WEST VIRGINIA

Division of Environmental Protection

An Ecological Assessment of the

North Branch of the Potomac River Watershed

OFFICE OF WATER RESOURCES MISSION STATEMENT

To enhance and preserve the physical, chemical and biological integrity of surface and ground waters, considering nature and health, safety, recreational and economic needs of humanity.

WV OWR

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The Office of Water Resources provides leadership on all water issues through effective programs that improve water quality and public safety statewide.

An Ecological Assessment of the North Branch of the Potomac River Watershed 1997

Report number - 02070002 - 1997

prepared by:

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<u>Typical culvert and road showing poor riparian buffer zone</u>

Summary

Assessment teams visited 66 sites in the North Branch of the Potomac River watershed (HUC # 02070002) between August 11 and August 27, 1997. One of the sources of the North Branch of the Potomac River is near the Fairfax Stone, which marks the corners of Grant, Preston and Tucker counties. The North Branch flows generally eastward 97 miles until it joins with the South Branch near Green Spring in Hampshire County to form the Potomac River. Along the way it forms part of the boundary between West Virginia and Maryland. Therefore, the watershed is split between these two states. This report addresses only the West Virginia portion of the watershed.

Of the 66 sites visited, 61 were assessed. Assessment at each site included measurements of physical attributes of the stream and riparian zone, observations of activities and disturbances in the surrounding area, water quality data and benthic macroinvertebrate collections. Many of the named streams in the North Branch watershed were not visited and therefore received no assessment. Most of the unmonitored streams are small, first or second order streams less than five miles in length. Assessments at most sites visited were more thorough than past efforts by the Office of Water Resources.

Fifteen comparable sites (3 in Ecoregion 67 and 12 in Ecoregion 69) had benthic scores below 50 and are considered biologically impaired. Six non-comparable sites were also sampled.

Only 13 sites (9 in Ecoregion 67 and 4 in Ecoregion 69) in the North Branch Watershed had concentrations of fecal coliform bacteria greater than the standard of 400 colonies per 100 ml.

Two sites violated the standard for dissolved oxygen. Both appeared to be caused by natural conditions at the sites. Ecoregion 69 had nine violations of the standard for pH. All of these sites were located in coalfields where drainage from coal mines frequently lowers pH.

The most frequently encountered human disturbances at the sites were roads. This is a reflection of the strategy of sampling as close to the mouths of the streams as possible.

An important factor in assessing the health of streams is the intactness of the vegetated buffer zone. On average the habitat at sites in Ecoregion 67 were considered sub-optimal. Those in Ecoregion 69 were considered optimal.

There are a few species of special concern to the West Virginia Division of Natural Resources that make Patterson Creek and some of its tributaries their homes. This large tributary to North Branch should be considered for special protection by authorities with water quality interests in the region.

The Program recommends the following actions:

- Better preserve and enhance the high quality waters present in all watersheds.
- Continue restoration efforts on streams impaired by acid mine drainage.
- Investigate the unnamed tributary of the unnamed tributary of New Creek and similar streams to determine if habitat and water quality problems can be solved through the use of best management practices at nearby farms.
- Investigate biologically impaired streams to determine the causes of their impairment if the causes are not already known.
- Include all streams on the 303(d) list and those crossing acid bearing rock

strata in the next round of sampling.

- Conduct a detailed survey of the Stony River watershed to determine the sources and impacts of acid mine drainage in the area.
- Review data on Laurel Run of Abram Creek, Little Buffalo Creek and Buffalo Creek below Little Buffalo Creek to determine if they should be added to the 303(d) list.

Acknowledgments

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Jeffrey Bailey, George Constantz, Alvan Gale, Christina Moore, Perry Casto, John Wirts, Mike Puckett, and Douglas Wood collected the samples and assessed the sites.

Marshall University Students, Eric Wilhelm and Andrea Henry, under the supervision of Dr. Donald Tarter and Jeffrey Bailey, processed the benthos samples. Jeffrey Bailey, Janice Smithson and John Wirts identified the benthic macroinvertebrates. Charles Surbaugh entered the raw data into the database. Douglas Wood summarized the data and co-authored this report with James Hudson. Patrick Campbell, Janice Smithson, and Michael Arcuri provided help in reviewing the various drafts of this report and bringing it to completion. James Hudson designed the layout and provided finishing touches to the report.

Why We Assess Watersheds - A Historical Perspective

In 1959, the West Virginia Legislature created the State Water Commission, predecessor of the Office of Water Resources (OWR). The agency has since been charged with balancing the human needs of economic development and water consumption with the restoration and maintenance of water quality in the state.

At the federal level, the U.S. Congress enacted the Clean Water Act of 1972 (the Act) plus its subsequent amendments to restore the quality of our nation's waters. For 25 years, the Act's National Pollutant Discharge Elimination System (NPDES) has resulted in reductions of pollutants piped to surface waters. There is broad consensus that because NPDES permits have reduced the amount of contaminants in point sources, the water quality of our nation's streams has improved significantly.

Under the federal law, each state was given the option of managing NPDES permits within its borders or leaving the federal government in that role. West Virginia assumed primacy over NPDES permits in 1982. At that time, the state's Water Resources Board (presently the Environmental Quality Board (EQB) began developing water quality criteria (see box on following page) for each type of use designated for the state's waters. In addition the West Virginia Division of Environmental Protection's (DEP) water protection activities are guided by the EQB's anti-degradation policy, which charges the OWR with maintaining surface waters at sufficient quality to support existing uses, whether or not the uses are specifically designated by the EQB.

Even with significant progress, by the early 1990s many streams still did not support their designated uses. Consequently, environmental managers began examining pollutants flushing off the landscape from a broad array of hard to control sources. Recognizing the negative impacts of these nonpoint sources (NPS) of pollution, which do not originate at clearly identifiable pipes or other outlets, was a conceptual step that served as a catalyst for today's holistic watershed approach to improving water quality.

Water Quality Criteria - The levels of water quality parameters or stream conditions that are required to be maintained by the Code of State Regulations, Title 46, Series 1 (Requirements Governing Water Quality Standards).

Designated Uses - For each water body, those uses specified in the Water Quality Standards, whether or not those uses are being attained. Unless otherwise designated by the rules, all waters of the State are designated for:

- **the propagation and maintenance of fish and other aquatic life, and**
- **water contact recreation.**

Other types of designated uses include:

- **public water supply,**
- **agriculture and wildlife uses, and**
- **industrial uses.**

Several DEP units, including the Watershed Assessment Program (the Program) are currently implementing a variety of watershed projects. Located within the OWR, the Program's scientists are charged with evaluating the health of streams in West Virginia's watersheds. The Program is guided, in part, by the Interagency Watershed Management Steering Committee (see box next page).

The Program uses the U.S. Geological Survey's (USGS) scheme of hydrologic units to divide the state into 32 watersheds. Some of these watershed units are entire stream basins bounded by natural hydrologic divides (e.g., Gauley River watershed). Two other types of watershed units were devised for manageability: (1) clusters of small tributaries that drain directly into a larger mainstem stream (e.g., Potomac River direct drains watershed) and (2) the West Virginia parts of interstate basins (e.g., Tug Fork watershed). A goal of the Program is to assess each watershed unit every 5 years, an interval coinciding with the reissuance of National Pollutant Discharge Elimination System (NPDES) permits.

The Interagency Watershed Management Steering Committee consists of representatives from each agency that participate in the Watershed Management Framework. Its function is to coordinate the operations of the existing water quality programs and activities within West Virginia to better achieve shared water resource management goals and objectives.

The Watershed Basin Coordinator serves as the day to day contact for the committee. The responsibilities of this position are to organize and facilitate the steering committee meetings, maintain the watershed management schedule, assist with public outreach, and to be the primary contact for watershed management related issues.

General Watershed Assessment Strategy

A watershed can be envisioned as an aquatic tree, a system of upwardly branching, successively smaller streams. An ideal watershed assessment would document changes in the quantity and quality of water flowing down every stream, at all water levels, in all seasons, from headwater reaches to the end of the watershed. Land uses throughout the watershed would also be quantified. Obviously this approach would require more time and resources than are available to any agency. The Program, therefore, assesses the health of a watershed by evaluating the health of as many of its streams as time, budget and personnel allow.

The Program has determined that approximately 600 sites will be evaluated each year. The number of streams sampled per basin depends on the size of the basin; larger watersheds will be subjected to a larger number of assessments.

Assessments are made on all streams identified as "severely impaired" in the U.S. Environmental Protection Agency's (EPA) Water Body System database and on all 303(d) streams (see box on page 8). Other sites sampled were identified by the public at town meetings and by DEP Environmental Enforcement inspectors. Consideration was also given to sites having the potential for serving as reference sites (sites with little or no evidence of human impact). The remainder of the site allotment included less impaired and previously unassessed streams. The locations of these final sites were selected so that a balanced spatial coverage of the watershed was achieved.

A new element for sample site selection was introduced in 1997. EPA statisticians using protocols established for their Regional Environmental Monitoring and Assessment Program (REMAP) randomly select approximately 35 sites within each watershed. These sites are included within the 600 sites per year total, but are analyzed separately from the remaining stations. The remainder of the sites will be selected in the manner described in the preceding paragraph. The random sites will provide sufficient information to obtain a general characterization of the watershed and will be useful for 305(b) reporting. The results of the random sampling for all sites each year will be included in a separate report.

With the exception of the randomized sites, most of the streams are assessed at the mouth or at the highway access point closest to the mouth. Larger streams, particularly the watershed mainstem, are evaluated at multiple locations. If inaccessible or unsuitable sites are dropped from the list, they are replaced with previously determined alternate sites.

Figure 1: A Generalized Watershed

In several dictionaries, the first definition of watershed is the divide between adjoining drainage areas. In this report, though, watershed is defined as all the land surface that drains water to a specific point. For example, the Stony River watershed includes those parts of Mineral, Grant and Tucker counties from which water drains to the mouth of Stony River at its confluence with the North Branch River.

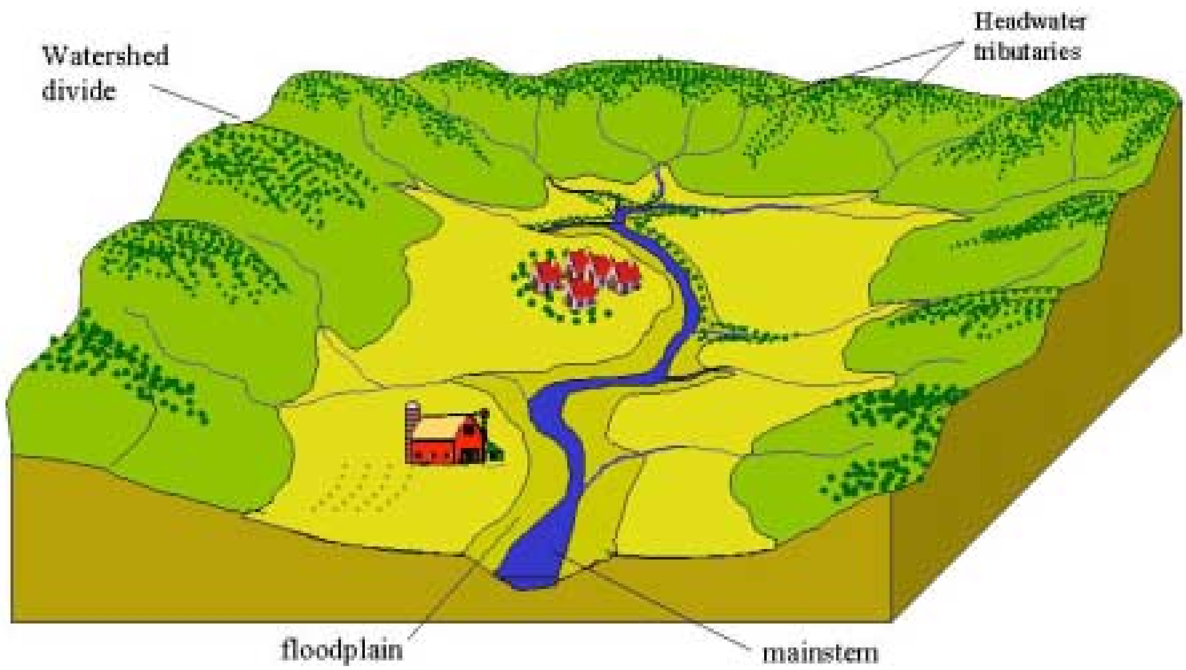
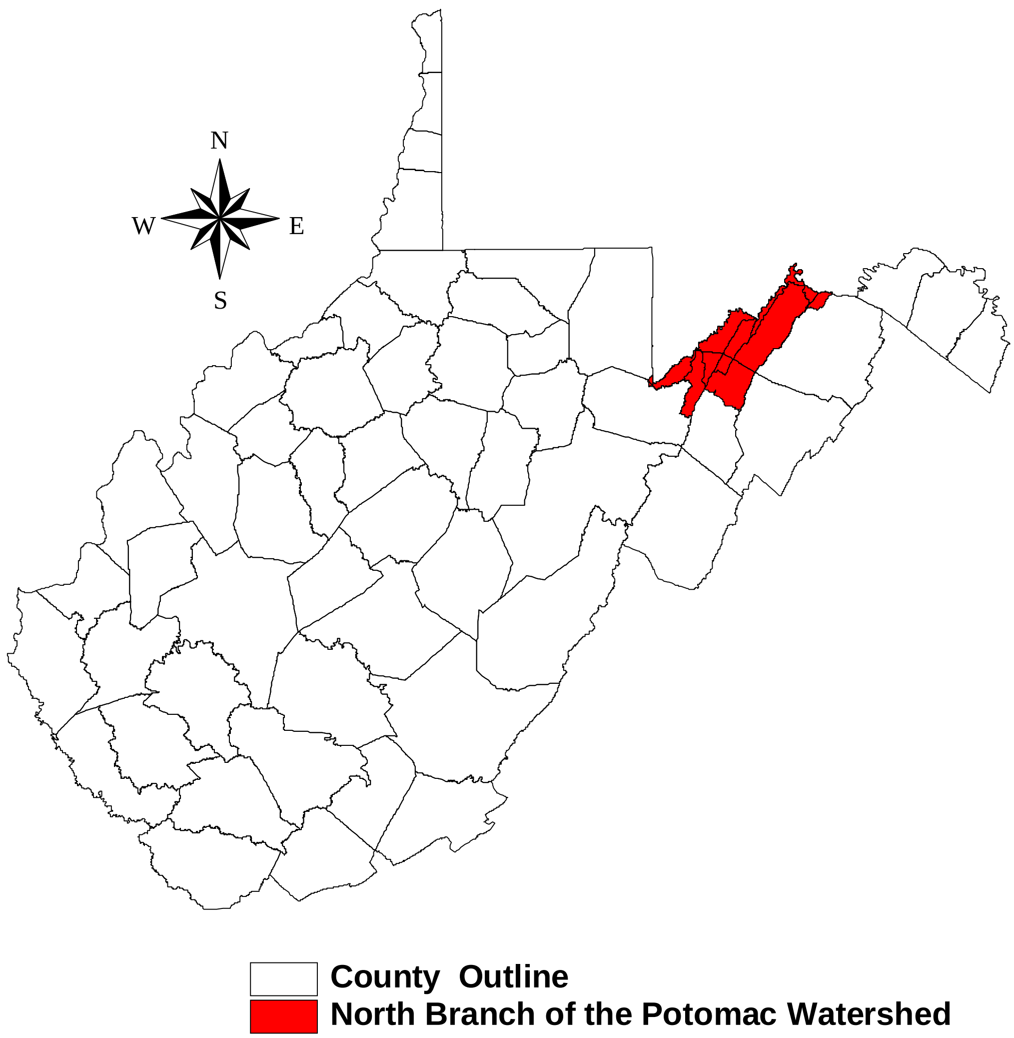


Figure 2: North Branch of the Potomac River Watershed



The Program has scheduled the study of each watershed for a specific year of a 5-year cycle. Advantages of this preset timetable include: a) synchronizing study dates with permit cycles, b) facilitating the inclusion of stakeholders to the information gathering process, c) ensuring assessment of all watersheds, d) improving the OWR's ability to plan and e) buffering the assessment process against domination by special interests.

In broad terms, OWR evaluates the streams and the Interagency Watershed Management Steering Committee sets priorities for more detailed study or restoration in each watershed in 5 phases:

Phase 1 - For an initial cursory view assessment teams measure or estimate about 50 indicator parameters in as many of each of the watershed's streams as possible.

Phase 2 - Combining pre-existing information, new Phase 1 data, and stakeholders' reports, the Program produces a list of streams of concern.

Phase 3 - From the list of streams of concern, the Interagency Watershed Management Steering Committee develops a smaller list of priority streams for more detailed study.

Phase 4 - Depending on the situation, Program teams or outside teams (e.g., USGS or consultants) intensively study the priority streams.

Phase 5 - The OWR issues recommendations for improvement; assists EPA in the development of total maximum daily loads (see box on following page), if applicable; and, makes data available to any interested party such as local watershed associations, educators, consultants, and citizen monitoring teams.

This document, which reports Phase I findings, has been prepared for a variety of users, including elected officials, environmental consultants, educators, natural resources managers, local watershed associations, and any other interested stakeholder.

Total Maximum Daily Load and the 303(d) List - The term "total maximum daily load" (TMDL) originates in the federal Clean Water Act, which requires that degraded streams be restored to their designated uses.

Every two years, a list of water quality limited streams [called the 303(d) list after the Clean Water Act section number wherein the list is described] is prepared. Prior to adding a stream to the list, technology-based pollution controls must have been implemented or the conclusion must have been reached that even after implementing such controls the stream would not support its designated uses. West Virginia's 303(d) lists include streams affected by a number of stressors including mine drainage, acid rain, metals and siltation.

Mathematically, a TMDL is the sum of the allocations of a particular pollutant (from point and nonpoint sources) into a particular stream, plus a margin of safety. Restoration of a 303(d) stream begins by calculating a TMDL, which involves several steps:

- **define when a water quality problem is occurring, the critical condition, (e.g., at base flow, during the hottest part of the day or throughout the winter ski season),**
- **calculate how much of a particular contaminant must be reduced in a stream in order to meet the appropriate water quality criterion,**
- **calculate the total maximum daily load from flow values during the problem period and the concentration allowed by the criterion,**
- **divide the total load allocation between point and nonpoint sources (e.g., 70% point and 30% nonpoint) and**
- **recommend pollution reduction controls to meet designated uses (e.g., install best management practices, reduce permit limits or prohibit discharges during problem periods). A TMDL cannot be approved, unless the proposed controls are reasonable and implementable.**

The Program was designed in part to determine whether a stream belongs on the 303(d) list. In some cases, this determination can be made readily, for example, a stream degraded by acid mine drainage (AMD). However, the determination is more difficult to make for most streams because of a lack of data or data that are conflicting, of questionable quality or too old. Any stream which would not support its designated uses, even after technology based controls were applied, that stream would be a candidate for listing.

The Program's Phase 1 screening process provides information for making decisions on listing. A broader interagency process, the West Virginia Watershed Management approach, enables diverse stakeholders to collectively decide which streams should be studied more intensively.

The North Branch of the Potomac River Watershed

The Fairfax stone, located where surveyors marked one corner of the original land grant to Thomas, 6th Lord Fairfax, is near one of the springs at the head of the North Branch of the Potomac River. This spring is on the eastern slope of Backbone Mountain in Tucker County, West Virginia, very near the Maryland border. From this spring, the North Branch of the Potomac River flows 97 miles to its confluence with the South Branch of the Potomac, just downstream of Oldtown, Maryland. The North Branch of the Potomac River drains approximately 1,328 square miles in West Virginia.

Oldtown was established as a village around the year 1722 by the Shawnee, Wopeththah (Opessah). It was later the home of Nemacolin, a Lenape who showed colonial Virginians a trail that led from the mouth of Wills Creek over the Great Eastern Divide to the forks of Ohio River (present day Pittsburgh, Pennsylvania).

The Virginia-based Ohio Land Company constructed a trading storehouse at the confluence of Wills Creek and North Branch that served as a fort during the French and Indian War, Pontiac's Uprising, Dunmore's War and the Revolutionary War. Fort Cumberland (named after William, Duke of Cumberland, the second son of George II, King of England) became the town of Cumberland, Maryland, the western terminus of the C&O Canal and later, an important location along the B&O Railroad. The North Branch of the Potomac River Valley became an important travel corridor because it provided a route through a gap in the Allegheny Front escarpment and continued westward deep into the heart of the rugged Allegheny Highlands.

Prior to modern coal production in the upper reach of North Branch of the Potomac River, a primary economic activity was timbering for various wood products. The paper mill at Luke, Maryland was established in 1888 by the Luke family. Historically, the mill has been a major source of environmental damage to North Branch and may even have played a role in the degradation of its migratory fishery. Modern coal mining's acid and metal-laden discharges destroyed the remaining fish that survived the waste discharged into North Branch from the paper mill. By the time the North Branch mainstem became acidic, the anadromous (those that return from the sea to spawn) fallfish and shad fisheries, and the catadromous (those that return to the sea to spawn) eel fisheries were completely destroyed.

The native brook trout, once a dominant fish in the North Branch, was reduced to a few remnant populations in scattered tributaries that did not suffer the onslaught of industrialization. The Stony River subwatershed is a good example of the destruction that modern industries visited upon the North Branch watershed trout fishery. Stony River Reservoir was constructed by Westvaco Corporation to ensure a reliable source of water for running its pulp mill at Luke Maryland. This small reservoir altered the trout fishery of the Stony River headwaters, but probably only insignificantly by preventing fish movement from further down the river into the headwaters. Trout adapted to the impoundment and continued to utilize the small feeder tributaries as breeding zones.

Virginia Electric Power Corporation constructed the Mount Storm Power Plant about 1965. Associated with it were Mount Storm Reservoir and several coal mines. The reservoir provided process water for the coal-fired power plant and the mines provided fuel for the boilers that drove the steam turbines. The creation of this industrial complex completed the near-destruction of the native trout fishery in the Stony River watershed, which had been initiated by impacts from existing mines.

Mount Storm Reservoir

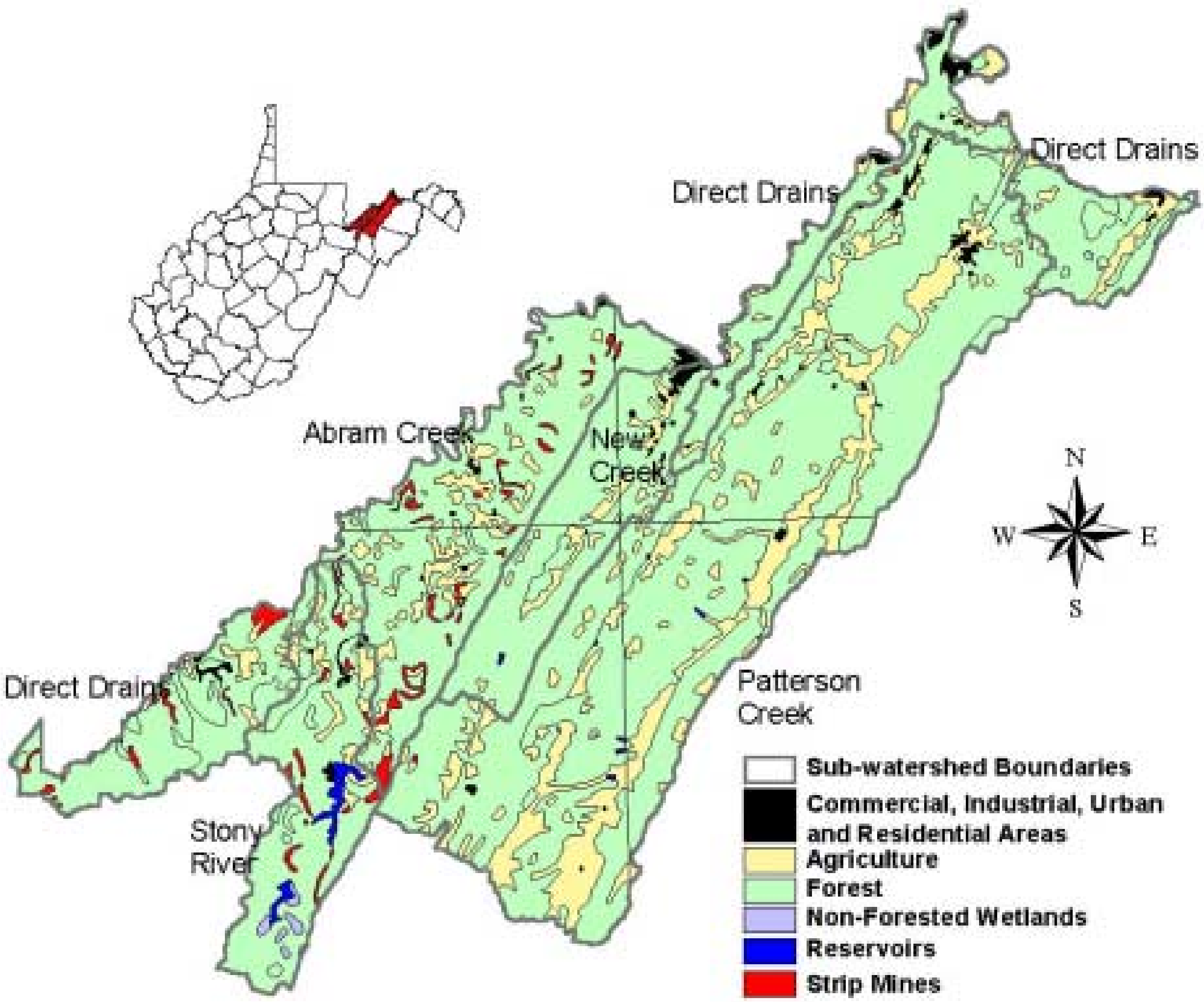
Except for a short segment of the mainstem upstream of Mount Storm Reservoir and a few tributaries, most notably Mill Run (PNB-17-B), the trout fishery has been severely degraded by impoundment, channelization, warm water discharge and mine drainage. Today, improvements in treating process water at the power plant and in eliminating acidic water at some of the mine sites (active and inactive) have allowed Stony River below Mill Run to support a stocked trout fishery, but there is no evidence that trout are breeding in the mainstem.

Another coal-fired power plant exists within the North Branch watershed. This small plant on Little Buffalo Creek is a rare example of a power plant that utilizes coal from reprocessed gob (coal mine waste material). Runoff from a huge gob pile located near this power plant has degraded both Little Buffalo Creek and the portion of Buffalo Creek from its confluence with Little Buffalo Creek to its mouth.

In recent decades, two activities have contributed greatly to improving the water quality of the North Branch mainstem: the construction of Jennings Randolph Reservoir and treatment of mine drainage. The treated mine drainage has replaced much of the formerly acidic, metal-laden water that once seeped into the watershed's streams. The reservoir provides a pollutant settling basin where the still untreated acidic, metal-laden water is transformed into a more suitable biological medium at the discharge chutes. This improvement in water quality is coincidental to the primary purpose for the dam's construction, low-flow augmentation on the lower Potomac River to ensure enough drinking water and pollution dilution for the cities located there.

Improvements in mine drainage have come from several treatment activities. Permitting authorities have allowed surface mining of older mines, while requiring mine operators to cover the acidic overburden. This is intended to prevent further production of acidic water. Researchers have employed a number of neutralization schemes to treat abandoned mine discharges and streams impacted by such discharges. These improvements, while far from solving all of the watershed's environmental problems, have renewed hope that the mainstem North Branch can recover somewhat from past environmental degradation.

Figure 3: Landuse Patterns in the North Branch of the Potomac



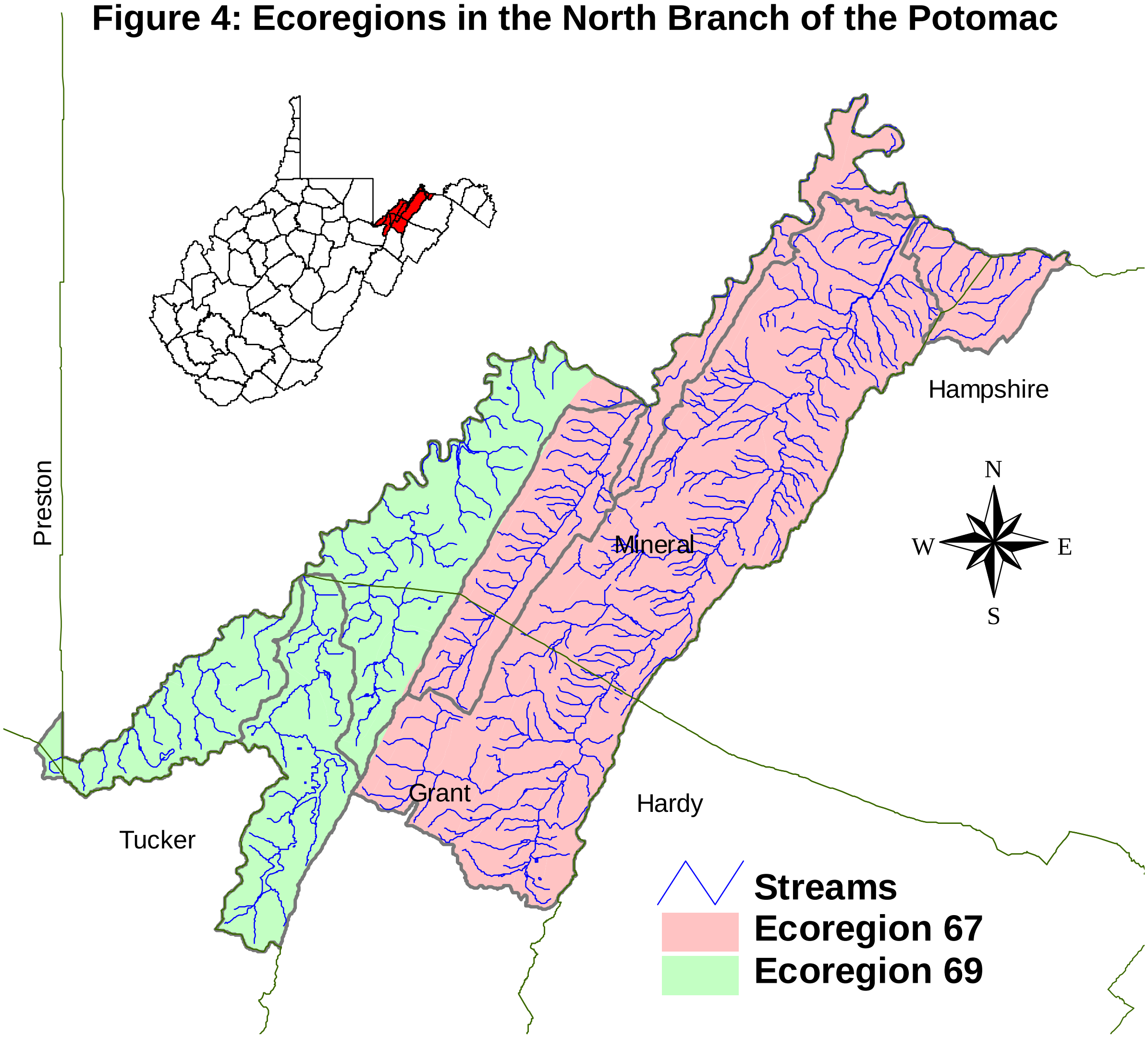
However, the full ecological health of the mainstem will likely never be recovered. There are trade-offs associated with the current water quality improvements. For instance, the application of neutralizing agents to acidic tributaries often have resulted in alkaline conditions and concrete-like precipitates on the substrates in those tributaries. Therefore, some tributaries have remained biologically hostile environments even as the North Branch mainstem has become more biologically productive. The construction of Jennings Randolph Reservoir, while providing for the establishment of a brown trout fishery downstream in the North Branch mainstem, has dashed all hopes of ever reestablishing the native migratory fisheries.

The North Branch of the Potomac River flows through two ecoregions. Approximately 47 miles of the upper portion of the mainstem and its tributaries drain land located in the Allegheny Highlands physiographic province and the Central Appalachians ecoregion (Ecoregion 69). The lower 50 miles drain lands in the Ridge and Valley physiographic province and the Central Appalachians Ridges and Valleys ecoregion (Ecoregion 67).

Stony River below the Mt. Storm Power Station

Short black lines indicate location of beaver dams.

Figure 4: Ecoregions in the North Branch of the Potomac



Ecoregion 67 is characterized by long parallel ridges and valleys underlain by alternating layers of sandstones and shales. There are no coals within this ecoregion. The valleys, gentler slopes and rounded ridge tops of this ecoregion support agricultural pursuits, primarily pasture and hay production, but also some orchard and row-crop production. The upper Patterson Creek subwatershed has become host to numerous poultry production facilities within the last decade. Mostly, these relatively new poultry facilities have been developed as additions to existing livestock farms rather than as new farms. Patterson Creek is home to at least three species of special concern; the mussels *Alasmidonta varicosa* and *Alasmidonta undulata*, and the wood turtle (*Clemmys insculpta*).

Ecoregion 69 is characterized by high, rounded mountains surrounding steep, narrow valleys through which flow mostly high-gradient streams. However, many headwater streams are sluggish as they meander through wet meadows on the uplands. The ecoregion is underlain with numerous coal seams, several of which produce acid drainage when mined.

Stony River is listed on the 1998 303(d) primary waterbody list. The use affected is aquatic life propagation. The primary source of pollutants in Stony River is mine drainage. Un-ionized ammonia and pH are identified as the pollutants affecting 4.69 miles of the river and metals are implicated in affecting 11.87 miles. Thirteen other streams in the North Branch watershed are listed on the 303(d) list of streams impaired by mine drainage. They are Slaughterhouse Run (PNB-10), Montgomery Run (PNB-11), Piney Swamp Run (PNB-12), Abram Creek (PNB-16), Emory Run (PNB-16-A), Glade Run (PNB-16-C), Little Creek (PNB-16-D), Laurel Run (PNB-17-B.5), Fourmile Run (PNB-17-C), Laurel Run (PNB-17-D), Helmick Run (PNB-17-E), Elk Run (PNB-21) and Deakin Run (PNB-22). All are located within Ecoregion 69.

Watershed Assessment Methods

In May of 1989, the U.S. EPA published a document entitled *Rapid Bioassessment Protocols for Use in Streams and Rivers - Benthic Macroinvertebrates and Fish* (Plafkin et al. 1989). The primary purpose of this document was to provide water quality monitoring programs, such as the one used by OWR, with a practical technical reference for conducting cost-effective biological assessments of flowing waters. Originally, the Rapid Bioassessment Protocols (RBP) were considered to be an inexpensive screening tool for determining if a stream was supporting or not supporting a designated aquatic life use. However, the current consensus is that the RBPs can also be applied to other program areas, such as:

- Characterizing the existence and severity of use impairment
- Helping to identify sources and causes of impairments in watershed studies
- Evaluating the effectiveness of control actions
- Supporting use-attainability studies
- Characterizing regional biological components.

The diversity of applications provided by the RBPs was the primary reason the program adopted it for use in assessing watersheds in West Virginia. Specifically, the Program used a slightly modified version of the Rapid Bioassessment Protocol II (RBP II). RBP II involves the collection of field data on ambient biological, chemical, and physical conditions. The following sections summarize the procedures used in assessing the streams in the North Branch of the Potomac River watershed. A more detailed description of the Program's assessment procedures can be found in the Watershed Assessment Program's *Standard Operating Procedures* (Smithson, undated working document). This document is available to interested persons.

Site Selection

There are four ways sites were selected for assessment. Some sites were chosen through a random process developed and promoted by the EPA. Others were selected after consultation with stakeholders who identified streams and stream locations of particular concern due to perceived pollution, inclusion on the current 303(d) list of impaired streams, the presence of rare species, or similar reasons. A few sampling locations were selected because reconnaissance crews or assessment teams identified them as potential reference sites or as sites with potential problems. Finally, some sites were selected simply because they were located on streams that had not been selected for sampling via the other three methods.

Several mainstem North Branch of the Potomac River sites were sampled during this study; however, none were located within the lowermost 52 miles since these waters are under the jurisdiction of the State of Maryland. This resulted in no mainstem sampling within Ecoregion 67. While no mine drainage exists within this lower portion of the watershed, other likely contributors to water quality (e.g., the towns of Cumberland, Maryland and Keyser, West Virginia, and the large tributaries, Savage River and Patterson Creek) discharge into North Branch within Ecoregion 67.

Biological Monitoring - Benthic Macroinvertebrates

Benthic macroinvertebrates are small animals living among the rocks and other material on the bottom of streams, rivers, and lakes. Insects comprise the most diverse class of these animals and include mayflies, stoneflies, caddisflies, beetles, midges, craneflies, dragonflies and others. A benthic community can also have snails, clams, aquatic worms and crayfish. These animals are extremely important in the food web of aquatic environments. They are important players in the processing and cycling of nutrients, and are major food sources for fish and other aquatic animals. In general, a clean stream has a diverse array of benthic organisms that occupy a variety of ecological niches. Polluted streams generally are low in diversity and often are devoid of sensitive species.

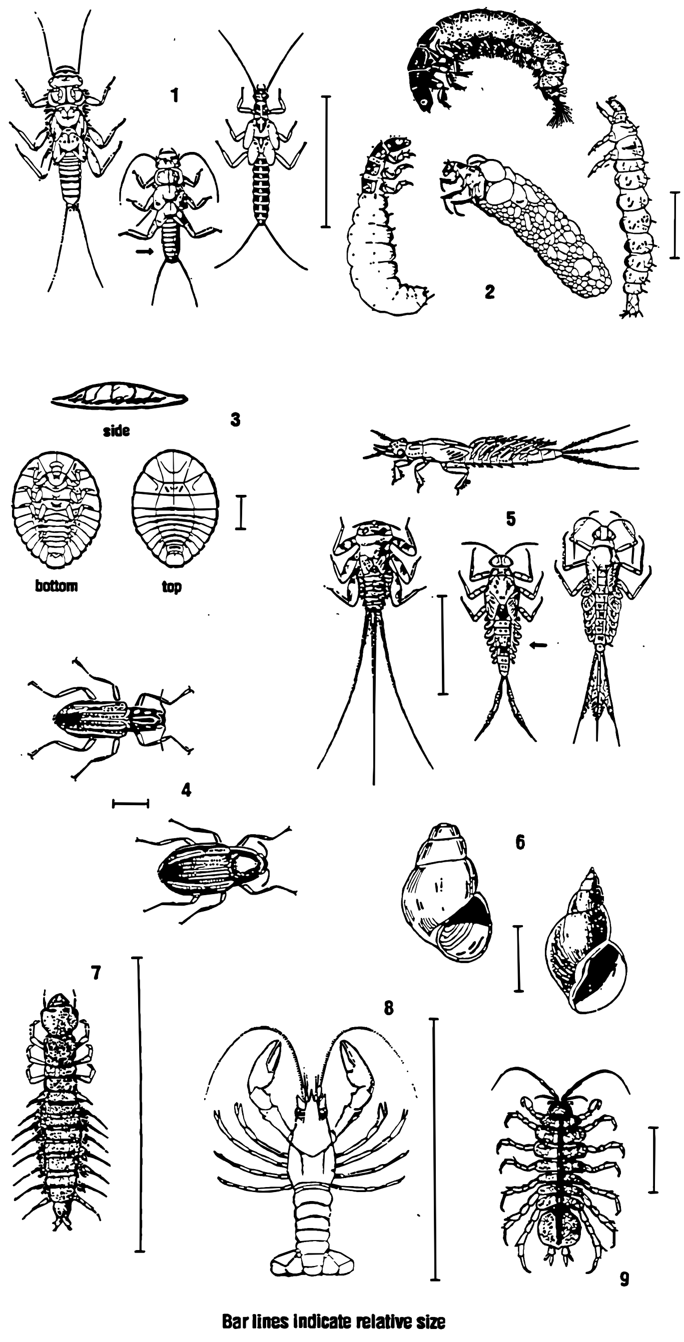
The use of benthic macroinvertebrate data for biological monitoring of streams has persisted over several decades as an integral tool for conducting ecological assessments. There are many federal, state, and private agencies and organizations currently using this group of animals as part of their biological monitoring programs. There are myriad advantages to using benthic macroinvertebrate data. The most recognized benefit is that benthic macroinvertebrate communities reflect overall ecological integrity (i.e., chemical, physical, and biological integrity). They provide a holistic measure of environmental conditions by integrating stresses over time. The public better understands biological indicators (as opposed to chemical conditions) as measures of a healthy environment (Plafkin et al. 1989). Some of the more common benthic macroinvertebrates are illustrated in Figure 5. This two-page document is used to help volunteer stream monitors identify organisms in the field.

Benthic macroinvertebrates can be collected using several techniques. The program utilized EPA's RBP II with some modifications involving the type of sampling devices used to make the collections. The two-man kick net procedure of the original RBP was replaced with a kick net modified for use by one person. In streams having adequate riffle/run habitat, the Program employed a modified kicknet (Surber-on-a-stick) to capture organisms dislodged by kicking the stream bottom substrate and rubbing large rocks and sticks. In riffle/run streams that were too small to accommodate the Surber-on-a-stick, a smaller D-frame net was used to collect dislodged organisms. In both cases approximately 2 square meters of substrate were sampled.

AMD IMPACTED STREAM

Riffle/run streams that did not have enough water to sample with either net were sampled using a procedure called hand picking. This procedure involved picking and washing stream substrate materials into a bucket of water. Field crews hand picked 2 square meters of stream substrate (equivalent to 8 kicks with a Surber-on-a-stick)

Figure 5: Stream Insects and Crustaceans



Stream Insects & Crustaceans

GROUP ONE TAXA

Pollution sensitive organisms found in good quality water.

1 *Stonefly: Order Plecoptera.* 1/2" - 1 1/2", 6 legs with hooked tips, antennae, 2 hair-like tails. Smooth (no gills) on lower half of body. (See arrow.)

2 *Caddisfly: Order Trichoptera.* Up to 1", 6 hooked legs on upper third of body, 2 hooks at back end. May be in a stick, rock or leaf case with its head sticking out. May have fluffy gill tufts on lower half.

3 *Water Penny: Order Coleoptera.* 1/4", flat saucer-shaped body with a raised bump on one side and 6 tiny legs on the other side. Immature beetle. Three views.

4 *Riffle Beetle: Order Coleoptera.* 1/4", oval body covered with tiny hairs, 6 legs, antennae. Walks slowly underwater. Does not swim on surface.

5 *Mayfly: Order Ephemeroptera.* 1/4" - 1", brown, moving, plate-like or feathery gills on sides of lower body (see arrow), 6 large hooked legs, antennae, 2 or 3 long, hair-like tails. Tails may be webbed together.

6 *Gilled Snail: Class Gastropoda.* Shell opening covered by thin plate called operculum. Shell usually opens on right.

7 *Dobsonfly (Hellgrammite): Family Corydalidae.* 3/4" - 4", dark-colored, 6 legs, large pinching jaws, eight pairs feelers on lower half of body with paired cotton-like gill tufts along underside, short antennae, 2 tails and two small hooks hooks at back end.

GROUP TWO TAXA

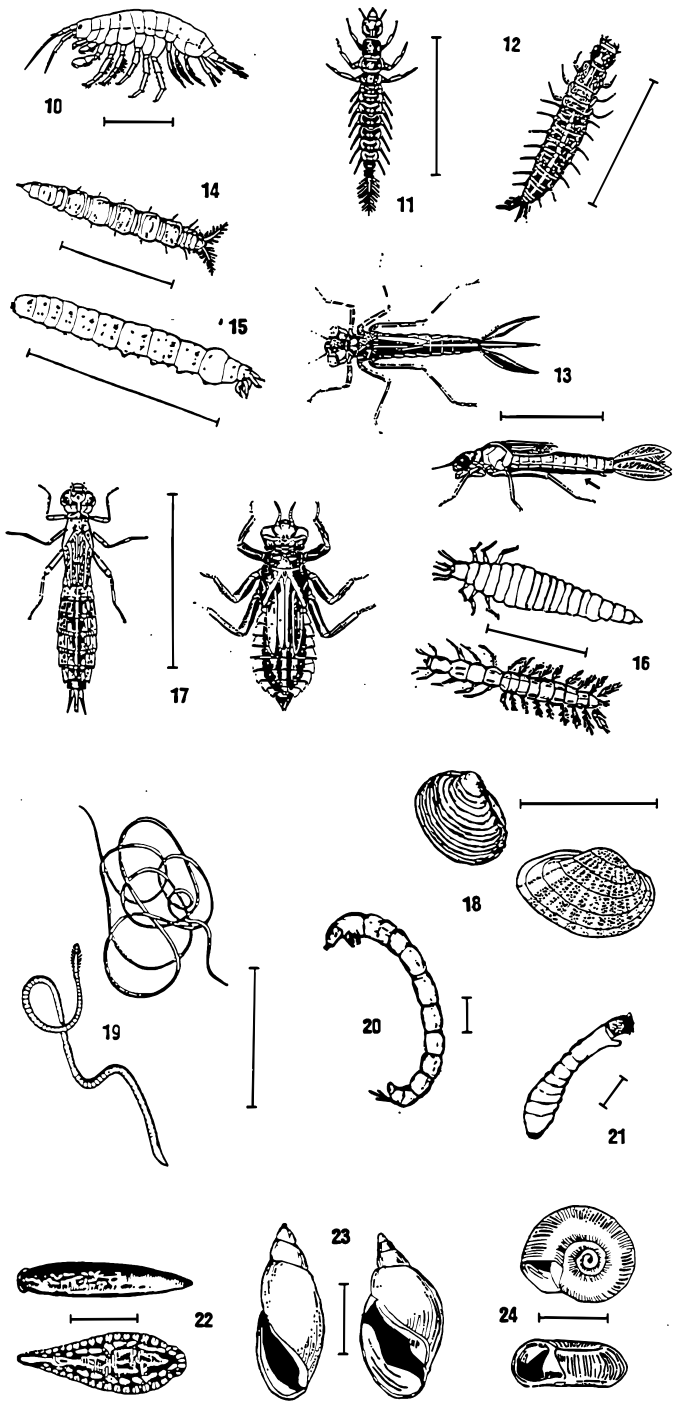
Somewhat pollution tolerant organisms can be in fair quality water.

8 *Crayfish: Order Decapoda.* Up to 6", 2 large claws, 8 legs, resembles small lobster.

9 *Sowbug: Order Isopoda.* 1/4" - 3/4", gray oblong body wider than it is high, more than 6 legs, long antennae.

Save Our Streams

Izaak Walton League of America
1401 Wilson Blvd. Level B
Arlington, VA 22209



Bar lines indicate relative size

GROUP TWO TAXA continued

10 *Scud: Order Amphipoda.* 1/4", white to grey, body higher than it is wide, swims sideways, more than 6 legs, resembles small shrimp.

11 *Alderfly larva: Family Sialidae.* 1" long. Looks like small hellgrammite but has 1 long, thin, branched tail at back end. No gill tufts underneath.

12 *Fishfly larva: Family Corydalidae.* Up to 1 1/2" long. Looks like small hellgrammite but often a lighter reddish-tan color, or with yellowish streaks. No gill tufts underneath.

13 *Damselfly: Suborder Zygoptera.* 1/2" - 1", large eyes, 6 thin hooked legs, 3 broad oar-shaped tails, positioned like a tripod. Smooth (no gills) on sides of lower half of body. (See arrow.)

14 *Watersnipe Fly Larva: Family Athericidae (Atherix).* 1/4" - 1", pale to green, tapered body, many caterpillar-like legs, conical head, feathery "horns" at back end.

15 *Crane Fly: Suborder Nematocera.* 1/3" -2", milky, green, or light brown, plump caterpillar-like segmented body, 4 finger-like lobes at back end.

16 *Beetle Larva: Order Coleoptera.* 1/4" 1", light-colored, 6 legs on upper half of body, feelers, antennae.

17 *Dragon Fly: Suborder Anisoptera.* 1/2" - 2", large eyes, 6 hooked legs. Wide oval to round abdomen.

18 *Clam: Class Bivalvia.*

GROUP THREE TAXA

Pollution tolerant organisms can be in poor quality water.

19 *Aquatic Worm: Class Oligochaeta.* 1/4" - 2", can be very tiny; thin worm- like body.

20 *Midge Fly Larva: Suborder Nematocera.* Up to 1/4", dark head, worm-like segmented body, 2 tiny legs on each side.

21 *Blackfly Larva: Family Simulidae.* Up to 1/4", one end of body wider. Black head, suction pad on end.

22 *Leech: Order Hirudinea.* 1/4" - 2", brown, slimy body, ends with suction pads.

23 *Pouch Snail and Pond Snails: Class Gastropoda.* No operculum. Breathe air. Shell usually opens on left.

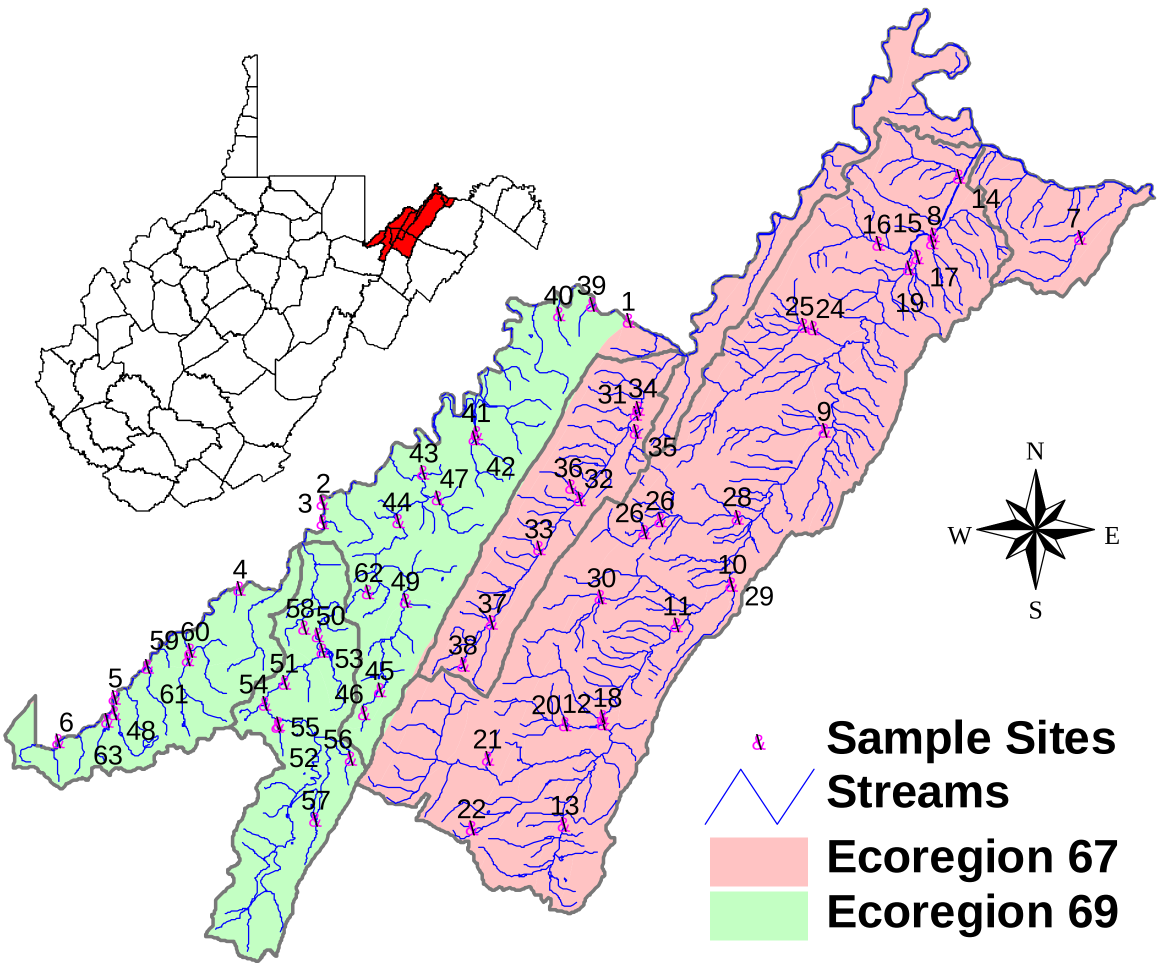
24 *Other snails: Class Gastropoda.* No operculum. Breath air. Snail shell coils in one plane.

The D-frame net was also used to collect macroinvertebrates in slow flowing (glide/pool dominated) streams that did not have riffle/run habitat. Sampling of macroinvertebrates in glide/pool streams was accomplished using a procedure developed for use in sluggish streams along the Mid-Atlantic coast. The sampling procedure is called the Mid-Atlantic Coastal Streams (MACS) technique and consists of sampling a variety of habitats (aquatic plants, woody debris, undercut streambanks, etc) through sweeping and jabbing motions of the net (Maxted 1993).

Benthic macroinvertebrate samples were preserved in alcohol or Formalin and delivered to the Department of Biological Sciences at Marshall University for processing. Processing involved removing a 100-organism subsample from the composite sample following RBP II protocols. The subsample was returned to Program biologists who counted and identified the organisms to family or the lowest level of classification possible. The samples were kept for future reference and for identification to lower taxonomic levels if necessary.

Appropriate biological collection permits were obtained from the Division of Natural Resources (DNR) prior to sampling. Fish specimens inadvertently collected during macroinvertebrate sampling were transferred to Dan Cincotta at the DNR Office in Elkins, West Virginia. Salamanders inadvertently collected were donated to the Marshall University Biological Museum in care of Dr. Tom Pauley.

Figure 6: Sample Sites in the North Branch of the Potomac



Sample Sites Keyed to Figure 6

KEY #	NAME	STREAM CODE	KEY #	NAME	STREAM CODE
1	NORTH BRANCH OF THE POTOMAC RIVER	WVP-20-{052.0}	33	NEW CREEK	WVPNB-07-{10.4}
2	NORTH BRANCH OF THE POTOMAC RIVER	WVP-20-{081.6}	34	BLOCK RUN	WVPNB-07-C
3	NORTH BRANCH OF THE POTOMAC RIVER	WVP-20-{082.6}	35	UNT OF UNT OF NEW CREEK	WVPNB-07-C.4-1-{0.2}
4	NORTH BRANCH OF THE POTOMAC RIVER	WVP-20-{088.9}	36	ASH SPRING RUN	WVPNB-07-F-{0.6}
5	NORTH BRANCH OF THE POTOMAC RIVER	WVP-20-{097.9}	37	LINTON CREEK	WVPNB-07-H
6	NORTH BRANCH OF THE POTOMAC RIVER	WVP-20-{101.8}	38	UNT OF LINTON CREEK	WVPNB-07-H-2-{1.0}
7	GREEN SPRING RUN	WVPNB-01-{4.2}	39	SLAUGHTERHOUSE RUN	WVPNB-10
8	PATTERSON CREEK	WVPNB-04-{04.6}	40	MONTGOMERY RUN	WVPNB-11-{0.8}
9	PATTERSON CREEK	WVPNB-04-{20.2}	41	DEEP RUN	WVPNB-15
10	PATTERSON CREEK	WVPNB-04-{29.7}	42	CRANBERRY RUN	WVPNB-15-A
11	PATTERSON CREEK	WVPNB-04-{33.0}	43	UNT OF ABRAMS CREEK	WVPNB-16-.5A-{0.4}
12	PATTERSON CREEK	WVPNB-04-{39.4}	44	ABRAM CREEK	WVPNB-16-{05.4}
13	PATTERSON CREEK	WVPNB-04-{45.2}	45	ABRAM CREEK	WVPNB-16-{16.8}
14	PLUM RUN	WVPNB-04-A	46	ABRAM CREEK	WVPNB-16-{18.1}
15	PAINTER RUN	WVPNB-04-C	47	EMORY CREEK	WVPNB-16-A-{0.8}
16	HORSESHOE CREEK	WVPNB-04-C.5	48	WYCROFF RUN	WVPNB-16-B
17	LONG PASTURE RUN	WVPNB-04-C-1-A	49	LAUREL RUN	WVPNB-16-B.5
18	ROSSER RUN	WVPNB-04-CC	50	STONY RIVER	WVPNB-17-{06.9}
19	MILL RUN	WVPNB-04-D	51	STONY RIVER	WVPNB-17-{09.6}
20	THORN CREEK	WVPNB-04-DD-{2.0}	52	STONY RIVER	WVPNB-17-{15.6}
21	UNT OF NORTH FORK PATTERSON CREEK	WVPNB-04-EE-7-{0.4}	53	MILL RUN	WVPNB-17-B
22	MIDDLE FORK/PATTERSON CREEK	WVPNB-04-FF	54	LAUREL RUN	WVPNB-17-B.5
23	UNT OF UNT OF MIDDLE FORK / PATTERSON	WVPNB-04-FF-5-A-{0.6}	55	FOURMILE RUN	WVPNB-17-C
24	CABIN RUN	WVPNB-04-J-{1.6}	56	LAUREL RUN	WVPNB-17-D
25	PARGUT RUN	WVPNB-04-J-1	57	HEMLICK RUN	WVPNB-17-E
26	MILLL CREEK	WVPNB-04-S-{04.7}	58	DIFFICULT CREEK	WVPNB-18
27	MILL CREEK	WVPNB-04-S-{5.6}	59	BUFFALO CREEK	WVPNB-19-{1.4}
28	SUGAR RUN	WVPNB-04-S-1	60	LITTLE BUFFALO CREEK	WVPNB-19-A
29	ELLIBER RUN	WVPNB-04-V	61	RED OAK CREEK	WVPNB-20
30	WHIP RUN	WVPNB-04-W-3	62	ELK RUN	WVPNB-21
31	NEW CREEK	WVPNB-07-{03.8}	63	DEAKIN RUN	WVPNB-22
32	NEW CREEK	WVPNB-07-{08.4}			

The Program's primary goal in collecting macroinvertebrate data was to determine the biological condition of the selected stream assessment sites in the North Branch of the Potomac River watershed. Determining the biological condition of each site involved calculating and summarizing five-community metrics using the benthic macroinvertebrate data. The following benthic community metrics were calculated for each assessment site:

1. *Taxa richness* - measures the total number of macroinvertebrate taxa (diversity or different kinds) collected in the sample. In general, taxa richness increases with improving water quality.
2. *EPT index* - measures the total number of distinct taxa within the generally pollution sensitive groups Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies). In general, the EPT index increases with improving water quality.
3. *HBI* (Hilsenhoff's Biotic Index - modified) - summarizes tolerances of the benthic community to organic pollution. Tolerance values range from 0 to 10 and generally decrease with improving water quality.
4. *Percent contribution of dominant taxon* - measures the relative dominance of a particular taxon to the total number of organisms in the sample (community balance). Domination by one or a few taxa may indicate environmental stress.
5. *Number of intolerant taxa* - measures the total number of distinct taxa that are known to be generally sensitive to various pollutant sources. In general, increases with improving water quality.

In order to determine biological condition, the five calculated metrics from each sample station were compared to metric values derived from a set of reference stations located in the same region and sampled during the same time frame. Reference stations are characterized by stream segments that are least impaired by human activities. They can be used to define attainable biological and habitat conditions. The term "reference condition" is used to describe the biological characteristics of reference stations in this report.

Reference stations were established by comparing the habitat and physico-chemical data of each assessment site to a list of minimum degradation criteria or reference site criteria. Assessment sites that met all of the minimum criteria were given reference station status. The degradation criteria were developed based on the assumption that they provide a reasonable approximation of least disturbed conditions, and therefore accurately describe reference conditions.

<u>Reference Condition</u> – Reference conditions describe the characteristics of waterbody segments least impaired by human activities and are used to define attainable biological and habitat conditions. Final selection of reference sites depends on a determination of minimal disturbance, which is derived from physico-chemical and habitat data collected during the assessment of the stream sites.

A site must meet least disturbed criteria established by the Program before it is given reference site status. In general, the following parameters are examined: dissolved oxygen, pH, conductivity, fecal coliform bacteria, violations of water quality standards, nonpoint sources of pollution, benthic substrate, channel alteration, sediment deposition, streambank vegetation, riparian vegetation, overall habitat condition, human disturbances, point sources of pollution. The information from the sites that meet the defined criteria is used to establish a reference condition for the watershed or ecoregion.

Benthic macroinvertebrate data from each assessment site can then be compared to the reference condition to produce a biological condition score for each site.

The first step in selecting reference sites for watershed or ecoregion studies, candidate streams are selected from maps and evaluated using existing information on water quality and personal experience. The level of human disturbance is evaluated and a number of relatively undisturbed sites are selected from the candidate sites. After these sites have been assessed, those meeting the minimum degradation criteria are chosen as reference sites.

The North Branch of the Potomac Watershed did not have sufficient sites within the watershed to establish a reference condition. Additional sites were used from Ecoregions 67 and 69 in the adjoining Cheat River Watershed. The following sites were used to determine the reference conditions for the North Branch of the Potomac study.

Table 1: Sites Used To Determine Reference Conditions

ECOREGION 69			ECOREGION 67	
Difficult Creek	PNB-18		UNT of North Fork of Patterson Creek	PNB-4-EE7-{0.4}
Glade Run/Mill Creek	MT-64-C			
Marsh Fork	MTB-31-J		Little Laurel Run	MCS-12 (DUP1)
Birch Fork/Schoolcraft Run	MTM-25-A		Little Laurel Run	MCS-12 (DUP 2)
Rocky Run	MTM-26-B		Roaring Run/Minear Run	MC-52-A
Schoolcraft Run	MTM-25-{1.5}		Hog Run/Panther Camp Run	MC-60-K-2-A
Right Fork	MTM-11-{7.6}		Swallow Rock Run	MC-60-T-3
Jenks Fork	MTM-11-E		Maxwell Run	MC-54-C
Hanging Run	MTM-1		Mike Run	MC-54-A
Bear Camp Run	MTB-32-D		Laurel Run	MCS-8
Mill Creek	MT-64-{6.7}			
Right Fork/Buckhannon River	MTB-31			

The distribution of benthic metric values of the reference sites was used to determine the scoring criteria for each metric. The lower quartile of three metric values (taxa richness, EPT taxa and number of intolerant taxa) of the reference sites was used to establish the lower threshold for receiving an optimal score for each metric. The upper quartile was used to determine the scoring threshold for HBI and percent dominant taxon which have values that go up with increasing perturbation. The mid-point between these scores and zero (or the worst score from all sites for HBI and percent dominant taxon) was the lower threshold for the intermediate score. Each site was scored for each metric following a comparison to the threshold values established by the range of values of the reference sites. The sum of the scores of the 5 metrics provided a single index value for each site. This value was adjusted to a scale of 100 and is referred to as the biological condition score or bioscore.

For the purposes of this report, an assessment site receiving a bioscore of less than 50 was considered biologically impaired and in need of further investigation and corrective action.

In previous watershed reports, the program classified benthic data based on stream width. Historic information has shown that aquatic communities in small streams are not comparable to those of large streams. The reasons for this fact are numerous, but collectively they can be identified as differences in number and character of ecological niches among various stream sizes. However, recent research has indicated that similar habitats in wadeable streams of orders I to III (Stribling et al. 1993) and in streams draining less than 500 square miles (PA DEP 1997) may be combined for analysis. In other words, a riffle in a small stream is likely to support a benthic community similar to a riffle in a large stream as long as other factors, including water quality, are similar. The individual taxa may differ, but the community metrics will be generally comparable. Also, the number of individuals may be greater per unit area in larger streams, but the 100-organism subsampling procedure utilized in this study equalizes this parameter.

Nearly 85% (52 of 61) of the stream sites assessed in the North Branch of the Potomac River watershed with benthic samples collected had stream widths of 10 meters or less. Consequently, the program did not classify assessment sites based on stream width.

Biological Monitoring - Fecal Coliform Bacteria

Released to the environment in feces, disease-causing organisms may accompany fecal coliform bacteria. Thus, the presence of fecal coliform bacteria in a water sample indicates the potential presence of human pathogens.

A fecal coliform bacteria sample was collected at each assessment site. U.S. EPA sampling guidelines limit the field holding time for such samples to 6 hours. Due to the distance to laboratories, personnel limitations and time constraints, 24 hours was the limit utilized during this sampling effort. All bacteria samples were packed in wet ice until delivered to the laboratory for analysis.

During this study, some laboratories tended to round result values before reporting them. Therefore, the reader should keep in mind that many of the values presented are approximate, not actual values obtained from analyses. This is especially true of the bacteria values obtained from the City of Keyser's laboratory.

Physico-Chemical Sampling

Physico-chemical samples were collected at most sites to help determine what types of stressors, if any, were impacting the benthic macroinvertebrate community. They were also helpful in providing clues about the sources of stressors.

Several parameters were measured at all sites. Temperature (°C), dissolved oxygen (mg/l), pH (Standard Units), and conductivity (μmhos/cm)-were measured in the field with a Hydrolab™ Scout™ and Multiprobe™ assembly. The manufacturer's calibration guidelines were followed with minimal variation except that the instruments were generally not calibrated at the end of each sampling day. Samples were collected at each site for analysis for specific constituents.

In areas where mine drainage was present, assessment teams collected water samples for the analysis of aluminum (mg/l), iron (mg/l), manganese (mg/l), hot acidity (mg/L), alkalinity (mg/L), and sulfate (mg/L). Water samples were collected in conjunction with the habitat assessment and benthic macroinvertebrate sampling.

Assessment teams were instructed to collect water samples for the analysis of nitrite + nitrate, total phosphorus and ammonia if they suspected the stream to have elevated levels of nutrients.

Because of the value of data from the random sites, additional parameters were measured from these 33 sites. The random parameters include temperature, pH, conductivity, dissolved oxygen, the nutrient parameters, chlorides, sulfates, hot acidity, alkalinity, suspended solids, and several metals including aluminum (total and dissolved), calcium (total and dissolved), manganese, iron, copper, magnesium and zinc. Table 2 summarizes the analytical methods, minimum detection limits, and holding times for all of the parameters analyzed.

Assessment teams measured flow (cfs) if a stream was listed on the 303(d) list for severe impairment or if field readings indicated that there was mine drainage impacting the stream. A current meter was used across a stream transect and the discharge was calculated with the sum-of-partial-discharges method.

Table 2: Water Quality Parameters			
All numbered references to analytical methods are from <u>EPA: Methods for Chemical Analysis of Water and Wastes; March 1983</u> unless otherwise noted.			
Parameter	Minimum Detection Limit or Instrument Accuracy	Analytical Method	Maximum Holding Time
Acidity	1 mg/l	305.1	14 days
Alkalinity	1 mg/l	310.1	14 days
Sulfate	50 mg/l	375.4	28 days
Iron	.050 mg/l	200.7	6 months
Aluminum	.050 mg/l	200.7	6 months
Manganese	.020 mg/l	200.7	6 months
Fecal Coliform Bacteria	Not Applicable	9222 D[1]	24 hours[2]
Conductance	1% of range[3]	Hydrolab™	Instant
PH	± 0.2 units[3]	Hydrolab™	Instant
Temperature	± 0.15 C[3]	Hydrolab™	Instant
Dissolved Oxygen	± 0.2 mg/l[3]	Hydrolab™	Instant
Total Phosphorus	0.02 mg/l	4500-PE[1]	28 days
Nitrite+Nitrate-N	0.5 mg/l	353.3	28 days
Ammonia-N	0.5 mg/l	350.2	28 days
Unionized Amm-N	0.5 mg/l	350.2	28 days
Suspended Solids	5 mg/l	160.2	28 days
Chloride	1 mg/l	325.2	28 days

[1] Standard Methods For The Examination Of Water And Wastewater, 18th Edition, 1992.
[2] U. S. EPA guidelines limit the holding time for these samples to 6 hours. Due to laboratory location, personnel limitations and time constraints, 24 hours was the limit utilized during this sampling effort.
[3] Explanations of and variations in these accuracies are noted in Hydrolab Corporation's Reporter TM Water Quality Multiprobe Operating Manual, May 1995, Application Note #109.

The collection, handling, and analysis of water samples generally followed procedures approved by the U.S. EPA. Field blanks for water sample constituents were prepared on a regular basis by each assessment team. The primary purpose of this procedure was to check for contamination of preservatives, containers, and sample water during sampling and transporting. A secondary purpose was to check the precision of analytical procedures.

Habitat Assessment

An eight page Stream Assessment Form was filled out at each site. A 100 meter section of stream and the land in its immediate vicinity were qualitatively evaluated for instream and streamside habitat conditions. The assessment team recorded the location of each site, utilizing GPS when possible, and provided detailed directions so future researchers may return to the same site. A map was sketched to aid in locating each site. The team recorded stream measurements, erosion potential, possible nonpoint source pollution, periphyton and algae abundance, and any anthropogenic activities and disturbances. They also recorded observations about the substrate, water and riparian zone.

An important part of each stream assessment was the completion of a two page Rapid Habitat Assessment (from EPA's EMAP-SW, Klemm and Lazorchak, 1994), which provided a numerical score of the habitat conditions most likely to affect aquatic life. The information from this section provided insight into what macroinvertebrate taxa may be present or expected to be present at the sample site. It also provided information on any physical impairments to the stream habitat that were encountered during the assessment. The following 12 parameters were evaluated:

- Instream cover (fish)
- Benthic substrate
- Embeddedness
- Velocity/Depth regimes
- Channel alteration
- Sediment deposition
- Riffle frequency

- Channel flow status
- Bank condition
- Bank vegetative protection
- Bank disruptive pressure (grazing), and
- Riparian vegetation zone width.

Each parameter was given a score ranging from 0 to 20. The following descriptive categories were used to rate each parameter:

Table 3: Scoring for Rapid Habitat Assessment Parameters	
Optimal (score 16-20)	Habitat quality meets natural expectations.
Suboptimal (score 11-15)	Habitat quality is less than desirable but satisfies expectations in most areas.
Marginal (score 6-10)	Habitat quality has a moderate level of degradation; severe degradation at frequent intervals of area.
Poor (score 0-5):	Habitat substantially altered; severe degradation.

The 12 individual scores for each parameter were summed (maximum possible = 240) and this number provided the final habitat condition score for each assessment site. The habitat condition score and biological condition score for each site was plotted on an XY graph (see box on page 38) to simplify interpretation of the results.

Findings - Benthic Macroinvertebrates

The data analysis procedure used in this report integrates several community and population measures into a single evaluation of biological condition. Each metric measures a different component of community structure and has a different range of sensitivity to pollution stress. This integrated approach provides greater assurance that a valid assessment has been achieved because a variety of parameters are evaluated.

The scope of this watershed assessment was extensive (i.e., large quantities of benthic data collected) and thus presented some difficulties in interpreting the results. In order to facilitate and simplify discussion of the benthic data, the assessment sites were categorized by ecoregion and all sites within an ecoregion were lumped together regardless of the reason for selection.

Currently, the use of ecoregions as a means of classifying streams is widely accepted. This is based on the prediction that natural biological differences exist between two ecoregions as a result of differences in land use, soil conditions, vegetation type, stream morphology, climate, elevation and underlying geology. In order to comply with this prediction, reference conditions were established for each ecoregion in the watershed.

There are 151 named streams in the North Branch of the Potomac River watershed. Of these, 44 (approximately 29%) were visited during this study. Only 5 unnamed tributaries were visited. Some streams were visited at more than one site, making the total number of sites visited 66. Of these 66 sites, 61 were sampled for benthic macroinvertebrates using the methodology discussed above. Five samples were non-comparable because of variations in sampling techniques. For the purposes of this report, comparable means collected from similar habitat, from equal sampling area, using similar sampling devices and techniques. The North Branch at mile point 52.0 (WVP-20-{52.0}) was considered too large to compare the benthic community with the other 60 sites. Four additional sites were not comparable because the MACS sampling procedure was used instead of the riffle/run procedure. Only 56 sites could be compared on the habitat/bioscore graph. These were further divided into the two ecoregions, giving 27 comparable sites in Ecoregion 67 and 29 comparable sites in Ecoregion 69.

SAMPLING SITE SUMMARY	
Named Streams	151
Sites Visited	66
Named Streams Visited	44
Unnamed Streams Visited	5
Comparable Sites	56
Non-comparable sites	10

Although the collection of benthic macroinvertebrates is an important component of the Program's protocol for assessing streams, there are numerous circumstances that could prevent assessment teams from collecting samples at all stations. Assessment teams did not collect benthic samples of any type at only 1 of the 66 sites sampled. Montgomery Run (PNB-11-{0.8}) was to be sampled for benthic macroinvertebrates, but when no organisms were found in the net after the first kick, the sampling team decided not to complete the sample. The stream at this site appeared to be impacted by mine drainage.

Of the 13 stream segments listed on the 1998 303(d) list of mine drainage-impaired streams, all but 3 were sampled during this study. Those three streams are Piney Swamp Run (PNB-12), Glade Run (PNB-16-C) and Little Creek (PNB-16-D). Other streams underlain by potentially acid-producing coal seams, but not evaluated during this study, are Thunder Hill Run (PNB-8), Powder House Run (PNB-9), Lynnwood Run (PNB-13) and Howell Run (PNB-14).

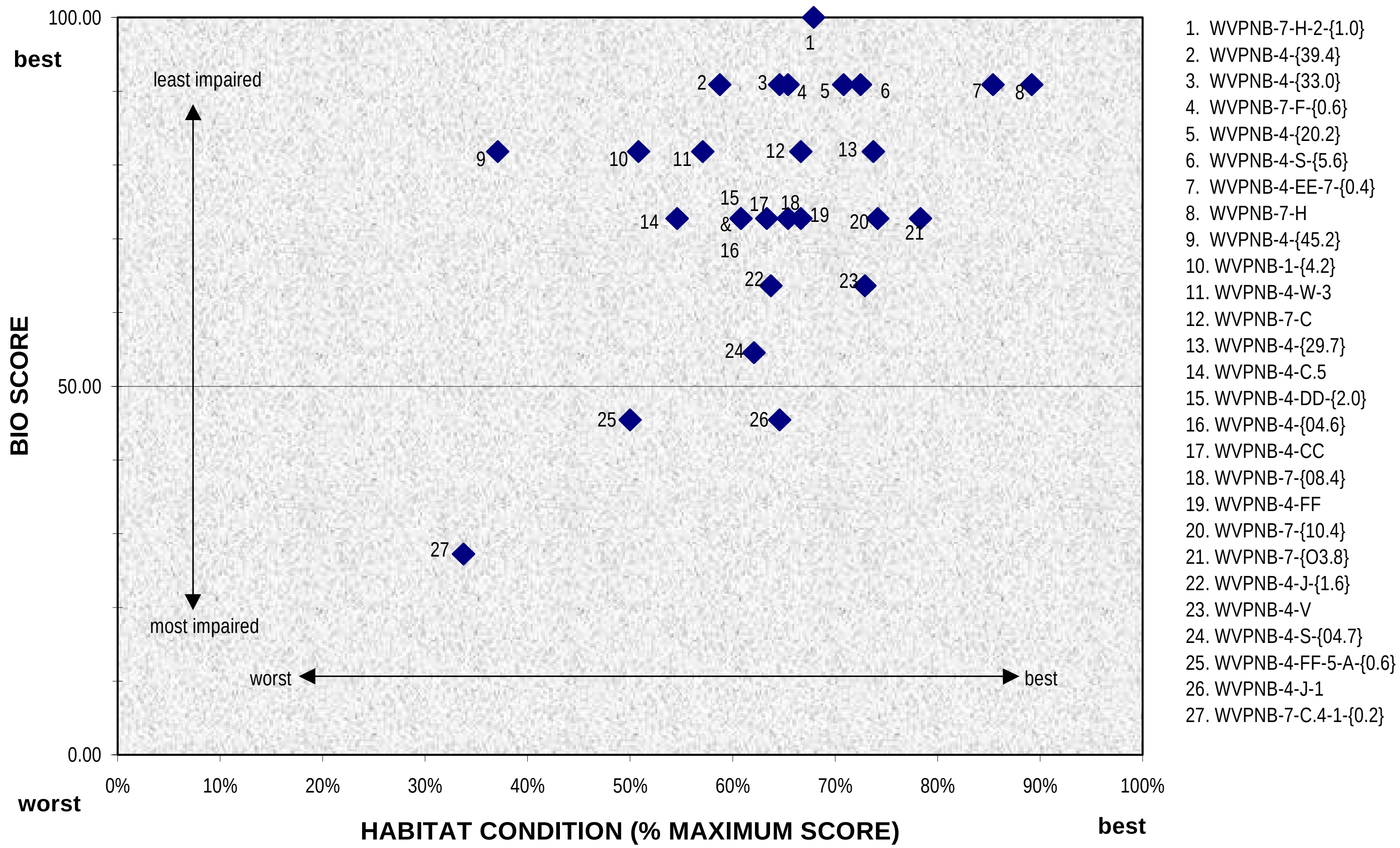
Duplication of effort was deliberate at 3 sites (Cranberry Run, Wyckoff Run, and Elk Run). Team personnel switched roles after all assessment procedures had been performed once and then carried them out again. This exercise was designed to help evaluate the degree of consistency in assessment techniques between different personnel. Both are listed in the tables, but only the first sample obtained was used in generating the metrics and bioscore.

The number of distinct taxa identified from all samples in the watershed was 76. Ecoregion 67 produced 65 taxa and Ecoregion 69 produced 59 taxa (Table 24). Generally, the watershed as a whole displayed good benthic diversity with several pollution sensitive taxa being well represented. The most frequently encountered taxon was the midge family Chironomidae. This family was collected at 58 sites, followed by the caddisfly family Hydropsychidae (56 sites). Nine taxa had only one organism found. A list of the benthic macroinvertebrates collected at each assessment site is presented in Table 23 of Appendix A.

INTERPRETING XY GRAPHS

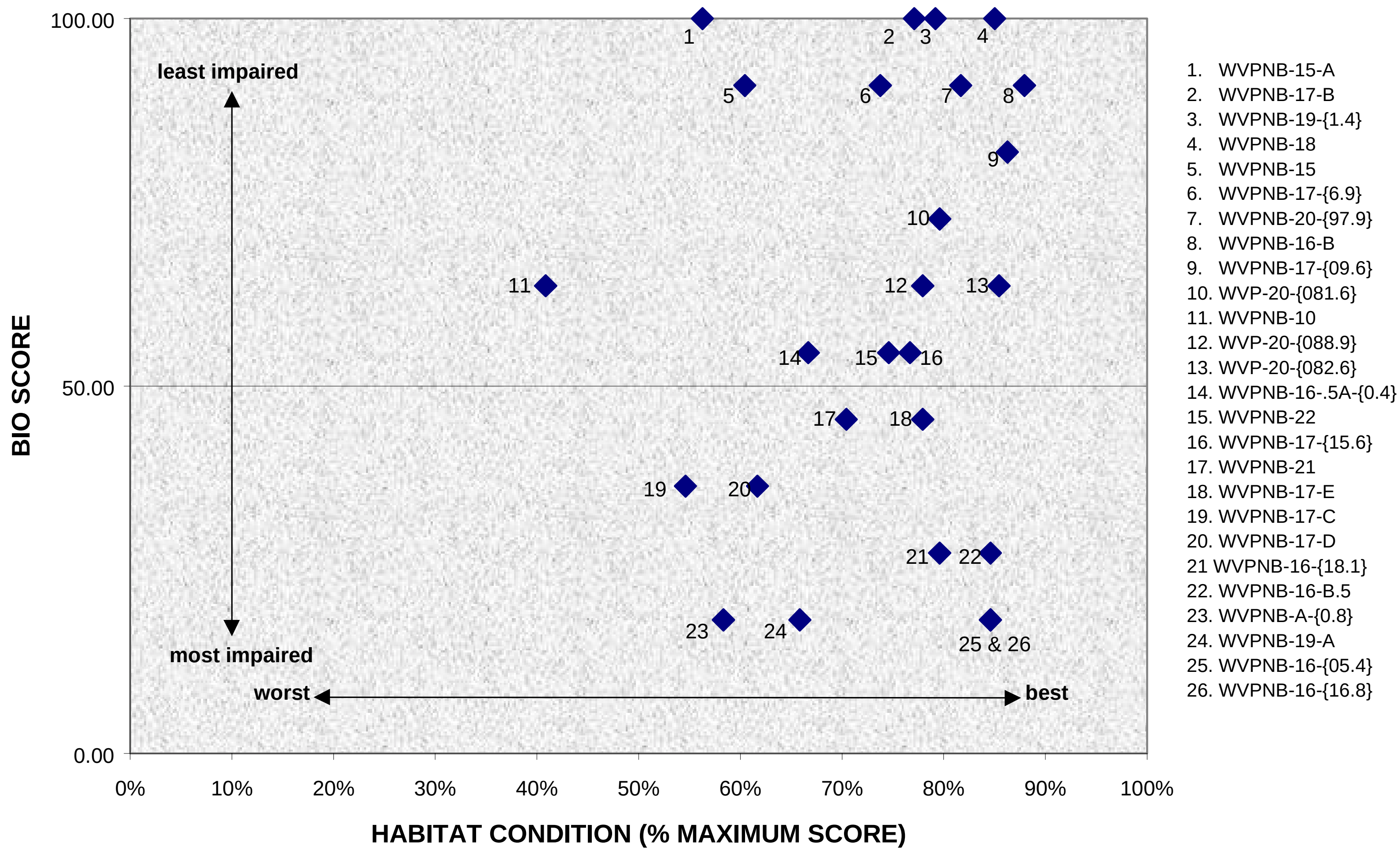
A point on an XY Graph represents two numbers, one for the biological condition score on the Y axis (vertical axis or side axis), and one on the X axis (horizontal axis or bottom axis) for the habitat condition score. The upper right-hand section of the graph is the ideal situation where optimal habitat quality and biological condition exist. The upper left-hand corner of the graph is where optimal biological condition is generally not possible due to severely degraded habitat.

The lower left-hand portion of the graph is where habitat quality is poor and further degradation may result in relatively little difference in biological condition. The lower right-hand corner of the graph is often considered the most important since this is where degraded biological condition can be attributed to something other than habitat quality (i.e., chemical pollutants). (Adopted from Barbour et al. 1997)



See Table 4(A) in Appendix A for Stream Names

Figure 7: Biological and Habitat Summary – Ecoregion 67



See Table 4(B) in Appendix A for Stream Names

Figure 8: Biological and Habitat Summary – Ecoregion 69

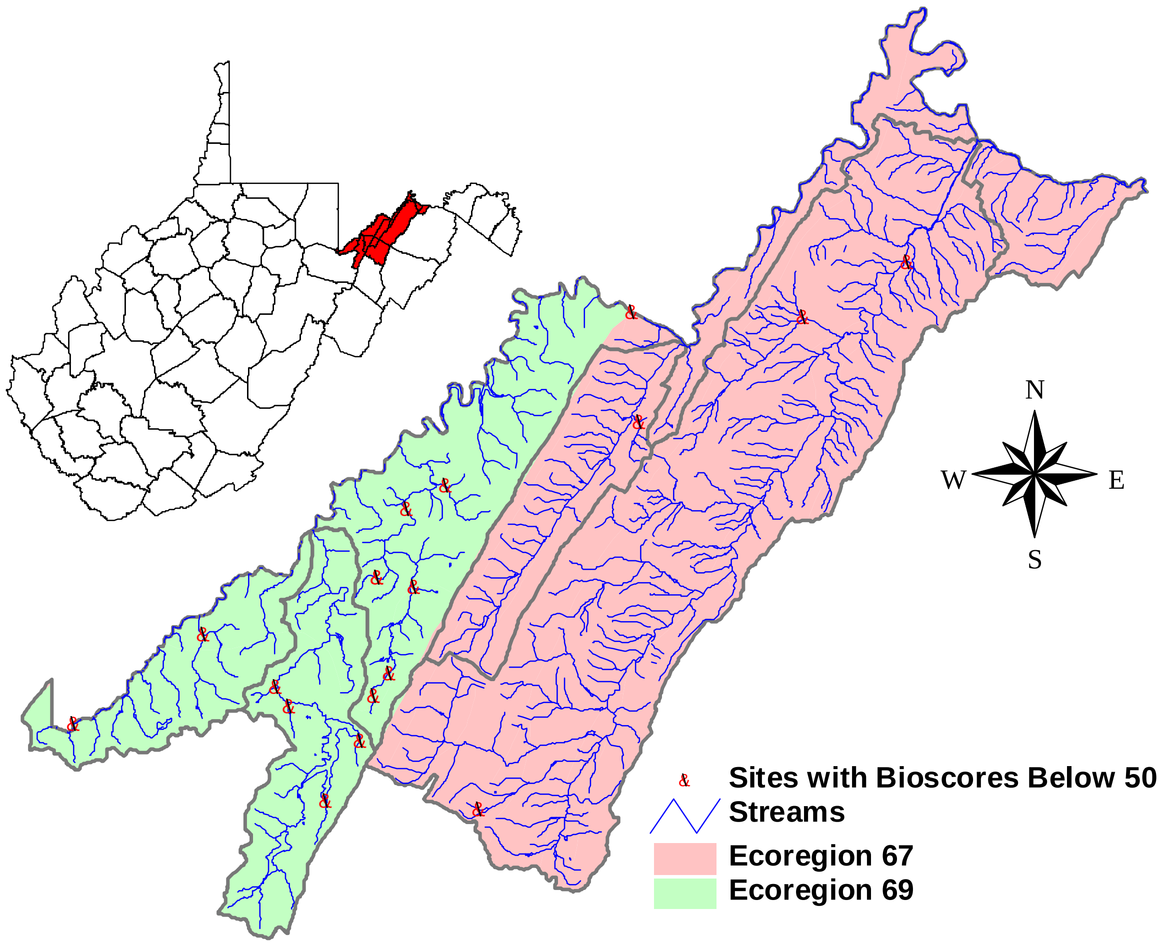
The habitat score and bioscore for each benthic sample site are graphically presented in Figures 7 and 8. The Program used these XY graphs as a means of summarizing the relationship between biological condition and habitat condition.

A total of 56 assessment sites with comparable benthic samples (27 sites for Ecoregion 67, and 29 sites for Ecoregion 69) are presented on the two graphs. For the purposes of this report, an assessment site receiving a biological condition score of less than 50 was considered biologically impaired and in need of further investigation and corrective action. Sites with bioscores less than 50 are depicted in Figure 9.

Figure 7 shows that in Ecoregion 67 only 3 of 27 (approximately 11%) comparable benthic samples received a bioscore of less than 50. However, Figure 8 indicates a much higher percentage of sites (approximately 41% or 12 of 29) in Ecoregion 69 scored below 50.

Of the 61 samples processed, most (approximately 84%) produced no scuds (Family Gammaridae) in their subsamples and only 6 (approximately 10%) produced more than 1. The notable exception to this paucity of scuds was from the subsample of an unnamed tributary of an unnamed tributary of New Creek (PNB-7-C.4-1-{0.2}), which produced 341 scuds. The next highest number from any of the sites was 34 from an unnamed tributary of Abram Creek (PNB-16-.5A-{0.4}). This overabundance of scuds is often an indicator of high organic content and high buffering capacity. This site had a manure smell and a fecal coliform bacteria concentration of 8,000. It also had a higher than normal alkalinity and calcium concentrations, which sometimes are correlated with high abundance of scuds.

Figure 9: Sites with Bioscores less than 50



Ecoregion 67 Comparable Sites

One site in Ecoregion 67 scored nearly 100% on the biological scale. The unnamed tributary of Linton Creek (PNB-7-H-2-{1.0}) had 16 taxa with hydropsychid caddisflies predominating. Linton Creek (PNB-7-H), an unnamed tributary of North Fork of Patterson Creek (PNB-4-EE-7- {0.4}), Mill Creek (PNB-4-S-{ 5.6}), Patterson Creek at Headsville (PNB-4-{20.2}), Ash Spring Run (PNB-7-F-

{0.6}), Patterson Creek at William Banes farm (PNB-4-{33.0}) and Patterson Creek near Williamsport (PNB-4-{39.4}) all had bioscores of 90.9%, but their habitat scores varied widely, scoring between 141 and 205 (see Table 17).

The 3 sites that scored below 50% on the biological scale are an unnamed tributary of an unnamed tributary of Middle Fork of Patterson Creek (PNB-4-FF-5-A-{0.6}), Pargut Run (PNB-4-J-1) and an unnamed tributary of an unnamed tributary of New Creek (PNB-7-C.4-1-{0.2}).

Ecoregion 69 Comparable Sites

It should be noted that several of the Ecoregion 69 sites with bioscores below 50 produced samples with less than 50 organisms each. Further discussion of these low organism numbers and their implications for comparative interpretation are found in the *Explanation Of Findings* section.

The sites with bioscores below 50 are Elk Run (PNB-21) [27.37 and 45.45], Fourmile Run (PNB-17-C) [36.36], Laurel Runs (PNB-17-D) [36.36] and Laurel Run (PNB-16-B.5) [27.27], Helmick Run (PNB-17-E) [45.5], Emory Creek (PNB-16-A-{0.8}) [18.18], Little Buffalo Creek (PNB-19-A) [18.18] and three sites on Abram Creek (PNB-16-{05.4} [18.18], PNB-16-{16.8} [18.18] and PNB-16-{18.1}) [27.27]).

Mill Run (PNB-17-B), Buffalo Creek (PNB-19-{1.4}), Cranbery Run (PNB-15-A) and Difficult Creek (PNB-18) (one of the reference condition sites) each had a bioscore of 100.

Noncomparable Sites

Comparing benthic data obtained using different sampling techniques is not appropriate within the Program's current analysis procedure. Therefore, streams lacking riffle/run habitat for kick sampling must be analyzed separately.

The majority of the streams sampled were of the riffle/run type. As a result, reference conditions were developed for this habitat type. Assessment sites with glide/pool habitat were not frequently encountered during the study. Therefore, a reference condition for glide/pool habitat streams was not established and bioscores were not calculated. In general, the biological condition of these streams is determined using best professional judgement after carefully considering biological, physico-chemical and habitat data.

In Ecoregion 67, only 1 site was sampled in a manner not comparable with either kick sampling or MACS techniques. Mill Run (PNB-4-D) had very little flow, so the team handpicked 20 cobbles into a bucket in order to get benthic specimens. Only 6 taxa were represented in the sample and only 2 of those were EPT taxa. Pollution tolerant Chironomidae (midges) dominated the sample (80 out of 98 organisms).

In Ecoregion 69, five benthic samples were deemed noncomparable with the others. Four were collected using noncomparable techniques. The other was collected from a site (North Branch of the Potomac at mile point 52.0) where the stream size was considered too large to be compared to the other sites. Of the 4 samples collected using non-comparable techniques, 3 were collected by handpicking organisms off substrate material and 1 was collected using the MACS protocol.

Laurel Run of Stony River below Mount Storm Reservoir (PNB-17-B.5) had very little water in it. It could not be sampled via the standard kick net sampling method, so approximately 42 rocks were hand-picked and only 2 D-net kicks could be made. Only 55 organisms were collected. Nonetheless, the total diversity was higher than might be expected (10 taxa), given the poor water quality (pH = 3.5, acidity = 20 mg/l and no alkalinity detected).

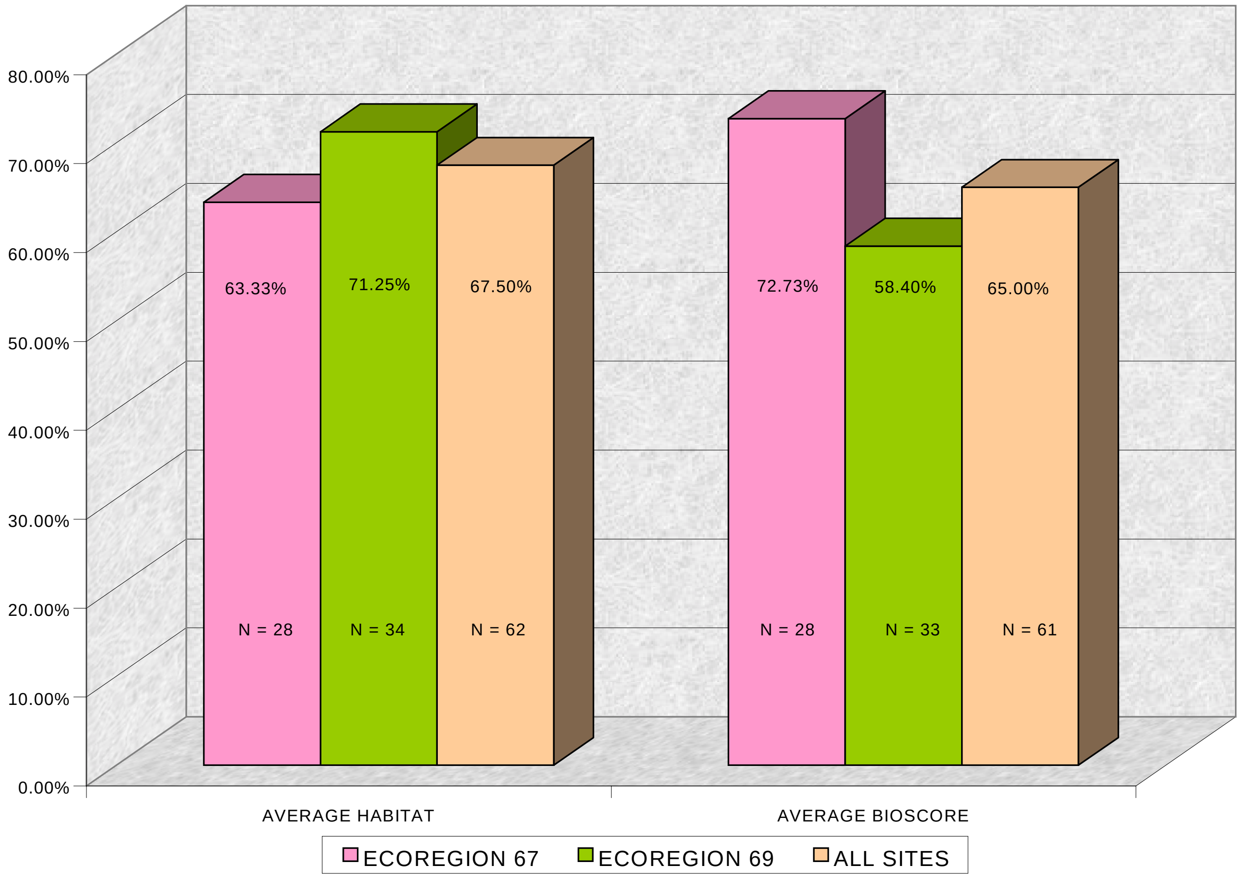
Red Oak Creek (PNB-20) was very low when visited. A standard kick net sampling procedure could not be used, so approximately 40 rocks were selected and rubbed into a bucket, and aquatic moss was torn apart and rinsed in the bucket. Of the 6 taxa collected, 5 fell within the EPT category. Only 1 midge was collected in the sample which consisted of only 34 organisms.

North Branch of the Potomac River near its headwater (P-20-{101.8}) was sampled using the MACS technique. The stream at this site was relatively small and very slow moving as it meandered through shrubby, moist meadows. There were 12 taxa represented in the sample dominated by Baetidae mayflies and Chironomidae midges.

North Branch of the Potomac River downstream of Westernport, Maryland (P-20-{52.0}) was too large to be comparable to the other kick-sampled sites. Only 7 taxa were represented in the sample with pollution tolerant Chironomidae (midges) making up approximately 74% of the total organism count and tolerant Hydropsychidae (caddisflies) making up approximately 16% of the total.

A discussion of the biologically impaired streams is presented in the *Explanation of Findings* section below. All data can be found in Appendix A.

Figure 10: Average Bioscores and Habitat Scores by Ecoregion



The number of comparable sites is lower for bioscores because the benthic macroinvertebrates were collected using non-comparable techniques.

Findings - Fecal Coliform Bacteria

The West Virginia water quality standards state that for primary contact recreation (e.g., swimming, boating, fishing), the fecal coliform bacteria content is not to exceed 400 colonies/100 ml in more than 10% of all samples taken during a month. In other words, streams with a count greater than 400 colonies are generally considered to be unsafe.

FECAL COLIFORM BACTERIA

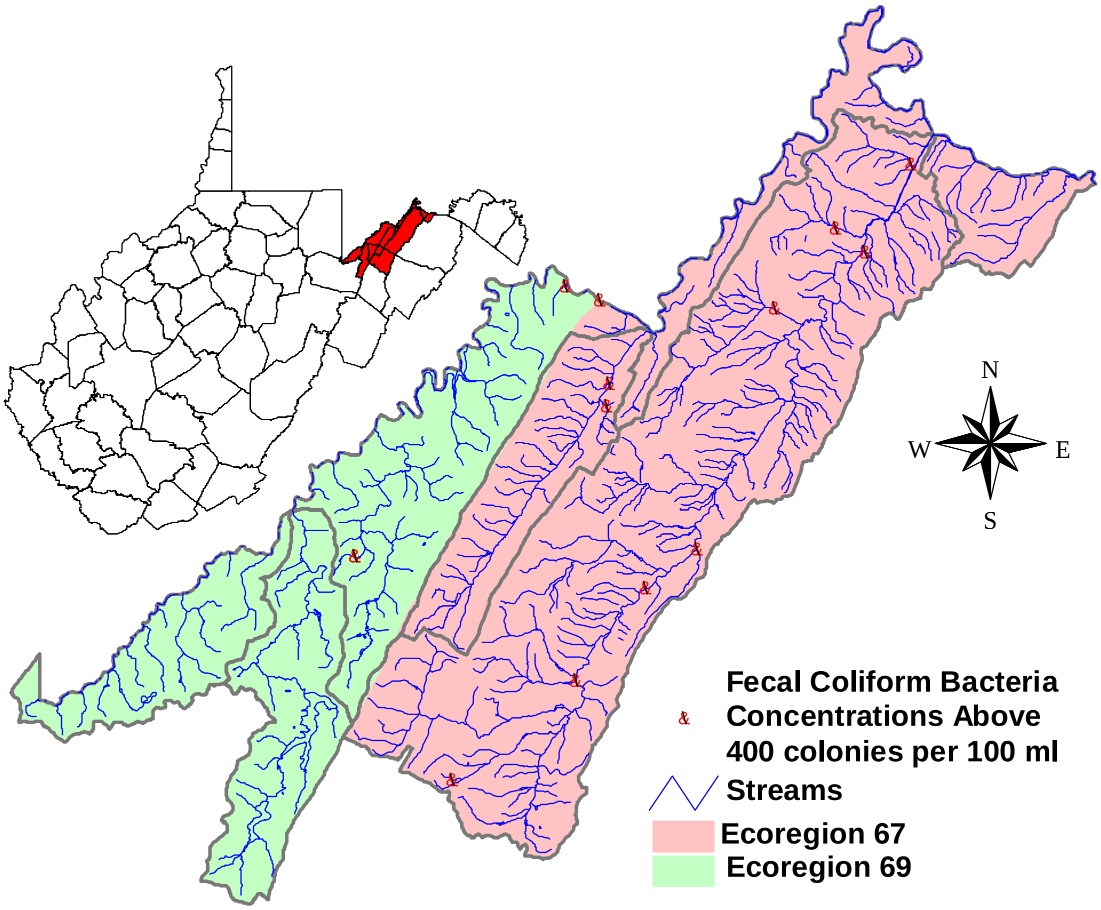
Fecal Coliform Bacteria are organisms that naturally live in the intestines of birds and mammals, including man.

Released to the environment in feces, disease-causing organisms may accompany fecal coliform bacteria. Thus, the presence of fecal coliform in a water sample indicates the potential presence of human pathogens. A stream could have a high concentration of fecal coliform bacteria due to a variety of sources, including failing septic systems, wildlife that concentrates along a stream, livestock herds with free access to the stream and field applied manure that washes into the stream. Therefore, understanding local land uses is important for inferring the reasons for a high count at any particular site.

Results of fecal coliform bacteria sampling for all assessment sites are in Table 22 of Appendix A. Figure 11 presents a location map of sites exceeding the fecal coliform bacteria standard of 400 colonies.

During the North Branch study, 13 (approximately 20%) of the samples had concentrations greater than the standard. Concentrations of fecal coliform bacteria in Ecoregion 67 ranged from less than 10 colonies at five sites to 8,000 colonies at the unnamed tributary of an unnamed tributary of New Creek (PNB-07-C.4-1-{0.2}). In Ecoregion 69 the concentrations ranged from 0 at three sites to 4,700 at a site on Elk Run (PND-21).

Figure 11: Sites Violating the Fecal Coliform Bacteria Standard

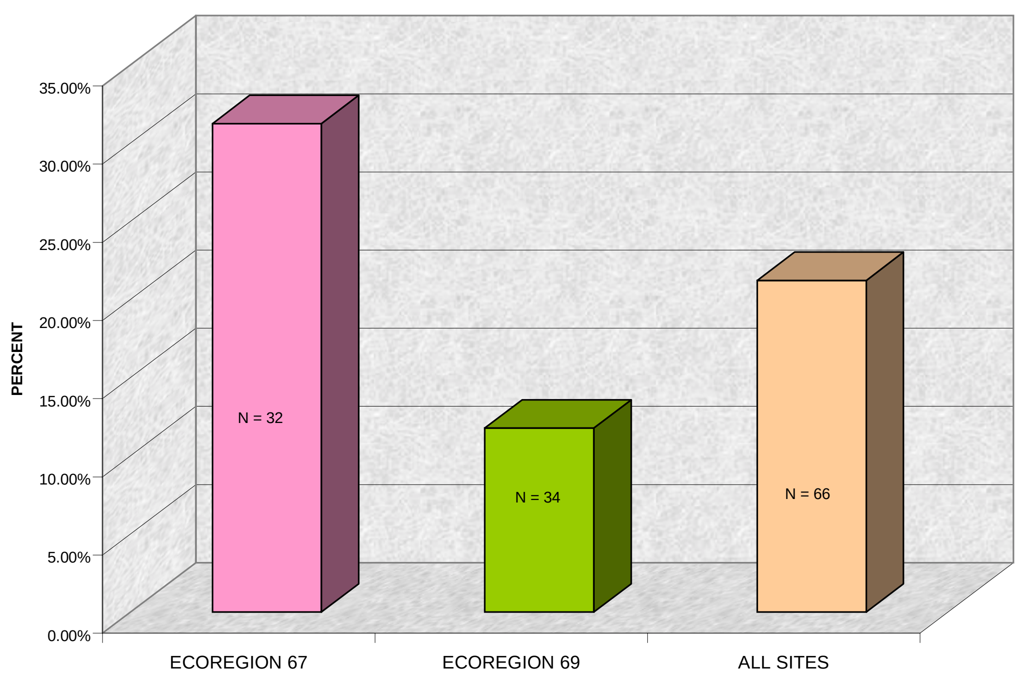


Fecal Coliform Bacteria Concentrations (In Colonies Per 100 Milliliters)			
NAME	ECOREGION	STREAM CODE	FECAL
PATTERSON CREEK	67	PNB-04-{29.7}	1000
PATTERSON CREEK	67	PNB-04-{33.0}	400
PATTERSON CREEK	67	PNB-04-{39.4}	480
PLUM RUN	67	PNB-04-A	1500
HORSESHOE CREEK	67	PNB-04-C.5	500
MILL RUN	67	PNB-04-D	1000
MIDDLE FORK / PATTERSON CREEK	67	PNB-04-FF	1790
CABIN RUN	67	PNB-04-J-{1.6}	3000
BLOCK RUN	67	PNB-07-C	2100
UNT OF UNT OF NEW CREEK	67	PNB-07-C.4-1-{0.2}	8000
NORTH BRANCH OF THE POTOMAC R	69	P-20-{052.0}	3200
SLAUGHTERHOUSE RUN	69	PNB-10	1000
ELK RUN (DUPLICATE 1)	69	PNB-21	4700
ELK RUN (DUPLICATE 2)	69	PNB-21	1000

There was a distinct difference between ecoregions in the percentage of sites exceeding 400 colonies. In Ecoregion 67, 31% (9 out of 29) of the assessment sites exceeded the standard. In contrast, the percentage of sites exceeding the standard in Ecoregion 69 was only 12% (4 out of 34).

Given the variety of potential sources of fecal coliform, it is sometimes difficult to pinpoint the cause of high concentrations in streams. For example, the unnamed tributary of an unnamed tributary of New Creek had a fecal coliform bacteria concentration of 8,000 colonies per 100 ml. Assessment teams indicated the presence of several disturbances and activities near the site including a residence, pasture and livestock access to the stream. These can all be considered potential sources of fecal coliform bacteria. Any one or a combination of these potential sources may have caused the high concentration of fecal coliform bacteria in this stream.

Figure 12: Percent of Sites with Violations of Fecal Coliform Bacteria Standard by Ecoregion



While the site on the unnamed tributary of an unnamed tributary of New Creek had several potential sources, the site located on Elk Run with a concentration of 4,700 colonies per 100 milliliters had no disturbance or activity documented that was likely to cause an increase in fecal coliform bacteria concentrations. A duplicate sample obtained one hour later had a fecal coliform concentration of 1,000 colonies. It is possible that the first value of 4,700 was due to the first sampler stirring up sediment laden with fecal coliform bacteria while collecting the sample. The source of the fecal coliform bacteria at this location can not be identified from the data on hand. An intensive study is needed to determine the source(s) of the extremely high levels of fecal coliform bacteria in this stream and all others exceeding the standard.

Findings - Physico-Chemical Sampling

The results of field readings for temperature, dissolved oxygen, pH, and conductivity are presented in Table 19 of Appendix A. The results for suspended solids, total phosphorus, ammonia, and nitrates + nitrites are in Table 20 of Appendix A.

The water quality standard for dissolved oxygen is equal to or greater than 5.0 mg/l (6.0 mg/l for trout streams). Two sites violated the standard. An unnamed tributary of an unnamed tributary of the Middle Fork of Patterson Creek (PNB-04-FF-5-A-{0.6}) had a value of 4.8 mg/L. This site was near the headwaters of the stream and just below a wetland where dissolved oxygen would be expected to be low. The second site, an unnamed tributary of Linton Creek (PNB-07-H-2-{1.0}) with a value of 2.7 mg/L, had a very low flow with little agitation or aeration of the water.

The minimum water quality standard for pH is 6.0 standard units. There were no pH values below the minimum standard of 6.0 or above the maximum standard of 9.0 in Ecoregion 67. Ecoregion 69 had nine violations of the minimum standard for pH. The Abram Creek and Stony River watersheds each had four violations. Little Buffalo Creek produced the other violation. Violations of the minimum standard frequently indicate mine drainage in West Virginia. All of these sites were located in coal fields.

Conductivity readings in Ecoregion 67 ranged from 85 μmhos/cm at Linton Creek (PNB-07-H) to 1391 μmhos/cm at the unnamed tributary of an unnamed tributary of the Middle Fork of Patterson Creek (PNB-04-FF-5-A-{0.6}). In Ecoregion 69 conductivity ranged from 44 μmhos/cm at Buffalo Creek (PNB-19-{1.4}) to 1298 μmhos/cm at one site on Stony River (PNB-17-{06.9}) There is no designated water quality standard for conductivity. However, when conductivity exceeds 1000 μmhos/cm it is generally indicative of some type of pollution.

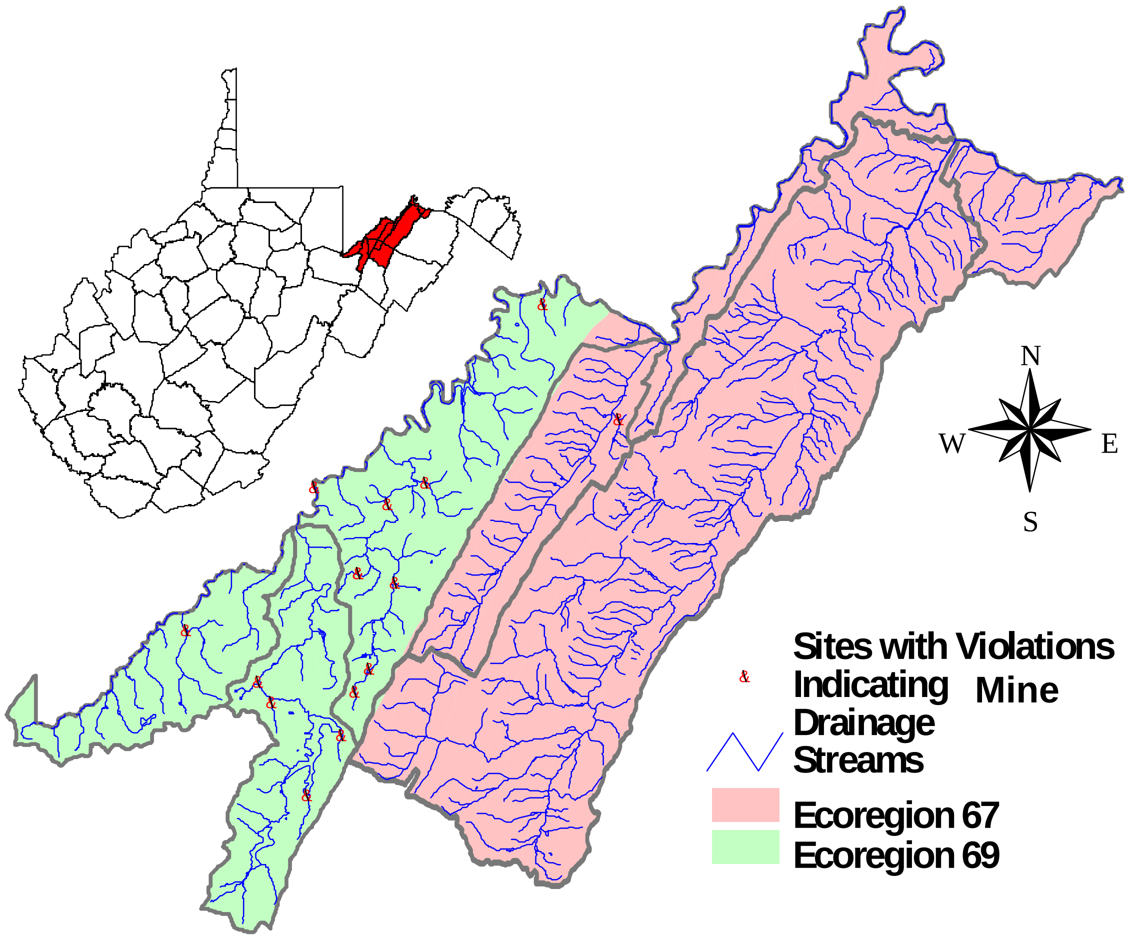
No ammonia nitrogen was detected at any of the North Branch mainstem sites; however, the mainstem contained the highest nitrite + nitrate nitrogen concentrations of all the streams sampled for this parameter. This concentration (2.9 mg/l) was detected 88.9 miles upstream of the mouth. There was a decreasing trend downstream from this point with 2.4 mg/l, 2.0 mg/l and 0.73 mg/l detected at mile points 82.6, 81.6 and 52.0, respectively.

Perhaps the most striking find from the nutrient sampling was that upstream of mile point 88.9 the nitrite + nitrate nitrogen concentrations were much lower, with only 0.19 mg/l and 0.07 mg/l detected at mile points 97.9 and 101.8, respectively. It is apparent that some inflow of nutrients was occurring between mile point 97.9 and 88.9.

Between mile points 97.9 and 88.9 there were also significant increases in sulfate (55 to 680 mg/l), alkalinity (23 to 46 mg/l) and some metals. The most notable metals increases were calcium (36.42 to 264.04 mg/l) and manganese (0.049 to 0.28 mg/l). Iron showed a reverse in this tendency for metals to increase between the upstream and downstream stations, decreasing from 0.53 to 0.068 mg/l. The possibility does exist that this trend is caused by treatment of acid mine drainage (AMD) between these two points. None of the results found at these sites are in violation of the water quality standards.

A HYDROLAB™ PROBE IN AN AMD IMPACTED STREAM

Figure 13: Sites with Violations Indicating Mine Drainage Impacts



Sites with Violations Indicating Mine Drainage Impacts					
NAME	ANCODE	pH	ALUMINUM	IRON	MANGANESE
MONTGOMERY RUN	WVPNB-11-{0.8}		5.400	3.100	
NORTH BRANCH OF THE POTOMAC	WVP-20-{081.6}		18.000	1.800	6.000
EMORY CREEK	WVPNB-16-A-{0.8}	4.7	1.800		3.000
ABRAM CREEK	WVPNB-16-{05.4}	5.1			3.800
ELK RUN	WVPNB-21			1.7	
ELK RUN	WVPNB-21			13.00	
LAUREL RUN	WVPNB-16-B.5	4.7	5.400		9.000
ABRAM CREEK	WVPNB-16-{16.8}				3.200
ABRAM CREEK	WVPNB-16-{18.1}	3.9	0.820		3.000
LAUREL RUN	WVPNB-17-B.5	3.6	1.0		1.30
FOURMILE RUN	WVPNB-17-C	4.7	2.800	7.300	4.700
LAUREL RUN	WVPNB-17-D	3.6	4.800	1.800	2.200
HEMLICK RUN	WVPNB-17-E	5.8			
LITTLE BUFFALO CREEK	WVPNB-19-A	5.8	1.900	8.000	

Elk Run's water quality values from duplicate sampling showed differences between the two samples. However, these differences are attributable to the greater amount of suspended solids collected in the first sample compared to the second. The substrate was covered with yellow-boy and it is likely the first sampler scooped some into the sample container. The sample with the higher amount of solids reflected the presence of yellowboy with an iron concentration of 13 mg/l, the highest found during this study. Duplicate 2 had only 1.7 mg/l of iron.

Plum Run (PNB-4-A) and Montgomery Run (PNB-11-{0.8}) were not sampled for benthic macroinvertebrates, but water quality analyses were performed. The Plum Run site produced an elevated fecal coliform bacteria count (1,500 colonies per 100 ml). The Montgomery Run site had a pH of 6.7 and a conductivity of 1,238, sulfates of 320 mg/l, calcium of 140 mg/l, aluminum of 5.4 mg/l, and iron of 3.1 mg/l. These elevated measurements of conductivity and metals, coupled with a “normal” pH, indicate the presence of treated mine drainage.

Findings - Habitat Assessment

Habitat quality is an important measurement in biological surveys because aquatic animals often have specific habitat requirements independent of water quality. The Program evaluated habitat quality by characterizing a variety of parameters such as sediment deposition, riffle frequency, bank condition, proximity to roads, local watershed erosion, etc. These data were useful in determining causes of water quality degradation and impairment to benthic communities. They also provided insight into the type and degree of human influences as well as rating a site's potential for reference site status. Additionally, program managers can use this information when prioritizing areas for restoration.

The eight-page stream assessment form involved an evaluation of habitat within and around a 100-meter assessment reach. Table 5 presents the physical measurements of the stream. The average stream width, riffle depth, run depth and pool depth are presented. Stream width ranged from 0.3 meters (12 inches) wide on the unnamed tributary of Linton Creek (PNB-07-H-2- {1.0}) and the unnamed tributary of an unnamed tributary of the Middle Fork of Patterson Creek (PNB-04-FF-5-A- {0.6}) to an estimated 75.0 meters wide on North Branch of the Potomac River at mile point 52.0. The majority of the streams sampled were relatively small, with over 85% being less than or equal to 10 meters wide.

Erosion and nonpoint source pollution are recorded in Table 6. Human related activities and disturbances observed near the assessment sites are recorded in Tables 7, 8, 9 and 11. The most frequently encountered disturbances were roads, which were observed at 50% of the assessment sites in the watershed.

Parking lots were also commonly encountered (31% of sites). The frequency of these disturbances is a reflection of the assessment strategy used by the Program, which dictates that most non-randomly selected streams be assessed as near the mouth as possible. These locations are often near roads, where access to the streams is generally less difficult. Other frequently encountered disturbances were residences, lawns, bank stabilization and channelization. The only major difference in disturbances between ecoregions was the presence of surface mines, deep mines and coal preparation plants. There were no surface mines, deep mines, or preparation plants observed at the assessment sites in Ecoregion 67. In contrast, surface mines were observed at 12% (4 out of 34) of the assessment sites in Ecoregion 69. These disturbances and their resultant pollutants are assumed to be a major cause of biological impairment at several assessment sites in Ecoregion 69.

Observations were made on the sediment and substrate at the assessment sites. Assessment teams examined the sediment for the presence of odors and oils. The teams recorded the types of sediment deposits, and percent composition of the inorganic substrate such as cobble, gravel and sand. Table 15 summarizes substrate composition. Information collected on sediment is found in Table 16.

Sand and silt were the most frequently encountered sediment deposits in the watershed. In Ecoregion 67 sand was found at 68% of the sites, while silt was documented at almost 93% of the sites. In Ecoregion 69 sand was found at 97% of the sites, while silt was documented at almost 79% of the sites. Every assessed site had sand or silt reported in the sediment deposits.

Table 18 presents observations on water level, water odor, surface oils, turbidity and color of the water as recorded at each site. Most sites (93.4%) had normal or no water odor and no surface oils. A sewage odor was detected at one site in each ecoregion [Elliber Run (PNB-4-V) and the North Branch of the Potomac mainstem (P-20-{52.0})]. Iron was observed at one site in Ecoregion 69 [Little Buffalo Creek (PNB-19-{1.4})]. Three sites in Ecoregion 67 [Patterson Creek (PNB-04-{45.2}), Plum Run (PNB-04-A) and unnamed tributary of an unnamed tributary of Middle Fork of Patterson Creek (PNB-04-EE-7-{0.4})] and one in Ecoregion 69 [Little Buffalo Creek (PNB-19-{1.4})] were documented as having flecks of oil on the surface. Water clarity ranged from clear to moderately turbid.

An important factor in maintaining the quality of habitat of streams is the intactness of the stream bank and the vegetated buffer zone. That is, the vegetation in the area closest to the stream. Stream bank vegetation performs a vital role in the control of erosion in streams. Trees and woody shrubs exhibit deeper and more permanent root systems than grasses and herbaceous plants and, thus, are more effective in reducing erosion throughout the year. The riparian zone blocks pollutants that may enter the stream through runoff, controls erosion, and provides habitat and appropriate nutrient input into the stream.

Field teams evaluated the canopy, understory and ground cover along each stream bank for 100 meters and extending 18 meters away from each bank. Results from this evaluation are presented in Tables 14, 15 and 16. In general, a combination of small trees and woody shrubs was the most prevalent cover at most of the sites. No substantial differences in the two ecoregions were noted.

An important element of each stream assessment was the completion of a two page Rapid Habitat Assessment (from EPA's EMAP-SW, Klemm and Lazorchak, 1994), which provided a numerical score of the habitat conditions most likely to affect aquatic life. The information from this section provided insight into what macroinvertebrate taxa may be present, or was expected to be present at the sample site. It also provided information on physical impairments to the stream habitat that were encountered during the assessment.

The Rapid Habitat Assessment is a valuable tool because it provides a means of comparing sites to one another. The twelve parameters are scored 0-20 for a possible total score of 240. It is this total score that is used in the biological and habitat data summary graphs, or XY graphs (Figures 7 and 8). Results of the Rapid Habitat Assessment for each site are presented in Table 17.

The lowest individual score for a site in Ecoregion 67 was at the unnamed tributary of an unnamed tributary of New Creek (PNB-07-C.4-1-{0.2}) with a score of 81. The site on Linton Creek (PNB-07-H) received the highest score of 214. The lowest individual score for a site in Ecoregion 69 was Slaughterhouse Run (PNB-10) with a score of 98. The highest score was 207 at one of the sites on Stony River (PNB-17-{6.9}).

On average, the habitat scores for Ecoregion 67 were considered sub-optimal, defined as “less than desirable but satisfies expectations in most areas”. Ecoregion 69, on average, received an optimal score, defined as “meeting natural expectations”. The parameter *Riparian Vegetative Zone Width* parameter had the lowest average score of all habitat parameters. This is a reflection of the Program’s sample site selection process that emphasizes sampling at sites closest to the streams’ mouths.

Explanation of Findings

In neither ecoregion did there appear to be strong correlations between biological scores and habitat condition scores.

Regarding the low dissolved oxygen readings taken from four sites during the study, the following explanations should shed light on the subject. North Branch of the Potomac River near its headwater (P-20-{101.8}, 5.6 mg/l), is a sluggish stream. At the site sampled the MACS technique was used since there was no riffle/run habitat. In addition, the site was sampled at 8:30 am so photosynthetic algal activity that might have increased dissolved oxygen concentration was still at a low level. This headwater is not currently considered a trout fishery. Therefore, the dissolved oxygen water quality standard to be met was the one for warm water fisheries (i.e., not less than 5.0 mg/l).

The unnamed tributary of an unnamed tributary of Middle Fork of Patterson Creek (PNB-4-FF-5-A- {0.6}) is one of the 3 sites in Ecoregion 67 that had a bioscore lower than 50. This stream is a headwater draining a marshy wetland pasture and, during the study, it had a mud substrate. The highest calcium concentration detected during this study (230 mg/l) was found at this site. It also had a high sulfate concentration (190 mg/l). The relatively high conductivity of 1,391 µmhos/cm is a reflection of the high calcium and sulfate concentrations. The landowner has reported that this stream is fed by a spring which never goes dry. The low oxygen reading of 4.8 mg/l would not be unusual for a slow moving stream draining a spring fed wetland. The reading likely reflected natural conditions. The wetland explains the higher temperature than would be expected for a spring-fed stream near its source (27.8°C). The team noted the presence of livestock access, but none of the water quality parameters lead to the suspicion that the low dissolved oxygen was due to livestock impacts. No nutrients were detected and the fecal coliform bacteria count was only 40 colonies per 100 ml.

At Plum Run (PNB-4-A), the sampling team did not attempt to get permission to access a site suitable for benthic sampling. Consequently, only water quality samples were collected and the assessment form was not completely filled out. Clues to the reasons for the low oxygen reading (5.24 mg/l) are few. The team noted the presence of cattle in the run upstream of the sample site. The team also indicated that cattle pastures were adjacent to both banks and the stream was fully exposed to the sun. The nitrite + nitrate nitrogen concentration of 0.48 mg/l is below the mean of approximately 0.52 mg/l from 40 samples in which such nitrogen was detected (42 nutrient samples were collected, but 2 had concentrations below the minimum detection level; see Table 20). The fecal coliform bacteria count was 1,500 colonies per 100ml. From these data and notes, it appears that land uses may have contributed to the low dissolved oxygen concentration at Plum Run, but this is not a certainty. The low dissolved oxygen may also have resulted from sampling during a low flow condition. The concentration was not a violation of the warm water fishery standard.

A note on the assessment form for the unnamed tributary of Linton Creek (PNB-7-H-2-{1.0}) states "water very low." The depth in one pool was only 0.1 meters or 4 inches. Indeed, the map drawn on the form shows the stream became multichanneled and dry in a downstream portion of the sampling site. The team also noted the presence of pasture and livestock access, and that the water level was below the seasonal norm. These are the only clues to reasons for the oxygen concentration of only 2.7 mg/l, which was a violation of the appropriate water quality standard. Nutrient concentrations were relatively low as was the fecal coliform bacteria count. The bioscore of this stream was the highest attained by

Ecoregion 67 sites during this study. This fact alone suffices to explain that the low oxygen concentration detected did not necessarily indicate the existence of a chronic problem.

Ecoregion 67 Comparable Sites

As mentioned previously, sample site PNB-7-C.4-1-{0.2} on an unnamed tributary of an unnamed tributary of New Creek produced 341 scuds. Only 11 other taxa were produced from this sample. The relatively poor showing of this site was likely due to organic pollution and poor riffle/run habitat. Here, the sampled substrate was composed primarily of sand (60%) and silt (20%). The site received the lowest habitat score of all sites in both ecoregions. The stream was surrounded by cattle pasture and the team noted that the sediment smelled of manure. The bacteria concentration was the highest detected from all of the sites sampled in both ecoregions (8,000 colonies per 100ml). This site also produced the highest alkalinity (260 mg/l). The high alkalinity and possible nutrient problem associated with the manure smell and fecal coliform bacteria concentrations may have contributed to the abundance of scuds.

The discussion of the unnamed tributary of an unnamed tributary of the Middle Fork of Patterson Run (PNB-4-FF-5-A-{0.6}), in the section on dissolved oxygen, explains why the site's poor biological score (45.45). Poor riffle/run habitat was probably the primary reason it scored below 50. The team noted that it was in a sloped wetland with sampled substrate consisting of 60% silt, 30% clay and 10% sand. Further investigation may reveal whether or not this is due to natural characteristics or human-induced conditions.

Pargut Run (PNB-4-J-1) also scored 45.45 on the biological scale. None of the physico-chemical values implicated potential causes. The sampling team noted several stream reach activities and disturbances which could have contributed to the poor bioscore (residences, lawns, hayfields). One cause could have been the poor sampling substrate, only 15% was cobble and 55% was gravel, the remainder was smaller particle sizes. Over half of the benthic sample consisted of the taxa Chironomidae, which indicates organic pollution is likely.

There were 8 sites in Ecoregion 67 that scored above 90 on the biological scale. They are Ash Spring Run (PNB-7-F-{0.6}), an unnamed tributary of Linton Creek (PNB-7-H-2-{1.0}), Linton Creek (PNB-7-H), an unnamed tributary of North Fork of Patterson Creek (PNB-4-EE-7-{0.4}), Mill Creek (PNB-4-S-{5.6}) and three Patterson Creek mainstem sites (PNB-4-{20.2}, PNB-4-{33.0} & PNB-4-{39.4}). The habitat scores of these sites varied from 141 (approximately 58% of the 240 points possible) to 214 (approximately 89%).

It is interesting to note the difference in biological scores between Mill Creek at 5.6 miles up from the mouth (PNB-4-S-{5.6}) and at 4.7 miles up (PNB-4-S-{4.7}). The lower site had a bioscore of 54.55 and a habitat score of 149. The upper site had a bioscore of 90.91 and a habitat score of 174. This is a difference in habitat score of only 10%. The primary differences between the habitats seemed to be that there were fewer management disturbances, such as riprap and channelization, along the upstream sample reach. There was a large flood control dam between them. Impoundments may alter the aquatic environment downstream in several ways. Changes in temperature, dissolved oxygen, and food concentrations as a result of dams are known to alter the benthic macroinvertebrate community. It appeared that the upstream site had a slight nutrient problem compared to the lower site as nitrate + nitrite nitrogen and phosphorus levels were higher and the benthic macroinvertebrate sample produced a subsample of nearly 1,000 organisms, with Hydropsychid (caddisflies) and Chironomids (midges) predominating.

Ecoregion 69 Comparable Sites

In Ecoregion 69, 10 comparable sites scored less than 50 on the biological scale. Most of these sites produced total sample populations of less than 100, several produced less than 50 and a few produced less than 30 organisms. Benthic communities in streams with low alkalinities, such as those affected by acid mine drainage or acid rain will have fewer taxa, lower abundances and reduced biomasses than streams with greater neutralizing capacities.

Fourmile Run (PNB-17-C), Laurel Run (PNB-17-D), Emory Creek (PNB-16-A-{0.8}), Little Buffalo Creek (PNB-19-A), Laurel Run (PNB-16-B.5), and the 3 sites on Abram Creek (PNB-16-{05.4}, PNB-16-{16.8} & PNB-16-{18.1}) all produced water quality constituents indicative of mine drainage. Other factors may have contributed to their low biological scores, but mine drainage was a definite suspect.

Helmick Run (PNB-17-E) was unlike the others in that the conditions indicative of acid concentrations were not excessively high. Based on the benthic macroinvertebrates (absence of mayflies and overall abundance of organisms) it appeared to have been impacted by acid, whether from AMD or atmospheric deposition is unknown.

Elk Run's (PNB-21) substrate was covered with yellow-boy (iron hydroxide precipitate) due to mine drainage. The biological impairment detected at this site was due in part to mine drainage. Since duplicate samples were obtained and analyzed at this site for QA/QC purposes we have two values for each parameter.

The two fecal coliform bacteria values were relatively high at this site (4,700 and 1,000 colonies per 100 ml), implicating concentrated fecal waste sources, human and/or animal.

Deakin Run (PNB-22) scored a little higher than 50 on the biological scale, yet the sample produced only 35 organisms and the team noted that yellow-boy (iron hydroxide precipitate) covered the substrate. Oddly, none of the water quality constituents sampled for provide definitive proof that mine drainage was the source of the biological impairment at this site. The site had low alkalinity (12 mg/l), but no acidity was detected and the pH was 6.7. The metals analyzed for were not particularly high and the sulfate of 160 mg/l was high but not alarming. The conductivity was a bit elevated (476 μmhos/cm), but not accusingly so. Perhaps Deakin Run is subject to abandoned mine discharges only in wetter weather. This would explain the abundance of yellow-boy even when the concentration of iron in the water column was not particularly high.

Deakin Run (PNB-22) and Elk Run (PNB-21) were similar in many regards. Their biological scores were close and the water quality of Duplicate 2 from Elk Run was very similar to that from Deakin Run's sample. These two streams are likely suffering from low-level water quality and habitat impacts due to mine drainage.

The differences in physico-chemical constituents between mile points 88.9 and 97.9 on the North Branch mainstem may have been due to treated acid mine drainage discharges between the two sites. In the downstream direction, increases in metals, particularly calcium, combined with significant increases in alkalinity support this suspicion. High levels of dissolved calcium often result from the addition of such neutralizing agents as limestone, quicklime, hydrated lime and calcium hydroxide.

The significant increase in NO_2+NO_3-N between the mile points was probably due to the use of ammonia in treating acid mine drainage, although it is conceivable that the communities of Gormania, West Virginia and Gorman, Maryland could have had major sewage discharges contributing nitrogen to the mainstem North Branch.

The Little Buffalo Creek watershed has active mining and reclaimed coal gob piles located therein. It is possible that the significant changes in water chemistry between North Branch mainstem milepoints 97.9 and 88.9 were partly due to inputs from Little Buffalo Creek via Buffalo Creek below their confluence. However, a few constituents (e.g., chlorides and sulfates) implicate at least one other source, perhaps Nydegger Run or Glade Run in Maryland.

Ongoing mine drainage treatment projects in Maryland and West Virginia, while improving the overall health of the upper North Branch mainstem, likely contributed to the odd physico-chemical makeup of this stretch of the river. Significant differences in certain water quality constituents, particularly certain metals and sulfate, above and below treated tributary streams can clearly show this odd chemistry. During this study, such oddities were demonstrated on the mainstem between milepoints 97.9 and 88.9, and between milepoints 82.6 and 81.6.

Noncomparable Sites

The Mill Run (PNB-4-D) site was sampled for benthic macroinvertebrates by hand picking organisms off of rocks. Because the benthic sample had an overwhelming abundance of midges, low taxa diversity and low EPT abundance, the site appeared to be biologically impaired. The team noted the presence of iron precipitate in pools, yet iron was not sampled for. The bacteria count was estimated at 1,000 per 100 milliliters. Algae were abundant in the pools and a hayfield bordered one streambank.

Laurel Run of Stony River (PNB-17-B.5) below Mount Storm Reservoir had poor water quality due to AMD. It was surprising to see 10 taxa produced from the hand picked sample. However, midges were the dominant taxon and several other taxa were recognized as having several acid-tolerant members (Cambaridae, Capnidae/Leuctridae, Elmidae, Sialidae, Tipulidae and Chironomidae). This information indicates there was a negative impact on the biota.

At the Red Oak Creek site (PNB-20), the benthic macroinvertebrates collected from a hand picked sample indicated good water quality with 5 of the 6 taxa falling in the EPT category. Water quality constituents reflected good water quality as well, but it would be best to collect a benthic sample during winter or spring, when there is more volume in the stream, before it is judged.

Baetidae mayflies and midges dominated the sample from North Branch of the Potomac River near its headwater (P-20-{101.8}). There were 12 taxa collected via the MACS procedure from this relatively small and slow-moving segment of North Branch. The water quality constituent values and the benthos found here indicated that the overall water quality was fair, but comparison with known high quality MACS sampleable streams would better assess the site.

In the sample collected from North Branch of the Potomac River downstream of Westernport, Maryland (P-20-{52.0}) only 7 taxa were represented with pollution tolerant midges making up approximately 74% of the total organism count and tolerant Hydropsychid caddisflies making up approximately 21% of the total. The site was muddy when sampled and had been muddy for several weeks before sampling, due to flood damage control measures being carried out in Georges Creek, a large tributary located not far upstream in Westernport, Maryland. This site is also downstream of the Westvaco pulp mill discharge at Luke, Maryland and the Westernport sewage treatment plant. With the highest total phosphorus value (0.15 mg/l), the highest chloride concentration (38 mg/l) and the third highest estimated bacteria count (3,200 colonies per 100ml), North Branch appeared to have had good reason for the dominance of pollution tolerant taxa at this site. All of these factors lead to the conclusion that this site was biologically impaired.

Implications

The restoration of highly degraded streams and the preservation of high quality streams present great challenges to the Program and other concerned agencies, as well as the citizens of West Virginia. The mission of the Office of Water Resources is to address these challenges by enhancing and preserving the physical, chemical and biological integrity of surface and ground waters, considering nature and the health, safety, recreational and economic needs of humanity. The following discussion attempts to address the charges of restoration and preservation of streams assessed by the Program in the North Branch of the Potomac River watershed. Ideally, a discussion of the status of each stream would be presented. However, due to the extensive scope of the study, implications are given in generalities with citations of specific examples given for illustration.

Approximately 71% of the named streams in the North Branch watershed were not visited and therefore received no assessment. Although assessments at most sites visited were more thorough than past OWR efforts, checking only one third of the named streams and only an insignificant few of the unnamed streams in a watershed leaves many streams unmonitored. Since resources do not allow all streams to be sampled, the Program developed a random sampling initiative. This initiative is, in part, designed to provide decision-makers statistically valid information on water quality conditions in a particular watershed without sampling every stream.

Ecoregion 67 Comparable Sites

The unnamed tributary of an unnamed tributary of New Creek (sampled at site PNB-7-C.4-1-{0.2}) should be investigated further to determine if habitat and water quality problems can be solved through the use of best management practices at the farm surrounding the site.

Both the unnamed tributary of an unnamed tributary of Middle Fork of Patterson Creek (PNB-4-FF-5-A-{0.6}) and Pargut Run (PNB-4-J-1) should be investigated further to determine the causes of their biological impairments. Poor substrate or other habitat conditions may have played roles, but whether such potential causes were natural or human-induced is unknown.

Patterson Creek was sampled for benthic macroinvertebrates at 6 sites on the mainstem of the stream. The lowest bioscore obtained was a bit greater than 70 and 3 sites scored approximately 90. Other than bacteria standard violations at 2 sites, water quality constituents did not indicate water quality problems existed along the mainstem. As previously mentioned, there are a few species of special concern that make Patterson Creek and some of its tributaries their homes. Its relatively high alkalinities probably contribute greatly to buffering North Branch from acid inputs coming from certain tributaries located in Ecoregion 69. This large tributary to North Branch should be considered for special protection by authorities with water quality interests in the region.

Ecoregion 69 Comparable Sites

During the next round of sampling in the North Branch of the Potomac River watershed, the following streams in Ecoregion 69 should be sampled to determine whether there are mine drainage impacts on their benthos: Piney Swamp Run (PNB-12), Glade Run (PNB-16-C), Little Creek (PNB-16-D), Thunder Hill Run (PNB-8), Powder House Run (PNB-9), Lynnwood Run (PNB-13) and Howell Run (PNB-14). The first 3 are on the 1998 303(d) mine drainage list and potentially acid-producing rock strata underlie the last 4.

Montgomery Run (PNB-11-{0.8}) did not receive a complete benthic sampling. It produced water quality constituents very similar to Slaughterhouse Run (PNB-10), which was sampled using the modified Surber-on-a-stick kick sampling procedure.

Water quality constituents indicated that both streams were receiving treated mine drainage. The primary difference between the two sites noted by the field team was that Montgomery Run had metal hydroxides on its substrate. No metal hydroxides were mentioned on the Slaughterhouse Run field sheet. The team deemed Montgomery Run lifeless after making only 1 kick, yet Slaughterhouse Run produced a biological score slightly above 60, even though it received the lowest habitat score in Ecoregion 69. Slaughterhouse Run produced a lower alkalinity value and a higher sulfate concentration. Montgomery Run had higher aluminum, iron and manganese concentrations. The presence of the metal hydroxide precipitates may have "armored" the substrate at Montgomery Run to the point that proper habitat for

SUGGESTED ACTION LIST

- **Better preserve and enhance the high quality waters present in all watersheds.**
- **Continue restoration efforts on streams impaired by acid mine drainage.**
- **Investigate the unnamed tributary of the unnamed tributary of New Creek and similar streams to determine if habitat and water quality problems can be solved through the use of best management practices at nearby farms.**
- **Investigate biologically impaired streams to determine the causes of their impairment if the causes are not already known.**
- **Include all streams on the 303(d) list and those crossing acid bearing rock strata in the next round of sampling.**
- **Conduct a detailed survey of the Stony River watershed to determine the sources and impacts of acid mine drainage in the area.**
- **Review data on Laurel Run of Abram Creek, Little Buffalo Creek and Buffalo Creek below Little Buffalo Creek to determine if they should be added to the 303(d) list.**

benthic macroinvertebrates was no longer present. Due to this the Program has discontinued the practice of aborting benthic sampling based upon observation of a partial sample in the field.

Even though Slaughterhouse Run scored slightly above 60 on the biological scale, its water quality data indicate it was negatively impacted by mine drainage, albeit treated mine drainage. Therefore, it is recommended that it remain on the 303(d) mine drainage list as should Montgomery Run.

Deakin Run (PNB-22), Elk Run (PNB-21), Fourmile Run (PNB-17-C), Helmick Run (PNB-17-E), Emory Creek (PNB-16-A-{0.8}), Little Buffalo Creek (PNB-19-A), two Laurel Runs (PNB-16-B.5 & PNB-17-D) and the three Abram Creek mainstem sites (PNB-16-{05.4}, PNB-16-{16.8} & PNB-16-{18.1}) all showed evidence of biological impairments due to mine drainage. Laurel Run of Abram Creek (PNB-16-B.5) and Little Buffalo Creek should be considered for addition to the 303(d) mine drainage list. The others should be retained on that list.

The Stony River mainstem should be further investigated to determine if ammonia and pH are still at levels that cause a failure to support the aquatic life propagation use designation. No ammonia nitrogen was detected at the one mainstem site sampled for that constituent (PNB-17-{09.6}) and no violations of the water quality criterion for pH were found at any of the mainstem sites. A more thorough investigation should begin with asking the local Office of Mining and Reclamation inspector if the mines in the watershed utilize ammonia in their water treatment processes. If so, then the investigation should include sampling the mainstem upstream and downstream of potential ammonia sources. The potential sources should be sampled as well. Sampling should be carried out during higher flows and during colder weather.

Likewise, there were no metals criteria violations from the two Stony River mainstem sites sampled for metals. Further investigation of the mainstem during higher flows is warranted to determine whether or not Stony River should be retained on the 303(d) list due to metals criteria violations.

A few sites in Ecoregion 69 were determined to have good water quality as reflected in both physico-chemical constituents and benthic community metrics. Deep Run (PNB-15), Cranberry Run (PNB-15-A), Wyckoff Run (PNB-16-B), Stony River near U.S. Rt. 50 bridge (PNB-17-{06.9}), Mill Run (PNB-17-B), Difficult Creek (PNB-18) and Buffalo Creek (PNB-19-{1.4}) scored 80 or better on the biological scale and had water quality constituents reflective of good water quality.

However, Deep Run and Stony River produced sulfates high enough to justify suspicion that there were mine drainages upstream of the sampling stations (390 mg/l each). Conductivities at these two sites (874 and 1,029 µmhos/cm, respectively) were relatively high compared to the other 5 sites. Tributaries to Stony River and a mainstem site upstream of Mill Run reflected conditions attributable to mine drainage impacts. Indeed, Stony River is known to have been negatively impacted by mine drainage for several decades.

This leads to the conclusion that Stony River and Deep Run may be considered for inclusion on a high quality stream list, but it first should be determined what segments of each are high quality. Also, the potential for future negative effects from mine drainage should be determined before they are included on such a list. The other 5 streams in Ecoregion 69 with samples that scored 80 or better on the biological scale should be investigated further for inclusion on a high quality streams list.

The evidence from this study indicated that Buffalo Creek, upstream of the mouth of Little Buffalo Creek, should be considered for inclusion on a high quality streams list. Below this confluence, however, Buffalo Creek is likely severely impacted by the mine drainage from Little Buffalo Creek and this segment may need to be included on the 303(d) mine drainage list.

Noncomparable Sites

Additional information on Mill Run (PNB-4-D) is necessary before considering it for inclusion on the 303(d) biologically impaired stream list. Although its bioscore (9.09) indicates that it was impaired it was not sampled in a comparable manner and only 98 organisms were found during a period of low flow.

The poor showing compared to West Virginia's water quality criteria of the North Branch of the Potomac below Westernport, Maryland (P-20-{52.0}) indicated that a portion of the mainstem would be included on the West Virginia 303(d) biologically impaired stream list. However, this waterbody is under the jurisdiction of the state of Maryland and they may assess it with different criteria. Maryland is the sole entity responsible for determining the degree of impairment of this stream.

Additional Resources

The watershed movement in West Virginia includes a wide variety of federal, state and non-governmental organizations that are available to help improve the health of the streams in this watershed. Several agencies have established the West Virginia Watershed Management Framework. A basin coordinator has been employed to coordinate the activities of these agencies. The basin coordinator may be contacted at (304) 558-2108. In addition, the DEP's Stream Partners Program, available at (800) 556-8181, provides technical and financial assistance to volunteer groups committed to the protection, restoration or enhancement of a watershed.

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Appendix A: Tables

Table 4(A): Sampling Sites In Ecoregion 67

NAME	STREAM CODE	LATITUDE			LONGITUDE			COUNTY
		DEG	MIN	SEC	DEG	MIN	SEC	
GREEN SPRING RUN	PNB-01-{4.2}	39	30	17.64	78	38	52.36	HAMPSHIRE
PATTERSON CREEK	PNB-04-{04.6}	39	30	30.02	78	45	55.00	MINERAL
PATTERSON CREEK	PNB-04-{20.2}	39	23	21.96	78	51	21.24	MINERAL
PATTERSON CREEK	PNB-04-{29.7}	39	17	46.27	78	55	54.62	MINERAL
PATTERSON CREEK	PNB-04-{33.0}	39	16	18.88	78	58	35.40	MINERAL
PATTERSON CREEK	PNB-04-{39.4}	39	12	44.84	79	2	10.25	GRANT
PATTERSON CREEK	PNB-04-{45.2}	39	8	59.58	79	4	8.29	GRANT
PLUM RUN	PNB-04-A	39	32	40.88	78	44	37.85	MINERAL
PAINTER RUN	PNB-04-C	39	30	14.11	78	45	59.14	MINERAL
HORSESHOE CREEK	PNB-04-C.5	39	30	15.10	78	48	31.56	MINERAL
LONG PASTURE RUN	PNB-04-C-1-A	39	29	43.01	78	46	40.99	MINERAL
ROSSER RUN	PNB-04-CC	39	12	59.09	79	2	9.71	GRANT
MILL RUN	PNB-04-D	39	29	18.57	78	47	5.27	MINERAL
THORN CREEK	PNB-04-DD-{2.0}	39	12	43.42	79	3	59.14	GRANT
UNT OF NORTH FORK PATTERSON CREEK	PNB-04-EE-7-{0.4}	39	11	31.08	79	7	42.47	GRANT
MIDDLE FORK / PATTERSON CREEK	PNB-04-FF	39	8	55.81	79	8	32.09	GRANT
UNT OF UNT OF MIDDLE FORK / PATTERSON	PNB-04-FF-5-A-{0.6}	39	8	55.81	79	8	32.09	GRANT
CABIN RUN	PNB-04-J-{1.6}	39	27	11.10	78	51	44.09	MINERAL
PARGUT RUN	PNB-04-J-1	39	27	17.27	78	52	13.61	MINERAL
MILL CREEK	PNB-04-S-{04.7}	39	20	12.87	78	59	15.73	MINERAL
MILL CREEK	PNB-04-S-{5.6}	39	19	45.31	78	59	59.09	MINERAL
SUGAR RUN	PNB-04-S-1	39	20	15.44	78	55	34.65	MINERAL
ELLIBER RUN	PNB-04-V	39	17	45.94	78	55	54.21	MINERAL
WHIP RUN	PNB-04-W-3	39	17	24.05	79	2	9.81	MINERAL
NEW CREEK	PNB-07-{03.8}	39	24	10.61	79	0	16.92	MINERAL
NEW CREEK	PNB-07-{08.4}	39	21	3.94	79	3	4.82	MINERAL
NEW CREEK	PNB-07-{10.4}	39	19	15.05	79	5	3.05	MINERAL
BLOCK RUN	PNB-07-C	39	24	22.16	79	0	11.40	MINERAL
UNT OF UNT OF NEW CREEK	PNB-07-C.4-1-{0.2}	39	23	28.33	79	0	18.66	MINERAL
ASH SPRING RUN	PNB-07-F-{0.6}	39	21	30.10	79	3	26.40	MINERAL
LINTON CREEK	PNB-07-H	39	16	31.65	79	7	22.03	GRANT
UNT OF LINTON CREEK	PNB-07-H-2-{1.0}	39	15	0.57	79	8	47.62	GRANT

Table 4(B): Sampling Sites In Ecoregion 69

NAME	STREAM CODE	LATITUDE			LONGITUDE			COUNTY
		DEG	MIN	SEC	DEG	MIN	SEC	
NORTH BRANCH OF THE POTOMAC	P-20-{052.0}	39	27	38.00	79	0	34.00	MINERAL
NORTH BRANCH OF THE POTOMAC	P-20-{081.6}	39	21	5.00	79	15	18.00	MINERAL
NORTH BRANCH OF THE POTOMAC	P-20-{082.6}	39	20	23.00	79	15	20.00	MINERAL
NORTH BRANCH OF THE POTOMAC	P-20-{088.9}	39	18	0.00	79	19	20.00	GRANT
NORTH BRANCH OF THE POTOMAC	P-20-{097.9}	39	14	3.00	79	25	23.00	GRANT
NORTH BRANCH OF THE POTOMAC	P-20-{101.8}	39	12	27.00	79	28	7.00	GRANT
SLAUGHTERHOUSE RUN	PNB-10	39	28	14.05	79	2	18.17	MINERAL
MONTGOMERY RUN	PNB-11-{0.8}	39	27	54.64	79	3	53.79	MINERAL
DEEP RUN	PNB-15	39	23	35.63	79	7	55.10	MINERAL
CRANBERRY RUN (DUP 1)	PNB-15-A	39	23	22.80	79	8	2.09	MINERAL
CRANBERRY RUN (DUP 2)	PNB-15-A	39	23	22.80	79	8	2.09	MINERAL
UNT OF ABRAMS CREEK	PNB-16-.5A-{0.4}	39	22	10.45	79	10	30.23	MINERAL
ABRAM CREEK	PNB-16-{05.4}	39	20	22.38	79	11	44.58	MINERAL
ABRAM CREEK	PNB-16-{16.8}	39	14	9.00	79	12	46.00	GRANT
ABRAM CREEK	PNB-16-{18.1}	39	13	17.73	79	13	32.69	GRANT
EMORY CREEK	PNB-16-A-{0.8}	39	21	12.35	79	9	49.99	MINERAL
WYCKOFF RUN (DUP 1)	PNB-16-B	39	17	46.91	79	13	13.55	GRANT
WYCKOFF RUN (DUP 2)	PNB-16-B	39	17	46.65	79	13	14.30	GRANT
LAUREL RUN	PNB-16-B.5	39	17	24.76	79	11	28.02	GRANT
STONY RIVER	PNB-17-{06.9}	39	16	13.00	79	15	42.00	GRANT
STONY RIVER	PNB-17-{09.6}	39	14	28.00	79	17	19.00	GRANT
STONY RIVER	PNB-17-{15.6}	39	12	54.38	79	17	41.51	GRANT
MILL RUN	PNB-17-B	39	15	37.00	79	15	28.00	GRANT
LAUREL RUN	PNB-17-B.5	39	13	43.00	79	18	16.00	GRANT
FOURMILE RUN	PNB-17-C	39	12	56.59	79	17	38.21	GRANT
LAUREL RUN	PNB-17-D	39	11	36.16	79	14	14.48	GRANT
HELMICK RUN	PNB-17-E	39	9	22.43	79	15	56.68	GRANT
DIFFICULT CREEK	PNB-18	39	16	29.00	79	16	18.00	GRANT
BUFFALO CREEK	PNB-19-{1.4}	39	15	24.00	79	21	52.00	GRANT
LITTLE BUFFALO CREEK	PNB-19-A	39	15	44.00	79	21	45.00	GRANT
RED OAK CREEK	PNB-20	39	15	10.00	79	23	49.00	GRANT
ELK RUN (DUP 1)	PNB-21	39	13	28.00	79	25	24.00	GRANT
ELK RUN (DUP 2)	PNB-21	39	13	28.00	79	25	24.00	GRANT
DEAKIN RUN	PNB-22	39	13	11.00	79	25	45.00	GRANT

Table 5(A): Study Reach Characteristics For Ecoregion 67					
NAME	STREAM CODE	STREAM WIDTH (meters)	RIFFLE DEPTH (meters)	RUN DEPTH (meters)	POOL DEPTH (meters)
GREEN SPRING RUN	PNB-01-{4.2}	2.9	0.10	0.15	0.40
PATTERSON CREEK	PNB-04-{04.6}	15.0	0.10	0.15	0.50
PATTERSON CREEK	PNB-04-{20.2}	9.0	0.20	0.25	2.00
PATTERSON CREEK	PNB-04-{29.7}	12.4	0.15	0.30	0.70
PATTERSON CREEK	PNB-04-{33.0}	9.2	0.15	0.25	0.60
PATTERSON CREEK	PNB-04-{39.4}	12.7	0.15	0.30	NP
PATTERSON CREEK	PNB-04-{45.2}	4.7	0.10	0.20	0.50
HORSESHOE CREEK	PNB-04-C.5	3.6	0.10	0.15	0.50
ROSSER RUN	PNB-04-CC	1.7	0.10	0.25	0.35
MILL RUN	PNB-04-D	0.8	NP	NP	0.20
THORN CREEK	PNB-04-DD-{2.0}	3.8	0.15	0.25	0.30
UNT OF NORTH FORK PATTERSON CREEK	PNB-04-EE-7-{0.4}	1.5	0.06	0.15	0.30
MIDDLE FORK/PATTERSON CREEK	PNB-04-FF	2.3	0.04	0.15	0.75
UNT OF UNT OF MIDDLE FORK / PATTERSON	PNB-04-FF-5-A-{0.6}	0.3	0.02	0.06	0.15
CABIN RUN	PNB-04-J-{1.6}	4.6	0.05	0.20	0.50
PARGUT RUN	PNB-04-J-1	1.0	0.02	0.05	0.20
MILL CREEK	PNB-04-S-{04.7}	3.4	0.15	0.20	0.35
MILL CREEK	PNB-04-S-{5.6}	5.8	0.06	0.40	0.60
ELLIBER RUN	PNB-04-V	3.7	0.10	0.15	0.25
WHIP RUN	PNB-04-W-3	3.5	0.10	0.20	NP
NEW CREEK	PNB-07-{03.8}	8.6	0.15	0.50	0.40
NEW CREEK	PNB-07-{08.4}	10.8	0.20	0.35	0.40
NEW CREEK	PNB-07-{10.4}	7.0	0.10	0.30	NP
BLOCK RUN	PNB-07-C	1.8	0.05	0.15	0.30
UNT OF UNT OF NEW CREEK	PNB-07-C.4-1-{0.2}	0.9	0.05	NP	0.20
ASH SPRING RUN	PNB-07-F-{0.6}	1.6	0.05	0.10	0.30
LINTON CREEK	PNB-07-H	6.3	0.10	0.15	0.25
UNT OF LINTON CREEK	PNB-07-H-2-{1.0}	0.3	0.02	0.04	0.10
ECOREGION 67 N = 28	Average	4.97	0.1	0.21	0.44
	Minimum	0.3	0.02	0.04	0.1
	Maximum	15	0.2	0.5	2

NP = NOT PRESENT

Table 5(B): Study Reach Characteristics For Ecoregion 69

NAME	STREAM CODE	STREAM WIDTH (meters)	RIFFLE DEPTH (meters)	RUN DEPTH (meters)	POOL DEPTH (meters)
NORTH BRANCH OF THE POTOMAC RIVER	P-20-{052.0}	75.0	0.25	0.40	2.00
NORTH BRANCH OF THE POTOMAC RIVER	P-20-{081.6}	21.4	0.15	0.50	NP
NORTH BRANCH OF THE POTOMAC RIVER	P-20-{082.6}	17.0	0.25	1.00	1.00
NORTH BRANCH OF THE POTOMAC RIVER	P-20-{088.9}	23.0	0.25	0.30	0.40
NORTH BRANCH OF THE POTOMAC RIVER	P-20-{097.9}	8.0	0.08	0.25	0.40
NORTH BRANCH OF THE POTOMAC RIVER	P-20-{101.8}	6.0	NP	NP	1.00
SLAUGHTERHOUSE RUN	PNB-10	1.8	0.02	0.01	0.02
MONTGOMERY RUN	PNB-11-{0.8}	1.2	0.10	0.20	0.30
DEEP RUN	PNB-15	3.8	0.10	0.20	0.25
CRANBERRY RUN (DUP 1)	PNB-15-A	2.4	0.05	0.10	0.15
CRANBERRY RUN DUP 2)	PNB-15-A	2.4	0.05	0.10	0.15
UNT OF ABRAMS CREEK	PNB-16-.5A-{0.4}	1.7	0.05	0.15	0.20
ABRAM CREEK	PNB-16-{05.4}	11.1	0.10	0.50	0.70
ABRAM CREEK	PNB-16-{16.8}	4.0	0.10	0.15	0.30
ABRAM CREEK	PNB-16-{18.1}	3.5	0.05	0.15	0.40
EMORY CREEK	PNB-16-A-{0.8}	4.1	0.10	0.20	0.40
WYCKOFF RUN (DUP 1)	PNB-16-B	1.5	0.05	0.10	0.15
WYCKOFF RUN (DUP 2)	PNB-16-B	1.0	0.15	0.20	0.50
LAUREL RUN	PNB-16-B.5	6.3	0.10	0.15	0.50
STONY RIVER	PNB-17-{06.9}	10.0	0.15	0.30	0.50
STONY RIVER	PNB-17-{09.6}	9.3	0.20	0.40	0.60
STONY RIVER	PNB-17-{15.6}	15.5	0.08	0.14	0.28
MILL RUN	PNB-17-B	4.4	0.10	0.20	0.40
LAUREL RUN	PNB-17-B.5	0.7	0.01	0.02	0.20
FOURMILE RUN	PNB-17-C	2.1	0.07	0.21	0.30
LAUREL RUN	PNB-17-D	1.5	0.07	0.19	0.50
HELMICK RUN	PNB-17-E	4.2	0.06	0.15	0.40
DIFFICULT CREEK	PNB-18	5.5	0.04	0.15	0.20
BUFFALO CREEK	PNB-19-{1.4}	3.6	0.04	0.12	0.28
LITTLE BUFFALO CREEK	PNB-19-A	2.8	0.02	0.15	0.30
RED OAK CREEK	PNB-20	1.3	0.01	0.02	0.10
ELK RUN (DUP 1)	PNB-21	1.5	0.02	0.15	0.25
ELK RUN (DUP 2)	PNB-21	4.0	0.01	0.08	0.10
DEAKIN RUN	PNB-22	3.6	0.06	0.10	0.20
ECOREGION 69 N = 34	Average	7.8	0.09	0.21	0.41
	Minimum	0.7	0.01	0.01	0.02
	Maximum	75	0.25	1	2

NP = NOT PRESENT

Table 6(A): Erosion And Nonpoint Source Pollution For Ecoregion 67

NAME	STREAM CODE	WATERSHED EROSION				NONPOINT SOURCE POLLUTION		
		NON	SLT	MOD	HVY	NO	POT	OBV
GREEN SPRING RUN	PNB-01-{4.2}				✔			✔
PATTERSON CREEK	PNB-04-{04.6}			✔			✔	
PATTERSON CREEK	PNB-04-{20.2}		✔				✔	
PATTERSON CREEK	PNB-04-{29.7}		✔					✔
PATTERSON CREEK	PNB-04-{33.0}			✔			✔	
PATTERSON CREEK	PNB-04-{39.4}		✔					✔
PATTERSON CREEK	PNB-04-{45.2}				✔			✔
PLUM RUN	PNB-04-A			✔				✔
HORSESHOE CREEK	PNB-04-C.5		✔					✔
ROSSER RUN	PNB-04-CC		✔				✔	
MILL RUN	PNB-04-D		✔				✔	
THORN CREEK	PNB-04-DD-{2.0}			✔			✔	
UNT OF NORTH FORK PATTERSON CREEK	PNB-04-EE-7-{0.4}	✔				✔		
MIDDLE FORK / PATTERSON CREEK	PNB-04-FF		✔					✔
UNT OF UNT OF MIDDLE FORK / PATTERSON	PNB-04-FF-5-A-{0.6}			✔				✔
CABIN RUN	PNB-04-J-{1.6}		✔				✔	
PARGUT RUN	PNB-04-J-1		✔				✔	
MILL CREEK	PNB-04-S-{04.7}		✔					✔
MILL CREEK	PNB-04-S-{5.6}		✔				✔	
ELLIBER RUN	PNB-04-V		✔				✔	
WHIP RUN	PNB-04-W-3			✔				✔
NEW CREEK	PNB-07-{03.8}	✔					✔	
NEW CREEK	PNB-07-{08.4}		✔				✔	
NEW CREEK	PNB-07-{10.4}			✔			✔	
BLOCK RUN	PNB-07-C				✔			✔
UNT OF UNT OF NEW CREEK	PNB-07-C.4-1-{0.2}				✔			✔
ASH SPRING RUN	PNB-07-F-{0.6}			✔			✔	
LINTON CREEK	PNB-07-H	✔				✔		
UNT OF LINTON CREEK	PNB-07-H-2-{1.0}		✔				✔	

WATERSHED EROSION	
NON	NONE
SLT	SLIGHT
MOD	MODERATE
HVY	HEAVY

NONPOINT SOURCE POLLUTION	
NO	NO EVIDENCE
POT	POTENTIAL SOURCES
OBV	OBVIOUS SOURCES

Table 6(B): Erosion And Nonpoint Source Pollution For Ecoregion 69

NAME	STREAM CODE	WATERSHED EROSION				NONPOINT SOURCE POLLUTION		
		NON	SLT	MOD	HVY	NO	POT	OBV
NORTH BRANCH OF THE POTOMAC	P-20-{052.0}	✔					✔	
NORTH BRANCH OF THE POTOMAC	P-20-{081.6}	✔					✔	
NORTH BRANCH OF THE POTOMAC	P-20-{082.6}	✔					✔	
NORTH BRANCH OF THE POTOMAC	P-20-{088.9}		✔			✔		
NORTH BRANCH OF THE POTOMAC	P-20-{097.9}		✔			✔		
NORTH BRANCH OF THE POTOMAC	P-20-{101.8}	✔				✔		
SLAUGHTERHOUSE RUN	PNB-10		✔					✔
MONTGOMERY RUN	PNB-11-{0.8}				✔	✔		
DEEP RUN	PNB-15			✔				✔
CRANBERRY RUN (DUP 1)	PNB-15-A		✔					✔
CRANBERRY RUN (DUP 2)	PNB-15-A			✔				✔
UNT OF ABRAMS CREEK	PNB-16-.5A-{0.4}				✔		✔	
ABRAM CREEK	PNB-16-{05.4}		✔					✔
ABRAM CREEK	PNB-16-{16.8}	✔					✔	
ABRAM CREEK	PNB-16-{18.1}		✔					✔
EMORY CREEK	PNB-16-A-{0.8}				✔			✔
WYCKOFF RUN (DUP 1)	PNB-16-B		✔					✔
WYCKOFF RUN (DUP 2)	PNB-16-B	✔				✔		
LAUREL RUN	PNB-16-B.5		✔			✔		
STONY RIVER	PNB-17-{06.9}	✔					✔	
STONY RIVER	PNB-17-{09.6}	✔				✔		
STONY RIVER	PNB-17-{15.6}		✔					✔
MILL RUN	PNB-17-B	✔						✔
LAUREL RUN	PNB-17-B.5			✔				✔
FOURMILE RUN	PNB-17-C			✔				✔
LAUREL RUN	PNB-17-D			✔			✔	
HELMICK RUN	PNB-17-E		✔				✔	
DIFFICULT CREEK	PNB-18	✔				✔		
BUFFALO CREEK	PNB-19-{1.4}		✔					✔
LITTLE BUFFALO CREEK	PNB-19-A			✔				✔
RED OAK CREEK	PNB-20		✔			✔		
ELK RUN (DUP 1)	PNB-21		✔				✔	
ELK RUN (DUP 2)	PNB-21			✔				✔
DEAKIN RUN	PNB-22		✔				✔	

WATERSHED EROSION	
NON	NONE
SLT	SLIGHT
MOD	MODERATE

NONPOINT SOURCE POLLUTION	
NO	NO EVIDENCE
POT	POTENTIAL SOURCES
OBV	OBVIOUS SOURCES

Table 7(A): Stream Reach Activities/Disturbances - Residential For Ecoregion 67

NAME	STREAM CODE	RE	LA	BD	CO	PD	BC	RD	RW	RS
GREEN SPRING RUN	PNB-01-{4.2}	✓	✓					✓	Single lane	Applied limestone
PATTERSON CREEK	PNB-04-{04.6}	✓	✓			✓		✓	Single lane	Asphalt
PATTERSON CREEK	PNB-04-{20.2}							✓	Single lane	Applied limestone
PATTERSON CREEK	PNB-04-{29.7}	✓	✓				✓			
PATTERSON CREEK	PNB-04-{33.0}	✓	✓							
PATTERSON CREEK	PNB-04-{39.4}									
PATTERSON CREEK	PNB-04-{45.2}									
PLUM RUN	PNB-04-A							✓	Single lane	Dirt
PAINTER RUN	PNB-04-C									
HORSESHOE CREEK	PNB-04-C.5									
LONG PASTURE RUN	PNB-04-C-1-A									
ROSSER RUN	PNB-04-CC									
MILL RUN	PNB-04-D	✓	✓					✓	Single lane	Applied limestone
THORN CREEK	PNB-04-DD-{2.0}	✓	✓					✓	Single lane	Dirt
UNT OF NORTH FORK PATTERSON CREEK	PNB-04-EE-7-{0.4}							✓	Single lane	Dirt
MIDDLE FORK / PATTERSON CREEK	PNB-04-FF		✓					✓	Single lane	Applied non-limestone
UNT OF UNT OF MIDDLE FORK / PATTERSON	PNB-04-FF-5-A-{0.6}									
CABIN RUN	PNB-04-J-{1.6}	✓	✓				✓	✓	Single lane	Dirt
PARGUT RUN	PNB-04-J-1	✓	✓				✓	✓	Single lane	Dirt
MILL CREEK	PNB-04-S-{04.7}									
MILL CREEK	PNB-04-S-{5.6}									
SUGAR RUN	PNB-04-S-1									
ELLIBER RUN	PNB-04-V	✓	✓			✓				
WHIP RUN	PNB-04-W-3	✓	✓				✓	✓	Single lane	Asphalt
NEW CREEK	PNB-07-{03.8}							✓	Double	Asphalt
NEW CREEK	PNB-07-{08.4}									
NEW CREEK	PNB-07-{10.4}	✓	✓					✓	Single lane	Applied limestone
BLOCK RUN	PNB-07-C	✓	✓							
UNT OF UNT OF NEW CREEK	PNB-07-C.4-1-{0.2}	✓	✓							
ASH SPRING RUN	PNB-07-F-{0.6}	✓	✓					✓	Double	Asphalt
LINTON CREEK	PNB-07-H	✓	✓					✓	Single lane	Applied limestone
UNT OF LINTON CREEK	PNB-07-H-2-{1.0}	✓	✓							

RE	RESIDENCES
LA	LAWNS
BD	BOAT DOCK

CO	CONSTRUCTION
PD	PIPE / DRAIN
BC	BRIDGE / CULVERT

RD	RESIDENTIAL ROAD
RW	ROAD WIDTH
RS	ROAD SURFACE

Table 7(B): Stream Reach Activities/Disturbances Residential For Ecoregion 69

NAME	STREAM CODE	RE	LA	BD	CO	PD	BC	RD	RW	RS
NORTH BRANCH	P-20-{052.0}									
NORTH BRANCH	P-20-{081.6}									
NORTH BRANCH	P-20-{082.6}									
NORTH BRANCH	P-20-{088.9}									
NORTH BRANCH	P-20-{097.9}									
NORTH BRANCH	P-20-{101.8}									
SLAUGHTERHOUSE RUN	PNB-10									
MONTGOMERY RUN	PNB-11-{0.8}									
DEEP RUN	PNB-15									
CRANBERRY RUN (DUP 1)	PNB-15-A	✔	✔			✔	✔	✔	Single lane	Applied non-limestone
CRANBERRY RUN (DUP 2)	PNB-15-A	✔	✔			✔				
UNT OF ABRAMS CREEK	PNB-16-.5A-{0.4}									
ABRAM CREEK	PNB-16-{05.4}									
ABRAM CREEK	PNB-16-{16.8}									
ABRAM CREEK	PNB-16-{18.1}									
EMORY CREEK	PNB-16-A-{0.8}									
WYCKOFF RUN (DUP 1)	PNB-16-B									
WYCKOFF RUN (DUP 2)	PNB-16-B							✔	Single lane	Applied limestone
LAUREL RUN	PNB-16-B.5									
STONY RIVER	PNB-17-{06.9}							✔	Single lane	Dirt
STONY RIVER	PNB-17-{09.6}									
STONY RIVER	PNB-17-{15.6}									
MILL RUN	PNB-17-B									
LAUREL RUN	PNB-17-B.5									
FOURMILE RUN	PNB-17-C									
LAUREL RUN	PNB-17-D									
HELMICK RUN	PNB-17-E									
DIFFICULT CREEK	PNB-18									
BUFFALO CREEK	PNB-19-{1.4}									
LITTLE BUFFALO CREEK	PNB-19-A									
RED OAK CREEK	PNB-20									
ELK RUN (DUP 1)	PNB-21									
ELK RUN (DUP 2)	PNB-21									
DEAKIN RUN	PNB-22									

RE	RESIDENCES
LA	LAWNS
BD	BOAT DOCK

CO	CONSTRUCTION
PD	PIPE / DRAIN
BC	BRIDGE / CULVERT

RD	RESIDENTIAL ROAD
RW	ROAD WIDTH
RS	ROAD SURFACE

Table 8(A): Stream Reach Activities/Disturbances Recreational For Ecoregion 67

NAME	STREAM CODE	PC	PL	BD	SM	FH	PD	FT	AHB	BC	RD	RW	RS
GREEN SPRING RUN	PNB-01-{4.2}												
PATTERSON CREEK	PNB-04-{04.6}					✔		✔					
PATTERSON CREEK	PNB-04-{20.2}												
PATTERSON CREEK	PNB-04-{29.7}					✔		✔					
PATTERSON CREEK	PNB-04-{33.0}												
PATTERSON CREEK	PNB-04-{39.4}												
PATTERSON CREEK	PNB-04-{45.2}												
PLUM RUN	PNB-04-A												
PAINTER RUN	PNB-04-C												
HORSESHOE CREEK	PNB-04-C.5												
LONG PASTURE RUN	PNB-04-C-1-A												
ROSSER RUN	PNB-04-CC												
MILL RUN	PNB-04-D												
THORN CREEK	PNB-04-DD-{2.0}	✔											
UNT OF NORTH FORK PATTERSON CREEK	PNB-04-EE-7-{0.4}												
MIDDLE FORK / PATTERSON CREEK	PNB-04-FF												
UNT OF UNT OF MIDDLE FORK / PATTERSON	PNB-04-FF-5-A-{0.6}												
CABIN RUN	PNB-04-J-{1.6}												
PARGUT RUN	PNB-04-J-1												
MILL CREEK	PNB-04-S-{04.7}												
MILL CREEK	PNB-04-S-{5.6}												
SUGAR RUN	PNB-04-S-1												
ELLIBER RUN	PNB-04-V												
WHIP RUN	PNB-04-W-3												
NEW CREEK	PNB-07-{03.8}												
NEW CREEK	PNB-07-{08.4}												
NEW CREEK	PNB-07-{10.4}	✔											
BLOCK RUN	PNB-07-C												
UNT OF UNT OF NEW CREEK	PNB-07-C.4-1-{0.2}												
ASH SPRING RUN	PNB-07-F-{0.6}												
LINTON CREEK	PNB-07-H												
UNT OF LINTON CREEK	PNB-07-H-2-{1.0}												

PC	PARK OR CAMP
PL	PARKING LOT
BD	BOAT DOCK
SM	SWIMMING

FH	FISHING
PD	PIPE / DRAIN
FT	FOOT TRAIL
AHB	ATV, HORSE OR BIKE TRAIL

BC	BRIDGE / CULVERT
RD	RECREATIONAL ROAD
RW	ROAD WIDTH
RS	ROAD SURFACE

Table 8(B): Stream Reach Activities/Disturbances Recreational For Ecoregion 69

NAME	STREAM CODE	PC	PL	BD	SM	FH	PD	FT	AHB	BC	RD	RW	RS
NORTH BRANCH	P-20-{052.0}												
NORTH BRANCH	P-20-{081.6}												
NORTH BRANCH	P-20-{082.6}												
NORTH BRANCH	P-20-{088.9}												
NORTH BRANCH	P-20-{097.9}												
NORTH BRANCH	P-20-{101.8}												
SLAUGHTERHOUSE RUN	PNB-10												
MONTGOMERY RUN	PNB-11-{0.8}												
DEEP RUN	PNB-15												
CRANBERRY RUN (DUP 1)	PNB-15-A												
CRANBERRY RUN (DUP 2)	PNB-15-A												
UNT OF ABRAMS CREEK	PNB-16-.5A-{0.4}												
ABRAM CREEK	PNB-16-{05.4}												
ABRAM CREEK	PNB-16-{16.8}												
ABRAM CREEK	PNB-16-{18.1}							✔	✔				
EMORY CREEK	PNB-16-A-{0.8}										✔	Single	Rutted dirt
WYCKOFF RUN (DUP 1)	PNB-16-B												
WYCKOFF RUN (DUP 2)	PNB-16-B												
LAUREL RUN	PNB-16-B.5												
STONY RIVER	PNB-17-{06.9}							✔					
STONY RIVER	PNB-17-{09.6}												
STONY RIVER	PNB-17-{15.6}												
MILL RUN	PNB-17-B												
LAUREL RUN	PNB-17-B.5												
FOURMILE RUN	PNB-17-C												
LAUREL RUN	PNB-17-D												
HELMICK RUN	PNB-17-E								✔				
DIFFICULT CREEK	PNB-18												
BUFFALO CREEK	PNB-19-{1.4}												
LITTLE BUFFALO CREEK	PNB-19-A												
RED OAK CREEK	PNB-20												
ELK RUN (DUP 1)	PNB-21												
ELK RUN (DUP 2)	PNB-21												
DEAKIN RUN	PNB-22												

PC	PARK OR CAMP
PL	PARKING LOT
BD	BOAT DOCK
SM	SWIMMING

FH	FISHING
PD	PIPE / DRAIN
FT	FOOT TRAIL
AHB	ATV, HORSE OR BIKE TRAIL

BC	BRIDGE / CULVERT
RD	RECREATIONAL ROAD
RW	ROAD WIDTH
RS	ROAD SURFACE

Table 9(A): Stream Reach Activities/Disturbances Agricultural In Ecoregion 67													
NAME	STREAM CODE	RC	PT	HAY	OR	PY	CA	IR	PD	BC	RD	RW	RS
GREEN SPRING RUN	PNB-01-{4.2}		✔				✔			✔	✔	Single	Rutted dirt
PATTERSON CREEK	PNB-04-{04.6}			✔									
PATTERSON CREEK	PNB-04-{20.2}			✔						✔			
PATTERSON CREEK	PNB-04-{29.7}												
PATTERSON CREEK	PNB-04-{33.0}	✔		✔							✔	Single	Dirt
PATTERSON CREEK	PNB-04-{39.4}	✔	✔				✔			✔	✔	Single	Dirt
PATTERSON CREEK	PNB-04-{45.2}	✔	✔				✔				✔	Single	Dirt
PLUM RUN	PNB-04-A		✔				✔						
PAINTER RUN	PNB-04-C												
HORSESHOE CREEK	PNB-04-C.5		✔	✔							✔	Single	Dirt
LONG PASTURE RUN	PNB-04-C-1-A												
ROSSER RUN	PNB-04-CC			✔							✔	Single	Dirt
MILL RUN	PNB-04-D			✔									
THORN CREEK	PNB-04-DD-{2.0}												
UNT OF NORTH FORK PATTERSON CREEK	PNB-04-EE-7-{0.4}												
MIDDLE FORK / PATTERSON CREEK	PNB-04-FF			✔		✔							
UNT OF UNT OF MIDDLE FORK / PATTERSON	PNB-04-FF-5-A-{0.6}		✔				✔						
CABIN RUN	PNB-04-J-{1.6}	✔	✔										
PARGUT RUN	PNB-04-J-1			✔									
MILL CREEK	PNB-04-S-{04.7}		✔				✔						
MILL CREEK	PNB-04-S-{5.6}		✔										
SUGAR RUN	PNB-04-S-1												
ELLIBER RUN	PNB-04-V												
WHIP RUN	PNB-04-W-3		✔	✔			✔						
NEW CREEK	PNB-07-{03.8}												
NEW CREEK	PNB-07-{08.4}												
NEW CREEK	PNB-07-{10.4}		✔										
BLOCK RUN	PNB-07-C												
UNT OF UNT OF NEW CREEK	PNB-07-C.4-1-{0.2}	✔	✔				✔				✔	Single	Dirt
ASH SPRING RUN	PNB-07-F-{0.6}												
LINTON CREEK	PNB-07-H			✔							✔	Single	Rutted dirt
UNT OF LINTON CREEK	PNB-07-H-2-{1.0}		✔										

RC	ROW CROPS
PT	PASTURE
HAY	HAY
OR	ORCHARD

PY	POULTRY
CA	CATTLE ACCESS
IR	IRRIGATION
PD	PIPE / DRAIN

BC	BRIDGE / CULVERT
RD	FARM ROAD
RW	ROAD WIDTH
RS	ROAD SURFACE

Table 9(B): Stream Reach Activities/Disturbances Agricultural In Ecoregion 69

NAME	STREAM CODE	RC	PT	HAY	OR	PY	CA	IR	PD	BC	RD	RW	RS
NORTH BRANCH	P-20-{052.0}												
NORTH BRANCH	P-20-{081.6}												
NORTH BRANCH	P-20-{082.6}												
NORTH BRANCH	P-20-{088.9}												
NORTH BRANCH	P-20-{097.9}												
NORTH BRANCH	P-20-{101.8}												
SLAUGHTERHOUSE RUN	PNB-10												
MONTGOMERY RUN	PNB-11-{0.8}												
DEEP RUN	PNB-15												
CRANBERRY RUN (DUP 1)	PNB-15-A												
CRANBERRY RUN (DUP 2)	PNB-15-A												
UNT OF ABRAMS CREEK	PNB-16-.5A-{0.4}												
ABRAM CREEK	PNB-16-{05.4}												
ABRAM CREEK	PNB-16-{16.8}												
ABRAM CREEK	PNB-16-{18.1}			✔									
EMORY CREEK	PNB-16-A-{0.8}												
WYCKOFF RUN (DUP 1)	PNB-16-B												
WYCKOFF RUN (DUP 2)	PNB-16-B												
LAUREL RUN	PNB-16-B.5												
STONY RIVER	PNB-17-{06.9}												
STONY RIVER	PNB-17-{09.6}												
STONY RIVER	PNB-17-{15.6}												
MILL RUN	PNB-17-B												
LAUREL RUN	PNB-17-B.5												
FOURMILE RUN	PNB-17-C												
LAUREL RUN	PNB-17-D												
HELMICK RUN	PNB-17-E												
DIFFICULT CREEK	PNB-18												
BUFFALO CREEK	PNB-19-{1.4}												
LITTLE BUFFALO CREEK	PNB-19-A												
RED OAK CREEK	PNB-20												
ELK RUN (DUP 1)	PNB-21												
ELK RUN (DUP 2)	PNB-21												
DEAKIN RUN	PNB-22												

RC	ROW CROPS
PT	PASTURE
HAY	HAY
OR	ORCHARD

PY	POULTRY
CA	CATTLE ACCESS
IR	IRRIGATION
PD	PIPE / DRAIN

BC	BRIDGE / CULVERT
RD	FARM ROAD
RW	ROAD WIDTH
RS	ROAD SURFACE

Table 10(A): Stream Reach Activities/Disturbances Industrial For Ecoregion 67

NAME	STREAM CODE	IP	SM	DM	CP	QU	OG	PO	LG	SW	LF	WW	PW	PD	PL	BC	RR	RD	RW	RS
GREEN SPRING RUN	PNB-01-{4.2}																			
PATTERSON CREEK	PNB-04-{04.6}																			
PATTERSON CREEK	PNB-04-{20.2}							✔												
PATTERSON CREEK	PNB-04-{29.7}							✔												
PATTERSON CREEK	PNB-04-{33.0}																			
PATTERSON CREEK	PNB-04-{39.4}																			
PATTERSON CREEK	PNB-04-{45.2}																			
PLUM RUN	PNB-04-A							✔												
PAINTER RUN	PNB-04-C																			
HORSESHOE CREEK	PNB-04-C.5													✔						
LONG PASTURE RUN	PNB-04-C-1-A																			
ROSSER RUN	PNB-04-CC																			
MILL RUN	PNB-04-D							✔												
THORN CREEK	PNB-04-DD-{2.0}							✔												
UNT OF NORTH FORK PATTERSON CREEK	PNB-04-EE-7-{0.4}																			
MIDDLE FORK / PATTERSON CREEK	PNB-04-FF																			
UNT OF UNT OF MIDDLE FORK / PATTERSON	PNB-04-FF-5-A-{0.6}																			
CABIN RUN	PNB-04-J-{1.6}							✔												
PARGUT RUN	PNB-04-J-1							✔												
MILL CREEK	PNB-04-S-{04.7}							✔												
MILL CREEK	PNB-04-S-{5.6}																			
SUGAR RUN	PNB-04-S-1																			
ELLIBER RUN	PNB-04-V							✔												
WHIP RUN	PNB-04-W-3							✔												
NEW CREEK	PNB-07-{03.8}																			
NEW CREEK	PNB-07-{08.4}							✔												
NEW CREEK	PNB-07-{10.4}																			
BLOCK RUN	PNB-07-C														✔	✔				
UNT OF UNT OF NEW CREEK	PNB-07-C.4-1-{0.2}																			
ASH SPRING RUN	PNB-07-F-{0.6}							✔												
LINTON CREEK	PNB-07-H																			
UNT OF LINTON CREEK	PNB-07-H-2-{1.0}																			

IP	INDUSTRIAL PLANT
SM	SURFACE MINE
DM	DEEP MINE
CP	COAL PREPARATION
QU	QUARRY
OG	OIL AND GAS WELLS
PO	POWER LINES

LG	LOGGING
SW	SAWMILL
LF	LANDFILL
WW	WASTE WATER TREATMENT
PW	PUBLIC WATER TREATMENT
PD	PIPE / DRAIN
PL	PARKING LOT

BC	BRIDGE / CULVERT
RR	RAILROAD
RD	INDUSTRIAL ROAD
RW	ROAD WIDTH
RS	ROAD SURFACE

Table 10(B): Stream Reach Activities/Disturbances Industrial For Ecoregion 69

NAME	STREAM CODE	IP	SM	DM	CP	QU	OG	PO	LG	SW	LF	WW	PW	PD	PL	BC	RR	RD	RW	RS
NORTH BRANCH	P-20-{052.0}																✔			
NORTH BRANCH	P-20-{081.6}																✔			
NORTH BRANCH	P-20-{082.6}																✔			
NORTH BRANCH	P-20-{088.9}																			
NORTH BRANCH	P-20-{097.9}																✔			
NORTH BRANCH	P-20-{101.8}																			
SLAUGHTERHOUSE RUN	PNB-10																			
MONTGOMERY RUN	PNB-11-{0.8}		✔		✔											✔				
DEEP RUN	PNB-15																			
CRANBERRY RUN (DUP 1)	PNB-15-A							✔												
CRANBERRY RUN (DUP 2)	PNB-15-A							✔												
UNT OF ABRAMS CREEK	PNB-16-.5A-{0.4}																			
ABRAM CREEK	PNB-16-{05.4}																			
ABRAM CREEK	PNB-16-{16.8}																	✔	Double	Applied non-limestone
ABRAM CREEK	PNB-16-{18.1}																			
EMORY CREEK	PNB-16-A-{0.8}																			
WYCKOFF RUN (DUP 1)	PNB-16-B							✔								✔				
WYCKOFF RUN (DUP 2)	PNB-16-B																			
LAUREL RUN	PNB-16-B.5																	✔	Single	Dirt
STONY RIVER	PNB-17-{06.9}							✔												
STONY RIVER	PNB-17-{09.6}																			
STONY RIVER	PNB-17-{15.6}																			
MILL RUN	PNB-17-B							✔										✔	Single	Applied limestone
LAUREL RUN	PNB-17-B.5								✔											
FOURMILE RUN	PNB-17-C		✔	✔	✔			✔												
LAUREL RUN	PNB-17-D																			
HELMICK RUN	PNB-17-E							✔										✔	Single	Rutted Dirt
DIFFICULT CREEK	PNB-18																			
BUFFALO CREEK	PNB-19-{1.4}													✔		✔	✔			
LITTLE BUFFALO CK	PNB-19-A							✔				✔		✔						
RED OAK CREEK	PNB-20																			
ELK RUN (DUP 1)	PNB-21				✔											✔		✔	Double	Asphalt
ELK RUN (DUP 2)	PNB-21		✔	✔	✔													✔	Double	Asphalt
DEAKIN RUN	PNB-22																			

IP	INDUSTRIAL PLANT
SM	SURFACE MINE
DM	DEEP MINE
CP	COAL PREPARATION
QU	QUARRY
OG	OIL AND GAS WELLS

LG	LOGGING
SW	SAWMILL
LF	LANDFILL
WW	WASTE WATER TREATMENT
PW	PUBLIC WATER TREATMENT
PD	PIPE / DRAIN

BC	BRIDGE / CULVERT
RR	RAILROAD
RD	INDUSTRIAL ROAD
RW	ROAD WIDTH
RS	ROAD SURFACE

Table 11(A): Stream Reach Activities/Disturbances Stream Bed Alterations In Ecoregion 67

NAME	STREAM CODE	LIMING	RIPRAP STABILIZATION	DREDGING	CHANNEL-IZATION	FILL	DAMS
GREEN SPRING RUN	PNB-01-{4.2}						✔
PATTERSON CREEK	PNB-04-{04.6}						
PATTERSON CREEK	PNB-04-{20.2}		✔				
PATTERSON CREEK	PNB-04-{29.7}				✔		✔
PATTERSON CREEK	PNB-04-{33.0}		✔				
PATTERSON CREEK	PNB-04-{39.4}						
PATTERSON CREEK	PNB-04-{45.2}				✔		
PLUM RUN	PNB-04-A						
PAINTER RUN	PNB-04-C						
HORSESHOE CREEK	PNB-04-C.5						✔
LONG PASTURE RUN	PNB-04-C-1-A						
ROSSER RUN	PNB-04-CC						
MILL RUN	PNB-04-D						
THORN CREEK	PNB-04-DD-{2.0}						
UNT OF NORTH FORK PATTERSON CREEK	PNB-04-EE-7-{0.4}						
MIDDLE FORK / PATTERSON CREEK	PNB-04-FF						
UNT OF UNT OF MIDDLE FORK / PATTERSON	PNB-04-FF-5-A-{0.6}						
CABIN RUN	PNB-04-J-{1.6}		✔		✔		
PARGUT RUN	PNB-04-J-1		✔		✔		
MILL CREEK	PNB-04-S-{04.7}		✔		✔		✔
MILL CREEK	PNB-04-S-{5.6}						✔
SUGAR RUN	PNB-04-S-1						
ELLIBER RUN	PNB-04-V		✔		✔		
WHIP RUN	PNB-04-W-3						
NEW CREEK	PNB-07-{03.8}						
NEW CREEK	PNB-07-{08.4}						
NEW CREEK	PNB-07-{10.4}						
BLOCK RUN	PNB-07-C						
UNT OF UNT OF NEW CREEK	PNB-07-C.4-1-{0.2}						
ASH SPRING RUN	PNB-07-F-{0.6}						
LINTON CREEK	PNB-07-H						
UNT OF LINTON CREEK	PNB-07-H-2-{1.0}						

Table 11(B): Stream Reach Activities/Disturbances Stream Bed Alterations In Ecoregion 69

NAME	STREAM CODE	LIMING	RIPRAP STABILIZATION	DREDGING	CHANNEL-IZATION	FILL	DAMS
NORTH BRANCH	P-20-{052.0}						
NORTH BRANCH	P-20-{081.6}					✔	
NORTH BRANCH	P-20-{082.6}						
NORTH BRANCH	P-20-{088.9}						
NORTH BRANCH	P-20-{097.9}					✔	
NORTH BRANCH	P-20-{101.8}						
SLAUGHTERHOUSE RUN	PNB-10		✔		✔		
MONTGOMERY RUN	PNB-11-{0.8}						
DEEP RUN	PNB-15			✔	✔		
CRANBERRY RUN (DUP 1)	PNB-15-A			✔			
CRANBERRY RUN (DUP 2)	PNB-15-A			✔	✔		
UNT OF ABRAMS CREEK	PNB-16-.5A-{0.4}						
ABRAM CREEK	PNB-16-{05.4}						
ABRAM CREEK	PNB-16-{16.8}						
ABRAM CREEK	PNB-16-{18.1}		✔				
EMORY CREEK	PNB-16-A-{0.8}						
WYCKOFF RUN (DUP 1)	PNB-16-B				✔		
WYCKOFF RUN (DUP 2)	PNB-16-B						
LAUREL RUN	PNB-16-B.5						
STONY RIVER	PNB-17-{06.9}		✔				
STONY RIVER	PNB-17-{09.6}						
STONY RIVER	PNB-17-{15.6}						
MILL RUN	PNB-17-B						
LAUREL RUN	PNB-17-B.5						
FOURMILE RUN	PNB-17-C						
LAUREL RUN	PNB-17-D						
HELMICK RUN	PNB-17-E						
DIFFICULT CREEK	PNB-18						
BUFFALO CREEK	PNB-19-{1.4}				✔	✔	
LITTLE BUFFALO CREEK	PNB-19-A					✔	
RED OAK CREEK	PNB-20						
ELK RUN (DUP 1)	PNB-21					✔	
ELK RUN (DUP 2)	PNB-21		✔			✔	
DEAKIN RUN	PNB-22						

Table 12(A): Riparian Groundcover For Ecoregion 67
(Less Than 0.5 Meters High)

NAME	STREAM CODE	LEFT DESCENDING BANK				RIGHT DESCENDING BANK				STREAM SHADE
		SHRUBS SEEDLINGS	NONWOODY HERBS GRASSES FERNS & MOSSES	LEAF LITTER	BARE SOIL	SHRUBS SEEDLINGS	NONWOODY HERBS GRASSES FERNS & MOSSES	LEAF LITTER	BARE SOIL	
GREEN SPRING RUN	PNB-01-{4.2}	2	3	0	2	1	3	0	2	1
PATTERSON CREEK	PNB-04-{04.6}	1	3	3	2	1	3	2	1	2
PATTERSON CREEK	PNB-04-{20.2}	1	3	1	1	2	3	1	1	1
PATTERSON CREEK	PNB-04-{29.7}	2	3	1	1	1	2	1	2	1
PATTERSON CREEK	PNB-04-{33.0}	1	4	0	2	1	4	0	1	2
PATTERSON CREEK	PNB-04-{39.4}	2	3	1	2	1	4	0	1	1
PATTERSON CREEK	PNB-04-{45.2}	2	3	1	2	1	3	0	2	2
HORSESHOE CREEK	PNB-04-C.5	1	3	1	1	1	2	1	3	1
ROSSER RUN	PNB-04-CC	1	4	0	1	1	2	1	2	2
MILL RUN	PNB-04-D	2	3	2	1	1	4	1	1	2
THORN CREEK	PNB-04-DD-{2.0}	2	3	1	0	2	3	1	1	3
UNT OF NORTH FORK PATTERSON CREEK	PNB-04-EE-7-{0.4}	1	3	4	2	1	3	4	1	4
MIDDLE FORK / PATTERSON CREEK	PNB-04-FF	0	4	0	0	0	4	0	2	1
UNT OF UNT OF MIDDLE FORK / PATTERSON	PNB-04-FF-5-A-{0.6}	0	4	1	1	0	4	2	3	1
CABIN RUN	PNB-04-J-{1.6}	2	3	2	2	2	2	2	2	2
PARGUT RUN	PNB-04-J-1	2	3	3	1	1	2	1	2	3
MILL CREEK	PNB-04-S-{04.7}	1	3	0	1	1	3	1	2	1
MILL CREEK	PNB-04-S-{5.6}	1	3	1	3	0	4	2	1	1
ELLIBER RUN	PNB-04-V	1	2	3	3	1	2	3	1	3
WHIP RUN	PNB-04-W-3	1	3	2	2	1	4	1	1	2
NEW CREEK	PNB-07-{03.8}	2	3	1	0	1	1	2	2	3
NEW CREEK	PNB-07-{08.4}	1	2	1	3	1	2	1	3	3
NEW CREEK	PNB-07-{10.4}	2	3	2	2	2	3	3	1	2
BLOCK RUN	PNB-07-C	0	3	1	1	0	3	0	3	3
UNT OF UNT OF NEW CREEK	PNB-07-C.4-1-{0.2}	2	4	0	1	1	4	0	1	2
ASH SPRING RUN	PNB-07-F-{0.6}	2	2	3	1	2	2	2	2	4
LINTON CREEK	PNB-07-H	2	2	2	1	2	3	2	0	4
UNT OF LINTON CREEK	PNB-07-H-2-{1.0}	1	1	3	2	1	2	3	2	4

SHRUB SEEDLINGS/NONWOODY HERBS, LEAF LITTER, BARE SOIL	
0	ABSENT
1	SPARSE (0-10%)
2	MODERATE (10-40%)
3	HEAVY (40-75%)
4	VERY HEAVY (>75%)

STREAM SHADE	
1	FULLY EXPOSED (0-25%)
2	PARTIALLY SHADED (25-50%)
3	PARTIALLY EXPOSED (50-75%)
4	FULLY SHADED (75-100%)

Table 12(B): Riparian Groundcover For Ecoregion 69
(Less Than 0.5 Meters High)

NAME	STREAM CODE	LEFT DESCENDING BANK				RIGHT DESCENDING BANK				STREAM SHADE
		SHRUBS SEEDLINGS	NONWOODY HERBS GRASSES FERNS & MOSSES	LEAF LITTER	BARE SOIL	SHRUBS SEEDLINGS	NONWOODY HERBS GRASSES FERNS & MOSSES	LEAF LITTER	BARE SOIL	
NORTH BRANCH	P-20-{052.0}	1	1	0	2	1	2	1	1	1
NORTH BRANCH	P-20-{081.6}	2	3	2	1	1	2	1	2	1
NORTH BRANCH	P-20-{082.6}	2	3	2	1	2	3	1	2	1
NORTH BRANCH	P-20-{088.9}	1	2	3	1	2	3	2	1	1
NORTH BRANCH	P-20-{097.9}	2	3	2	1	2	2	3	1	1
NORTH BRANCH	P-20-{101.8}	0	4	0	0	0	4	0	0	1
SLAUGHTERHOUSE RUN	PNB-10	1	4	2	2	1	4	1	1	1
MONTGOMERY RUN	PNB-11-{0.8}	1	1	1	3	1	1	1	2	4
DEEP RUN	PNB-15	2	4	3	1	1	2	2	1	4
CRANBERRY RUN (DUP 1)	PNB-15-A	1	4	0	0	1	4	0	1	1
CRANBERRY RUN (DUP 2)	PNB-15-A	1	3	1	1	1	3	1	1	2
UNT OF ABRAMS CREEK	PNB-16-.5A-{0.4}	1	2	3	2	1	2	3	1	4
ABRAM CREEK	PNB-16-{05.4}	1	3	2	1	1	3	3	1	3
ABRAM CREEK	PNB-16-{16.8}	1	3	0	1	1	3	0	0	1
ABRAM CREEK	PNB-16-{18.1}	2	3	3	1	3	3	2	1	3
EMORY CREEK	PNB-16-A-{0.8}	1	2	2	1	1	3	2	2	3
WYCKOFF RUN (DUP 1)	PNB-16-B	1	2	2	1	1	3	2	1	3
WYCKOFF RUN (DUP 2)	PNB-16-B	1	3	2	0	1	3	2	1	2
LAUREL RUN	PNB-16-B.5	1	2	3	2	1	2	3	2	0
STONY RIVER	PNB-17-{06.9}	1	3	1	0	2	2	2	1	1
STONY RIVER	PNB-17-{09.6}	1	2	3	2	1	3	2	2	1
STONY RIVER	PNB-17-{15.6}	2	3	2	1	2	2	3	1	1
MILL RUN	PNB-17-B	1	1	3	0	1	1	1	2	4
LAUREL RUN	PNB-17-B.5	1	2	2	1	1	3	2	1	3
FOURMILE RUN	PNB-17-C	1	2	2	3	1	2	2	3	3
LAUREL RUN	PNB-17-D	1	4	0	1	1	4	0	1	1
HELMICK RUN	PNB-17-E	1	4	1	1	1	4	1	1	1
DIFFICULT CREEK	PNB-18	2	2	2	0	2	2	3	0	3
BUFFALO CREEK	PNB-19-{1.4}	1	2	1	3	1	2	2	3	4
LITTLE BUFFALO CREEK	PNB-19-A	2	3	1	2	2	3	2	1	3
RED OAK CREEK	PNB-20	2	3	3	1	2	2	3	1	4
ELK RUN (DUP 1)	PNB-21	1	4	1	1	1	2	1	1	1
ELK RUN (DUP 2)	PNB-21	0	3	0	1	0	2	0	1	1
DEAKIN RUN	PNB-22	0	4	0	0	1	3	1	0	1

SHRUB SEEDLINGS/NONWOODY HERBS, LEAF LITTER, BARE SOIL	
0	ABSENT
1	SPARSE (0-10%)
2	MODERATE (10-40%)
3	HEAVY (40-75%)
4	VERY HEAVY (>75%)

STREAM SHADE	
1	FULLY EXPOSED (0-25%)
2	PARTIALLY SHADED (25-50%)
3	PARTIALLY EXPOSED (50-75%)
4	FULLY SHADED (75-100%)

Table 13(A): Riparian Understory For Ecoregion 67
(0.5 To 5.0 Meters High)

NAME	STREAM CODE	LEFT DESCENDING BANK			RIGHT DESCENDING BANK		
		VEGETATION TYPE	SHRUBS SAPLINGS	NON-WOODY HERBS	VEGETATION TYPE	SHRUBS SAPLINGS	NON-WOODY HERBS
GREEN SPRING RUN	PNB-01-{4.2}	D	2	3	D	1	2
PATTERSON CREEK	PNB-04-{04.6}	D	2	2	D	2	2
PATTERSON CREEK	PNB-04-{20.2}	D	2	3	D	2	2
PATTERSON CREEK	PNB-04-{29.7}	D	2	2	D	2	2
PATTERSON CREEK	PNB-04-{33.0}	D	2	1	M	2	1
PATTERSON CREEK	PNB-04-{39.4}	M	3	0	N	0	0
PATTERSON CREEK	PNB-04-{45.2}	D	2	0	D	2	0
HORSESHOE CREEK	PNB-04-C.5	D	1	3	D	1	2
ROSSER RUN	PNB-04-CC	D	2	1	D	3	1
MILL RUN	PNB-04-D	D	2	2	D	1	1
THORN CREEK	PNB-04-DD-{2.0}	D	2	2	D	3	0
UNT OF NORTH FORK PATTERSON CREEK	PNB-04-EE-7-{0.4}	D	1	1	D	3	2
MIDDLE FORK / PATTERSON CREEK	PNB-04-FF	D	1	0	D	1	2
UNT OF UNT OF MIDDLE FORK / PATTERSON	PNB-04-FF-5-A-{0.6}	D	1	0	N	0	0
CABIN RUN	PNB-04-J-{1.6}	D	1	2	D	2	2
PARGUT RUN	PNB-04-J-1	D	3	2	D	2	2
MILL CREEK	PNB-04-S-{04.7}	D	1	4	D	1	3
MILL CREEK	PNB-04-S-{5.6}	D	3	3	D	0	4
ELLIBER RUN	PNB-04-V	D	2	1	D	2	1
WHIP RUN	PNB-04-W-3	D	3	1	D	2	1
NEW CREEK	PNB-07-{03.8}	D	3	3	D	3	2
NEW CREEK	PNB-07-{08.4}	D	2	1	M	3	0
NEW CREEK	PNB-07-{10.4}	D	3	2	D	2	3
BLOCK RUN	PNB-07-C	D	3	1	D	1	1
UNT OF UNT OF NEW CREEK	PNB-07-C.4-1-{0.2}	D	2	0	D	1	0
ASH SPRING RUN	PNB-07-F-{0.6}	D	3	0	D	3	0
LINTON CREEK	PNB-07-H	D	3	2	D	3	2
UNT OF LINTON CREEK	PNB-07-H-2-{1.0}	D	2	0	D	2	0

VEGETATION TYPE	
D	DECIDUOUS
C	CONIFEROUS
M	MIXED

SHRUB SAPLINGS / NON-WOODY HERBS	
0	ABSENT
1	SPARSE (0-10%)
2	MODERATE (10-40%)
3	HEAVY (40-75%)
4	VERY HEAVY (> 75%)

Table 13(B): Riparian Understory For Ecoregion 69
(0.5 To 5.0 Meters High)

NAME	STREAM CODE	LEFT DESCENDING BANK			RIGHT DESCENDING BANK		
		VEGETATION TYPE	SHRUBS SAPLINGS	NON-WOODY HERBS	VEGETATION TYPE	SHRUBS SAPLINGS	NON-WOODY HERBS
NORTH BRANCH	P-20-{052.0}	D	1	2	D	1	2
NORTH BRANCH	P-20-{081.6}	D	1	1	D	1	2
NORTH BRANCH	P-20-{082.6}	D	3	1	D	3	1
NORTH BRANCH	P-20-{088.9}	M	2	1	M	2	1
NORTH BRANCH	P-20-{097.9}	M	2	3	M	2	2
NORTH BRANCH	P-20-{101.8}	D	1	2	D	1	2
SLAUGHTERHOUSE RUN	PNB-10	D	2	2	D	1	1
MONTGOMERY RUN	PNB-11-{0.8}	D	2	2	D	2	2
DEEP RUN	PNB-15	D	2	4	D	1	1
CRANBERRY RUN (DUP 1)	PNB-15-A	M	1	1	D	1	1
CRANBERRY RUN (DUP 2)	PNB-15-A	D	1	1	D	1	1
UNT OF ABRAMS CREEK	PNB-16-.5A-{0.4}	D	2	2	D	2	2
ABRAM CREEK	PNB-16-{05.4}	M	1	1	M	1	1
ABRAM CREEK	PNB-16-{16.8}	D	2	2	D	2	3
ABRAM CREEK	PNB-16-{18.1}	M	2	1	M	2	2
EMORY CREEK	PNB-16-A-{0.8}	D	2	2	D	2	2
WYCKOFF RUN (DUP 1)	PNB-16-B	D	1	2	D	2	2
WYCKOFF RUN (DUP 2)	PNB-16-B	D	3	2	D	3	2
LAUREL RUN	PNB-16-B.5	D	1	1	D	1	1
STONY RIVER	PNB-17-{06.9}	D	2	2	D	3	2
STONY RIVER	PNB-17-{09.6}	D	1	1	D	2	1
STONY RIVER	PNB-17-{15.6}	D	2	2	D	2	0
MILL RUN	PNB-17-B	D	2	1	D	1	1
LAUREL RUN	PNB-17-B.5	M	1	1	M	1	1
FOURMILE RUN	PNB-17-C	M	2	2	D	1	2
LAUREL RUN	PNB-17-D	M	1	1	D	2	1
HELMICK RUN	PNB-17-E	M	2	3	M	2	3
DIFFICULT CREEK	PNB-18	D	2	1	M	1	1
BUFFALO CREEK	PNB-19-{1.4}	D	1	2	M	2	1
LITTLE BUFFALO CREEK	PNB-19-A	D	1	3	D	2	2
RED OAK CREEK	PNB-20	D	2	1	M	2	1
ELK RUN (DUP 1)	PNB-21	M	2	3	M	1	2
ELK RUN (DUP 2)	PNB-21	D	1	2	D	1	1
DEAKIN RUN	PNB-22	D	1	3	D	1	3

VEGETATION TYPE	
D	DECIDUOUS
C	CONIFEROUS
M	MIXED

SHRUB SAPLINGS / NON-WOODY HERBS	
0	ABSENT
1	SPARSE (0-10%)
2	MODERATE (10-40%)
3	HEAVY (40-75%)
4	VERY HEAVY (> 75%)

Table 14(A): Riparian Canopy For Ecoregion 67
(Over 5.0 Meters High)

NAME	STREAM CODE	LEFT DESCENDING BANK			RIGHT DESCENDING BANK		
		VEGETATION TYPE	BIG TREES	SMALL TREES	VEGETATION TYPE	BIG TREES	SMALL TREES
GREEN SPRING RUN	PNB-01-{4.2}	D	0	1	D	0	1
PATTERSON CREEK	PNB-04-{04.6}	D	3	3	D	2	2
PATTERSON CREEK	PNB-04-{20.2}	D	1	2	D	2	2
PATTERSON CREEK	PNB-04-{29.7}	D	3	2	D	2	2
PATTERSON CREEK	PNB-04-{33.0}	D	2	1	D	1	2
PATTERSON CREEK	PNB-04-{39.4}	D	1	3	N	0	0
PATTERSON CREEK	PNB-04-{45.2}	D	2	2	D	1	2
HORSESHOE CREEK	PNB-04-C.5	D	1	1	D	1	2
ROSSER RUN	PNB-04-CC	D	1	2	D	1	3
MILL RUN	PNB-04-D	D	2	3	D	1	0
THORN CREEK	PNB-04-DD-{2.0}	D	0	3	D	1	2
UNT OF NORTH FORK PATTERSON CREEK	PNB-04-EE-7-{0.4}	M	2	2	M	2	2
MIDDLE FORK / PATTERSON CREEK	PNB-04-FF	D	0	1	D	0	1
UNT OF UNT OF MIDDLE FORK / PATTERSON	PNB-04-FF-5-A-{0.6}	D	1	2	D	2	1
CABIN RUN	PNB-04-J-{1.6}	D	2	2	D	2	3
PARGUT RUN	PNB-04-J-1	D	2	3	D	2	2
MILL CREEK	PNB-04-S-{04.7}	D	1	1	D	1	1
MILL CREEK	PNB-04-S-{5.6}	D	0	2	D	1	0
ELLIBER RUN	PNB-04-V	D	2	2	D	2	2
WHIP RUN	PNB-04-W-3	D	2	2	D	2	1
NEW CREEK	PNB-07-{03.8}	D	1	2	D	2	3
NEW CREEK	PNB-07-{08.4}	D	1	3	D	3	3
NEW CREEK	PNB-07-{10.4}	D	2	2	D	2	2
BLOCK RUN	PNB-07-C	D	1	2	D	0	1
UNT OF UNT OF NEW CREEK	PNB-07-C.4-1-{0.2}	D	1	1	D	1	1
ASH SPRING RUN	PNB-07-F-{0.6}	D	2	3	D	2	3
LINTON CREEK	PNB-07-H	D	2	3	D	2	3
UNT OF LINTON CREEK	PNB-07-H-2-{1.0}	D	0	3	D	1	3

VEGETATION TYPE	
D	DECIDUOUS
C	CONIFEROUS
M	MIXED

BIG TREES / SMALL TREES	
0	ABSENT
1	SPARSE (0-10%)
2	MODERATE (10-40%)
3	HEAVY (40-75%)
4	VERY HEAVY (> 75%)

Table 14(B): Riparian Canopy For Ecoregion 69
(Over 5.0 Meters High)

NAME	STREAM CODE	LEFT DESCENDING BANK			RIGHT DESCENDING BANK		
		VEGETATION TYPE	BIG TREES	SMALL TREES	VEGETATION TYPE	BIG TREES	SMALL TREES
NORTH BRANCH OF THE POTOMAC	P-20-{052.0}	D	1	1	D	2	2
NORTH BRANCH OF THE POTOMAC	P-20-{081.6}	D	2	2	D	1	1
NORTH BRANCH OF THE POTOMAC	P-20-{082.6}	D	2	3	D	1	1
NORTH BRANCH OF THE POTOMAC	P-20-{088.9}	D	2	3	M	3	3
NORTH BRANCH OF THE POTOMAC	P-20-{097.9}	M	2	3	M	2	2
NORTH BRANCH OF THE POTOMAC	P-20-{101.8}	N	0	0	N	0	0
SLAUGHTERHOUSE RUN	PNB-10	D	2	1	D	1	1
MONTGOMERY RUN	PNB-11-{0.8}	D	2	1	D	1	1
DEEP RUN	PNB-15	D	4	1	D	3	2
CRANBERRY RUN (DUP 1)	PNB-15-A	M	1	1	D	1	0
CRANBERRY RUN (DUP 2)	PNB-15-A	D	0	2	M	1	2
UNT OF ABRAMS CREEK	PNB-16-.5A-{0.4}	D	2	3	D	1	2
ABRAM CREEK	PNB-16-{05.4}	M	3	2	M	3	2
ABRAM CREEK	PNB-16-{16.8}	D	0	1	N	0	0
ABRAM CREEK	PNB-16-{18.1}	M	2	3	D	1	2
EMORY CREEK	PNB-16-A-{0.8}	D	1	3	D	2	2
WYCKOFF RUN (DUP 1)	PNB-16-B	D	3	2	D	2	2
WYCKOFF RUN (DUP 2)	PNB-16-B	D	1	3	D	1	3
LAUREL RUN	PNB-16-B.5	D	3	2	M	3	2
STONY RIVER	PNB-17-{06.9}	D	1	3	D	1	2
STONY RIVER	PNB-17-{09.6}	D	1	2	M	1	2
STONY RIVER	PNB-17-{15.6}	M	2	3	D	2	3
MILL RUN	PNB-17-B	M	2	2	D	1	1
LAUREL RUN	PNB-17-B.5	M	1	1	M	1	1
FOURMILE RUN	PNB-17-C	M	2	2	D	2	1
LAUREL RUN	PNB-17-D	M	1	1	D	0	1
HELMICK RUN	PNB-17-E	M	2	2	M	1	2
DIFFICULT CREEK	PNB-18	D	1	2	M	2	3
BUFFALO CREEK	PNB-19-{1.4}	D	1	2	M	1	2
LITTLE BUFFALO CREEK	PNB-19-A	D	1	1	D	1	2
RED OAK CREEK	PNB-20	D	2	2	D	2	3
ELK RUN (DUP 1)	PNB-21	N	0	0	N	0	0
ELK RUN (DUP 2)	PNB-21	D	0	1	D	0	1
DEAKIN RUN	PNB-22	D	1	1	M	1	2

VEGETATION TYPE	
D	DECIDUOUS
C	CONIFEROUS
M	MIXED

BIG TREES / SMALL TREES	
0	ABSENT
1	SPARSE (0-10%)
2	MODERATE (10-40%)
3	HEAVY (40-75%)
4	VERY HEAVY (> 75%)

Table 15(A): Substrate Compositions In Ecoregion 67								
NAME	STREAM CODE	% BEDROCK	% BOULDER	% COBBLE	% GRAVEL	% SAND	% SILT	% CLAY
GREEN SPRING RUN	PNB-01-{4.2}	0	0	40	40	20	0	0
PATTERSON CREEK	PNB-04-{04.6}	0	0	60	20	0	20	0
PATTERSON CREEK	PNB-04-{20.2}	0	0	25	60	15	5	0
PATTERSON CREEK	PNB-04-{29.7}	0	0	15	45	40	0	0
PATTERSON CREEK	PNB-04-{33.0}	0	10	75	10	5	0	0
PATTERSON CREEK	PNB-04-{39.4}	0	20	60	10	10	0	0
PATTERSON CREEK	PNB-04-{45.2}	0	0	80	5	10	5	0
HORSESHOE CREEK	PNB-04-C.5	0	0	20	60	20	0	0
ROSSER RUN	PNB-04-CC	0	10	90	0	0	0	0
MILL RUN	PNB-04-D	0	0	100	0	0	0	0
THORN CREEK	PNB-04-DD-{2.0}	0	5	50	25	15	0	5
UNT OF NORTH FORK PATTERSON CREEK	PNB-04-EE-7-{0.4}	0	20	40	30	10	0	0
MIDDLE FORK/PATTERSON CREEK	PNB-04-FF	0	5	60	15	15	5	0
UNT OF UNT OF MIDDLE FORK / PATTERSON	PNB-04-FF-5-A-{0.6}	0	0	0	0	10	60	30
CABIN RUN	PNB-04-J-{1.6}	0	0	60	25	5	10	0
PARGUT RUN	PNB-04-J-1	0	0	15	55	15	15	0
MILL CREEK	PNB-04-S-{04.7}	15	0	60	10	0	15	0
MILL CREEK	PNB-04-S-{5.6}	0	0	60	20	20	0	0
ELLIBER RUN	PNB-04-V	0	20	30	35	10	5	0
WHIP RUN	PNB-04-W-3	0	10	50	20	10	10	0
NEW CREEK	PNB-07-{03.8}	0	10	70	15	5	0	0
NEW CREEK	PNB-07-{08.4}	0	40	40	15	5	0	0
NEW CREEK	PNB-07-{10.4}	0	10	60	20	10	0	0
BLOCK RUN	PNB-07-C	0	5	45	35	10	5	0
UNT OF UNT OF NEW CREEK	PNB-07-C.4-1-{0.2}	0	0	10	10	60	20	0
ASH SPRING RUN	PNB-07-F-{0.6}	0	10	50	25	10	5	0
LINTON CREEK	PNB-07-H	0	10	70	15	5	0	0
UNT OF LINTON CREEK	PNB-07-H-2-{1.0}	0	0	40	50	10	0	0

Table 15(B): Substrate Compositions In Ecoregion 69

NAME	ANCODE	% BEDROCK	% BOULDER	% COBBLE	% GRAVEL	% SAND	% SILT	% CLAY
NORTH BRANCH	P-20-{052.0}	0	5	70	15	10	0	0
NORTH BRANCH	P-20-{081.6}	0	15	75	5	5	0	0
NORTH BRANCH	P-20-{082.6}	0	25	55	15	5	0	0
NORTH BRANCH	P-20-{088.9}	0	10	30	40	20	0	0
NORTH BRANCH	P-20-{097.9}	0	25	35	35	5	0	0
SLAUGHTERHOUSE RUN	PNB-10	0	5	20	20	40	15	0
MONTGOMERY RUN	PNB-11-{0.8}	0	0	70	20	5	5	0
DEEP RUN	PNB-15	0	10	50	20	15	5	0
CRANBERRY RUN (DUP 1)	PNB-15-A	0	10	40	20	25	5	0
CRANBERRY RUN (DUP 2)	PNB-15-A	0	5	40	30	20	5	0
UNT OF ABRAMS CREEK	PNB-16-.5A-{0.4}	0	30	25	30	15	0	0
ABRAM CREEK	PNB-16-{05.4}	0	70	20	5	5	0	0
ABRAM CREEK	PNB-16-{16.8}	0	10	65	20	5	0	0
ABRAM CREEK	PNB-16-{18.1}	0	10	60	5	20	5	0
EMORY CREEK	PNB-16-A-{0.8}	0	40	35	10	15	0	5
WYCKOFF RUN (DUP 1)	PNB-16-B	0	5	55	20	10	5	5
WYCKOFF RUN (DUP 2)	PNB-16-B	0	20	60	10	10	0	0
LAUREL RUN	PNB-16-B.5	0	15	60	15	10	0	0
STONY RIVER	PNB-17-{06.9}	0	10	55	20	15	0	0
STONY RIVER	PNB-17-{09.6}	0	20	45	25	5	5	0
STONY RIVER	PNB-17-{15.6}	30	40	15	7	5	3	0
MILL RUN	PNB-17-B	0	5	30	30	30	5	0
LAUREL RUN	PNB-17-B.5	0	25	40	30	5	0	0
FOURMILE RUN	PNB-17-C	10	15	25	30	20	0	0
LAUREL RUN	PNB-17-D	10	20	50	15	5	0	0
HELMICK RUN	PNB-17-E	60	20	10	0	5	5	0
DIFFICULT CREEK	PNB-18	0	5	35	30	30	0	0
BUFFALO CREEK	PNB-19-{1.4}	0	10	40	45	5	0	0
LITTLE BUFFALO CREEK	PNB-19-A	0	20	50	20	10	0	0
ELK RUN (DUP 1)	PNB-21	0	5	35	60	0	0	0
ELK RUN (DUP 2)	PNB-21	0	5	30	60	5	0	0
DEAKIN RUN	PNB-22	0	0	45	35	20	0	0

Table 16(A): Sediment Characteristics In Ecoregion 67

STREAM CODE	SEDIMENT ODOR							SEDIMENT OILS				SEDIMENT DEPOSITS									
	NR	SE	PE	CH	AN	NO	OTHER	AB	SL	MO	PR	SL	SW	PF	SD	RS	ML	ST	LS	MH	OTHER
PNB-01-{4.2}						✓		✓							✓			✓			
PNB-04-{04.6}	✓							✓										✓			
PNB-04-{20.2}	✓							✓							✓			✓			
PNB-04-{29.7}	✓							✓							✓			✓			
PNB-04-{33.0}	✓							✓							✓			✓			
PNB-04-{39.4}	✓							✓							✓			✓			
PNB-04-{45.2}							Manure	✓							✓			✓			
PNB-04-C.5	✓							✓							✓			✓			
PNB-04-CC	✓							✓							✓			✓			
PNB-04-D	✓							✓										✓		✓	
PNB-04-DD-{2.0}	✓							✓							✓			✓			
PNB-04-EE-7-{0.4}						✓		✓													
PNB-04-FF						✓		✓										✓			
PNB-04-FF-5-A-{0.6}						✓			✓									✓			
PNB-04-J-{1.6}	✓							✓							✓			✓			
PNB-04-J-1		✓						✓							✓			✓			
PNB-04-S-{04.7}	✓							✓							✓			✓			
PNB-04-S-{5.6}						✓		✓										✓			
PNB-04-V	✓							✓							✓			✓			
PNB-04-W-3	✓							✓							✓			✓			
PNB-07-{03.8}						✓		✓							✓			✓			
PNB-07-{08.4}	✓							✓							✓			✓			
PNB-07-{10.4}						✓		✓										✓			
PNB-07-C						✓		✓										✓			
PNB-07-C.4-1-{0.2}							Manure	✓							✓			✓			Manure
PNB-07-F-{0.6}	✓							✓							✓			✓			
PNB-07-H						✓		✓							✓						
PNB-07-H-2-{1.0}						✓		✓										✓			

SEDIMENT ODORS	
NR	NORMAL
SE	SEWAGE
PE	PETROLEUM
CH	CHEMICAL
AN	ANAEROBIC
NO	NONE

SEDIMENT DEPOSITS			
SL	SLUDGE	ML	MARL
SW	SAWDUST	ST	SILT
PF	PAPER FIBER	LS	LIMESTONE
SD	SAND	MH	METAL HYDROXIDES
RS	RELIC SHELLS		

SEDIMENT OILS	
AB	ABSENT
SL	SLIGHT
MO	MODERATE
PR	PROFUSE

Table 16(B): Sediment Characteristics In Ecoregion 69

STREAM CODE	SEDIMENT ODOR							SEDIMENT OILS				SEDIMENT DEPOSITS									
	NR	SE	PE	CH	AN	NO	Other	AB	SL	MO	PR	SL	SW	PF	SD	RS	ML	ST	LS	MH	OTHER
P-20-{052.0}		✓					Algae	✓							✓			✓			
P-20-{081.6}	✓							✓										✓			
P-20-{082.6}	✓							✓							✓			✓			
P-20-{088.9}	✓							✓							✓			✓			
P-20-{097.9}	✓							✓							✓			✓		✓	
P-20-{101.8}					✓			✓							✓			✓		✓	
PNB-10						✓		✓							✓			✓			
PNB-11-{0.8}						✓		✓							✓			✓		✓	
PNB-15						✓		✓							✓			✓			
PNB-15-A (DUP 1)						✓		✓							✓			✓			
PNB-15-A (DUP 2)	✓							✓							✓			✓			
PNB-16-.5A-{0.4}	✓							✓							✓			✓			
PNB-16-{05.4}	✓							✓							✓					✓	
PNB-16-{16.8}							Iron	✓				.			✓					✓	
PNB-16-{18.1}	✓							✓							✓			✓		✓	
PNB-16-A-{0.8}	✓							✓							✓			✓		✓	Clay
PNB-16-B (DUP 1)						✓		✓							✓			✓			Clay
PNB-16-B (DUP 2)						✓		✓							✓			✓			
PNB-16-B.5						✓		✓							✓			✓			
PNB-17-{06.9}	✓							✓							✓			✓			
PNB-17-{09.6}						✓		✓							✓						
PNB-17-{15.6}							Organic	✓							✓			✓			
PNB-17-B	✓							✓							✓			✓			
PNB-17-B.5	✓							✓							✓					✓	
PNB-17-C						✓		✓							✓			✓			
PNB-17-D						✓		✓							✓			✓		✓	
PNB-17-E							Iron	✓							✓			✓		✓	
PNB-18	✓							✓							✓						
PNB-19-{1.4}	✓							✓							✓			✓			
PNB-19-A							Iron		✓						✓			✓		✓	
PNB-20	✓							✓							✓			✓			
PNB-21 (DUP 1)							Iron	✓							✓			✓		✓	
PNB-21 (DUP 2)							Iron	✓							✓					✓	
PNB-22	✓							✓							✓					✓	

SEDIMENT ODORS	
NR	NORMAL
SE	SEWAGE
PE	PETROLEUM
CH	CHEMICAL
AN	ANAEROBIC
NO	NONE

SEDIMENT DEPOSITS			
SL	SLUDGE	ML	MARL
SW	SAWDUST	ST	SILT
PF	PAPER FIBER	LS	LIMESTONE
SD	SAND	MH	METAL HYDROXIDES
RS	RELIC SHELLS		

SEDIMENT OILS	
AB	ABSENT
SL	SLIGHT
MO	MODERATE
PR	PROFUSE

Table 17(A): Rapid Habitat Assessment For Ecoregion 67

NAME	STREAM CODE	COV	SUB	EMB	VEL	ALT	SED	RIF	FLW	BNK	BKV	GRZ	RVG	TOT
GREEN SPRING RUN	PNB-01-{4.2}	11	11	9	15	15	13	12	15	9	9	3	0	122
PATTERSON CREEK	PNB-04-{04.6}	15	10	11	13	15	15	8	18	10	10	10	11	146
PATTERSON CREEK	PNB-04-{20.2}	16	16	14	17	12	16	15	18	16	15	10	5	170
PATTERSON CREEK	PNB-04-{29.7}	18	17	15	15	14	17	11	18	17	16	12	7	177
PATTERSON CREEK	PNB-04-{33.0}	11	17	14	14	13	13	16	9	13	10	17	8	155
PATTERSON CREEK	PNB-04-{39.4}	12	15	14	10	16	11	14	11	12	12	12	2	141
PATTERSON CREEK	PNB-04-{45.2}	6	11	9	14	9	5	8	12	4	3	4	4	89
HORSESHOE CREEK	PNB-04-C.5	10	10	9	8	11	13	16	17	13	12	7	5	131
ROSSER RUN	PNB-04-CC	14	16	14	10	18	13	17	9	13	14	9	5	152
MILL RUN	PNB-04-D	7	7	13	5	14	15	5	2	12	16	6	2	104
THORN CREEK	PNB-04-DD-{2.0}	12	16	9	10	16	12	16	9	9	9	15	13	146
UNT OF NORTH FORK PATTERSON CREEK	PNB-04-EE-7-{0.4}	19	18	19	17	20	15	16	14	18	15	20	14	205
MIDDLE FORK / PATTERSON CREEK	PNB-04-FF	13	17	13	18	9	15	16	16	15	17	10	1	160
UNT OF UNT OF MIDDLE FORK / PATTERSON	PNB-04-FF-5-A-{0.6}	4	5	3	15	18	18	16	13	7	8	9	4	120
CABIN RUN	PNB-04-J-{1.6}	17	12	12	15	13	10	15	17	15	11	10	6	153
PARGUT RUN	PNB-04-J-1	14	18	14	10	11	12	17	15	15	14	10	5	155
MILL CREEK	PNB-04-S-{04.7}	14	17	11	10	11	13	17	18	14	14	8	2	149
MILL CREEK	PNB-04-S-{5.6}	16	18	14	18	18	15	16	18	10	11	15	5	174
ELLIBER RUN	PNB-04-V	17	18	15	10	13	14	19	17	16	15	12	9	175
WHIP RUN	PNB-04-W-3	9	18	14	10	13	11	17	9	8	9	12	7	137
NEW CREEK	PNB-07-{03.8}	17	16	18	14	16	15	13	13	18	19	19	10	188
NEW CREEK	PNB-07-{08.4}	17	16	15	10	16	15	18	9	11	6	10	14	157
NEW CREEK	PNB-07-{10.4}	18	18	16	19	14	15	15	15	17	13	13	5	178
BLOCK RUN	PNB-07-C	16	16	14	16	12	18	17	18	13	10	10	0	160
UNT OF UNT OF NEW CREEK	PNB-07-C.4-1-{0.2}	2	6	1	9	17	2	12	9	7	10	3	3	81
ASH SPRING RUN	PNB-07-F-{0.6}	15	12	16	9	17	14	15	6	10	9	16	18	157
LINTON CREEK	PNB-07-H	19	20	18	13	18	18	19	19	18	17	18	17	214
UNT OF LINTON CREEK	PNB-07-H-2-{1.0}	15	14	19	13	19	8	18	7	13	10	19	8	163
ECOREGION 67 N = 28	Average	13	14	13	13	15	13	15	13	13	12	11	7	152
	Minimum	2	5	1	5	9	2	5	2	4	3	3	2	81
	Maximum	19	20	19	19	20	18	19	19	18	19	20	18	214

COV	INSTREAM COVER
SUB	SUBSTRATE
EMB	EMBEDDEDNESS
VEL	VELOCITY DEPTH REGIMES

ALT	MAN MADE CHANNEL ALTERATIONS
SED	SEDIMENT DEPOSITION
RIF	RIFFLE FREQUENCY
FLW	CHANNEL FLOW STATUS
BNK	BANK CONDITION

BKV	BANK VEGETATIVE PROTECTION
GRZ	GRAZING OR OTHER DISRUPTIVE PRESSURE
RVG	RIPARIAN VEGETATIVE ZONE WIDTH
TOT	TOTAL SCORE

Table 17(B): Rapid Habitat Assessment For Ecoregion 69

NAME	STREAM CODE	COV	SUB	EMB	VEL	ALT	SED	RIF	FLW	BNK	BKV	GRZ	RVG	TOT
NORTH BRANCH	P-20-{052.0}	11	13	16	14	15	14	16	16	15	16	15	10	171
NORTH BRANCH	P-20-{081.6}	16	13	18	15	15	18	18	14	20	14	15	15	191
NORTH BRANCH	P-20-{082.6}	16	12	19	19	20	19	19	15	20	14	17	15	205
NORTH BRANCH	P-20-{088.9}	13	17	15	14	18	13	18	14	12	16	19	18	187
NORTH BRANCH	P-20-{097.9}	19	16	16	12	19	15	18	12	16	19	19	15	196
NORTH BRANCH	P-20-{101.8}	10	13	14	17	20	13	11	17	19	20	20	17	191
SLAUGHTERHOUSE RUN	PNB-10	7	6	6	7	3	6	16	6	13	13	10	5	98
MONTGOMERY RUN	PNB-11-{0.8}	16	16	6	13	10	8	16	7	5	5	6	7	115
DEEP RUN	PNB-15	15	17	11	10	10	15	17	11	15	5	11	8	145
CRANBERRY RUN (DUP 1)	PNB-15-A	13	16	9	10	6	8	16	8	16	5	5	5	117
CRANBERRY RUN (DUP 2)	PNB-15-A	16	16	9	8	7	10	18	16	15	10	8	2	135
UNT OF ABRAMS CREEK	PNB-16-.5A-{0.4}	15	18	10	10	19	11	19	16	7	11	11	13	160
ABRAM CREEK	PNB-16-{05.4}	19	19	15	15	20	16	18	17	15	14	17	18	203
ABRAM CREEK	PNB-16-{16.8}	16	17	17	15	20	16	17	19	16	17	18	15	203
ABRAM CREEK	PNB-16-{18.1}	18	15	16	14	19	13	18	15	14	18	17	14	191
EMORY CREEK	PNB-16-A-{0.8}	13	17	8	10	15	7	18	11	11	11	10	9	140
WYCKOFF RUN (DUP 1)	PNB-16-B	17	16	10	10	14	13	16	7	18	15	11	9	156
WYCKOFF RUN (DUP 2)	PNB-16-B	19	18	16	16	15	16	19	18	19	17	20	18	211
LAUREL RUN	PNB-16-B.5	19	19	14	17	17	18	18	19	17	15	18	12	203
STONY RIVER	PNB-17-{06.9}	18	14	15	15	15	15	17	10	17	18	12	11	177
STONY RIVER	PNB-17-{09.6}	20	15	17	16	20	16	18	15	19	15	20	16	207
STONY RIVER	PNB-17-{15.6}	15	9	13	10	20	15	19	13	18	16	19	17	184
MILL RUN	PNB-17-B	17	14	16	15	18	19	18	15	19	18	11	5	185
LAUREL RUN	PNB-17-B.5	15	17	12	9	17	13	17	7	14	16	13	3	153
FOURMILE RUN	PNB-17-C	16	16	8	10	16	6	16	9	9	6	9	10	131
LAUREL RUN	PNB-17-D	13	16	12	14	15	12	16	13	9	14	11	3	148
HELMICK RUN	PNB-17-E	14	15	18	14	19	12	17	16	15	19	18	10	187
DIFFICULT CREEK	PNB-18	17	15	19	10	20	18	18	14	19	19	20	15	204
BUFFALO CREEK	PNB-19-{1.4}	16	16	18	10	13	18	18	14	16	18	17	16	190
LITTLE BUFFALO CREEK	PNB-19-A	15	17	8	10	16	12	18	13	11	14	12	12	158
RED OAK CREEK	PNB-20	9	14	16	9	19	17	16	4	18	17	18	18	175
ELK RUN (DUP 1)	PNB-21	16	19	11	10	14	13	19	14	17	18	10	8	169
ELK RUN (DUP 2)	PNB-21	13	13	7	9	11	11	18	12	14	18	18	7	151
DEAKIN RUN	PNB-22	17	17	5	10	17	16	18	18	15	19	16	11	179
ECOREGION 69 N = 34	Average	15	15	13	12	16	14	17	13	15	15	14	11	171
	Minimum	7	6	5	7	3	6	11	4	5	5	6	2	98
	Maximum	20	19	19	19	20	19	19	19	20	20	20	18	207

COV	INSTREAM COVER
SUB	SUBSTRATE
EMB	EMBEDDEDNESS
VEL	VELOCITY DEPTH REGIMES
ALT	MAN MADE CHANNEL ALTERATIONS
SED	SEDIMENT DEPOSITION
RIF	RIFFLE FREQUENCY
FLW	CHANNEL FLOW STATUS
BNK	BANK CONDITION
BKV	BANK VEGETATIVE PROTECTION
GRZ	GRAZING OR OTHER DISRUPTIVE PRESSURE
RVG	RIPARIAN VEGETATIVE ZONE WIDTH
TOT	TOTAL SCORE

Table 18(A): Indicators Of Water Quality In Ecoregion 67

NAME	STREAM CODE	WATER LEVEL	WATER ODOR	SURFACE OILS	WATER CLARITY	WATER COLOR
GREEN SPRING RUN	PNB-01-{4.2}	Normal	None	None	Clear	
PATTERSON CREEK	PNB-04-{04.6}	Normal	Normal	None	Clear	
PATTERSON CREEK	PNB-04-{20.2}	Normal	Normal	None	Clear	
PATTERSON CREEK	PNB-04-{29.7}	Normal	Normal	None	Clear	
PATTERSON CREEK	PNB-04-{33.0}	Normal	Normal	None	Clear	
PATTERSON CREEK	PNB-04-{39.4}	Normal	Normal	None	Clear	
PATTERSON CREEK	PNB-04-{45.2}	Above Normal	Normal	Flecks	Slightly turbid	
PLUM RUN	PNB-04-A	Normal		Flecks	Clear	
PAINTER RUN	PNB-04-C					
HORSESHOE CREEK	PNB-04-C.5	Normal	Normal	None	Clear	
LONG PASTURE RUN	PNB-04-C-1-A					
ROSSER RUN	PNB-04-CC	Normal	Normal	None	Clear	
MILL RUN	PNB-04-D	Below Normal	Normal	None	Clear	
THORN CREEK	PNB-04-DD-{2.0}	Normal	Normal	None	Clear	
UNT OF NORTH FORK PATTERSON CREEK	PNB-04-EE-7-{0.4}	Normal	None	None	Clear	
MIDDLE FORK / PATTERSON CREEK	PNB-04-FF	Normal	None	None	Clear	
UNT OF UNT OF MIDDLE FORK / PATTERSON	PNB-04-FF-5-A-{0.6}	Below Normal	None	Flecks	Clear	
CABIN RUN	PNB-04-J-{1.6}	Normal	Normal	None	Slightly turbid	
PARGUT RUN	PNB-04-J-1	Normal	Normal	None	Clear	
MILL CREEK	PNB-04-S-{04.7}	Normal	Normal	None	Slightly turbid	
MILL CREEK	PNB-04-S-{5.6}	Normal	None	None	Clear	
SUGAR RUN	PNB-04-S-1					
ELLIBER RUN	PNB-04-V	Normal	Sewage	None	Slightly turbid	Gray
WHIP RUN	PNB-04-W-3	Normal	Normal	None	Clear	
NEW CREEK	PNB-07-{03.8}	Normal	None	None	Clear	
NEW CREEK	PNB-07-{08.4}	Normal	Normal	None	Clear	
NEW CREEK	PNB-07-{10.4}	Normal	None	None	Clear	
BLOCK RUN	PNB-07-C	Normal	None	None	Clear	
UNT OF UNT OF NEW CREEK	PNB-07-C.4-1-{0.2}	Normal	Normal	None	Clear	
ASH SPRING RUN	PNB-07-F-{0.6}	Normal	Normal	None	Clear	
LINTON CREEK	PNB-07-H	Above Normal	None	None	Clear	
UNT OF LINTON CREEK	PNB-07-H-2-{1.0}	Below Normal	None	None	Clear	

Table 18(B): Indicators Of Water Quality In Ecoregion 69

NAME	ANCODE	WATER LEVEL	WATER ODOR	SURFACE OILS	WATER CLARITY	WATER COLOR
NORTH BRANCH	P-20-{052.0}	Above Normal	Sewage	None	Turbid	
NORTH BRANCH	P-20-{081.6}	Above Normal	Normal	None	Clear	
NORTH BRANCH	P-20-{082.6}	Above Normal	Normal	None	Clear	
NORTH BRANCH	P-20-{088.9}	Normal	Normal	None	Clear	
NORTH BRANCH	P-20-{097.9}	Normal	Normal	None	Clear	
NORTH BRANCH	P-20-{101.8}	Normal	Normal	None	Moderately turbid	Greenish brown
SLAUGHTERHOUSE RUN	PNB-10	Normal	None	None	Clear	
MONTGOMERY RUN	PNB-11-{0.8}	Normal	Normal	None	Slightly turbid	Gray
DEEP RUN	PNB-15	Normal	Normal	None	Clear	
CRANBERRY RUN (DUP 1)	PNB-15-A	Normal	None	None	Clear	
CRANBERRY RUN (DUP 2)	PNB-15-A	Normal	Normal	None	Clear	
UNT OF ABRAMS CREEK	PNB-16-.5A-{0.4}	Normal	Normal	None	Clear	
ABRAM CREEK	PNB-16-{05.4}	Normal	Normal	None	Clear	
ABRAM CREEK	PNB-16-{16.8}	Above Normal	Normal	None	Clear	
ABRAM CREEK	PNB-16-{18.1}	Normal	Normal	None	Clear	
EMORY CREEK	PNB-16-A-{0.8}	Normal	Normal	None	Clear	
WYCKOFF RUN (DUP 1)	PNB-16-B	Above Normal	Normal	None	Clear	
WYCKOFF RUN (DUP 2)	PNB-16-B	Normal	None	None	Clear	
LAUREL RUN	PNB-16-B.5	Normal	Normal	None	Clear	
STONY RIVER	PNB-17-{06.9}	Normal	Normal	None	Clear	
STONY RIVER	PNB-17-{09.6}	Normal	Normal	None	Clear	
STONY RIVER	PNB-17-{15.6}	Normal	Normal	None	Clear	
MILL RUN	PNB-17-B	Normal	Normal	None	Clear	
LAUREL RUN	PNB-17-B.5	Normal	Normal	None	Clear	
FOURMILE RUN	PNB-17-C	Normal	Normal	None	Clear	
LAUREL RUN	PNB-17-D	Normal	Normal	None	Clear	
HELMICK RUN	PNB-17-E	Normal	Normal	None	Clear	
DIFFICULT CREEK	PNB-18	Normal	Normal	None	Clear	
BUFFALO CREEK	PNB-19-{1.4}	Normal	Normal	None	Clear	
LITTLE BUFFALO CREEK	PNB-19-A	Normal	Iron	Flecks	Slightly turbid	
RED OAK CREEK	PNB-20	Normal	Normal	None	Clear	
ELK RUN (DUP 1)	PNB-21	Normal	Normal	None	Slightly turbid	Green to brown
ELK RUN (DUP 2)	PNB-21	Normal	Normal	None	Slightly turbid	Greenish-brown
DEAKIN RUN	PNB-22	Normal	Normal	None	Clear	

Table 19(A): Physico-Chemical Water Characteristics - Ecoregion 67

NAME	STREAM CODE	TEMPERATURE (CELSIUS)	pH (SU)	DISSOLVED OXYGEN (mg/L)	CONDUCTIVITY (µmhos/cm)
GREEN SPRING RUN	PNB-01-{4.2}	21.1	8.0	6.3	439
PATTERSON CREEK	PNB-04-{04.6}	21.4	7.7	6.9	258
PATTERSON CREEK	PNB-04-{20.2}	23.9	7.9	6.4	277
PATTERSON CREEK	PNB-04-{29.7}	23.6	8.4	10.2	279
PATTERSON CREEK	PNB-04-{33.0}	22.4	8.0	6.7	316
PATTERSON CREEK	PNB-04-{39.4}	23.5	8.4	9.3	328
PATTERSON CREEK	PNB-04-{45.2}	23.5	7.6	8.0	440
PLUM RUN	PNB-04-A	21.0	7.6	5.2	332
HORSESHOE CREEK	PNB-04-C.5	21.5	7.7	6.7	288
ROSSER RUN	PNB-04-CC	25.4	8.5	8.0	204
MILL RUN	PNB-04-D	24.3	7.4	8.2	287
THORN CREEK	PNB-04-DD-{2.0}	19.9	8.3	8.7	329
UNT OF NORTH FORK PATTERSON CREEK	PNB-04-EE-7-{0.4}	18.3	7.3	8.1	198
MIDDLE FORK/PATTERSON CREEK	PNB-04-FF	24.3	7.9	8.1	298
UNT OF UNT OF MIDDLE FORK / PATTERSON	PNB-04-FF-5-A-{0.6}	27.8	7.6	4.8	1391
CABIN RUN	PNB-04-J-{1.6}	22.8	7.5	6.7	314
PARGUT RUN	PNB-04-J-1	26.1	7.7	6.2	276
MILL CREEK	PNB-04-S-{04.7}	23.4	8.1	8.0	297
MILL CREEK	PNB-04-S-{5.6}	23.6	8.7	10.1	311
ELLIBER RUN	PNB-04-V	18.0	8.3	8.8	418
WHIP RUN	PNB-04-W-3	21.1	7.9	7.2	199
NEW CREEK	PNB-07-{03.8}	21.8	8.2	7.4	270
NEW CREEK	PNB-07-{08.4}	21.3	8.8	8.4	210
NEW CREEK	PNB-07-{10.4}	17.9	8.4	8.6	204
BLOCK RUN	PNB-07-C	23.2	8.2	8.0	224
UNT OF UNT OF NEW CREEK	PNB-07-C.4-1-{0.2}	20.7	8.1	6.7	515
ASH SPRING RUN	PNB-07-F-{0.6}	20.5	8.0	6.5	150
LINTON CREEK	PNB-07-H	15.5	8.5	8.8	85
UNT OF LINTON CREEK	PNB-07-H-2-{1.0}	18.0	8.0	2.7	209
ECOREGION 67 N = 29	Average	21.9	8	7.44	322
	Minimum	15.5	7.3	2.7	85
	Maximum	27.8	8.8	10.2	1391

Table 19(B): Physico-Chemical Water Characteristics - Ecoregion 69

NAME	STREAM CODE	TEMPERATURE (CELSIUS)	pH (SU)	DISSOLVED OXYGEN (mg/L)	CONDUCTIVITY (µ mhos/cm)
NORTH BRANCH	P-20-{052.0}	20.0	7.5	8.7	553
NORTH BRANCH	P-20-{081.6}	19.0	7.9	8.0	1074
NORTH BRANCH	P-20-{082.6}	19.2	7.9	8.1	1147
NORTH BRANCH	P-20-{088.9}	18.7	7.8	8.5	1570
NORTH BRANCH	P-20-{097.9}	19.6	7.3	7.6	271
NORTH BRANCH	P-20-{101.8}	19.9	6.8	5.6	284
SLAUGHTERHOUSE RUN	PNB-10	17.5	6.8	7.8	1247
MONTGOMERY RUN	PNB-11-{0.8}	14.7	6.7	8.5	1238
DEEP RUN	PNB-15	18.6	7.3	8.5	874
CRANBERRY RUN (DUP 1)	PNB-15-A	18.6	7.2	7.4	116
CRANBERRY RUN (DUP 2)	PNB-15-A	18.6	7.2	7.4	116
UNT OF ABRAMS CREEK	PNB-16-.5A-{0.4}	17.4	8.0	7.6	647
ABRAM CREEK	PNB-16-{05.4}	22.0	5.1	7.7	752
ABRAM CREEK	PNB-16-{16.8}	15.4	6.3	8.2	574
ABRAM CREEK	PNB-16-{18.1}	19.4	3.9	7.7	715
EMORY CREEK	PNB-16-A-{0.8}	17.5	4.7	8.5	665
WYCKOFF RUN (DUP 1)	PNB-16-B	16.4	7.3	7.9	121
WYCKOFF RUN (DUP 2)	PNB-16-B	18.4	7.5	7.7	156
LAUREL RUN	PNB-16-B.5	16.6	4.7	7.8	711
STONY RIVER	PNB-17-{06.9}	20.4	7.9	8.2	1029
STONY RIVER	PNB-17-{09.6}	22.0	7.4	7.5	1298
STONY RIVER	PNB-17-{15.6}	22.1	6.3	8.1	255
MILL RUN	PNB-17-B	19.0	7.8	7.9	360
LAUREL RUN	PNB-17-B.5	19.4	3.6	6.8	187
FOURMILE RUN	PNB-17-C	19.4	4.7	7.8	1295
LAUREL RUN	PNB-17-D	19.8	3.6	7.3	463
HELMICK RUN	PNB-17-E	18.3	5.8	8.2	108
DIFFICULT CREEK	PNB-18	17.5	7.2	7.8	53
BUFFALO CREEK	PNB-19-{1.4}	17.3	6.9	8.2	44
LITTLE BUFFALO CREEK	PNB-19-A	21.5	5.8	7.3	626
RED OAK CREEK	PNB-20	16.6	7.3	7.1	148
ELK RUN (DUP 1)	PNB-21	19.8	7.2	6.6	437
ELK RUN (DUP 2)	PNB-21	19.8	7.3	7.0	437
DEAKIN RUN	PNB-22	20.3	6.8	7.3	476
ECOREGION 69 N = 34	Average	18.8	6.6	7.7	590
	Minimum	14.7	3.6	5.6	44
	Maximum	22.1	8	8.7	1570

Table 20(A): Water Characteristics Nutrient Samples In Ecoregion 67

NAME	STREAM CODE	SUSPENDED SOLIDS (mg/l)	TOTAL PHOSPHORUS (mg/l)	AMMONIA NITROGEN (mg/l)	NITRATE + NITRITE (mg/l)
GREEN SPRING RUN	PNB-01-{4.2}	<5	<0.02	<0.50	0.20
PATTERSON CREEK	PNB-04-{04.6}	23	<0.02	<0.50	0.07
PATTERSON CREEK	PNB-04-{20.2}	7	<0.02	<0.5	0.11
PATTERSON CREEK	PNB-04-{29.7}	6	<0.02	0.50	0.18
PATTERSON CREEK	PNB-04-{33.0}	<5	<0.02	<0.5	0.18
PATTERSON CREEK	PNB-04-{39.4}	<5	<0.02	<0.5	0.27
PATTERSON CREEK	PNB-04-{45.2}	9	<0.02	<0.5	0.30
PLUM RUN	PNB-04-A		<0.02	<.50	.48
ROSSER RUN	PNB-04-CC	<5			
MILL RUN	PNB-04-D	9			
THORN CREEK	PNB-04-DD-{2.0}	<5	<0.02	<0.50	0.27
UNT OF NORTH FORK PATTERSON CREEK	PNB-04-EE-7-{0.4}	5	<0.02	<0.50	0.21
MIDDLE FORK / PATTERSON CREEK	PNB-04-FF	10			
UNT OF UNT OF MIDDLE FORK / PATTERSON	PNB-04-FF-5-A-{0.6}	<5	<0.02	<0.50	<0.05
CABIN RUN	PNB-04-J-{1.6}	6	<0.02	<0.5	<0.05
PARGUT RUN	PNB-04-J-1				
MILL CREEK	PNB-04-S-{04.7}	15	<0.02	<0.50	0.15
MILL CREEK	PNB-04-S-{5.6}	<5	0.02	<0.5	0.42
WHIP RUN	PNB-04-W-3	<5	<0.02	<0.5	0.20
NEW CREEK	PNB-07-{03.8}	<5	<0.02	<0.5	0.31
NEW CREEK	PNB-07-{08.4}	5	<0.02	<0.5	0.35
NEW CREEK	PNB-07-{10.4}	<5	<0.02	<0.5	0.50
UNT OF UNT OF NEW CREEK	PNB-07-C.4-1 -{0.2}	15	0.04	<0.5	0.50
ASH SPRING RUN	PNB-07-F-{0.6}	7	<0.02	<0.50	0.53
LINTON CREEK	PNB-07-H	<5			
UNT OF LINTON CREEK	PNB-07-H-2-{1.0}	14	<0.02	<0.50	0.42
ECOREGION 67 N = 26	Average	11	0.03	0.5	0.30
	Minimum	5	0.02	0.5	0.07
	Maximum	23	0.04	0.5	0.53

Table 20(B): Water Characteristics Nutrient Samples In Ecoregion 69

NAME	STREAM CODE	SUSPENDED SOLIDS (mg/l)	TOTAL PHOSPHORUS (mg/l)	AMMONIA NITROGEN (mg/l)	NITRATE + NITRITE (mg/l)
NORTH BRANCH	P-20-{052.0}	15	0.15	<0.50	0.73
NORTH BRANCH	P-20-{081.6}	<5	<0.02	<0.5	2.0
NORTH BRANCH	P-20-{082.6}	<5	<0.02	<0.5	2.4
NORTH BRANCH	P-20-{088.9}	8	<0.02	<0.50	2.9
NORTH BRANCH	P-20-{097.9}	<5	<0.02	<0.5	0.19
NORTH BRANCH	P-20-{101.8}	5	<0.02	<0.5	0.07
MONTGOMERY RUN	PNB 1-{0.8}	29	<0.02	<0.5	0.64
DEEP RUN	PNB 5	<5	<0.02	<0.5	0.37
CRANBERRY RUN (DUP 1)	PNB 5-A	<5	<0.02	<0.5	0.37
CRANBERRY RUN (DUP 2)	PNB 5-A	<5	<0.02	<0.5	0.38
UNT OF ABRAMS CREEK	PNB 6-.5A-{0.4}	<5	<0.02	<0.5	0.39
ABRAM CREEK	PNB 6-{05.4}	<5	<0.02	2.3	1.6
ABRAM CREEK	PNB 6-{16.8}	<5	<0.02	1.0	0.23
ABRAM CREEK	PNB 6-{18.1}	<5	<0.02	<0.5	0.28
EMORY CREEK	PNB 6-A-{0.8}	<5	<0.02	<0.5	0.22
WYCKOFF RUN (DUP 1)	PNB 6-B	11	<0.02	<0.5	0.27
WYCKOFF RUN (DUP 2)	PNB 6-B	13			
LAUREL RUN	PNB 6-B.5	10	<0.02	<0.5	0.44
STONY RIVER	PNB 7-{09.6}	5	<0.02	<0.5	0.73
MILL RUN	PNB 7-B	<5	<0.02	<0.5	0.15
DIFFICULT CREEK	PNB 8	6	<0.02	<0.5	0.28
BUFFALO CREEK	PNB 9-{1.4}	<5	<0.02	0.6	0.42
RED OAK CREEK	PNB-20	<5			
ELK RUN (DUP 1)	PNB-21	74			
ELK RUN (DUP 2)	PNB-21	28			
ECOREGION 69 N = 25	Average	18.54545	***0.15***	1.3	0.717143
	Minimum	5	***0.15***	0.6	0.07
	Maximum	74	***0.15***	2.3	2.9

Table 21(A): Chemical Characteristics Indicating Acid Mine Drainage In Ecoregion 67

NAME	ANCODE	HOT ACIDITY (mg/l)	ALK (mg/l)	SUL (mg/l)	CA (mg/l)	AL (mg/l)	FE (mg/l)	MN (mg/l)
GREEN SPRING RUN	PNB-01-{4.2}	<1	120	86	59.00	<0.050	<0.050	0.021
PATTERSON CREEK	PNB-04-{04.6}	<1	96	25	29.00	<0.050	0.140	0.024
PATTERSON CREEK	PNB-04-{20.2}	<1	100	28	38.00	<0.050	0.150	0.024
PATTERSON CREEK	PNB-04-{29.7}	<1	110	25	29.00	<0.050	0.074	<0.020
PATTERSON CREEK	PNB-04-{33.0}	<1	120	28	43.00	<0.050	0.110	<0.020
PATTERSON CREEK	PNB-04-{39.4}	<1	130	31	47.00	<0.050	0.085	0.026
PATTERSON CREEK	PNB-04-{45.2}	<1	160	38	66.00	0.100	0.320	0.093
ROSSER RUN	PNB-04-CC				28.91	0.043		
MILL RUN	PNB-04-D				22.59	0.226		
THORN CREEK	PNB-04-DD-{2.0}	<1	150	19	52.00	<0.050	0.052	<0.020
UNT OF NORTH FORK PATTERSON CREEK	PNB-04-EE-7-{0.4}	<1	88	6	29.00	0.073	0.170	<0.020
MIDDLE FORK / PATTERSON CREEK	PNB-04-FF				41.25	0.167		
UNT OF UNT OF MIDDLE FORK / PATTERSON	PNB-04-FF-5-A-{0.6}	<1	84	190	230.00	<0.050	0.160	0.690
CABIN RUN	PNB-04-J-{1.6}	<1	100	31	30.00	<0.050	0.260	0.062
MILL CREEK	PNB-04-S-{04.7}	<1	120	25	34.00	0.130	0.520	0.320
MILL CREEK	PNB-04-S-{5.6}	<1	120	45	46.00	<0.050	0.087	0.026
WHIP RUN	PNB-04-W-3				28.10	0.080		
NEW CREEK	PNB-07-{03.8}	<1	100	23	37.00	<0.050	0.076	<0.020
NEW CREEK	PNB-07-{08.4}	<1	78	19	27.00	0.100	0.160	<0.020
NEW CREEK	PNB-07-{10.4}	<1	73	19	27.00	0.061	0.074	<0.020
UNT OF UNT OF NEW CREEK	PNB-07-C.4-1 -{0.2}	<1	260	38	88.00	0.510	1.500	0.071
ASH SPRING RUN	PNB-07-F-{0.6}	<1	52	8	16.00	0.240	0.450	0.030
LINTON CREEK	PNB-07-H				9.57	0.120		
UNT OF LINTON CREEK	PNB-07-H-2-{1.0}	<1	84	6	25.00	0.140	0.260	0.021

HOT ACID	HOT ACIDITY
ALK	ALKALINITY
SUL	SULFATES
CA	TOTAL CALCIUM
AL	TOTAL ALUMINUM
FE	TOTAL IRON
MN	TOTAL MANGANESE

Table 21(B): Chemical Characteristics Indicating Acid Mine Drainage In Ecoregion 69

NAME	ANCODE	HOT ACIDITY (mg/l)	ALK (mg/l)	SUL (mg/l)	CA (mg/l)	AL (mg/l)	FE (mg/l)	MN (mg/l)
NORTH BRANCH	P-20-{052.0}	<1	46	260	67.00	0.440	0.310	0.360
NORTH BRANCH	P-20-{081.6}	<1	34	860	21.00	18.000	1.800	6.000
NORTH BRANCH	P-20-{082.6}	<1	35	510	160.00	0.063	<0.050	0.270
NORTH BRANCH	P-20-{088.9}	<1	46	620	210.00	<0.050	0.068	0.280
NORTH BRANCH	P-20-{097.9}	<1	23	55	32.00	<0.050	0.530	0.049
NORTH BRANCH	P-20-{101.8}	<1	35	94	33.00	<0.050	1.000	0.340
SLAUGHTERHOUSE RUN	PNB 0	<1	16	620		0.14	0.11	0.050
MONTGOMERY RUN	PNB 1-{0.8}	<1	78	320	140.00	5.400	3.100	0.460
DEEP RUN	PNB 5	<1	31	390	81	0.087	<0.05	0.360
CRANBERRY RUN (DUP 1)	PNB 5-A	<1	27	20	13	0.081	0.120	<0.020
CRANBERRY RUN (DUP 2)	PNB 5-A	<1	27	25	12	<0.05	0.086	<0.02
UNT OF ABRAMS CREEK	PNB 6-.5A-{0.4}	<1	90	160	73.00	<0.050	<0.050	<0.020
ABRAM CREEK	PNB 6-{05.4}	10	4	320	75.00	0.710	0.100	3.800
ABRAM CREEK	PNB 6-{16.8}	3	8	550	73.00	<0.050	0.730	3.200
ABRAM CREEK	PNB 6-{18.1}	22	<1	280	63.00	0.820	0.920	3.000
EMORY CREEK	PNB 6-A-{0.8}	17	3	280	59.00	1.800	0.150	3.000
WYCKOFF RUN (DUP 1)	PNB 6-B	<1	33	6	13.00	0.180	0.560	0.080
WYCKOFF RUN (DUP 2)	PNB 6-B				17.54	0.369		
LAUREL RUN	PNB 6-B.5	38	4	940	62.00	5.400	0.110	9.000
STONY RIVER	PNB 7-{06.9}	<1	31	390		<0.050	<0.050	0.029
STONY RIVER	PNB 7-{09.6}	<1	15	580	160.00	<0.050	<0.050	0.180
MILL RUN	PNB 7-B	<1	50	160	45	<0.05	0.120	0.049
LAUREL RUN	PNB 7-B.5	20	<1	25		1.0	0.130	1.30
FOURMILE RUN	PNB 7-C	42	<1	630		2.800	7.300	4.700
LAUREL RUN	PNB 7-D	53	<1	190		4.800	1.800	2.200
HELMICK RUN	PNB 7-E	8	3	25		0.180	0.720	0.900
DIFFICULT CREEK	PNB 8			<5		<0.050	0.260	<0.020
BUFFALO CREEK	PNB 9-{1.4}	<1	16	<5	4.00	<0.050	0.054	<0.020
LITTLE BUFFALO CREEK	PNB 9-A	18	3	160		1.900	8.000	0.950
RED OAK CREEK	PNB-20				20.55	0.068		
ELK RUN (DUP 1)	PNB-21	<1	54	160		0.330	13.00	0.240
ELK RUN (DUP 2)	PNB-21	<1	53	94		0.40	1.7	0.082
DEAKIN RUN	PNB-22	<1	12	160		<0.05	1.100	0.620

HOT ACID	HOT ACIDITY
ALK	ALKALINITY
SUL	SULFATES
AL	TOTAL ALUMINUM

CA	TOTAL CALCIUM
FE	TOTAL IRON
MN	TOTAL MANGANESE

Table 22(A): Fecal Coliform Bacteria Concentrations In Ecoregion 67

(In Colonies Per 100 Milliliters)

NAME	STREAM CODE	FECAL
GREEN SPRING RUN	PNB-01-{4.2}	230
PATTERSON CREEK	PNB-04-{04.6}	130
PATTERSON CREEK	PNB-04-{20.2}	150
PATTERSON CREEK	PNB-04-{29.7}	1000
PATTERSON CREEK	PNB-04-{33.0}	400
PATTERSON CREEK	PNB-04-{39.4}	480
PATTERSON CREEK	PNB-04-{45.2}	220
PLUM RUN	PNB-04-A	1500
HORSESHOE CREEK	PNB-04-C.5	500
ROSSER RUN	PNB-04-CC	140
MILL RUN	PNB-04-D	1000
THORN CREEK	PNB-04-DD-{2.0}	40
UNT OF NORTH FORK PATTERSON CREEK	PNB-04-EE-7-{0.4}	<10
MIDDLE FORK/PATTERSON CREEK	PNB-04-FF	1790
UNT OF UNT OF MIDDLE FORK / PATTERSON CREEK	PNB-04-FF-5-A-{0.6}	40
CABIN RUN	PNB-04-J-{1.6}	3000
PARGUT RUN	PNB-04-J-1	<10
MILL CREEK	PNB-04-S-{04.7}	50
MILL CREEK	PNB-04-S-{5.6}	50
ELLIBER RUN	PNB-04-V	120
WHIP RUN	PNB-04-W-3	<10
NEW CREEK	PNB-07-{03.8}	100
NEW CREEK	PNB-07-{08.4}	300
NEW CREEK	PNB-07-{10.4}	30
BLOCK RUN	PNB-07-C	2100
UNT OF UNT OF NEW CREEK	PNB-07-C.4-1-{0.2}	8000
ASH SPRING RUN	PNB-07-F-{0.6}	<10
LINTON CREEK	PNB-07-H	<10
UNT OF LINTON CREEK	PNB-07-H-2-{1.0}	40
ECOREGION 67 N = 29	Average	892
	Minimum	30
	Maximum	8000

Table 22(B): Fecal Coliform Bacteria Concentrations In Ecoregion 69
(In Colonies Per 100 Milliliters)

NAME	STREAM CODE	FECAL
NORTH BRANCH	P-20-{052.0}	3200
NORTH BRANCH	P-20-{081.6}	<10
NORTH BRANCH	P-20-{082.6}	<10
NORTH BRANCH	P-20-{088.9}	100
NORTH BRANCH	P-20-{097.9}	200
NORTH BRANCH	P-20-{101.8}	30
SLAUGHTERHOUSE RUN	PNB-10	1000
MONTGOMERY RUN	PNB-11-{0.8}	<10
DEEP RUN	PNB-15	<10
CRANBERRY RUN (DUP 1)	PNB-15-A	20
CRANBERRY RUN (DUP 2)	PNB-15-A	200
UNT OF ABRAMS CREEK	PNB-16-.5A-{0.4}	37
ABRAM CREEK	PNB-16-{05.4}	0.0
ABRAM CREEK	PNB-16-{16.8}	<10
ABRAM CREEK	PNB-16-{18.1}	0.0
EMORY CREEK	PNB-16-A-{0.8}	0.0
WYCKOFF RUN (DUP 1)	PNB-16-B	200
WYCKOFF RUN (DUP 2)	PNB-16-B	300
LAUREL RUN	PNB-16-B.5	14
STONY RIVER	PNB-17-{06.9}	230
STONY RIVER	PNB-17-{09.6}	<10
STONY RIVER	PNB-17-{15.6}	1.0
MILL RUN	PNB-17-B	52
LAUREL RUN	PNB-17-B.5	<10
FOURMILE RUN	PNB-17-C	11.0
LAUREL RUN	PNB-17-D	<2
HELMICK RUN	PNB-17-E	35
DIFFICULT CREEK	PNB-18	260
BUFFALO CREEK	PNB-19-{1.4}	<10
LITTLE BUFFALO CREEK	PNB-19-A	<10
RED OAK CREEK	PNB-20	<10
ELK RUN (DUP 1)	PNB-21	4700
ELK RUN (DUP 2)	PNB-21	1000
DEAKIN RUN	PNB-22	60
ECOREGION 69 N = 34	Average	506
	Minimum	0
	Maximum	4700

Table 23: Macroinvertebrate Taxa Collected At Each Site				
NAME AND STREAM CODE	TAXON	COUNT	TAXON	COUNT
NORTH BRANCH OF THE POTOMAC RIVER P-20-{101.8}	Planorbidae	1	Calopterygidae	1
	Baetidae	46	Gerridae	1
	Caenidae	5	Culicidae	2
	Leptophlebiidae	3	Tabanidae	1
	Limnephilidae	2	Chironomidae	30
	Polycentropodidae	1	Dixidae	1
NORTH BRANCH OF THE POTOMAC RIVER P-20-{52.0}	Oligochaeta	1	Hydropsychidae	21
	Ancylidae	4	Tipulidae	1
	Cambaridae	1	Chironomidae	96
	Gammaridae	5		
NORTH BRANCH OF THE POTOMAC RIVER P-20-{81.6}	Oligochaeta	1	Pteronarcyidae	1
	Hydropsychidae	94	Curculionidae	1
	Rhyacophilidae	7	Corydalidae	3
	Philopotamidae	19	Athericidae	1
	Capnidae/Leuctridae	2	Chironomidae	17
	Perlidae	12		
NORTH BRANCH OF THE POTOMAC RIVER P-20-{82.6}	Hydropsychidae	64	Elmidae	2
	Rhyacophilidae	3	Tipulidae	2
	Philopotamidae	37	Empididae	1
	Capnidae/Leuctridae	3	Simuliidae	2
	Perlidae	10	Chironomidae	15
NORTH BRANCH OF THE POTOMAC RIVER P-20-{88.9}	Hydropsychidae	77	Elmidae	3
	Rhyacophilidae	1	Psephenidae	1
	Philopotamidae	1	Corydalidae	3
	Capnidae/Leuctridae	1	Athericidae	2
	Perlidae	2	Chironomidae	29
NORTH BRANCH OF THE POTOMAC RIVER P-20-{97.9}	Cambaridae	1	Capnidae/Leuctridae	1
	Gammaridae	2	Perlidae	2
	Baetidae	17	Elmidae	5
	Heptageniidae	8	Athericidae	1
	Isonychiidae	7	Tipulidae	2
	Hydropsychidae	50	Simuliidae	2
	Philopotamidae	12	Chironomidae	10

Table 23: Macroinvertebrate Taxa Collected At Each Site (Continued)

NAME AND STREAM CODE	TAXON	COUNT	TAXON	COUNT
GREEN SPRINGS RUN PNB-1-{4.2}	Turbellaria	1	Polycentropodidae	1
	Oligochaeta	2	Capnidae/Leuctridae	44
	Lymnaeidae	1	Chloroperlidae	1
	Physidae	4	Gomphidae	1
	Baetidae	20	Elmidae	38
	Caenidae	6	Gyrinidae	1
	Heptageniidae	18	Psephenidae	36
	Isonychiidae	4	Veliidae	2
	Hydropsychidae	61	Tipulidae	9
	Hydroptilidae	3	Empididae	1
	Philopotamidae	48	Chironomidae	94
SLAUGHTERHOUSE RUN PNB-10	Asellidae	17	Philopotamidae	2
	Gammaridae	14	Capnidae/Leuctridae	1
	Baetidae	7	Dytiscidae	1
	Glossosomatidae	9	Chironomidae	22
	Hydropsychidae	25	Muscidae	3
	Rhyacophilidae	2		
DEEP RUN PNB-15	Baetidae	25	Peltoperlidae	1
	Glossosomatidae	1	Perlidae	2
	Hydropsychidae	37	Tipulidae	3
	Philopotamidae	9	Empididae	1
	Capnidae/Leuctridae	24	Chironomidae	4
	Chloroperlidae	1		
CRANBERRY RUN PNB-15-A (DUP1)	Oligochaeta	1	Dytiscidae	1
	Baetidae	36	Veliidae	1
	Ephemerellidae	1	Tipulidae	1
	Leptophlebiidae	5	Empididae	1
	Hydropsychidae	50	Simuliidae	3
	Philopotamidae	10	Chironomidae	15
	Capnidae/Leuctridae	21	Psychodidae	1
	Chloroperlidae	2		

Table 23: Macroinvertebrate Taxa Collected At Each Site (Continued)

NAME AND STREAM CODE	TAXON	COUNT	TAXON	COUNT
CRANBERRY RUN PNB-15-A (DUP2)	Cambaridae	1	Nemouridae	1
	Baetidae	19	Peltoperlidae	11
	Heptageniidae	3	Perlidae	3
	Leptophlebiidae	2	Pteronarcyidae	1
	Glossosomatidae	2	Corydalidae	1
	Hydropsychidae	36	Veliidae	1
	Philopotamidae	13	Tipulidae	4
	Capnidae/Leuctridae	54		
UNT OF ABRAMS CREEK PNB-16-.5A-{0.4}	Asellidae	5	Capnidae/Leuctridae	1
	Gammaridae	34	Sialidae	1
	Baetidae	4	Tipulidae	5
	Glossosomatidae	2	Muscidae	1
	Hydropsychidae	56		
ABRAM CREEK PNB-16-A-{0.8}	Hydropsychidae	69	Chrysomelidae	1
	Limnephilidae	1	Tipulidae	10
	Capnidae/Leuctridae	7	Chironomidae	9
WYCKOFF RUN PNB-16-B (DUP1)	Oligochaeta	6	Perlidae	6
	Baetidae	1	Aeshnidae	1
	Ephemerellidae	1	Elmidae	1
	Heptageniidae	2	Psephenidae	2
	Glossosomatidae	1	Corydalidae	1
	Hydropsychidae	49	Pygalidae	1
	Rhyacophilidae	1	Tipulidae	12
	Philopotamidae	4	Chironomidae	3
	Capnidae/Leuctridae	1		
WYCKOFF RUN PNB-16-B (DUP2)	Oligochaeta	3	Aeshnidae	2
	Branchiobdellidae	5	Elmidae	3
	Baetidae	4	Hydrophilidae	1
	Ephemerellidae	1	Psephenidae	1
	Heptageniidae	2	Corydalidae	1
	Leptophlebiidae	1	Veliidae	1
	Hydropsychidae	68	Tipulidae	10
	Philopotamidae	5	Ceratopogonidae	1
	Capnidae/Leuctridae	3	Empididae	1
	Chloroperlidae	1	Chironomidae	12
	Perlidae	9		

Table 23: Macroinvertebrate Taxa Collected At Each Site (Continued)

NAME AND STREAM CODE	TAXON	COUNT	TAXON	COUNT
LAUREL RUN PNB-16-B.5	Hydropsychidae	49	Pygalidae	2
	Philopotamidae	1	Tipulidae	2
	Capnidae/Leuctridae	1	Chironomidae	7
	Elmidae	3		
ABRAM CREEK PNB-16-{05.4}	Hydropsychidae	17	Polycentropodidae	1
	Tipulidae	1	Sialidae	1
	Chironomidae	6	Tipulidae	1
	Hydropsychidae	13	Chironomidae	1
	Philopotamidae	1		
ABRAM CREEK PNB-16-{18.1}	Polycentropodidae	1	Chironomidae	1
	Dytiscidae	1	Sciomyzidae	1
	Sialidae	1		
MILL RUN PNB-17-B	Cambaridae	1	Philopotamidae	25
	Baetidae	23	Capnidae/Leuctridae	5
	Ephemeridae	2	Perlidae	11
	Heptageniidae	5	Elmidae	1
	Leptophlebiidae	3	Corydalidae	3
	Isonychiidae	1	Tipulidae	22
	Hydropsychidae	41	Simuliidae	1
	Rhyacophilidae	2	Chironomidae	12
LAUREL RUN PNB-17-B.5	Oligochaeta	2	Elmidae	1
	Cambaridae	1	Sialidae	2
	Polycentropodidae	14	Gerridae	1
	Capnidae/Leuctridae	2	Tipulidae	1
	Cordulegastridae	1	Chironomidae	30
FOURMILE RUN PNB-17-C	Hydropsychidae	1	Simuliidae	1
	Pygalidae	1	Chironomidae	2
	Tipulidae	1		
LAUREL RUN PNB-17-D	Hydropsychidae	2	Corydalidae	1
	Polycentropodidae	9	Sialidae	10
	Phryganeidae	1	Corixidae	2
	Curculionidae	1	Notonectidae	1
	Dytiscidae	1	Chironomidae	20
	Elmidae	1		

Table 23: Macroinvertebrate Taxa Collected At Each Site (Continued)

NAME AND STREAM CODE	TAXON	COUNT	TAXON	COUNT
HELMICK RUN PNB-17-E	Cambaridae	1	Corydalidae	2
	Hydropsychidae	5	Sialidae	2
	Polycentropodidae	1	Simuliidae	50
	Capnidae/Leuctridae	11	Chironomidae	37
	Aeshnidae	3		
STONY RIVER PNB-17-{06.9}	Baetidae	1	Capnidae/Leuctridae	1
	Heptageniidae	2	Perlidae	5
	Leptophlebiidae	1	Pteronarcyidae	1
	Isonychiidae	8	Elmidae	3
	Glossosomatidae	1	Corydalidae	2
	Hydropsychidae	44	Veliidae	2
	Philopotamidae	7	Simuliidae	3
	Polycentropodidae	1	Chironomidae	15
STONY RIVER PNB-17-{09.6}	Oligochaeta	2	Peltoperlidae	1
	Baetidae	1	Perlidae	6
	Hydropsychidae	63	Elmidae	16
	Hydroptilidae	1	Sialidae	1
	Rhyacophilidae	1	Pygalidae	1
	Polycentropodidae	2	Tipulidae	3
	Capnidae/Leuctridae	3	Chironomidae	9
STONY RIVER PNB-17-{15.6}	Turbellaria	1	Hydroptilidae	1
	Oligochaeta	1	Nemouridae	1
	Planorbidae	1	Perlidae	5
	Baetidae	2	Athericidae	1
	Hydropsychidae	28	Chironomidae	37
DIFFICULT CREEK PNB-18	Baetidae	7	Capnidae/Leuctridae	24
	Heptageniidae	14	Peltoperlidae	5
	Leptophlebiidae	4	Perlidae	15
	Isonychiidae	3	Corydalidae	2
	Glossosomatidae	3	Athericidae	1
	Hydropsychidae	21	Tipulidae	21
	Rhyacophilidae	2	Simuliidae	3
	Philopotamidae	23	Chironomidae	8
DIFFICULT CREEK PNB-19-A	Hydropsychidae	13	Chrysomelidae	1
	Capnidae/Leuctridae	1	Pygalidae	1

Table 23: Macroinvertebrate Taxa Collected At Each Site (Continued)

NAME AND STREAM CODE	TAXON	COUNT	TAXON	COUNT
BUFFALO CREEK PNB-19-{1.4}	Oligochaeta	3	Capnidae/Leuctridae	37
	Cambaridae	1	Chloroperlidae	1
	Baetidae	24	Peltoperlidae	1
	Heptageniidae	45	Perlidae	8
	Leptophlebiidae	1	Pteronarcyidae	3
	Glossosomatidae	1	Dryopidae	1
	Hydropsychidae	64	Corydalidae	23
	Rhyacophilidae	8	Tipulidae	7
	Philopotamidae	25	Empididae	1
	Limnephilidae	1	Chironomidae	26
RED OAK CREEK PNB-20	Heptageniidae	7	Limnephilidae	4
	Glossosomatidae	1	Perlidae	11
	Hydropsychidae	10	Chironomidae	1
ELK RUN PNB-21 (DUP1)	Oligochaeta	1	Corydalidae	2
	Cambaridae	1	Sialidae	1
	Heptageniidae	1	Tipulidae	4
	Hydropsychidae	8	Ceratopogonidae	1
	Polycentropodidae	1	Chironomidae	7
	Hydrophilidae	1		
ELK RUN PNB-21 (DUP2)	Oligochaeta	2	Hydrophilidae	1
	Cambaridae	4	Corydalidae	2
	Baetidae	1	Tipulidae	6
	Hydropsychidae	30	Ceratopogonidae	1
	Elmidae	1	Chironomidae	46
DEAKIN RUN PNB-22	Hydropsychidae	12	Corydalidae	2
	Capnidae/Leuctridae	4	Tipulidae	2
	Perlidae	1	Ceratopogonidae	4
	Gomphidae	1	Chironomidae	8
	Calopterygidae	1		
HORSESHOE CREEK PNB-4-C.5	Oligochaeta	6	Hydroptilidae	1
	Physidae	2	Capnidae/Leuctridae	5
	Planorbidae	1	Perlidae	1
	Baetidae	65	Coenagrionidae	1
	Caenidae	53	Elmidae	4
	Ephemerellidae	7	Psephenidae	20
	Heptageniidae	13	Corydalidae	1
	Leptophlebiidae	2	Sialidae	1
	Tricorythidae	3	Tipulidae	4
	Isonychiidae	48	Empididae	3
	Hydropsychidae	323	Chironomidae	27

Table 23: Macroinvertebrate Taxa Collected At Each Site (Continued)

NAME AND STREAM CODE	TAXON	COUNT	TAXON	COUNT
ROSSER RUN PNB-4-CC	Oligochaeta	2	Gomphidae	2
	Baetidae	8	Coenagrionidae	1
	Ephemerellidae	3	Elmidae	6
	Heptageniidae	25	Hydrophilidae	1
	Isonychiidae	12	Corydalidae	21
	Hydropsychidae	103	Sialidae	1
	Hydroptilidae	2	Veliidae	2
	Philopotamidae	25	Tipulidae	27
	Helicopsychidae	1	Empididae	1
	Capnidae/Leuctridae	2	Chironomidae	57
MILL RUN PNB-4-D	Oligochaeta	1	Baetidae	1
	Ancylidae	1	Heptageniidae	5
	Physidae	10	Chironomidae	80
THORN CREEK PNB-4-DD-{2.0}	Baetidae	16	Elmidae	3
	Caenidae	1	Corydalidae	12
	Heptageniidae	8	Athericidae	4
	Leptophlebiidae	3	Tipulidae	5
	Isonychiidae	33	Ceratopogonidae	1
	Hydropsychidae	31	Empididae	2
	Philopotamidae	19	Simuliidae	1
	Capnidae/Leuctridae	143	Chironomidae	29
	Perlidae	1		
UNT OF NORTH FORK OF PATTERSON CREEK PNB-4-EE-7-{0.4}	Branchiobdellidae	1	Capnidae/Leuctridae	67
	Gammaridae	4	Chloroperlidae	3
	Baetidae	7	Perlidae	13
	Heptageniidae	4	Pteronarcyidae	3
	Leptophlebiidae	2	Elmidae	2
	Glossosomatidae	1	Corydalidae	2
	Hydropsychidae	30	Tipulidae	14
	Philopotamidae	4	Chironomidae	5
	Polycentropodidae	1		
MIDDLE FORK OF PATTERSON CREEK PNB-4-FF	Oligochaeta	3	Helicopsychidae	3
	Lymnaeidae	3	Elmidae	64
	Baetidae	5	Psephenidae	12
	Caenidae	8	Corydalidae	23
	Ephemerellidae	1	Athericidae	1
	Heptageniidae	11	Tipulidae	4
	Isonychiidae	7	Ceratopogonidae	1
	Hydropsychidae	47	Tabanidae	1
	Philopotamidae	11	Chironomidae	55

Table 23: Macroinvertebrate Taxa Collected At Each Site (Continued)

NAME AND STREAM CODE	TAXON	COUNT	TAXON	COUNT
UNT OF UNT OF MIDDLE FORK OF PATTERSON CREEK PNB-4-FF-5-A-{0.6}	Hydropsychidae	5	Elmidae	2
	Philopotamidae	14	Hydrophilidae	11
	Capnidae/Leuctridae	2	Corydalidae	1
	Aeshnidae	2	Sialidae	2
	Calopterygidae	2	Tipulidae	66
	Cordulegastridae	1	Chironomidae	9
PARGUT RUN PNB-4-J-1	Cambaridae	2	Dytiscidae	1
	Baetidae	5	Elmidae	20
	Caenidae	1	Corydalidae	1
	Heptageniidae	2	Athericidae	1
	Leptophlebiidae	1	Empididae	1
	Hydropsychidae	19	Chironomidae	86
	Philopotamidae	17		
CABIN RUN PNB-4-J-{1.6}	Lymnaeidae	1	Aeshnidae	1
	Baetidae	3	Elmidae	10
	Caenidae	2	Gyrinidae	1
	Isonychiidae	1	Corydalidae	12
	Hydropsychidae	30	Veliidae	1
	Philopotamidae	6	Tipulidae	3
	Polycentropodidae	1	Chironomidae	22
MILL CREEK PNB-4-S-{04.7}	Oligochaeta	1	Corydalidae	7
	Planorbidae	3	Athericidae	2
	Pleuroceridae	60	Tipulidae	3
	Baetidae	2	Empididae	1
	Isonychiidae	2	Simuliidae	1
	Hydropsychidae	88	Tabanidae	1
	Leptoceridae	1	Chironomidae	31
MILL CREEK PNB-4-S-{5.6}	Oligochaeta	1	Philopotamidae	5
	Physidae	1	Capnidae/Leuctridae	255
	Gammaridae	1	Perlodidae	8
	Baetidae	54	Elmidae	6
	Ephemerellidae	5	Athericidae	1
	Heptageniidae	16	Tipulidae	10
	Leptophlebiidae	2	Empididae	5
	Isonychiidae	98	Simuliidae	17
	Glossosomatidae	7	Chironomidae	132
	Hydropsychidae	283		

Table 23: Macroinvertebrate Taxa Collected At Each Site (Continued)

NAME AND STREAM CODE	TAXON	COUNT	TAXON	COUNT
ELLIBER RUN PNB-4-V	Turbellaria	1	Capnidae/Leuctridae	480
	Oligochaeta	3	Elmidae	4
	Asellidae	1	Psephenidae	5
	Baetidae	62	Corydalidae	1
	Heptageniidae	12	Veliidae	1
	Leptophlebiidae	12	Tipulidae	5
	Hydropsychidae	113	Chironomidae	13
	Philopotamidae	1		
WHIP RUN PNB-4-W-3	Baetidae	56	Perlidae	6
	Heptageniidae	17	Psephenidae	1
	Leptophlebiidae	4	Corydalidae	2
	Isonychiidae	42	Tipulidae	3
	Hydropsychidae	60	Simuliidae	1
	Philopotamidae	9	Tabanidae	1
	Capnidae/Leuctridae	103	Chironomidae	44
	Peltoperlidae	3		
PATTERSON CREEK PNB-4-{04.6}	Turbellaria	1	Leptoceridae	1
	Oligochaeta	2	Polycentropodidae	3
	Sphaeriidae	1	Capnidae/Leuctridae	1
	Ancylidae	8	Perlidae	1
	Baetidae	4	Coenagrionidae	2
	Caenidae	2	Elmidae	35
	Ephemerellidae	1	Psephenidae	1
	Ephemeridae	1	Sialidae	2
	Heptageniidae	17	Tipulidae	1
	Tricorythidae	1	Ceratopogonidae	1
	Isonychiidae	5	Empididae	1
	Hydropsychidae	14	Simuliidae	1
	Hydroptilidae	1	Chironomidae	65

Table 23: Macroinvertebrate Taxa Collected At Each Site (Continued)

NAME AND STREAM CODE	TAXON	COUNT	TAXON	COUNT
PATTERSON CREEK PNB-4-{20.2}	Turbellaria	2	Polycentropodidae	1
	Oligochaeta	1	Capnidae/Leuctridae	2
	Corbiculidae	1	Perlidae	1
	Pleuroceridae	26	Coenagrionidae	1
	Baetidae	34	Elmidae	43
	Ephemerellidae	21	Corydalidae	14
	Heptageniidae	42	Athericidae	3
	Isonychiidae	28	Empididae	1
	Hydropsychidae	53	Simuliidae	6
	Philopotamidae	20	Chironomidae	2
	Lepidostomatidae	1		
PATTERSON CREEK PNB-4-{29.7}	Nemertea	1	Leptoceridae	3
	Oligochaeta	2	Polycentropodidae	1
	Planorbidae	1	Perlidae	1
	Hydrobiidae	1	Elmidae	6
	Baetidae	13	Hydrophilidae	1
	Ephemerellidae	5	Psephenidae	1
	Heptageniidae	28	Corydalidae	4
	Tricorythidae	4	Tipulidae	1
	Isonychiidae	13	Ceratopogonidae	1
	Brachycentridae	1	Simuliidae	1
	Hydropsychidae	43	Chironomidae	14
	Philopotamidae	1		
PATTERSON CREEK PNB-4-{33.0}	Turbellaria	1	Philopotamidae	76
	Oligochaeta	2	Polycentropodidae	2
	Pleuroceridae	33	Perlidae	10
	Baetidae	75	Gomphidae	1
	Caenidae	4	Elmidae	81
	Ephemerellidae	51	Psephenidae	4
	Heptageniidae	42	Corydalidae	7
	Isonychiidae	114	Athericidae	3
	Brachycentridae	1	Tipulidae	5
	Hydropsychidae	152	Simuliidae	35
	Hydroptilidae	3	Chironomidae	52
	Rhyacophilidae	2		

Table 23: Macroinvertebrate Taxa Collected At Each Site (Continued)

NAME AND STREAM CODE	TAXON	COUNT	TAXON	COUNT
PATTERSON CREEK PNB-4-{39.4}	Pleuroceridae	2	Polycentropodidae	1
	Cambaridae	1	Helicopsychidae	1
	Baetidae	20	Capnidae/Leuctridae	5
	Caenidae	8	Elmidae	6
	Ephemerellidae	18	Psephenidae	4
	Heptageniidae	25	Corydalidae	15
	Isonychiidae	114	Athericidae	7
	Hydropsychidae	121	Tipulidae	3
	Philopotamidae	22	Empididae	3
	Lepidostomatidae	1	Simuliidae	3
	Leptoceridae	2	Chironomidae	30
	Limnephilidae	1		
PATTERSON CREEK PNB-4-{45.2}	Hirudinea	1	Hydroptilidae	1
	Physidae	1	Philopotamidae	57
	Baetidae	13	Leptoceridae	3
	Caenidae	4	Capnidae/Leuctridae	6
	Heptageniidae	10	Elmidae	36
	Leptophlebiidae	1	Corydalidae	4
	Isonychiidae	34	Tipulidae	2
	Hydropsychidae	74	Chironomidae	27
BLOCK RUN PNB-7-C	Oligochaeta	3	Perlidae	1
	Ancylidae	2	Gomphidae	3
	Cambaridae	6	Dryopidae	1
	Baetidae	8	Elmidae	143
	Caenidae	2	Psephenidae	48
	Heptageniidae	19	Ptilodactylidae	3
	Leptophlebiidae	7	Corydalidae	2
	Isonychiidae	6	Veliidae	5
	Hydropsychidae	16	Tipulidae	15
	Philopotamidae	29	Empididae	2
	Polycentropodidae	1	Chironomidae	89
	Capnidae/Leuctridae	45		

Table 23: Macroinvertebrate Taxa Collected At Each Site (Continued)

NAME AND STREAM CODE	TAXON	COUNT	TAXON	COUNT
UNT OF UNT OF NEW CREEK PNB-7-C.4-1-{0.2}	Oligochaeta	1	Elmidae	1
	Physidae	1	Hydrophilidae	1
	Asellidae	1	Corydalidae	2
	Gammaridae	341	Veliidae	1
	Leptophlebiidae	3	Tipulidae	3
	Capnidae/Leuctridae	8	Chironomidae	6
ASH SPRING RUN PNB-7-F-{0.6}	Cambaridae	1	Capnidae/Leuctridae	21
	Gammaridae	1	Perlidae	4
	Baetidae	14	Pteronarcyidae	1
	Heptageniidae	15	Psephenidae	3
	Leptophlebiidae	36	Corydalidae	2
	Glossosomatidae	2	Veliidae	1
	Hydropsychidae	46	Tipulidae	9
	Rhyacophilidae	2	Chironomidae	15
	Philopotamidae	2		
LINTON CREEK PNB-7-H	Turbellaria	1	Capnidae/Leuctridae	326
	Oligochaeta	6	Peltoperlidae	23
	Baetidae	38	Perlidae	5
	Ephemeridae	1	Elmidae	7
	Heptageniidae	5	Corydalidae	5
	Leptophlebiidae	52	Pygalidae	1
	Isonychiidae	1	Tipulidae	36
	Glossosomatidae	1	Empididae	3
	Hydropsychidae	50	Simuliidae	15
	Rhyacophilidae	3	Chironomidae	15
	Philopotamidae	49		
UNT OF LINTON CREEK PNB-7-H-2-{1.0}	Oligochaeta	1	Chloroperlidae	2
	Baetidae	1	Nemouridae	1
	Ephemerellidae	1	Peltoperlidae	1
	Ephemeridae	1	Perlodidae	2
	Heptageniidae	11	Corydalidae	4
	Leptophlebiidae	4	Veliidae	1
	Hydropsychidae	29	Tipulidae	7
	Capnidae/Leuctridae	19	Chironomidae	2

Table 23: Macroinvertebrate Taxa Collected At Each Site (Continued)

NAME AND STREAM CODE	TAXON	COUNT	TAXON	COUNT
NEW CREEK PNB-7-{03.8}	Oligochaeta	2	Philopotamidae	4
	Baetidae	7	Capnidae/Leuctridae	29
	Heptageniidae	13	Elmidae	2
	Isonychiidae	27	Athericidae	6
	Glossosomatidae	1	Tipulidae	23
	Hydropsychidae	32	Empididae	2
	Rhyacophilidae	2	Chironomidae	23
NEW CREEK PNB-7-{08.4}	Oligochaeta	2	Polycentropodidae	1
	Gammaridae	1	Capnidae/Leuctridae	303
	Baetidae	8	Perlidae	1
	Heptageniidae	19	Corydalidae	2
	Leptophlebiidae	6	Tipulidae	3
	Isonychiidae	13	Empididae	3
	Hydropsychidae	68	Chironomidae	61
	Philopotamidae	5		
NEW CREEK PNB-7-{10.4}	Turbellaria	1	Capnidae/Leuctridae	101
	Oligochaeta	6	Elmidae	15
	Baetidae	24	Corydalidae	2
	Heptageniidae	12	Athericidae	1
	Leptophlebiidae	2	Tipulidae	12
	Isonychiidae	3	Ceratopogonidae	1
	Hydropsychidae	126	Empididae	4
	Philopotamidae	2	Chironomidae	47

Table 24: Frequency Of Occurrence Of Macroinvertebrates

TAXON	ECOREGION 67		ECOREGION 69		ALL SITES	
	NUMBER OF SITES	NUMBER OF ORGANISMS	NUMBER OF SITES	NUMBER OF ORGANISMS	NUMBER OF SITES	NUMBER OF ORGANISMS
Chironomidae	28	1132	30	535	58	1667
Hydropsychidae	26	2017	30	1117	56	3134
Tipulidae	25	273	22	121	47	394
Capnidae/Leuctridae	21	1967	22	208	43	2175
Baetidae	26	563	16	218	42	781
Philopotamidae	22	426	16	194	38	620
Corydalidae	23	146	14	48	37	194
Elmidae	22	534	12	40	34	574
Heptageniidae	24	389	10	89	34	478
Oligochaeta	19	47	11	23	30	70
Perlidae	12	45	16	108	28	153
Isonychiidae	20	605	4	19	24	624
Leptophlebiidae	15	137	8	20	23	157
Empididae	15	33	5	5	20	38
Polycentropodidae	10	13	9	31	19	44
Simuliidae	10	81	8	65	18	146
Athericidae	10	29	5	6	15	35
Glossosomatidae	5	12	9	21	14	33
Psephenidae	11	135	3	4	14	139
Cambaridae	4	10	9	12	13	22
Ephemerellidae	10	113	3	3	13	116
Rhyacophilidae	4	9	9	27	13	36
Caenidae	11	91	1	5	12	96
Sialidae	4	6	8	19	12	25
Veliidae	8	14	4	5	12	19
Ceratopogonidae	5	5	4	7	9	12
Gammaridae	5	349	4	55	9	404
Hydroptilidae	6	11	2	2	8	13
Peltoperlidae	3	27	5	19	8	46
Turbellaria	7	8	1	1	8	9
Chloroperlidae	3	6	4	5	7	11
Hydrophilidae	4	14	3	3	7	17
Physidae	6	19			6	19
Pteronarcyidae	2	4	4	6	6	10
Pygalidae	1	1	5	6	6	7
Aeshnidae	2	3	3	6	5	9
Dytiscidae	1	1	4	4	5	5
Gomphidae	4	7	1	1	5	8
Leptoceridae	5	10			5	10
Limnephilidae	1	1	4	8	5	9
Planorbidae	3	5	2	2	5	7

Table 24: Frequency Of Occurrence Of Macroinvertebrates (Continued)

TAXON	ECOREGION 67		ECOREGION 69		ALL SITES	
	NUMBER OF SITES	NUMBER OF ORGANISMS	NUMBER OF SITES	NUMBER OF ORGANISMS	NUMBER OF SITES	NUMBER OF ORGANISMS
Ancylidae	3	11	1	4	4	15
Asellidae	2	2	2	22	4	24
Coenagrionidae	4	5			4	5
Ephemeridae	3	3	1	2	4	5
Pleuroceridae	4	121			4	121
Psychodidae			4	5	4	5
Tabanidae	3	3	1	1	4	4
Calopterygidae	1	2	2	2	3	4
Helicosychidae	3	5			3	5
Lymnaeidae	3	5			3	5
Nemouridae	1	1	2	2	3	3
Tricorythidae	3	8			3	8
Brachycentridae	2	2			2	2
Branchiobdellidae	1	1	1	5	2	6
Chrysomelidae			2	2	2	2
Cordulegastridae	1	1	1	1	2	2
Curculionidae			2	2	2	2
Dryopidae	1	1	1	1	2	2
Gerridae			2	2	2	2
Gyrinidae	2	2			2	2
Lepidostomatidae	2	2			2	2
Muscidae			2	4	2	4
Perlodidae	2	10			2	10
Corbiculidae	1	1			1	1
Corixidae			1	2	1	2
Culicidae			1	2	1	2
Dixidae			1	1	1	1
Hirudinea	1	1			1	1
Hydrobiidae	1	1			1	1
Nemertea	1	1			1	1
Notonnectidae			1	1	1	1
Phryganeidae			1	1	1	1
Ptilodactylidae	1	3			1	3
Sciomyzidae			1	1	1	1
Sphaeriidae	1	1			1	1

Table 25(A): Benthic Macroinvertebrate Community Metrics For Ecoregion 67

STREAM NAME	STREAM CODE	TOTAL TAXA	EPT TAXA	HBI-M	% DOMINANT FAMILY	# INTOLERANT TAXA	BIOSCORE
GREEN SPRING RUN	PNB-01-{4.2}	22	10	4.65	23.74	3	81.82
PATTERSON CREEK	PNB-04-{04.6}	26	13	5.68	37.57	4	72.73
PATTERSON CREEK	PNB-04-{20.2}	21	10	4.10	17.49	7	90.91
PATTERSON CREEK	PNB-04-{29.7}	23	11	4.54	29.25	5	81.82
PATTERSON CREEK	PNB-04-{33.0}	23	12	4.18	20.11	7	90.91
PATTERSON CREEK	PNB-04-{39.4}	23	13	3.82	29.30	6	90.91
PATTERSON CREEK	PNB-04-{45.2}	16	10	4.25	27.01	3	81.82
HORSESHOE CREEK	PNB-04-C.5	23	11	4.94	54.56	5	72.73
ROSSER RUN	PNB-04-CC	20	9	4.60	34.11	4	72.73
MILL RUN	PNB-04-D	6	2	6.95	81.63	0	9.09
THORN CREEK	PNB-04-DD-{2.0}	17	9	2.69	45.83	5	72.73
UNT OF NORTH FORK PATTERSON CREEK	PNB-04-EE-7-{0.4}	17	11	2.62	41.10	6	90.91
MIDDLE FORK/PATTERSON CREEK	PNB-04-FF	19	8	4.98	24.52	4	72.73
UNT OF UNT OF MIDDLE FORK / PATTERSON CREEK	PNB-04-FF-5-A-{0.6}	12	3	3.61	56.41	3	45.45
CABIN RUN	PNB-04-J-{1.6}	14	6	4.93	31.91	2	63.64
PARGUT RUN	PNB-04-J-1	13	6	5.83	54.78	2	45.45
MILL CREEK	PNB-04-S-{04.7}	14	4	5.18	43.35	3	54.55
MILL CREEK	PNB-04-S-{5.6}	19	10	3.74	31.20	6	90.91
ELLIBER RUN	PNB-04-V	15	6	2.29	67.23	2	63.64
WHIP RUN	PNB-04-W-3	15	9	3.49	29.26	5	81.82
NEW CREEK	PNB-07-{03.8}	14	8	3.62	18.50	5	72.73
NEW CREEK	PNB-07-{08.4}	15	9	2.64	61.09	4	72.73
NEW CREEK	PNB-07-{10.4}	16	7	4.06	35.10	4	72.73
BLOCK RUN	PNB-07-C	23	10	4.63	31.36	4	81.82
UNT OF UNT OF NEW CREEK	PNB-07-C.4-1-{0.2}	12	2	4.01	92.41	2	27.27
ASH SPRING RUN	PNB-07-F-{0.6}	17	10	3.82	26.29	6	90.91
LINTON CREEK	PNB-07-H	21	12	2.47	50.70	7	90.91
UNT OF LINTON CREEK	PNB-07-H-2-{1.0}	16	11	3.43	33.33	7	100.00

TOTAL TAXA	Total number of different macroinvertebrate taxa collected
EPT	Number of Ephemeroptera (mayfly), Plecoptera (stonefly), and Trichoptera (caddisfly) taxa collected
HBI-M	Hilsenhoff's Biotic Index – Modified – an index indicating relative pollution tolerance of benthic macroinvertebrates collected
% DOMINANT FAMILY	Percent of total number of organisms which are of the numerically dominant family
# INTOLERANT TAXA	Number of the intolerant taxa

Table 25(B): Benthic Macroinvertebrate Community Metrics For Ecoregion 69							
STREAM NAME	STREAM CODE	TOTAL TAXA	EPT TAXA	HBI-M	% DOMINANT FAMILY	# INTOLERANT TAXA	BIOSCORE
NORTH BRANCH	P-20-{052.0}	7	1	6.50	74.42	0	18.18
NORTH BRANCH	P-20-{081.6}	11	6	4.40	59.49	6	72.73
NORTH BRANCH	P-20-{082.6}	10	5	4.27	46.04	3	63.64
NORTH BRANCH	P-20-{088.9}	10	5	5.21	64.17	5	63.64
NORTH BRANCH	P-20-{097.9}	14	7	4.58	41.67	4	90.91
NORTH BRANCH	P-20-{101.8}	12	5	5.77	48.94	1	45.45
SLAUGHTERHOUSE RUN	PNB-10	11	6	5.30	24.75	3	63.64
DEEP RUN	PNB-15	11	8	3.81	34.26	5	90.91
CRANBERRY RUN	PNB-15-A (D1)	15	7	4.44	33.56	3	81.82
CRANBERRY RUN	PNB-15-A (D2)	15	11	2.91	35.53	7	100.00
UNT OF ABRAMS CREEK	PNB-16-.5A-{0.4}	9	4	4.64	51.38	2	54.55
ABRAM CREEK	PNB-16-{05.4}	3	1	5.42	70.83	0	18.18
ABRAM CREEK	PNB-16-{16.8}	6	3	4.94	72.22	0	18.18
ABRAM CREEK	PNB-16-{18.1}	5	1	6.60	20.00	0	27.27
EMORY CREEK	PNB-16-A-{0.8}	6	3	4.68	71.13	1	18.18
WYCKOFF RUN	PNB-16-B (D1)	21	9	4.47	50.37	5	90.91
WYCKOFF RUN	PNB-16-B (D2}	17	9	4.58	52.69	6	90.91
LAUREL RUN	PNB-16-B.5	7	3	5.06	75.38	1	27.27
STONY RIVER	PNB-17-{06.9}	16	11	4.60	45.36	6	90.91
STONY RIVER	PNB-17-{09.6}	14	8	4.87	57.27	4	81.82
STONY RIVER	PNB-17-{15.6}	10	5	5.74	47.44	3	54.55
MILL RUN	PNB-17-B	16	10	4.01	25.95	5	100.00
LAUREL RUN	PNB-17-B.5	10	2	6.55	54.55	2	36.36
FOURMILE RUN	PNB-17-C	5	1	5.50	33.33	0	36.36
LAUREL RUN	PNB-17-D	11	3	5.90	40.82	1	36.36
HELMICK RUN	PNB-17-E	9	3	5.61	44.64	2	45.45
DIFFICULT CREEK	PNB-18	16	11	3.16	15.38	8	100.00
BUFFALO CREEK	PNB-19-{1.4}	20	13	3.75	22.78	8	100.00
LITTLE BUFFALO CREEK	PNB-19-A	4	2	4.75	81.25	1	18.18
RED OAK CREEK	PNB-20	6	5	3.65	32.35	2	63.64
ELK RUN	PNB-21 (D1)	11	3	5.21	28.57	1	45.45
ELK RUN	PNB-21 (D2)	10	2	5.90	48.94	1	27.27
DEAKIN RUN	PNB-22	9	3	4.74	34.29	3	54.55

TOTAL TAXA	Total number of different macroinvertebrate taxa collected
EPT	Number of Ephemeroptera (mayfly), Plecoptera (stonefly), and Trichoptera (caddisfly) taxa collected
HBI-M	Hilsenhoff's Biotic Index – Modified – an index indicating relative pollution tolerance of benthic macroinvertebrates collected
% DOMINANT FAMILY	Percent of total number of organisms which are of the numerically dominant family
# INTOLERANT TAXA	Number of the intolerant taxa

Appendix B: Glossary

303(d) list -a list of streams that are water quality limited and not expected to meet water quality criteria even after applying technology-based controls. Required by the Clean Water Act and named for the section of the Act in which it appears.

acidity -the capacity of water to donate protons. The abbreviation pH (see definition) refers to degree of acidity. Higher acidities are more corrosive and harmful to aquatic life.

alkalinity -measures water's buffering capacity or resistance to acidification; often expressed as the concentration of carbonate and bicarbonate.

aluminum -a potentially toxic metallic element often found in mine drainage; when oxidized, forms a white precipitate called "white boy".

AMD or acid mine drainage -acidic water discharged from an active or abandoned mine.

benthic macroinvertebrates - small animals without backbones yet still visible to the naked eye, that live on the bottom (the substrate) of a water body. Examples include insects, worms, snails, clams, and crayfish.

benthic organisms, or benthos - organisms that live on or near the substrate (bottom) of a water body, e.g., algae, mayfly larvae, and darters.

buffer -a dissolved substance that maintains a solution's original pH by neutralizing added acid.

canopy -The layer of vegetation that is more than 5 meters from the ground; see understory and ground cover.

citizens monitoring team -a group of volunteers that periodically check the ecological health of their local streams.

conductivity (conductance) -the capacity of water to conduct an electrical current; higher conductivities indicate higher concentrations of ions.

DEP or Division of Environmental Protection -a regulatory unit in the executive branch of West Virginia's state government charged with enforcing environmental laws and monitoring environmental quality.

designated uses -the uses specified in the state water quality standards for each waterbody or segment (e.g., "fish propagation" or "industrial water supply").

discharge -liquid flowing from a point source; the volume of water flowing down a stream per unit of time, typically recorded as cfs (cubic feet / second).

discharge permit -a legal document issued by a government regulatory agency specifying the kinds and amounts of pollutants a person or group may discharge into a water body; often called National Pollutant Discharge Elimination System (NPDES) permit.

dissolved oxygen - the amount of molecular oxygen dissolved in water.

ecoregion -a land area with relative homogeneity in ecosystems that, under nonimpaired conditions, contain habitats which should support similar communities of animals.

ecosystem -the complex of a community and its environment functioning as an ecological unit in nature. A not easily defined aggregation of biotic and abiotic components that are interconnected through various feeding pathways, and interact systematically in the transfer of nutrients and energy.

effluent -liquid flowing from a point source (e.g., pipe or collection pond).

EPA or Environmental Protection Agency -a unit in the executive branch of the federal government charged with enforcing environmental laws.

EQB or Environmental Quality Board -a standing group, whose members are appointed by the governor, that promulgates water quality criteria and judges appeals for relief from water quality regulations.

ephemeral -a stream that carries surface water during only part of the year; a stream that occasionally dries up.

eutrophic -a condition of a lake or stream which has higher than normal levels of nutrients contributing to excessive plant growth. Usually etropic waters are seasonally deficient in oxygen. Consequently more food and cover is provided to some macrobenthos than would be provided otherwise.

fecal coliform bacteria -a group of single-celled organisms common in the alimentary tracts of some birds and all mammals, including man; indicates fecal pollution and the *potential* presence of human pathogens.

ground cover -vegetation that forms the lowest layer in a plant community (defined as less than 0.5 meters high for this assessment) .

impaired -(1) according to water quality standards, a stream that does not fully support one or more of its designated uses; (2) as used in this assessment report, a benthic macroinvertebrate community with metric scores substantially worse than those of an appropriate reference site, or having a bioscore below 50.

iron -a metallic element, often found in mine drainage, that is potentially harmful to aquatic life. When oxidized, it forms an orange precipitate called “yellow boy” that can clog fish and macroinvertebrate gills.

lacustrine - of or having to do with a lake or lakes.

MACS -Mid-Atlantic Coastal Streams -macrobenthic sampling methodology used in streams with very low gradient that lack riffle habitat suitable for the Program’s preferred procedure.

manganese -a metallic element, often found in mine drainage, that is potentially harmful to aquatic life.

metrics -statistical tools used by ecologists to evaluate biological communities.

mg/l – milligrams per liter.

nonimpaired -(1) according to water quality standards, a stream that fully supports all of its designated uses: (2) as used in this assessment report, a benthic community with metric scores comparable to those of an appropriate reference site.

NPDES or National Pollutant Discharge Elimination System -a government permitting activity created by section 402 of the federal Clean Water Act of 1972 to control all discharges of pollutants from point sources. In West Virginia, this activity is conducted by the Office of Water Resources.

NPS or nonpoint source pollution -contaminants that run off a broad landscape area (e.g., plowed field, parking lot, dirt road) and enter a receiving water body.

OWR or Office of Water Resources -a unit within the DEP that manages a variety of regulatory and voluntary activities to enhance and protect West Virginia's surface and ground waters.

Oligotrophic - a stream, lake or pond which is poor in nutrients.

Palustrine - of or having to do with a marsh, swamp or bog.

pH -indicates the concentration of hydrogen ions; a measure of the intensity of acidity of a liquid. Represented on a scale of zero-14, a pH of one describes the strongest acid, 14 represents the strongest base, and seven is neutral. Aquatic life cannot tolerate either extreme.

point source -a specific, discernible site (e.g., pipe, ditch, container) locatable on a map as a point, from which pollution discharges into a water body.

Program, (the) – the Watershed Assessment Program, a program within the Office of Water Resources, Division of Environmental Protection.

reference site -a stream reach that represents an area's (watershed or ecoregion) least impacted condition; used for comparison with other sites within that area. Site must meet the agency's minimum degradation criteria.

SCA -Soil Conservation Agency

stakeholder -a person or group with a vested interest in a watershed, e.g., landowner, businessperson, angler.

STORET -STOrage and RETrieval of U.S. waterways parametric data -a system maintained by EPA and used by OWR to store and analyze water quality data.

TMDL or total maximum daily load -the total amount of a particular pollutant that can enter a water body and not cause a water quality standards violation.

turbidity -the extent to which light passes through water, indicating its clarity; indirect measure of suspended sediment.

understory -the layer of vegetation that forms a forest's middle layer (defined as 0.5 to five meters high for this assessment).

UNT – unnamed tributary.

USGS -United States Geological Survey.

water-contact recreation -the type of designated use in which a person (e.g., angler, swimmer, or boater) comes in contact with the stream's water.

watershed -a geographic area from which water drains to a particular point.

Watershed Approach Steering Committee -a task force of federal (e.g., U.S. EPA, USGS) and state (e.g., DEP, SCA) officers that recommends streams for intense, detailed study.

Watershed Assessment Program (the Program) -a group of scientists within the OWR charged with evaluating and reporting on the ecological health of West Virginia's watersheds.

watershed association -a group of diverse stakeholders working via a consensus process to improve water quality in their local streams.

Watershed Network -an informal coalition of federal, state, multi-state, and non-governmental groups cooperating to support local watershed associations.

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