15 | 75 | 12 | 12 | 20 | 73 | 74.0 | SUB OPTIMAL |
| BEAVER CREEK | CHEAT | 3-5 | May-04 | | | | | | 16 | 8 | 60 | 16 | 14 | 18 | 80 | 72.0 | SUB OPTIMAL |
| BEAVER CREEK | CHEAT | 3-10 | May-04 | | | | | | 8 | 9 | 43 | 12 | 14 | 16 | 70 | 59.0 | MARGINAL |
| BEAVER CREEK | CHEAT | 3-9 | May-04 | | | | | | 5 | 6 | 28 | 10 | 15 | 16 | 68 | 52.0 | MARGINAL |
| BEAVER CREEK | CHEAT | 3-8 | May-04 | | | | | | 5 | 5 | 25 | 16 | 14 | 16 | 77 | 56.0 | MARGINAL |
| BUFFALO RUN | CHEAT | 1-2 | Apr-04 | | | | | | 16 | 13 | 73 | 6 | 15 | 4 | 42 | 54.0 | MARGINAL |
| BUFFALO RUN | CHEAT | 1-1 | Aug-03 | | | | | | 15 | 16 | 78 | 12 | 19 | 2 | 55 | 64.0 | MARGINAL |
| BUFFALO RUN | CHEAT | 1-2 | Aug-03 | | | | | | 16 | 16 | 80 | 14 | 20 | 4 | 63 | 70.0 | SUB OPTIMAL |
| BUFFALO RUN | CHEAT | 1-3 | Aug-03 | | | | | | 10 | 12 | 55 | 17 | 16 | 9 | 70 | 64.0 | MARGINAL |
| BUFFALO RUN | CHEAT | 1-4 | Aug-03 | | | | | | 11 | 11 | 55 | 20 | 18 | 13 | 85 | 73.0 | SUB OPTIMAL |
| BUFFALO RUN | CHEAT | 1-5 | Aug-03 | | | | | | 13 | 16 | 73 | 10 | 10 | 9 | 48 | 58.0 | MARGINAL |
| BUFFALO RUN | CHEAT | 1-6 | Aug-03 | | | | | | 10 | 11 | 53 | 16 | 20 | 11 | 78 | 68.0 | SUB OPTIMAL |
| BUFFALO RUN | CHEAT | 1-7 | Jul-03 | | | | | | 4 | 11 | 38 | 16 | 18 | 12 | 77 | 61.0 | MARGINAL |
| BUFFALO RUN | CHEAT | 1-1 | May-04 | | | | | | 13 | 17 | 75 | 8 | 13 | 4 | 42 | 55.0 | MARGINAL |
| BUFFALO RUN | CHEAT | 1-3 | May-04 | | | | | | 12 | 16 | 70 | 10 | 12 | 4 | 43 | 54.0 | MARGINAL |
| BUFFALO RUN | CHEAT | 1-5 | May-04 | | | | | | 10 | 12 | 55 | 8 | 8 | 4 | 33 | 42.0 | POOR |
| BUFFALO RUN | CHEAT | 1-6 | May-04 | | | | | | 11 | 19 | 75 | 13 | 13 | 10 | 60 | 66.0 | SUB OPTIMAL |
| BUFFALO RUN | CHEAT | 1-7 | May-04 | | | | | | 18 | 19 | 93 | 11 | 16 | 8 | 58 | 72.0 | SUB OPTIMAL |
| GLADY FORK | CHEAT | | Aug-04 | | | | | | 11 | 16 | 68 | 15 | 15 | 16 | 77 | 73.0 | SUB OPTIMAL |
| GLADE RUN | CHEAT | 4-1 | Jul-03 | | | | | | 8 | 5 | 33 | 14 | 12 | 4 | 50 | 43.0 | POOR |
| GLADE RUN | CHEAT | 4-2 | Jul-03 | | | | | | 9 | 8 | 43 | 6 | 2 | 4 | 20 | 29.0 | POOR |
| GLADE RUN | CHEAT | 4-3 | Jul-03 | | | | | | 5 | 5 | 25 | 8 | 10 | 6 | 40 | 34.0 | POOR |

| STREAM | BASIN | STATION | DATE | CHANNEL | | | | | SEDIMENTATION | | | BANKS & BUFFER | | | | INDEX | INTEGRITY |
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| | | | | ATTACHMENT | RIFFLE | VELOCITY/DEPTH | FLOW | ALTERATION | SEDIMENT DEP | EMBEDDED | INDEX | COVER | STABILITY | BUFFER | INDEX | | |
| GLADE RUN | CHEAT | 4-2 | May-04 | | | | | | | 6 | 30 | 14 | 12 | 2 | 47 | 42.5 | POOR |
| GLADE RUN | CHEAT | 4-3 | May-04 | | | | | | 7 | 3 | 25 | 12 | 10 | 4 | 43 | 36.0 | POOR |
| GLADE RUN | CHEAT | 4-4 | May-04 | | | | | | 9 | 20 | 73 | 2 | 2 | 2 | 10 | 35.0 | POOR |
| MUDDY CREEK | CHEAT | 1 | Jun-03 | | | | | | 14 | | 70 | 17 | 17 | 12 | 77 | 75.0 | SUB OPTIMAL |
| MUDDY CREEK | CHEAT | 1 | Jul-03 | | | | | | 13 | 15 | 70 | 16 | 19 | 14 | 82 | 77.0 | SUB OPTIMAL |
| NF GREENS RUN | CHEAT | 2-1 | Jul-03 | | | | | | 11 | 16 | 68 | 16 | 15 | 15 | 77 | 73.0 | SUB OPTIMAL |
| NF GREENS RUN | CHEAT | 2-2 | Jul-03 | | | | | | 20 | 15 | 88 | 18 | 16 | 10 | 73 | 79.0 | SUB OPTIMAL |
| NF GREENS RUN | CHEAT | 2-3 | Jul-03 | | | | | | 15 | 16 | 78 | 14 | 18 | 20 | 87 | 83.0 | OPTIMAL |
| NF GREENS RUN | CHEAT | 2-4 | Jul-03 | | | | | | 6 | 16 | 55 | 20 | 18 | 20 | 97 | 80.0 | OPTIMAL |
| NF GREENS RUN | CHEAT | 2-1 | May-04 | | | | | | 11 | 13 | 60 | 10 | 12 | 4 | 43 | 50.0 | MARGINAL |
| NF GREENS RUN | CHEAT | 2-2 | May-04 | | | | | | 6 | 10 | 40 | 5 | 12 | 3 | 33 | 36.0 | POOR |
| NF GREENS RUN | CHEAT | 2-4 | May-04 | | | | | | 2 | 5 | 18 | 6 | 4 | 4 | 23 | 21.0 | POOR |
| ROARING CREEK | CHEAT | 1 | Jun-03 | | | | | | 9 | | 45 | 8 | 12 | 4 | 40 | 41.3 | POOR |
| ROARING CREEK | CHEAT | 2 | Jul-03 | | | | | | 12 | 14 | 65 | 16 | 14 | 12 | 70 | 68.0 | SUB OPTIMAL |
| WATKINS RUN | CHEAT | 1 | May-03 | | | | | | 16 | 17 | 83 | 18 | 16 | 20 | 90 | 87.0 | OPTIMAL |
| WATKINS RUN | CHEAT | 2 | Aug-03 | | | | | | 16 | 17 | 83 | 14 | 14 | 20 | 80 | 81.0 | OPTIMAL |
| WATKINS RUN | CHEAT | 2 | Aug-04 | | | | | | 18 | 18 | 90 | 20 | 20 | 20 | 100 | 96.0 | OPTIMAL |
| CLEAR FORK | COAL | | Apr-04 | | | | | | 6 | | 30 | | 10 | 6 | 40 | 36.7 | POOR |
| BIG SPRING FORK | ELK | 1 | Jul-04 | 15 | 18 | 14 | 7 | 14 | 12 | 13 | 63 | 14 | 17 | 13 | 73 | 68.5 | SUB OPTIMAL |
| CAMP CREEK | ELK | 1 | Jun-04 | 9 | 5 | 17 | 12 | 20 | 10 | 18 | 70 | 19 | 20 | 15 | 90 | 72.5 | SUB OPTIMAL |
| OLD FIELD FORK | ELK | 1 | Apr-04 | 19 | 19 | 13 | 15 | 20 | 12 | 18 | 75 | 10 | 17 | 16 | 72 | 79.5 | SUB OPTIMAL |
| ELK RIVER | ELK | 1 | Oct-03 | 20 | 20 | 15 | 14 | 20 | 14 | 13 | 68 | 13 | 13 | 18 | 73 | 80.0 | OPTIMAL |
| ELK RIVER | ELK | 1 | Oct-03 | 19 | 17 | 15 | 14 | 20 | 17 | 19 | 90 | 15 | 13 | 19 | 78 | 84.7 | OPTIMAL |
| ELK RIVER | ELK | 2 | Aug-04 | | | | | | 15 | | 75 | | 13 | 10 | 58 | 63.3 | MARGINAL |
| ELKLICK RUN | GAULEY | | Oct-04 | | | | | | 10 | 16 | 65 | 13 | 14 | 13 | 67 | 66.0 | SUB OPTIMAL |
| RICH CREEK | GAULEY | | Mar-03 | | | | | | 10 | | 50 | | 15 | 15 | 75 | 66.7 | SUB OPTIMAL |
| UPPER GLADE RUN | GAULEY | 1 | Apr-04 | 18 | 19 | 8 | 14 | 11 | 15 | 13 | 70 | 7 | 6 | 4 | 28 | 57.5 | MARGINAL |
| UPPER GLADE RUN | GAULEY | 2 | Jun-04 | | | | | | 15 | 12 | 68 | | 5 | 3 | 20 | 43.8 | POOR |
| UPPER GLADE RUN | GAULEY | 3 | Jun-03 | | | | | | 15 | 12 | 68 | 8 | 10 | 4 | 37 | 49.0 | POOR |
| HARTS RUN | GREENBRIER | | Feb-04 | | | | | | 8 | 18 | 65 | 11 | 12 | 12 | 58 | 61.0 | MARGINAL |
| GREENBRIER RIVER | GREENBRIER | | Jul-04 | | | | | | 15 | | 75 | | 15 | 5 | 50 | 58.3 | MARGINAL |
| SECOND CREEK | GREENBRIER | 1 | Jul-04 | | | | | | 15 | | 75 | | 15 | 15 | 75 | 75.0 | SUB OPTIMAL |
| SECOND CREEK | GREENBRIER | 2 | Jul-03 | | | | | | 10 | | 50 | | 20 | 16 | 90 | 76.7 | SUB OPTIMAL |
| BARKERS CREEK | GUYANDOTTE | | May-03 | | | | | | 5 | 15 | 50 | 15 | 10 | 7 | 53 | 52.0 | MARGINAL |
| CABIN CREEK | GUYANDOTTE | | Jul-03 | | | | | | 10 | | 50 | 20 | | 14 | 85 | 73.3 | SUB OPTIMAL |
| DEVILS FORK | GUYANDOTTE | | Jul-03 | | | | | | 20 | | 100 | 10 | | 10 | 50 | 66.7 | SUB OPTIMAL |
| GUYANDOTTE RIVER | GUYANDOTTE | | Sep-03 | | | | | | 15 | 12 | 68 | 10 | 18 | 8 | 60 | 63.0 | MARGINAL |
| SLAB FORK | GUYANDOTTE | 1 | Jul-03 | | | | | | 15 | | 75 | | 10 | 14 | 60 | 65.0 | SUB OPTIMAL |
| SLAB FORK | GUYANDOTTE | 1 | Oct-04 | | | | | | 11 | | 55 | | 16 | 9 | 63 | 60.0 | MARGINAL |
| ASH BRANCH | KANAWHA | | Aug-03 | | | | | | 12 | 12 | 60 | 4 | 10 | 20 | 57 | 58.0 | MARGINAL |
| FIVEMILE FORK | KANAWHA | 1 | Apr-03 | | | | | | 9 | 16 | 63 | 8 | 4 | 14 | 43 | 51.0 | MARGINAL |
| FIVEMILE FORK | KANAWHA | 2 | Jul-03 | | | | | | 10 | 8 | 45 | 12 | 10 | 16 | 63 | 56.0 | MARGINAL |

| STREAM | BASIN | STATION | DATE | CHANNEL | | | | | SEDIMENTATION | | | BANKS & BUFFER | | | | INDEX | INTEGRITY |
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| | | | | ATTACHMENT | RIFFLE | VELOCITY/DEPTH | FLOW | ALTERATION | SEDIMENT DEP | EMBEDDED | INDEX | COVER | STABILITY | BUFFER | INDEX | | |
| FROZEN BRANCH | KANAWHA | | Jul-03 | | | | | | 10 | 12 | 55 | 15 | 12 | 19 | 77 | 68.0 | SUB OPTIMAL |
| GOOSE HOLLOW | KANAWHA | 1 | Jul-03 | | | | | | 10 | 16 | 65 | 17 | 16 | 15 | 80 | 74.0 | SUB OPTIMAL |
| GOOSE HOLLOW | KANAWHA | 2 | Jul-03 | | | | | | 10 | 10 | 50 | 10 | 2 | 2 | 23 | 34.0 | POOR |
| HICKS HOLLOW | KANAWHA | | Jun-03 | | | | | | 6 | 4 | 25 | 12 | 10 | 9 | 52 | 41.0 | POOR |
| HORSEMILL BRANCH | KANAWHA | | Jun-03 | | | | | | 6 | 6 | 30 | 13 | 14 | 10 | 62 | 49.0 | POOR |
| HURRICANE FORK | KANAWHA | | Jul-03 | | | | | | 8 | 6 | 35 | 11 | 16 | 7 | 57 | 48.0 | POOR |
| KELLYS CREEK | KANAWHA | 1 | Jun-03 | | | | | | 12 | 10 | 55 | 13 | 10 | 13 | 60 | 58.0 | MARGINAL |
| KELLYS CREEK | KANAWHA | 2 | Jul-03 | | | | | | 2 | 6 | 20 | 15 | 16 | 6 | 62 | 45.0 | POOR |
| KELLYS CREEK | KANAWHA | 3 | Jul-03 | | | | | | 12 | 12 | 60 | 12 | 15 | 16 | 72 | 67.0 | SUB OPTIMAL |
| KELLYS CREEK | KANAWHA | 4 | Jul-03 | | | | | | 10 | 10 | 50 | 15 | 12 | 12 | 65 | 59.0 | MARGINAL |
| KELLYS CREEK | KANAWHA | | Jun-03 | | | | | | 15 | 20 | 88 | 11 | 10 | 10 | 52 | 66.0 | SUB OPTIMAL |
| MORRIS CREEK | KANAWHA | | Jun-03 | | | | | | 10 | 10 | 50 | | 12 | 7 | 48 | 48.8 | POOR |
| MORRIS CREEK | KANAWHA | 15 | Sep-04 | | | | | | 14 | | 70 | | 12 | 15 | 68 | 68.3 | SUB OPTIMAL |
| MORRIS CREEK | KANAWHA | 7 | Nov-04 | 13 | 19 | 11 | 20 | 20 | 13 | 13 | 65 | 20 | 18 | 20 | 97 | 83.5 | OPTIMAL |
| MANILA CREEK | KANAWHA | 7 | Jul-03 | | | | | | 14 | 18 | 80 | 11 | 11 | 14 | 60 | 68.0 | SUB OPTIMAL |
| MANILA CREEK | KANAWHA | 6 | Apr-03 | | | | | | 16 | 16 | 80 | 8 | 7 | 12 | 45 | 59.0 | MARGINAL |
| MANILA CREEK | KANAWHA | 5 | Apr-03 | | | | | | 8 | 18 | 65 | 7 | 4 | 15 | 43 | 52.0 | MARGINAL |
| MANILA CREEK | KANAWHA | 4 | Jul-03 | | | | | | 18 | 16 | 85 | 8 | 6 | 5 | 32 | 53.0 | MARGINAL |
| MANILA CREEK | KANAWHA | 3 | Jul-03 | | | | | | 18 | 15 | 83 | 8 | 4 | 9 | 35 | 54.0 | MARGINAL |
| MANILA CREEK | KANAWHA | 2 | Jul-03 | | | | | | 18 | 18 | 90 | 12 | 4 | 10 | 43 | 62.0 | MARGINAL |
| MANILA CREEK | KANAWHA | 1 | Jul-03 | | | | | | 18 | 16 | 85 | 4 | 6 | 4 | 23 | 48.0 | POOR |
| MANILA CREEK | KANAWHA | 7 | Apr-03 | | | | | | 14 | 18 | 80 | 11 | 10 | 14 | 58 | 67.0 | SUB OPTIMAL |
| MANILA CREEK | KANAWHA | | Oct-03 | | | | | | 6 | 8 | 35 | | 16 | 17 | 83 | 58.3 | MARGINAL |
| POCATALICO RIVER | KANAWHA | | May-03 | | | | | | | | | 10 | 12 | 12 | 57 | 56.7 | MARGINAL |
| TRACE FORK | KANAWHA | | Aug-03 | | | | | | 14 | 12 | 65 | 9 | 10 | 12 | 52 | 57.0 | MARGINAL |
| UNT LEFT FORK | KANAWHA | | Nov-04 | 16 | 18 | 13 | 15 | 15 | 17 | 16 | 83 | 18 | 15 | 16 | 82 | 79.5 | SUB OPTIMAL |
| WILLIS BRANCH | KANAWHA | | Jul-03 | | | | | | 10 | 10 | 50 | 14 | 12 | 18 | 73 | 64.0 | MARGINAL |
| CEDAR CREEK | LITTLE KANAWHA | | Jul-03 | | | | | | 12 | 16 | 70 | 19 | 19 | 10 | 80 | 76.0 | SUB OPTIMAL |
| CEDAR CREEK | LITTLE KANAWHA | | Sep-03 | | | | | | 12 | 12 | 60 | 17 | 14 | 15 | 77 | 70.0 | SUB OPTIMAL |
| ELLIS CREEK | LITTLE KANAWHA | | Apr-03 | | | | | | 8 | 12 | 50 | 13 | 14 | 16 | 72 | 63.0 | MARGINAL |
| LITTLE KANAWHA RIVER | LITTLE KANAWHA | | Sep-03 | 10 | 2 | 6 | 16 | 17 | 2 | 8 | 25 | 4 | 4 | 4 | 20 | 37.0 | POOR |
| ABRAMS CREEK | NORTH BRANCH | | | | | 5 | | | 7 | 3 | 25 | | 14 | 12 | 65 | 41.0 | POOR |
| ELKLICK RUN | NORTH BRANCH | | | | | 7 | | | 8 | 12 | 50 | | 14 | 11 | 63 | 52.0 | MARGINAL |
| NF PATTERSON CREEK | NORTH BRANCH | 1 | | | | 15 | | | 10 | 18 | 70 | | 16 | 16 | 80 | 75.0 | SUB OPTIMAL |
| NF PATTERSON CREEK | NORTH BRANCH | 2 | | | | 5 | | | 10 | 13 | 58 | | 14 | 13 | 68 | 55.0 | MARGINAL |
| PATTERSON CREEK | NORTH BRANCH | | | | | 14 | | | 13 | 17 | 75 | | 18 | 17 | 88 | 79.0 | SUB OPTIMAL |
| BRUSH CREEK | NEW | 2 | Oct-04 | | | | | | 16 | | 80 | | 17 | 12 | 73 | 76.7 | SUB OPTIMAL |
| BRUSH CREEK | NEW | 1 | Apr-03 | 18 | 18 | 16 | 18 | 8 | 12 | 16 | 70 | 12 | 17 | 14 | 72 | 74.5 | SUB OPTIMAL |
| DROOPING LICK CREEK | NEW | | May-04 | | | | | | 14 | | 70 | | 15 | 10 | 63 | 65.0 | SUB OPTIMAL |
| HANS CREEK | NEW | | Oct-03 | | | | | | 14 | | 70 | | 7 | 5 | 30 | 43.3 | POOR |
| INDIAN CREEK | NEW | | Sep-03 | | | | | | 17 | | 85 | | 16 | 17 | 83 | 83.3 | OPTIMAL |
| LAUREL CREEK | NEW | | Oct-03 | | | | | | 12 | 10 | 55 | 14 | 14 | 13 | 68 | 63.0 | MARGINAL |

| STREAM | BASIN | STATION | DATE | CHANNEL | | | | | SEDIMENTATION | | | BANKS & BUFFER | | | | INDEX | INTEGRITY |
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| | | | | ATTACHMENT | RIFFLE | VELOCITY/DEPTH | FLOW | ALTERATION | SEDIMENT DEP | EMBEDDED | INDEX | COVER | STABILITY | BUFFER | INDEX | | |
| WOLF CREEK | NEW | | May-03 | | | | | | 18 | 17 | 88 | 4 | 9 | 4 | 28 | 52.0 | MARGINAL |
| LITTLE MILL CREEK | MIDDLE OHIO | | May-04 | | | | | | 10 | | 50 | | 18 | 15 | 83 | 71.7 | SUB OPTIMAL |
| STEWARTS RUN | MIDDLE OHIO | | Jul-04 | | | | | | 10 | | 50 | | 16 | 18 | 85 | 73.3 | SUB OPTIMAL |
| UNT HUGHES RIVER | MIDDLE OHIO | | Apr-03 | | | | | | 10 | | 50 | 20 | | 16 | 90 | 76.7 | SUB OPTIMAL |
| TOMLINSON RUN | UPPER OHIO | | Mar-03 | | | | | | 9 | 10 | 48 | 12 | 13 | 11 | 90 | 55.0 | MARGINAL |
| BACK CREEK | POTOMAC DIRECT | 3 | Jul-04 | | | | | | 11 | | 55 | | 13 | 14 | 68 | 63.3 | MARGINAL |
| HARPER RUN | POTOMAC DIRECT | | Jul-03 | 14 | 13 | 16 | 18 | 8 | 5 | 9 | 35 | 20 | 20 | 20 | 100 | 71.5 | SUB OPTIMAL |
| HALF MILE RUN | POTOMAC DIRECT | | Mar-04 | | | | | | 11 | | 55 | | 20 | 18 | 95 | 81.7 | OPTIMAL |
| KATES RUN | POTOMAC DIRECT | | Jun-04 | 18 | 10 | 16 | 15 | 20 | 10 | 16 | 65 | 20 | 20 | 20 | 100 | 82.5 | OPTIMAL |
| OPEQUON CREEK | POTOMAC DIRECT | 2 | Jul-04 | | | | | | 8 | | 40 | 8 | 6 | 4 | 30 | 32.5 | POOR |
| OPEQUON CREEK | POTOMAC DIRECT | 1 | Oct-03 | | | | | | 6 | 8 | 35 | 10 | 8 | 3 | 35 | 35.0 | POOR |
| RATTLESNAKE RUN | POTOMAC DIRECT | 2 | Sep-03 | | | | | | 15 | 13 | 70 | 17 | 17 | 4 | 63 | 66.0 | SUB OPTIMAL |
| RATTLESNAKE RUN | POTOMAC DIRECT | 1 | Apr-03 | | | | | | 16 | 13 | 73 | 15 | 18 | 4 | 62 | 66.0 | SUB OPTIMAL |
| RATTLESNAKE RUN | POTOMAC DIRECT | 3 | Apr-03 | | | | | | 15 | 15 | 75 | | | 5 | 25 | 58.3 | MARGINAL |
| SLEEPY CREEK | POTOMAC DIRECT | 1 | May-04 | | | | | | 15 | | 75 | | 20 | 15 | 58 | 83.3 | OPTIMAL |
| SLEEPY CREEK | POTOMAC DIRECT | 2 | Jun-04 | | | | | | 8 | | 40 | | 11 | 13 | 40 | 53.3 | MARGINAL |
| SLEEPY CREEK | POTOMAC DIRECT | 3 | Jul-04 | | | | | | 11 | | 55 | | 12 | 12 | 40 | 58.3 | MARGINAL |
| SLEEPY CREEK | POTOMAC DIRECT | 3 | Nov-03 | | | | | | 15 | | 75 | | 20 | 12 | 53 | 78.3 | SUB OPTIMAL |
| SLEEPY CREEK | POTOMAC DIRECT | 2 | Aug-03 | | | | | | 15 | | 75 | | 15 | 10 | 42 | 66.7 | SUB OPTIMAL |
| SLEEPY CREEK | POTOMAC DIRECT | 1 | Jul-03 | | | | | | 15 | | 75 | | 10 | 10 | 33 | 58.3 | MARGINAL |
| SLEEPY CREEK | POTOMAC DIRECT | | Sep-04 | | | | | | 20 | | 100 | 20 | 18 | | 95 | 96.7 | OPTIMAL |
| TUSCARORA CREEK | POTOMAC DIRECT | 1 | Jul-04 | | | | | | 15 | | 75 | | 20 | 10 | 75 | 75.0 | SUB OPTIMAL |
| TUSCARORA CREEK | POTOMAC DIRECT | 2 | Apr-04 | | | | | | 12 | 10 | 55 | 7 | 9 | 2 | 30 | 40.0 | POOR |
| ANDERSON RUN | SOUTH BRANCH | | | | | 3 | | | 10 | 3 | 33 | | 14 | 11 | 63 | 54.0 | MARGINAL |
| BIG RUN | SOUTH BRANCH | 1 | Jun-04 | | | | | | 14 | | 70 | | 13 | 16 | 73 | 71.7 | SUB OPTIMAL |
| BIG RUN | SOUTH BRANCH | 2 | Aug-04 | 12 | 12 | 15 | 10 | 15 | 10 | 13 | 58 | 11 | 14 | 17 | 70 | 64.5 | MARGINAL |
| BIG RUN | SOUTH BRANCH | 1 | Apr-04 | | | | | | 12 | | 60 | | 8 | 10 | 45 | 50.0 | MARGINAL |
| CLIFFORD HOLLOW | SOUTH BRANCH | | | | | 12 | | | 13 | 16 | 73 | | 18 | 17 | 88 | 76.0 | SUB OPTIMAL |
| DUMPLING RUN | SOUTH BRANCH | | | | | 7 | | | 10 | 12 | 55 | | 14 | 14 | 70 | 57.0 | Marginal |
| FORT RUN | SOUTH BRANCH | | | | | 12 | | | 10 | 17 | 68 | | 14 | 15 | 73 | 68.0 | SUB OPTIMAL |
| NORTH FORK | SOUTH BRANCH | | Oct-04 | | | | | | 16 | | 80 | | 20 | 17 | 93 | 88.3 | OPTIMAL |
| SOUTH BRANCH | SOUTH BRANCH | | Oct-04 | | | | | | 14 | | 70 | | 13 | 5 | 45 | 53.3 | MARGINAL |
| SOUTH BRANCH | SOUTH BRANCH | | Oct-04 | | | | | | 12 | | 60 | | 14 | 14 | 70 | 66.7 | SUB OPTIMAL |
| SOUTH BRANCH | SOUTH BRANCH | | Oct-04 | | | | | | 17 | | 85 | | 16 | 17 | 83 | 83.3 | OPTIMAL |
| SOUTH MILL CREEK | SOUTH BRANCH | | Jul-03 | 12 | 19 | 10 | 16 | 18 | 17 | 15 | 80 | 15 | 15 | 8 | 63 | 72.5 | SUB OPTIMAL |
| SPRING RUN | SOUTH BRANCH | 1 | Jul-03 | | | | | | 16 | 14 | 75 | 18 | 17 | 16 | 85 | 81.0 | OPTIMAL |
| SPRING RUN | SOUTH BRANCH | 2 | Jul-03 | | | | | | 16 | 15 | 78 | 16 | 18 | 13 | 78 | 78.0 | SUB OPTIMAL |
| SPRING RUN | SOUTH BRANCH | 3 | Jul-03 | | | | | | 18 | 15 | 83 | 16 | 20 | 15 | 85 | 84.0 | OPTIMAL |
| SPRING RUN | SOUTH BRANCH | 4 | Jul-03 | | | | | | 19 | 18 | 93 | 14 | 13 | 8 | 58 | 72.0 | SUB OPTIMAL |
| SOUTH FORK | SOUTH BRANCH | | Oct-04 | | | | | | 9 | | 45 | | 11 | 11 | 55 | 51.7 | MARGINAL |
| TOMBS HOLLOW RUN | SOUTH BRANCH | | | | | 7 | | | 10 | 12 | 55 | | 14 | 16 | 75 | 59.0 | MARGINAL |
| WALNUT BOTTOM | SOUTH BRANCH | 1 | | | | 6 | | | 6 | 7 | 33 | | 16 | 14 | 75 | 50.0 | MARGINAL |

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| | | | | ATTACHMENT | RIFFLE | VELOCITY/DEPTH | FLOW | ALTERATION | SEDIMENT DEP | EMBEDDED | INDEX | COVER | STABILITY | BUFFER | INDEX | | |
| WALNUT BOTTOM | SOUTH BRANCH | 2 | | | | 7 | | | 8 | 11 | 48 | | 16 | 16 | 80 | 58.0 | MARGINAL |
| EVITTS RUN | SHENANDOAH | 4 | Apr-03 | | | | | | 12 | 11 | 58 | 18 | 18 | 6 | 70 | 65.0 | SUB OPTIMAL |
| HUBBARDS RUN | SHENANDOAH | 2 | Apr-03 | | | | | | 14 | 10 | 60 | 10 | 10 | 4 | 40 | 48.0 | POOR |
| BRADSHAW CREEK | TUG FORK | 2 | Mar-03 | | | | | | 15 | | 75 | | 10 | 5 | 38 | 50.0 | MARGINAL |
| BRADSHAW CREEK | TUG FORK | 1 | Mar-03 | | | | | | 20 | | 100 | | 5 | 5 | 25 | 50.0 | MARGINAL |
| DRY FORK | TUG FORK | | Apr-03 | | | | | | 15 | | 75 | | 15 | 10 | 63 | 66.7 | SUB OPTIMAL |
| ELKHORN CREEK | TUG FORK | | Mar-03 | | | | | | 10 | | 50 | | 15 | 10 | 63 | 58.3 | MARGINAL |
| TWIN BRANCH | TUG FORK | | Oct-03 | | | | | | 5 | | 25 | | 15 | 10 | 63 | 50.0 | MARGINAL |
| LEADING CREEK | TYGART VALLEY | | | | | 9 | | | 10 | 13 | 58 | | 14 | 11 | 63 | 57.0 | MARGINAL |
| LF FILES CREEK | TYGART VALLEY | | Jun-04 | | | | | | 13 | 18 | 78 | | 14 | 10 | 60 | 68.8 | SUB OPTIMAL |
| LF FILES CREEK | TYGART VALLEY | | May-04 | | | | | | 15 | | 75 | | 10 | 15 | 63 | 66.7 | SUB OPTIMAL |
| LF FILES CREEK | TYGART VALLEY | | May-03 | | | | | | 15 | | 75 | 15 | 10 | | 63 | 66.7 | SUB OPTIMAL |
| LB/LF SANDY CREEJ | TYGART VALLEY | 1 | Jun-04 | | | | | | | 16 | 80 | 6 | 10 | 10 | 43 | 52.5 | MARGINAL |
| LB/LF SANDY CREEJ | TYGART VALLEY | 1 | Jul-03 | | | | | | | 16 | 80 | 8 | 10 | | 45 | 56.7 | MARGINAL |
| LB/LF SANDY CREEJ | TYGART VALLEY | 2 | Aug-04 | | | | | | | 16 | 80 | 6 | 10 | 10 | 43 | 52.5 | MARGINAL |
| LF SANDY CREEK | TYGART VALLEY | | Jul-03 | | | | | | | 16 | 80 | 2 | | 2 | 10 | 33.3 | POOR |
| LF SANDY CREEK | TYGART VALLEY | | May-03 | | | | | | 16 | 16 | 80 | 2 | | 2 | 10 | 45.0 | POOR |
| MILLSTONE CREEK | TYGART VALLEY | | May-04 | | | | | | 15 | | 75 | | 20 | 20 | 100 | 91.7 | OPTIMAL |
| MILLSTONE CREEK | TYGART VALLEY | | May-03 | | | | | | 20 | | 100 | | 20 | 15 | 88 | 91.7 | OPTIMAL |
| RB/LF SANDY CREEK | TYGART VALLEY | 2 | Jun-04 | | | | | | | 14 | 35 | 16 | 14 | 14 | 73 | 72.5 | SUB OPTIMAL |
| RB/LF SANDY CREEK | TYGART VALLEY | 2 | May-03 | | | | | | | 16 | 40 | 4 | | 10 | 35 | 50.0 | MARGINAL |
| RB/LF SANDY CREEK | TYGART VALLEY | 2 | Jul-03 | | | | | | 16 | 14 | 75 | 16 | 14 | 14 | 73 | 74.0 | SUB OPTIMAL |
| RB/LF SANDY CREEK | TYGART VALLEY | 1 | Aug-04 | | | | | | | 14 | 70 | 16 | 14 | 14 | 73 | 72.5 | SUB OPTIMAL |
| UNT MIDDLE FORK RIVER | TYGART VALLEY | | Jul-04 | 18 | 20 | 10 | 12 | 18 | 10 | 12 | 55 | 13 | 16 | 13 | 70 | 71.0 | SUB OPTIMAL |
| BOOTH CREEK | WEST FORK | | Jul-03 | | | | | | 3 | 12 | 38 | 12 | 7 | 14 | 55 | 48.0 | POOR |
| BRUSHY FORK | WEST FORK | | Jul-03 | 16 | 15 | 14 | 16 | 19 | 10 | 15 | 63 | 17 | 12 | 15 | 73 | 74.5 | SUB OPTIMAL |
| ELK CREEK | WEST FORK | | Mar-04 | | | | | | 3 | 14 | 43 | 17 | 15 | 13 | 75 | 62.0 | MARGINAL |
| HELENS RUN | WEST FORK | | Aug-04 | | | | | | 4 | | 20 | | 16 | 5 | 53 | 41.7 | POOR |
| ISAACS CREEK | WEST FORK | | Jul-03 | 14 | 9 | 12 | 14 | 19 | 11 | 15 | 65 | 14 | 8 | 10 | 53 | 63.0 | MARGINAL |
| KINCHELOE CREEK | WEST FORK | | Jul-03 | 9 | 12 | 11 | 15 | 18 | 11 | 11 | 55 | 7 | 11 | 6 | 40 | 55.5 | MARGINAL |
| LAMBERTS RUN | WEST FORK | | Jun-03 | 20 | 20 | 8 | 20 | 19 | 15 | 17 | 80 | 14 | 15 | 18 | 78 | 83.0 | OPTIMAL |
| SALEM FORK | WEST FORK | | May-03 | 12 | 5 | 10 | 10 | 20 | 12 | 11 | 58 | 14 | 14 | 20 | 80 | 64.0 | MARGINAL |
| SKIN CREEK | WEST FORK | | Apr-03 | | | | | | 10 | 10 | 50 | 9 | 11 | 14 | 57 | 54.0 | MARGINAL |
| TENMILE CREEK | WEST FORK | | Sep-03 | 10 | 10 | 12 | 7 | 16 | 8 | 16 | 60 | 10 | 10 | 14 | 57 | 56.5 | MARGINAL |
| TWO LICK CREEK | WEST FORK | | Jul-03 | 18 | 17 | 10 | 15 | 20 | 16 | 15 | 78 | 13 | 11 | 11 | 58 | 69.5 | SUB OPTIMAL |
| RHINE CREEK | YOUGHIOGHENY | | Apr-03 | | | | | | 15 | 15 | 75 | 20 | 10 | 20 | 83 | 80.0 | OPTIMAL |

**Appendix 5**. Biological integrity

| STREAM | BASIN | STATION | DATE | METRICS | | | | | | | STREAM INDEX | INTEGRITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TOTAL TAXA | EPT TAXA | % EPT | HILSENHOFF | % DOMINANT | % MIDGE | SOS INDEX | | |
| BAKERS RUN | CACAPON | 1 | | 15 | 12 | 80.4 | 3.3 | 28.7 | 6.9 | | 87.5 | OPTIMAL |
| BAKERS RUN | CACAPON | 2 | | 12 | 6 | 64.2 | 4.4 | 31.2 | 11.0 | | 78.5 | SUB OPTIMAL |
| BAKERS RUN | CACAPON | 3 | | 12 | 9 | 82.2 | 4.3 | 28.7 | 14.9 | | 84.1 | OPTIMAL |
| BAKERS RUN | CACAPON | 4 | May-04 | 16 | 9 | | 4.8 | | | | 77.4 | SUB OPTIMAL |
| LONG LICK RUN | CACAPON | | | 12 | 8 | 84.4 | 3.5 | 25.7 | 11.9 | | 83.7 | OPTIMAL |
| LOST RIVER | CACAPON | 1 | Jul-02 | 13 | 9 | 85.6 | 3.7 | 27.5 | 10.1 | | 83.9 | OPTIMAL |
| LOST RIVER | CACAPON | 2 | | 13 | 9 | 85.5 | 3.7 | 27.5 | 10.1 | | 86.3 | OPTIMAL |
| SAUERKRAUT RUN | CACAPON | 1 | | 10 | 8 | 39.1 | 6.6 | 67.4 | 60.6 | | 50.8 | MARGINAL |
| SAUERKRAUT RUN | CACAPON | 2 | | 15 | 9 | 84.9 | 3.8 | 38.3 | 3.5 | | 87.0 | OPTIMAL |
| TROUT RUN | CACAPON | 1 | | 11 | 7 | 67.0 | 4.2 | 32.0 | 18.0 | | 75.9 | SUB OPTIMAL |
| TROUT RUN | CACAPON | 2 | | 11 | 7 | 66.0 | 4.3 | 31.1 | 17.5 | | 76.5 | SUB OPTIMAL |
| WAITES RUN | CACAPON | | | 16 | 11 | 78.6 | 2.7 | 26.2 | 2.4 | | 87.0 | OPTIMAL |
| BEAVER CREEK | CHEAT | 3-1 | Aug-03 | 7 | 5 | | 2.8 | | | | 57.3 | MARGINAL |
| BEAVER CREEK | CHEAT | 3-2 | Jul-03 | 19 | 11 | 66.7 | 4.3 | 48.5 | 3.0 | | 83.4 | OPTIMAL |
| BEAVER CREEK | CHEAT | 3-3 | Jul-03 | 13 | 7 | 80.2 | 3.9 | 74.9 | 0.0 | | 71.3 | SUB OPTIMAL |
| BEAVER CREEK | CHEAT | 3-4 | Aug-03 | 5 | 3 | | 4.3 | | | | 44.4 | POOR |
| BEAVER CREEK | CHEAT | 3-5 | Aug-03 | 5 | 4 | | 4.4 | | | | 50.3 | MARGINAL |
| BEAVER CREEK | CHEAT | 3-6 | Aug-03 | 9 | 4 | | 4.6 | | | | 44.9 | POOR |
| BEAVER CREEK | CHEAT | 3-7 | Aug-03 | 16 | 8 | | 3.8 | 62.5 | 0.0 | | 77.3 | OPTIMAL |
| BEAVER CREEK | CHEAT | 3-1 | May-04 | 10 | 6 | | 3.3 | | | | 63.2 | MARGINAL |
| BEAVER CREEK | CHEAT | 3-5 | May-04 | 14 | 9 | 84.8 | 2.9 | 53.3 | 0.5 | | 82.8 | OPTIMAL |
| BEAVER CREEK | CHEAT | 3-10 | May-04 | 12 | 9 | | 1.9 | | | | 75.4 | SUB OPTIMAL |
| BEAVER CREEK | CHEAT | 3-9 | May-04 | 9 | 5 | | 3.8 | | | | 56.7 | MARGINAL |
| BEAVER CREEK | CHEAT | 3-8 | May-04 | 3 | 1 | | 6.8 | | | | 22.6 | POOR |
| BUFFALO RUN | CHEAT | 1-2 | Apr-04 | 16 | 12 | 92.8 | 3.4 | 21.6 | 0.0 | | 93.8 | OPTIMAL |
| BUFFALO RUN | CHEAT | 1-1 | Aug-03 | 13 | 6 | 81.1 | 4.7 | 66.2 | 0.0 | | 70.4 | SUB OPTIMAL |
| BUFFALO RUN | CHEAT | 1-2 | Aug-03 | 20 | 11 | 85.2 | 3.6 | 46.5 | 6.0 | | 89.7 | OPTIMAL |
| BUFFALO RUN | CHEAT | 1-3 | Aug-03 | 12 | 6 | 96.0 | 2.6 | 94.0 | 1.5 | | 68.7 | SUB OPTIMAL |
| BUFFALO RUN | CHEAT | 1-4 | Aug-03 | 10 | 5 | 89.0 | 3.3 | 87.4 | 0.4 | | 67.4 | SUB OPTIMAL |
| BUFFALO RUN | CHEAT | 1-5 | Aug-03 | 13 | 6 | 65.9 | 4.6 | | | | 61.7 | MARGINAL |
| BUFFALO RUN | CHEAT | 1-6 | Aug-03 | 16 | 9 | 77.2 | 4.0 | 34.4 | 3.1 | | 84.9 | OPTIMAL |
| BUFFALO RUN | CHEAT | 1-7 | Jul-03 | 16 | 7 | 84.1 | 4.8 | 68.8 | 0.0 | | 73.7 | SUB OPTIMAL |
| BUFFALO RUN | CHEAT | | Oct-04 | | | | | | | 5.7 | 61.4 | MARGINAL |
| BUFFALO RUN | CHEAT | 1-1 | May-04 | 14 | 9 | 52.9 | 3.4 | 63.0 | 5.9 | | 73.0 | SUB OPTIMAL |
| BUFFALO RUN | CHEAT | 1-3 | May-04 | 10 | 6 | | 2.6 | | | | 64.6 | MARGINAL |
| BUFFALO RUN | CHEAT | 1-5 | May-04 | 10 | 5 | 94.1 | 1.5 | | | | 78.3 | SUB OPTIMAL |
| BUFFALO RUN | CHEAT | 1-6 | May-04 | 15 | 10 | 91.0 | 2.0 | 64.3 | 3.2 | | 83.0 | OPTIMAL |
| BUFFALO RUN | CHEAT | 1-7 | May-04 | 5 | 3 | | 1.4 | | | | 50.0 | MARGINAL |
| GLADY FORK | CHEAT | | Aug-04 | | | 68.5 | 3.8 | 25.0 | 0.3 | | 86.1 | OPTIMAL |
| GLADE RUN | CHEAT | 4-1 | Jul-03 | 10 | 2 | 15.1 | 7.2 | 76.2 | 66.7 | | 31.3 | POOR |

| STREAM | BASIN | STATION | DATE | METRICS | | | | | | | STREAM INDEX | INTEGRITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TOTAL TAXA | EPT TAXA | % EPT | HILSENHOFF | % DOMINANT | % MIDGE | SOS INDEX | | |
| GLADE RUN | CHEAT | 4-2 | Jul-03 | 7 | 2 | 7.8 | 7.6 | 84.9 | 17.3 | | 33.0 | POOR |
| GLADE RUN | CHEAT | 4-3 | Jul-03 | 9 | 2 | 19.7 | 6.8 | 69.2 | 8.4 | | 43.9 | POOR |
| GLADE RUN | CHEAT | 4-2 | May-04 | 12 | 4 | | 6.4 | | | | 48.2 | POOR |
| GLADE RUN | CHEAT | 4-3 | May-04 | 7 | 2 | | 4.7 | | | | 42.5 | POOR |
| GLADE RUN | CHEAT | 4-4 | May-04 | 7 | 3 | 54.5 | 3.6 | 52.3 | 21.6 | | 59.4 | MARGINAL |
| MUDDY CREEK | CHEAT | 1 | Jun-03 | 16 | 9 | | 3.1 | | | | 81.3 | OPTIMAL |
| MUDDY CREEK | CHEAT | 1 | Jul-03 | 16 | 9 | 86.9 | 3.4 | | | | 88.3 | OPTIMAL |
| NF GREENS RUN | CHEAT | 2-1 | Jul-03 | 7 | 3 | | 4.0 | | | | 47.4 | POOR |
| NF GREENS RUN | CHEAT | 2-2 | Jul-03 | 9 | 5 | 88.2 | 3.4 | 73.8 | 2.9 | | 68.4 | SUB OPTIMAL |
| NF GREENS RUN | CHEAT | 2-3 | Jul-03 | 7 | 4 | 88.6 | 3.7 | | | | 51.4 | MARGINAL |
| NF GREENS RUN | CHEAT | 2-1 | May-04 | 4 | 2 | | 3.2 | | | | 43.8 | POOR |
| NF GREENS RUN | CHEAT | 2-2 | May-04 | 5 | 4 | | 3.1 | | | | 51.1 | MARGINAL |
| ROARING CREEK | CHEAT | 1 | Jun-03 | 16 | 10 | | 4.3 | | | | 78.2 | OPTIMAL |
| ROARING CREEK | CHEAT | 2 | Jul-03 | 16 | 11 | | 3.9 | | | | 82.6 | OPTIMAL |
| WATKINS RUN | CHEAT | 1 | May-03 | 14 | 9 | | 3.2 | | | | 80.7 | OPTIMAL |
| WATKINS RUN | CHEAT | 2 | Aug-03 | 18 | 8 | 31.9 | 4.4 | 43.2 | 2.4 | | 75.3 | SUB OPTIMAL |
| WATKINS RUN | CHEAT | 2 | Aug-04 | 18 | 8 | 38.4 | 4.4 | | | | 76.0 | SUB OPTIMAL |
| CLEAR FORK | COAL | | Apr-04 | | | | | | | 5.1 | 70.0 | SUB OPTIMAL |
| BIG SPRING FORK | ELK | 1 | Jul-04 | 14 | 8 | 73.2 | 4.0 | 48.4 | 8.9 | | 78.6 | SUB OPTIMAL |
| CAMP CREEK | ELK | 1 | Jun-04 | 17 | 8 | 87.8 | 3.2 | | | | 72.5 | OPTIMAL |
| OLD FIELD FORK | ELK | 1 | Apr-04 | 15 | 10 | 92.8 | 3.4 | 25.7 | 3.4 | | 91.2 | OPTIMAL |
| ELK RIVER | ELK | 1 | Oct-03 | 17 | 10 | 95.4 | 3.4 | | | | 90.4 | OPTIMAL |
| ELK RIVER | ELK | 1 | Oct-04 | 14 | 8 | 94.3 | 3.3 | 29.6 | 1.2 | | 88.8 | OPTIMAL |
| ELK RIVER | ELK | 2 | Aug-04 | 16 | | | | | | 4.8 | 78.4 | OPTIMAL |
| ELKLICK RUN | GAULEY | | Oct-04 | 12 | 8 | 94.0 | 2.9 | | | | 86.2 | OPTIMAL |
| RICH CREEK | GAULEY | | Mar-03 | 14 | | | | | | 4.5 | 72.7 | SUB OPTIMAL |
| UPPER GLADE RUN | GAULEY | 1 | Apr-04 | 12 | 7 | 68.9 | 4.7 | 35.9 | 5.7 | | 75.3 | SUB OPTIMAL |
| UPPER GLADE RUN | GAULEY | 2 | Jun-04 | | | | | | | 5.4 | 66.2 | SUB OPTIMAL |
| UPPER GLADE RUN | GAULEY | 3 | Jun-03 | 15 | 7 | | 5.0 | | | | 65.5 | SUB OPTIMAL |
| HARTS RUN | GREENBRIER | | Feb-04 | 12 | 9 | 82.5 | 3.6 | | | | 78.9 | SUB OPTIMAL |
| GREENBRIER RIVER | GREENBRIER | | Jul-04 | 10 | | | | | | 4.1 | 66.0 | SUB OPTIMAL |
| SECOND CREEK | GREENBRIER | 1 | Jul-04 | 10 | | | | | | 4.0 | 66.4 | SUB OPTIMAL |
| SECOND CREEK | GREENBRIER | 2 | Jul-03 | | | | 4.6 | | | | 77.1 | SUB OPTIMAL |
| BARKERS CREEK | GUYANDOTTE | | May-03 | 9 | 6 | | 4.7 | | | | 56.9 | MARGINAL |
| CABIN CREEK | GUYANDOTTE | | Jul-03 | | | | | | | 4.8 | 74.3 | SUB OPTIMAL |
| DEVILS FORK | GUYANDOTTE | | Jul-03 | | | | | | | 4.7 | 75.7 | SUB OPTIMAL |
| GUYANDOTTE RIVER | GUYANDOTTE | | Sep-03 | 8 | 5 | 80.0 | 3.9 | | | | 70.5 | SUB OPTIMAL |
| SLAB FORK | GUYANDOTTE | 1 | Jul-03 | | | | | | | 4.9 | 72.9 | SUB OPTIMAL |
| SLAB FORK | GUYANDOTTE | 1 | Oct-04 | | | | | | | 5.5 | 70.4 | SUB OPTIMAL |
| ASH BRANCH | KANAWHA | | Apr-03 | 17 | 11 | 83.7 | 3.6 | | | | 88.9 | OPTIMAL |
| FIVEMILE FORK | KANAWHA | 1 | Jul-03 | 8 | 3 | 61.0 | 4.8 | | | | 60.6 | MARGINAL |
| FIVEMILE FORK | KANAWHA | 2 | Jul-03 | 12 | 4 | 59.5 | 4.6 | | | | 64.4 | MARGINAL |

| STREAM | BASIN | STATION | DATE | METRICS | | | | | | | STREAM INDEX | INTEGRITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TOTAL TAXA | EPT TAXA | % EPT | HILSENHOFF | % DOMINANT | % MIDGE | SOS INDEX | | |
| FROZEN BRANCH | KANAWHA | | Jul-03 | 10 | 5 | 76.5 | 4.9 | | | | 67.2 | SUB OPTIMAL |
| GOOSE HOLLOW | KANAWHA | 1 | Jul-03 | 13 | 5 | 68.9 | 5.4 | | | | 67.1 | SUB OPTIMAL |
| GOOSE HOLLOW | KANAWHA | 2 | Jun-03 | 11 | 2 | 59.7 | 5.1 | | | | 60.0 | MARGINAL |
| HICKS HOLLOW | KANAWHA | | Jun-03 | 7 | 5 | 91.2 | 4.9 | | | | 68.5 | SUB OPTIMAL |
| HORSEMILL BRANCH | KANAWHA | | Jul-03 | 6 | 1 | 14.3 | 4.0 | | | | 45.1 | POOR |
| HURRICANE FORK | KANAWHA | | Jun-03 | 9 | 3 | 15.2 | 7.7 | | | | 32.5 | POOR |
| KELLYS CREEK | KANAWHA | 1 | Jul-03 | 9 | 4 | 81.8 | 3.5 | | | | 71.2 | SUB OPTIMAL |
| KELLYS CREEK | KANAWHA | 2 | Jul-03 | 1 | 1 | 100.0 | 5.0 | | | | 56.8 | MARGINAL |
| KELLYS CREEK | KANAWHA | 3 | Jul-03 | 8 | 2 | 53.1 | 5.2 | | | | 55.7 | MARGINAL |
| KELLYS CREEK | KANAWHA | 4 | Jun-03 | 17 | 6 | 55.9 | 5.5 | | | | 65.4 | SUB OPTIMAL |
| KELLYS CREEK | KANAWHA | | Jun-03 | 16 | 3 | | 5.6 | | | | 54.1 | MARGINAL |
| MORRIS CREEK | KANAWHA | | Sep-04 | 15 | 7 | | | | | 4.2 | 74.5 | SUB OPTIMAL |
| MORRIS CREEK | KANAWHA | 15 | Nov-04 | 15 | 9 | 46.9 | 5.6 | 64.9 | 38.7 | | 61.7 | MARGINAL |
| MORRIS CREEK | KANAWHA | 7 | Nov-04 | 10 | 5 | 70.9 | 5.2 | 74.6 | 14.9 | | 59.8 | MARGINAL |
| MANILA CREEK | KANAWHA | 7 | Jul-03 | 11 | 2 | 35.7 | 5.4 | | | | 49.8 | POOR |
| MANILA CREEK | KANAWHA | 6 | Apr-03 | NO MACROINVERTEBRATES | | | | | | | 0.0 | POOR |
| MANILA CREEK | KANAWHA | 5 | Apr-03 | NO MACROINVERTEBRATES | | | | | | | 0.0 | POOR |
| MANILA CREEK | KANAWHA | 4 | Jul-03 | NO MACROINVERTEBRATES | | | | | | | 0.0 | POOR |
| MANILA CREEK | KANAWHA | 3 | Jul-03 | NO MACROINVERTEBRATES | | | | | | | 0.0 | POOR |
| MANILA CREEK | KANAWHA | 2 | Jul-03 | NO MACROINVERTEBRATES | | | | | | | 0.0 | POOR |
| MANILA CREEK | KANAWHA | 1 | Jul-03 | NO MACROINVERTEBRATES | | | | | | | 0.0 | POOR |
| MANILA CREEK | KANAWHA | 7 | Apr-03 | 12 | 3 | 26.5 | 5.6 | | | | 50.9 | MARGINAL |
| MANILA CREEK | KANAWHA | | Oct-03 | 13 | 5 | 77.9 | 4.9 | 66.8 | 0.0 | | 67.9 | SUB OPTIMAL |
| POCATALICO RIVER | KANAWHA | | May-03 | 12 | 4 | 17.5 | 5.8 | 45.6 | 4.4 | | 56.9 | POOR |
| TRACE FORK | KANAWHA | | Aug-03 | 10 | | | | | | 5.2 | 58.1 | MARGINAL |
| UNT LEFT FORK | KANAWHA | | Jul-03 | 6 | 3 | 50.0 | 5.2 | | | | 51.3 | MARGINAL |
| WILLIS BRANCH | KANAWHA | | Jul-03 | 15 | 8 | 79.6 | 5.3 | | | | 76.2 | SUB OPTIMAL |
| CEDAR CREEK | LITTLE KANAWHA | | Sep-03 | 16 | 4 | 53.5 | 5.1 | | | | 65.1 | SUB OPTIMAL |
| CEDAR CREEK | LITTLE KANAWHA | | Apr-03 | 11 | 6 | 81.1 | 4.2 | | | | 72.1 | SUB OPTIMAL |
| ELLIS CREEK | LITTLE KANAWHA | | Sep-03 | 18 | 5 | 34.5 | 6.0 | 48.8 | 31.2 | | 63.5 | MARGINAL |
| LITTLE KANAWHA RIVER | LITTLE KANAWHA | | Aug-03 | 11 | 5 | 66.0 | 3.4 | | | | 71.7 | SUB OPTIMAL |
| ABRAMS CREEK | NORTH BRANCH | | | 9 | 1 | 2.1 | 7.7 | 71.6 | 58.9 | | 28.1 | POOR |
| ELKLICK RUN | NORTH BRANCH | | | 13 | 9 | 53.3 | 4.6 | 51.1 | 1.1 | | 72.9 | SUB OPTIMAL |
| NF PATTERSON CREEK | NORTH BRANCH | 1 | | 8 | 1 | 78.6 | 4.7 | 84.1 | 0.0 | | 55.3 | MARGINAL |
| NF PATTERSON CREEK | NORTH BRANCH | 2 | | 13 | 8 | 77.5 | 5.1 | 33.3 | 18.3 | | 76.4 | SUB OPTIMAL |
| PATTERSON CREEK | NORTH BRANCH | | | 17 | 7 | 36.4 | 5.2 | 40.4 | 32.3 | | 67.0 | SUB OPTIMAL |
| BRUSH CREEK | NEW | 2 | Oct-04 | 9 | | | | | | 5.2 | 55.0 | MARGINAL |
| BRUSH CREEK | NEW | 1 | Apr-03 | 10 | 4 | 74.1 | 4.1 | 36.6 | 12.5 | | 70.7 | SUB OPTIMAL |
| DROOPING LICK CREEK | NEW | | May-04 | 14 | | | | | | 5.1 | 68.7 | SUB OPTIMAL |
| HANS CREEK | NEW | | Oct-03 | | | | | | | 4.4 | 80.0 | OPTIMAL |
| INDIAN CREEK | NEW | | Sep-03 | | | 29.3 | 4.7 | | | | 68.5 | SUB OPTIMAL |

| STREAM | BASIN | STATION | DATE | METRICS | | | | | | | STREAM INDEX | INTEGRITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TOTAL TAXA | EPT TAXA | % EPT | HILSENHOFF | % DOMINANT | % MIDGE | SOS INDEX | | |
| LAUREL CREEK | NEW | | Oct-03 | | | 82.8 | 5.0 | | | | 87.8 | OPTIMAL |
| WOLF CREEK | NEW | | May-04 | 9 | 5 | 29.4 | 5.5 | | | | 57.7 | MARGINAL |
| LITTLE MILL CREEK | MIDDLE OHIO | | May-04 | 17 | 6 | | 5.2 | | | | 73.8 | SUB OPTIMAL |
| STEWARTS RUN | MIDDLE OHIO | | Jul-04 | 10 | | | | | | 4.7 | 62.9 | MARGINAL |
| UNT HUGHES RIVER | MIDDLE OHIO | | Apr-03 | 14 | | | | | | 5.5 | 67.2 | SUB OPTIMAL |
| TOMLINSON RUN | UPPER OHIO | | Mar-03 | 15 | 5 | 9.5 | 7.5 | | | | 35.5 | POOR |
| BACK CREEK | POTOMAC DIRECT | 3 | Jul-04 | 13 | | | | | | 4.0 | 73.8 | SUB OPTIMAL |
| ELK BRANCH | POTOMAC DIRECT | | Oct-03 | 15 | 5 | 49.3 | 4.4 | 49.9 | 12.0 | | 69.4 | SUB OPTIMAL |
| ELK RUN | POTOMAC DIRECT | 1 | May-03 | 16 | 7 | 13.1 | 4.9 | 40.9 | 21.0 | | 63.4 | MARGINAL |
| ELK RUN | POTOMAC DIRECT | 2 | Oct-03 | 15 | 5 | 31.6 | 4.7 | 47.6 | 2.2 | | 67.3 | SUB OPTIMAL |
| ELK RUN | POTOMAC DIRECT | 1 | Oct-03 | 16 | 6 | 58.5 | 4.8 | 55.6 | 2.6 | | 70.8 | SUB OPTIMAL |
| HARPER RUN | POTOMAC DIRECT | | Jul-03 | 2 | 0 | 0.0 | 8.0 | | | | 7.7 | POOR |
| HALF MILE RUN | POTOMAC DIRECT | | Mar-04 | | | 62.7 | 3.8 | 22.1 | 1.8 | | 84.7 | OPTIMAL |
| KATES RUN | POTOMAC DIRECT | | Jun-04 | 10 | 6 | 67.3 | 4.1 | 36.7 | 16.3 | | 72.1 | SUB OPTIMAL |
| OPEQUON CREEK | POTOMAC DIRECT | 2 | Jul-04 | 9 | | | | | | 5.6 | 52.9 | MARGINAL |
| OPEQUON CREEK | POTOMAC DIRECT | 1 | Oct-03 | 11 | 3 | 2.9 | 5.8 | | | | 41.4 | POOR |
| RATTLESNAKE RUN | POTOMAC DIRECT | 3 | Sep-03 | 10 | 2 | 14.7 | 6.4 | 64.2 | 22.5 | | 43.9 | POOR |
| RATTLESNAKE RUN | POTOMAC DIRECT | 2 | Sep-03 | 9 | 0 | 0.0 | 6.2 | 74.7 | 26.7 | | 32.5 | POOR |
| RATTLESNAKE RUN | POTOMAC DIRECT | 1 | Apr-03 | 19 | 7 | 36.4 | 5.5 | 33.2 | 9.9 | | 75.4 | SUB OPTIMAL |
| RATTLESNAKE RUN | POTOMAC DIRECT | 3 | Apr-03 | 8 | 1 | 7.1 | 4.6 | 51.5 | 23.7 | | 42.7 | POOR |
| RATTLESNAKE RUN | POTOMAC DIRECT | 1 | Apr-03 | 7 | 0 | 0.0 | 6.3 | 32.9 | 19.8 | | 33.8 | POOR |
| ROCKY MARSH RUN | POTOMAC DIRECT | 1 | Oct-03 | 14 | 3 | 26.5 | 6.2 | 77.3 | 0.6 | | 48.8 | POOR |
| ROCKY MARSH RUN | POTOMAC DIRECT | 2 | Apr-03 | 12 | 4 | 34.4 | 6.1 | 69.5 | 42.4 | | 50.1 | MARGINAL |
| SLEEPY CREEK | POTOMAC DIRECT | 1 | May-04 | 16 | | | | | | 5.1 | 73.1 | SUB OPTIMAL |
| SLEEPY CREEK | POTOMAC DIRECT | 2 | Jun-04 | 15 | | | | | | 4.3 | 76.4 | SUB OPTIMAL |
| SLEEPY CREEK | POTOMAC DIRECT | 3 | Jul-04 | 14 | | | | | | 4.5 | 72.7 | SUB OPTIMAL |
| SLEEPY CREEK | POTOMAC DIRECT | 3 | Nov-03 | | | 31.6 | 3.4 | | | | 76.5 | SUB OPTIMAL |
| SLEEPY CREEK | POTOMAC DIRECT | 2 | Aug-03 | | | 57.5 | 4.7 | | | | 77.3 | SUB OPTIMAL |
| SLEEPY CREEK | POTOMAC DIRECT | 1 | Jul-03 | | | | 5.8 | | | | 60.0 | MARGINAL |
| SLEEPY CREEK | POTOMAC DIRECT | | Sep-04 | 14 | | | | | | 4.9 | 72.4 | SUB OPTIMAL |
| TOWN RUN | POTOMAC DIRECT | | Oct-03 | 8 | 0 | 0.0 | 7.1 | 71.2 | 0.0 | | 36.1 | POOR |
| TUSCARORA CREEK | POTOMAC DIRECT | 1 | Jul-04 | 12 | | | | | | 5.6 | 60.0 | MARGINAL |
| TUSCARORA CREEK | POTOMAC DIRECT | 2 | May-03 | 17 | 5 | 25.5 | 6.1 | 40.0 | 11.1 | | 64.9 | MARGINAL |
| ANDERSON RUN | SOUTH BRANCH | | | 8 | 5 | | 3.8 | | | | 55.1 | MARGINAL |
| BIG RUN | SOUTH BRANCH | 1 | Jun-04 | 14 | 8 | | | | | 4.3 | 69.7 | OPTIMAL |
| BIG RUN | SOUTH BRANCH | 2 | Aug-04 | 18 | 11 | 93.2 | 3.1 | 31.7 | 2.8 | | 94.3 | OPTIMAL |
| BIG RUN | SOUTH BRANCH | 1 | Apr-04 | 12 | 8 | | | | | 5.2 | 62.4 | SUB OPTIMAL |
| CLIFFORD HOLLOW | SOUTH BRANCH | | | 15 | 11 | | 2.8 | | | | 85.3 | OPTIMAL |
| DUMPLING RUN | SOUTH BRANCH | | | 8 | 4 | 87.0 | 3.5 | 54.1 | 4.1 | | 69.7 | SUB OPTIMAL |
| FORT RUN | SOUTH BRANCH | | | 19 | 9 | 46.7 | 5.5 | 42.9 | 35.2 | | 71.4 | SUB OPTIMAL |
| NORTH FORK | SOUTH BRANCH | | Oct-04 | 11 | 7 | 91.2 | 3.3 | 32.4 | 0.0 | | 83.2 | OPTIMAL |
| SOUTH BRANCH | SOUTH BRANCH | | Oct-04 | 10 | 6 | 62.6 | 5.0 | 51.7 | 35.4 | | 61.6 | MARGINAL |

| STREAM | BASIN | STATION | DATE | METRICS | | | | | | | STREAM INDEX | INTEGRITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TOTAL TAXA | EPT TAXA | % EPT | HILSENHOFF | % DOMINANT | % MIDGE | SOS INDEX | | |
| SOUTH BRANCH | SOUTH BRANCH | | Oct-04 | 12 | 7 | 89.9 | 3.9 | 37.0 | 7.4 | | 80.5 | OPTIMAL |
| SOUTH BRANCH | SOUTH BRANCH | | Oct-04 | 14 | 8 | 67.8 | 4.8 | 41.7 | 28.1 | | 72.5 | SUB OPTIMAL |
| SOUTH MILL CREEK | SOUTH BRANCH | | Jul-03 | 19 | 11 | 91.4 | 4.2 | 56.7 | 1.0 | | 86.7 | OPTIMAL |
| SPRING RUN | SOUTH BRANCH | 1 | Jul-03 | 12 | 6 | | 5.2 | | | | 57.3 | MARGINAL |
| SPRING RUN | SOUTH BRANCH | 2 | Jul-03 | 14 | 7 | | 5.1 | | | | 63.5 | SUB OPTIMAL |
| SPRING RUN | SOUTH BRANCH | 3 | Jul-03 | 14 | 8 | | 4.7 | | | | 68.0 | SUB OPTIMAL |
| SPRING RUN | SOUTH BRANCH | 4 | Jul-03 | 11 | 9 | | 3.4 | | | | 72.0 | SUB OPTIMAL |
| SOUTH FORK | SOUTH BRANCH | | Oct-04 | 14 | 6 | 74.3 | 4.2 | 38.3 | 20.7 | | 74.6 | SUB OPTIMAL |
| TOMBS HOLLOW RUN | SOUTH BRANCH | | | 9 | 4 | 13.0 | 7.3 | 80.9 | 4.6 | | 41.9 | POOR |
| WALNUT BOTTOM | SOUTH BRANCH | 1 | | 10 | 6 | | 5.7 | | | | 51.7 | SUB OPTIMAL |
| WALNUT BOTTOM | SOUTH BRANCH | 2 | | 10 | 7 | 83.7 | 4.5 | 53.5 | 14.0 | | 71.2 | SUB OPTIMAL |
| BULLSKIN RUN | SHENANDOAH | 1 | Nov-03 | 12 | 3 | 38.8 | 4.7 | 64.0 | 5.0 | | 60.6 | MARGINAL |
| BULLSKIN RUN | SHENANDOAH | 2 | Oct-03 | 14 | 3 | 32.2 | 5.5 | 52.2 | 7.7 | | 61.4 | MARGINAL |
| BULLSKIN RUN | SHENANDOAH | 3 | Nov-03 | 15 | 5 | 32.7 | 5.1 | 42.2 | 4.6 | | 68.0 | SUB OPTIMAL |
| EVITTS RUN | SHENANDOAH | 1 | May-03 | 14 | 8 | 38.6 | 6.4 | | | | 53.1 | MARGINAL |
| EVITTS RUN | SHENANDOAH | 1 | Oct-03 | 15 | 7 | 71.9 | 5.4 | 56.0 | 2.0 | | 75.2 | SUB OPTIMAL |
| EVITTS RUN | SHENANDOAH | 2 | Oct-03 | 12 | 3 | 46.5 | 5.7 | 57.2 | 6.1 | | 56.9 | MARGINAL |
| EVITTS RUN | SHENANDOAH | 3 | Oct-03 | 16 | 4 | 53.8 | 4.7 | 35.8 | 0.5 | | 76.1 | SUB OPTIMAL |
| EVITTS RUN | SHENANDOAH | 4 | Apr-03 | 11 | 6 | 41.3 | 6.1 | 66.0 | 47.6 | | 52.0 | MARGINAL |
| EVITTS RUN | SHENANDOAH | 4 | Oct-03 | 14 | 6 | 54.6 | 5.0 | 51.9 | 2.7 | | 70.2 | SUB OPTIMAL |
| HUBBARDS RUN | SHENANDOAH | 1 | Nov-03 | 8 | 1 | 2.1 | 6.0 | 84.4 | 2.1 | | 38.8 | POOR |
| HUBBARDS RUN | SHENANDOAH | 2 | Apr-03 | 5 | 1 | 0.5 | 5.5 | 96.5 | 20.4 | | 29.4 | POOR |
| BRADSHAW CREEK | TUG FORK | 2 | Mar-03 | | | | | | | 5.6 | 62.9 | MARGINAL |
| BRADSHAW CREEK | TUG FORK | 1 | Mar-03 | | | | | | | 5.2 | 68.6 | SUB OPTIMAL |
| DRY FORK | TUG FORK | | Apr-03 | | | | | | | 5.6 | 62.9 | MARGINAL |
| ELKHORN CREEK | TUG FORK | | Mar-03 | | | | | | | 5.6 | 62.9 | MARGINAL |
| TWIN BRANCH | TUG FORK | | Oct-03 | | | | | | | 5.1 | 70.0 | SUB OPTIMAL |
| LEADING CREEK | TYGART VALLEY | | | 12 | 6 | 77.8 | 3.8 | 55.2 | 15.5 | | 71.5 | SUB OPTIMAL |
| LF FILES CREEK | TYGART VALLEY | | Jun-04 | 14 | | | | | | 3.8 | 77.7 | SUB OPTIMAL |
| LF FILES CREEK | TYGART VALLEY | | May-04 | 10 | | | | | | 4.1 | 66.0 | SUB OPTIMAL |
| LF FILES CREEK | TYGART VALLEY | | May-03 | 12 | | | | | | 4.4 | 68.6 | SUB OPTIMAL |
| LB/LF SANDY CREEJ | TYGART VALLEY | 1 | Jun-04 | 8 | 5 | 93.9 | 4.1 | | | | 73.2 | SUB OPTIMAL |
| LB/LF SANDY CREEJ | TYGART VALLEY | 1 | Jul-03 | 12 | 5 | | 4.7 | | | | 57.1 | MARGINAL |
| LB/LF SANDY CREEJ | TYGART VALLEY | 2 | Aug-04 | 9 | 5 | 93.3 | 4.1 | 32.8 | 2.8 | | 78.9 | SUB OPTIMAL |
| LF SANDY CREEK | TYGART VALLEY | | Jul-03 | 7 | 3 | 50.0 | 4.4 | | | | 54.1 | MARGINAL |
| LF SANDY CREEK | TYGART VALLEY | | May-03 | 10 | 5 | | 4.7 | | | | 53.4 | MARGINAL |
| MILLSTONE CREEK | TYGART VALLEY | | May-04 | 9 | | | | | | 4.1 | 63.6 | MARGINAL |
| MILLSTONE CREEK | TYGART VALLEY | | May-03 | | | | 4.4 | | | | 80.0 | OPTIMAL |
| RB/LF SANDY CREEK | TYGART VALLEY | 2 | Jun-04 | 7 | 4 | | 3.3 | | | | 53.3 | MARGINAL |
| RB/LF SANDY CREEK | TYGART VALLEY | 2 | May-03 | 12 | 6 | 64.3 | 4.2 | | | | 62.1 | SUB OPTIMAL |
| RB/LF SANDY CREEK | TYGART VALLEY | 2 | Jul-03 | 8 | 4 | | 4.1 | | | | 51.1 | MARGINAL |
| RB/LF SANDY CREEK | TYGART VALLEY | 1 | Aug-04 | 7 | 3 | | 4.4 | | | | 45.5 | POOR |

| STREAM | BASIN | STATION | DATE | METRICS | | | | | | | STREAM INDEX | INTEGRITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TOTAL TAXA | EPT TAXA | % EPT | HILSENHOFF | % DOMINANT | % MIDGE | SOS INDEX | | |
| UNT MIDDLE FORK RIVER | TYGART VALLEY | | Jul-04 | 4 | 3 | | 3.5 | | | | 45.0 | POOR |
| BOOTH CREEK | WEST FORK | | Jul-03 | 16 | 6 | 52.2 | 4.8 | 32.2 | 3.3 | | 75.9 | SUB OPTIMAL |
| BRUSHY FORK | WEST FORK | | Jul-03 | 11 | 4 | 46.2 | 5.4 | | | | 55.5 | MARGINAL |
| ELK CREEK | WEST FORK | | Mar-04 | 13 | 8 | 41.6 | 6.1 | 66.0 | 1.6 | | 67.0 | SUB OPTIMAL |
| HELENS RUN | WEST FORK | | Aug-04 | 12 | | | | | | 5.3 | 62.1 | SUB OPTIMAL |
| ISAACS CREEK | WEST FORK | | Jul-03 | 15 | 3 | 39.6 | 5.7 | | | | 57.9 | MARGINAL |
| KINCHELOE CREEK | WEST FORK | | Jul-03 | 14 | 4 | 63.2 | 3.9 | | | | 70.3 | SUB OPTIMAL |
| LAMBERTS RUN | WEST FORK | | Jun-03 | 3 | 0 | 0.0 | 6.5 | | | | 27.7 | POOR |
| SALEM FORK | WEST FORK | | May-03 | 15 | 5 | 32.9 | 5.7 | | | | 53.3 | MARGINAL |
| SKIN CREEK | WEST FORK | | Apr-03 | 14 | 7 | 48.6 | 5.5 | | | | 59.7 | MARGINAL |
| TENMILE CREEK | WEST FORK | | Sep-03 | 15 | 6 | 65.7 | 5.7 | | | | 65.4 | SUB OPTIMAL |
| TWO LICK CREEK | WEST FORK | | Jul-03 | 16 | 6 | 48.1 | 4.2 | | | | 70.7 | SUB OPTIMAL |
| UNT LAMBERTS RUN | WEST FORK | | May-03 | | | | | | | | 0.0 | POOR |
| RHINE CREEK | YOUGHIOGHENY | | Apr-03 | 13 | 8 | | 4.1 | | | | 72.0 | SUB OPTIMAL |

**Appendix 6**. Water level (discharge)

| STREAM | BASIN | STATION | DATE | VELOCITY | | | | | WEATHER | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | DISCHARGE | LOW | NORMAL | HIGH | NO FLOW | CURRENT WEATHER | PAST 48-HOURS |
| BAKERS RUN | CACAPON | 1 | | | | | X | | | |
| BAKERS RUN | CACAPON | 2 | | | | X | | | | |
| BAKERS RUN | CACAPON | 3 | | | | X | | | | |
| BAKERS RUN | CACAPON | 4 | May-04 | | | | X | | LIGHT SHOWERS | HEAVY RAINS |
| LONG LICK RUN | CACAPON | | | | | X | | | | |
| LOST RIVER | CACAPON | 1 | | | | X | | | | |
| LOST RIVER | CACAPON | 2 | | | | X | | | | |
| SAUERKRAUT RUN | CACAPON | 1 | | | | | X | | | |
| SAUERKRAUT RUN | CACAPON | 2 | | | X | | | | | |
| TROUT RUN | CACAPON | 1 | | | | | X | | | |
| TROUT RUN | CACAPON | 2 | | | | | X | | | |
| WAITES RUN | CACAPON | | | | | | X | | | |
| BEAVER CREEK | CHEAT | 3-1 | Aug-03 | 6.25 | | X | | | | |
| BEAVER CREEK | CHEAT | 3-2 | Jul-03 | 6.25 | | X | | | | |
| BEAVER CREEK | CHEAT | 3-3 | Jul-03 | 4.98 | | X | | | | |
| BEAVER CREEK | CHEAT | 3-5 | Aug-03 | 0.39 | X | | | | | |
| BEAVER CREEK | CHEAT | 3-6 | Aug-03 | 5.65 | | X | | | | |
| BEAVER CREEK | CHEAT | 3-7 | Aug-03 | 1.12 | X | | | | | |
| BEAVER CREEK | CHEAT | 3-1 | May-04 | 15.10 | | X | | | | |
| BEAVER CREEK | CHEAT | 3-5 | May-04 | 39.50 | | | X | | | HEAVY RAINS |
| BEAVER CREEK | CHEAT | 3-10 | May-04 | 8.40 | | X | | | | |
| BEAVER CREEK | CHEAT | 3-9 | May-04 | 11.40 | | X | | | | |
| BEAVER CREEK | CHEAT | 3-8 | May-04 | 0.56 | X | | | | | |
| BUFFALO RUN | CHEAT | 1-2 | Apr-04 | 8.60 | | X | | | | |
| BUFFALO RUN | CHEAT | 1-1 | Aug-03 | 4.70 | | X | | | | |
| BUFFALO RUN | CHEAT | 1-2 | Aug-03 | 1.30 | X | | | | | |
| BUFFALO RUN | CHEAT | 1-3 | Aug-03 | 3.20 | | X | | | | |
| BUFFALO RUN | CHEAT | 1-4 | Aug-03 | 2.10 | | X | | | | |
| BUFFALO RUN | CHEAT | 1-5 | Aug-03 | 1.20 | X | | | | | |
| BUFFALO RUN | CHEAT | 1-6 | Aug-03 | 0.93 | X | | | | | |
| BUFFALO RUN | CHEAT | 1-7 | Jul-03 | 0.30 | X | | | | | |
| BUFFALO RUN | CHEAT | | Oct-04 | 74.20 | | | X | | | |
| BUFFALO RUN | CHEAT | 1-1 | May-04 | 49.60 | | | X | | | THUNDER SHOWERS |
| BUFFALO RUN | CHEAT | 1-3 | May-04 | 35.80 | | | X | | | HEAVY RAINS |
| BUFFALO RUN | CHEAT | 1-5 | May-04 | 7.80 | | X | | | | SCATTERED SHOWERS |
| BUFFALO RUN | CHEAT | 1-6 | May-04 | 1.50 | X | | | | | SCATTERED SHOWERS |
| BUFFALO RUN | CHEAT | 1-7 | May-04 | 3.60 | | X | | | | HEAVY RAINS |
| GLADY FORK | CHEAT | | Aug-04 | | | X | | | | |
| GLADE RUN | CHEAT | 4-1 | Jul-03 | | | | | | | |
| GLADE RUN | CHEAT | 4-2 | Jul-03 | 1.70 | X | | | | | |
| GLADE RUN | CHEAT | 4-3 | Jul-03 | 1.20 | X | | | | | |

| STREAM | BASIN | STATION | DATE | VELOCITY | | | | | WEATHER | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | DISCHARGE | LOW | NORMAL | HIGH | NO FLOW | CURRENT WEATHER | PAST 48-HOURS |
| MUDDY CREEK | CHEAT | 1 | Jun-03 | | | X | | | | |
| MUDDY CREEK | CHEAT | 1 | Jul-03 | | | X | | | | |
| NF GREENS RUN | CHEAT | 2-1 | Jul-03 | | | X | | | | |
| NF GREENS RUN | CHEAT | 2-2 | Jul-03 | | | X | | | | |
| NF GREENS RUN | CHEAT | 2-3 | Jul-03 | | | X | | | | |
| NF GREENS RUN | CHEAT | 2-4 | Jul-03 | | | X | | | | |
| NF GREENS RUN | CHEAT | 2-1 | May-04 | 12.70 | | X | | | LIGHT SHOWERS | |
| NF GREENS RUN | CHEAT | 2-2 | May-04 | 7.70 | | X | | | | |
| NF GREENS RUN | CHEAT | 2-4 | May-04 | 7.50 | | X | | | | SCATTERED SHOWERS |
| ROARING CREEK | CHEAT | 1 | Jun-03 | | | | X | | | |
| ROARING CREEK | CHEAT | 2 | Jul-03 | | | | X | | LIGHT SHOWERS | |
| WATKINS RUN | CHEAT | 1 | May-03 | | | X | | | | |
| WATKINS RUN | CHEAT | 2 | Aug-03 | | X | | | | | |
| WATKINS RUN | CHEAT | 2 | Aug-04 | | | X | | | | |
| CLEAR FORK | COAL | | Apr-04 | | | | X | | | SCATTERED SHOWERS |
| BIG SPRING FORK | ELK | 1 | Jul-04 | 3.40 | X | | | | | |
| CAMP CREEK | ELK | 1 | Jun-04 | 10.80 | X | | | | LIGHT RAINS | |
| OLD FIELD FORK | ELK | 1 | Apr-04 | 20.20 | | X | | | | STEADY LIGHT RAINS |
| ELK RIVER | ELK | 1 | Oct-03 | | | X | | | STEADY LIGHT RAIN | SCATTERED SHOWERS |
| ELK RIVER | ELK | 1 | Oct-04 | 18.20 | | X | | | | |
| ELK RIVER | ELK | 2 | Aug-04 | | X | | | | | |
| ELKLICK RUN | GAULEY | | Oct-04 | | | X | | | SCATTERED SHOWERS | HEAVY DOWNPOURS |
| RICH CREEK | GAULEY | | Mar-03 | | | X | | | | |
| UPPER GLADE RUN | GAULEY | 1 | Apr-04 | 3.90 | | X | | | | |
| UPPER GLADE RUN | GAULEY | 2 | Jun-04 | | | X | | | SCATTERED SHOWERS | SCATTERED SHOWERS |
| UPPER GLADE RUN | GAULEY | 3 | Jun-03 | 2.80 | | X | | | | SCATTERES SHOWERS |
| HARTS RUN | GREENBRIER | | Feb-04 | | | | X | | | LIGHT SNOW |
| GREENBRIER RIVER | GREENBRIER | | Jul-04 | | | X | | | | |
| SECOND CREEK | GREENBRIER | 1 | Jul-04 | | | | X | | HEAVY RAINS | SCATTERED SHOWERS |
| SECOND CREEK | GREENBRIER | 2 | Jul-03 | | | X | | | | |
| BARKERS CREEK | GUYANDOTTE | | May-03 | | | | X | | HEAVY AT TIMES | |
| CABIN CREEK | GUYANDOTTE | | Jul-03 | | | X | | | | |
| GUYANDOTTE RIVER | GUYANDOTTE | | Sep-03 | | X | | | | | |
| SLAB FORK | GUYANDOTTE | 1 | Jul-03 | | | X | | | | |
| SLAB FORK | GUYANDOTTE | 1 | Oct-04 | | | X | | | SOME HEAVY RAINS | SCATTERED SHOWERS |
| ASH BRANCH | KANAWHA | | Apr-03 | | | | X | | HEAVY RAINS | THUNDER STORMS |
| FIVEMILE FORK | KANAWHA | 1 | Jul-03 | | X | | | | | |
| FIVEMILE FORK | KANAWHA | 2 | Jul-03 | | | X | | | | |
| FROZEN BRANCH | KANAWHA | | Jul-03 | | | X | | | | |
| GOOSE HOLLOW | KANAWHA | 1 | Jul-03 | | X | | | | | |
| GOOSE HOLLOW | KANAWHA | 2 | Jun-04 | | X | | | | | |
| HICKS HOLLOW | KANAWHA | | Jun-03 | | X | | | | | |

| STREAM | BASIN | STATION | DATE | VELOCITY | | | | | WEATHER | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | DISCHARGE | LOW | NORMAL | HIGH | NO FLOW | CURRENT WEATHER | PAST 48-HOURS |
| HORSEMILL BRANCH | KANAWHA | | Jul-03 | | X | | | | | |
| HURRICANE FORK | KANAWHA | | Jun-03 | | | X | | | | |
| KELLYS CREEK | KANAWHA | 1 | Jul-03 | | | X | | | | |
| KELLYS CREEK | KANAWHA | 2 | Jul-03 | | | X | | | | |
| KELLYS CREEK | KANAWHA | 3 | Jul-03 | | X | | | | | |
| KELLYS CREEK | KANAWHA | 4 | Jun-03 | | X | | | | | |
| KELLYS CREEK | KANAWHA | | Jun-03 | | | | X | | | |
| MORRIS CREEK | KANAWHA | | Sep-04 | | | X | | | | HURRICANE FRANCIS RAINS |
| MORRIS CREEK | KANAWHA | 15 | Nov-04 | | | X | | | | |
| MORRIS CREEK | KANAWHA | 7 | Nov-04 | | | X | | | | |
| MANILA CREEK | KANAWHA | 7 | Jul-03 | | X | | | | | |
| MANILA CREEK | KANAWHA | 6 | Apr-03 | | X | | | | | |
| MANILA CREEK | KANAWHA | 5 | Apr-03 | | X | | | | | |
| MANILA CREEK | KANAWHA | 4 | Jul-03 | | X | | | | | |
| MANILA CREEK | KANAWHA | 3 | Jul-03 | | X | | | | | |
| MANILA CREEK | KANAWHA | 2 | Jul-03 | | X | | | | | |
| MANILA CREEK | KANAWHA | 7 | Apr-03 | | | | X | | | |
| MANILA CREEK | KANAWHA | | Oct-03 | 7.44 | | X | | | SCATTERED SHOWERS | |
| POCATALICO RIVER | KANAWHA | | May-03 | | | X | | | SCATTERED SHOWERS | THUNDER STORMS |
| TRACE FORK | KANAWHA | | Aug-03 | | X | | | | | |
| UNT LEFT FORK | KANAWHA | | Jul-03 | | | X | | | | |
| WILLIS BRANCH | KANAWHA | | Jul-03 | | | X | | | | SCATTERED SHOWERS |
| CEDAR CREEK | LITTLE KANAWHA | | Sep-03 | 9.85 | | X | | | LIGHT RAIN | SCATTERED SHOWERS |
| CEDAR CREEK | LITTLE KANAWHA | | Apr-03 | 32.90 | | | X | | HEAVY RAINS | SCATTERED SHOWERS |
| ELLIS CREEK | LITTLE KANAWHA | | Sep-03 | 5.80 | X | | | | | |
| LITTLE KANAWHA RIVER | LITTLE KANAWHA | | Aug-03 | | | X | | | | |
| ABRAMS CREEK | NORTH BRANCH | | | | X | | | | | |
| ELKLICK RUN | NORTH BRANCH | | | | | X | | | | |
| NF PATTERSON CREEK | NORTH BRANCH | 1 | | | | X | | | | |
| NF PATTERSON CREEK | NORTH BRANCH | 2 | | | X | | | | | |
| PATTERSON CREEK | NORTH BRANCH | | | | | | X | | | |
| BRUSH CREEK | NEW | 2 | Oct-04 | | | | X | | HEAVY DOWNPOURS | |
| BRUSH CREEK | NEW | 1 | Apr-03 | | | | X | | SCATTERED SHOWERS | HEAVY DOWNPOURS |
| DROOPING LICK CREEK | NEW | | May-04 | | | X | | | | |
| HANS CREEK | NEW | | Oct-03 | | | X | | | | |
| INDIAN CREEK | NEW | | Sep-03 | | | | X | | LIGHT SHOWERS | HEAVY RAINS |
| LAUREL CREEK | NEW | | Oct-03 | 32.90 | | | X | | SHOWERS, HEAVY AT TIMES | LIGHT RAIN |
| WOLF CREEK | NEW | | May-04 | 19.10 | | | X | | SCATTERED SHOWERS | |
| LITTLE MILL CREEK | MIDDLE OHIO | | May-04 | | | X | | | LIGHT SHOWERS, SOME HEAVY | |
| STEWARTS RUN | MIDDLE OHIO | | Jul-04 | | X | | | | | |
| UNT HUGHES RIVER | MIDDLE OHIO | | Apr-03 | | X | | | | | |
| TOMLINSON RUN | UPPER OHIO | | Mar-03 | | X | | | | | |

| STREAM | BASIN | STATION | DATE | VELOCITY | | | | | WEATHER | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | DISCHARGE | LOW | NORMAL | HIGH | NO FLOW | CURRENT WEATHER | PAST 48-HOURS |
| BACK CREEK | POTOMAC DIRECT | 3 | Jul-04 | | | X | | | | |
| ELK BRANCH | POTOMAC DIRECT | | Oct-03 | | | | X | | | |
| ELK RUN | POTOMAC DIRECT | 1 | May-03 | | | | X | | | |
| ELK RUN | POTOMAC DIRECT | 2 | Oct-03 | | | | X | | | |
| ELK RUN | POTOMAC DIRECT | 1 | Oct-03 | | | | X | | | |
| HARPER RUN | POTOMAC DIRECT | | Jul-03 | | X | | | | | |
| HALF MILE RUN | POTOMAC DIRECT | | Mar-04 | | | X | | | | |
| KATES RUN | POTOMAC DIRECT | | Jun-04 | | | X | | | | |
| OPEQUON CREEK | POTOMAC DIRECT | 2 | Jul-04 | | | X | | | | |
| RATTLESNAKE RUN | POTOMAC DIRECT | 2 | Sep-03 | | | | X | | | |
| RATTLESNAKE RUN | POTOMAC DIRECT | 1 | Apr-03 | | | | X | | | |
| RATTLESNAKE RUN | POTOMAC DIRECT | 1 | Apr-03 | | | | X | | | |
| ROCKY MARSH RUN | POTOMAC DIRECT | 1 | Oct-03 | | | | X | | | |
| ROCKY MARSH RUN | POTOMAC DIRECT | 2 | Apr-03 | | | | X | | | |
| SLEEPY CREEK | POTOMAC DIRECT | 1 | May-04 | | | | X | | | |
| SLEEPY CREEK | POTOMAC DIRECT | 2 | Jun-04 | | | | X | | | |
| SLEEPY CREEK | POTOMAC DIRECT | 3 | Jul-04 | | | X | | | | |
| SLEEPY CREEK | POTOMAC DIRECT | 3 | Nov-03 | | | X | | | | |
| SLEEPY CREEK | POTOMAC DIRECT | 2 | Aug-03 | | X | | | | THUNDER STORMS | |
| SLEEPY CREEK | POTOMAC DIRECT | 1 | Jul-03 | | | X | | | | |
| SLEEPY CREEK | POTOMAC DIRECT | | Sep-04 | | X | | | | | |
| TOWN RUN | POTOMAC DIRECT | | Oct-03 | | | X | | | | |
| TUSCARORA CREEK | POTOMAC DIRECT | 1 | Jul-04 | | | | X | | | |
| TUSCARORA CREEK | POTOMAC DIRECT | 2 | Apr-04 | | | | X | | | HEAVY RAIN |
| ANDERSON RUN | SOUTH BRANCH | | | | | X | | | | |
| BIG RUN | SOUTH BRANCH | 1 | Jun-04 | | X | | | | SCATTERED SHOWERS | |
| BIG RUN | SOUTH BRANCH | 2 | Aug-04 | | X | | | | | |
| BIG RUN | SOUTH BRANCH | 1 | Apr-04 | | | X | | | | |
| CLIFFORD HOLLOW | SOUTH BRANCH | | | | | | X | | | |
| DUMPLING RUN | SOUTH BRANCH | | | | | X | | | | |
| FORT RUN | SOUTH BRANCH | | | | | | X | | | |
| NORTH FORK | SOUTH BRANCH | | Oct-04 | | | X | | | | |
| SOUTH BRANCH | SOUTH BRANCH | | Oct-04 | | | X | | | | |
| SOUTH BRANCH | SOUTH BRANCH | | Oct-04 | | | X | | | SCATTERED SHOWERS | |
| SOUTH BRANCH | SOUTH BRANCH | | Oct-04 | | | X | | | LIGHT RAIN | |
| SOUTH MILL CREEK | SOUTH BRANCH | | Jul-03 | | | X | | | | |
| SPRING RUN | SOUTH BRANCH | 1 | Jul-03 | 40.30 | | | X | | | SCATTERED SHOWERS |
| SPRING RUN | SOUTH BRANCH | 2 | Jul-03 | 40.10 | | | X | | | SCATTERED SHOWERS |
| SPRING RUN | SOUTH BRANCH | 3 | Jul-03 | | | | X | | | SCATTERED SHOWERS |
| SPRING RUN | SOUTH BRANCH | 4 | Jul-03 | 22.90 | | X | | | STEADY LIGHT RAIN | |
| SOUTH FORK | SOUTH BRANCH | | Oct-04 | | | X | | | | |
| TOMBS HOLLOW RUN | SOUTH BRANCH | | | | | X | | | | |

| STREAM | BASIN | STATION | DATE | VELOCITY | | | | | WEATHER | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | DISCHARGE | LOW | NORMAL | HIGH | NO FLOW | CURRENT WEATHER | PAST 48-HOURS |
| WALNUT BOTTOM | SOUTH BRANCH | 1 | | | X | | | | | |
| WALNUT BOTTOM | SOUTH BRANCH | 2 | | | | X | | | | |
| BULLSKIN RUN | SHENANDOAH | 1 | Nov-03 | | | | X | | | |
| BULLSKIN RUN | SHENANDOAH | 2 | Oct-03 | | | | X | | | |
| BULLSKIN RUN | SHENANDOAH | 3 | Nov-03 | | | | X | | | |
| EVITTS RUN | SHENANDOAH | 1 | May-03 | | | | X | | | |
| EVITTS RUN | SHENANDOAH | 1 | Oct-03 | | | | | | | |
| EVITTS RUN | SHENANDOAH | 2 | Oct-03 | | | | X | | | |
| EVITTS RUN | SHENANDOAH | 3 | Oct-03 | | | | | | | |
| EVITTS RUN | SHENANDOAH | 4 | Apr-03 | | | | X | | | |
| EVITTS RUN | SHENANDOAH | 4 | Oct-03 | | | | X | | | |
| HUBBARDS RUN | SHENANDOAH | 1 | Nov-03 | | | | X | | | |
| HUBBARDS RUN | SHENANDOAH | 2 | Apr-03 | | | X | | | | |
| BRADSHAW CREEK | TUG FORK | 2 | Mar-03 | | | X | | | | |
| BRADSHAW CREEK | TUG FORK | 1 | Mar-03 | | | X | | | | |
| DRY FORK | TUG FORK | | Apr-03 | | | X | | | | |
| ELKHORN CREEK | TUG FORK | | Mar-03 | | | | X | | | |
| TWIN BRANCH | TUG FORK | | Oct-03 | | | X | | | | |
| LEADING CREEK | TYGART VALLEY | | | | | | X | | | |
| LF FILES CREEK | TYGART VALLEY | | Jun-04 | | | X | | | | |
| LF FILES CREEK | TYGART VALLEY | | May-04 | | | X | | | | |
| LF FILES CREEK | TYGART VALLEY | | May-03 | | | X | | | | |
| LB/LF SANDY CREEK | TYGART VALLEY | 1 | Jun-04 | | | X | | | | |
| LB/LF SANDY CREEK | TYGART VALLEY | 1 | May-03 | | | X | | | | |
| LB/LF SANDY CREEK | TYGART VALLEY | 2 | Aug-04 | | | X | | | | |
| LF SANDY CREEK | TYGART VALLEY | | Jul-03 | | | | X | | | |
| LF SANDY CREEK | TYGART VALLEY | | May-03 | | | | | | | |
| MILLSTONE CREEK | TYGART VALLEY | | May-04 | | | X | | | | |
| MILLSTONE CREEK | TYGART VALLEY | | May-03 | | | | X | | SCATTERED SHOWERS | |
| RB/LF SANDY CREEK | TYGART VALLEY | 2 | Jun-04 | | | X | | | | |
| RB/LF SANDY CREEK | TYGART VALLEY | 2 | Jul-03 | | | X | | | | |
| RB/LF SANDY CREEK | TYGART VALLEY | 2 | Jul-03 | | | | | | | |
| RB/LF SANDY CREEK | TYGART VALLEY | 1 | Aug-04 | | | X | | | | |
| UNT MIDDLE FORK RIVER | TYGART VALLEY | | Jul-04 | | | | X | | SCATTERED SHOWERS | HEAVY DOWNPOURS |
| BOOTH CREEK | WEST FORK | | Jul-03 | | | | X | | | HEAVY RAIN |
| BRUSHY FORK | WEST FORK | | Jul-03 | 15.70 | | | X | | | |
| ELK CREEK | WEST FORK | | Mar-04 | 24.40 | | | X | | SCATTERED SHOWERS | LOCAL HEAVY RAIN |
| HELENS RUN | WEST FORK | | Aug-04 | | X | | | | | |
| ISAACS CREEK | WEST FORK | | Jul-03 | 65.40 | | | X | | | |
| KINCHELOE CREEK | WEST FORK | | Jul-03 | 16.30 | | | X | | | |
| SALEM FORK | WEST FORK | | May-03 | | X | | | | | |
| SKIN CREEK | WEST FORK | | Apr-03 | | | X | | | | |

| STREAM | BASIN | STATION | DATE | VELOCITY | | | | | WEATHER | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | DISCHARGE | LOW | NORMAL | HIGH | NO FLOW | CURRENT WEATHER | PAST 48-HOURS |
| TENMILE CREEK | WEST FORK | | Sep-03 | | X | | | | | |
| TWO LICK CREEK | WEST FORK | | Jul-03 | 21.90 | | X | | | | |
| UNT LAMBERTS RUN | WEST FORK | | May-03 | | X | | | | | |
| RHINE CREEK | YOUGHIOGHENY | | Apr-03 | | | X | | | | |
| TOTALS | | | | | 46 | 99 | 62 | | | |

**Appendix 7**. Land use assessment

| STREAM | BASIN | STATION | SUB-URBAN, URBAN & INDUSTRIAL | | | | | RECREATION | | | AGRICULTURE | | | RESOURCE EXTRACTION | | | | | TRASH | | | TOTAL | IMPACT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SINGLE | SUBURBAN | URBAN | ROADS | BRIDGES ETC | TRAILS | PARKS | OTHER USES | PASTURE | CROP | FEEDLOTS | CONSTRUCTION | LOGGING | OIL/GAS | ACTIVE MINES | ABD MINES | LANDFILL | TRASH | OTHER | | |
| BAKERS RUN | CACAPON | 4 | 2 | | | 3 | 1 | | | | 2 | | | | | | | | | | | 8 | MODERATE |
| TROUT RUN | CACAPON | 1 | | | | | | | | | 1 | | 2 | | | | | | | | | 3 | SLIGHT |
| BEAVER CREEK | CHEAT | 3-1 | | | | 1 | | | | 1 | | | | | 2 | | | | | | | 4 | MODERATE |
| BEAVER CREEK | CHEAT | 3-2 | | | | 3 | | | | | | | | | | | | | | 1 | 3 | 7 | MODERATE |
| BEAVER CREEK | CHEAT | 3-3 | | | | 2 | | | | | | | | | | | | | | | | 2 | SLIGHT |
| BEAVER CREEK | CHEAT | 3-4 | 1 | | | 1 | | | | 1 | 3 | 1 | | | 3 | | 1 | 1 | | | | 12 | HIGH |
| BEAVER CREEK | CHEAT | 3-5 | 1 | | | 3 | | | | 1 | 1 | | | | 1 | | 2 | 2 | | | | 11 | HIGH |
| BEAVER CREEK | CHEAT | 3-6 | 1 | | | 1 | | | | | | | | | 1 | | 2 | 2 | | | | 7 | MODERATE |
| BEAVER CREEK | CHEAT | 3-7 | 1 | | | 1 | | | | | | | | | 1 | | 1 | 1 | | | 1 | 6 | MODERATE |
| BEAVER CREEK | CHEAT | 3-1 | | | | 1 | | | | 1 | | | | | 2 | | | | | | | 4 | MODERATE |
| BEAVER CREEK | CHEAT | 3-5 | | | | 2 | | | | | | | | | | | | 1 | | 2 | 1 | 6 | MODERATE |
| BEAVER CREEK | CHEAT | 3-10 | | 1 | | 1 | | | | | | | | | 1 | | | 2 | | | 1 | 6 | MODERATE |
| BEAVER CREEK | CHEAT | 3-9 | | 1 | | 1 | | | | | | | | | 3 | | | | | | 1 | 6 | MODERATE |
| BEAVER CREEK | CHEAT | 3-8 | | 1 | | 1 | | | | | | | | | 3 | | | 3 | | | | 8 | MODERATE |
| BUFFALO RUN | CHEAT | 1-2 | 1 | | | 1 | | | | 3 | | | | | | | | | | | | 5 | MODERATE |
| BUFFALO RUN | CHEAT | 1-1 | 1 | | | 1 | | | | 2 | 1 | | | 1 | 1 | | | 1 | | | | 8 | HIGH |
| BUFFALO RUN | CHEAT | 1-2 | 1 | | | 2 | | | | 2 | 1 | | | 1 | 1 | | | 1 | | | | 9 | MODERATE |
| BUFFALO RUN | CHEAT | 1-3 | 1 | | | 2 | | | | 1 | 1 | 1 | | | 1 | | | 1 | | 1 | | 9 | MODERATE |
| BUFFALO RUN | CHEAT | 1-4 | 3 | 1 | | 3 | | | | 1 | 1 | 1 | | 3 | 2 | | | 1 | | 1 | | 17 | HIGH |
| BUFFALO RUN | CHEAT | 1-5 | 3 | | | 1 | | | | 1 | 1 | | | 1 | 2 | | | 1 | | 1 | | 11 | HIGH |
| BUFFALO RUN | CHEAT | 1-6 | 1 | | | 3 | | | | 1 | 1 | 1 | | 1 | 1 | | | 2 | | | | 11 | HIGH |
| BUFFALO RUN | CHEAT | 1-7 | 2 | | | 3 | | | | 1 | 1 | 1 | | 1 | 1 | | | 1 | | 1 | | 12 | HIGH |
| BUFFALO RUN | CHEAT | | 2 | | | 3 | | | | 1 | | | | | 1 | | | 3 | | | | 10 | MODERATE |
| BUFFALO RUN | CHEAT | 1-1 | | 1 | | 2 | | | | 3 | 1 | | | | 2 | | | 1 | | 1 | | 11 | HIGH |
| BUFFALO RUN | CHEAT | 1-3 | | 2 | | 2 | | | | 3 | 1 | 1 | | 1 | 1 | | | 3 | | | | 14 | HIGH |
| BUFFALO RUN | CHEAT | 1-5 | | 3 | | 2 | | | | 2 | 1 | 1 | | 1 | 2 | | | 3 | | 1 | | 16 | HIGH |
| BUFFALO RUN | CHEAT | 1-6 | | 1 | | 2 | | | | 3 | 1 | 1 | | 1 | 1 | | | 3 | | 1 | | 14 | HIGH |
| BUFFALO RUN | CHEAT | 1-7 | | 2 | | 2 | | | | 3 | 1 | 1 | | 1 | 1 | | | 3 | | 1 | | 15 | HIGH |
| GLADY FORK | CHEAT | | | | | 1 | | | | 1 | | | | | 1 | | | | | | | 3 | SLIGHT |
| GLADE RUN | CHEAT | 4-1 | 1 | | | | | | | | 1 | 2 | | | | | | | | 2 | | 6 | MODERATE |
| GLADE RUN | CHEAT | 4-2 | 1 | | | | | | | | | | | | | | | 2 | | 3 | | 6 | MODERATE |
| GLADE RUN | CHEAT | 4-3 | 2 | | | | | | | | | | | | | | | 2 | | 2 | | 6 | MODERATE |
| GLADE RUN | CHEAT | 4-2 | 1 | | | 1 | | | | | 1 | 1 | | | | | | | | 2 | | 6 | MODERATE |
| GLADE RUN | CHEAT | 4-3 | | 2 | | 1 | | | | | 1 | 1 | | | | | | | | 3 | | 8 | MODERATE |
| GLADE RUN | CHEAT | 4-4 | | 3 | | 1 | | | | | 2 | | | | | | | | | 2 | | 8 | MODERATE |
| MUDDY CREEK | CHEAT | 1 | | | | 2 | 1 | 1 | | | 2 | | | | 2 | | | 1 | | | | 9 | MODERATE |
| MUDDY CREEK | CHEAT | 1 | | | | 1 | 1 | | | | 2 | | | | 2 | | | 2 | | | | 8 | MODERATE |
| NF GREENS RUN | CHEAT | 2-1 | | | | 1 | | | | 1 | | 1 | | 1 | | | | 2 | | | | 6 | MODERATE |
| NF GREENS RUN | CHEAT | 2-2 | 1 | 1 | | 1 | | | | | 2 | 1 | | 1 | | | | 2 | | | | 9 | HIGH |
| NF GREENS RUN | CHEAT | 2-3 | 1 | 1 | | 1 | | | | 1 | | | | | 1 | | | 1 | | | | 6 | MODERATE |
| NF GREENS RUN | CHEAT | 2-4 | 2 | 1 | | 1 | | | | 1 | 2 | 1 | | | 1 | | | 1 | | | | 10 | HIGH |

| STREAM | BASIN | STATION | SUB-URBAN, URBAN & INDUSTRIAL | | | | | RECREATION | | | AGRICULTURE | | | RESOURCE EXTRACTION | | | | | TRASH | | | TOTAL | IMPACT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SINGLE | SUBURBAN | URBAN | ROADS | BRIDGES ETC | TRAILS | PARKS | OTHER USES | PASTURE | CROP | FEEDLOTS | CONSTRUCTION | LOGGING | OIL/GAS | ACTIVE MINES | ABD MINES | LANDFILL | TRASH | OTHER | | |
| NF GREENS RUN | CHEAT | 2-1 | | 3 | | 2 | | | | | | | | | 2 | | | 3 | | | | 10 | MODERATE |
| NF GREENS RUN | CHEAT | 2-2 | | 3 | | 2 | | | | | | | | | 2 | | | 2 | | | | 9 | MODERATE |
| NF GREENS RUN | CHEAT | 2-4 | | | | 3 | | | | | | | | | 3 | | | | | | 3 | 9 | MODERATE |
| ROARING CREEK | CHEAT | 1 | | | | 3 | 3 | | | | 1 | | | | 1 | | | | | | | 8 | MODERATE |
| ROARING CREEK | CHEAT | 2 | | | | 1 | 3 | | | | | | | | 1 | | | | | | | 5 | MODERATE |
| WATKINS RUN | CHEAT | 1 | | | | | | | | | 1 | | | | | | | | | | | 1 | SLIGHT |
| WATKINS RUN | CHEAT | 2 | | | | | | | | | 1 | | | | | | | | | | | 1 | SLIGHT |
| CLEAR FORK | COAL | | 2 | | | 2 | | | | | | | | | 2 | | | 2 | | | | 8 | HIGH |
| BIG SPRING FORK | ELK | 1 | 2 | | | | | | | 1 | 1 | | | 1 | 2 | | | | | | | 7 | MODERATE |
| CAMP CREEK | ELK | 1 | 1 | | | | | | | | 1 | 1 | | | | 1 | | | | 2 | | 6 | MODERATE |
| OLD FIELD FORK | ELK | 1 | | | | | | | | 3 | 2 | | | | 2 | | | | | | | 7 | MODERATE |
| ELK RIVER | ELK | 1 | 1 | | | | | | | | 1 | | | 2 | 2 | | | | | | | 6 | MODERATE |
| ELK RIVER | ELK | 1 | 1 | | | | | | | | 1 | 1 | | | 2 | | | | | | | 5 | MODERATE |
| ELKLICK RUN | GAULEY | | | | | | | | | 2 | | | | | 1 | | | | | | | 3 | MODERATE |
| RICH CREEK | GAULEY | | 2 | | | | | | | 1 | | | | | | | | | | | | 3 | MODERATE |
| UPPER GLADE RUN | GAULEY | 1 | | | | 3 | | | | 3 | | | | | 1 | | | | | | 2 | 9 | MODERATE |
| UPPER GLADE RUN | GAULEY | 2 | | | | 3 | 1 | | | 3 | | | | | 1 | | | | | | 2 | 10 | HIGH |
| UPPER GLADE RUN | GAULEY | 3 | | | | 1 | 3 | | | 3 | | | | | 1 | | | | | | | 8 | MODERATE |
| HARTS RUN | GREENBRIER | | | | | 3 | 1 | | 2 | | | | | | | | | | | | | 6 | MODERATE |
| GREENBRIER RIVER | GREENBRIER | | 1 | | | 1 | | | | 3 | 3 | | | | 1 | | | | | 3 | | 12 | HIGH |
| SECOND CREEK | GREENBRIER | 1 | 1 | | | 2 | | | 1 | 1 | 2 | 1 | | 1 | 2 | | | | | | | 11 | HIGH |
| SECOND CREEK | GREENBRIER | 2 | | | | 2 | | | 1 | 2 | 2 | | | | 1 | | | | | | | 8 | MODERATE |
| BARKERS CREEK | GUYANDOTTE | | 3 | | | 3 | | | | | | | | | 2 | | | | | 1 | | 9 | HIGH |
| CABIN CREEK | GUYANDOTTE | | 2 | | | 2 | | 3 | 2 | | 1 | 1 | | 1 | | 1 | | 1 | | | | 14 | HIGH |
| DEVILS FORK | GUYANDOTTE | | 1 | | | | | | | 2 | | | | | | 1 | | | | 1 | | 5 | MODERATE |
| SLAB FORK | GUYANDOTTE | 1 | 3 | | | | 1 | | | | | | | 2 | 2 | 1 | | 2 | | | | 11 | HIGH |
| SLAB FORK | GUYANDOTTE | 1 | 3 | | | 3 | 1 | | | | | | | | 3 | | | 2 | | | | 12 | HIGH |
| ASH BRANCH | KANAWHA | 7 | 1 | | | 1 | | | | 1 | | | | | 2 | 1 | | 2 | | 1 | | 9 | MODERATE |
| FIVEMILE FORK | KANAWHA | 6 | | | | 3 | | | | 1 | | | | | 1 | 1 | | 3 | 3 | 1 | | 13 | HIGH |
| FIVEMILE FORK | KANAWHA | 5 | | | | 2 | | | | 1 | | | | | 1 | 1 | | 3 | 3 | 1 | | 12 | HIGH |
| FROZEN BRANCH | KANAWHA | 4 | 2 | | | | | | | | | | | 1 | 1 | 1 | | 3 | 3 | | | 11 | HIGH |
| GOOSE HOLLOW | KANAWHA | 3 | 2 | | | 3 | | | | | | | | | 2 | 2 | | 3 | 3 | 1 | | 16 | HIGH |
| GOOSE HOLLOW | KANAWHA | 2 | 2 | | | 1 | | | | | 1 | | | | 1 | 2 | | 3 | 3 | | | 13 | HIGH |
| HICKS HOLLOW | KANAWHA | 1 | 3 | | | 2 | | | | | | | | | 1 | 2 | | 3 | | 2 | | 13 | HIGH |
| HORSEMILL BRANCH | KANAWHA | 7 | | | | 1 | | | | 1 | 1 | | | | 1 | 1 | | | | 1 | | 6 | MODERATE |
| HURRICANE FORK | KANAWHA | | 1 | | | 2 | | | | 1 | | | | | 3 | 1 | | | | | | 8 | MODERATE |
| KELLYS CREEK | KANAWHA | | 2 | 2 | | 1 | 2 | | | | 2 | 1 | | | 1 | 1 | | | | | | 12 | HIGH |
| KELLYS CREEK | KANAWHA | | 1 | | | 2 | 3 | 1 | | | | | | 3 | 1 | | | | | | | 11 | HIGH |
| MANILA CREEK | KANAWHA | | | | | 3 | | | | | | | | | 1 | 1 | | 2 | | 1 | | 8 | HIGH |
| MANILA CREEK | KANAWHA | | | | | | 2 | | | | | | | | 1 | | | 1 | | | | 4 | MODERATE |
| POCATALICO RIVER | KANAWHA | 15 | | | | 1 | | | | 1 | | | | | | | | 1 | | | | 3 | SLIGHT |
| TRACE FORK | KANAWHA | 7 | 1 | | | 1 | | | | 1 | | | | | 1 | 1 | | 3 | | | | 8 | MODERATE |

| STREAM | BASIN | STATION | SUB-URBAN, URBAN & INDUSTRIAL | | | | | RECREATION | | | AGRICULTURE | | | RESOURCE EXTRACTION | | | | | TRASH | | | TOTAL | IMPACT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SINGLE | SUBURBAN | URBAN | ROADS | BRIDGES ETC | TRAILS | PARKS | OTHER USES | PASTURE | CROP | FEEDLOTS | CONSTRUCTION | LOGGING | OIL/GAS | ACTIVE MINES | ABD MINES | LANDFILL | TRASH | OTHER | | |
| WILLIS BRANCH | KANAWHA | | 1 | | | 1 | | | | | | | | | 2 | | | | | | | 4 | MODERATE |
| CEDAR CREEK | LITTLE KANAWHA | | | | | 1 | | 1 | | | 2 | | | | | 2 | | 1 | | | | 7 | MODERATE |
| CEDAR CREEK | LITTLE KANAWHA | | | | | 2 | | 1 | | | 2 | | | | 1 | 1 | | 1 | | | | 8 | MODERATE |
| ELLIS CREEK | LITTLE KANAWHA | | | | | 2 | | | | | 3 | | | | | 1 | | 1 | | 1 | | 8 | MODERATE |
| LITTLE KANAWHA RIVER | LITTLE KANAWHA | | 1 | | | 2 | | | | 1 | 3 | 1 | | | 2 | 2 | | 1 | | | | 13 | HIGH |
| BRUSH CREEK | NEW | | 1 | | | 1 | | | | 1 | | | | 2 | | | | 2 | | | | 7 | MODERATE |
| BRUSH CREEK | NEW | | | | | 3 | 2 | | | 2 | 1 | | | 2 | | | | | | | | 10 | HIGH |
| DROOPING LICK CREEK | NEW | 2 | 1 | | | 2 | 3 | | | | 1 | | | | | | | | | | | 7 | MODERATE |
| HANS CREEK | NEW | 1 | | | 1 | 3 | 3 | | | 3 | 1 | | | | | | | | | 1 | | 12 | HIGH |
| INDIAN CREEK | NEW | | 2 | | | 3 | | | | 1 | 1 | | | | 1 | | | | | 1 | | 9 | MODERATE |
| LAUREL CREEK | NEW | | 1 | | | 1 | | | | | 3 | 3 | 1 | 1 | 1 | | | | | | | 11 | HIGH |
| WOLF CREEK | NEW | | 1 | | | 2 | | 1 | | 1 | 2 | 2 | | 1 | 1 | | | | | | | 11 | HIGH |
| LITTLE MILL CREEK | MIDDLE OHIO | | | | | 2 | 2 | | | | 2 | | | | 2 | | | | | 1 | 2 | 11 | HIGH |
| STEWARTS RUN | MIDDLE OHIO | | | | | 1 | | | | | 2 | | | | | 2 | | | | | | 5 | MODERATE |
| UNT HUGHES RIVER | MIDDLE OHIO | | | | | 2 | 1 | | | | | | | 3 | | | | | | | | 6 | MODERATE |
| TOMLINSON RUN | UPPER OHIO | | 1 | | | 1 | 2 | 2 | | 2 | 1 | | | | | | | | | | | 9 | HIGH |
| BACK CREEK | POTOMAC DIRECT | 3 | 2 | | | | 2 | | | | 2 | 2 | | 3 | | | | | | | | 11 | HIGH |
| ELK RUN | POTOMAC DIRECT | 1 | 1 | | | 1 | | | 1 | 1 | 1 | 1 | | | | | | | | | 1 | 7 | MODERATE |
| HARPER RUN | POTOMAC DIRECT | | 1 | | | | | 3 | | 3 | 1 | | | 3 | | | | | | | | 11 | HIGH |
| HALF MILE RUN | POTOMAC DIRECT | | 2 | | | | | | | | | | | | 2 | | | | | 2 | | 6 | MODERATE |
| KATES RUN | POTOMAC DIRECT | | 1 | | | | | | | | | | | | | | | | 3 | | | 4 | SLIGHT |
| OPEQUON CREEK | POTOMAC DIRECT | 2 | 1 | 2 | 2 | 1 | | | | | 3 | 1 | | | | | | | | | | 10 | HIGH |
| OPEQUON CREEK | POTOMAC DIRECT | 1 | 2 | 3 | | | 3 | | | | 3 | | | 1 | | | | | | | | 12 | HIGH |
| RATTLESNAKE RUN | POTOMAC DIRECT | 2 | 1 | 1 | | 2 | | | | | 1 | 1 | | | | | | | | | | 6 | MODERATE |
| RATTLESNAKE RUN | POTOMAC DIRECT | 1 | 1 | 1 | | 1 | | | | 2 | 1 | | | | | | | | | | | 6 | MODERATE |
| SLEEPY CREEK | POTOMAC DIRECT | 1 | 2 | 1 | | 1 | | | | | 1 | 1 | | | | | | | | | | 6 | MODERATE |
| SLEEPY CREEK | POTOMAC DIRECT | 2 | 2 | 1 | | 3 | | | | 2 | | | | | 2 | | | | | | | 10 | HIGH |
| SLEEPY CREEK | POTOMAC DIRECT | 3 | 1 | | | | | | | 1 | | | | | 1 | | | | | | | 3 | SLIGHT |
| SLEEPY CREEK | POTOMAC DIRECT | 3 | 2 | 2 | | | | 1 | | | | | | 1 | | | | | | | | 6 | MODERATE |
| SLEEPY CREEK | POTOMAC DIRECT | 1 | 2 | | | | | | | | 1 | 1 | | 2 | | | | | | | | 6 | MODERATE |
| SLEEPY CREEK | POTOMAC DIRECT | | 2 | | | 1 | | | | | 1 | 1 | | | | | | | | | | 5 | MODERATE |
| TUSCARORA CREEK | POTOMAC DIRECT | 1 | 2 | | | 1 | | | | 3 | 2 | 2 | | | | | | | | | | 10 | HIGH |
| TUSCARORA CREEK | POTOMAC DIRECT | 2 | 2 | 3 | | 3 | 3 | | | 3 | 1 | | | 3 | | | | | | | | 18 | HIGH |
| ANDERSON RUN | SOUTH BRANCH | | | | | | | | | | 3 | | | | | | | | | | | 3 | SLIGHT |
| BIG RUN | SOUTH BRANCH | 1 | | | | | | 1 | | 2 | | | | | | | | | | | | 3 | SLIGHT |
| BIG RUN | SOUTH BRANCH | 2 | | | | | | 1 | | | 1 | | | | 1 | | | | | | | 3 | SLIGHT |
| BIG RUN | SOUTH BRANCH | 1 | | | | | | 1 | | | 2 | | | | | | | | | | | 3 | SLIGHT |
| FORT RUN | SOUTH BRANCH | | | | | | | | | | | | | | | | | | | 3 | | 3 | SLIGHT |
| NORTH FORK | SOUTH BRANCH | | 2 | | | 1 | | | | 2 | 1 | 1 | | 1 | 2 | | | | | | | 10 | MODERATE |
| SOUTH BRANCH | SOUTH BRANCH | | 2 | | | 1 | | | | 3 | 2 | 3 | | | 2 | | | | | | | 13 | HIGH |
| SOUTH BRANCH | SOUTH BRANCH | | 2 | | | 2 | | | | 1 | 2 | 2 | 1 | 1 | 2 | | | | | | | 13 | HIGH |
| SOUTH BRANCH | SOUTH BRANCH | | 2 | | | 2 | | | | 3 | 2 | 2 | | | 2 | | | | | | | 13 | HIGH |

| STREAM | BASIN | STATION | SUB-URBAN, URBAN & INDUSTRIAL | | | | | RECREATION | | | AGRICULTURE | | | RESOURCE EXTRACTION | | | | | TRASH | | | TOTAL | IMPACT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SINGLE | SUBURBAN | URBAN | ROADS | BRIDGES ETC | TRAILS | PARKS | OTHER USES | PASTURE | CROP | FEEDLOTS | CONSTRUCTION | LOGGING | OIL/GAS | ACTIVE MINES | ABD MINES | LANDFILL | TRASH | OTHER | | |
| SOUTH MILL CREEK | SOUTH BRANCH | | | | | 2 | | | | | 3 | 1 | 1 | | | | | | | | | 7 | MODERATE |
| SPRING RUN | SOUTH BRANCH | 1 | 1 | | | 1 | | 1 | | | 1 | | 3 | | | | | | | | | 7 | MODERATE |
| SPRING RUN | SOUTH BRANCH | 2 | 2 | | | 1 | | | | | 1 | | 3 | | | | | | | | | 7 | MODERATE |
| SPRING RUN | SOUTH BRANCH | 3 | 2 | | | 1 | | | | | 1 | | 3 | | | | | | | | | 7 | MODERATE |
| SPRING RUN | SOUTH BRANCH | 4 | | | | | | 1 | | | 1 | | | | | | | | | | | 2 | SLIGHT |
| SOUTH FORK | SOUTH BRANCH | | 1 | | | 1 | 2 | | | 1 | 3 | 2 | | | 2 | | | | | | | 12 | HIGH |
| WALNUT BOTTOM | SOUTH BRANCH | 1 | | | | | | | | | 3 | | | | | | | | | | | 3 | SLIGHT |
| EVITTS RUN | SHENANDOAH | 4 | 1 | 2 | | 2 | | | | | 1 | | | | | | | | | | | 6 | MODERATE |
| HUBBARDS RUN | SHENANDOAH | 2 | 2 | 1 | | 1 | | | | | 1 | | | 2 | | | | | | | | 7 | MODERATE |
| BRADSHAW CREEK | TUG FORK | 2 | 3 | | | 3 | | | | | | | | 1 | 2 | 2 | | | | | | 11 | HIGH |
| BRADSHAW CREEK | TUG FORK | 1 | 3 | | | 3 | | | | | | | | | 3 | 3 | | | | | | 12 | HIGH |
| DRY FORK | TUG FORK | | 3 | | | 3 | | | | 2 | 1 | | | | 2 | 2 | | | | | | 13 | HIGH |
| TWIN BRANCH | TUG FORK | | 1 | | | 1 | | | 2 | | | | | | 1 | | | | | | | 5 | MODERATE |
| LF FILES CREEK | TYGART VALLEY | | | | | 1 | | 1 | | | | | | | 1 | | | | | | | 3 | MODERATE |
| LF FILES CREEK | TYGART VALLEY | | | | | 1 | | 2 | | | | | | | 2 | | | | | | | 5 | MODERATE |
| LF FILES CREEK | TYGART VALLEY | | | | | 1 | | | | 1 | | | | | 2 | | | | | | | 4 | MODERATE |
| LB/LF SANDY CREEJ | TYGART VALLEY | 1 | | | | | | | | | 1 | | | | | | | 3 | | | | 4 | SLIGHT |
| LB/LF SANDY CREEJ | TYGART VALLEY | 1 | | | | 2 | | | | | 1 | | | | | | | 3 | | | | 6 | MODERATE |
| LB/LF SANDY CREEJ | TYGART VALLEY | 2 | | | | 1 | | | | | | | | | | | | 3 | | | | 4 | SLIGHT |
| LF SANDY CREEK | TYGART VALLEY | | | | | | | | | | 2 | 1 | | | | | | 3 | | | | 6 | MODERATE |
| LF SANDY CREEK | TYGART VALLEY | | 1 | | | 1 | | | | | 2 | 2 | | | | | | 3 | | | | 9 | MODERATE |
| MILLSTONE CREEK | TYGART VALLEY | | | | | | | 1 | 1 | | | | | | 2 | | | | | | | 4 | SLIGHT |
| MILLSTONE CREEK | TYGART VALLEY | | | | | | | | 1 | 1 | | | | | 2 | | | | | | | 4 | MODERATE |
| RB/LF SANDY CREEK | TYGART VALLEY | 2 | | | | | | | | | 2 | | | | | | | 3 | | | | 5 | MODERATE |
| RB/LF SANDY CREEK | TYGART VALLEY | 2 | 1 | | | | | | | | 2 | 1 | | | | | | 2 | | | | 6 | MODERATE |
| RB/LF SANDY CREEK | TYGART VALLEY | 2 | | | | 1 | 1 | | | | 1 | | | | | | | 3 | | | | 6 | MODERATE |
| RB/LF SANDY CREEK | TYGART VALLEY | 1 | | | | 1 | | | | | | | | | | | | 3 | | | | 4 | SLIGHT |
| UNT MIDDLE FORK RIVER | TYGART VALLEY | | | | | | | | | 3 | | | | | | | | 3 | | | | 6 | MODERATE |
| BOOTH CREEK | WEST FORK | | 2 | | | 2 | 3 | | | | | | | 1 | | | | 2 | | | | 10 | HIGH |
| BRUSHY FORK | WEST FORK | | 2 | | | 1 | | | | | | | | | | | | 3 | | | | 6 | MODERATE |
| ELK CREEK | WEST FORK | | 1 | | | 1 | | | | | 2 | | | | | | | 2 | | | | 6 | MODERATE |
| HELENS RUN | WEST FORK | | 3 | | | 3 | | | | | | | | | 3 | | | | | | 3 | 12 | HIGH |
| ISAACS CREEK | WEST FORK | | 3 | | | 3 | | | | | 2 | 2 | | | | | | | | | | 10 | HIGH |
| KINCHELOE CREEK | WEST FORK | | 3 | | | 2 | | | | | 2 | | | | | 2 | | 1 | | | | 10 | HIGH |
| LAMBERTS RUN | WEST FORK | | 1 | | | 3 | | | | | | | | 1 | | 1 | | 3 | | 2 | | 11 | High |
| SALEM FORK | WEST FORK | | 1 | | | 3 | 3 | | | | 2 | | | | | | | | | | | 9 | MODERATE |
| SKIN CREEK | WEST FORK | | | | | 1 | | | | 1 | 3 | 2 | | | 2 | 1 | | | | | | 10 | HIGH |
| TENMILE CREEK | WEST FORK | | 1 | | | 2 | | | | | 3 | 1 | | | | 1 | | 1 | | | | 9 | MODERATE |
| TWO LICK CREEK | WEST FORK | | 3 | | | 2 | | | | | 2 | | | | | 2 | | | | | | 9 | MODERATE |
| UNT LAMBERTS RUN | WEST FORK | | 1 | | | 3 | | | | | | | | | | | | 3 | | | | 7 | HIGH |
| RHINE CREEK | YOUGHIOGHENY | | 1 | | | | | 2 | | | 1 | | | | | | | | | | | 4 | SLIGHT |
| | | | **2.4** | | | | | **0.7** | | | **1.2** | | | **2.0** | | | | | **0.5** | | | **6** | **MODERATE** |

**Appendix 8**. Riffle composition

| STREAM | BASIN | STATION | DATE | COMPOSITION | | | | | | | INDEX | INTEGRITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | SILT/CLAY | SAND | FINE GRAVEL | COARSE GRAVEL | COBBLE | BOULDER | BEDROCK | | |
| BAKERS RUN | CACAPON | 1 | | | | 20.0 | 20.0 | 50.0 | 10.0 | | 80.0 | SUB OPTIMAL |
| BAKERS RUN | CACAPON | 2 | | 5.0 | 20.0 | 15.0 | 15.0 | 30.0 | 15.0 | | 61.3 | MARGINAL |
| BAKERS RUN | CACAPON | 3 | | | 20.0 | | 40.0 | 30.0 | 10.0 | | 70.0 | SUB OPTIMAL |
| LONG LICK RUN | CACAPON | | | 5.0 | 10.0 | 20.0 | 20.0 | 15.0 | 30.0 | | 57.5 | MARGINAL |
| LOST RIVER | CACAPON | 1 | | | 10.0 | 40.0 | 10.0 | 10.0 | 30.0 | | 55.0 | MARGINAL |
| LOST RIVER | CACAPON | 2 | | | 10.0 | | 10.0 | 50.0 | 30.0 | | 75.0 | SUB OPTIMAL |
| SAUERKRAUT RUN | CACAPON | 1 | | | 30.0 | 10.0 | 10.0 | 20.0 | 25.0 | 5.0 | 53.8 | MARGINAL |
| SAUERKRAUT RUN | CACAPON | 2 | | | 20.0 | | 20.0 | 30.0 | 35.0 | 5.0 | 68.8 | SUB OPTIMAL |
| TROUT RUN | CACAPON | 1 | | | 20.0 | | 20.0 | 10.0 | 10.0 | 40.0 | 45.0 | POOR |
| TROUT RUN | CACAPON | 2 | | | 20.0 | 10.0 | 20.0 | 10.0 | 20.0 | 20.0 | 50.0 | MARGINAL |
| WAITES RUN | CACAPON | | | 5.0 | 5.0 | | 10.0 | 70.0 | 10.0 | | 83.8 | OPTIMAL |
| BEAVER CREEK | CHEAT | 3-1 | Aug-03 | 5.0 | 30.0 | | 10.0 | 30.0 | 15.0 | 10.0 | 55.0 | MARGINAL |
| BEAVER CREEK | CHEAT | 3-2 | Jul-03 | | 25.0 | | 15.0 | 20.0 | 20.0 | 20.0 | 52.5 | MARGINAL |
| BEAVER CREEK | CHEAT | 3-3 | Jul-03 | | 15.0 | | 15.0 | 15.0 | 30.0 | 15.0 | 48.8 | POOR |
| BEAVER CREEK | CHEAT | 3-4 | Aug-03 | 30.0 | 35.0 | | 10.0 | 15.0 | 10.0 | | 36.3 | POOR |
| BEAVER CREEK | CHEAT | 3-5 | Aug-03 | 15.0 | 15.0 | | 30.0 | 30.0 | 10.0 | | 61.3 | MARGINAL |
| BEAVER CREEK | CHEAT | 3-6 | Aug-03 | 2.0 | 18.0 | | 5.0 | 65.0 | 10.0 | | 78.3 | SUB OPTIMAL |
| BEAVER CREEK | CHEAT | 3-7 | Aug-03 | 20.0 | 25.0 | | 10.0 | 15.0 | 30.0 | | 43.8 | POOR |
| BEAVER CREEK | CHEAT | 3-1 | May-04 | 10.0 | 5.0 | | 10.0 | 25.0 | 25.0 | 25.0 | 52.5 | MARGINAL |
| BEAVER CREEK | CHEAT | 3-5 | May-04 | | 25.0 | | 5.0 | 50.0 | 10.0 | 10.0 | 67.5 | SUB OPTIMAL |
| BEAVER CREEK | CHEAT | 3-9 | May-04 | | 10.0 | 15.0 | 30.0 | 30.0 | 10.0 | 5.0 | 68.8 | SUB OPTIMAL |
| BEAVER CREEK | CHEAT | 3-8 | May-04 | 5.0 | 15.0 | | 10.0 | 20.0 | 25.0 | 25.0 | 50.0 | MARGINAL |
| BUFFALO RUN | CHEAT | 1-2 | Apr-04 | | 8.0 | | 20.0 | 62.0 | 10.0 | | 84.0 | OPTIMAL |
| BUFFALO RUN | CHEAT | 1-1 | Aug-03 | | 7.0 | | 7.0 | 86.0 | | | 93.0 | OPTIMAL |
| BUFFALO RUN | CHEAT | 1-2 | Aug-03 | | 10.0 | 10.0 | 10.0 | 30.0 | 40.0 | | 65.0 | SUB OPTIMAL |
| BUFFALO RUN | CHEAT | 1-3 | Aug-03 | | 10.0 | | 20.0 | 40.0 | 30.0 | | 72.5 | SUB OPTIMAL |
| BUFFALO RUN | CHEAT | 1-4 | Aug-03 | | 5.0 | | 15.0 | 20.0 | 20.0 | 40.0 | 52.5 | MARGINAL |
| BUFFALO RUN | CHEAT | 1-5 | Aug-03 | | 20.0 | 10.0 | 30.0 | 30.0 | 10.0 | | 67.5 | SUB OPTIMAL |
| BUFFALO RUN | CHEAT | 1-6 | Aug-03 | | 10.0 | 10.0 | 20.0 | 45.0 | 15.0 | | 75.0 | SUB OPTIMAL |
| BUFFALO RUN | CHEAT | 1-7 | Jul-03 | | 10.0 | | 20.0 | 50.0 | 15.0 | 5.0 | 76.3 | SUB OPTIMAL |
| BUFFALO RUN | CHEAT | | Oct-04 | 20.0 | 25.0 | | 10.0 | 30.0 | 10.0 | 5.0 | 50.0 | MARGINAL |
| BUFFALO RUN | CHEAT | 1-1 | May-04 | | | | 50.0 | 50.0 | | | 87.5 | OPTIMAL |
| BUFFALO RUN | CHEAT | 1-3 | May-04 | | | | 60.0 | 40.0 | | | 85.0 | OPTIMAL |
| BUFFALO RUN | CHEAT | 1-5 | May-04 | | | | 80.0 | 20.0 | | | 80.0 | OPTIMAL |
| BUFFALO RUN | CHEAT | 1-6 | May-04 | | | | 10.0 | 10.0 | 20.0 | 60.0 | 42.5 | POOR |
| BUFFALO RUN | CHEAT | 1-7 | May-04 | | | | 10.0 | 80.0 | 10.0 | | 92.5 | OPTIMAL |
| GLADY FORK | CHEAT | | Aug-04 | | 12.0 | | 30.0 | 53.0 | 5.0 | | 81.0 | OPTIMAL |
| GLADE RUN | CHEAT | 4-1 | Jul-03 | 25.0 | 25.0 | | 30.0 | 10.0 | 10.0 | | 43.8 | POOR |
| GLADE RUN | CHEAT | 4-2 | Jul-03 | 62.0 | 3.0 | | 15.0 | 10.0 | 5.0 | 5.0 | 25.8 | POOR |
| GLADE RUN | CHEAT | 4-3 | Jul-03 | 15.0 | 20.0 | 30.0 | 20.0 | 10.0 | 5.0 | | 47.5 | POOR |
| GLADE RUN | CHEAT | 4-2 | May-04 | 10.0 | 20.0 | | 30.0 | 30.0 | 10.0 | | 62.5 | MARGINAL |

| STREAM | BASIN | STATION | DATE | COMPOSITION | | | | | | | INDEX | INTEGRITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | SILT/CLAY | SAND | FINE GRAVEL | COARSE GRAVEL | COBBLE | BOULDER | BEDROCK | | |
| GLADE RUN | CHEAT | 4-3 | May-04 | 20.0 | 20.0 | | 40.0 | 15.0 | 5.0 | | 52.5 | MARGINAL |
| GLADE RUN | CHEAT | 4-4 | May-04 | | | | 10.0 | 80.0 | 10.0 | | 92.5 | OPTIMAL |
| MUDDY CREEK | CHEAT | 1 | Jun-03 | | 10.0 | | 10.0 | 40.0 | 40.0 | | 70.0 | SUB OPTIMAL |
| MUDDY CREEK | CHEAT | 1 | Jul-03 | | 10.0 | 10.0 | 30.0 | 30.0 | 20.0 | | 70.0 | SUB OPTIMAL |
| NF GREENS RUN | CHEAT | 2-1 | Jul-03 | | 10.0 | | 10.0 | 40.0 | 40.0 | | 70.0 | SUB OPTIMAL |
| NF GREENS RUN | CHEAT | 2-2 | Jul-03 | | 10.0 | 10.0 | 10.0 | 40.0 | 30.0 | | 70.0 | SUB OPTIMAL |
| NF GREENS RUN | CHEAT | 2-3 | Jul-03 | | 10.0 | | 20.0 | 20.0 | 30.0 | 20.0 | 57.5 | MARGINAL |
| NF GREENS RUN | CHEAT | 2-4 | Jul-03 | | 20.0 | | 10.0 | 30.0 | 40.0 | | 62.5 | MARGINAL |
| NF GREENS RUN | CHEAT | 2-1 | May-04 | | 5.0 | | 10.0 | 50.0 | 35.0 | | 76.3 | SUB OPTIMAL |
| NF GREENS RUN | CHEAT | 2-2 | May-04 | 10.0 | 20.0 | | 25.0 | 25.0 | 20.0 | | 58.8 | SUB OPTIMAL |
| NF GREENS RUN | CHEAT | 2-4 | May-04 | | 75.0 | | 10.0 | 10.0 | 5.0 | | 38.8 | POOR |
| ROARING CREEK | CHEAT | 1 | Jun-03 | | 10.0 | 10.0 | 20.0 | 20.0 | 40.0 | | 62.5 | MARGINAL |
| ROARING CREEK | CHEAT | 2 | Jul-03 | | 15.0 | 10.0 | 35.0 | 35.0 | 5.0 | | 72.5 | SUB OPTIMAL |
| WATKINS RUN | CHEAT | 1 | May-03 | | 5.0 | | 25.0 | 65.0 | 5.0 | | 87.5 | OPTIMAL |
| WATKINS RUN | CHEAT | 2 | Aug-04 | | 5.0 | | 20.0 | 75.0 | | | 91.3 | OPTIMAL |
| CLEAR FORK | COAL | | Apr-04 | | 5.0 | | 30.0 | 60.0 | 5.0 | | 86.3 | OPTIMAL |
| BIG SPRING FORK | ELK | 1 | Jul-04 | | | | 56.0 | 36.0 | 4.0 | | 80.0 | SUB OPTIMAL |
| CAMP CREEK | ELK | 1 | Jun-04 | | 17.8 | | 31.7 | 20.8 | 4.0 | | 51.0 | MARGINAL |
| OLD FIELD FORK | ELK | 1 | Apr-04 | | 10.8 | | 2.7 | 29.7 | 32.4 | | 50.6 | MARGINAL |
| ELK RIVER | ELK | 1 | Oct-03 | | 8.0 | 12.0 | | 78.0 | | | 86.0 | OPTIMAL |
| ELK RIVER | ELK | 1 | Oct-04 | | 0.7 | 2.7 | 13.5 | 64.3 | 16.2 | 2.7 | 84.7 | OPTIMAL |
| ELK RIVER | ELK | 2 | Aug-04 | | 5.0 | | 35.0 | 50.0 | 10.0 | | 82.5 | OPTIMAL |
| ELKLICK RUN | GAULEY | | Oct-04 | | 5.0 | | 20.0 | 60.0 | 15.0 | | 83.8 | OPTIMAL |
| RICH CREEK | GAULEY | | Mar-03 | | 8.0 | | 60.0 | 30.0 | 2.0 | | 78.0 | SUB OPTIMAL |
| UPPER GLADE RUN | GAULEY | 1 | Apr-04 | 3.5 | 8.9 | | 40.0 | 35.7 | 7.8 | 4.3 | 72.9 | SUB OPTIMAL |
| UPPER GLADE RUN | GAULEY | 2 | Jun-04 | | 25.0 | | 35.0 | 40.0 | | | 72.5 | SUB OPTIMAL |
| UPPER GLADE RUN | GAULEY | 3 | Jun-03 | | 5.0 | 20.0 | 15.0 | 35.0 | 25.0 | | 70.0 | SUB OPTIMAL |
| HARTS RUN | GREENBRIER | | Feb-04 | | 3.0 | | 37.0 | 60.0 | | | 88.5 | OPTIMAL |
| GREENBRIER RIVER | GREENBRIER | | Jul-04 | 3.0 | 9.0 | | 30.0 | 43.0 | 15.0 | | 75.3 | SUB OPTIMAL |
| SECOND CREEK | GREENBRIER | 1 | Jul-04 | 2.0 | 5.0 | | 15.0 | 48.0 | 10.0 | 20.0 | 70.5 | SUB OPTIMAL |
| SECOND CREEK | GREENBRIER | 2 | Jul-03 | | 5.0 | 20.0 | 40.0 | 30.0 | 5.0 | | 73.8 | SUB OPTIMAL |
| BARKERS CREEK | GUYANDOTTE | | May-03 | 5.0 | 10.0 | | 45.0 | 40.0 | | | 76.3 | SUB OPTIMAL |
| CABIN CREEK | GUYANDOTTE | | Jul-03 | 5.0 | 5.0 | | 15.0 | 35.0 | 40.0 | | 67.5 | SUB OPTIMAL |
| DEVILS FORK | GUYANDOTTE | | Jul-03 | 5.0 | 5.0 | 5.0 | 25.0 | 60.0 | | | 82.5 | OPTIMAL |
| GUYANDOTTE RIVER | GUYANDOTTE | | Sep-03 | | 30.0 | | 10.0 | 45.0 | 15.0 | | 67.5 | SUB OPTIMAL |
| SLAB FORK | GUYANDOTTE | 1 | Jul-03 | 5.0 | 15.0 | | 35.0 | 25.0 | 20.0 | | 65.0 | SUB OPTIMAL |
| SLAB FORK | GUYANDOTTE | 1 | Oct-04 | | 1.0 | | 50.0 | 49.0 | | | 86.8 | OPTIMAL |
| ASH BRANCH | KANAWHA | | Apr-03 | 5.0 | 20.0 | | 30.0 | 40.0 | 5.0 | | 70.0 | SUB OPTIMAL |
| HORSEMILL BRANCH | KANAWHA | | Jul-03 | | 30.0 | 10.0 | 30.0 | 10.0 | 20.0 | | 55.0 | MARGINAL |
| HURRICANE FORK | KANAWHA | | Jun-03 | | 20.0 | | 40.0 | 20.0 | 20.0 | | 65.0 | SUB OPTIMAL |
| MORRIS CREEK | KANAWHA | | Sep-04 | | 5.0 | 25.0 | 40.0 | 20.0 | 10.0 | | 68.8 | SUB OPTIMAL |
| MORRIS CREEK | KANAWHA | 15 | Nov-04 | 5.0 | 15.0 | | 10.0 | 60.0 | 10.0 | | 76.3 | SUB OPTIMAL |

| STREAM | BASIN | STATION | DATE | COMPOSITION | | | | | | | INDEX | INTEGRITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | SILT/CLAY | SAND | FINE GRAVEL | COARSE GRAVEL | COBBLE | BOULDER | BEDROCK | | |
| MORRIS CREEK | KANAWHA | 7 | Nov-04 | | 5.0 | | 25.0 | 65.0 | 5.0 | | 87.5 | OPTIMAL |
| MANILA CREEK | KANAWHA | 7 | Jul-03 | 1.0 | 10.0 | 10.0 | 25.0 | 45.0 | 9.0 | | 75.8 | SUB OPTIMAL |
| MANILA CREEK | KANAWHA | 6 | Apr-03 | 1.4 | 3.4 | | 27.2 | 54.4 | 13.6 | | 82.5 | OPTIMAL |
| MANILA CREEK | KANAWHA | 5 | Apr-03 | 1.9 | 12.9 | 20.0 | 34.8 | 25.8 | 4.5 | | 67.4 | SUB OPTIMAL |
| MANILA CREEK | KANAWHA | 4 | Jul-03 | 1.0 | 4.8 | 14.4 | 20.0 | 37.7 | 1.0 | | 61.6 | MARGINAL |
| MANILA CREEK | KANAWHA | 3 | Jul-03 | 2.0 | 5.0 | 20.0 | 50.0 | 21.0 | 2.0 | | 70.8 | SUB OPTIMAL |
| MANILA CREEK | KANAWHA | 2 | Jul-03 | 2.0 | 6.0 | | 40.0 | 40.0 | 12.0 | | 77.5 | SUB OPTIMAL |
| MANILA CREEK | KANAWHA | 1 | Jul-03 | 2.0 | 20.0 | | 30.0 | 45.0 | 3.0 | | 74.0 | SUB OPTIMAL |
| MANILA CREEK | KANAWHA | 7 | Apr-03 | 1.0 | 10.0 | | 35.0 | 45.0 | 9.0 | | 78.3 | SUB OPTIMAL |
| MANILA CREEK | KANAWHA | | Oct-03 | | 18.0 | 20.0 | 25.0 | 30.0 | 7.0 | | 66.8 | SUB OPTIMAL |
| TRACE FORK | KANAWHA | | Aug-03 | 10.0 | 5.0 | 30.0 | 10.0 | 30.0 | 15.0 | | 61.3 | MARGINAL |
| WILLIS BRANCH | KANAWHA | | Jul-03 | | 10.0 | 10.0 | 35.0 | 45.0 | | | 78.8 | SUB OPTIMAL |
| CEDAR CREEK | LITTLE KANAWHA | | Sep-03 | 5.0 | 15.0 | | 45.0 | 25.0 | 10.0 | | 67.5 | SUB OPTIMAL |
| CEDAR CREEK | LITTLE KANAWHA | | Apr-03 | 10.0 | 20.0 | 30.0 | 20.0 | 10.0 | 10.0 | | 50.0 | MARGINAL |
| ELLIS CREEK | LITTLE KANAWHA | | Sep-03 | | 35.0 | | 60.0 | 5.0 | | | 58.8 | MARGINAL |
| LITTLE KANAWHA RIVER | LITTLE KANAWHA | | Aug-03 | 40.0 | 20.0 | | 30.0 | 10.0 | | | 37.5 | POOR |
| ABRAMS CREEK | NORTH BRANCH | | | 10.0 | 60.0 | | 10.0 | 20.0 | | | 42.5 | POOR |
| ELKLICK RUN | NORTH BRANCH | | | 30.0 | 5.0 | | 30.0 | 30.0 | 5.0 | | 56.3 | MARGINAL |
| NF PATTERSON CREEK | NORTH BRANCH | 1 | | | 10.0 | | 38.0 | 35.0 | 10.0 | 10.0 | 73.5 | SUB OPTIMAL |
| NF PATTERSON CREEK | NORTH BRANCH | 2 | | | | | 80.0 | 20.0 | | | 80.0 | SUB OPTIMAL |
| PATTERSON CREEK | NORTH BRANCH | | | | | | 10.0 | 20.0 | 10.0 | 60.0 | 47.5 | POOR |
| BRUSH CREEK | NEW | 2 | Oct-04 | | 5.0 | | 5.0 | 10.0 | 75.0 | | 52.5 | MARGINAL |
| BRUSH CREEK | NEW | 1 | Apr-03 | | 5.0 | | 5.0 | 80.0 | 10.0 | | 90.0 | OPTIMAL |
| DROOPING LICK CREEK | NEW | | May-04 | 3.0 | 15.0 | 3.0 | 30.0 | 40.0 | 2.0 | 7.0 | 70.5 | SUB OPTIMAL |
| HANS CREEK | NEW | | Oct-03 | 5.0 | 25.0 | | 30.0 | 40.0 | | | 68.8 | SUB OPTIMAL |
| INDIAN CREEK | NEW | | Sep-03 | 5.0 | 25.0 | | 45.0 | 25.0 | | | 65.0 | SUB OPTIMAL |
| LAUREL CREEK | NEW | | Oct-03 | | 30.0 | | 10.0 | 40.0 | 20.0 | | 65.0 | SUB OPTIMAL |
| WOLF CREEK | NEW | | May-03 | | 5.0 | 10.0 | | 55.0 | 30.0 | | 76.3 | SUB OPTIMAL |
| STEWARTS RUN | MIDDLE OHIO | | Jul-04 | | 20.0 | | 30.0 | 30.0 | | 20.0 | 62.5 | MARGINAL |
| UNT HUGHES RIVER | MIDDLE OHIO | | Apr-03 | | 5.0 | 10.0 | 25.0 | 50.0 | 10.0 | | 80.0 | OPTIMAL |
| TOMLINSON RUN | UPPER OHIO | | Mar-03 | 10.0 | 10.0 | | 40.0 | 30.0 | 10.0 | | 67.5 | SUB OPTIMAL |
| BACK CREEK | POTOMAC DIRECT | 3 | Jul-04 | 20.0 | 15.0 | | 60.0 | 5.0 | | | 53.8 | MARGINAL |
| HARPER RUN | POTOMAC DIRECT | | Jul-03 | 40.0 | 10.0 | 20.0 | | 20.0 | | | 32.5 | POOR |
| HALF MILE RUN | POTOMAC DIRECT | | Mar-04 | 30.0 | 35.0 | | 10.0 | 20.0 | 5.0 | | 38.8 | POOR |
| KATES RUN | POTOMAC DIRECT | | Jun-04 | 10.0 | | | 25.0 | 40.0 | 20.0 | 5.0 | 70.0 | SUB OPTIMAL |
| OPEQUON CREEK | POTOMAC DIRECT | 2 | Jul-04 | 10.0 | 40.0 | 30.0 | 20.0 | | | | 40.0 | POOR |
| OPEQUON CREEK | POTOMAC DIRECT | 1 | Oct-03 | | 70.0 | | 30.0 | | | | 40.0 | POOR |
| RATTLESNAKE RUN | POTOMAC DIRECT | 1 | Apr-03 | 6.0 | 28.0 | | 6.0 | 60.0 | | | 71.5 | SUB OPTIMAL |
| SLEEPY CREEK | POTOMAC DIRECT | 1 | May-04 | 5.0 | 15.0 | | 25.0 | 50.0 | 5.0 | | 75.0 | SUB OPTIMAL |
| SLEEPY CREEK | POTOMAC DIRECT | 2 | Jun-04 | | 4.0 | | 1.0 | 15.0 | 80.0 | | 56.8 | MARGINAL |
| SLEEPY CREEK | POTOMAC DIRECT | 3 | Nov-03 | | 5.0 | | 35.0 | 55.0 | 5.0 | | 85.0 | OPTIMAL |
| SLEEPY CREEK | POTOMAC DIRECT | 2 | Aug-03 | | | | 5.0 | 15.0 | 80.0 | | 58.8 | SUB OPTIMAL |

| STREAM | BASIN | STATION | DATE | COMPOSITION | | | | | | | INDEX | INTEGRITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | SILT/CLAY | SAND | FINE GRAVEL | COARSE GRAVEL | COBBLE | BOULDER | BEDROCK | | |
| SLEEPY CREEK | POTOMAC DIRECT | 1 | Jul-03 | | 20.0 | 10.0 | | 60.0 | 10.0 | | 75.0 | SUB OPTIMAL |
| SLEEPY CREEK | POTOMAC DIRECT | | Sep-04 | | 10.0 | 20.0 | 60.0 | 10.0 | | | 67.5 | SUB OPTIMAL |
| TUSCARORA CREEK | POTOMAC DIRECT | 1 | Jul-04 | 10.0 | 10.0 | 5.0 | 10.0 | 60.0 | 5.0 | | 75.0 | SUB OPTIMAL |
| TUSCARORA CREEK | POTOMAC DIRECT | 2 | Apr-04 | 10.0 | 20.0 | | 10.0 | | 60.0 | | 42.5 | POOR |
| ANDERSON RUN | SOUTH BRANCH | | | 20.0 | | | 80.0 | | | | 60.0 | MARGINAL |
| BIG RUN | SOUTH BRANCH | 1 | Jun-04 | | 5.0 | | 30.0 | 50.0 | 15.0 | | 81.3 | OPTIMAL |
| BIG RUN | SOUTH BRANCH | 2 | Aug-04 | | 10.0 | | 30.0 | 40.0 | 20.0 | | 75.0 | SUB OPTIMAL |
| BIG RUN | SOUTH BRANCH | 1 | Apr-04 | | 15.0 | | 30.0 | 50.0 | 5.0 | | 78.8 | SUB OPTIMAL |
| CLIFFORD HOLLOW | SOUTH BRANCH | | | 10.0 | 30.0 | | 20.0 | 20.0 | 20.0 | | 52.5 | MARGINAL |
| DUMPLING RUN | SOUTH BRANCH | | | | | 5.0 | 5.0 | 80.0 | 10.0 | | 91.3 | OPTIMAL |
| FORT RUN | SOUTH BRANCH | | | | | | 5.0 | 70.0 | 10.0 | 5.0 | 80.0 | OPTIMAL |
| NORTH FORK | SOUTH BRANCH | | Oct-04 | | 10.0 | | 8.0 | 70.0 | 12.0 | | 84.5 | OPTIMAL |
| SOUTH BRANCH | SOUTH BRANCH | | Oct-04 | | | | 10.0 | 80.0 | 10.0 | | 92.5 | OPTIMAL |
| SOUTH BRANCH | SOUTH BRANCH | | Oct-04 | | 5.0 | | 5.0 | 90.0 | | | 95.0 | OPTIMAL |
| SOUTH BRANCH | SOUTH BRANCH | | Oct-04 | | 15.0 | | 35.0 | 45.0 | 5.0 | | 77.5 | SUB OPTIMAL |
| SPRING RUN | SOUTH BRANCH | 1 | Jul-03 | | 14.7 | | 52.6 | 25.6 | 2.1 | 5.2 | 71.1 | SUB OPTIMAL |
| SPRING RUN | SOUTH BRANCH | 2 | Jul-03 | | 9.2 | | 60.3 | 14.7 | 11.4 | 4.3 | 69.0 | SUB OPTIMAL |
| SPRING RUN | SOUTH BRANCH | 3 | Jul-03 | | 10.0 | | 30.0 | 40.0 | 10.0 | | 70.0 | SUB OPTIMAL |
| SPRING RUN | SOUTH BRANCH | 4 | Jul-03 | | 10.0 | | 45.0 | 35.0 | 10.0 | | 76.3 | SUB OPTIMAL |
| SOUTH FORK | SOUTH BRANCH | | Oct-04 | | | | 10.0 | 75.0 | 3.0 | 12.0 | 87.0 | OPTIMAL |
| TOMBS HOLLOW RUN | SOUTH BRANCH | | | 5.0 | 40.0 | 25.0 | 20.0 | 10.0 | 5.0 | | 50.0 | MARGINAL |
| WALNUT BOTTOM | SOUTH BRANCH | 1 | | 20.0 | | 5.0 | 5.0 | 30.0 | 40.0 | | 56.3 | MARGINAL |
| WALNUT BOTTOM | SOUTH BRANCH | 2 | | | 10.0 | 5.0 | 5.0 | 5.0 | | 70.0 | 31.3 | POOR |
| EVITTS RUN | SHENANDOAH | 4 | Apr-03 | 5.0 | 10.0 | 20.0 | 10.0 | 45.0 | 10.0 | | 70.0 | SUB OPTIMAL |
| HUBBARDS RUN | SHENANDOAH | 2 | Apr-03 | 25.0 | 20.0 | | 25.0 | 5.0 | | | 28.8 | MARGINAL |
| BRADSHAW CREEK | TUG FORK | 2 | Mar-03 | 2.0 | 2.0 | | 10.0 | 40.0 | 46.0 | | 71.0 | SUB OPTIMAL |
| BRADSHAW CREEK | TUG FORK | 1 | Mar-03 | | 5.0 | | 70.0 | 15.0 | 10.0 | | 73.8 | SUB OPTIMAL |
| DRY FORK | TUG FORK | | Apr-03 | 2.0 | 20.0 | | 5.0 | 56.0 | 10.0 | | 69.8 | SUB OPTIMAL |
| ELKHORN CREEK | TUG FORK | | Mar-03 | 2.0 | 8.0 | | 15.0 | 75.0 | | | 88.3 | OPTIMAL |
| TWIN BRANCH | TUG FORK | | Oct-03 | | 20.0 | 1.0 | 59.0 | 20.0 | | | 69.8 | SUB OPTIMAL |
| LEADING CREEK | TYGART VALLEY | | | 10.0 | | | 10.0 | 60.0 | 10.0 | 10.0 | 75.0 | SUB OPTIMAL |
| LF FILES CREEK | TYGART VALLEY | | Jun-04 | | 5.0 | | 35.0 | 45.0 | 15.0 | | 80.0 | SUB OPTIMAL |
| LB/LF SANDY CREEK | TYGART VALLEY | 1 | Jun-04 | | 5.0 | 10.0 | 10.0 | 70.0 | 5.0 | | 86.3 | OPTIMAL |
| LB/LF SANDY CREEK | TYGART VALLEY | 1 | Jul-03 | | 5.0 | | 20.0 | 55.0 | 15.0 | | 78.8 | SUB OPTIMAL |
| LB/LF SANDY CREEK | TYGART VALLEY | 2 | Aug-04 | | 5.0 | | 20.0 | 70.0 | 5.0 | | 88.8 | OPTIMAL |
| LF SANDY CREEK | TYGART VALLEY | | Jul-03 | | 5.0 | | 20.0 | 70.0 | 5.0 | | 88.8 | OPTIMAL |
| LF SANDY CREEK | TYGART VALLEY | | May-03 | | 5.0 | | 20.0 | 70.0 | 5.0 | | 88.8 | OPTIMAL |
| RB/LF SANDY CREEK | TYGART VALLEY | 2 | Jun-04 | | 5.0 | 10.0 | 10.0 | 70.0 | 5.0 | | 86.3 | OPTIMAL |
| RB/LF SANDY CREEK | TYGART VALLEY | 2 | May-03 | | 5.0 | | 20.0 | 70.0 | 5.0 | | 88.8 | OPTIMAL |
| RB/LF SANDY CREEK | TYGART VALLEY | 2 | Jul-03 | | 5.0 | 10.0 | 20.0 | 60.0 | 5.0 | | 83.8 | OPTIMAL |
| RB/LF SANDY CREEK | TYGART VALLEY | 1 | Aug-04 | | 5.0 | | 20.0 | 70.0 | 5.0 | | 88.8 | OPTIMAL |
| UNT MIDDLE FORK RIVER | TYGART VALLEY | | Jul-04 | | 25.0 | | 30.0 | 40.0 | 5.0 | | 71.3 | SUB OPTIMAL |

| STREAM | BASIN | STATION | DATE | COMPOSITION | | | | | | | INDEX | INTEGRITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | SILT/CLAY | SAND | FINE GRAVEL | COARSE GRAVEL | COBBLE | BOULDER | BEDROCK | | |
| BOOTH CREEK | WEST FORK | | Jul-03 | | 10.0 | 80.0 | 10.0 | | | | 50.0 | MARGINAL |
| BRUSHY FORK | WEST FORK | | Jul-03 | | 8.0 | | 25.0 | 65.0 | 2.0 | | 86.8 | OPTIMAL |
| ELK CREEK | WEST FORK | | Mar-04 | 5.0 | | | 20.0 | 50.0 | 10.0 | | 70.0 | SUB OPTIMAL |
| HELENS RUN | WEST FORK | | Aug-04 | 5.0 | 30.0 | 15.0 | 25.0 | 25.0 | | | 58.8 | MARGINAL |
| ISAACS CREEK | WEST FORK | | Jul-03 | 1.0 | 4.0 | | 25.0 | 70.0 | | | 89.8 | OPTIMAL |
| KINCHELOE CREEK | WEST FORK | | Jul-03 | | 14.0 | | 55.0 | 30.0 | 1.0 | | 75.3 | SUB OPTIMAL |
| LAMBERTS RUN | WEST FORK | | Jun-03 | | 10.0 | 8.0 | 20.0 | 62.0 | | | 83.5 | OPTIMAL |
| SALEM FORK | WEST FORK | | May-03 | | 8.3 | | 20.0 | 47.6 | 24.1 | | 76.7 | SUB OPTIMAL |
| SKIN CREEK | WEST FORK | | Apr-03 | 15.0 | 10.0 | | 60.0 | 15.0 | | | 62.5 | MARGINAL |
| TWO LICK CREEK | WEST FORK | | Jul-03 | | 4.0 | 5.0 | 10.0 | 60.0 | 21.0 | | 81.5 | OPTIMAL |
| UNT LAMBERTS RUN | WEST FORK | | May-03 | 7.0 | 13.0 | 15.0 | 50.0 | 15.0 | | | 63.3 | MARGINAL |
| RHINE CREEK | YOUGHIOGHENY | | Apr-03 | | 10.0 | 5.0 | 20.0 | 45.0 | 20.0 | | 75.0 | SUB OPTIMAL |

**Appendix 9**. Program survey data sheets

**WV SAVE OUR STREAMS SURVEY**

DEP Save Our Streams

The purpose of this form is to aid you in gathering and recording important data about the health of your stream. By keeping accurate and consistent records of your observations, you can document changes in your adopted stream conditions.

Date _____

Stream Name _____
Persons completing the survey _____
Affiliation _____
Mailing Address _____
E-mail _____ Web Page _____

Station _____ # of participants _____ Watershed _____
County _____ Latitude _____ Longitude _____
Location description (please be specific) _____
Nearest town _____

Average riffle width _____ Average riffle depth _____ "River Reach" mile point _____

Temperature (°F/°C) _____ pH _____ Conductivity _____ Dissolved $O_2$ _____
$PO_4$ _____ $NO_2 - NO_3$ _____ Other attributes (describe) _____

Discharge (cfs) _____ Estimated Flow(s) Normal ☐ High ☐ Low ☐
Weather for the past two days _____
Fish and amphibians observed _____

Send this survey form and a copy of your macroinvertebrate tally sheet to the address below.

**Citizens Monitoring Coordinator**
**WV Division of Water and Waste Management**
**601 57th Street**
**Charleston, WV 25304**

Phone: (304) 926-0499 x 1040

**Quality Assurance Review**
Reviewers Name _____
Review Date _____
Comments _____

Questions? Send e-mail to tcraddock@wvdep.org

Collect a minimum of **2** (preferably **3**) samples from the best areas within your 100-meter survey reach. Use the tally sheet to indicate the types of macroinvertebrate groups you collect, and the abundance coding system to record the approximate numbers (relative abundance). It is also advisable to estimate the **total taxa** collected from your samples.

**Abundance Code System**

- **A** (Abundant) is > 100, **C** (Common) 10 - 100, and **R** (Rare) is < 10.

**HABITAT ASSESSMENT**: Use the boxes to describe the conditions that closely resemble those of your stream. Use the extra space to write in any additional comments. Often times you may see more than one type of condition. Be sure to indicate (check all boxes that apply) these conditions on your survey.

**Water Clarity**

| Clear | | Murky | | Muddy | | Milky | |
|---|---|---|---|---|---|---|---|

**Water Color**

| None | | Green | | Brown | |
|---|---|---|---|---|---|
| Very dark (black) | | Gray/white | | Orange/red | |

**Water Odor**

| None | | Musky | | Rotten egg | |
|---|---|---|---|---|---|
| Sewage | | Chemical | | Other | |

**Algae Abundance**

| None | | In Spots | | Everywhere | |
|---|---|---|---|---|---|

**Algae Color**

| Light green | | Dark green | | Brown | | Other | |
|---|---|---|---|---|---|---|---|
| Comments: | | | | | | | |

**Algae Texture**

| Even coating | | Hairy | | Matted | | Floating | |
|---|---|---|---|---|---|---|---|

**Surface Foam**

| None | | Slight | | Moderate | | Heavy | |
|---|---|---|---|---|---|---|---|

**Streambed Color**

| Brown | | Green | | Yellow | |
|---|---|---|---|---|---|
| Black | | Gray/white | | Orange/red | |

**Stream Channel Shade**: Estimate the amount of shade based on an estimate at sunny full-leaf conditions.

| Excellent | Good | Marginal | Poor |
|---|---|---|---|
| > 80% | 80 - 60 | 59 - 40 | < 40% |

**RIFFLE COMPOSITION**: You should always estimate the **bed composition**, and/or complete a pebble count within the riffles you've selected as your macroinvertebrate sample locations. Record your results below.

| % Silt | % Sand | % Gravel | % Cobble | % Boulder | % Bedrock |
|---|---|---|---|---|---|
| | | | | | |

**Comments** _____

_____ Continue your habitat assessment by providing a sore for each of the habitat attributes described on the next page.

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LEVEL ONE

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sediment Deposition** | Little or no enlargement of islands or point bars; less than 5% of the streambed affected by sediment deposition. | | | | | Some new increase in bar formation, mostly from coarse gravel; 5-30% of the streambed affected by sediment deposition. | | | | | Moderate amounts of sand/gravel deposits on new and old point bars; 30-50% of the streambed affected by sediment deposition. | | | | | Heavy deposits of fine materials and increase point bar formations; more than 50% of the streambed affected; pools are absent or very shallow due to substantial sediment deposition. | | | | |
| Score | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| **Bank Stability** | Banks are stable; no evidence of erosion or bank failure; little or no potential for future problems. | | | | | Banks are moderately stable; infrequent areas of erosion occur, mostly shown by banks healed over. | | | | | Banks are moderately unstable; 60% of the reach has some areas of erosion; high potential for erosion during flooding events. | | | | | Banks are unstable; many have eroded areas (bare soils) along straight sections or bends; obvious bank collapse or failure; more then 60% of the reach has erosion scars. | | | | |
| Left bank | 10 | | 9 | | 8 | | 7 | | 6 | | 5 | | 4 | | 3 | | 2 | | 1 | |
| Right bank | 10 | | 9 | | 8 | | 7 | | 6 | | 5 | | 4 | | 3 | | 2 | | 1 | |
| **Riparian Buffer Width** | Mainly undisturbed vegetation of more than 60 ft; no evidence of human impacts such as parking lots, roadbeds, clear-cuts, mowed areas, fields etc. | | | | | Zone of undisturbed vegetation 40-60 ft; some areas of disturbance evident. | | | | | Zone of undisturbed vegetation 20-40 ft; disturbed areas common throughout the reach. | | | | | Zone of undisturbed vegetation less than 20 ft; disturbed areas common throughout the entire reach. | | | | |
| Left bank | 10 | | 9 | | 8 | | 7 | | 6 | | 5 | | 4 | | 3 | | 2 | | 1 | |
| Right bank | 10 | | 9 | | 8 | | 7 | | 6 | | 5 | | 4 | | 3 | | 2 | | 1 | |

**TOTAL HABITAT SCORE** _____

**HABITAT INTEGRITY**: Insert your **Total Habitat Score** (**THS**) into the formula and compare your result to the integrity scale below.

= [**THS** ÷ 60] x 100

= _____

| Excellent | Good | Marginal | Poor |
|---|---|---|---|
| > 80 | 80 - 65 | 64.9 - 50 | < 50 |

**LAND USE IMPACTS**: Record all known land uses upstream and surrounding your monitoring site. Indicate whether they have a high (**3**), moderate (**2**), slight (**1**) or no (**0**) potential to impact the quality of the stream. Also, indicate whether the land use occurs beside the stream site (**S**), within ¼ mile of the stream site (**M**), or somewhere within the watershed (**W**).

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Residential | | | Oil and gas wells | | | Cropland | | |
| Recreational | | | Logging | | | Livestock pasture | | |
| Urban uses | | | Active construction | | | Poultry farming | | |
| Sanitary landfill | | | Mining | | | Paved roads | | |
| Trash dump | | | Quarries | | | Intensive feedlots | | |
| Other land uses (describe): | | | | | | | | |
| Are there any types of pipes? | | Yes | No | Describe: | | | | |

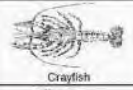
Comments _____

_____

_____

_____

**MACROINVERTEBRATE TALLY**

| | | | | | |
|---|---|---|---|---|---|
|  Stoneflies | |  Dragonflies | |  Gilled Snails | |
|  Mayflies | |  Damselflies | |  Pouch & Pond Snails | |
|  Most Caddisflies[1] | |  Water Bugs | |  Clams | |
|  Common Netspinning Caddisfly | |  Watersnipe | |  Mussels | |
|  Riffle Beetle | |  Cranefly | |  Scuds | |
|  Water Penny | |  Horsefly/Deerfly | |  Crayfish | |
|  Other Beetles | |  Other Fly Larva | |  Sowbugs | |
|  Fishflies & Dobsonflies | |  Blackfly Larva | |  Leeches | |
|  Alderflies | |  Midge Larva | |  Aquatic Worms | |
| Other invertebrates collected or observed _____ _____ | | | |  Flatworms | |

**Abundance Code System**

- **A** (Abundant) is > 100, **C** (Common) 10 - 100, and **R** (Rare) is < 10

**Estimated Total Taxa** _____

[1] All caddisflies, except for the **common netspinning caddisfly** should be placed in this group.

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**STREAM INDEX CALCULATIONS** – The relative abundance and the tolerance values are used to determine your stream index score. Use the table below and these instructions to help you calculate your stream index.

1. Determine the points for each group based upon their relative abundance (abundance points). If the group is abundant **A** the point value is **3**, if the group is common **C** the point value is **2** and if the group is rare R the point value is **1**. Enter the point values for each macroinvertebrate group that you collect.
2. Multiply the abundance points by the macroinvertebrate group's tolerance to determine the tolerance point value.
3. Sum all of the abundance points, and then sum all of the tolerance points.
4. Divide the total tolerance points by the total abundance points. This number is your **stream index score**. Use the formula on the next page and the scale to determine your biological integrity rating.

| Insect Groups | | | |
|---|---|---|---|
| **Macroinvertebrate Groups** | **Abundance Points** | **Tolerance** | **Tolerance Points** |
| Stoneflies | | 2 | |
| Mayflies | | 3 | |
| Caddisflies | | 3 | |
| Common Netspinning Caddisfly | | 5 | |
| Water Penny | | 4 | |
| Riffle Beetles | | 4 | |
| Other Beetles | | 5 | |
| Water Bugs | | 8 | |
| Fishflies | | 4 | |
| Alderflies | | 6 | |
| Dragonflies | | 5 | |
| Damselflies | | 7 | |
| Watersnipes | | 3 | |
| Craneflies | | 4 | |
| Blackflies | | 6 | |
| Horseflies/Deerflies | | 6 | |
| Other Fly Larva | | 7 | |
| Midge Larva | | 8 | |
| Non-Insect Groups | | | |
| Gilled Snails | | 5 | |
| Pouch or Pond Snails | | 7 | |
| Clams | | 5 | |
| Mussels | | 4 | |
| Scuds "sideswimmer" | | 5 | |
| Aquatic Sowbugs | | 7 | |
| Crayfish | | 6 | |
| Flatworms | | 7 | |
| Aquatic Worms | | 10 | |
| Leeches | | 10 | |
| Divide the total tolerance points by the total abundance points to calculate your stream index score. Use the formula on the next page to determine the biological integrity. | **Total Abundance Points** | | **Total Tolerance Points** |
| | | | |

**STREAM INDEX SCORE** _____

**BIOLOGIAL INTEGRITY**: Insert your **Stream Index Score** (**SIS**) into the formula and compare your result with the integrity scale below. If your calculation result is > 100, use 100.

= [(10 – **SIS**) ÷ 7.0] x 100

= _____

| Excellent | Good | Marginal | Poor |
|---|---|---|---|
| > 80 | 80 - 65 | 64.9 - 50 | < 50 |

**OVERALL ASSESSMENT**

Compare all the information to complete an overall assessment. Consider water quality, biological and physical indicators, land uses and any other supporting information observed or collected. Please provide your comments below.

| Fully Supporting | | Threatened | | Partially Supporting | | Non Supporting | |
|---|---|---|---|---|---|---|---|

Possible causes & sources _____

- **Fully Supporting**: All conditions are adequate in support of a healthy stream environment.
- **Threatened**: All conditions are adequate; however, there may be possible problems now or in the near future.
- **Partially Supporting**: Certain conditions are not adequate; anyone of the biological, physical or chemical attributes may show signs of impairment.
- **Non-Supporting**: All conditions (physical, biological and chemical) show signs of impairment.

Include any other comments that you feel are important and include topographic maps, photographs, watershed surveys or any other types information relating to your stream.

Draw a "**BIRDS EYE VIEW**" of your stream reach. Note the locations of feature that you feel are significant. Be sure and mark the areas where your macroinvertebrate samples were collected. Use an arrow to indicate the stream flow direction.

**WV SAVE OUR STREAMS**

Stream _____ Date _____
County _____ Basin _____
Latitude _____ Longitude _____ Station _____
pH _____ Conductivity _____ Temperature _____ DO _____
Other chemical attributes (describe): _____

Monitor(s) _____
Mailing address _____
Phone/e-mail _____
Directions to site _____

Discharge (cfs) _____ Water Level | High | Normal | Low | Dry

### Physical Descriptions

Use the boxes to check the conditions that closely resemble those of your stream (check all that apply). Feel free to describe the conditions in more detail or provide any additional comments.

**Water Clarity**

| Clear | | Murky | | Muddy | | Other | |
|---|---|---|---|---|---|---|---|

**Water Color**

| None | | Green | | Brown | |
|---|---|---|---|---|---|
| Black | | White/gray | | Red/orange | |

**Water Odor**

| None | | Musky | | Rotten egg | |
|---|---|---|---|---|---|
| Sewage | | Chemical | | Other | |

**Algae Abundance**

| None | | In spots | | Everywhere | |
|---|---|---|---|---|---|

**Algae Color**

| Light green | | Dark green | | Brown | | Other | |
|---|---|---|---|---|---|---|---|

**Algae Texture**

| Even coating | | Hairy | | Matted | | Free-floating | |
|---|---|---|---|---|---|---|---|

**Surface Foam**

| None | | Slight | | Moderate | | Heavy | |
|---|---|---|---|---|---|---|---|

**Streambed Color**

| Brown | | Green | | Yellow | |
|---|---|---|---|---|---|
| Black | | White/gray | | Red/orange | |

**Composition**: Determine the composition of the streambed materials within your reach. Collect samples using a pebble count from representative habitats such as pools and riffles, or riffles only. Use the table to record your results. Even if you do not complete a pebble count, you should always **estimate** the composition of the streambed materials from the riffles where you collect macroinvertebrate samples.

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**Sediment Size Classes**[1]

| Silt/clay | Sand | Fine Gravel | Coarse Gravel | Cobble | Boulder | Bedrock |
|---|---|---|---|---|---|---|
| < .062 | .062 – 2 | 2 – 24 | 24 – 64 | 64 – 256 | 256 – 1096 | > 1096 |
| Smooth/slick texture | Gritty texture | Pea to marble size | Marble to tennisball size | Tennisball to basketball size | Basketball size or larger | Large solid surface |

**Pebble Count Data Sheet**

| Silt | Sand | Fine Gravel | Coarse Gravel | Cobble | Boulder | Bedrock |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| **Totals** | **Totals** | **Totals** | **Totals** | **Totals** | **Totals** | **Totals** |
| | | | | | | |

| % Silt/clay | % Sand | % Gravel | % Cobble | % Boulder | % Bedrock |
|---|---|---|---|---|---|
| | | | | | |

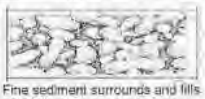
Pool width/depth | WIDTH | DEPTH | | Riffle width/depth | WIDTH | DEPTH |

**Pebble Count Habitat Types**: Record the percentage of the pebble counts collected from the pools and riffles, or simply indicate **riffles** if you estimated composition.

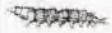
Riffle _____ Pool _____

[1] Bed material size is shown in millimeters (mm)

**Habitat Assessment** - Score each parameter using the scales provided and add each parameter's score to determine your overall habitat score and rating. Feel free to describe additional features that you feel are important.

| Parameters | Optimal | Sub Optimal | Marginal | Poor |
|---|---|---|---|---|
| **Embeddedness** |  Fine sediments surrounds and fills 0-25% of the spaces between the gravel, cobble and boulders. |  Fine sediment surrounds and fills 25-50% of the spaces between the gravel, cobble and boulders. |  Fine sediment surrounds and fills 50-75% of the spaces between the gravel, cobble and boulders. |  Fine sediment surrounds and fills more than 75% of the spaces between the gravel, cobble and boulders. |
| Score | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| **Sediment Deposition** | Little or no enlargement of islands or point bars; less than 5% of the streambed affected by sediment deposition. | Some new increase in bar formation, mostly from coarse gravel; 5-30% of the streambed affected by sediment deposition. | Moderate amounts of sand/gravel deposits on new and old point bars; 30-50% of the streambed affected by sediment deposition. | Heavy deposits of fine materials and an increase in point bar formations; more than 50% of the streambed affected; pools are absent or very shallow due to substantial sediment deposition. |
| Score | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| **Bank Vegetative Protection** | More than 90% of the banks are covered by natural vegetation; all levels "trees, shrubs and herbaceous vegetation" represented; disruption from grazing, mowing etc. minimal or absent; all plants allowed to grow naturally. | 70-90% of the banks covered by natural vegetation; one level of plants may be missing or not well represented; some disruption of vegetation evident; more than 50% of the potential plant height remains. | 50-70% of the banks covered by natural vegetation; patches of bare soil may be present and closely cropped vegetation is common; less than 50% of the potential plant heights remains. | Less than 50% of the banks covered by natural vegetation; disruption is high; vegetation has been removed or the potential plant heights are greatly reduced. |
| Left bank score | 10 9 | 8 7 6 | 5 4 3 | 2 1 0 |
| Right bank score | 10 9 | 8 7 6 | 5 4 3 | 2 1 0 |
| **Bank Stability** | Banks are stable; no evidence of erosion or bank failure; little or no potential for future problems. | Banks are moderately stable; infrequent areas of erosion occur, mostly shown by banks healed over. | Banks are moderately unstable; 60% of the reach has some areas of erosion; high potential for erosion during flooding events. | Banks are unstable; many have eroded areas (bare soils) along straight sections or bends; obvious bank collapse or failure; more than 60% of the reach has erosion scars. |
| Left bank score | 10 9 | 8 7 6 | 5 4 3 | 2 1 0 |
| Right bank score | 10 9 | 8 7 6 | 5 4 3 | 2 1 0 |
| **Riparian Buffer Width** | Mainly undisturbed vegetation > 60 ft; no evidence of human impacts such as parking lots, roadbeds, clear-cuts, mowed areas, crops etc. | Zone of undisturbed vegetation 40-60 ft; some areas of disturbance evident. | Zone of undisturbed vegetation 20-40 ft; disturbed areas common throughout the reach. | Zone of undisturbed vegetation less than 20 ft; disturbed areas common throughout the entire reach. |
| Left bank score | 10 9 | 8 7 6 | 5 4 3 | 2 1 0 |
| Right bank score | 10 9 | 8 7 6 | 5 4 3 | 2 1 0 |
| **Total Habitat Score** | **Optimal** | **Sub Optimal** | **Marginal** | **Poor** |
| | **> 80** | **80 - 65** | **64 - 50** | **< 50** |

**Macroinvertebrate Tally Sheet**: Use the tally sheet to record the numbers of macroinvertebrates collected from your all of your samples combined. Record the numbers for each major group and the number of different kinds (**families**) found within each major group. Certain groups will always have only one family. Contact the coordinator for more details.

| | | | | | |
|---|---|---|---|---|---|
| **Stonefly**  | Total # | # Of kinds | **Other beetle larva**  | Total # | # Of kinds |
| **Mayfly**  | Total # | # Of kinds | **Fishfly/Dobsonfly**  | Total # | # Of kinds |
| **Caddisfly**[2]  | Total # | # Of kinds | **Alderfly**  | Total # | # Of kinds |
| **Common netspinner**  | Total # | # Of kinds | **Cranefly**  | Total # | # Of kinds |
| **Water penny**  | Total # | # Of kinds | **Watersnipe**  | Total # | # Of kinds |
| **Riffle beetle**  | Total # | # Of kinds | **Dragonfly**  | Total # | # Of kinds |

[2] All caddisflies, except for the **common netspinner**, are to be recorded in this category.

| | | | | | |
|---|---|---|---|---|---|
| **Damselfly**  | Total # | # Of kinds | **Crayfish**  | Total # | # Of kinds |
| **Sowbug**  | Total # | # Of kinds | **Scud**  | Total # | # Of kinds |
| **Blackfly larva**  | Total # | # Of kinds | **Midge larva**  | Total # | # Of kinds |
| **Other fly larva**  | Total # | # Of kinds | **Mussel**  | Total # | # Of kinds |
| **Clam**  | Total # | # Of kinds | **Aquatic worm**  | Total # | # Of kinds |
| **Leech**  | Total # | # Of kinds | **Flatworm**  | Total # | # Of kinds |
| **Gilled snail**  | Total # | # Of kinds | **Pouch snail**  | Total # | # Of kinds |
| **Miscellaneous** | Total # | # Of kinds | Other organisms observed/collected (describe): | | |

**Metric Calculations** – Use this table to record your macroinvertebrate information and to help you calculate each metric.

| Macroinvertebrates | Total | Kinds | Tolerance | HBI Score |
|---|---|---|---|---|
| Mayfly | | | 3 | |
| Stonefly | | | 2 | |
| Caddisfly | | | 3 | |
| Common Netspinner | | | 5 | |
| Water Penny | | | 4 | |
| Riffle Beetle | | | 4 | |
| Other Beetles | | | 5 | |
| Fishfly/Dobsonfly | | | 4 | |
| Alderfly | | | 6 | |
| Watersnipe | | | 3 | |
| Cranefly | | | 4 | |
| Blackfly | | | 6 | |
| Other Fly Larva | | | 6 | |
| Midge Tolerant | | | 8 | |
| Dragonfly | | | 5 | |
| Damselfly | | | 7 | |
| Mussels | | | 5 | |
| Clam | | | 6 | |
| Gilled Snail | | | 5 | |
| Pouch Snail Tolerant | | | 7 | |
| Crayfish | | | 6 | |
| Scud "sideswimmer" | | | 5 | |
| Aquatic Sowbug Tolerant | | | 7 | |
| Flatworm Tolerant | | | 7 | |
| Aquatic Worm Tolerant | | | 10 | |
| Leech Tolerant | | | 10 | |
| **Totals** | | | **Total HBI** | |

**Integration of the Metrics**

The **stream index** score is the average point-score from the 5 different metrics. The metrics work best when more than 100 invertebrates are collected. For less numbers an alternate scoring method should be considered. If you are unsure about the calculations, the coordinator can provide instructions on how to calculate each metric, or will evaluate the information for you and send you the results.

Revised – February 2005

| Metrics | Values (X) | Formulas | Points |
|---|---|---|---|
| % EPT | | = 100 x (X ÷ 90) | |
| Taxa Richness | | = 100 x (X ÷ 21) | |
| EPT Richness | | = 100 x (X ÷ 13) | |
| Hillsenhoff Index | | = 100 x [(10 - X) ÷ 7] | |
| % Tolerant | | = 100 x [(100 - X) ÷ 95] | |

**Stream Index** _____

**Biological Integrity Rating**

| Excellent | Good | Marginal | Poor |
|---|---|---|---|
| > 80 | 80 - 65 | 64.9 - 50 | < 50 |

**Land Uses in the Watershed**: Record all known land uses upstream and surrounding your monitoring site. Indicate whether they have a High (**3**), Moderate (**2**), Slight (**1**) potential to impact (I) the quality of the stream. Also, indicate the approximate location (**L**) of the land use Does it occurs beside the stream site (**S**), within ¼ mile of the stream site (**M**), or within the stream's watershed (**W**).

| | Impact | Location | | Impact | Location |
|---|---|---|---|---|---|
| Suburban | | | Trash dumps | | |
| Urban | | | Landfill | | |
| Sing family residences | | | Oil and gas wells | | |
| Construction | | | Logging | | |
| Recreation | | | Abandoned mining | | |
| Bridges, parking lots etc | | | Active mining | | |
| Paved roads | | | Pastureland | | |
| Unpaved roads | | | Cropland | | |
| Other | | | Feedlots | | |

**Land Use Comments** _____

Use the space below to sketch a "**birds eye view**" of your stream reach. Include, as many features of the stream that you feel are important. Use an arrow to show the direction of flow and be sure to indicate the places within your reach where macroinvertebrate sample were collected.

**Overall comments** – Indicate what you feel are the present and future threats to your stream or make any additional comments. Feel free to attach any additional information such as topographic maps, photographs or any other information that you feel is important.

**Cross Section and Discharge** - Choose a section of your stream reach that you feel will represent the average cross-section and use the boxes below to record your measurements. If you use a float method for your discharge calculations, the float should be a neutrally buoyant object, something that floats just slightly submersed in the water.

| Float Trials | Float Distance | **Velocity** (ft/sec) | **Cross Section** ($ft^2$) | |
|---|---|---|---|---|
| | | | Depth (ft) | Width (ft) |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| | | | Av. Depth | Width |

**Average Velocity** (ft/sec) _____ _____ _____

**Average Cross Section** = Average Depth x Width

_____ _____

Average Cross Section = _____ ($ft^2$)

**Discharge** = Cross Section x Correction x Average Velocity

_____ **0.80** _____

**Total Discharge** = _____ ($ft^3$/sec) or cfs

Submit the survey to the address below:

**West Virginia Save Our Streams**
**WV DEP's Division of Water and Waste Management**
**601 57th Street, SE**
**Charleston, WV 25304**

Questions? Send e-mail to tcraddock@wvdep.org

**WV SAVE OUR STREAMS**

Stream _____ Date _____
County _____ Basin _____
Latitude _____ Longitude _____ Station _____
Monitor(s) _____
Mailing address _____
Phone/e-mail _____
Directions to site _____

| Discharge (cfs) _____ | Water Level | High | Normal | Low | Dry |
|---|---|---|---|---|---|

**Physical Descriptions**

Use the boxes to check the conditions that closely resemble those of your stream (check all that apply). Feel free to describe the conditions in more detail or provide any additional comments.

**Water Clarity**

| Clear | | Murky | | Muddy | | Other | |
|---|---|---|---|---|---|---|---|

**Water Color**

| None | | Green | | Brown | |
|---|---|---|---|---|---|
| Black | | White/gray | | Red/orange | |

**Water Odor**

| None | | Musky | | Rotten egg | |
|---|---|---|---|---|---|
| Sewage | | Chemical | | Other | |

**Algae Abundance**

| None | | In spots | | Everywhere | |
|---|---|---|---|---|---|

**Algae Color**

| Light green | | Dark green | | Brown | | Other | |
|---|---|---|---|---|---|---|---|

**Algae Texture**

| Even coating | | Hairy | | Matted | | Floating | |
|---|---|---|---|---|---|---|---|

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**Surface Foam**

| None | | Slight | | Moderate | | Heavy | |
|---|---|---|---|---|---|---|---|

**Streambed Color**

| Brown | | Green | | Yellow | |
|---|---|---|---|---|---|
| Black | | White/gray | | Red/orange | |

**Water Chemistry**

| Attributes | Result | Units | Method (DL) |
|---|---|---|---|
| Temperature (°F/°C) | | | |
| Conductivity | | | |
| PH | | | |
| Dissolved Oxygen | | | |
| Nitrate/nitrite | | | |
| Total Phosphate | | | |
| Ammonia | | | |
| Fecal Coliform | | | |
| Acidity | | | |
| Alkalinity/Hardness | | | |
| Iron | | | |
| Aluminum | | | |
| Manganese | | | |
| Turbidity | | | |
| Total Suspended Solids | | | |
| Other (describe below) | | | |

_____
_____
_____

**Composition**: Determine the composition of the streambed materials within your reach. Collect samples using a pebble count from representative habitats such as pools and riffles, or riffles only. Use the table to on the next page record your results. Even if you do not complete a pebble count, you should always **estimate** the composition of the streambed materials from the riffles where you collect macroinvertebrate samples.

**Riffle Composition Estimates**

| % Silt/clay | % Sand | % Gravel | % Cobble | % Boulder | % Bedrock |
|---|---|---|---|---|---|
| | | | | | |

**Sediment Size Classes**[1]

| Silt/clay | Sand | Fine Gravel | Coarse Gravel | Cobble | Boulder | Bedrock |
|---|---|---|---|---|---|---|
| < .062 | .062 – 2 | 2 – 24 | 24 – 64 | 64 – 256 | 256 – 1096 | > 1096 |
| Smooth/slick texture | Grainy texture | Pea to marble size | Marble to tennisball size | Tennisball to basketball size | Basketball size or larger | Large solid surface |

**Pebble Count Data Sheet**

| Silt | Sand | Fine Gravel | Coarse Gravel | Cobble | Boulder | Bedrock |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| **Totals** | | | | | | |
| | | | | | | |

| Pool width/depth | WIDTH | DEPTH | Riffle width/depth | WIDTH | DEPTH |
|---|---|---|---|---|---|
| | | | | | |

[1] Bed material size is shown in millimeters (mm)

**Pebble Count Habitat Types**: Record the percentage of the pebble counts collected from the pools and riffles, or simply indicate **riffles** if you estimated composition.

Riffle _____ Pool _____

**Land Uses in the Watershed**: Record all known land uses upstream and surrounding your monitoring site. Indicate whether they have a High (**3**), Moderate (**2**), Slight (**1**) potential to impact (**I**) the quality of the stream. Also, indicate the approximate location (**L**) of the land use Does it occurs beside the stream site (**S**), within ¼ mile of the stream site (**M**), or within the stream's watershed (**W**).

| | Impact | Location | | Impact | Location |
|---|---|---|---|---|---|
| Suburban | | | Trash dumps | | |
| Urban | | | Landfill | | |
| Sing family residences | | | Oil and gas wells | | |
| Construction | | | Logging | | |
| Recreation | | | Abandoned mining | | |
| Bridges, parking lots etc | | | Active mining | | |
| Paved roads | | | Pastureland | | |
| Unpaved roads | | | Cropland | | |
| Other | | | Feedlots | | |

**Land Use Comments** _____

_____
_____
_____
_____
_____
_____
_____
_____
_____

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**Habitat Assessment** - Score each parameter using the scales provided and add each parameter's score to determine your overall habitat score and rating. Feel free to describe additional features that you feel are important.

| Parameters | Optimal | Sub Optimal | Marginal | Poor |
|---|---|---|---|---|
| **Embeddedness** Estimate in riffles |  Fine sediments surrounds and fills 0-25% of the spaces between the gravel, cobble and boulders |  Fine sediment surrounds and fills 25-50% of the spaces between the gravel, cobble and boulders |  Fine sediment surrounds and fills 50-75% of the spaces between the gravel, cobble and boulders |  Fine sediment surrounds and fills more than 75% of the spaces between the gravel, cobble and boulders |
| Score | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| **Sediment Deposition** | Little or no enlargement of islands or point bars, less than 5% of the streambed affected by sediment deposition | Some new increase in bar formation, mostly from coarse gravel; 5-30% of the streambed affected by sediment deposition | Moderate amounts of sand/gravel deposits on new and old point bars; 30-50% of the streambed affected by sediment deposition | Heavy deposits of fine materials and an increase in point bar formations; more than 50% of the streambed affected; pools are absent or very shallow due to substantial sediment deposition |
| Score | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| **Riffle Frequency** | Occurrence of riffles very frequent, making up more than 60% of the reach; habitat variety is key in streams with continuous riffle habitats; note the presence and/or absence of bends and other structures | Occurrence of riffles relatively frequent, making up 40-60% of the reach; bends and/or other structures may provide additional habitat | Occurrence of riffles infrequent, making up 20-40% of the reach; there are occasional riffles and bends, but the distances between such areas have greatly increased | Occurrence of riffles less than 20%, mostly all flat water throughout the reach; if riffles are present they are generally shallow and have very little gobble |
| Score | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| **Attachment Sites for Invertebrates** | Well developed riffles and runs; riffles are as wide as the stream and their lengths is up to two times the stream's width; cobble is prevalent, boulders and gravel also common | Riffles are as wide as the stream but their length is less than two times the stream's width; cobble less abundant, gravel, boulders, and other substrates maybe more common | Riffle and runs lacking; if riffles are present they are not as wide as the stream nor is their length two times the stream's width; cobble rare, other substrate more common | Riffles and runs virtually nonexistent; large boulders and/or bedrock may be prevalent; or the reach may be mainly flat water throughout with finer sediments |
| Score | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| **Velocity and Depth Combinations** | All four velocity/depth combinations present: slow shallow, slow deep, fast shallow and fast deep; slow is < 1 ft/s and deep is > 1.5 feet | 3 of 4 velocity/depth combinations present; fast currents generally dominate (score lower if they are absent) | 2 of 4 velocity/depth combinations present (score lower if fast current areas are absent) | Stream reach dominated by one velocity/depth regime (usually slow-shallow or slow-deep) |
| Score | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |

Revised – March 2005

| Parameters | Optimal | Sub Optimal | Marginal | Poor |
|---|---|---|---|---|
| **Channel Flow Status** | Water reaches the base of both lower banks and a minimal amount of channel substrate is exposed. | Water fills more than 75% of the channel, less than 25% of the channel substrate is exposed. | Water fills 25-75% of the channel much of the riffle areas are exposed. | Very little water in the channel, mostly present as only standing pools. |
| Score | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| **Channel Alteration** | Stream straightening, dredging, artificial embankments, dams, bridge abutments etc. absent or minimal; stream has a natural pattern. | Some type of channel alteration present, usually in areas of bridge abutments, no evidence of recent channel alterations | Artificial embankment structures present, at least to some extent, on both sides of the stream; 40-80% of the reach has been altered. | Stream banks are shored with gabions, rip/rap, cement etc., more than 80% of the reach has been disrupted. |
| Score | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |

The next three parameters are scored from both sides of the stream reach

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bank Vegetative Protection** | More than 90% of the banks are covered by natural vegetation; all levels "trees, shrubs and herbaceous vegetation" represented; disruption from grazing, mowing etc. minimal or absent; all plants allowed to grow naturally. | | 70-90% of the banks covered by natural vegetation; one level of plants may be missing or not well represented; some disruption of vegetation evident; more than 50% of the potential plant height remains | | | 50-70% of the banks covered by natural vegetation; patches of bare soil may be present and closely cropped vegetation is common; less than 50% of the potential plant heights remains | | | Less than 50% of the banks covered by natural vegetation; disruption is high; vegetation has been removed or the potential plant heights are greatly reduced. | | |
| Left bank score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Right bank score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| **Bank Stability** | Banks are stable; no evidence of erosion or bank failure; little or no potential for future problems. | | Banks are moderately stable; infrequent areas of erosion occur, mostly shown by banks healed over. | | | Banks are moderately unstable; 60% of the reach has some areas of erosion; high potential for erosion during flooding events. | | | Banks are unstable; many have eroded areas (bare soils) along straight sections or bends; obvious bank collapse or failure; more then 60% of the reach has erosion scars. | | |
| Left bank score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Right bank score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| **Riparian Buffer Width** | Mainly undisturbed vegetation > 60 ft; no evidence of human impacts such as parking lots, roadbeds, clear-cuts, mowed areas, crops etc. | | Zone of undisturbed vegetation 40-60 ft; some areas of disturbance evident | | | Zone of undisturbed vegetation 20-40 ft; disturbed areas common throughout the reach. | | | Zone of undisturbed vegetation less than 20 ft; disturbed areas common throughout the entire reach | | |
| Left bank score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Right bank score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

| Total Habitat Score | Optimal | Sub Optimal | Marginal | Poor |
|---|---|---|---|---|
| | > 160 | 159 - 130 | 129 - 100 | < 100 |

**Invertebrate Tally Sheet**: Use the tally sheet to on the next page keep track of the numbers of macroinvertebrates collected from your all of your samples.

| | | | | | |
|---|---|---|---|---|---|
| Plecoptera STONEFLY  | Total # | Family | Other Coleoptera BEETLES  | Total # | Family |
| Ephemeroptera MAYFLY  | Total # | Family | Corydalidae FISHFLY/DOBSONFLY  | Total # | Family |
| Trichoptera[2] CADDISFLY  | Total # | Family | Sialidae ALDERFLY  | Total # | Family |
| Hydropsychidae COMMON NETSPINNER  | Total # | Family | Tipulidae CRANEFLY  | Total # | Family |
| Psephenidae WATER PENNY  | Total # | Family | Simuliidae BLACKFLY  | Total # | Family |
| Elmidae RIFFLE BEETLE  | Total # | Family | Chironomidae MIDGE  | Total # | Family |

[2] All caddisflies, except for **Hydropsychidae**, are to be recorded in this category.

| | | | | | |
|---|---|---|---|---|---|
| Zygoptera DAMSELFLY  | Total # | Family | Anisoptera DRAGONFLY  | Total # | Family |
| Other Diptera TRUE FLIES  | Total # | Family | Amphipoda SCUD  | Total # | Family |
| Athericidae WATERSNIPE  | Total # | Family | Decapoda CRAYFISH  | Total # | Family |
| Unionidae MUSSEL  | Total # | Family | Isopoda AQUATIC SOWBUG  | Total # | Family |
| Sphaeriidae/Corbiculidae CLAM  | Total # | Family | Oligochaeta AQUATIC WORM  | Total # | Family |
| Hirudinea LEECH  | Total # | Family | Turbellaria FLATWORM  | Total # | Family |
| Gastropoda OPERCULATE SNAIL  | Total # | Family | Gastropoda NON OPERCULATE SNAIL  | Total # | Family |
| Miscellaneous | Total # | Family | Other organisms observed/collected (describe): | | |

Refer to the table on the last page of this survey for guidance regarding the possibility of multiple families being encountered within the major groups.

**Metric Calculations –** Use this table to record your macroinvertebrate information and calculate each metric.

| Invertebrate Taxon | Total | Tolerance | HBI Score |
|---|---|---|---|
| **Aquatic Insects** | | | |
| *Ephemeroptera* MAYFLY | | 3 | |
| *Plecoptera* STONEFLY | | 2 | |
| *Trichoptera* CADDISFLY | | 3 | |
| *Hydropsychidae* COMMON NETSPINNER | | 5 | |
| *Psephenidae* WATER PENNY | | 4 | |
| *Elmidae* RIFFLE BEETLE | | 4 | |
| *Other Coleoptera* | | 5 | |
| *Corydalidae* FISHFLY/DOBSONFLY | | 4 | |
| *Sialidae* ALDERFLY | | 6 | |
| *Odonata (Anisoptera)* DRAGONFLY | | 5 | |
| *Odonata (Zygoptera)* DAMSELFLY | | 7 | |
| *Tipulidae* CRANEFLY | | 4 | |
| *Athericidae* WATERSNIPE | | 3 | |
| *Simuliidae* BLACKFLY | | 6 | |
| *Chironomidae* MIDGE | | 8 | |
| *Other Diptera* | | 6 | |
| **Aquatic Non Insects** | | | |
| *Unionidae* MUSSEL | | 4 | |
| *Sphaeriidae* PEA CLAM | | 5 | |
| *Corbiculidae* ASIAN CLAM | | 6 | |
| *Gastropoda* OPERCULATE SNAIL | | 5 | |
| *Gastropoda* NON OPERCULATE SNAIL | | 7 | |
| *Decapoda* CRAYFISH | | 6 | |
| *Amphipoda* SCUD | | 5 | |
| *Isopoda* AQUATIC SOWBUG | | 7 | |
| *Turbellaria* FLATWORM | | 7 | |
| *Oligochaeta* AQUATIC WORM | | 10 | |
| *Hirudinea* LEECH | | 10 | |
| Totals | | **Total HBI** | |

Other organisms observed/collected: _____

Revised – March 2005

**Integration of the Metrics**

The **stream index** score is the average point-score from the six different metrics. The metrics work best when more than 100 invertebrates are collected. For less numbers an alternate scoring method should be considered. If you are unsure about the calculations, the coordinator can provide instructions on how to calculate each metric, or will evaluate the information for you and send you the results.

| Metrics | Values (X) | Formulas | Points |
|---|---|---|---|
| Total Taxa | | = 100 × (X ÷ 21) | |
| EPT Taxa | | = 100 × (X ÷ 13) | |
| % EPT | | = 100 × (X ÷ 90) | |
| % Dominant Taxa | | = 100 × [(100 - X) ÷ 70] | |
| Hillsenhoff Index | | = 100 × [(10 - X) ÷ 7] | |
| % Chironomidae | | = 100 × [(100 - X) ÷ 98] | |

**Stream Index** _____

**Biological Integrity Rating**

| Excellent | Good | Marginal | Poor |
|---|---|---|---|
| > 80 | 80 - 65 | 64.9 - 50 | < 50 |

**Important Note**: The table on the next page provides spaces to list the family taxa collected, and their specific count if known, within the orders Ephemeroptera, Plecoptera, Trichoptera, excluding Hydropsychidae. Also list the family taxa collected within the orders Odonata, Diptera and Coleoptera if additional taxa are collected. Finally, include any Hemiptera (water bugs) and miscellaneous taxa if they are collected.

| | Total | | Total |
|---|---|---|---|
| *Ephemeroptera* MAYFLY | | *Diptera* TRUE FLIES | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| *Plecoptera* STONEFLY | | *Odonata* DRAGONFLY/DAMSELFLY | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| *Trichoptera* CADDISFLY | | *Coleoptera* BEETLES | |
| | | | |
| | | | |
| | | | |
| | | *Hemiptera and misc.* | |
| | | | |
| | | | |
| | | | |
| | | | |

Comments _____

Use the space below to sketch a "**birds eye view**" of your stream reach. Include, as many features of the stream that you feel are important. Use an arrow to show the direction of flow and be sure to indicate the places within your reach where macroinvertebrate sample were collected.

**Overall Assessment** – Indicate your final assessment by checking a box below, and describe what you feel are the possible causes and sources of disturbances to your stream reach. Also feel free to use these spaces to make any additional comments. Finally, include any additional information such as topographic maps, photographs or any other information that you feel is important.

| Fully Supporting | Partially Supporting | Non Supporting |
|---|---|---|
| | | |

Submit the survey to the address below:

**West Virginia Save Our Streams**
**WV DEP's Division of Water and Waste Management**
**601 57th Street, SE**
**Charleston, WV 25304**

Questions? Send e-mail to tcraddock@wvdep.org

Revised – March 2005

**Cross Section and Discharge** - Choose a section of your stream reach that you feel will represent the average cross-section and use the boxes below to record your measurements. If you use a float method for your discharge calculations, the float should be a neutrally buoyant object, something that floats just slightly submersed in the water.

| Float Trials | Float Distance | **Velocity** (ft/sec) | **Cross Section** ($ft^2$) | |
|---|---|---|---|---|
| | | | Depth (ft) | Width (ft) |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |

**Average Velocity** (ft/sec) _____ Av. Depth _____ Width _____

**Average Cross Section** = Average Depth _____ x Width _____

Average Cross Section = _____ ($ft^2$)

**Discharge** = Cross Section _____ x Correction [0.80] x Average Velocity _____

**Total Discharge** = _____ ($ft^3$/sec) or cfs

If you used an alternate method to measure flow (i.e. flow meter or velocity head rod) record your results and describe your method in the spaces below.

_____ ($ft^3$/sec) or cfs

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| Aquatic Insect Groups | Multiple Families: Yes | Multiple Families: No |
|---|---|---|
| *Ephemeroptera* MAYFLY | X | |
| *Plecoptera* STONEFLY | X | |
| *Trichoptera* CADDISFLY | X | |
| *Hydropsychidae* COMMON NETSPINNER | | X |
| *Elmidae* RIFFLE BEETLE | | X |
| *Psephenidae* WATER PENNY | | X |
| *Other Coleoptera* BEETLES | X | |
| *Corydalidae* FISHFLY/DOBSONFLY | | X |
| *Sialidae* ALDERFLY | | X |
| *Odonata (Anisoptera)* DRAGONFLY | X | |
| *Odonata (Zygoptera)* DAMSELFLY | X | |
| *Tipulidae* CRANEFLY | | X |
| *Athericidae* WATERSNIPE | | X |
| *Simuliidae* BLACKFLY | | X |
| *Chironomidae* MIDGE | | X |
| *Other Diptera* TRUE FLIES | X | |

| Non Insect Groups | Multiple Families: Yes | Multiple Families: No |
|---|---|---|
| *Unionidae* MUSSEL | | X |
| *Sphaeriidae* PEA CLAM | | X |
| *Corbiculidae* ASIAN CLAM | X | |
| *Gastropoda* OPERCULATE SNAIL | | X |
| *Gastropoda* NON OPERCULATE SNAIL | X | |
| *Decapoda* CRAYFISH | | X |
| *Amphipoda* SCUD | | X |
| *Isopoda* AQUATIC SOWBUG | | X |
| *Oligochaeta* AQUATIC WORM | | X |
| *Hirudinea* LEECH | | X |
| *Turbellaria* FLATWORM | X | |

Fishflies and dobsonflies (*Corydalidae*) are often mistakenly considered to be two separate families due to the slight difference in appearance. Many kinds of aquatic worms (*Oligochaeta*) occur in a variety of freshwater aquatic habitats, however most streams and rivers only have one dominant family, others kinds are rare and often very small.

The order *Hemiptera* (water bugs) is not included in the table. In some cases representatives are collected, however they are generally more abundant in backwater areas of large rivers and streams, and common in ponds, lakes and wetland. Other groups not included in this table are *Collembola* (spring tails), *Lepidoptera* (aquatic moth) and *Hydracarina* (water mites).

**Appendix 10**. Trout Unlimited water quality data

| Date | Stream | County | Sampler | Location Description | Alkalinity | Acidity | pH | Temp | Turbidity | Water Level | Fe |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 16-Apr-04 | Missouri Run | Webster | Crowder | At the Forks | 66 | 2 | 7.9 | 55° | Mild | High | None |
| 14-Apr-04 | Elk | Randolph | Crowder | Elk Springs | 27 | 1 | 7.79 | 54° | None | High | None |
| 10-Apr-04 | Morris Creek | Kanawha | Crowder | At Falls Crossing | 14 | 2 | 7.22 | 54° | None | High | None |
| 18-Mar-04 | Amos Run | Webster | Crowder | Below Forks | 75 | 2 | 7.94 | 45° | None | High | None |
| 14-Mar-04 | Elk Creek of Guyandotte | Logan | Lee Orr | | 53 | 1.5 | | | | | |
| 14-Mar-04 | Horsepen Creek | Mingo | Lee Orr | Near Gilbert 37*36.88 N 81*53.25 W Elev 1560' | 58 | 0 | | | | | |
| 14-Mar-04 | Pigeon Creek | Mingo | Lee Orr | Near Varney 37*38.97 N 82*82.38 W Elev 1235' | 240+ | 0 | | | | | |
| 12-Mar-04 | Elk Creek of Guyandotte | Logan | Lee Orr | | 60 | | | | | | |
| 12-Mar-04 | Spice Creek - Tug Fork | McDowell | Lee Orr | Premier | 140 | 1 | | | | | |
| 11-Mar-04 | Polemic Run | Nicholas | Nester Crowder | Mouth | 15 | 1 | | 40° | | High | |
| 11-Mar-04 | Powell Creek | Nicholas | Nester Crowder | Above Rt. 82 | 25 | 1 | | 40° | | High | |
| 16-Feb-04 | Amos Run Left Fork | Webster | Crowder | At Forks | 34 | 4 | 7.08 | 41° | None | High | Yes |
| 16-Feb-04 | Amos Run Right Fork | Webster | Crowder | At Forks | 30 | 4 | 7.25 | 39° | None | High | None |
| 31-Oct-03 | Laurel of Second Creek | Greenbrier | Maguire | Below Archer Fork | 26 | 4 | | 45° | | Normal | |
| 07-Oct-03 | Culverson Creek | Greenbrier | Nester | Rt. 17 Bridge | 90 | 2 | | 54° | | | |
| 07-Oct-03 | Locust Creek | Pocahontas | Nester | Rt. 31 Covered Bridge | 137 | 0 | | 59° | | | |
| 07-Oct-03 | Mill Creek | Greenbrier | Nester | Rt. 66 Bridge | 140 | 3 | | 54° | | | |
| 07-Oct-03 | Muddy Creek | Greenbrier | Nester | Rt. 25 Br - Alderson | 95 | 2 | | 54° | | | |
| 07-Oct-03 | Sinking Creek | Greenbrier | Nester | Rt. 60/10 Bridge | 57 | 2 | | 52° | | | |
| 07-Oct-03 | Spring Creek | Greenbrier | Nester | Rt. 13 Bridge | 66 | 1 | | 57° | | | |
| 07-Oct-03 | Stamping Creek | Pocahontas | Nester | Barnett Cabins | 110 | 0 | | 59° | | | |
| 02-Aug-03 | Cranberry Creek | Mercer | Nester | RR Trestle | 79 | 1 | | 64° | Clear | | |
| 02-Aug-03 | Piney | Raleigh | Nester | Above Cranberry | 102 | 0 | | 69° | Milky | | |
| 26-Jul-03 | Strange Creek | Nicholas | Crowder | .2 miles from bridge just of Rt 1 | 12 | 2.5? | | 65° | Clear | Normal | None |
| 25-Jul-03 | Elk | Webster | Orr | RR Trestle in C&R | 62 | 1 | | 62° | Clear | Low | None |
| 24-Jul-03 | Big Spring of East River | Mercer | Nester | Rt. 219/8 | 181 | 1 | | 64° | Clear | | |
| 24-Jul-03 | Dropping Lick | Monroe | Nester | Zenith Road Bridge | 123 | 0 | | 59° | Clear | | |
| 24-Jul-03 | East River | Mercer | Nester | Above Pigeon Creek | 148 | 1 | | 64° | Clear | | |
| 24-Jul-03 | Howard's Creek | Greenbrier | Nester | Rt. 60 Br. - Caldwell | 90 | 0 | | 74° | Clear | | |
| 24-Jul-03 | Kitchen Creek | Monroe | Nester | Rt. 3 – Cheese Store | 99 | 0 | | 66° | Clear | | |
| 24-Jul-03 | Pigeon Creek | Mercer | Nester | Mouth | 164 | 1 | | 56° | Clear | | |
| 24-Jul-03 | Rich Creek | Monroe | Nester | Wilson Mill Rd. Bridge | 124 | 1 | | 59° | Clear | | |
| 24-Jul-03 | Second Creek | Monroe | Nester | Above Rt. 15 Gap Mills | 97 | 1 | | 64° | Milky | | |
| 24-Jul-03 | Sweet Springs | Monroe | Nester | Rt. 3/14 Sweet Sp. | 181 | 10 | | 61° | Clear | | |
| 24-Jul-03 | Turkey Creek | Monroe | Nester | Rt. 29/1 Willow Bend | 122 | 1 | | 56° | Clear | | |
| 13-Jul-03 | Cup Run of Elk River | Pocahontas | Nester | Rt. 66 | 50 | 3 | | 58° | | Normal | |
| 13-Jul-03 | Stony Creek | Pocahontas | Nester | Rt. 219 | 90 | 4 | | 60° | | Normal | |

| Date | Stream | County | Sampler | Location Description | Alkalinity | Acidity | pH | Temp | Turbidity | Water Level | Fe |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 13-Jul-03 | Swago Creek | Pocahontas | Nester | Rt. 219 | 90 | 2 | | 55° | | Normal | |
| 11-Jul-03 | Big Spring Fork of Elk | Pocahontas | Nester | Mouth | 60 | 1 | | 63° | | Normal | |
| 11-Jul-03 | Old Field Fork of Elk | Pocahontas | Nester | Mouth | 40 | 1 | | 64° | | Normal | |
| 06-Jun-03 | Dry Fork | Tucker | Orr | Mennonite Church 2.7 mi. downstream of Harman | 45 | 3 | | 58° | Clear | High | None |
| 06-Jun-03 | Gandy Creek | Randolph | Orr | 1.9 mi. above bridge at Whitmer | 18 | 1 | | 58° | Clear | High | None |
| 06-Jun-03 | Greenbrier - W. Fork | Pocahontas | Maguire | A few miles upstream of mouth of Little River | 8 | 4 | | 50° | Clear | High | |
| 06-Jun-03 | Greenbrier - Mill Run | Pocahontas | Maguire | Trib that enters the W. Fork at May from the east | 9 | 3 | | 50° | Clear | High | |
| 06-Jun-03 | Seneca Creek | Randolph | Orr | Just above confluence with White's Run | 14 | 1 | | 58° | Clear | High | None |
| 06-Jun-03 | Seneca Creek | Randolph | Orr | Bridge 1.3 mi. below confluence with White's Run | 19 | 1 | | 58° | Clear | High | None |
| 06-Jun-03 | Seneca Creek | Randolph | Orr | Below Rt. 33 bridge at Onego | 30 | 1 | | 58° | Clear | High | None |
| 06-Jun-03 | White's Run | Randolph | Orr | Mouth | 25 | 2 | | 54° | Clear | High | None |
| 08-May-03 | Deer Creek | Pocahontas | Maguire | Cases Road Bridge (below mouth of North Fork) | 32 | 2 | | 52° | Cloudy | High | |
| 08-May-03 | Dunmore Spring | Pocahontas | Maguire | Upstream of old resort swimming pool foundation | 112 | 4 | | 55° | | | |
| 08-May-03 | North Fork of Deer Creek | Pocahontas | Maguire | Upstream paved County Road crossing | 20 | 2 | | 46° | Clear | High | |
| 08-May-03 | Shaver's Fork | Randolph | Maguire | Linan Bridge | 16 | 4 | | 48° | Clear | High | |
| 08-May-03 | John's Camp Run | Randolph | Maguire | FS Road Crossing | 4 | 11 | | 42° | Clear | Normal | |
| 08-May-03 | Shaver's Fork - Glade Run | Randolph | Maguire | Just upstream of FS Road Crossing | 12 | 4 | | 40° | Clear | High | |
| 08-May-03 | Shaver's Fork - Glade Run | Randolph | Maguire | 30 yds downstream of FS Road and DNR Lime station | 14 | 2 | | 40° | Clear | High | |
| 08-May-03 | Shaver's Fork - First Fork | Randolph | Maguire | 2 FS Road Crossing | 19 | 1 | | 44° | Chalky | Normal | |
| 08-May-03 | Fish Hatchery Run | Randolph | Maguire | FS Road Crossing | 6.8 | 2 | | 53° | Tad Cloudy | High | |
| 08-May-03 | Sitlington Creek | Pocahontas | Maguire | Dunmore | 42 | 3 | | 65° | Normal | Low | |
| 27-Apr-03 | Cherry River - North Fork | Nicholas | Maguire | 2.5 mi. downstream of Bear Run | 10 | 4 | | 50° | Clear | Normal | |
| 27-Apr-03 | Summit Lake | Nicholas | Green | Middle | 10 | 3 | | 54° | | | |
| 25-Apr-03 | Milligan Creek | Greenbrier | Maguire | Mouth | 138 | 12 | | 42° | | | |
| 25-Apr-03 | Second Creek | Greenbrier | Maguire | FFO | 80 | 3 | | 51° | | | |
| 24-Apr-03 | Big Spring of East River | Mercer | Nester | Rt. 219/8 Hales Gap Rd. Bridge | 134 | 1 | | 53° | | | |
| 24-Apr-03 | Elk - Slaty Fork | Pocahontas | Maguire | RR Trestle at downstream end of special regs | 45 | 2 | | 51° | | | |
| 15-Apr-03 | Back Creek | Monroe | Maguire | Trib of Indian | 147 | 8 | | 50° | | | |
| 15-Apr-03 | Indian Draft | Monroe | Maguire | Trib of Indian - Rt. 7 | 103 | 5 | | 49° | | | |
| 15-Apr-03 | Laurel Creek | Monroe | Maguire | Trib of Indian | 48 | 4 | | 52° | | | |
| 15-Apr-03 | Laurel Run | Monroe | Maguire | Trib of Wolf - Rt. 3 Br. | 19 | 3 | | 49° | | | |
| 15-Apr-03 | Rock Camp | Monroe | Maguire | 0.8 mi above mouth | 134 | 3 | | 53° | | | |
| 15-Apr-03 | Wolf Creek | Monroe | Maguire | 0.36 mi above Broad | 158 | 3 | | 49° | | | |
| 14-Apr-03 | Big Clear Creek | Greenbrier | Maguire | Above Anjean | 30 | 2 | | 50° | | | |
| 14-Apr-03 | Brown's Creek | Greenbrier | Maguire | Near Big Clear Cr. | 25 | 3 | | 50° | | | |
| 14-Apr-03 | Indian Creek | Monroe | Maguire | Covered Bridge - Rt. 219 | 132 | 7 | | 50° | | | |
| 14-Apr-03 | Little Clear Creek | Greenbrier | Maguire | 1.7 mi above Rt. 60 | 28 | 3 | | 52° | | | |

| Date | Stream | County | Sampler | Location Description | Alkalinity | Acidity | pH | Temp | Turbidity | Water Level | Fe |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 13-Apr-03 | Cherry River - North Fork | Nicholas | Maguire | 2 mi. downstream of Bear Run | 5 | 3 | | | | | |
| 13-Apr-03 | Cherry River - North Fork | Nicholas | Maguire | 2.5 mi. downstream of Bear Run | 4 | 2 | | | | | |
| 13-Apr-03 | Cherry River - North Fork | Nicholas | Maguire | Just upstream of above sample | 13 | 2 | | 38° | | | |
| 13-Apr-03 | Howard's Creek | Greenbrier | Maguire | Rt. 60 Br. - Church | 26 | 3 | | 47° | | | |
| 13-Apr-03 | Monroe Draft | Greenbrier | Maguire | 1.25 mi above mouth | 28 | 3 | | 42° | | | |
| 13-Apr-03 | Second Creek | Greenbrier | Maguire | Rt. 29 Bridge | 50 | 3 | | 44° | | | |
| 12-Apr-03 | Howard's Creek | Greenbrier | Maguire | Rt. 60 Br. - Church | 13 | 1 | | 50° | | | |
| 11-Apr-03 | Greenbrier River Trib | Greenbrier | Maguire | Horrock Sta. Rt. 7/2 | 125 | 5 | | 40° | | | |
| 03-Apr-03 | Bruffey Creek | Pocahontas | Maguire | Lobelia & Bruffey Road | 16 | 5 | | 43° | | | |
| 03-Apr-03 | Cave Run of Bruffey Creek | Pocahontas | Maguire | Rt. 29 Bridge | 30 | 3 | | 42° | | | |
| 03-Apr-03 | Hills Creek | Pocahontas | Maguire | Poca. Trailhead | 9 | 4 | | 37° | | | |
| 03-Apr-03 | Hills Creek | Pocahontas | Maguire | FS Gate above Lobelia | 8 | 2 | | 43° | | | |
| 03-Apr-03 | Locust Creek | Pocahontas | Maguire | Rt. 31 Covered Bridge | 62 | 4 | | 38° | | | |
| 03-Apr-03 | Millstone Creek | Pocahontas | Maguire | Rt. 29 Br. - Lobelia Rd. | 12 | 2 | | 40° | | | |
| 03-Apr-03 | Rush Run | Pocahontas | Maguire | Rt. 29 Br. S. of Lobelia | 40 | 3 | | 44° | | | |
| 23-Mar-03 | Loop Creek | Fayette | Nester | Baptist Church | 93 | 0 | | 52° | | | |
| 20-Mar-03 | Big Draft of Anthony | Greenbrier | Maguire | Big Draft Road | 7 | 2 | | 37° | | | |
| 20-Mar-03 | Buckeye Creek | Greenbrier | Maguire | 1.75 mi above cave | 42 | 3 | | 39° | | | |
| 20-Mar-03 | Howard's Creek | Greenbrier | Maguire | Eakle Church | 18 | 1 | | 38° | | | |
| 20-Mar-03 | Rocky Run of Anthony | Greenbrier | Maguire | Mouth | 7 | 2 | | 37° | | | |
| 19-Mar-03 | Cochran Creek | Pocahontas | Maguire | Rt. 92 USFS Camp. | 3 | 1 | | 36° | | | |
| 19-Mar-03 | Knapp's Creek | Pocahontas | Maguire | 1 mi below Min. Sp. | 18 | 2 | | 46° | | | |
| 19-Mar-03 | Meadow Creek | Greenbrier | Maguire | Mouth | 4 | 2 | | 38° | | | |
| 19-Mar-03 | Meadow Creek | Greenbrier | Maguire | Below Laurel Run | 5 | 2 | | 38° | | | |
| 19-Mar-03 | Stamping Creek | Pocahontas | Maguire | Mouth | 45 | 3 | | 39° | | | |
| 19-Mar-03 | Swago Creek | Pocahontas | Maguire | Rt. 219 Buckeye | 47 | 3 | | 41° | | | |
| 19-Mar-03 | Walnut Spring | Pocahontas | Maguire | Rt. 39 Devil's Back. | 105 | 6 | | 45° | | | |
| 18-Mar-03 | Big Branch | Monroe | Maguire | Mouth | 12 | 2 | | 64° | | | |
| 18-Mar-03 | Hart's Run | Greenbrier | Maguire | So. Boun. Gr St. For. | 10 | 2 | | 38° | | | |
| 18-Mar-03 | Laurel Creek | Monroe | Maguire | Below Archer Fork | 14 | 2 | | 42° | | | |
| 18-Mar-03 | Laurel of Second Creek | Greenbrier | Maguire | Below Archer Fork | 14 | 2 | | 42° | | | |
| 18-Mar-03 | Milligan Creek | Greenbrier | Maguire | Herns Covered Bridge | 116 | 3 | | 46° | | | |
| 18-Mar-03 | Tucahoe Run | Greenbrier | Maguire | Tucahoe Lake | 10 | 2 | | 40° | | | |
| 17-Mar-03 | Back Creek | Monroe | Maguire | Bridge below Cove | 22 | 3 | | 45° | | | |
| 17-Mar-03 | Ewin Run | Monroe | Maguire | Rt. 21 | 58 | 2 | | 48° | | | |
| 17-Mar-03 | Sweet Springs | Monroe | Maguire | Rt. 3/14 Sweet Sp. | 160 | 12 | | 49° | | | |
| 16-Mar-03 | Flynn Creek | Greenbrier | Orr | Rt. 10/43 Bridge | 5 | 1 | | 45° | | | |
| 16-Mar-03 | Indian Creek | Greenbrier | Nester | Rt. 9 Bridge | 17 | 1 | | 49° | Milky | Normal | |

| Date | Stream | County | Sampler | Location Description | Alkalinity | Acidity | pH | Temp | Turbidity | Water Level | Fe |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 16-Mar-03 | Kitchen Creek | Greenbrier | Orr | Rt. 31 Bridge | 22 | 1 | | 56° | | | |
| 16-Mar-03 | Milligan Creek | Greenbrier | Orr | Herns Covered Bridge | 106 | 1 | | 48° | | | |
| 16-Mar-03 | Muddy Creek | Greenbrier | Orr | Rt. 31 Bridge | 35 | 2 | | 42° | | | |
| 16-Mar-03 | Roaring Creek | Greenbrier | Orr | Rt. 10/2 near Trout | 5 | 1 | | 45° | | | |
| 16-Mar-03 | Robbins Run | Greenbrier | Nester | Rt. 5/2 Bridge (3 mi.) | 5 | 1 | | 46° | Clear | High | |
| 16-Mar-03 | Spring Creek | Greenbrier | Orr | Rt. 5 - Leonard | 8 | 1 | | 46° | | | |
| 16-Mar-03 | Tater Creek - Trib | Greenbrier | Nester | Hartsook Road Br. | 30 | 2 | | 46° | | | |
| 15-Mar-03 | Back Creek | Monroe | Orr | Bridge below Cove | 18 | 1 | | 42° | Clear | Normal | |
| 15-Mar-03 | Cove Creek | Monroe | Nester | Gate - below Pedro | 28 | 1 | | 48° | Clear | Normal | |
| 15-Mar-03 | Ewin Run | Monroe | Orr | Rt. 20 | 44 | 1 | | 48° | Clear | Normal | |
| 15-Mar-03 | Kitchen Creek | Monroe | Nester | Rt. 3 - Cheese Store | 83 | 0 | | 44° | Clear | Normal | |
| 15-Mar-03 | Mill Creek | Greenbrier | Hayne | Rt. 60 - Hines | 13 | 1 | | | | | |
| 15-Mar-03 | Second Creek | Greenbrier | Orr | Rt. 3 below Kitchen | 77 | 0 | | 54° | Clear | Normal | |
| 15-Mar-03 | S. Fork Potts | Monroe | Maguire | Above Waiteville | 6 | 2 | | 47° | Clear | Normal | |
| 15-Mar-03 | Sweet Springs | Monroe | Nester | Rt. 3/14 Sweet Sp. | 126 | 5 | | 49° | Clear | Normal | |
| 15-Mar-03 | Trout Branch | Monroe | Hayne | Rt. 20 Culvert | 56 | 3 | | 45° | Clear | Normal | |
| 15-Mar-03 | Turkey Creek | Monroe | Nester | Rt. 13/3 Culvert | 90 | 1 | | 52° | Clear | Normal | |
| 02-Feb-03 | East River | Mercer | Nester | Above Pigeon Creek | 90 | 0 | | 36° | | | |

**Appendix 11**. Study design outline

## **Getting Started**: **Organize your Technical Committee**

1. List the members of your technical committee and their expertise.
    - *Write a job description that describes the roles and responsibilities of the technical committee members.*

## **Step 1**: **Why are you monitoring?**

1. Provide background information on your river: For example, describe the geography of your stream, where it begins, where it joins larger water bodies and other important characteristics of its watershed.
2. List (or put on a map) the classifications and the designated uses or other ecological values associated with your river.
3. List the uses, values and threats identified by the members of your river's communities.
4. Describe the issues facing your river posed by the threats or conflicts and what, if anything is being done to address them?
    - *List the river segments that do not support, or only partially support, their designated uses.*
    - *List the threats, causes or reasons that specific river segments do not support their designated uses.*
    - *List the protection or restoration efforts underway to address the problems.*
    - *List the information that you believe you will need in order to address the issues.*
    - *What type of information will you need to define and evaluate the extent of the problems?*
    - *What type(s) of information will you need to define and evaluate effective solutions?*
5. List the specific questions you will try to answer through stream monitoring.

## **Step 2**: **What will you monitor?**

1. List the indicators you will use to monitor your river.
2. Describe the significances of each indicator(s) and how they will help you answer your questions.

## **Step 3**: **What are your data quality objectives and requirements?**

1. List the intended uses and users of your information.
2. List your data quality objectives.
3. List your data quality requirements of the sampling and analysis of each indicator:
    - ***Accuracy*** *is how close are your results are to the true values.*
    - ***Precision*** *is how close are your results, through repeated analysis of the same sample, to each other.*
    - ***Sensitivity*** *is the smallest change or lowest concentration you seek to detect.*

## **Step 4**: **How will you monitor?**

1. Describe how you will collect your samples.
    - *What will be sampled (e.g. the water, bottom sediment, aquatic life etc.)?*

- *List the types of sampling containers and/or other equipment and devices to be used.*
- *What quantity of sample(s) will be collected?*
- *How many samples will your monitoring team collect at each location?*
- *Provide a description of your procedures (reference a particular method if applicable).*

2. Describe how you will analyze the samples.
    - *How will the samples be transported to the lab (if applicable), and what is your chain of custody procedures?*
    - *How soon after collection will your samples be analyzed?*
    - *What method(s) will be used to analyze the samples: Site a particular method such as "EPA Method 360.2", or "WV Save Our Streams Monitoring Manual".*
    - *Provide a brief description of your procedures.*
    - *What units will your results be reported in?*

**Step 5**: **Where will you monitor?**

1. List the criteria you used to select sampling sites.
2. List each sampling site and the rationale for each one. This could be a table with the following column heading:
    - *Site "station" Number and/or name.*
    - *How the site be sampled (e.g. wading, from shore, by boat etc.).*
    - *Why the site is being monitored.*
3. List where each indicator will be analyzed (field or lab etc.).

**Step 6**: **When will you monitor?**

1. List the sampling and analysis dates for each type of sampling.
2. List the time of day each sample will be taken.
3. List the holding times for each type of sample.

**Step 7**: **Who will monitor?**

1. List the paid and volunteer positions.
    - *Title*
    - *Responsibilities*
    - *Name, address, phone number, e-mail etc.*

**Step 8**: **What are your quality assurance and quality control (QAQC) measures?**

1. List the QAQC measures you will use:
    - *Internal checks*
    - *External checks*
2. Describe each one and how it will be carried out.

**Put your plan in writing and review it annually**

- Your technical committee should complete an annual review of your study design document with input from others, especially field personnel.

**Appendix 12**. Description of the program metrics

The data analysis scheme used by WV Save Our Streams integrates biotic indices (metrics) to evaluate the stream's condition. A metric is a numerical value or narrative expression that describes the characteristics of a living aquatic community. The complexity of biological systems, and the varied impacts humans have on them, require a broad based multimetric approach that integrates information from individual, population, and assemblage levels. Each index measures a different component of the macroinvertebrate community and has a different range of sensitivity to pollution stress. This approach provides better statistical precision due to the variety of parameters evaluated. Examples of the metrics used to analyze the macroinvertebrate community are described below.

1. **% EPT Abundance**: This index is the percentage of the three most pollution sensitive groups, the order ***E****phemeroptera* (mayflies), ***P****lecoptera* (stoneflies), and ***T****richoptera* (caddisflies). Generally, with a few exceptions, a high percentage of EPT's indicates healthy stream conditions. % EPT is calculated by dividing the total number of EPT's by the total number of organisms in your sample, then multiply by 100 to obtain the percentage.

2. **Taxa Richness**: This index is the total number of kinds in your sample. Taxa richness is calculated by simply adding the total number of kinds. A healthy stream generally has a wide variety of organisms (high diversity) with most families sensitive to disturbances.

3. **EPT Richness**: This index is the total number of EPT kinds in your sample. EPT Richness is calculated by adding the number of EPT kinds. A healthy stream has a high diversity represented from the EPT families.

4. **Hilsenhoff Biotic Index** (**HBI**): This index is based upon the stress tolerance of the organism to organic pollution or low levels of dissolved oxygen. The families or orders are rated on a scale from 0 to 10, with 0 being the most sensitive and 10 being the most tolerant. HBI is calculated by multiplying the total number within a category by their respective tolerance values. The results of all these multiplication are then summed and divided by the total number of organisms in the sample. Ideally the index should be a low number, which indicates an overall sensitive community. Higher values indicate increasing numbers of tolerant organisms dominating the community.

5. **% Chironomid**: This index is the percentage of the samples midges, family *Chironomidae* (midges). % Chironomid is calculated by dividing the total number of midges by the total number of organisms in the sample. Multiply by 100 to obtain the percentage. A high percentage of midge larvas are often an indication of impaired conditions.

6. **% Dominant Taxa**: This index is an estimation of the two most dominant taxa (family or kinds) within your sample. The index is calculates by first adding the top two most dominant families and then dividing by the total number of organisms. Multiply by 100 to obtain the percentage. Dominance of a particular group(s) sometimes an indication of an imbalanced community, which is often an indication of impairments.

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